Energy Planning & Implementation Guidebook for Vermont Communities

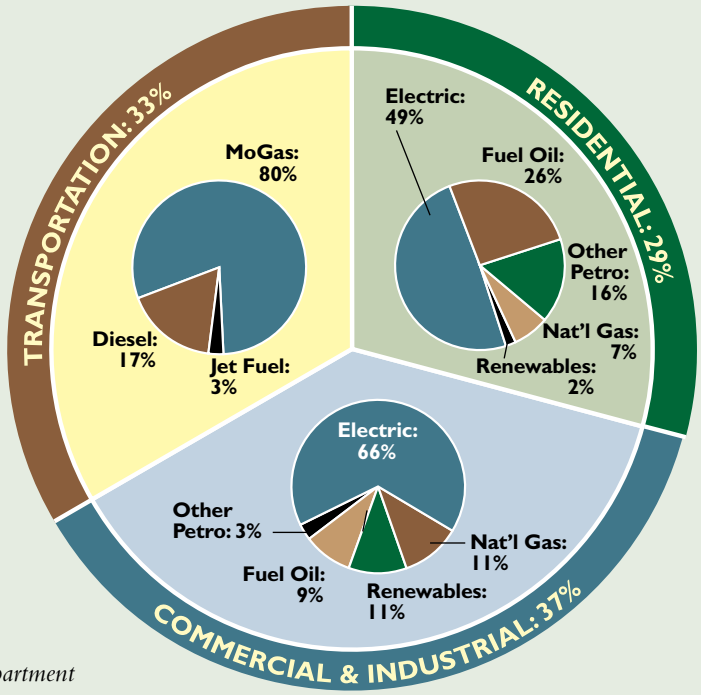
April 2011

VNRC Vermont Natural Resources Council

Vermont League of Cities & Towns

Vermont's Energy Mix

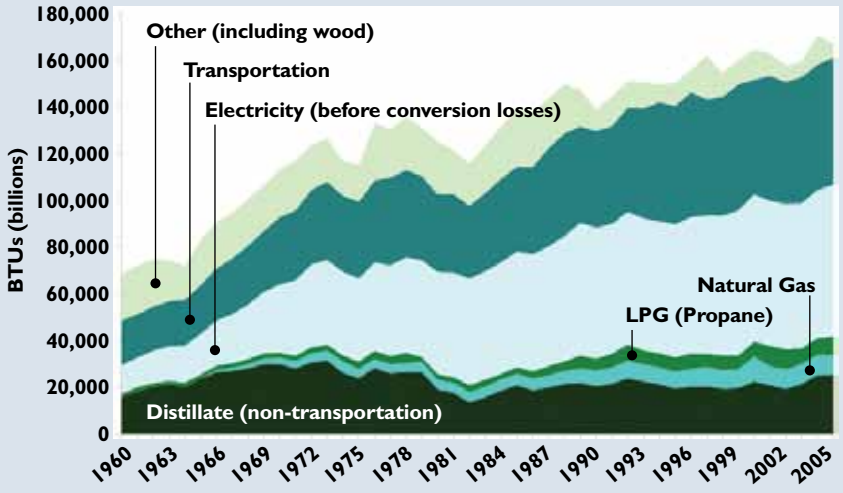
Vermont's heaviest energy use is in commercial and industrial enterprises and the transportation sector. Without a significant shift in the way that Vermont uses energy and the sources by which we obtain it, the state will fall short in meeting its energy efficiency, renewable energy and climate action goals.



Source: Vermont Public Service Department

Vermont's Energy Consumption By Category

Vermont's energy consumption has risen significantly from 1960 to 2005, most notably in the transportation and electrical sectors. Without reducing consumption and increasing investments and activity in conservation and efficiency, it's likely those numbers will continue to rise.



Source: Vermont Public Service Department

Energy Planning and Implementation Guidebook for Vermont Communities

April 2011

Table of Contents

Photo credits: Cover photos: 1-3 VNRC, 4 Bob Walker-SERG; Page 4: Trent Campbell; Page 8: Waterbury LEAP; Page 10: Bob Walker-SERG; Page 11 (top): Efficiency Vermont and HEART (lower); Page 22: Central Vermont Community Action Council; Page 25 (lower): Steve Webster; Page 27: Bast & Rood Architects; Page 36: Chittenden County Regional Planning Commission; Page 44 (top): Green Mountain Power; Page 45: Carrie Fenn; Page 48: City of Montpelier (left) and Upper Valley Transporatation Management Association (right); Page 49: Ken Perotte; Page 52: David Thurlow.

Acknowledgements

The ***Energy Planning and Implementation Guidebook for Vermont Communities*** is the culmination of the efforts of numerous individuals and organizations, and the result of collaboration between the Vermont Natural Resources Council (VNRC) and the Vermont League of Cities and Towns (VLCT).

Principal authors of the Guidebook are Johanna Miller and Brian Shupe of VNRC and Stephanie Smith of VLCT. Additional advice and assistance was provided by Abigail Friedman and Karen Horn of VLCT.

Research and writing assistance was provided by VNRC interns Elizabeth McDonald (Vermont Law School), Erin Lavoie, (Vermont Law School), Daniel Burke (Vermont Law School), Maddie Brown (University of Vermont) and Mikayla McDonald.

VNRC and VLCT are also grateful to the following individuals for their help in drafting, editing, reviewing or otherwise supporting the creation of this guide including:

- Adam Sherman and Kamalesh Doshi (Biomass Energy Resource Center)
- Sharon Murray (Front Porch Planning & Design)
- Jim Ashley (Green Mountain Geothermal)
- Greg Strong and Jon Griesser (Spring Hill Solutions)
- Chris Sargent (Two Rivers-Ottauquechee Regional Commission)
- Stephanie Congo (Vermont Agency of Agriculture)
- Shane Jaquith (Vermont Agency of Natural Resources)
- George Twigg (Vermont Energy Investment Corporation)
- Scott Sawyer and Netaka White (Vermont Sustainable Jobs Fund)
- Jamison Ervin (Waterbury LEAP)
- And all of the many contacts in the accompanying *Communities Tackling Vermont's Energy Challenges, Volume II* of this guide, who shared their stories, photos and lessons learned.

VNRC and VLCT would really like to thank the High Meadows Fund and the The Harris and Frances Block Foundation for their generous support to make the production and distribution of this guide possible.

April 2011

I. Why Prepare an Energy Plan?

"You got to be careful if you don't know where you're going because you might not get there."
— Yogi Berra (1925-present)

Everyone plans at some time in his or her life, typically because we want to accomplish something – some goal or aspiration – or to avoid or prevent some unwanted future condition. We plan our meals, vacations, careers, and families. In planning, we use available facts and information to help us understand our present circumstances, make the best guess about the future, and choose the best and most practical steps to accomplish our goals.

The same concept is good for cities and towns. That is a primary reason why it has long been state policy to encourage Vermont communities to prepare municipal plans. It is a way to engage the community in a discussion of shared concerns and values and for community members to prepare for the future.

Energy planning has been a required element of municipal planning in Vermont for over 20 years. In recent years local governments have become much more aware of the many benefits of energy planning across their communities. These include:

- **Municipal Cost Savings.** Increased energy efficiency and energy conservation in municipal facilities and operations can reduce fuel and utility bills over the long term – well beyond the costs of the initial investment. And, local renewable energy generation, if used to power municipal facilities, can reduce fuel and utility bills.
- **Increased Revenues.** Renewable energy facilities may result in substantial revenues for municipalities and offset municipal property taxes.
- **A Strong Economy.** For most communities today, 70-80% of money spent on energy leaves town, going to utilities, oil companies, and state and federal taxes. By investing in energy efficiency or local renewable energy projects, a larger portion of that money will remain in the community, stimulating the local economy. In addition, energy efficiency and renewable energy investments create local employment both directly and indirectly.
- **Greater Energy Independence and Security.** Reduced reliance on external energy sources can safeguard residents and businesses from worldwide energy price shocks and supply shortages. It can also serve to ready communities and residents for a world with dwindling oil supplies.
- **Local Influence Over Energy Facility Siting.** In Vermont, electric generation and transmission facilities that are required to receive a Certificate of Public Good from the Vermont Public Service Board (PSB) – which includes any facility that is connected to the electrical grid – are exempt from regulation under municipal land use regulations, such as zoning bylaws. However, the PSB must consider the municipal plan in granting Certificates of Public Good, so having a clear plan is the principal tool for municipalities to influence the development of energy facilities.
- **More Efficient Communities.** Energy planning, especially if integrated with land use and transportation plans, will result in more compact and efficient use of land, leading to transportation options and shorter travel times and lower operating costs for businesses and residents. This is consistent with the desire of many Vermont communities – and state policies – to protect the state's working landscape and promote compact development in existing centers and planned growth centers.
- **Healthier Communities.** Reduced energy use can lead to improved local air quality and associated health benefits. Efficient land use and transportation planning can also promote walking and cycling opportunities, thus promoting healthier lifestyles and reducing levels of obesity and related ailments.
- **A Clean Environment.** Energy efficiency and renewable energy result in reduced greenhouse gas emissions, improved air quality, and healthier ecosystems. Vermont communities of all sizes have expressed a desire to combat climate change, and addressing local energy demand and generation is among the most direct means of doing that.
- **Regional Coordination and Collaboration.** Because many energy issues transcend municipal – as well as state and national – boundaries, the process of preparing an energy plan is an opportunity to consider local needs, opportunities, and challenges in a broader context.

There are many other reasons for communities to adopt an energy plan, including state incentives that are available to communities that have adopted a plan and the greater authority granted to communities that have plans in place. It is not only important that communities adopt a plan, but that the process of preparing the plan is inclusive and engages the largest number of residents, landowners, and other stakeholders to chart out a road map to a shared future – a road map that not only charts a course,

but includes the specific programs, policies, and investments needed to get there.

Planning to Meet Vermont's Energy Goals

In recent years, the Vermont state government has established several clear and ambitious goals related to energy efficiency, in-state generation of renewable energy and the reduction of greenhouse gas emissions (GHG). In 2007, the Governor's Climate Change Commission recommended that GHG be reduced from 1990 levels by 50% by 2028, and 75% by 2050. To achieve a 75% reduction by 2050, the Commission determined that 30-50% of the cuts must come from efficiency measures. To help reach this goal, the Vermont Legislature established statewide goals "to improve substantially the energy fitness of at least 20% of the state's housing stock by 2017 (more than 60,000 housing units), and 25% of the state's housing stock by 2020 (approximately 80,000 housing units)."[1]

With regard to renewable energy production, the Vermont Legislature established the Sustainably Priced Energy Enterprise Development (SPEED) program in 2005 with the goal of generating a minimum of 20% of total statewide electric retail sales from SPEED projects by 2017. To qualify as a SPEED project, the generating facility must be located in Vermont, must produce energy using renewable sources, and must come into service after December 31, 2004. The SPEED goal was largely met by 2011, however, and is expected to be expanded.

Meeting the state goals for energy efficiency and renewable energy generation will require a concerted effort at the local, regional and state level. Thoughtful municipal energy planning is a critical piece of a comprehensive strategy.

How to Use this Guidebook

This guidebook is presented in two volumes. Volume One, the *Energy Planning & Implementation Guidebook for Vermont Communities* is intended to update the *Guide to Municipal Energy Planning* prepared by the Vermont Department of Public Service in 1993. It addresses the process of preparing an energy plan, including resources available to aid in that process and identifies the various implementation tools that can put that plan into action at the community level. Volume Two, *Communities Tackling Vermont's Energy Challenges*, presents several dozen case studies of projects that Vermont communities have initiated to address their energy goals. These are intended to illustrate, through example, the types of implementation strategies communities are undertaking to reshape Vermont's energy future. As you will see, throughout the guidebook are short snapshots of inspiring case studies you can read in far greater detail in Volume Two.

Both print and web versions of the guidebook are available. One goal of the authors is to regularly update the case studies in the web version of the publication as more communities undertake interesting energy-related projects. This should help local planners and energy committees to be aware of the innovation and hard work of their colleagues around the state and to celebrate the ingenuity of Vermont's cities and towns. Web versions are available on the following organization's web sites:

Vermont Energy & Climate Action Network:
www.vecan.net

Vermont League of Cities & Towns:
www.vlct.org

Vermont Natural Resources Council:
www.vnrc.org

With regard to online resources identified in this guidebook, with the exception of the three web sites listed above, references are hyperlinked so that readers using the online version could link directly to the site. Throughout the guidebook, these references are italicized. Actual web addresses (URLs) were not, however, included in the main body of the document. The web addresses for all references cited are listed in Appendix A.

In writing this guidebook the authors attempted to avoid redundancy with readily available publications that address more general, or a broader range of, community planning tools and techniques. Readers interested in developing a deeper understanding of the statutory foundation of planning in Vermont, community outreach and engagement techniques, or specific regulatory implementation tools, are encouraged to review those resources. Among the most relevant is the *Planning Manual for Vermont Municipalities* published by the Vermont Department of Economic, Housing & Community Development (DEHCD) in 2000, *Citizen Participation Strategies for Municipal Planning in Vermont* prepared by the University of Vermont's Center for Rural Studies in 2004, and the *Vermont Land Use Planning Implementation Manual* published by DEHCD in 2007 (and subsequently updated to include a topic paper addressing Energy Efficiency, Conservation, & Renewable Energy). These documents, and other helpful resources, are available on-line at the Vermont Planning Information Center.

CASE STUDY: Starksboro Power Purchase Agreement

A public/private partnership will help power the rural town's municipal buildings and elementary school with clean, renewable and affordable energy.

II. Introduction to Local Energy Planning in Vermont

Most communities will prepare an energy plan as a separate element, or chapter, of a municipal plan, although some may choose to adopt a separate, stand-alone document, such as a climate action plan. Incorporating the energy plan into a municipal plan has several advantages, including:

- The comprehensive nature of the municipal plan supports the integration of the energy plan with related topics, such as transportation, land use, and community facilities;
- The municipal plan serves as the basis for the adoption of local regulations, capital investments, and municipal energy programs;
- The municipal plan is intended to serve as the principal policy document for the municipality and is designed to guide the decisions of regional and state entities in several formal processes, including Act 250 and PSB proceedings under 30 V.S.A. Section 248;
- Municipal plans are typically evaluated and updated on a regular basis (they presently expire every five years); and
- The process for adopting a municipal plan is public and inclusive, requiring formal hearings and adoption by both the planning commission and selectboard.

State law does not mandate that Vermont municipalities engage in a planning process, although most local officials recognize the benefits of planning for the future. Consequently, more than 90% of Vermont communities have adopted a municipal plan within the past five years. In addition to the municipal plan, municipalities are authorized to adopt "supporting plans[2]" as stand-alone documents and incorporate those plans into the municipal plan. There are a handful of communities that have adopted energy and climate action plans separate from the municipal plan. This guidebook, however, presumes that most energy planning will occur within the context of the municipal plan. Should a community opt to develop an energy plan as a supporting plan, the information presented in this guidebook related to data collection and analysis, policy development and implementation remain relevant. Unless incorporated into the municipal plan, however, those communities will not realize all of the aforementioned benefits.

Vermont's Planning Framework

The Vermont Legislature, through Chapter 117 of Title 24 of the Vermont Statutes Annotated, has authorized municipalities to undertake comprehensive planning programs, adopt municipal plans, and implement those plans through a variety of tools. "Chapter 117" provides the policy framework for planning in the state. It encourages a coordinated planning effort among state and regional planning agencies and municipalities and requires citizen participation at all levels of a planning process. Chapter 117 also provides the methods and tools for local planning, including information on the roles of municipal officials and the public and the adoption process of both the municipal plan and regulatory and non-regulatory implementation strategies that conform to the plan.

The municipal plan is the principal policy document that guides many municipal government decisions. It is the foundation for local land use regulation, the capital budget, natural resource conservation strategies, and energy programs. In fact, a municipality must have adopted a plan to enact or revise land use regulations, and state law requires that local bylaws be in "conformance with the plan."

A comprehensive municipal plan alerts regional and state agencies to community priorities, including local energy policy. Act 250 district commissions consider municipal plans under criterion 10, as does the PSB in the Certificate of Public Good (Section 248) review process. Because the municipal plan is an important consideration in these regulatory review processes, it is important for a municipality to clearly articulate its values and goals for its energy future and related policies as part of the municipal plan. For a description of how the PSB considers the municipal plan as part of the Section 248 process see sidebar on page 26.

Required Contents of the Municipal Plan

If a municipality chooses to prepare a plan, Chapter 117 requires that the plan include 10 elements, including an energy plan. The energy element of a comprehensive plan must include:

- an analysis of energy resources, needs, scarcities, costs, and problems within the municipality;
- a statement of policy on the conservation of energy, including programs, such as thermal integrity standards for buildings, to implement that policy;
- a statement of policy on the development of renewable energy resources; and
- a statement of policy on patterns and densities of land use likely to result in conservation of energy.

Energy planning also relates to other elements of the municipal plan, most directly the land use, transportation, and the facility and utility plans. In addition to the issues that must

Required Municipal Plan Elements

Vermont municipalities are not required to adopt a plan, although those that do are required to prepare a comprehensive plan that includes the following elements:

1) A statement of the objectives, policies and programs of the municipality
2) A land use plan
3) A transportation plan
4) A utility and facility plan
5) A statement on the preservation of rare and irreplaceable natural areas, scenic and historic features and resources
6) An educational facilities plan
7) A recommended program for the implementation of the plan
8) A statement of how the plan relates to plans and development trends of neighboring communities and the region
9) An energy plan
10) A housing element

For more detailed information regarding the required contents, and preparation and adoption, of a municipal plan see the *Planning Manual for Vermont Municipalities* last updated by the DEHCD in 2000.

Energy Related State Planning and Development Goals

It is the intent of the state that "municipalities, regional planning commissions and state agencies shall engage in a continuing planning process that will further the following goals:"

(1) Plan development to maintain historic settlement patterns of compact village and urban centers, separated by rural countryside.

(4) Provide for safe, convenient, economic and energy efficient transportation systems that respect the integrity of the natural environment, including public transit options and paths for pedestrians and bicyclers.
(A) Highways, air, rail and other means of transportation should be mutually supportive, balanced and integrated.

(7) Encourage efficient use of energy and development of renewable energy resources.

be addressed in these plan chapters, a municipal plan must also include a "recommended program for the implementation of the plan." The plan should clearly spell out the actions that the community must take to achieve its desired future. The energy plan is typically implemented through identified actions or tasks in the comprehensive plan, including such statutory tools as land use regulations and capital budgeting, as well as a host of energy programs.

The 10 required planning elements are not the only topics that a municipality may address. For instance, a plan for a healthy community is not a listed element; however, policy decisions that promote healthy behavior and support state planning goals may complement an energy plan. A policy supporting community health, efficient use of energy resources, and alternative transportation networks may include constructing or retrofitting sidewalks and bicycle lanes and providing amenities like benches and bike racks or lockers to encourage use of these systems.

Vermont's State Planning & Development Goals

Chapter 117 also includes state planning and development goals that guide not only the local planning process and related policies, but also regional and state planning efforts. These include goals for energy efficiency and renewable energy development, as well as energy efficient land use patterns and transportation facilities. Municipalities are encouraged to adopt plans that are consistent with the planning and development goals. Regional planning commissions cannot confirm[3] local planning programs unless the municipal plan is consistent with these goals.

Roles, Responsibilities, and Relationships

Despite specific statutes that describe the required content of municipal plans, Vermont's towns, cities and villages actually have broad discretion in drafting plans. No two communities are alike, and each will choose the policies and programs that are most appropriate to its unique circumstances. The local boards responsible for drafting and adopting those plans, however, are generally the same in each community. Understanding who has jurisdiction over specific actions will help energy committees, interested citizens, and others participate in the process and advance energy policies or conservation strategies.

Selectboard: The selectboard (or legislative body – see sidebar on page 8) is at the center of Vermont's local government. It is the elected body that is responsible for the general supervision and control over the affairs of the municipality. The selectboard has the authority to adopt a municipal plan upon receipt from the planning commission and after a public hearing (unless the voters have opted to adopt a municipal plan by a vote of the municipality). The selectboard also is charged with a wide range of duties that relate to energy plan implementation, including:

- adopting a capital budget;
- proposing an annual budget to the voters (after a public hearing);
- overseeing the maintenance, operation, and improvement of most municipal buildings and facilities (excluding schools and, in some communities, other facilities such as libraries);
- authorizing a variety of grant applications; and
- adopting land use regulations (after a public hearing, unless

the selectboard or voters opt to submit the regulations to the voters).

This combination of responsibilities uniquely positions a legislative body to adopt and implement energy planning policy within local government. The selectboard can also provide leadership by setting an example on a variety of energy issues, such as maximizing efficiency in municipal buildings and operations.

Planning Commission: A planning commission may be created at any time by a selectboard, and its members are either appointed or elected by the voters (the majority of towns have appointed planning commissions). The planning commission has many responsibilities, including the preparation of the municipal plan. As part of that process, the planning commission typically oversees the public outreach efforts, coordinates with other stakeholders, and may delegate some of the preparation process to committees or other entities, such as an energy committee. The commission may also undertake studies related to a wide range of topics, including energy policies and programs.

The planning commission is also responsible for certain aspects of the plan's implementation, including the preparation of land use regulations and making recommendations to the selectboard regarding the adoption of such regulations. It is authorized to prepare and submit to the selectboard a capital budget and program and may prepare and recommend building, plumbing, fire, electrical, housing, and related codes and enforcement procedures, and construction specifications for streets and related public improvements.

Climate Action Plans:
An Energy Plan and More

What is a climate action plan?

A climate action plan (CAP) is the result of a process wherein communities attempt to measure (e.g. a carbon inventory), plan for, and reduce their greenhouse gas emissions and climatic impact through energy efficiency, renewable energy, and various other sustainability initiatives. The goal is to create a roadmap and decision making framework for understanding where and how to achieve the most cost-effective emission reductions.

Mitigation strategy categories may include energy efficiency in buildings, renewable energy resources, municipal government transportation, community transportation, waste reduction and recycling, local farms, gardens, and food production, and urban forestry and carbon offsets.

How do carbon inventories differ from energy inventories?

Energy use is often a direct proxy for greenhouse gas emissions. Carbon inventories simply take energy action plans one step further. Energy inventories focus on energy consumption – the number of kilowatt hours of electricity used, the gallons of propane consumed etc. If a municipality chooses to conduct a carbon inventory, the greenhouse gas emissions associated with their energy usage can be calculated easily. Energy inventories are often preferable because of the direct relationship between energy savings and cost savings. In addition, most people are more familiar with kilowatt-hours and gallons of fuel oil, rather than tons of carbon dioxide.

Municipalities may choose to conduct an inventory using the GHG Protocol, the accounting framework for nearly every GHG standard and program in the world, including the Climate Registry and the U.S. E.P.A's Climate Leaders program. More commonly, municipalities have joined the International Council for Local Environmental Initiatives (ICLEI), now officially called 'ICLEI - Local Governments for Sustainability.' ICLEI was founded in 1990 and provides information, tools, training, and technical consulting to build capacity, share knowledge, and support local governments in the implementation of sustainable development at the local level.

Conducting a municipal GHG inventory and climate action plan using ICLEI

ICLEI encourages its municipal members to follow a five-milestone process. This process includes (1) conducting a baseline emissions inventory, (2) establishing an emissions reduction target, (3) developing a local action plan, (4) implementing the local action plan, and (5) measuring results.

For the purpose of measuring municipal emissions, this framework depends on the collection of several data sources. ICLEI first organizes these data sources into community and government categories, and second by sector. Community sectors include: residential, commercial, industrial, transportation, waste, and other. Each of these is then further divided into more detailed emission sources. Government sectors include: buildings, streetlights and traffic signals, airports, water supply and wastewater facilities, solid waste, fleet vehicle, employee commuting, transit fleet, electric power, fugitive emissions (e.g., from leaking pressurized industrial processes), and refrigerants. These government sectors are then further divided into more detailed emission sources.

How common are municipal climate action plans in Vermont?

Although Vermont has scores of energy and climate groups, few municipalities in the state have both conducted a GHG emissions inventory and written a climate action plan. Among those that have include Burlington, Brattleboro, and Middlebury.

Municipal Legislative Bodies

- **Selectboards** are the most common – but not the only – local legislative body in Vermont.
- **Village trustees** have the authority to exercise powers granted to selectboards, within the boundaries of incorporated villages. This includes the authority to appoint planning commissions, adopt plans and enact bylaws.
- **City Councils (or Boards of Aldermen)** are legislative bodies responsible for incorporated cities. The passage of a charter creates boundaries and the laws that govern the city. In most instances general law related to the preparation and adoption of plans also applies.

Town school districts, and incorporated school districts, fire and water districts also have legislative bodies. For simplicity, the term *selectboard* is used generically in this document to apply to all forms of municipal legislative bodies.

The Value of Volunteers

Most local governments in Vermont rely heavily on volunteers. Not only do they take the time to express their values about their community and participate in shaping its future, they also contribute their time – which adds up.

Selectboards, planning commissions, and energy committees are typically comprised of volunteers. That commitment to community and our collective future as Vermonters is priceless, although some have attempted to quantify the financial benefits that volunteers bring to communities.

According to the non-profit Independent Sector, the average value of an hour of a volunteer's time in Vermont is $17.27. Volunteerism results in contributions of expertise that municipal employees might not have, and if it weren't for volunteers, Vermont's municipalities would need to raise these funds in order to complete the work. Such a dollar amount could be used to calculate "in-kind" contributions when writing grants.

Conservation Commission: There are approximately 75 municipal conservation commissions in Vermont. These local boards are empowered to protect natural resources within their communities, but do not have regulatory powers. Commission projects include: restoration, conservation, education, policy development, land management, proposed development review, and natural resource inventory and monitoring. Conservation commissions often participate in drafting municipal plans and, prior to the creation of a large number of energy committees over the past decade, could be expected to help shape the energy plan. The involvement of conservation commissions can be especially useful on energy issues that overlap with other plan considerations, such as forest and farm land conservation, renewable energy development in undeveloped high elevation locations, and bicycle and pedestrian path planning.

Energy Coordinator: The Legislature created the office of municipal energy coordinator during the height of the national energy crisis in 1975, with amendments addressing the legislative body's authority to appoint in 2007. There are approximately 70 Municipal Energy Coordinators in the state.[4] The selectboard appoints and determines the length of term for an energy coordinator. Energy coordinators have no independent authority to act. They take direction from the selectboard, but also advise local boards and commissions on energy issues.

As the local expert on energy conservation and utilization, he or she should assist the planning commission with its energy planning responsibilities and work closely with regional, state and federal agencies involved in energy planning. The energy coordinator may also be an ex-officio, non-voting member of the planning commission and participate in energy-related policy creation. This means an energy coordinator may be present at all hearings and meetings of the planning commission, and may participate in discussion, but does not have a vote and would not be counted for quorum requirements.

The energy coordinator's specific role is:

- to study both public and private energy use;
- to assist with policy formation;
- to encourage the development and utilization of alternative energy resources; and
- to promote municipal energy conservation efforts.[5]

A municipal energy committee may be chaired by the energy coordinator. The committee and the energy coordinator would assist the planning commission in developing the energy element of the municipal plan.

Energy Committees: There are approximately 100 energy committees currently active in Vermont. The two most common models of energy committee are the municipal energy committee, enabled under state statute[6] as an advisory committee, and the grassroots committee, which is a group that organizes on its own accord and is unaffiliated with municipal government. These two

CASE STUDY: Sustaining a Strong Community Energy Committee

The independent Waterbury LEAP energy committee, which also works closely with the municipality, operates smoothly and methodically to successfully implement many important clean energy strategies.

types of committees have different rules regarding their creation, membership, function, funding, and role in municipal government. Deciding which type of energy committee to organize depends on several factors including the area it will serve (local or regional), its primary activities, the reasons for creating the committee, and funding sources. Regardless of a committee's organizational structure, each should have a clear mission statement and engage the public in its policy discussions and activities.

Municipal Energy Committee: Section 4433 of Chapter 117 authorizes municipalities to establish "advisory committees" to assist the planning commission and selectboard with "preparing, adopting and implementing the municipal plan." There are many types of advisory committees, with conservation commissions and energy committees being the most popular in the state. The energy committee provides an important mechanism for involving more people in the planning process and providing an opportunity for citizens with special skills or interests in energy policies and programs to focus their attention on those topics.

Advisory committees may be formed by either a vote of the municipality, via a charter, or by action or resolution of a selectboard. The resolution, vote, or charter should contain a mission statement that defines the scope of the committee's work and guides its actions. An advisory energy committee may consist of no fewer than three members, all of whom must be residents of the municipality. The selectboard, in its resolution, should determine how many members to appoint and their terms. The selectboard retains the authority to set term lengths, and to appoint and remove members. As a public body, advisory committees must comply with the open meeting law and public records law.

Grassroots Energy Committee: The grassroots energy committee is a group of citizens with an interest in energy issues in their municipality or a larger geographic area. Just like a municipal energy committee it, too, should have a mission statement and regular meetings. The grassroots committee will be bound by its own rules of procedure, although they may choose informal rules and their proceedings are not subject to the open meeting law.

Which type of committee to choose? There are pros and cons to the two different types of energy committees. Establishing an advisory energy committee is an official act of the municipality that reflects its commitment to addressing energy issues and – as part of municipal government – typically results in a formal role in the development of the energy plan. Some people may prefer being part of a committee that is sanctioned by the town, although the resolution forming the committee may limit the scope of its work or areas of responsibility. Also, advisory committees established by the municipality are more likely to receive support through the municipal budget. On the other hand, a grassroots energy committee is not bound by a resolution of the town and not accountable to the selectboard or the voters and may therefore be better able to advance positions on energy policies that are not popular with elected officials. It may also be easier for them to serve multi-town regions. Unlike advisory committees, which are formed expressly to advise on the preparation and implementation of the plan, grassroots committees may be tasked with participating in the preparation of the plan to no greater degree than any other group of citizens who are free to attend hearings and provide comments.

VECAN:

Helping to Harness the Power and Proliferation of Energy Committees

The Vermont Energy & Climate Action Network (VECAN) is a network of organizations helping communities across Vermont to reduce energy costs, promote clean energy solutions and address climate change through programs and policies aimed at promoting conservation, efficiency, renewables, alternative transportation and smart growth land use practices. VECAN's mission is to start, support and strengthen town energy committees. VECAN:

- Serves as an information resource and clearinghouse.
- Provides direct technical assistance and education.
- Facilitates networking among communities and resource providers.

In 2010, there were nearly 100 community energy committees in Vermont. These groups are instrumental in moving clean energy solutions from ideas to action. VECAN strives to be a partner to these groups. Among the resources VECAN can provide communities is the *Town Energy and Climate Action Guide*, a publication designed to help citizens and local officials organize and run energy committees.

To learn more about VECAN or for help starting a new energy committee or getting active in an existing group, visit www.vecan.net.

III. Engaging the Public in Energy Planning

Public engagement is more than an opportunity for local residents to express their opinions about energy issues. It helps to identify and explain relevant issues, challenges and opportunities. What sector has the highest energy use and what can be done to reduce that use? Are there opportunities for cogeneration or small hydro? Does the town support the installation of large-scale wind turbines? These are all questions that should be addressed in the energy plan after an opportunity for public input.

Effective community engagement requires an open, informed dialogue among municipal officials and members of the community. A public engagement process is not only necessary under Vermont law – it also leads to buy-in by citizens and the recognition that the process and outcomes were designed by and for the community. Using a variety of methods to communicate information about the planning process and provide opportunities for citizens to express their values and opinions will result in more effective implementation of the plan.

Identifying and Involving Stakeholders

Regardless of the public outreach approaches used to develop the energy plan, it is important to identify and engage interested "stakeholders." Stakeholders are, generally, those individuals or organizations that may be affected by an action or decision made by a municipality. Stakeholders may engage in different stages of the planning process and have varying responsibilities relative to their authority in making a decision or taking action. A stakeholder who understands when he or she can be most influential and understands the process is better positioned to contribute.

As an example, in a policy discussion on building codes that mandate specific energy standards for new construction and alterations to existing homes, the stakeholders could include property owners, developers and contractors. The interests of affordable housing and preservation advocates are also affected. Other stakeholders are those who initiate the policy discussion, those responsible for making the decision and finally the people who administer the building code.

Besides the many different interests and levels of participation, a stakeholder may step into different roles in the planning process depending on the goals or scope of a program. For instance, a grassroots energy committee is a stakeholder in the creation of energy policy. It might be both an initiator of policy and subsequently the power behind implementing the policy through education and outreach. Stakeholders can be influential in energizing others to participate and in keeping the discussion on energy issues relevant and exciting.

Engagement Tools

There are many methods for engaging the public, although Vermont's planning statutes have little to say about public participation outside of a mandate that a planning commission "solicit the participation of local citizens and organizations by holding informal working sessions that suit the needs of the local people."[7] There are also minimum statutory requirements to hold public hearings prior to adopting municipal plans, bylaws, and other regulatory and some non-regulatory tools. This leaves the door open to innovative approaches to community engagement at all stages of the planning process.

A variety of engagement methods should be used in order to ensure broad participation and to solicit diverse opinions. Relying on a single method may give a skewed view of what the citizens want or imagine for the future of the municipality. For example, an internet-based community survey will exclude those without regular access to a computer. An evening meeting or workshop may not be attended by someone who works nights or lacks access to child-care.

There are many sources of information available to assist communities with public engagement, including a series of fact sheets prepared by the University of Vermont's center for Rural Studies entitled *Citizen Participation Strategies for Municipal Planning in Vermont*. Examples of outreach techniques that are useful for energy planning and commonly used by Vermont communities include:

- **Workshops/Open Houses:** These are among the most common form of public participation. They are generally used

CASE STUDY: Solar Hot Water Challenge

The success of a multi-town initiative to get neighbors in the First Branch area to switch old water heaters to solar relied largely on public meetings, outreach and education.

to provide information and receive feedback, but tend to draw a limited number of people. Communities have found that adding a social aspect, such as a potluck dessert party or other means of sharing food, can generate greater attendance.

- **Surveys/Questionnaires:** Surveys can provide a much broader-based indication of the community's interest and concerns than open houses or workshops. New web-based survey tools, like Survey Monkey, have made surveys easier and less expensive to develop, distribute, and administer, although this excludes citizens without internet access. To increase response rates, surveys should be kept fairly short and simple. Providing incentives for the completion of a survey by offering a drawing for a prize can also significantly increase participation (see sidebar on page 12).

- **Public Displays:** A display panel or kiosk, placed in a well-travelled public location such as a post office, library, farmers market, Town Meeting, or the general store, can be set up to attract participation from audiences that might not otherwise be involved. A display offers the opportunity to both provide information and receive feedback.

- **Information Campaigns:** This typically involves sharing information with the community, but without an opportunity to provide feedback. This is probably best used early in the planning process to build community awareness with the opportunity for public input coming later. Information can be distributed through mailings, local newspapers, community newsletters, community cable programming, web postings, or unstaffed public displays.

- **Stakeholder Engagement (e.g., Interviews and Focus Groups):** It may be beneficial to target the public participation to representatives of larger groups, those with knowledge in the area, or those likely most impacted. Potential stakeholders might include neighborhood associations, transit officials, major employers and industries, utility representatives and energy or environmental organizations.

CASE STUDY: Change-a-Light Challenge

In 2003, Poultney undertook a successful community involvement and education initiative to change out incandescent lightbulbs to energy-saving CFLs.

- **Websites and Social Networking:** Establishing an on-line presence as a way to share information with the public is increasingly common. There are several online techniques for doing this, many of which provide interactive opportunities for stakeholders to provide input into the planning process. These include web pages and blogs, as well as social networking programs like Facebook and on-line surveying programs.

- **Energy Fairs:** A local energy fair – typically hosted by a community energy committee – is an effective means of sharing information on energy efficiency, renewable energy and sustainability with community residents. An energy fair can be a way to implement an energy plan through community outreach and education as well as a way to share information and receive feedback from participants.

- **Partnering with Other Organizations:** Many communities have local non-profit groups or other organizations interested in promoting energy planning. Partnering with these groups early in the process can be valuable in getting public buy-in.

CASE STUDY: Hardwick Energy Fair

Over 1,200 people attended Hardwick's sustainable living and agricultural fair in Vermont's Northeast Kingdom in 2009.

Conducting a Community Energy Survey

A survey or questionnaire is a useful tool for gathering local information about energy consumption and costs, attitudes toward the development of local renewable energy resources, support for local efficiency policies and programs, and a variety of other important topics. Conducting a statistically valid survey, however, can be expensive and time consuming. Surveys must be carefully prepared and administered to get valid results. Data entry, collation, creation of a computer database, cross-tabulations, and analysis can be time-consuming tasks. Sampling techniques can be used to collect information from a small group of individuals who are representative of the entire municipality, but unless the sample size and selection are properly determined the results will have little value.

Energy surveys typically focus on two general types of information: data about energy use, and public opinions about energy needs, potential programs, and policies. Most town plan surveys will be designed to gather both types of information to best shape the energy plan. Common information collected includes:

- types and costs of primary and secondary heating fuels;
- types of heating and hotwater systems;
- past energy retrofits;
- travel behavior;
- attitudes regarding renewable energy development in the community; and
- support and interest in participating in voluntary programs (e.g., home weatherization, Way to Go! Commuter Challenge, the Property Assessed Clean Energy financing program, etc).

It is important to note that communities have found that data supplied by homeowners regarding technical information, such as insulation levels and related topics, are often unreliable. Likewise, consumers' perceptions of their fuel consumption, in fuel units or dollars, are often inaccurate. Therefore, getting valid fuel consumption information is difficult and should be checked against statewide and national averages.

Surveys can be conducted in a number of different ways, but in order to get meaningful information it is necessary to consult with people who are experienced in defining an appropriate sample size and questionnaire. Communities often conduct a general townwide survey as part of a municipal plan update, which is an effective way to gather data not only regarding energy, but also related plan topics (e.g., land use, community facilities, transportation). Some considerations for developing a good survey include:

- What new information is needed in relation to survey objectives should be defined – think in terms of results.
- If possible, a direct-mail survey should be preceded a week or two by a postcard (informing residents that a survey is forthcoming) and be followed up with a postcard a week or two after the survey is delivered reminding residents to respond.
- Clear directions and instructions on how to respond should be provided; a postage paid response typically yields the best results.
- A direct mail survey should be sent to the entire population or an appropriate sample (if a sample is used, direct contact with the sample population is appropriate);
- Leaving surveys out in public places, or sending them bulk mail, is a useful way to share information and solicit feedback, but it will not provide statistically valid data.
- Questions should be carefully crafted to avoid bias – vague, ambiguous, biased, repetitive, or irrelevant questions should be avoided.
- Avoid double-barreled questions that ask for a single answer to more than one question.
- Avoid negative terms.

For a more detailed discussion of survey tools and techniques, see the "Community Planning Surveys Technical Appendix" to the publication entitled *Citizen Participation Strategies for Municipal Planning in Vermont* prepared by the University of Vermont's Center for Rural Studies.

IV. Organizing the Energy Plan

The format and content of an energy element of a municipal plan will depend on several factors, including the format of the municipal plan (unless the energy plan is a stand-alone document), the level of detail and range of issues the community chooses to address, and the overall complexity of the municipality. Complexity, in this context, includes such considerations as the number and type of facilities owned by the municipality, whether the community owns a municipal electric facility, whether the community has or plans to enact local ordinances and regulations related to energy efficiency, such as building codes, and availability of professional staff support, and the mix and pattern of land uses in the municipality.

Most Vermont municipalities organize their plans with separate chapters addressing the different topics required by statute (e.g., transportation, land use, energy), in addition to an overall description of the impact the plan will have on the region and on neighboring communities, the plan's conformance with state planning and development goals, and a description of the plan's implementation.

Energy Plan Contents

Regardless of the format, communities should consider including the following elements as part of their energy plan:

- An **Overview** or **Purpose Statement** that summarizes the intent of the energy plan and includes relevant background information that establishes the community's context regarding energy. This should explain not only why the community is adopting an energy plan, but the key benefits that should result from that plan. Some communities choose to include a Vision Statement in which the long-term aspirations or desired future conditions related to energy are articulated. The vision can also be set forth within energy related goal statements, or may be expressed more broadly to encompass all of the elements and considerations of the municipal plan.

- Many communities find it useful to provide additional planning context by providing a summary of **Statewide Trends** in energy supplies, costs, demand, and conservation and efficiency measures. This is helpful given the relatively small scale of the state and most municipalities, the limited availability of local data, and the significant impact that policies enacted at the state level can have on municipal conditions.

- A description of **Current Conditions**, setting forth existing energy use, or demand, by sector, as well as current energy supplies (given available data). These topics might be addressed separately or as an **Energy Profile** for the community. Topics to include in an assessment of current conditions include:
  - electrical use by sector (i.e., residential, commercial, government);
  - heating fuel use by sector;
  - transportation trends (commuter trends, vehicle miles traveled, transportation options); and
  - energy supplies and costs (including transportation fuels and local renewable energy generation).

This section of the plan is typically the most data intensive and is well suited to using graphs and tables to present information. If practical, trends and anticipated future demand based upon growth projections or other policy considerations should be included. Projections typically include population and housing forecasts and employment projections that can be used to estimate future land development and associated energy demand.

- Identification of **Energy Resources** in the community, focusing on **Renewable Resources** and **Energy Efficiency**. Renewable energy and energy efficiency resources are discussed in greater detail in Chapter VI.

- Discussions of how the energy plan relates to other plan elements, most importantly those that address **Transportation, Land Use** and **Community Facilities**. There is no need to be redundant with other plan chapters, but summarizing how energy efficiency in transportation, for example, could be achieved through transit service, park and ride facilities, or demand side management incentives under local zoning, should be identified. Likewise, energy plans are required to include "a statement of policy on patterns and densities of land use likely to result in conservation of energy," so a summary of the community's land use policies from the perspective of energy conservation is also important. This is addressed in Chapter VIII.

To best coordinate the energy plan with other elements of the municipal plan, it is also important to remember that use of the plan during PSB Section 248 proceedings expressly considers whether a proposed energy project "unduly interfere[s] with the orderly development of [a] region with due consideration having been given to the recommendations of the municipal legislative bodies, and the land conservation measures contained in the

plan of any affected municipality." Therefore, energy policies that may relate to the future development of energy facilities in the community should be consistent with land use and conservation measures (see "Municipal participation and influence at the Public Service Board" on page 26).

Energy Chapter Table of Contents

(Example)

I. Community Energy Vision
II. Overview
III. Energy Profile
    1. Statewide Trends
    2. Energy Supplies (by fuel source)
    3. Energy Demand (by sector)
    4. Energy Projections (Supply & Demand)
IV. Renewable Energy Resources
    1. Biomass
    2. Solar
    3. Wind
    4. Geothermal
    5. Hydro
    6. Other
V. Energy Efficiency & Conservation
    1. Statewide Programs
    2. Local Programs (e.g., Button-up VT)
    3. Municipal Facilities
    4. Transportation
    5. Land Use
VI. Goals, Policies & Implementation Tasks

- The use of **Indicators**, **Benchmarks**, or **Performance Measures**, is an increasingly common tool that communities use to establish a baseline with regard to a specific operation or condition (e.g., monthly electrical use in the Town Office; total annual vehicle miles travelled (VMT) in the community). Indicators are discussed in greater detail in Chapter IX.

- A statement of **Goals, Policies** and **Tasks** (or programs, implementation measures, strategies, etc.). Together with the implementation plan, the goals, policies and tasks are the most critical part of the plan. The other information provides the context and justification for the goals and policies adopted by the municipality and the specific tasks that are required to achieve the goals and implement the policies.

Setting Goals, Policies & Tasks

When preparing an outline of the energy plan, it is important to be mindful of the primary purpose of the planning process: to clearly articulate the community's long-term aspirations, or vision, with regard to its energy future and to lay out the means with which the community will achieve those aspirations. The goals, policies, and tasks set forth in the plan will provide that vision and the steps needed to achieve it. It should establish community priorities, identify who is responsible for the tasks or actions called for, where they will get the resources needed to carry them out, and the general timing of the plan's implementation. A detailed discussion regarding goal and priority setting is included in Chapter IX that addresses plan implementation.

V. Assessing Energy Use, Needs and Opportunities

An effective plan is based on an understanding of the trends and factors that have shaped current circumstances and will likely affect future conditions. In Vermont, an energy plan adopted as part of a municipal plan must include "an analysis of energy resources, needs, scarcities, costs and problems within the municipality." This requires that communities gather and evaluate available data and information related to local energy supplies and use.

A challenge to local energy planning is the lack of town-level data related to energy use, demand and availability. This is especially true of private sector (i.e., non-governmental) energy use, as well as energy supplies that are not regulated by state government, including most heating and transportation fuels. Available resources provide a general indication of private sector energy use, however, which can be combined with other sources of local data to develop a community energy profile.

The level of detail of an energy inventory will vary by community depending on such factors as:

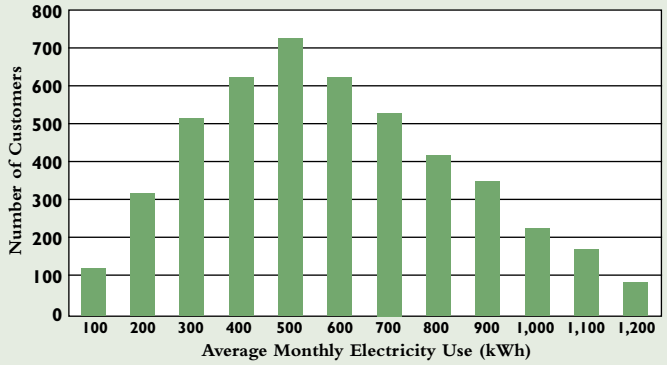
- the type and number of municipal facilities;
- local record keeping;
- the resources available to conduct an inventory;
- the extent of public outreach involved (e.g., whether community surveys or interviews are undertaken); and
- the mix of land uses in the community.

Regardless of the amount of data available, it is important to understand ***the energy inventory is not an end in itself*** – it is intended to inform policies and implementation programs and to measure performance over time. Data limitations should not discourage a community from using whatever data is available, including statewide data extrapolated for the community. What is most important is moving forward with policies and programs that promote greater conservation and efficiency and the use of renewable energy resources that promote community goals and values.

CASE STUDY: **A Peer-to-Peer Energy Assessment Tool**

The Essex Energy Committee helped local residents understand — and compare — their energy consumption and shared that information broadly.

Residential Electricity Use
Town of Essex



Assessment Tools

Increasingly municipalities engaged in energy planning – or more typically climate action planning – use computer-based tools to inventory greenhouse gas emissions and energy use, and to analyze emissions reductions likely to result from various public policy options. Among the most widely used of these are:

- the Clean Air Climate Protection software program available through membership in ICLEI - Local Governments for Sustainability - USA (formerly the International Council for Local Environmental Initiatives);

- the U.S. Environmental Protection Agency (EPA) developed an ENERGY STAR Portfolio Manager and an associated benchmarking starter kit to quickly and easily prioritize energy efficiency projects in buildings, measure progress, and verify/report results;

- The Small Town Carbon Calculator (STOCC) developed by Clean Air-Cool Planet in conjunction with Carbon Solutions New England and the University of New Hampshire.

Each of these tools help communities (and businesses in the case of the ENERGY STAR Portfolio Manager) to reduce greenhouse gas emissions through strategies that in part promote greater energy efficiency and reliance on low-emissions energy sources. They can be used to help establish baseline information regarding energy consumption and to analyze the energy savings from various implementation strategies. Their application in

Vermont has been limited, however, due to the resources needed to use the programs and, in the case of ICLEI, the relatively small, rural nature of Vermont municipalities compared to the average ICLEI - USA member, which tends to be a larger urban area. This guidebook anticipates that most Vermont communities will opt to conduct their energy inventories without the use of these tools, although it is likely that comparable computer based inventory tools appropriate to Vermont communities will be developed in the future.

Creating a Community Energy Profile

There are many ways in which an energy inventory can be conducted and organized. The example energy plan outline discussed in the previous chapter defines a relatively straightforward approach for a Vermont community with limited resources to undertake a local inventory. Such an inventory includes the following components:

1. State and National Overview

It is helpful to include an overview of national and statewide energy trends that impact local energy options. State and federal policies affect energy supplies – including support for renewable energy development and energy efficiency – and are evolving at a rapid pace. Continued uncertainty over global energy supplies and costs has prompted all levels of government to pursue greater energy independence. Identifying broad trends related to fuel costs, energy supplies, and policies and programs that influence local energy use, conservation and efficiency is a useful step in crafting an effective local energy plan.

Data Sources for Statewide Trends

- Vermont Department of Public Service
- U.S. Energy Information Administration
- UVM Transportation Research Center
- Regional Planning Commissions
- Efficiency Vermont

2. Energy Supplies

An inventory of energy supplies by fuel source helps identify the types of energy currently available in the community, including major providers and general information about the costs, advantages, and potential problems associated with a source. Sources typically include electricity, heating fuel, and transportation fuels.

Local information should be available for some energy sources. Most electric utilities, for example, can provide information about electrical generation, utility lines, use, loads and rates, as well as any issues associated with current or future system reliability. As the state builds-out the anticipated "smart grid" (e.g., interactive metering devices that can provide utilities and customers with real-time data regarding electricity consumption) in the coming year and beyond, better information may become available. Information on local generation of energy (e.g., local wind, hydro, farm-methane, net-metered facilities, etc.) is also available from utilities, the Public Service Board, and the Renewable Energy Atlas of Vermont (see page 25).

Fuel supplies that are not regulated by the Department of Public Service, including most heating and transportation fuels, are more difficult to inventory. Interviewing local fuel dealers can be an effective way to gather information. One-on-one interviews or focus groups, conducted by volunteers or staff, can be used to collect specific data from local residents and to help to broaden local understanding of energy supply issues. Interviewers should understand the information being sought and be able to organize and present it in a consistent manner. Often times, a random, well-rounded sampling of residents — not of the town as a whole — is more manageable and can combine to create a useful set of information upon which to base action.

Data Sources for Energy Supplies

- Electric Utility(s)
- Efficiency Vermont
- Vermont Gas Systems (if applicable)
- Vermont Department of Public Service
- Vermont Department of Forests & Parks
- Vermont Council on Rural Development
- Renewable Energy Atlas of Vermont (for local net-metered renewable energy installations)
- Interviews with:
  - Propane Dealers
  - Firewood Dealers
  - Gasoline Fuel Dealers
  - Renewable Energy Vendors
  - Homebuilders

3. Energy Demand

Inventories of energy demand, or use, are typically organized by sector. This provides a framework for collecting and organizing data and developing sector-based policies and implementation measures. Sectors typically include:

- Government (municipal or any state or federal facilities)
- Residential
- Commercial/Industrial
- Transportation (across other sectors, though municipal transportation energy use is often included under the municipal sector).

Relevant information to analyze for each sector includes the types and quantities of energy purchased and used to satisfy each type of demand and the cost of the energy consumed. This is based on the premise that local energy consumption is equivalent with local demand, although that may not be the case as replacing an outdated piece of equipment with a more efficient model can substantially change consumption. Assessing current consumption by source, however, can help to identify potential savings. The primary non-transportation residential demand for energy, for example, is for space and water heating, although lighting, air conditioning, refrigeration, and other appliance use can also be important. In the commercial and industrial sectors, lighting, heating and cooling, motors, and industrial processing are the major end uses. The most commonly used sources of purchased

energy are electricity, natural gas, oil, liquid propane, wood, gasoline, and diesel fuel.

The inventory should identify, to the extent possible, how much energy is consumed for each sector by fuel source and use (e.g., building electricity, electricity for street lighting, space and water heating), along with this energy's respective cost. This may be possible for municipal energy use, but less so for other sectors without the use of a community energy survey to gather data. Again, the data and related information should inform the plan's policies and implementation strategies to the extent that information is available. Strategies for inventorying energy demand by sector are highlighted below.

Municipal Sector: Collecting and analyzing municipal energy use is fairly straightforward. It is in some respects the most important sector, in that the municipality has direct control over its energy use and reducing energy costs has a direct bearing on the municipal budget – and because it is an opportunity for the municipality to lead by example. Most communities will maintain billing records that allow for an accurate accounting of electricity and heating fuel use for each building or facility. In general, with the exception of transportation (which is covered separately), the municipality's energy uses consist of:

- space heating, cooling, and water heating for all town buildings and operations;
- lighting and basic operations such as computers, copiers and standard office equipment;
- streetlighting;
- major operations such as water pumps, wastewater treatment plants, recreation facilities (e.g., ballfield lighting, swimming pools, skating rinks), and heavy equipment (e.g., chippers, loaders and generators); and
- solid waste facilities.

An inventory should start with information regarding both the consumption (in appropriate units such as kilowatt-hours for electricity, gallons for #2 fuel oil for space heating, etc.) and cost of energy for a minimum of a one-year period. Charting cost changes over multiple years can also be instructive. If possible, data should be collected for each municipal department or each building or facility, including streetlighting and other facilities and uses. Many Vermont communities have conducted energy audits of municipal buildings and facilities in recent years. It is important to determine whether audits have already been performed and to what extent recommendations have been implemented. For buildings that have not been audited or if previous audits are obsolete or not comprehensive, new audits can be initiated (see page 24 for additional discussion of energy efficiency measures and programs).

Data Sources for Energy Demand

- Electric Utility(s)
- Vermont Gas Systems (if applicable)
- Municipal Billing Records
- School District Billing Records
- School Energy Management Program
- U.S. Census
- Community Survey
- Interviews with:
  - ♦ Business Owners
  - ♦ Local Institutions (e.g., hospital)
  - ♦ Renewable Energy Vendors
  - ♦ Homebuilders

Measuring Energy Consumption

Different energy sources come in different units of measurement. One common unit of measurement is cost, expressed in dollars. The fluctuating nature of energy costs, however, makes tracking expenditures an inaccurate measure of changes in energy consumption. It is better to track energy in standard units of measurement.

Electricity use is typically expressed as a kilowatt hour (kWh). One kWh would power a device that consumes a kilowatt of power for an hour, or a 100 watt light bulb for 10 hours, etc.

Electrical generation is typically expressed in megawatts (MW), which equals 1,000 kilowatts.

Natural gas, available to Vermont Gas customers in northwest Vermont, is measured in hundreds of cubic feet (CcF).

Most **transportation and heating fuels**, including #2 heating oil and liquid propane, are measured in gallons.

It is also useful to consult with the selectboard, public works director, or other facility managers to determine the age and efficiency rating of boilers, furnaces and motors; building and window insulation values; interior and exterior lighting efficiencies; and current use and purchasing policies, including the use of life-cycle costing, cooperative or group purchasing or other efficiency-based procurement policies (see Chapter IX regarding municipal financing of energy projects).

Data about school facilities is typically available through the district superintendent's office. Many Vermont school districts participate in the School Energy Management Program (SEMP) through the Vermont Superintendents Association. Since 1993, SEMP, in partnership with Efficiency Vermont, has helped schools to reduce costs by providing free, practical advice on energy efficiency and money-saving capital improvements.

Residential Sector: While the residential sector is not under the control of the municipal government, the energy plan and associated policies and implementation programs and strategies can have a significant impact on the use and supply of energy by homeowners. Under the best circumstances, an inventory of residential energy use would include information regarding:

- residents' annual energy consumption by type (e.g., electricity, heating);
- annual energy costs;
- approximate size and general condition of the home;
- residential energy generation and net-metering;
- whether residents have invested in energy efficiency measures in recent years (e.g., weatherization, energy-star appliances); and

- their interest in making additional energy efficiency or renewable energy investments.

This assessment should ideally be developed from town-specific data gathered according to statistically valid methods, but the municipality may want to develop a minimum assessment of current energy demand by combining qualitative information and various estimates and indicators taken from town-wide data or statewide studies. As noted previously, the data collected as part of the plan are a means to an end, not an end in itself.

A minimum assessment of residential energy use could include data regarding the household heating fuel and the type and size of housing units available through the U.S. Census and grand list records. Community Action agencies may have information regarding past weatherization efforts in the community, and community land trusts and other affordable housing providers may have information regarding the efficiency of housing units under their management. Electricity use trends for residential users may be available from the electric utility.

Communities may use other available information and estimates, even if these are not specific to the municipality. For example, the Vermont Department of Public Service estimated that in 2009 the average Vermont family consumed 1,329 gallons of motor fuel annually and 850 gallons of heating oil. This may vary by community, but provides a reasonable basis for estimating local fuel consumption. What is important is to create a general picture of current energy use sufficient for supporting the goals, objectives, and programs of the energy plan. Sources for these general types of information are U.S. Census data, statewide data prorated to the municipal level (e.g., Vermont Department of Public Service), data from electric utility surveys, the Renewable Energy Atlas of Vermont, and other sources.

In some municipalities, available resources (financial, staff and/or volunteer support) may enable a more sophisticated approach to the energy inventory. A community energy survey, or including energy-related questions as part of a broader community survey, is an effective way of gathering local information. Surveys, however – if done properly to obtain statistically valid results – can be expensive and time consuming.

Commercial/Industrial Sector: Gathering information about the energy needs and uses for the commercial and industrial sectors involves many of the same difficulties that are inherent in collecting data from the residential sector. Although there are typically fewer commercial and industrial entities than residences, there may be no practical way to access information about their energy consumption. It may be necessary to combine whatever local information is available with estimates or indicators taken from statewide data sources. This approach is sufficient if the scope of the plan is broad and general.

There are advantages to working with local businesses in the community – including major energy users and representative business groups. Businesses generally maintain records about types of energy used, annual quantities consumed, and associated costs (although some businesses may not want to disclose this information), and may have programs for regularly improving the efficiency of their facilities and equipment. Many larger businesses have taken advantage of one or more programs offered by Efficiency Vermont. Those that have not may learn about available opportunities through their participation in the planning process.

Transportation Sector: Generally, data collection for the transportation sector relates to three broad variables related to energy consumption. These are:

- the number and efficiency of vehicles;
- transportation fuels; and
- travel behavior (e.g. choice of transportation mode, vehicle miles travelled etc.).

The energy plan typically focuses on reducing transportation-related energy consumption by promoting the most efficient transportation options and local, renewable energy sources. The transportation element of a municipal plan, however, should address the transportation system and associated infrastructure in a more comprehensive manner. There are many resources to assist with transportation planning that are beyond the scope of this guidebook. The Vermont Agency of Transportation and Regional Planning Commissions, the Chittenden County Metropolitan Planning Organization, UVM's Transportation Research Center, and the transportation section of the municipal plan, are the best sources of information on comprehensive transportation planning for Vermont communities.

Energy data related to the transportation sector is also limited. Due to the state's small scale and rural character, however, data related to topics such as travel behavior and fuel costs are more useful to local planning efforts than might be the case in larger, more urbanized states. Useful information and sources include:

- Travel-to-work data (average commute time and travel mode) and commuter origin-destination information data (town to which local residents commute, town from which local employees commute) are available from the U.S. Census;
- Traffic volume data for some state highways are available from the Vermont Agency of Transportation and regional planning commissions;
- Data and research related to transportation patterns in the region, as well as detailed information for specific highway corridors, is often available from regional planning commissions;

CASE STUDY: Community Transportation Solutions

The successful 'Hinesburg Rides' program harnesses volunteer support, business partnerships and a civic commitment to shift local transportation habits in the rapidly growing bedroom community.

Data Sources for Transportation Energy Demand

- UVM Transportation Research Center
- Vermont Department of Public Service
- Municipal Facilities Inventory
- School District Facilities Inventory
- Regional Planning Commission/Metropolitan Planning Organization
- U.S. Census
- Transit Providers
- Community Survey
- Interviews with:
  - Business Owners
  - Local Institutions (e.g., hospital)
  - Transit Providers
  - Safe Routes to School Group

- statewide fuel consumption and cost data available from the Vermont Department of Public Service; and
- additional statewide information related to travel trends and transportation related energy consumption is available from UVM's Transportation Research Center.

In addition, municipalities have some control over the use of alternative fuels and the efficiency of their own vehicle fleets. They can influence vehicle efficiency in the private sector largely through outreach and education and to a limited extent through incentives.

An inventory of municipal vehicles should include:
- annual mileage and fuel purchases;
- efficiency ratings;
- use of alternative fuels (e.g., electricity, bio-diesel);
- estimated replacement dates;
- market availability of more efficient vehicles; and
- existing municipal vehicle use and procurement standards, including efficiency requirements.

This information can inform plan strategies aimed at maximizing fuel efficiency in municipal government operations. Identifying fuel efficiency programs and the use of alternative fuel vehicles within the residential and commercial sectors is more challenging at the local level, but useful questions to ask include:
- How many hybrid or electric vehicles are registered in the community?
- Do local businesses or institutions have vehicle fleets that include fuel efficient or alternative fuel vehicles?
- Do businesses provide incentives to employees or clients for driving such vehicles (e.g., preferred parking, charging stations)?
- Are there any distributors or producers of alternative fuels in the community?
- Does the community, local businesses or institutions, have a "no-idling" policy or ordinance in place?
- Does the local school system include efficient (or "green") driving techniques as part of the driver-education curriculum?

The availability of public transportation is also a key question for local transportation and energy planning. There are at least 12 public transit providers in Vermont. These groups provide a range of services, including relatively large, fixed-route bus service in and around several of the state's larger regional centers and nearby communities; inter-town commuter shuttles; and on-demand service geared toward transportation challenged Vermonters with specific health or social needs.

In many instances, the availability of transit service depends on whether a municipality is providing direct support to the provider. Information regarding public transportation includes determining whether there is a transit system serving the community and, if so:
- What are the routes and schedules?
- What are the trends in ridership (e.g., number of riders on a monthly basis over the past one-five years)?
- What are the current and planned fares and funding sources, including the municipal contribution?
- Are there planned changes to the service area (routes)?
- Do local employers provide incentive programs to encourage ridership?
- What other challenges or opportunities might affect future service?

Transit provider and employer interviews can help determine if there are gaps in service or if there are challenges with integrating transit services with other travel modes. Are transit stops accessible by sidewalk? Are bus shelters available? Are route schedules posted? Are they coordinated with employee commuting times?

The availability of programs, facilities and infrastructure that provide energy efficient transportation options should be assessed, including:
- park and ride lots to promote ride sharing;
- public parking, including on-street parking, to promote multi-destination trips;
- sidewalks and pedestrian and bicycle paths;
- bicycle lanes on roads;
- transit shelters; and
- development standards or incentives to promote pedestrian and bicycle access and transit, reduce automobile dependency, and foster ride sharing and transportation management (such as density bonuses or parking reduction provisions), under local land use regulations.

Mapping existing and planned facilities and services will help the community identify gaps and needed improvements and better integrate transportation modes.

Useful Data Sources for Community Energy Inventories

General data sources related to energy supply, costs, and projections include:

- The **Vermont Comprehensive Energy Plan**, a 20-year plan prepared by the Department of Public Service in conjunction with other state agencies. Updated every five years, the plan includes:
  - ♦ A comprehensive analysis and projections regarding the use, cost, supply and environmental effects of all forms of energy resources used within Vermont.
  - ♦ Recommendations for state implementation actions, regulation, legislation, and other public and private action to carry out the comprehensive energy plan.

- The **U.S. Energy Information Administration** maintains state energy profiles that provide data on a variety of fuel sources and associated costs. This information can be useful in providing a statewide context and cost information for different energy sources.

- The **U.S. Census** provides data regarding home-heating fuel and commuter trends. Historically taken every 10 years, the U.S. Census Bureau recently initiated the American Community Survey – a more frequent sampling of the population – that will provide data on transportation and home heating, in addition to other demographic data. Information regarding the sampling methodologies and most recent data is available at the Vermont Data Center, maintained by the University of Vermont's Center for Rural Studies.

- The **Vermont Fuelwood Assessment**, last updated in 1999, is scheduled for an update in the near future. The assessment provides extensive data on wood heating in Vermont.

- **Efficiency Vermont**, the state's energy efficiency utility, maintains electric use data for the entire state, as well as information related to a wide range of energy efficiency programs. This information has been made available for individual towns by sector (although commercial sector data may not be available to ensure the confidentiality of local businesses). Efficiency Vermont also provides a wide range of information regarding energy efficiency programs and assistance available to municipalities, businesses and homeowners.

- ***Strengthening Vermont's Energy Economy: Final Report and Recommendations of the Vermont Rural Energy Council*** (and associated documents) is the final report of a two-year project (2006-2007) developed by the Vermont Council on Rural Development to provide a non-partisan analysis of opportunities in rural electric generation, fuel development and energy efficiency in Vermont.

- **Electric Utilities** can also provide town electric use data, by sector, although the availability of this information varies by utility. Several utilities have also conducted customer surveys that can provide information regarding energy use within their service area. Information and contact information for Vermont's electric utilities is available from the Department of Public Service.

- **The University of Vermont's Transportation Research Center** (TRC) undertakes a range of interdisciplinary research, education and outreach on sustainable transportation systems. The TRC hosts the Vermont Clean Cities Coalition and prepares the annual Vermont Transportation Energy Report which includes data on the status of fuel consumption, vehicle purchases, transportation expenditures, and travel behavior. The TRC also maintains Vermont data from the National Household Transportation Survey and issues periodic reports based on this information and relevant research conducted by TRC researchers.

- The **Renewable Energy Atlas of Vermont**, developed and maintained by the Vermont Sustainable Jobs Fund, is the most comprehensive resource for renewable energy resources in the state (see sidebar on page 25).

- **DSIRE** is a comprehensive source of information on state, local, utility and federal incentives and policies that promote renewable energy and energy efficiency. Funded by the U.S. Department of Energy, DSIRE is an ongoing project of the N.C. Solar Center and the Interstate Renewable Energy Council.

- **Vermont in Transition: Chapter 10 Energy** is an excerpt from the *Vermont in Transition* report conducted as part of the Council on Vermont's Future, and initiative of the Vermont Council on Rural Development. Prepared by the Center for Social Science Research at Saint Michael's College in 2008, the report summarizes significant social, economic and environmental trends, including this chapter on energy.

VI. Energy Efficiency and Renewable Energy Development

Energy conservation and energy efficiency should be top planning priorities because they are far more cost effective than any other form of energy, including energy generated from renewable sources. It's always better – and cheaper – to reduce energy consumption than to produce energy. In 2010, it was estimated that reducing energy demand in Vermont cost approximately $0.37 for every kWh reduced, 25% of the cost of comparable electric supply.

The importance of energy efficiency is reflected in Vermont's planning statutes, which require an energy plan adopted as part of a municipal plan to include "a statement of policy on the conservation of energy, including programs, such as thermal integrity standards for buildings, to implement that policy."[8] In addition, the state's planning and development goals call for communities to "encourage the efficient use of energy."[9]

Energy efficiency measures also have direct economic benefits to communities. Approximately $0.80 of every dollar spent on energy efficiency remains in Vermont, while approximately $0.80 of every dollar spent to purchase energy leaves the state. In addition, reducing monthly energy bills improves the bottom line for municipalities, residents, and businesses. Efficiency improvements are also good investments. A 2007 report prepared for the Vermont Department of Public Service found that the state could save over $3 dollars in reduced fuel cost for every $1 dollar invested in making our homes and businesses more efficient. The study estimated nearly half a billion dollars in savings over 10 years.

Energy Efficiency Programs and Opportunities

Vermont was the first state in the nation to create a single energy efficiency utility – Efficiency Vermont – to coordinate the state's electrical efficiency programs in 2000 (although the Burlington Electric Department maintains separate efficiency programs comparable to Efficiency Vermont's). Funded by an efficiency surcharge on electric bills throughout the state,[10] Efficiency Vermont replaced various efficiency programs managed by individual utilities. In 2008 the mission of the efficiency utility was expanded to include efficiency programs for unregulated heating fuels, although no ongoing funding mechanism has been created to maintain that program. In addition to Efficiency Vermont, Vermont Gas Systems has administered both residential and business efficiency programs for its customers since 1992.

Vermont's five Community Action agencies also have a long history of assisting households with home weatherization and heating fuel assistance programs. These programs are typically available to income-eligible homeowners. Weatherization programs are often supplemented by, or coordinated with, weatherization initiatives administered by the various state and local housing authorities and community land trusts that own and manage thousands of affordable housing units.

Despite the success of Efficiency Vermont and other energy efficiency initiatives, it is widely agreed that there remains significant potential for greater energy efficiency in all sectors in the state. The *Vermont Electric Energy Efficiency Potential Study,* prepared in 2007 for the Vermont Department of Public Service, conservatively estimated that the state could cost effectively reduce electric demand by 20% by 2015. Other estimates, based upon a more aggressive definition of what is "cost effective," are higher. Due to the age of the state's housing stock (Vermont has the second oldest housing stock in the nation) and our reliance on the single occupancy vehicle for most transportation, the potential for significant reductions in heating and transportation fuel is also significant. Taking advantage of these opportunities, however, will require concerted efforts at all levels of government, including municipalities.

Efficiency & Conservation

Reducing energy consumption provides long-term financial gains for consumers. Consequently, reducing energy demand through energy conservation and efficiency are among the most important strategies that communities can undertake.

Energy conservation means taking steps and adopting habits that decrease the amount of energy used.

Energy efficiency means using improved technology to decrease energy demand.

Both efficiency and conservation offer businesses and homeowners ways to reduce their energy bills. Actions range from very simple efforts like closing windows and turning off lights, to installing new, high-efficiency heating and cooling equipment.

Planning for Energy Efficiency

Addressing efficiency in the energy plan typically involves identifying potential efficiency opportunities, establishing efficiency goals and policies, and identifying the programs and implementation strategies necessary to achieve those goals. The number and range of programs will vary by community and most will be available through regional or statewide entities.

Inventorying these programs and associated eligibility requirements is not only an important step in understanding available resources, but is also necessary for promoting greater local participation in such programs and understanding the gaps that need to be filled.

Considerations related to common implementation goals and strategies for energy efficiency (discussed in detail in Chapter IX) include the following:

Maximize local access to available regional, state and federal programs. Many communities, homeowners and businesses are not aware of the range of assistance programs that are available. The plan can identify efficiency programs and incentives available to the municipality and local residents, businesses and property owners, as well as information regarding the benefits of those programs and how to access them, into education and outreach efforts.

Improve efficiency in municipal buildings, facilities and operations. Buildings owned by the municipality (schools, town hall, fire department, town garage, etc.) are logical choices for consideration because the municipality pays directly for the energy the buildings use, and stands to gain directly from lower bills. The plan should identify past investments in energy efficiency, including whether energy audits of municipal buildings have been undertaken and whether efficiency improvements have been made. Auditing buildings that have not been inspected, and making improvements to audited buildings that have not been completed, are obvious implementation strategies.

Municipalities may be eligible for a variety of efficiency programs and financial incentives through Efficiency Vermont for interior lighting, heating and cooling systems, building performance and street lighting, and municipal facilities and equipment. Understanding – and taking advantage of – available resources should be an implementation priority. Changes to municipal operations and procurement standards also can result in greater efficiency in the use of existing facilities and ensure maximum efficiency in new equipment and facilities.

Improve fuel efficiency of municipal vehicles. Fuel efficiency in municipal vehicles is an important consideration, especially when vehicles are replaced. Understanding existing efficiency performance standards and how those standards compare with other available technologies will help to identify opportunities for improvement. In addition, regular maintenance (including maintaining appropriate tire pressure) tune-ups, and driver behavior, can have a significant impact on vehicle fuel efficiency and emissions.

Promote town-wide transportation efficiency. A variety of municipal programs and investments can promote ride sharing, transit, bicycle and pedestrian travel, and fuel efficiency. In addition to the land use and transportation considerations discussed in Chapter VIII, strategies to reduce fuel consumption, such as eco-driving training for students and residents, programs and ordinances to reduce vehicle idling, and working with local businesses and institutions to establish transportation demand management (TMD) programs, may be appropriate.

Support building efficiency in the private sector. There are several ways in which the plan can promote greater efficiency in new and existing buildings in the community. Several programs have been developed in past years to promote homeowner retrofits to existing homes. These include the successful Button-Up Vermont Campaign that resulted in home energy savings

Energy Audit: The First Step Toward Efficiency

An energy audit is a comprehensive assessment of a building's energy use designed to identify the most cost-effective opportunities for energy savings. Efficiency Vermont supports a network of "Home Performance with ENERGY STAR" contractors serving Vermont homeowners. These independent contractors are certified by the Building Performance Institute to perform energy audits, diagnose building problems such as moisture, mold, and ice dams, and install recommended energy efficiency improvements. Efficiency Vermont provides contractor training, quality assurance, and customer incentives.

A Home Performance with ENERGY STAR energy audit typically includes:

- A comprehensive home evaluation of building tightness and insulation effectiveness, heating system, lighting, appliances, and windows;
- Identification of energy-saving products such as efficient light bulbs and water conservation products;
- An audit report and scope of work for recommended energy efficiency home improvements.

The fee for a home energy audit typically ranges between $400-600. Homeowners should check with Efficiency Vermont to determine whether incentives are available to assist with the cost of the audit or to make energy saving home improvements identified by a qualified contractor.

CASE STUDY: **A "21st Century Barn Raising" Significantly Increases Municipal Energy Efficiency**

An energy efficiency project to retrofit the Middlesex elementary school, led by volunteers and under the supervision of a professional team, helped to significantly save taxpayers money.

CASE STUDY: **Button Up Vermont**

This successful statewide public education program taught Vermonters about energy savings opportunities in their homes.

BUTTON-UP VERMONT
A Vermont Home Energy Savings Campaign

CASE STUDY: Rutland Energy Challenge

An effort aimed at engaging a broad cross-section of the community to help them save energy and save money.

Rutland County ENERGY CHALLENGE

workshops being held in nearly 100 communities in 2009 and 2010. Local education and outreach efforts can replicate these programs that are designed to train homeowners to make often simple, cost effective and energy saving home improvements. In addition, the level to which existing weatherization programs have been used varies from municipality to municipality, and municipal support can help facilitate the delivery of weatherization assistance to the community.

Land use and development regulations can be used to promote greater energy efficiency through incentives or development standards. In addition, certificates of occupancy administered through zoning bylaws can be used to ensure compliance with state efficiency standards that have not been effectively enforced. Finally, municipal building codes may establish local efficiency standards.

Understanding past efficiency investments in local buildings and facilities, made through Efficiency Vermont, a Community Action agency, Vermont Gas Company or another entity, is useful for promoting past successes and informing other property owners of available programs. The Renewable Energy Atlas of Vermont is a source for information on past efficiency investments.

Overcoming Barriers to Energy Efficiency

Planning for energy efficiency requires understanding the barriers to the widespread use of efficiency programs and creating strategies and programs to overcome those barriers. In 2008 the Montpelier-based Regulatory Assistance Project (RAP) published a report entitled *Affordable Heat: A Whole-Buildings Efficiency Service for Vermont Families and Businesses* (updated in 2011). The report evaluated Vermont's building efficiency programs and barriers to those programs, and made recommendations for expanding efficiency efforts through a variety of policy and programmatic changes.

Among the barriers identified were those that prevented home and business owners from making efficiency investments and participating in existing programs. Many involve misperceptions or lack of awareness that can be carried out through the implementation of the energy plan. These included:

- **Split incentives:** A problem in delivering the full value of efficiency investments in buildings is the distinction between the party who makes the investment and the party who will benefit from that investment over the long term. Builders construct buildings that they will never live in, and most commercial office space is built by developers who will never pay to heat the building. Many homeowners do not expect to stay in their present home long enough to fully benefit from insulation or other upgrades. Tenants have little opportunity to upgrade their rental units and have little reason to invest in the owner's property. All of these actors may take a short-term view, yet the building stock will be adding to the state's overall power and fuel demands for decades to come.

- **Upfront costs and high discount rates:** Another barrier to consumer investment in efficiency lies in the relationship between today's costs and tomorrow's benefits. It is difficult for many homeowners to pay the up-front costs of efficiency improvements that will lower bills over several years. Most consumers discount those future benefits greatly, resulting in under-investment in efficiency over the long term. The cost of efficiency audits and upgrades significantly limits the demand for many efficiency retrofits. Even when a relatively short payback period can be demonstrated, the up-front costs can remain a barrier to consumer investment. The majority of Vermonters do not qualify for services under the Weatherization Assistance Program, and cannot afford to invest in their homes at a level that would provide meaningful energy savings (even with the reduced interest rate financing available through Home Performance with Energy Star). Some cannot qualify for reduced rate financing.

- **Poor understanding of benefits:** Homeowners have a limited understanding of the benefits that can result from efficiency retrofit projects, including better comfort, increased safety, increased property value, and lower energy bills. Many people are resigned to being cold and uncomfortable during Vermont winters. Also, many efficiency improvements such as insulation and air sealing are largely invisible after installation.

- **Lack of information about efficiency and quality contractors:** There is limited information from trusted sources about the most cost-effective efficiency measures, what retrofit work needs to be done in homes, and which contractors to hire to perform these services. There is not a statewide referral service for reputable auditors or contractors who have experience in whole-buildings retrofits (although since the publication of the RAP report, Efficiency Vermont has developed a registry of Home Performance with ENERGY STAR® contractors certified by the Building Performance Institute). Most customers have a limited understanding of the connections between various problems in a home, such as discomfort, high maintenance costs, air quality, ice dams on roofs, and energy use. Homeowners also attempt to make efficiency improvements themselves, often to reduce the costs, but limited information exists to help do-it-yourselfers accomplish a high-quality retrofit.

- **Timing of home improvements:** Home improvements and equipment upgrades often take place when a home reaches a certain age, in the first few years after a home has been purchased by a new owner or when existing equipment fails. Most homes do not fall into the first two categories, and homeowners replacing failed equipment may not be interested in undertaking a more extensive efficiency project at that time.

Taking Energy Action Into Your Own Hands

To help homeowners make energy improvements, the Central Vermont Community Action Council (CVCAC) implemented a pilot program to support and train do-it-yourself homeowners to undertake comprehensive efficiency improvements in their own homes (with financial incentives from Efficiency Vermont). CVCAC hopes to continue this successful program in the future.

- **Commercial/industrial issues:** In commercial, institutional, and industrial settings there may be no single employee with the authority, knowledge, or time to make good efficiency decisions. There is high turnover at some workplaces that leads to a lack of institutional knowledge of building operations. As a result, such buildings often are not retrofitted comprehensively or at all. Efficient products for some commercial and industrial customers are not readily available in Vermont, and often require transactions involving new suppliers. Such customers are sometimes unwilling to take risks on unfamiliar equipment or designs, and there is no quality assurance for efficient heating, ventilation and air conditioning (HVAC) equipment and building shell upgrades. Some customers do not have the capital to invest in efficiency upgrades or have other priorities.

- **Piecemeal approach:** As a result of the previous barriers, many homeowners make only partial efficiency improvements instead of more comprehensive ones. For example, the owner of an un-insulated house may insulate just the attic instead of both the attic and sidewalls, using a contractor who gave the lowest bid. Such a contractor may not understand that significant air leakage into the attic should be sealed first, before attic insulation is added (once attic insulation is installed, it is much more difficult to fix the air leakage). The greatest energy savings are achieved when homes are treated comprehensively.

The Art of Motivating People to Take Action

Another key study undertaken by the Lawrence Berkeley National Laboratory called *Driving Demand for Home Energy Improvements* looks at how to motivate people to invest in energy efficiency projects. The report examines how simple but important things like approach or language can play a powerful role in whether or not people take action or change their behavior.

The report also stresses that if you want to motivate people to act, you must inspire them with something they value. While "saving energy" motivates some, health, comfort, energy security, saving money or competition motivates more.

The reality is that financial incentives or cold, hard facts often fall far short in getting people to act. That's why *Driving Demand* is so useful; offering important human-centered context along with practical, tested outreach techniques to help communities design and implement successful programs.

The RAP study identified other barriers that related to the lack of qualified contractors with an interest in doing efficiency work, although significant steps have been made to address that problem. Several of the consumer barriers described above may be overcome through better information and awareness, assistance with upfront costs, such as energy audits, and better coordination between local officials and citizens, such as energy coordinators, and administrators of state and regional efficiency programs.

Planning for Renewable Energy

"Renewable energy resources" means energy available for collection or conversion from direct sunlight, wind, running water, organically derived fuels, including wood and agricultural sources, waste heat, and geothermal sources." — 24 V.S.A. S 4303 (24)

An energy plan adopted as part of a municipal plan in Vermont is required to include… "a statement of policy on the development of renewable energy resources."[11] Such a statement is an important means of complying with Vermont's planning and development goals, which include "(encouraging) the efficient use of energy and the development of renewable energy resources."[12]

Recent improvements to renewable energy technology, state and federal incentives for renewable energy generation and growing public awareness of the economic and environmental benefits of renewable energy have combined to make the

Energy Efficiency Incentive Programs

For Homeowners

Energy Star Products Tax Incentives
Tax Incentives Assistance Project (TIAP) - Consumers
Vermont Gas Energy Efficiency Programs
Vermont Weatherization Assistance Program
U.S. Department of Energy - Weatherization Assistance Program
HUD FHA Insured Energy Efficient Mortgages

For Businesses

U.S. Department of Energy - Financial Opportunities for Businesses, Industry, and Universities
Energy Star Guide for Small Businesses
Small Business Guide to Energy Efficiency (Business.gov)
Vermont Office of Economic Stimulus and Recovery
Tax Incentives Assistance Project (TIAP)

For Non-Profits, Municipalities and Schools

U.S. Department of Energy - Financial Opportunities for Businesses, Industry, and Universities
Energy Star Guide for K-12 Schools
Energy Star Guide for Higher Education
U.S. Department of Energy - EnergySmart Schools Program
Vermont School Energy Management Program
Northeast Energy Efficiency Partnerships - High Performance Schools Exchange
Schools for Energy Efficiency
Greening Schools - Funding Opportunities

Renewable Energy Atlas of Vermont:
Mapping and analyzing existing and potential renewable energy sites in Vermont

The Renewable Energy Atlas of Vermont was created to assist town energy committees, the Clean Energy Development Fund and other funding entities, educators, planners, policy-makers, and businesses in making informed decisions about the planning and implementation of renewable energy in their communities – decisions that ultimately lead to successful projects, greater energy security, a cleaner and healthier environment, and a better quality of life across the state. The GIS-based web application identifies, analyzes and visualizes existing and promising locations for renewable energy projects.

A collaboration between the Vermont Sustainable Jobs Funds, Vermont Center for Geographic Information, Fountains Spatial, and Overit Media, the Atlas enables end users to click on their town (or several towns or county/counties) to analyze detailed information on a variety of energy sources, including: biomass, efficiency, geothermal, hydroelectric, solar, and wind.

development of renewable energy generation much more viable than in recent decades. At the same time, the development of renewable energy facilities – especially large-scale wind, hydro-electric and large-scale biomass – has prompted significant controversy due to perceived or potential community and environmental impacts. The energy plan, and related elements of the municipal plan, provides an important opportunity for communities to articulate local goals and policies related to the development of renewable energy and to balance those goals and policies with other community values.

In addition to providing energy developers and state regulators with local guidance regarding the development of renewable energy facilities within municipal boundaries, municipalities are playing an increasingly active role in the generation of renewable energy, often in partnership with private parties through incentives or financing, such as through Property Assessed Clean Energy (PACE) districts (see Chapter IX). Finally, facilities that are not subject to regulation by the PSB, may be subject to local review and should be addressed in the plan (e.g., solar hot water systems, wind turbines not connected to the electric grid etc).

The initial step in planning for renewable energy is to identify the potential resources that are available in the community. It is then critical to evaluate both the costs and benefits of local generation. Costs and benefits might include the financial costs of generating energy from local resources and the payback in the form of energy savings over time, as well as the potential community impacts on other resources (e.g., impacts to wildlife in the event that utilization of a particular resource would adversely impact a critical habitat). Based upon this determination, policies and programs for the generation of renewable energy may be developed. To address renewable energy in the energy plan, a community should:

CASE STUDY: Marlboro Solar School

Catalyzed by student and faculty leadership and supported in part by a state grant, the Marlboro Middle School went solar.

- include an inventory of renewable energy opportunities, including local energy sources (e.g., wind, biomass) and available technologies, and those locations in the community that the development of those resources are encouraged. It is also important to identify any areas where development of renewable energy would likely be in conflict with other community goals, such as natural resource conservation or impacts to community character;
- identify opportunities and strategies for the local generation of renewable energy for public use, either through municipal development or partnerships with private sector energy developers (e.g., power purchase agreements);
- identify strategies for public support for private investment in renewable energy (e.g., Property Assessed Clean Energy districts);
- provide a policy foundation for municipal regulatory incentives for private development of renewable energy generation through zoning or other regulatory processes (e.g., density bonuses for on-site generation, specific standards for renewable generation subject to local zoning, such as solar hot-water); and
- provide clear and unambiguous policies to influence decisions of the PSB in certificate of public good (Section 248) proceedings for private sector renewable energy projects.

Through this process, a community can put in place the policies, programs and tools to take advantage of the primary renewable energy resources available in Vermont – solar, wind, hydro, geothermal, biomass and farm and landfill methane – in a manner that is consistent with other local land use and natural resource protection goals. Considerations regarding the use and development of these renewable energy resources vary by the type of resource, as highlighted in the renewable energy matrix on pages 28 to 34.

Making Renewables Happen

Strong state and federal goals and incentives for renewables are imperative. Currently Vermont runs the Sustainably Priced Energy

CASE STUDY: Group Net Metering

A group of Underhill residents collaborated to bring solar photovoltaic power to six households and a small business.

Municipal Participation and Influence at the Public Service Board

Municipalities that want a say in the development of proposed energy facilities in their communities should be sure their town plans are detailed, comprehensive and clearly state their objectives. Clear energy policies within a plan provide policy information to developers when they are developing a project, but it also should establish the basis for municipal participation in any regulatory proceeding by the planning commission and selectboard. Establishing consensus with a town plan can mean a united voice and clear direction.

All new energy facilities in Vermont are required to obtain a Certificate of Public Good (CPG) from the PSB before construction. Municipal support or opposition to proposed energy projects may influence the PSB's decision of whether or not to issue a Certificate of Public Good.

The process for obtaining a CPG is commonly referred to as a § 248 proceeding, which is a short-hand reference to 30 V.S.A § 248(b) — the statute that outlines 10 criteria the PSB must consider before it approves a project. These criteria include consideration of the environmental, economic, and aesthetic impacts of a project, whether or not there is sufficient demand for the facility, and whether the project would have an adverse impact on the reliability and security of the electricity grid. More importantly, from the perspective of a municipality, the PSB is also required to evaluate whether or not a new project "unduly interfere[s] with the orderly development of [a] region with due consideration having been given to the recommendations of the municipal legislative bodies, and the land conservation measures contained in the plan of any affected municipality."

Municipalities may participate in a § 248 proceeding in one of two ways: simply filing comments in support of or in opposition to a proposed project or by obtaining formal party status. However, before a petition is filed with the PSB, municipalities have an opportunity to shape a project. Municipalities should be aware of what is happening within their boundaries and invite developers or utilities to a public meeting with stakeholders to discuss the proposal before the petition is filed. This provides a greater opportunity for the municipality and the public to influence the outcomes before the PSB process begins.

By obtaining party status, a municipality can present evidence and cross-examine opposing witnesses at hearings. Conversely, if a municipality limits its involvement to filing comments with the PSB, it cannot submit evidence or challenge opposing testimony. This difference is important, because the PSB's final decision must be based on the evidence presented by the formal parties. Although comments may inform the PSB and possibly shape the nature of the proceedings, the PSB is barred from incorporating comments into its final factual findings and orders. Thus, a municipality is more likely to affect the outcome of a § 248 proceeding if it obtains party status and actively participates in hearings.

Obtaining party status and actively participating in proceedings before the PSB can take considerable time and money. Although a municipality isn't required to hire a lawyer to participate, the hearings can be technical and require a relatively high degree of legal sophistication. Therefore, to present an effective case before the PSB, hiring legal counsel is highly beneficial. ***However, a municipality can avoid or reduce legal expenses by drafting a comprehensive energy plan ahead of time that unambiguously states the municipality's position towards the development of new energy facilities.*** Municipalities can pool resources with their Regional Planning Commission or adjacent municipalities to manage participation costs.

As mentioned above, by statute, the PSB is required only to give "due consideration" to the recommendations of local and regional planners during § 248 proceedings. The PSB is not required to find the project actually complies with the town or regional plan. Accordingly, in § 248 proceedings the PSB looks at town and regional zoning, land-use, and energy plans for guidance in evaluating whether or not an energy project will unduly affect regional development. While under statute, the PSB is only required to give local and regional plans "due consideration," it's clear in three recent PSB proceedings that town and regional energy plans have had a significant impact on the decision of whether or not to issue a CPG.

In the case of the Georgia Community Wind Project, the PSB examined the language from local zoning bylaws, regional land-use plans, and regional energy plans. The PSB noted that although town plans from Milton and Georgia encouraged protection of scenic views, they also encouraged the development of renewable energy. The PSB interpreted these two provisions to mean that the towns intended to "ensure that any wind generation projects are sited in a way that minimizes the aesthetic and other impacts associated with these projects." Based on these plans and regional energy plans, the PSB determined that there was regional support for an industrial scale wind project and issued the project a CPG.

The PSB relied heavily on town plans in approving two other wind projects, one in Sheffield and one in Searsburg. Notably, in both cases the PSB gave preference to the host town's plan (which supported renewable energy development) over the plans from neighboring towns.

Local and regional energy plans may have an effect on the PSB's evaluation of energy projects. Further, PSB precedent is clear that energy plans need to be clearly written and unambiguous. If a town supports renewable energy projects within its borders, its energy plan should clearly indicate that position. Alternatively, a town that opposes new development should make that position as clear as possible in its energy plan. Also, if there is a conflict between neighboring towns, the PSB will likely settle the dispute by relying on the plan from the town where the proposed project will be constructed.

Hooking-up to the Grid:
Net Metering Small-scale Renewable Energy

Net metering is a system whereby consumers who own and operate their own renewable energy facilities, such as solar, wind or hydropower, receive credit for the electricity they generate. That credit allows homes and businesses to offset their electric bills (in whole or in part) based on how much electricity they generate versus how much they use. The electricity is metered into the grid and then the credit is applied to the customer's use, thereby creating an electric bill with no charge or a reduced charge.

Group net metering allows a group of customers, or a single customer with multiple electric meters (located within the same electric utility service territory), to combine meters as a single billing entity and to join together to offset their electricity bill as a net metered system. Group net metering works the same as net metering. The significant exception is that it allows one generating source — a landowner with ample capacity on their property, home or business — to generate far more electricity than they would use and 'share' or distribute that generating benefit with a group of customers within the same utility service territory. The benefits of group net metering are many. If one local resident has the perfect space for solar, wind, hydro, community-scale biomass etc., group net metering allows them to band together with friends or neighbors to share the renewable energy benefits — as well as the cost of the project.

Enterprise Development program, which is designed to promote the development of in-state renewable resources by setting targeted goals the state must meet. In 2009, Vermont enacted the first state-based "standard offer" program to financially incentivize the development of Vermont renewables. The program, capped initially at 50 MW, was extremely successful, helped catalyze many new projects and may be expanded in the future.

A state Comprehensive Energy Plan is essential to mapping out the most strategic, effective way for Vermont to meet its energy needs now and far into the future and outlining the necessary action strategies to turn state goals into reality. The Department of Public Service is charged with updating the state's energy plan every five years and is anticipated to complete a plan in Fall 2011.

On the ground, making a renewable energy project happen takes significant work and preparation. It also takes a good deal of public engagement and outreach. For projects, big or small, public outreach (talking to your neighbors!) is imperative to a smooth and strong permit and installation process. Many projects have been stalled for years, stopped or dismantled because of the failure to adequately consider or engage the interests, needs or concerns of the public.

Permitting Renewables

Most renewable projects will require a permit or permits or, at a minimum, notification to the municipality in which a project is proposed. Necessary permits, certificates and notifications are the responsibility of the landowner. The types of permits required for any renewable project will vary greatly depending on the project.

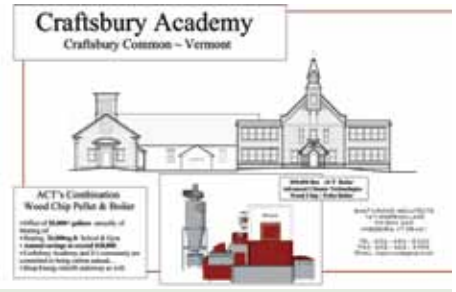
For all renewable energy projects that will be interconnected to the electrical grid (net-metered), a Certificate of Public Good is required from the PSB. The PSB, under the provisions of Section 248, issues Certificates of Public Good to applicants if they meet specified criteria, including need, reliability, economic benefit and site-specific environmental criteria incorporated from Act 250. However, net-metered projects are exempt from some Section 248 criteria in order to expedite the permitting process. These exemptions are outlined in PSB rules. For more details about Section 248, acquiring a Certificate of Public Good or navigating the process, see the PSB publication "Citizens' Guide to the Vermont Public Service Board's Section 248 Process."

Other permits that might be required for a renewable energy project include:

- **Construction General Permit** — Obtained from the Vermont Agency of Natural Resources (a stormwater permit; required when disturbing over one acre of land)
- **Air Pollution Control Permit** — Obtained from the Department of Environmental Conservation, Air Quality Division
- **General Permit** — Obtained from the Army Corps of Engineers (most often for projects with likely wetland impacts)

Because the types of permits required vary (depending on the generation type, the scale of the proposed project, the location of the proposed project, etc.), consulting with appropriate state officials should occur early in the project planning process. Municipalities that develop local renewable energy facilities for public use often work in partnership with private energy developers. General information about renewables, the regulatory process and qualified energy developers may be available from Renewable Energy Vermont, a trade organization for renewable energy businesses and contractors.

CASE STUDY: Craftsbury Academy Biomass Boiler



A community supported project at this school located on Craftsbury Common will help the town become more energy independent, reduce greenhouse gas emissions and support the Vermont economy.

Overview of Renewable Energy Options

Solar Energy

The original energy source, the sun, has several applications that make solar an attractive solution for Vermont. Every building that gets direct sunshine receives some measure of free solar energy that reduces the amount of fuel needed for heat. Types of solar energy technology include:

Passive Heating and Lighting. Buildings that are oriented close to true South (within 30 degrees) maximize available solar energy, as long as the solar radiation is not blocked. Through the use of window glazing on the south wall, installation of thermal mass (such as concrete, brick, quarry tile, or water), and adequate insulation, as much as 60 percent of a building's space heat can be derived from the sun. Solar energy can also provide natural day-lighting in well-designed buildings. Careful design and placement of windows and clerestory can greatly reduce the energy required for daytime lighting, as evidenced by the large windows often found in old school houses around Vermont that were designed to maximize natural lighting. This means of capturing solar energy is known as passive solar because no pumps or moving parts are required; collection and storage of solar energy is built into the structure. Active solar systems employ equipment such as collector panels, pumps, and fans.

Water Heating. Solar water heating is a well-established technology that is suited to Vermont. A typical solar hot-water system includes collectors to capture the sun's energy, a pump that circulates a nontoxic antifreeze solution through the collectors to extract heat energy, an electronic controller to regulate the operation of the system, and a well-insulated storage tank to hold the solar-heated water. A solar system can be integrated with a water-heating system already in place, so that the existing system can provide backup heating when there is not enough solar energy. Solar hot water heating is fairly cost effective; typically the payback period for solar hot water systems is between 5 and 8 years. The payback on solar photovoltaic is longer and can vary significantly depending on the incentives one might be able to secure. Because solar water systems are not regulated by the PSB, they are subject to regulation under local zoning bylaws.

Electricity Generation. With the advent of net-metering, solar arrays are no longer limited to isolated "off-the-grid" locations. A typical solar electric system consists of photovoltaic modules that convert the solar energy to electricity, batteries that store the electricity, and an inverter that converts the DC electricity stored in the batteries to the AC electricity used by conventional electric appliances.

Solar Energy Planning Considerations

- Building and site design is an important factor in promoting passive solar. Building codes, zoning bylaws and subdivision regulations can all have a direct bearing on the promotion of solar energy in a community through strategic siting, landscaping and building design and construction standards. Likewise, properly designed municipal buildings — or any building for that matter — can also take advantage of this "free" technology.

- The cost of photovoltaic technology has been a barrier to widespread use in the past, but state and federal incentives, the premium for solar power paid by some Vermont utilities, and steady declines in the cost of photovoltaic technology over the past decade has made solar much more competitive. This trend is expected to continue in the coming years, making solar electric generation an increasingly viable option for municipalities, individuals, businesses, and utilities.

- Most photovoltaic systems require a Certificate of Public Good from the PSB and are therefore exempted from local regulations (see sidebar page 26), although the Board is required to consider "the land conservation measures contained in the (municipal) plan." Should the town have concerns regarding the placement of solar facilities in specific locations due to natural resource concerns (e.g., placement in flood hazard areas or riparian buffers, fragmentation of agricultural lands), those concerns should be expressed through clear conservation policies in the plan. Similarly, should a town wish to promote the siting of solar facilities or solar "farms" in well-suited locations, specifying those locations in a town plan is one way to help do that.

- Solar arrays that are not connected to the electric grid, such as solar hot water systems, and therefore do not require a certificate of public good, are subject to local zoning review. It is important to consider whether such standards will create barriers to the placement of solar arrays on buildings or sites, keeping in mind the various regulatory provisions that apply specifically to renewable energy in Vermont's planning enabling statutes (see Appendix B). If your community wishes to promote solar hot water or photovoltaics, it is advisable to proactively identify and work to break down those barriers if they exist.

Wind Energy

Wind power has become an increasingly economically viable form of renewable energy. Wind turbines come in a wide variety of sizes for on-site electricity for homes, businesses, schools, and communities; utilities use larger scale turbines in the windiest locations to generate far more electricity and add power to the grid.

There are a variety of turbine types available including free-standing and building-mounted versions. Building-mounted wind turbines are usually situated on the roof of a building, although this is uncommon in Vermont due to the lack of reliable wind at lower elevations. Free-standing turbines are also available in a range of sizes. Large (1-3 MW machines) are typically used in wind farm developments, while smaller (<1 MW turbines) are generally more suitable for on-site applications and net-metering.

The American Wind Energy Association defines small wind turbines as electric generators that utilize wind energy to produce clean, emissions-free power for homes, farms, and small businesses. With this simple and increasingly popular technology, individuals can generate their own power and cut their energy bills while helping to protect the environment. The U.S. has been a world leader in the production of small wind turbines, which are defined as having rated capacities of 100 kilowatts and less, and the market is expected to continue strong growth through the next decade.

Presently, there are over 150 wind turbines producing electricity in Vermont (this number likely excludes additional turbines not connected to the electrical grid). The majority are small scale (10 KW or smaller), although some larger facilities have been developed in recent years and one "utility scale" wind farm has been developed. That facility (Searsburg Wind Farm owned by Green Mountain Power) has received state permits to expand, and at least three other utility scale projects have either received state permits or are in the permitting process.

Some municipalities have developed small-scale wind facilities to help meet municipal electricity needs. Evaluating the viability of municipal properties for wind energy is an important plan consideration if the municipality is interested in developing the site or making it available to private energy developers. Looking at group net metering possibilities for the municipality or for a group of residents can be a way to make projects cost effective and possible.

For wind energy to be viable, good wind conditions are required. In Vermont, viable wind sites are often limited to high elevations with good exposure to prevailing westerly winds. For anything other than small-scale, on-site use, viable wind sites in Vermont are on mountain tops and ridges with reasonable access and proximity to transmission lines. The Renewable Energy Atlas of Vermont provides the most up-to-date mapped data for potential wind sites. However, site specific data – gathered with temporary meteorological towers – is necessary to determine whether a site is viable.

Wind Energy Planning Considerations

- Due to the need to locate wind turbines on high elevations where wind resources are greatest, and concerns related to the community and environmental impacts of large (utility) scale wind projects, developing wind energy in Vermont is challenging. Many of the issues related to large scale wind energy were considered by the Department of Public Service and presented in the report entitled *Wind Energy Planning Resources for Utility-Scale Systems in Vermont*. A great deal of new information, partially based on Vermont experience, and changes in technology has occurred since the report was published in 2002. But many of the issues identified (and left unresolved) in the report remain relevant, as does the conclusion:

  "Though questions around the siting of wind power projects may be years from being answered in a clear and consistent manner, now is the time to examine the issues and implications. Through the planning process, Vermont's town and regional planning commissions will have a strong influence on the development of wind energy. Towns and regions that establish a clear planning direction for wind resources and wind power will be most influential in directing this policy discussion."

  To have such an influence, it is important that communities consider the possible costs and benefits of large scale wind projects on the community and draft clear, unambiguous policy statements regarding acceptable and unacceptable wind facility locations in the community. Such policies are best if accompanied by mapped information and care should be made to ensure that the energy policies are consistent with land use and natural resource conservation policies.

- Wind facilities that are not connected to the electric grid fall under the jurisdiction of local zoning bylaws. Siting and height standards should be considered to balance impacts on neighboring properties while ensuring that projects remain viable.

- The development of large-scale wind projects have been among the most contentious development issues in Vermont over the past decade. Public concerns often involve a variety of issues, including impacts on:
  - aesthetics and community character;
  - wildlife populations, including bears, birds and bats; and
  - water quality associated with development on steep slopes and high-elevation soils.

In addition, concerns related to the impact of large scale wind turbines on public health, including impacts associated with noise, are frequently raised, although the scientific basis of those concerns is inconclusive.

Overview of Renewable Energy Options

Geothermal Energy

Many technologies have been developed to take advantage of geothermal energy—the heat from the earth. There are approximately 50,000 geothermal heat pumps installed in the United States each year. In Vermont, however, geothermal energy typically involves the use of heat pumps that take advantage of the relatively constant temperature below the frost line of 45-55 °F through use of water from a well or that has circulated through underground pipes. During the winter, as this water is circulated through the heat pump, the heat pump "extracts" and upgrades heat from the water to distribute throughout the building. The now-cooled water is returned to the earth to be re-warmed. The system is reversed in the summer, with the heat pump extracting heat out of the hot air in the building and sending warmed water into the earth to be chilled.

Open-loop systems are the most common and most efficient of the geothermal heat sources; a single well where water is pumped from the bottom and returned to the top can operate almost everywhere in Vermont. The well is simply drilled deep enough for sufficient heat exchange. This well commonly also serves as the domestic water well. For larger commercial projects, multiple wells may be needed. Where sufficient ground water is available, water may be pumped from a source well and, after heat exchanged, returned to a recharge well.

In addition, three types of closed loop systems are generally available in Vermont: Horizontal, vertical and pond systems. Horizontal systems require loop pipes placed in trenches at least four feet deep. A large land area with suitable soils is required. Vertical systems are ideal for minimizing disturbance to the landscape. These use grouted loop pipes placed in multiple holes drilled to a depth of 150 to 400 feet. Pond systems involve a pipe run from the building into a nearby body of water and coiled at least eight feet under the surface.

Geothermal Energy Planning Considerations

- The installation price of a geothermal system can frequently be greater than that of a conventional heating and cooling system, although dual use of the well for domestic water in an open loop system can greatly reduce this difference. The additional costs are typically returned in energy savings in 5–10 years. System life is estimated at 25 years for the inside components and 50+ years for the well or ground loop.

- The installation of closed loop geothermal systems can require extensive site work such as drilling deep bore holes or digging deep trenches to house the collector pipes. The feasibility of doing this will depend on the geological conditions at the site. Installation of an open loop system can be as simple as drilling a new well or deepening an existing well.

- Geothermal systems are designed to operate at moderate temperatures. Connecting a geothermal system to an existing heating system is often constrained by the requirement of some existing systems to operate at higher temperatures. This can often be overcome, but at an increased cost. Any project that includes extensive weatherization can greatly enhance a geothermal project and make conversion of an existing high temperature system more feasible. Ground source heat pumps are generally best suited to new-build projects, where they can be included in a high efficiency building design.

- The operation of geothermal heat pumps requires electricity, which can heavily offset the energy savings unless the electricity is generated from renewable sources. Geothermal heat pump systems can, however, be highly efficient producing considerably more heat energy than necessary to operate them, and usually are twice as efficient as the common room air conditioner. They are also subject to none of the inefficiencies of air-to-air systems from the seasonal changes in air temperature. Operating costs can frequently be less than other heating or cooling system available in Vermont, and considerably less than conventional systems.

Hydropower

Hydropower relies on the gravitational force of flowing water to spin a turbine and generate electricity. Hydropower has played a large role in Vermont's history, shaping early settlement around rivers and streams that powered the mechanical devices of the state's early industries (e.g., grain mills, saw mills). Hydropower also provided an important source of electricity – by the 1940s hydropower provided a majority of Vermont's electricity, although that percentage declined with the advent of power from inexpensive fossil fuels and nuclear energy. Today, in-state hydropower provides some of Vermont's cheapest electricity and out of state hydro – most notably from Quebec – accounts for a substantial portion of Vermont's energy portfolio.

There are two main forms of hydropower generated in Vermont: run-of-river, which uses the natural flow of water to generate power and facilities that store water behind an impoundment. Run-of-river facilities rely on seasonal rainfall and snow pack to produce power, resulting in periods of low production (e.g, mid and late summer).

Impounding water behind a dam allows for control of the water flow and thus consistent electricity production. When demand for electricity is at peak levels, these facilities can increase electricity production, unlike run-of river systems. Hydropower may also be generated by pumping water from a lower reservoir to an upper reservoir when demand for electricity is low, and releasing the water back to the lower reservoir to generate electricity when demand is high.

Most of the best sites for large-scale hydropower production in Vermont have been developed, although some additional opportunities may exist. The Vermont Agency of Natural published a Small Hydro Report in 2008 that stated "(t)here are opportunities to develop additional in-state hydroelectric capacity at existing but undeveloped dams. The total capacity is likely to be on the order of 25 MW, assuming new development is restricted to existing dams, but additional study is needed to develop an accurate estimate."

Estimates for additional potential hydropower (i.e., viable sites along rivers and streams where dams don't presently exist) range widely from a low of 15 MW to a high estimate of over 400 MW. This wide range highlights the disagreement that exists among experts as to the number of appropriate sites relative to potential ecological impacts and compliance with state and federal permitting requirements.

A commonly used term for small-scale, and presumably low-impact, hydropower is "micro-hydro." While there is not one standard definition of micro-hydro, it generally relates to a facility that generates up to 100 kW. Otherwise, micro-hydro shares the same characteristics as other, larger hydro-facilities (e.g., either run of river or storage), only at a smaller scale.

Hydropower Planning Considerations

- Retrofitting existing dams for hydropower may be a means of generating power with minimal environmental impacts. Evaluating the hydro-potential of existing dams in the community is a useful first-step in determining whether hydro-power is a viable option.

- Hydropower facilities are subject to licensing by the Federal Energy Regulatory Commission (FERC) and stringent federal water quality standards. Consequently, the regulatory process for hydro facilities is extensive and time consuming. Further, streams are public trust resources and the potential impacts of hydro projects warrant significant consideration. The Vermont Agency of Natural Resources (ANR) recently developed a streamlined application process to assist small-scale hydro developers with the FERC process. While this may better inform potential developers, the analysis needed to comply with all applicable permits and ensure that a hydro-facility will not result in undue adverse impacts to riverine ecosystems remains time consuming and comprehensive. The importance of contacting ANR officials very early in the process to determine whether a hydro facility is viable, including the retrofit of an existing dam, cannot be over-emphasized.

- Run-of-river power is considered more environmentally friendly than other hydropower forms, as it does not require major changes to river flow or surrounding ecosystems, although it is not without impact. Facilities that use impoundments to store water are much more easily controlled and are therefore more predictable, although impoundments and controlled flows can have a significant impact to riverine ecology and aquatic ecosystems.

- Dams can have significant impacts on river ecology. These impacts frequently correspond to the size of the facility relative to the river, although that is not always the case. In recent years, some hydro projects have been considered on Vermont streams that lack adequate stream flows and/or head (river slope). For them to be economically viable, it would require consuming a significant amount of the total flow of the river, which can cause environmental impacts and other concerns. In addition to stream flow, fragmentation of fisheries habitat resulting from dam construction is a significant concern of state fisheries biologists.

Overview of Renewable Energy Options

Woody Biomass

Biomass refers to the use of a wide variety of organic material, such as wood, grass, dedicated energy crops, sewage sludge and animal litter. Biomass can be viewed as a form of stored solar energy as the sun's energy is captured and stored via the process of photosynthesis in growing material. This energy is released through combustion (burning) or more slowly when the biomass material eventually composts or rots. Combusting wood from Vermont's forest has provided biomass energy for Vermonters since pre-European settlement and, in the heavily forested Green Mountain State, it will likely continue to be a significant source of thermal energy. It will also continue to provide a source of electrical generation, although the degree to which that will occur will largely be dependent on state and federal policy.

Combusting biomass fuels such as wood, straw or energy crops (for example, willow coppice or specific types of grasses) to produce heat or steam for space or process heating is presently one of the most efficient and cost-effective applications for biomass. Using biomass to generate electricity without utilizing the waste heat, however, is among the least efficient means of generating electricity. While two utility scale biomass electric facilities have been built in Vermont without utilizing the waste heat, the most likely municipal applications for biomass are for heating or, in some communities, for combined heat and power (CHP) in which case the energy is used for both heating and electrical generation.

Biomass currently provides about two percent of America's electricity and some of the heat and steam used by homes and businesses. With more energy crops and better conversion technology, it could gain a much larger portion of the market. It is estimated that energy crops and crop residues could provide 14 percent of U.S. electricity use.

Biomass heating facilities come in a wide range of sizes from a few thousand Btus to many million Btus of heat. For biomass thermal led CHP, sizes tend to range from around 1 MW to 5 MW of electrical generation capacity. At smaller sizes, fuel is usually supplied as wood pellets or wood chips. Hand-fed, log-based systems are rare outside the domestic sector. At the larger scale, wood chips are one of the most common fuels at present.

In Vermont, the Ryegate biomass facility has a capacity to generate 20 MW of electricity, and Burlington Electric Department's (BED) McNeil facility has a capacity of 50 MW. Over 45 schools have converted to wood heating in recent years, and Middlebury College has a biomass cogeneration facility used for heating and cooling campus buildings, in addition to generating three-to-five million kWh of power annually. The college is studying the use of fast growing willows on school-owned land as a fuel source. Green Mountain College also uses woodchips for its combined heat & power projects. Firewood also provides a significant source of energy for home heating.

Woody Biomass Planning Considerations

- The electrical power output of CHP installations commonly ranges from 1 MW to over 5 MW. For each MW of electrical generation approximately 3 MW of heat will be produced. Therefore, CHP is best suited for areas with a high concentration of buildings or facilities, such as large institutions (e.g., college campuses), downtowns, high-density neighborhoods, and office or industrial complexes. Typically, the economics of biomass CHP installations are based on the capacity to use the heat rather than the electrical production.

- Location, location, location. Strategic siting of biomass facilities is key for many reasons, including ensuring proximity to a sustainable wood supply (ample procurement possibilities), a local market for the energy product (heat, electricity or pellets), permitting, water and air quality and local support for a project. Communities should be mindful of the existing and potential biomass fuel sources that are locally available. A reliable and accessible source of fuel, as well as a suitable supplier, is needed for biomass facilities. (Consequently, biomass is particularly attractive for businesses that produce a by-product that can be used as a fuel, either alone or in combination with bought-in biomass fuels.) When it comes to ensuring a sustainable wood supply, communities must consider forest health and its carrying capacity as well as maintaining a productive forest base. The relationship between the use of biomass and the maintenance of forest health is a real concern. Communities should consider consulting with the County Forester or independent consulting foresters to understand and address issues related to sustainable forest management. In January 2011, an interim report of a Biomass Energy Development Working Group formed by the Legislature identified the need for additional study regarding forest health associated with harvesting for woody biomass energy. The final results of the Working Group should also help to inform communities on this topic.

- Communities must also be mindful of the public piece of this equation, including ensuring that projects are sited within regions properly zoned for their placement. Though technology developments have made it possible to burn biomass more cleanly and efficiently, siting biomass plants in often the most strategic locations, in or near load centers, requires ample consideration to public health issues related to air and water quality. These and other issues, such as truck traffic associated with fuel hauling, often necessitate proactive public engagement in the siting and development process.

Biogas

Biogas refers to technologies that harness sources of methane gas to produce energy. Human sewage, animal manure and food wastes naturally emit small amounts of methane when they break down naturally. When any of these wastes are processed in an anaerobic digester they create methane gas, which is collected and used to power natural gas engines and generate electricity.

Biogas projects range in size and can utilize a single waste stream or a combination of wastes. They can be home-based (generating enough gas to run a cook stove), farm-based (generating enough gas to supply electricity for the farm or more, with group net metering potential) or industrial-based (generating enough to supply power and heat several buildings or a campus).

There are 12 digesters in Vermont as of February 2011, two under construction and 10 in active planning, many made possible by Vermont's SPEED program. Central Vermont Public Service's (CVPS) nationally recognized "CVPS Cow Power" manure-to-methane initiative produced approximately 1.4 MW annually from eight farms in 2010. CVPS and Green Mountain Power (GMP) customers can opt to get a percentage of their electricity from manure-to-methane projects, with participating farms being added each year.

Other sources of existing or potential biogas operations in Vermont include landfills, wastewater treatment facilities (such as the existing Essex Junction wastewater plant), and large-scale food processing facilities, such as the Magic Hat Brewery in South Burlington.

There are significant opportunities in Vermont to expand energy generated from biogas, including tapping into other existing wastewater plants, landfills, food processing plants or large-scale food waste collection in regions around Vermont focusing on high waste producers such as schools, hospitals and restaurants.

Biogas Planning Considerations

- Biogas facilities are often sited on farms, at wastewater treatment plants or at landfills, taking advantage of the methane potential of organic wastes.

- Wastewater treatment plants offer one of the most significant and effective sources of biogas energy as well as landfills, which are responsible for capturing and eliminating methane (which they often simply waste, burning off the methane and creating the tall flames you sometimes see at many landfills).

- For many Vermont farmers, harnessing power in a waste-to-methane effort also offers a way for them to create a steady supply of bedding for their farm animals. There is often extra heat created from the gas engine, not all of which is currently used. Many farms would benefit by working with neighboring houses, schools or towns to utilize that heat. Working with greenhouses or swimming pools in the winter (to heat them) might offer another creative way to use the waste heat.

- Waste to methane energy plants go a step further, utilizing much of the same manure to methane technologies to harness that methane, turning trash into electricity. Landfills in Coventry and Moretown, Vermont have the generating capacity to produce 8 MW and 3.2 MW, respectively. Carbon Harvest's waste-to-methane project, expected to open in Brattleboro in Spring 2011, will sequester excess carbon dioxide and heat from methane combustion — feeding algae and powering a greenhouse that will grow vegetables and produce tilapia as well as future feedstocks for biodiesel.

- Proper management of any biogas system is key to its success. Ensuring a point person or small team is responsible for overseeing the day-to-day operation of the system will help make certain it runs well. Working with your neighbors and your town to create a strong project is instrumental in a project going forward smoothly.

Overview of Renewable Energy Options

Biofuels

Biofuels are made from different types of renewable biomass, with biodiesel and ethanol being the most widely used liquid biofuels. Lifecycle greenhouse gas (GHG) assessments of these two biofuels show they are capable of reducing GHG emissions by 20 to 60 percent, compared to using fossil fuels.

Biodiesel is a diesel replacement fuel that can be made from oilseed crops (e.g. canola, soybean, or sunflower), reclaimed vegetable oil (e.g., from restaurant deep-friers) and, from algae. Since it can be used in any compression ignition ("diesel") engine without significant modification, biodiesel is being used today in farm equipment and other applications, including transportation and space heating.

Biodiesel blends easily with refined petroleum products and can be added to or replace No.2 heating oil or low sulfur diesel in any engine, equipment or heating appliance that uses distillate fossil fuels (i.e., diesel, heating oil, kerosene). Biodiesel is produced via a chemical reaction that turns vegetable oils, animal fats or recycled greases into an efficient and clean-burning alternative, or additive, to fossil fuels.

Ethanol is produced via hydrolysis and fermentation, transforming the energy stored in sugar and starch crops such as corn, into a replacement or additive for gasoline engines.

Biofuels are commonly grouped into two categories: "first generation" and "second generation." First generation biofuels usually refers to corn-based ethanol and oilseed crop-based biodiesel. First generation biofuels are well established nationally and gasoline with a 10% mix of ethanol is commonly available at Vermont gas stations. There is no commercial corn-based ethanol production in Vermont, however a number of Vermont farms have established oilseed crops and on-farm biodiesel production in recent years (growing oilseeds and extracting the oil also yields a high-value co-product; the seed meal, which is used as a livestock feed or soil amendment). A number of other organizations, entrepreneurs, and educational institutions have developed a nascent infrastructure for waste vegetable oil biodiesel and oilseed biodiesel, leading to in-state reductions in fossil fuel use.

Second generation biofuels refer to algae-based biodiesel and ethanol made from the cellulose in plants. Second generation biofuels are still in a research and development phase, but they are expected to produce substantially more fuel, using far less land than first generation biofuels.

Biofuels Planning Considerations

- Vermont's heavy reliance on private automobiles for transportation makes Vermonters vulnerable to supply disruptions and rising costs of fossil fuels. Ethanol is mandated as an additive in gasoline, however biodiesel use is up to the individual end-users. While transitioning to more sustainable forms of mobility, promoting the local production and use of renewable biodiesel for transportation and heating (in addition to the environmental benefits) increases Vermont's self-sufficiency and keeps energy dollars in the local economy.

- Vermont farms are unlikely to invest in the production of corn-based ethanol, however, biodiesel production makes sense economically, and the co-products are a good fit for Vermont dairies.

- Biofuels production can be done sustainably, or not. In the Vermont context, biodiesel from oilseeds is being developed as a function of diversified agriculture. In this case, oilseeds are planted in rotation with other grains and grasses and yield oil for food, oil for fuel and meal for feed or organic fertilizer.

- A recent study sponsored by the Vermont Sustainable Jobs Fund and undertaken by the University of Vermont — Homegrown Feed, Food and Fuel — showed that Vermont could produce an equivalent amount of all of the diesel it uses (in the form of biodiesel) to power its' farms, dairies, grain, vegetable and sugaring operations, sustainably and economically. And this can be done without taking any land out of current food production.

- Promoting bio-fuels made from oilseed crops raise many of the same land use issues associated with efforts to maintain Vermont's productive farmland for food production and the state's rural character. In fact, the potential development of a biofuel industry exacerbates the need to protect farmland from development. It also raises the potential to create competing demand for quality agricultural lands in the future, although this will likely result in enhanced economic viability of farmland.

Renewable Energy Resources

The **Biomass Energy Resource Center** (BERC) is an independent, national nonprofit organization located in Montpelier, Vermont with a Midwest office in Madison, Wisconsin, that assists communities, colleges and universities, state and local governments, businesses, utilities, schools, and others in making the most of their local energy resources.

The **Clean Energy Development Fund** (CEDF) was established by the Vermont Legislature to increase the development and deployment of cost-effective and environmentally sustainable electric power resources — primarily with respect to renewable energy resources and the use of combined heat and power technologies — in Vermont. The CEDF provides incentives, grants, and loans for the installation of renewable energy systems.

The **New England Wind Forum** was launched in 2005 to provide a single comprehensive source of up-to-date, web-based information on a broad array of wind-energy-related issues pertaining to New England. It is funded by the Wind Powering America Program, Massachusetts Technology Collaborative's Renewable Energy Trust, and the Maine State Energy Program. Co-funding has been requested from each of the New England states.

The **Northeastern Vermont Development Association** (NVDA), with the support of the Clean Energy Development Fund, published a series of five guidebooks to assist local officials, energy committees, property owners and other interested citizens with using small-scale renewable energy. They address heating with conventional woodstoves, pellet stoves, geothermal, small-scale wind, and solar. The guidebooks are available on NVDA's website.

The **Renewable Energy Atlas of Vermont** is an online tool that enables users to analyze the availability and potential development of various renewable energy resources at a site, town-wide, or regional scale [see sidebar].

Renewable Energy Vermont (REV) is comprised of renewable energy companies, institutional and academic partners and concerned citizens of Vermont. REV member businesses are leading experts in helping homes and businesses generate their own clean power and heat. REV is a useful resource for questions concerning developing renewable energy projects, renewable energy incentives etc.

The **Vermont Rural Energy Council** published a final report entitled *Strengthening Vermont's Energy Economy,* together with several associated research papers, in 2007 as part of a two-year project developed by Vermont Council on Rural Development to provide a non-partisan analysis of opportunities in rural electric generation, fuel development and energy efficiency in Vermont.

The **Vermont Public Interest Research Group** prepared the *Vermont Clean Energy Guidebook* in 2009. The *Guidebook* is designed to assist individuals, communities and businesses in identifying available incentives, rebates, providers and programs that are available to help with the development of renewable energy facilities.

VII. Solid Waste Management

Historically, waste management has been a municipal concern with important implications for energy planning. Since 1960 the amount of waste generated per person per day in the U.S. has increased by 1.8 pounds. Total waste generation in the U.S. in 2008 was 249.6 million tons. That same year, over 560,000 tons of solid waste was disposed of by Vermonters, 80% of which ended up in in-state landfills. Managing and removing materials from the waste stream may not only extend the life of our landfills, but also reduce energy consumption and may reduce costs – monetary and environmental – that are associated with disposal.

In Vermont, municipalities "are responsible for the management and regulation of the storage, collection, processing and disposal of solid wastes within their jurisdiction in conformance with the state solid waste management plan.[13]" Nearly 90% of Vermont municipalities have opted to satisfy this responsibility either through membership in a solid waste management district or coordination with a regional planning commission's solid waste planning initiative. Consequently, energy issues associated with waste management are typically not given focused consideration in the municipal plan.

Regardless of whether or not solid waste planning is the responsibility of a regional entity, municipalities should be aware of the connection between energy consumption and solid waste management in developing an energy plan. Local governments and schools with their solid waste districts, can adopt policies and practices that reduce the amount of waste they produce by separating recyclable or compostable items from the waste stream.

Turning Food Scraps Into Fertile Opportunity

The Vermont Agency of Natural Resources has estimated that more than 30% of the solid waste that ends up in landfills is organic matter, primarily food scraps (21%), discarded paper (9%) and yard waste (1%). This not only takes up scarce landfill capacity, but it results in the generation of significant amount of methane and represents a lost opportunity to turn trash into a valuable natural resource: soil.

The Highfields Center for Composting, located in Hardwick, Vermont, was founded in 1999 to promote the use of on-farm composting as a manure management program. The Highfields Center for Composting offers a variety of programs and training workshops to help farmers, businesses, restaurants, trash haulers, schools and individuals, reduce the amount of organic material they send to landfills, building soil health and economic opportunity and reducing greenhouse gas emissions in the process.

Municipal solid waste is defined as "combined household, commercial and industrial waste materials generated in a given area[14]." Solid waste management districts, and in some cases regional planning commissions, offer technical assistance, grants, and links to providers of services (such as residential drop off locations for food scraps or curb side recycling pick-up) to assist municipalities and individuals in reducing what enters our landfills. Understanding what policies and programs exist, and what role the municipality can play in "reducing, reusing and recycling" municipal solid waste, should be considered when preparing an energy plan. This should include an assessment of policies that affect solid waste management in the community to determine whether:

- source separation (systems that separate compostable and recyclable materials from non-compostable, non-recyclable materials at the point of generation) is required of local businesses and residents;
- there is convenient access to recycling and composting facilities;
- the local government has a policy of purchasing office supplies and other materials that contain recycled content (the State of Vermont offers bulk purchasing for environmentally preferred products (EPP) through state contracts);
- provisions to encourage (or minimize barriers to) composting exist;
- "pay as you go" solid waste collection (collection and disposal rates that are based on the volume of waste) is available or required of local haulers and collection facilities; and
- consideration has been given to the municipality contracting with one or more haulers, as opposed to individual residents and homeowners entering into separate contracts, as a means of maximizing efficiency and reducing duplicate truck trips.

CASE STUDY: **Energy Efficiency Through Solid Waste Hauling**

One waste hauler, instead of several, undertaking pick-up service helped the Town of Westford save fuel and minimize impact to local roadways.

VIII. Integrating Energy, Land Use and Transportation

It is impossible to address the full range of local concerns and considerations related to energy without addressing issues associated with transportation and land use – both topics that Vermont statute requires communities to address in a municipal plan. The relationship between land use patterns and energy use, and most significantly transportation, is well documented.[15] This relationship prompted the Vermont Legislature to require that municipalities include "a statement of policy on patterns and densities of land use likely to result in conservation of energy" in the energy plan prepared as part of a municipal plan.[16]

Traditional Settlement Patterns and Smart Growth

Vermont's rural, relatively low density settlement patterns contribute to the state's reliance on the private automobile for most travel. Consequently, 33% of the state's energy consumption may be attributed to transportation.[17] Vermont's statutory planning and development goals call on municipalities to "plan development so as to maintain the historic settlement pattern of compact village and urban centers separated by rural countryside." This historic pattern was established prior to the age of the automobile and cheap fossil fuels. Development was located to take advantage of the dominant energy sources of the times, including animal power that required open land for food and pasture, hydro-power which concentrated industrial activity around water resources and coal and wood that fueled early rail service that served burgeoning communities located along main lines.

Vermont's historic settlement pattern – characterized by compact, mixed-use development – is the precursor to the contemporary development model often referred to as smart growth. Regardless of the name, traditional development, or smart growth, continues to offer energy-efficient alternatives to scattered, low-density development. Considering smart growth principles as the basis for developing the land use plan, and reinforcing those principles with investments in municipal services and facilities (e.g., siting schools and civic buildings in town centers; prohibiting the extension of municipal water and sewer lines that would foster sprawl) are critical strategies for promoting energy efficient development.

The primary focus of smart growth planning is well designed, compact, mixed use developments that, in Vermont, would fit within and adjacent to historic downtowns, villages and neighborhoods. The flip-side of that smart growth coin involves keeping the state's rural landscape intact. Maintaining large tracts of healthy forests and productive farmland not only provides the contrast with the built environment that defines Vermont's traditional settlement pattern but – much more importantly – ensures long term access to local food supplies and forest products. The importance of these two land based resources from an energy standpoint is difficult to overstate and conserving them is an important means of addressing Vermont's energy goals.

Under Vermont statute, "Smart Growth Principles" mean growth that:

- Maintains the historic development pattern of compact village and urban centers separated by rural countryside.
- Develops compact mixed-use centers at a scale appropriate for the community and the region.
- Enables choice in modes of transportation.
- Protects the state's important environmental, natural and historic features, including natural areas, water quality, scenic resources, and historic sites and districts.
- Serves to strengthen agricultural and forest industries and minimizes conflicts of development with these industries.
- Balances growth with the availability of economic and efficient public utilities and services.
- Supports a diversity of viable businesses in downtowns and villages.
- Provides for housing that meets the needs of a diversity of social and income groups in each community.
- Reflects a settlement pattern that, at full build-out, is not characterized by:
  - ♦ scattered development located outside of compact urban and village centers that is excessively land consumptive;
  - ♦ development that limits transportation options, especially for pedestrians;
  - ♦ the fragmentation of farm and forest land;
  - ♦ development that is not serviced by municipal infrastructure or that requires the extension of municipal infrastructure across undeveloped lands in a manner that would extend service to lands located outside compact village and urban centers;
  - ♦ linear development along well-traveled roads and highways that lacks depth, as measured from the highway.

[24 VSA 76A § 4302]

In addition to focusing on land use patterns that promote transportation options and reduce reliance on the private automobile, transportation plans can also help to reduce energy use through policies and investments in community facilities that promote transportation options, such as municipal support for transit service, bicycle and pedestrian paths, park-and-ride facilities, and regulatory incentives that promote transportation demand management (TDM) as an alternative to excessive parking facilities and traffic congestion. These strategies are addressed in greater detail in Chapter IX Implementation.

CASE STUDY: Expanding Transit with a New Rural Commuter Line

The leadership of energy committee members in East Montpelier, Plainfield and Marshfield, along with the local transit agency, helped establish a new bus commuter option between Montpelier and St. Johnsbury for getting rural residents where they need to go.

It is useful to evaluate existing land use patterns and policies and regulations that help shape future development patterns. A useful tool designed to help Vermont communities with such an evaluation is The Vermont Smart Growth Scorecard, published by Smart Growth Vermont (formerly the Vermont Forum on Sprawl). This self-assessment tool provides background information regarding different development patterns, including smart growth, as well as a step by step process for analyzing a community's land use patterns and development regulations and associated growth management policies and problems.

Characteristics of Sprawl and Smart Growth

Attribute	Energy Inefficient Development Pattern (Sprawl)	Energy Efficient Development Pattern (Smart Growth)
Density	Lower Density	Higher Density
Settlement Pattern	Urban periphery (greenfield) development	Infill (brownfield) development
Activity Location	Commercial and institutional activities are dispersed	Commercial and institutional activities are concentrated into village centers and downtowns
Land Use Mix	Homogeneous land uses	Mixed land uses
Scale	Large/Automobile scale. Larger buildings, blocks, wide roads	Human scale. Smaller buildings, blocks and roads, care to design details for pedestrians
Transportation	Automobile-oriented, poorly suited for walking, cycling and transit	Multi-modal transportation supporting walking, cycling and public transit
Street Design	Streets designed to maximize motor vehicle traffic volume and speed	Streets designed to accommodate a variety of activities. Traffic calming
Planning Process	Unplanned, with little coordination between jurisdictions and stakeholders	Planned and coordinated between jurisdictions and stakeholders
Public Space	Emphasis on the private realm (yards, shopping malls, gated communities)	Emphasis on the public realm (streetscapes, sidewalks, public parks, public facilities)
Energy Use	Energy consumptive due to automobile dependency, limited coordination between energy users	Energy efficient due to transportation options, opportunities for coordination among energy users (e.g., district heating)

Source: *Evaluating Transportation Land Use Impacts: Considering the Impacts, Benefits and Costs of Different Land Use Development Patterns*, Victoria Transport Policy Institute, 2010

Other Considerations

Historic Preservation: Vermont has the nation's second oldest housing stock (with Maine having the oldest). This presents important energy challenges in that retrofitting historic buildings to make them more energy efficient can be expensive, and some changes (e.g., replacing historic windows with modern energy-efficient windows) can alter a building's historic character. On the other hand, Vermont's historic structures not only help define the state's character, but represent a wealth of embodied energy (in this instance embodied energy refers to the total energy consumption from resource extraction, through manufacturing, delivery and construction, for different building materials). Modern building materials, especially aluminum, vinyl and plastic, are much more energy consumptive than traditional materials such as masonry and wood.

In addition, the embodied energy in existing historic structures has been spent, so replacing them with new buildings – especially new buildings constructed with modern materials – represents wasted energy. Finally, Vermont's historic buildings largely define the state's traditional, and more efficient, settlement pattern. This greater efficiency is due to the compact nature, walkability, and greater ease with which traditional settlements can be served by transit, in contrast to more contemporary, lower-density development patterns.

Embodied Energy: From Extraction to Disposal

Embodied energy refers to the commercial energy used to manufacture a product, bring it to market, and dispose of it. Embodied energy is an accounting methodology designed to find the sum total of the energy necessary for an entire product lifecycle. This lifecycle includes raw material extraction, transport, manufacture, assembly, installation, disassembly, deconstruction and/or decomposition.

Policies that ensure a long life for products and facilities, such as re-using historic buildings and ensuring that products and materials are re-used or recycled rather than disposed of, are strategies for maximizing energy efficiency.

CASE STUDY: **Weatherizing a Historic Municipal Building**

Led in large part by volunteers, Thetford residents successfully weatherized the town's historic and popular community center.

IX. The Key to Success: Energy Plan Implementation

Vision without action is merely a dream.
Action without vision just passes the time.
Vision with action can change the world.
— Joel A. Barker

A successful municipal energy plan is a call to action. It articulates a vision for how a community will meet future energy needs through efficiency and the local generation of renewable energy in a manner that is balanced with other community goals. It provides the policy foundation to inform citizens, businesses and others of the community's values. And, it serves as a guide for municipal officials and other decision makers in a variety of settings, including local budgeting, facilities management, zoning and PSB review proceedings.

Defining Clear Goals, Policies and Implementation Tasks

The energy profile, analysis of energy needs and future conditions, and other background information and data are intended to provide the foundation for defining energy goals and setting out the specific actions needed to achieve those goals. There are many approaches to setting goals and related policies and tasks and as many terms. Most communities will use some combination of vision statements, goals, objectives, policies, programs, tasks, strategies, or other terms. Generally, however, a comprehensive energy plan that provides clear guidance for implementation will include:

- One or more broad, aspirational statements that communicate a desired future condition;
- A set of clear policies or objectives that can guide the actions of local officials, as well as the actions of citizens, businesses, state regulators and others when conformance with the plan is desired (e.g., during Section 248 or Act 250 review); and
- Specific actions that local officials and others will take to implement the plan and achieve the desired future conditions.

To assure the plan is implemented, it is common to assign responsibilities for undertaking the task and set priorities (e.g., the time frame in which the task will be completed and the importance of the task in achieving the community's energy goals relative to other tasks). The Town of Stowe took this approach in developing the implementation section of its Town Plan, which includes a detailed energy plan.

Setting Priorities

Many communities will develop ambitious energy plans with a long list of actions that should be pursued by various local officials, often in partnership with others. This can be daunting because implementation may require a concerted effort on the part of many people with multiple responsibilities and competing demands for their time and attention. It is therefore important to set priorities that are realistic given staff and volunteer capacity, and that key boards and individuals (e.g., Selectboard, municipal manager, energy coordinator, energy committee) have bought into the goals, policies, tasks and programs called for by the plan.

After conducting an energy inventory, establishing energy goals and policies, and identifying available strategies, it is critical to prioritize the strategies so that those implemented will enable a municipality to achieve its goals in a cost-effective and efficient manner. When setting clean-energy priorities, an established rule of thumb is: conservation first, efficiency second and renewables third. Depending upon the resources and opportunities available, the goals of the community, and the co-benefits of certain strategies, this should not be used as a hard and fast rule. Opportunities often present themselves that a community may want to take advantage of regardless of priority. Important factors and benefits that should be considered when prioritizing strategies include:

- access to financing and funding – especially grants
- fiscal and development impact
- emission reductions and other environmental benefits
- capacity and skill of – and impact on – the implementing party
- the creation of educational opportunities
- public visibility and marketability
- increased local economic activity
- improved human health and safety
- timeline of work

- permitting and regulatory exposure (more likely with energy generation)
- opportunity costs

There are several approaches for municipalities to set priorities in a systematic manner. Common considerations include an analysis of costs and benefits to the municipality, the economic and social benefits to the community, and the availability of local capacity to carry out specific recommendations. The mix of considerations used to set priorities will vary from community to community; what is important is that the implementation section of the plan be based on careful consideration of what is realistic given local resources and capacity and what is supported by those responsible for implementation. The City of Burlington went through an extensive priority setting exercise when developing its Climate Action Plan. That exercise involved assessing the costs and benefits of over 200 climate mitigation strategies identified by eight working groups.

Implementation Tools

Community Education and Outreach

As noted earlier in this document, the planning process should be inclusive and involve the public to the greatest extent practical. That interaction with local citizens and businesses should not end once the plan is completed. To the contrary, an ongoing effort to motivate a community to achieve the goals of the energy plan is an important implementation strategy in its own right. Local officials, most notably energy committees and coordinators, are often tasked with being aware of various programs that are available to help citizens and businesses to reduce energy use, generate renewable energy, and achieve other energy goals. These community energy leaders share this information with the public to help open up opportunities and deliver assistance that might not otherwise be taken advantage of.

There are many techniques available for sharing information and increasing public awareness of energy plan goals and available resources to help individuals and businesses achieve those goals. Motivating and inspiring as broad-based a segment of community members as possible is essential. Common outreach efforts to assist with plan implementation include the following:

- **Hold an Energy Fair** to highlight available resources, products and opportunities local residents might tap to save energy or transition to renewable supplies.
- **Get the word out** in the local newspaper or town bulletin. Create a poster and place it about town. Start a Facebook page or "tweet" energy-innovating ideas over Twitter.
- **Organize an Energy Challenge.** Neighbor-to-neighbor or community-to-community challenges are fun and potentially fruitful ways to help residents and businesses reduce their energy consumption or implement clean energy solutions.
- **Maintain a town webpage**, with links to various resources that would be helpful to the municipality or local residents. Or, use the VECAN web page, where energy committees can create their own web pages to share information.

CASE STUDY: Middlebury "Unplugged"

With the support of the Vermont Community Foundation, 14 Middlebury businesses participated in an energy-savings challenge to raise awareness, reduce energy use and save money.

Maximizing Efficiency in Municipal Facilities & Operations

One of the most direct public benefits of municipal energy efficiency initiatives (or the generation of below-market rate energy from renewable resources) is that the savings are passed on directly to taxpayers. Common efficiency measures include the following:

- **Energy Audits and Retrofits.** One of the most popular energy saving strategies undertaken in recent years has been energy audits of and upgrades to municipal buildings and facilities. Energy audits typically include:
  - a comprehensive evaluation of a building's air tightness and insulation effectiveness and windows;
  - identification of energy efficiency opportunities with mechanical systems, lighting, and appliances;
  - installation of energy-saving products such as efficient light bulbs and water conservation products;
  - an audit report and scope of work for recommended energy efficiency improvements.

  Information on energy audits, including qualified contractors and available incentives, is available from Efficiency Vermont. The audit is the first step – following through on the recommended improvements is the critical step for reducing energy consumption and saving tax dollars. Some of the improvements will be fairly straightforward, while others may involve capital expenditures (e.g., upgrading a heating system).

- **Street Light Change-out.** Many Vermont communities have substantially reduced electricity costs by surveying existing street lights and making adjustments to their location and number to ensure public safety while reducing unnecessary nighttime lighting. In addition, replacing old

CASE STUDY: Hartford Town Street Lighting Initiative

A town analysis based on saving dollars and saving energy translated into an initiative to change out or remove the town's streetlights.

street light technology with new LED lights will reduce energy consumption from 25% to 75%, and the LED lamps last up to 10 times longer than conventional technologies. Efficiency Vermont has published a step-by-step guide to *Improving Efficiency in Municipal Street and Public Space Lighting* that is available on their web page. This document walks through the steps in conducting an inventory and developing a lighting plan.

- **Municipal Operations.** There are many steps that a municipal government can take to create a culture of energy efficiency and conservation. A municipality can adopt a "smart energy" policy as an addendum to personnel policies that set forth guidelines for energy consumption during work hours. These might allow for teleconferencing and telecommuting to reduce vehicle trips, installing timers on light fixtures and adopting lights-out policies for office lights, computers and other equipment (e.g., copiers), setting thermostats in municipal buildings at 68° (or lower), adopting "green" procurement policies (see below) to conserve energy, and reducing hours of operations of municipal facilities (the Town of Weathersfield, for example, recently implemented a four-day work week partly as an energy conservation measure).

Funding Efficiency and Renewable Energy Development

- **Municipal Budget.** Vermont municipalities adopt annual budgets that cover all aspects of local government operations. This often includes expenses related to energy and municipal planning, energy audits and studies, and some efficiency measures associated with municipal buildings and facilities. Annual budgets are funded primarily through the property tax, in addition to state assistance programs (e.g., state aid for highways), municipal fees, and other generally minor sources.

  The annual budget is prepared by the selectboard and approved by voters at the municipality's annual meeting. Bringing specific projects to the selectboard's attention during the budget writing process (typically December and January in municipalities that adopt the annual budget at March Town Meeting) is an important way to have them considered for funding in the town report. Including cost-benefit analysis and the pay-back period for projects that will result in long-term savings for taxpayers, such as energy efficiency investments in municipal buildings and street light change-outs, is an effective strategy for securing support.

- **Municipal Procurement Policies.** Unlike the municipal budget, which identifies anticipated revenues and expenditures for a fiscal year, a procurement policy sets forth the considerations that a municipality will use to purchase goods and services. An obvious factor is cost, although basing spending decisions on the purchase price may not be the most cost effective option over the long run. Including "life-cycle cost" provisions in local procurement policies can save both energy and tax dollars. Similarly, buy-local provisions that allow some discretion in favor of local bidders when awarding contracts or making purchases not only keeps a larger proportion of municipal dollars in the community, it can reduce energy use associated with excessive travel.

- **Capital Projects.** Capital projects, unlike operations and maintenance expenses, are typically funded through reserve funds set aside for multiple years in anticipation of large purchases, long-term borrowing, and impact fees (i.e., fees levied against new development to pay for the incremental cost of capital facilities required by the new development). Funding for capital projects is typically voted on separately from the annual budget at an annual or special Town Meeting.

  A growing number of communities prepare and adopt a Capital Improvement Program (CIP – also commonly referred to as a capital budget and program) to better plan for capital investments. A CIP is a planning and budget tool that helps communities implement their town plan and schedule major purchases in a manner that avoids sharp fluctuations in the municipal property tax rate. A CIP includes a capital budget and a capital program. A capital budget lists and describes the capital projects to be undertaken during the coming fiscal year, the estimated cost of those projects, and the proposed method of financing. A capital program is a plan of capital projects proposed to be undertaken during each of the following five years, the estimated cost of those projects, and the proposed method of financing. A benefit of preparing and adopting a CIP is that it allows the community to review and consider major spending decisions well in advance and to set priorities among competing needs and demands.

Life Cycle Costing

This procurement technique considers all life cycle costs of a capital facility, including the purchase price, installation, ongoing operation (including energy use), maintenance and upgrade, disposal or salvage, and any other costs.

The goal of life-cycle costing is long-term savings through making the most cost effective capital expenditures. Many municipalities have experienced long-term cost savings by purchasing energy efficient equipment and facilities, despite paying a higher purchase price.

Establishing a Reserve Fund for Energy Investments

Communities can establish a Reserve Fund for capital projects to fund renewable or energy efficiency projects. At the 2011 Town Meeting, the Town of Waitsfield unanimously adopted (by voice vote) the following ballot item:

ARTICLE 13: *Will the Town vote to authorize the Selectboard to establish a reserve fund for renewable energy and energy efficiency projects and to appropriate the sum of $5,000 to establish such fund in 2011?*

Communities define capital projects differently. According to Vermont statute,[18] "a capital project is any one or more of the following:

1. Any physical betterment or improvement, including furnishings, machinery, apparatus, or equipment for that physical betterment or improvement when first constructed or acquired.
2. Any preliminary studies and surveys relating to any physical betterment or improvement.
3. Land or rights in land.
4. Any combination of subdivisions (1), (2), and (3)."

Municipalities may have thresholds to differentiate capital projects from other types of purchases. These typically include a total purchase price (e.g., $5,000-$10,000 for small communities), estimated "life" of the equipment or facility (e.g., minimum of three-five years) or financing mechanism (e.g., capital projects are funded in part through established reserve funds, grants or borrowing). Energy efficiency improvements to a municipal building, for example, might be included in a maintenance line item in the municipal budget, although a major energy retrofit would appropriately be included in the CIP. Likewise, investments in renewable energy facilities, such as solar photovoltaic panels to power municipal buildings, would also be considered a capital project.

To spread the cost of capital facilities out over time, municipalities have the option of short or long-term borrowing (short-term borrowing generally refers to loan periods of five years or less), or establishing reserve funds that are used to fund future purchases. Establishing an energy efficiency or renewable energy reserve fund is one means of funding energy related capital expenditures.

- **Grants.** Energy coordinators and committees may stay informed of available energy grants and assist the selectboard and municipal manager to secure those grants. It can be frustrating that grant sources, especially state and federal programs, come and go too frequently to maintain a single reference list. This is especially true in recent years with the one-time infusion of energy related federal funding from the 2009 American Recovery and Reinvestment Act (ARRA). VPIRG maintains an on-line *Clean Energy Guidebook* that provides resources available to municipal governments to assist with energy efficiency and renewable energy programs.

- **Public-Private Partnerships.** Partnerships between municipal government and other parties, including local property owners, private investors, and energy developers, have become increasingly common in Vermont. With regard to energy improvements, some promising partnerships include:

- **Property Assessed Clean Energy (PACE) Districts.** In recent years, Property Assessed Clean Energy (PACE) programs have grown increasingly popular throughout the United States, with over 25 states having authorized this funding tool. That's because PACE programs help homeowners overcome a significant hurdle — gaining access to the upfront capital necessary to make significant energy improvements. In 2009, Vermont authorized municipalities to enact PACE programs (also known as clean energy assessment districts). The enabling legislation permits municipalities to use their authority to borrow funds, typically at favorable market rates, and to make those borrowed funds available to local property owners to make energy efficiency investments to their property or install renewable energy facilities. The property owner then repays the town over time as a special assessment on their property tax bill. In the event the property owner sells the property, the balance of the assessment would remain with the property to be repaid by the new owner.

  Typically, municipalities use long-term bonding authority to borrow money, often for periods of 20 years or more. Property owners benefit from the ability to borrow for a long term and for the debt service to remain with the property. Importantly, only those property owners who choose to participate in the program pay for its implementation. However, implementing a PACE program at the local level requires a vote of the whole community. That vote, or votes, must be to create the district and to support the funding mechanism to make it happen.

  Vermont's PACE program was enacted in 2009. Shortly after, national mortgage backers Fannie Mae and Freddie Mac announced that they would no longer back mortgages that were secondary to the PACE assessment, calling Vermont's PACE program – and the scores of other PACE programs around the nation – into question. In 2011, lawmakers introduced legislation to remedy this situation and make the program more attractive and secure to investors by making the PACE lien subordinate to any existing property-secured lien, mandating a loan-loss-reserve fund as a safety net and creating a statewide aggregator to help municipalities administer the program and associated borrowing. Information on PACE, including sources of available assistance to interested Vermont communities, is available on VEIC's website.

- **Renewable Energy Power Purchase Agreements.** One of the most important incentives for small-scale renewable energy facilities, such as solar photovoltaic, has been state and federal income tax credits. Because municipalities are exempt from state and federal income taxes, however, they have not been able to benefit from those incentives. Some municipalities have overcome this by entering into

CASE STUDY: Piloting PACE in Putney

Despite federal setbacks and general uncertainty about the program, Putney is among the towns at the forefront of moving the promising clean energy financing program forward in Vermont.

partnerships with private renewable energy developers who install renewable facilities (in most instances photovoltaic) on town property that are net-metered to provide electricity to municipal buildings.

Under the most common scenario, the municipality enters into an agreement with the developer to purchase the power generated from the facility at or below current market rate, and has an option to purchase the equipment at a depreciated price after a fixed time period (usually between five to 10 years). In this case, the developer takes advantage of the tax credits and depreciation and the municipality receives a fixed rate for short-term power and the opportunity to purchase the equipment at reduced cost, thereby enjoying several more years of electricity. Several renewable energy developers have offered this type of partnership with municipalities. A list of Vermont renewable energy companies is available from Renewable Energy Vermont.

- **Energy Service Companies (ESCOs).** Though not as common in Vermont as in other parts of the nation, Energy Service Companies (ESCOs) develop, install, and arrange financing for projects designed to improve the energy efficiency and maintenance costs for facilities – including municipal buildings and facilities – over a seven to 20 year time period. ESCOs generally act as project developers and assume the technical and performance risk associated with the project. Typically, they offer the following services:
  - develop, design, and arrange financing for energy efficiency projects;
  - install and maintain the energy efficient equipment involved;
  - measure, monitor, and verify the project's energy savings; and
  - assume the risk that the project will save the amount of energy guaranteed.

  These services are bundled into the project's cost and are repaid through the dollar savings generated, typically through performance-based contracting. When an ESCO undertakes a project, the company's compensation, and often the project's financing, is directly linked to the amount of energy that is actually saved. The comprehensive energy efficiency retrofits inherent in ESCO projects often require a large initial capital investment and offer a relatively long payback period. The customer's debt payments are tied to the energy savings offered under the project so that the customer pays for the capital improvement with the money that comes out of the difference between pre-installation and post-installation energy use and other costs. Many ESCOs are members of the National Association of Energy Service Companies (NAESCO), which has information related to member firms.

- **Payment in Lieu of Taxes/Host Town Agreements.** Communities that are hosts to large-scale energy projects may receive financial benefits beyond property tax revenues. Vermont municipalities have negotiated host-town agreements with the developers of large-scale wind facilities, for example, that make supplemental payments based on power generation. Host town agreements allow for a municipality to share in the financial benefits of energy generation in exchange for possible impacts on the community during the time that the facility is in operation.

CASE STUDY: Brattleboro's ESCO Project

Brattleboro used an Energy Services Company (ESCO) to fund improvements to 15 municipal and school buildings that resulted in a 17 percent reduction in energy use.

CASE STUDY: A Model of Building Community Support for Wind

Green Mountain Power, proposing a wind farm in the Northeast Kingdom town of Lowell, undertook an aggressive community outreach campaign to build support for a project they assert will bring the community, and neighboring towns, tax and other benefits.

Promoting Energy Efficient Construction and Retrofits

Municipalities may promote energy efficiency in private homes and commercial buildings through public outreach and education, incentive programs (e.g., light bulb exchanges) or through regulations that establish minimum efficiency standards for new construction or building improvements. Some examples include:

- **Weatherization/Button-Up.** Energy committees across the state have provided important leadership to help homeowners make their homes more energy efficient. Working with Efficiency Vermont, the Central Vermont Community Action Council (CVCAC) and VECAN, Vermonters have partnered on the Button Up weatherization program as well as the Vermont Community Energy Mobilization (VCEM) Program. Button Up was a public education program of CVCAC aimed at mobilizing Vermonters to save energy in their homes. The Button Up program offered a series of two-hour workshops around the state for citizens interested in learning about the fundamentals of how buildings lose energy. Button Up also offered do-it-yourself opportunities for saving energy, including behavioral changes and low-cost weatherization measures. VCEM was a very successful program of Efficiency Vermont

wherein trained community volunteers helped their friends and neighbors save energy and money and learn about additional opportunities to reduce energy costs. VCEM volunteers went door-to-door to interested homeowners and changed out incandescent lightbulbs to CFLs and installed low-flow showerheads, conducted a walk-through assessment identifying energy-saving opportunities, and provided homeowners with information about technical and financial resources available to improve home energy efficiency.

- **Building Codes.** State statute (24 V.S.A. § 3101) authorizes Vermont municipalities to "establish codes and regulations for the construction, maintenance, repair, and alteration of buildings and other structures within the municipality. Such codes and regulations may include provisions relating to building materials, structural design, passageways, stairways and exits, heating systems, fire protection procedures, and such other matters as may be reasonably necessary for the health, safety and welfare of the public…" Few municipalities enact such

CASE STUDY: Energy Efficiency Standards in Zoning Bylaws

Hinesburg made strategic changes to its zoning bylaws to offer incentives for energy efficient construction practices.

Vermont's Residential Energy Code

Requirements Governing Residential New Construction, Alteration, Renovation, & Repair

The **Vermont Residential Building Energy Standards** (VT-RBES), also known as Vermont's Energy Code, is a state law requiring builders (or the person acting as the general contractor) to certify to their buyer that the work they perform on Vermont homes complies with minimum energy-efficiency standards. All newly constructed homes, additions, alterations, renovations, and repairs are required to meet updated Vermont Residential Building Energy Standards and be certified as such by the builder/contractor performing the work. If the work to be performed affects the energy use of the home, then the home or the component of the home being altered has to meet the VT-RBES requirements.

Owners doing their own work and who live in the subject property are exempted from complying with the new standards, but at the time the property is sold, they must disclose what construction or rehab work performed did or did not meet the VT-RBES standards.

VT-RBES requires the builder/contractor to provide self-certification of compliance with the energy code. Self-certification is accomplished as follows:

- Complete the VT-RBES compliance certificate using the available compliance paths (easy methods for builder self-certification exist and Efficiency Vermont's residential new construction service, serving about 30% of the new homes in Vermont, provides compliance verification through Home Energy Ratings at no charge).
- Post the original, signed VT-RBES compliance certificate on the breaker box door or on the heating equipment, file a copy with the Town Clerk where the home is located, and mail a copy to the Vermont Deptartment of Public Service in Montpelier.

Although buyers may have recourse via civil action for a false or defective certification, failure to build to VT-RBES Standards does not constitute a defect in marketable title.

With increasing frequency, realtor and buyer requests for assistance are coming to the Vermont Energy Code Assistance Center, the Vermont Department of Public Service, and Efficiency Vermont for both new home sales and resale of homes where the required compliance certificate is absent. This can be a problem for all parties involved when, as is usually the case, it is discovered at or near closing that a VT-RBES Certificate does not exist. This will become more prevalent as the 2011 VT-RBES begins affecting homes where alterations, renovations, and repairs occur and home resale then occurs.

In exchange for funds received through the American Recovery and Reinvestment Act of 2009, the State of Vermont pledged to achieve 90% energy code (VT-RBES) compliance between now and 2017. If Vermont falls short on that pledge it could hamper the state's ability to compete for future energy-efficiency and/or housing grants or programs.

What towns can do to educate communities about VT-RBES:

1) Distribute Energy Code materials through town offices, especially to individuals undertaking new construction or renovation projects. Make them aware of the Vermont's Energy Code as early in the construction process as possible. Materials can be requested by contacting the Energy Code Assistance Center: 855-887-0673.

2) Establish a process to request, collect, and file VT-RBES certificates for projects that must adhere to the code. One method of accomplishing this would be to require certification prior to receiving a Certificate of Occupancy under local zoning bylaws.

More information about this state law (as well as the Commercial Building Energy Standards) is available on the Vermont Department of Public Service website.

codes, however. Those that do are generally larger cities, and they tend to set health and safety standards rather than standards for energy efficiency. The lack of codes is partly due to limited staff capacity in most small communities to enforce them, state government's longstanding oversight of commercial building codes, and the recent adoption of statewide efficiency standards that apply to most housing construction and renovation.

Communities may, as an alternative to local efficiency codes, ensure that contractors meet state residential energy standards when they build new homes. One means of doing this is for the municipality to require proof of compliance prior to issuing a certificate of occupancy under the zoning bylaw or by placing a condition on subdivision approval decisions that subsequent development must meet those standards, although this could place the burden of enforcing state codes on the municipality. Another option is for municipal officials (e.g., the Zoning Administrator) to provide information related to state building codes to applicants for local zoning permits. Information regarding the Vermont Residential Building Energy Code (V-RBES) is on page 45.

Land Use and Development Regulations

One of the most commonly used tools for implementing the municipal plan in Vermont are development regulations, such as zoning bylaws. They are used to address a wide range of planning considerations, including land use, housing, transportation, community services and facilities, and natural resource protection. Development regulations may address community energy concerns in a variety of ways, including guiding overall development patterns and site and building design. Key energy considerations include the following:

- **Smart Growth.** As discussed in Chapter VIII, smart growth is a contemporary term for managing development patterns that reflect traditional Vermont settlements of compact village centers surrounded by rural countryside. From a land use standpoint, there are a variety of tools, including zoning and other development regulations, infrastructure policies, and public investments, that can ensure that nearly all new development reflects smart growth principles. Examples of many of the various tools are described in the online Community Planning Toolbox maintained by Smart Growth Vermont. When choosing the most appropriate smart growth implementation tools a community should consider the following issues:

  - Maintaining the economic and cultural vitality of Vermont's traditional downtowns and village centers is an important means of maintaining energy efficient (e.g., pedestrian and transit friendly) development patterns and preserving historic buildings (and the embodied energy contained within them). The Vermont Downtown Program was established in 1994 to provide technical assistance and training to communities and help them to develop skills and strategies for their downtown revitalization efforts.

  - Plan for compact development, which means allow enough development density to recreate historic downtowns, village centers, and walkable neighborhoods. Vermonters celebrate the state's historic settlement patterns, and planning for growth centers (areas within a community where compact development is encouraged) is an important means of reinforcing this legacy. Vermont's Growth Centers program, enacted in 2006, provides a framework for communities that undertake growth center planning. While the Growth Centers program is not the only approach to growth center planning available to Vermont's community planners, the designation process does provide incentives to communities and affected landowners that would not otherwise be available.

  - On the other side of the compact development coin are policies to maintain the rural landscape. This involves land use regulations that promote land-based activities, such as agriculture, forestry, resource conservation, recreation and low-density development.

  - If local zoning allows general commercial development (e.g., retail, restaurants) along highway corridors, the result may be commercial strip development. Strip development is energy inefficient, automobile oriented, land consumptive and detrimental to economic viability of historic centers.

  - Zoning and other development regulations are not the only tools to implement smart growth. Municipal policies for managing water and wastewater facilities, especially the extension of such facilities into un-serviced areas, can have a profound impact on the success or failure of smart growth policies. Generally, infrastructure policies would reinforce municipal land use policies. The Vermont Agency of Natural Resources amended its rules for funding wastewater projects in 2002 to require that to receive funding proposed projects must only serve locally designated growth centers (except in the case of an immediate threat to public health outside the growth center). The Agency developed a guidance document to assist municipal officials and others to comply with this rule.

- **Development Standards:** Approximately 80% of Vermont municipalities have enacted zoning bylaws and more than half have adopted subdivision regulations. These range from very basic regulations with few development review standards to relatively complicated regulations with extensive standards covering a wide range of community concerns.

  Energy considerations have been embedded in the enabling statutes that authorize Vermont municipalities to enact development regulations since the 1980s. Under some common regulatory provisions local review boards are required to consider a project's impact on energy resources. Other statutory provisions are discretionary, giving communities considerable latitude in drafting standards to address energy concerns related to land use, site development and – to a limited extent –

building construction. Common considerations can be broken into three categories:

- **Statutory Standards** are mandatory considerations under certain review procedures that municipalities are authorized to adopt. The two most common are conditional use review, which requires the review board to find that a proposed project will "not have an undue adverse effect on … the utilization of renewable energy facilities," and site plan review which authorizes the review board to impose "appropriate conditions and safeguards with respect to ... the protection of the utilization of renewable energy resources." Many communities struggle with how to apply these standards. Most commonly, boards consider whether a development will adversely impact a neighboring property's access to sunlight or whether the development is planned to accommodate renewable energy on the site. This might include ensuring that the building orientation and fenestration (the placement of windows in a building), as well as landscaping, be designed to take advantage of passive solar.

- **Discretionary Development Standards** are those that a community may elect to adopt. Such standards may cover a wide range of site design, building design and related concerns. They are typically imposed on certain categories of development through common review processes (e.g., conditional use, subdivision regulations).

- **"Green" Development Incentives** are available for municipalities to "encourage the use of ... planned neighborhood developments that allow for reduced use of fuel for transportation, and increased renewable technology by providing for regulatory incentives, including increased densities and expedited review."[19] This could involve providing a density bonus (e.g., higher density, greater lot coverage, smaller lot) in exchange for on-site renewable energy generation or third-party certification that new construction meets specified efficiency standards.

A summary of common development standards is presented in the Energy Smart Zoning sidebar below. A complete list of regulatory provisions related to energy under 24 V.S.A. Chapter 117 is contained in Appendix B.

Energy Smart Zoning: How a Community Can Do It

- Plan for smart growth – including compact, walkable downtowns, village centers and neighborhoods, while preventing the development and fragmentation of farm and forest land and protecting natural resources.

- Include energy-related site development standards, such as:
  - ♦ Building location and orientation standards to maximize passive solar;
  - ♦ Building fenestration (i.e., window opening) standards to maximize passive solar;
  - ♦ Site standards to consider whether the developed site will be configured to accommodate renewable energy facilities (e.g., solar photovoltaic panels) in the future;
  - ♦ Lighting standards to avoid overlighting and require the use of LEDs or other efficient fixtures.

- Provide incentives, such as increased density, in exchange for on-site generation of renewable energy or compliance with certifiable energy efficiency standards (e.g., LEED).

- Avoid barriers to renewable energy facilities that are subject to local zoning. For example, communities could exempt wind turbines from height requirements or enact building design standards that accommodate solar hot water systems on rooftops.

- Include historic preservation and adaptive reuse provisions to allow for economically viable uses of historic structures and avoid their demolition.

- Include development standards to address transportation efficiency, such as:
  - ♦ requiring bicycle racks or lockers;
  - ♦ ensuring connections to existing or planned sidewalks, bicycle lanes and paths;
  - ♦ requiring transit shelters.

- Require a landscape design and maintenance plan to: (1) incorporate the use of deciduous trees on southern sides of buildings to avoid interference with solar access; (2) use low-impact-development (LID) stormwater management practices; and, (3) minimize irrigation, mechanized maintenance, and the application of chemical treatment.

- Allow for a reduction in parking requirements in exchange for parking demand management programs (e.g., employer-sponsored ride-sharing incentives, flex-time) and shared parking.

- Include Planned Residential Development (PRD) or conservation subdivision standards to facilitate clustering, limit the amount of infrastructure and maintain a specified percentage of the property as open space (50-80% is not uncommon in Vermont).

- Require the submission of a recycling and disposal plan for construction waste.

CASE STUDY: **The Montpelier Community Renewable Energy Project**

Following a commitment to meet the energy and climate action goals of the city, there is an effort to construct a state-of-the-art district heating facility to primarily serve the needs of downtown businesses, residents and state agencies.

Guiding Renewable Energy Development through Plan Policies

As noted in Chapter VI, it is important for the municipal plan to clearly articulate the community's policies with regard to the private-sector development of renewable energy projects from an energy standpoint but also policies related to the protection of natural and cultural resources. Because municipalities lack regulatory jurisdiction over most energy facilities, it is important that policies to support, guide or limit the development of renewable energy facilities are:

- **Consistent.** The energy goals and policies related to the siting and development of renewable energy facilities should be consistent with the land use and natural resource protection goals and policies. Energy policies that promote wind energy and natural resource protection policies that call for the protection of ridgelines will only cause confusion as to the municipality's intent.

- **Clear and unambiguous.** If the community wants to limit renewable energy facilities from being located in a specific location, such as a fragile alpine area or prominent peak, the town plan should say so. Including a mapped exclusion area is particularly helpful. Likewise, if there are particular site design concerns that the community wants the PSB to consider, such as avoiding the placement of energy facilities on primary agricultural soils, that standard should be clearly articulated. On the other hand, if a community is interested in fostering the development of renewables, the town plan should identify good locations for potential facilities and make clear in town plan language how, where and what types of renewable facilities the community wants to see developed.

- **Available to renewable energy developers.** It is important that municipalities provide up-to-date plans to the PSB with a letter directing them to specific areas of concern, monitor PSB Section 248 application notices, and provide comments in a timely manner.

CASE STUDY: **Regional Effort to Reduce Reliance on Single Occupancy Vehicles**

The Upper Valley Transportation Management Authority takes a multi-pronged approach to develop workplace-based alternative transportation commuting solutions.

Transportation Tools & Strategies

A good clearinghouse of information regarding transportation options, especially information regarding ride-sharing, van-pools and transit providers, is the Vermont Agency of Transportation's Go Vermont website. Vermont's 11 regional planning commissions also provide a range of transportation planning assistance to member municipalities and help coordinate transportation plans and programs with the Agency of Transportation and regional transit providers. Key opportunities for implementing the energy-efficient transportation policies include the following:

- **Transit.** There are nearly a dozen regional transit providers in Vermont, generally serving communities located in and around the state's traditional regional centers. In some instances, fixed-route bus service is available to municipalities based on a cost sharing arrangement or membership in the regional transit authority. Providers generally offer multiple transportation options in addition to fixed-route bus service, including volunteer drivers and on-call shuttle service to assist populations with special needs and transportation challenges. Understanding what services are available, and working with the regional provider to bring those services into the community, can be among the most energy efficient transportation-related implementation measures that a municipality can undertake. Links to the state transit providers are available on the Go Vermont website.

- **Bicycle & Pedestrian Facilities.** Vermont communities have made significant strides at building communities that are accessible and friendly to bicyclists and pedestrians, although many opportunities for improvement remain. Integrating planning for bicycle and pedestrian facilities with land use planning is a critical step. Taking advantage of state assistance for bike and pedestrian facilities, such as the Agency of Transportation's Safe Routes to School program to promote biking and walking to school, is a high priority for many communities. Adopting local policies to ensure that roads are designed and constructed to serve all users, not just automobiles, is increasingly popular. Information on complete streets policies is available from the National Complete Streets Coalition. Additional information on resources available to communities to develop bicycle and pedestrian facilities is available from the Vermont Bicycle and Pedestrian Coalition.

CASE STUDY: "Eco Driving" Program

An "eco-driving" program that has been incorporated as part of Colchester High School's driver's education curriculum is helping raise broad public awareness and shape energy-saving techniques of new drivers.

- **Transportation Demand Management.** Transportation demand management (TDM) refers to programs to reduce reliance on the single-occupancy vehicle by fostering certain transportation behaviors, such as ride-sharing and car-pooling and greater use of transit service and bike and pedestrian options. Strategies include investing in infrastructure, such as park-and-ride lots, transit service and bicycle and pedestrian facilities; education and networking; (which is typically most effective if done through large employers and institutions); parking policies to encourage ride sharing through reserved spaces or favorable pricing; and employer-based incentives (e.g., such as subsidized transit passes).

  The Vermont *Way to Go* program, sponsored in part by VEIC and the Chittenden County Metropolitan Planning Organization, is an example of a statewide TDM initiative (see sidebar). The Upper Valley Transportation Management Authority (UVTMA) is an example of a regionally focused TDM initiative that serves the communities of the Connecticut River Valley in and around Hanover and Lebanon, New Hampshire and White River Junction, Vermont. UVTMA sponsors a Smart Commute program that works with employers located along the NH Route 120 corridor to promote transit, ride sharing and other commuting alternatives to the single occupancy vehicle.

- **Idling.** Policies to discourage or prohibit unnecessary vehicle idling are an effective means of reducing transportation energy use. Anti-idling policies have the added benefits of reducing engine wear and prolonging the life of vehicles, reducing emissions, and improving air quality. Strategies to reduce idling include policies that apply to municipal vehicles, education programs (e.g., posting no-idling signs in appropriate locations), prohibiting drive-through lanes in commercial buildings, and adopting ordinances that prohibit vehicle idling in a community. Information about anti-idling policies and programs is available from Idle Free Vermont, a non-profit organization formed to reduce vehicle idling in the state.

CASE STUDY: Anti-Idling Initiative

Middlebury undertook a public education campaign and passed an anti-idling policy as one important way to help reduce greenhouse gas emissions.

Way To Go:
Transportation Options for Vermonters

Overview: *Way to Go* is a dynamic citizen engagement program that challenges commuters to find and use more efficient transportation options to meet their mobility needs. The program involves the public, employers, schools, municipalities, transit and transportation agencies, and others in exploring alternative mobility opportunities. Its purpose is to help Vermonters lower emissions, conserve energy, improve health, and save transportation dollars through a sustained reduction in single occupancy vehicle use.

Background: *Way to Go* as a commuter program started in 2004 evolving from the "Curb Your Car Day" first held in the late 1990's. *Way to Go* has been hosted by the Chittenden County Metropolitan Planning Organization and held as a weeklong "challenge" in May, engaging over 3000 participants annually. People that register are then encouraged to bike, walk, take a bus, carpool, and telecommute and awards are given in various categories (employer, school, town) for the highest levels of participation. While the program started in Chittenden County there is growing interest in participation from other parts of the state as well. The Vermont Energy Investment Corporation (VEIC) assumed management of the program in 2010.

Looking Forward: In the years ahead, VEIC plans to expand the program statewide and to leverage the *Way to Go* brand by building a wide array of programs and events to promote transportation efficiency while addressing mobility needs. *Way to Go* has the potential to serve as a highly effective forum to build support and to deploy demand-side management strategies that can advance transportation efficiency in a rural state.

Monitoring Results

After a municipality's adopted plan and implementation program are in place, how does it determine whether it's achieving its goals? One effective way is to establish metrics or indicators of success. Being able to track success of a municipality's efforts is an important part of the planning process. It allows a municipality to celebrate its success and validate that it's reaching its goals and to adjust strategies, if necessary.

Examples of indicators may include municipal government

electricity and fuel use, the number of residents participating in a PACE program, total renewable energy generation capacity, transit ridership, average annual residential and business electricity consumption, and increases in the number of housing units developed in a designated growth center. Some indicators will be more difficult to track and may involve asking citizens to report changes in habits in an annual survey. These include personal travel behavior (e.g., whether an individual carpools or bikes to work) and energy efficiency investments in private homes.

A way to measure success and to share the load is to monitor results on a neighborhood basis and enlist individuals to challenge neighbors and collect data. This may also have the added benefit of building community and networks for encouraging changes in behavior (i.e. a clothing/toy/tool/book swap or carpooling).

LEAP (Local Energy Action Partnership), the Town of Waterbury's non-profit energy committee, identified several guidelines for choosing indicators to track electricity and heating fuel consumption, transportation and renewable energy generation associated with local residences, businesses and the municipality. They concluded the indicators should:

- Rely on existing data that are already available (e.g., Vermont's Renewable Energy Atlas)
- Be relatively cheap and easy to measure using simply surveys
- Measure a range of factors, including awareness, actions and actual energy outputs
- Be easy to replicate in the future, both in Waterbury and in other towns
- Provide results that would be easily communicated to others
- Drive changes in behavior and energy use pattern
- Be relatively scale-independent, so they could apply equally to small and large towns

Based on these considerations, Waterbury LEAP developed the following draft indicators:

How Are We Measuring?

	Transportation	Heating Fuel	Electricity	Renewable Energy
Homes	**Residential Fuel Efficiency and Practices** • Average residential fuel efficiency/population (DMV data)	**Heating Efficiency of Residences** • % of households aware of fossil fuel heating index (school survey) • Average BTU/sq foot (fuel supplier survey)	**Electrical Efficiency of Residences** • % of households aware of electric use index (school survey) • % of low-energy lighting in households (school survey) • Total kW/population (GMP)	**Residential Renewable Energy Production** • % of homes w/ renewable energy (Energy Atlas) • Total kW produced per population (Energy Atlas) • % students exposed to education about renewables
Businesses	**Business Fuel Efficiency and Policies** • Average fuel efficiency of business vehicles (business survey) • % of employees with low-impact transportation (business survey)	**Heating Efficiency of Businesses** • % businesses who have conducted heating audits (business survey) • Ave heating BTU/ft2 of businesses (business survey)	**Electrical Efficiency of Busineeses** • % of businesses aware of energy use (business survey) • % of businesses having energy audit (business survey) • % low-energy lighting used (business survey)	**Business Energy Production** • Total kW produced by renewables on business infrastructure (Energy Atlas)
Public Buildings	**Public Fuel Efficiency and Policies** • % school bus ridership (direct survey) • % pop. served by public transport option (DoT?) • Average fuel efficiency of public vehicles (direct survey)	**Heating Efficiency of Public Buildings** • % of public buildings with heating audits (direct survey) • Ave heating BTU/ft2 of public buildings (direct survey)	**Electrical Efficiency of Public Buildings** • Total kW use/ft2 of public buildings (direct survey) • % public buildings with electric energy audit (direct survey)	**Public Energy Production** • Total kW produced on public infrastructure (schools, town offices, dams, etc.) (Energy Atlas)

Source: Waterbury LEAP Local Energy Action Partnership

Conclusion

Planning is an important means for communities to assess opportunities and select the most effective strategies for achieving its goals. Planning without action, however, will leave good ideas and the best intentions unrealized.

Implementation is key to realizing a vision; to turning plans and potential into reality.

Putting the ideas, strategies and programs outlined in the *Energy Planning & Implementation Guidebook for Vermont Communities* into action will help your community reduce energy consumption and transition to a clean energy future. With elevating energy prices, uncertain markets and dwindling supplies of fossil fuel, there are many reasons to plan for our energy future. As noted in the introduction, the benefits include:

- Municipal cost savings.
- Increased revenues.
- A strong economy.
- Greater independence and security.
- Local influence over energy facility siting.
- More efficient communities.
- Healthier communities.
- A clean environment.
- Regional coordination and collaboration.

There are many resources available to help your community successfully undertake a strategic energy planning process and the accompanying action steps necessary to achieve your energy goals. For information and potential support for your local energy planning work, contact:

- The Vermont League of Cities and Towns. **www.vlct.org**
- The Vermont Natural Resources Council. **www.vnrc.org**
- Your local regional planning commission. **www.vapda.org**

Together, with the support of these and other partners, you can help your community map out and achieve a forward-looking plan and a clean, green, cost-effective energy future.

Endnotes

[1] 10 V.S.A. § 581

[2] 24 V.S.A. § 4432

[3] 24 V.S.A. § 4350

[4] http://resources.vlct.org/u/2008 Vermont General Municipal Information Report final.pdf

[5] 24 V.S.A. § 1131

[6] 24 V.S.A. § 4403

[7] 24 V.S.A. § 4384(a)

[8] 24 V.S.A. § 4382

[9] 24 VSA § 4302

[10] Burlington Electric Department (BED) manages its own energy efficiency programs.

[11] 24 V.S.A. § 4382

[12] 24 V.S.A. § 4302

[13] 24 V.S.A. § 2202a

[14] 10 V.S.A. § 6602(24)

[15] *Our Built and Natural Environments,* Environmental Protection Agency, January 2001: http://www.epa.gov/smartgrowth/built.htm; *Growing Cooler: The Evidence on Urban Development and Climate Change,* Urban Land Institute, 2007: http://www.smartgrowthamerica.org/gcindex.html; *Evaluating Transportation Land Use Impacts: Considering the Impacts, Benefits and Costs of Different Land Use Development Patterns,* Victoria Tranport Policy Institute, 2010: http://www.vtpi.org/landuse.pdf; *Driving and the Built Environment: Effects of Compact Development on Motorized Travel, Energy Use, and CO_2 Emissions,* National Academy of Sciences, 2009: http://books.nap.edu/catalog.php?record_id=12747.

[16] 24 V.S.A. § 4382(9)

[17] *The Vermont Transportation Energy Report: Vermont Clean Cities Coalition,* University of Vermont Transpotation Research Center, 2010. http://www.uvm.edu/~transctr/cleancty/pdf/UVM-TRC-10-017.pdf

[18] 24 V.S.A. Chapter 117 § 4430

[19] 24 V.S.A. Chapter 117 § 4414(14)

Appendix A:

Online Resources

The following is a list of website addresses to all online resources referenced in the *Community Planning & Implementation Guidebook for Vermont Communities*. Those resources are shown as hyperlinks in the printed and on-line versions of the guidebook.

Organizations: Support for Municipal Planning and Energy Committees

Vermont Energy & Climate Action Network
http://www.vecan.net/

Vermont League of Cities & Towns
http://www.vlct.org/

Vermont Natural Resources Council
http://www.vnrc.org/

Regional Planning Commissions
http://www.vapda.org/

Chittenden County Metropolitan Planning Organization
http://www.ccmpo.org/

Municipal Planning Resources and Examples

Planning Manual for Vermont Municipalities
http://www.vpic.info/pubs/planningmanual/

Citizen Participation Strategies for Municipal Planning in Vermont
http://www.vpic.info/pubs/citpart/

Community Planning Surveys Technical Appendix
http://www.vpic.info/pubs/citpart/handouts/3a_surveyapp.pdf

Stowe Town Plan: Implementation Chapter
http://www.townofstowevt.org/images/photos/chapter_5.pdf

City of Burlington Climate Action Plan
http://www.cedo.ci.burlington.vt.us/legacy/cap.html

Vermont Planning Information Center
www.vpic.info/

Town Energy and Climate Action Guide
http://www.vnrc.org/energy/hot-issues/town-energy-and-climate-action-guide/

General Energy Resources and Data Sources

Clean Air-Cool Planet
http://www.cleanair-coolplanet.org/

DSIRE
http://www.dsireusa.org/

Electric Utilities
http://psb.vermont.gov/utilityindustries/electric/industryinfo

ENERGY STAR Portfolio Manager
http://www.energystar.gov/ia/business/government/Leveraging_Portfolio_Manager_Factsheet.pdf

GHG Protocol
www.ghgprotocol.org/

Independent Sector (Value of Volunteer Time)
http://www.independentsector.org/volunteer_time /

International Council for Local Environmental Initiatives (ICLEI)
www.iclei.org/

State of Vermont bulk purchasing for environmentally preferred products
http://bgs.vermont.gov/purchasing/currentcontracts

Strengthening Vermont's Energy Economy: Final Report of the Vermont Rural Energy Council
http://vtrural.org/programs/policy-councils/ruralenergycouncil

UVM's Transportation Research Center
http://www.uvm.edu/~transctr/

U.S. Energy Information Administration
http://eia.doe.gov/state_energy_profiles.cfm?sid+VT#overview

U.S. Census
http://crs.uvm.edu/census/

Vermont Public Interest Research Group Clean Energy Guide
http://www.vpirg.org/cleanenergyguide

Vermont Comprehensive Energy Plan
http://publicservice.vermont.gov/planning/CEP%20WEB%20DRAFT%20FINAL%206-4-08.pdf

Vermont in Transition: Chapter 10 Energy
http://vtrural.org/sites/default/files/library/files/futureofvermont/documents/VTTransitions_Ch10.pdf

Energy Efficiency Resources

Building Performance Institute
http://www.bpi.org/

Central Vermont Community Action Council
http://www.cvcac.org/

Efficiency Vermont
http://www.efficiencyvermont.com/pages/

Electric Utilities
http://psb.vermont.gov/utilityindustries/electric/industryinfo

Highfields Center for Composting
http://www.highfieldscomposting.org/index.htm

Improving Efficiency in Municipal Street and Public Space Lighting
http://www.efficiencyvermont.com/stella/filelib/EVT_MunicipalStreetLightingGuide_Final.pdf

Lawrence Berkeley National Laboratory - Driving Demand report
http://drivingdemand.lbl.gov/

National Association of Energy Service Companies
http://www.naesco.org/about/default.htm

School Energy Management Program
http://www.vtvsa.org/school-energy-management-program.php

Vermont Commercial Building Energy Standards
http://publicservice.vermont.gov/energy/ee_resbuildingstandards.html

Vermont Energy Investment Corporation
http://www.veic.org

Vermont Residential Building Energy Standards
http://publicservice.vermont.gov/energy/ee_resbuildingstandards.html

Renewable Energy Resources

American Wind Energy Association
http://www.awea.org/

Biomass Energy Resource Center
http://www.biomasscenter.org/

New England Wind Forum
http://www.windpoweringamerica.gov/ne_astate_template.asp?stateab=vt

Renewable Energy Atlas of Vermont
http://www.vtenergyatlas.com/

Renewable Energy Vermont
http://www.revermont.org/about.htm

Vermont Clean Energy Development Fund
http://publicservice.vermont.gov/energy/ee_renewables.html

Wind Energy Planning Resources for Utility-Scale Systems in Vermont
http://publicservice.vermont.gov/energy/ee_files/wind/planningpacket.pdf

Land Use and Smart Growth Resources

Smart Growth Vermont Community Planning Toolbox
http://www.smartgrowthvermont.org/toolbox/

Vermont Agency of Natural Resources Smart Growth Wastewater Funding Rule
http://www.anr.state.vt.us/dec/fed/financial/docs/growth%20center%20and%20growth%20management%20guideance%20november%202010.pdf

Vermont Downtowns and Village Centers program
http://www.historicvermont.org/programs/downtown.html

Vermont Growth Centers program
http://www.dhca.state.vt.us/Planning/GrowthCenters.htm

The Vermont Smart Growth Scorecard
http://www.smartgrowthvermont.org/fileadmin/files/publications/SPRAWLscorecard.pdf

Transportation Resources

National Complete Streets Coalition
http://www.completestreets.org/

Idle Free Vermont
http://www.idlefreevt.org/

Vermont Bicycle and Pedestrian Coalition
http://www.vtbikeped.org/

VTrans Go Vermont Commuter Assistance Program
http://www.connectingcommuters.org/

VTrans Safe Routes to School Program
http://www.aot.state.vt.us/progdev/Sections/LTF/SRTS/VTSRTS.htm

Way to Go Vermont
http://www.waytogovt.org/

Appendix B

Energy in Municipal Bylaws:

Statutory Provisions Under 24 VSA Chapter 117

§4412 Required provisions and prohibited effects

(6) Heights of renewable energy resource structures. The height of wind turbines with blades less than 20 feet in diameter, or rooftop solar collectors less than 10 feet high, any of which are mounted on complying structures, shall not be regulated unless the bylaws provide specific standards for regulation. In addition, the regulation of antennae that are part of a telecommunications facility, as defined in 30 V.S.A. § 248a, may be exempt from review under this chapter according to the provisions of that section.

§4313 Limitations on municipal bylaws

(b) A bylaw under this chapter shall not regulate public utility power generating plants and transmission facilities regulated under 10 VSA Section 248. [2003] Note: This includes net-metered wind generators, solar panels, etc.

(g) Notwithstanding any provision of law to the contrary, a bylaw adopted under this chapter shall not prohibit or have the effect of prohibiting the installation of solar collectors, clotheslines, or other renewable energy devices based on renewable energy resources. [2009]

§4414 Zoning; permissible types of regulations

(3) Conditional uses. ... These general standards shall require that the proposed conditional use shall not result in an undue adverse effect on any of the following: ...

(v) Utilization of renewable energy resources. [2003]

(6) Access to renewable energy resources. Any municipality may adopt zoning and subdivision bylaws to encourage energy conservation and to protect and provide access to, among others, the collection or conversion of direct sunlight, wind, running water, organically derived fuels, including wood and agricultural sources, waste heat, and geothermal sources, including those recommendations contained in the adopted municipal plan, regional plan, or both. The bylaw shall establish a standard of review in conformance with the municipal plan provisions required pursuant to subdivision 4382(a)(9) of this title.

(8) Waivers. A bylaw may allow a municipality to grant waivers to reduce dimensional requirements, in accordance with specific standards that shall be in conformance with the plan and the goals set forth in Section 4302 of this title. These standards may: ...

(iii) Provide for energy conservation and renewable energy structures.

(14) Green development incentives. A municipality may encourage the use of ... planned neighborhood developments that allow for reduced use of fuel for transportation, and increased renewable technology by providing for regulatory incentives, including increased densities and expedited review. [2007]

§4416 Site plan review

As a prerequisite to the approval of any use other than one- and two-family dwellings, the approval of site plans by the appropriate municipal panel may be required under the procedures set for in subchapter 10 of this chapter. In reviewing site plans, the appropriate municipal panel may impose, in accordance with the bylaws, appropriate conditions and safeguards with respect to: ...the protection of the utilization of renewable energy resources, ... [2003]

§4417 Planned unit development

(a) Any municipality adopting a bylaw should provide for planned unit development to permit flexibility on the application of land development regulations for the purposes of section 4302 of this title [state planning goals] and in conformance with the municipal plan. The following may be purposes for planned unit development bylaws: ...

(7) To encourage and preserve opportunities for energy efficient development and redevelopment. [2003]

§4418 Subdivision bylaws

(2) Subdivision bylaws may include: ...

(C) Specific development standards to promote the conservation of energy or to permit the utilization of renewable energy resources, or both. [2003]

§4469 Appeal; variances

(b) On an appeal under section 4465 or 4471 of this title in which a variance from the provisions of a bylaw or interim bylaw is requested for a structure that is primarily a renewable energy resource structure, the board of adjustment or development review board or the environmental division may grant that variance and render a decision in favor of the appellant if all the following facts are found, and the finding is specified in its decision:

(1) It is unusually difficult or unduly expensive for the appellant to build a suitable renewable energy resource structure in conformance with the bylaws.

(2) The hardship was not created by the appellant.

(3) The variance, if authorized, will not alter the essential character of the neighborhood or district in which the property is located, substantially or permanently impair the appropriate use or development of adjacent property, reduce access to renewable energy resources, or be detrimental to the public welfare.

(4) The variance, if authorized, will represent the minimum variance that will afford relief and will represent the least deviation possible from the bylaws and from the plan.

Notes

Vermont Natural Resources Council
Common Sense Solutions for a Changing Vermont
9 Bailey Avenue, Montpelier, VT 05602
802-223-2328
www.vnrc.org

Vermont League of Cities and Towns
Serving and Strengthening Vermont's Local Governments
89 Main Street, Suite 4, Montpelier, VT 05602
802-229-9111
www.vlct.org