

ENERGY POLICIES & STANDARDS: A GUIDE FOR SOUTHERN WINDSOR COUNTY COMMUNITIES

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Developed by the
**Southern Windsor County
Regional Planning Commission**

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INTRODUCTION

Purpose. Adopted plans and bylaws for the ten communities in our region were reviewed as part of this project to evaluate the current status of local energy planning and policy development.¹ This analysis revealed that:

- All ten local plans have energy sections that incorporate generally stated policies for energy efficiency and conservation – including policies to promote energy-efficient development and transportation alternatives – and, to a more varied extent, for renewable energy resource development.
- More recently adopted energy plans are more comprehensive in scope, reflecting a renewed emphasis on energy planning locally and statewide – especially in relation to the impacts of rising energy costs. Only one plan identifies climate change and the need to reduce greenhouse gas emissions as energy-related concerns.
- Few plans include clear, written policy statements – i.e., community standards – that are specific enough to reference in Public Service Board proceedings; or recommended strategies, such as proposed energy programs or bylaw amendments, for municipal implementation.² A few plans and one bylaw include standards for transmission line upgrades and the siting of telecom and/or wind towers to protect scenic resources.
- No bylaws reviewed include provisions to protect access to renewable energy resources, or incentives to promote energy-efficient development and renewable energy facilities.

This energy policy guide is presented for use by our member municipalities – by local planning commissions, energy coordinators and committees – as you update your municipal plans and land use regulations. It includes background information on the current status of community energy planning in Vermont and our region, and model plan policies and community standards for local consideration. This guide is intended to complement other available energy planning publications, including the 2011 *Energy Planning & Implementation Guidebook for Vermont Communities* recently released by the Vermont Natural Resources Council and the Vermont League of Cities and Towns.³

¹ The complete results of this review are available from the Regional Planning Commission.

² In some cases, plans included specific statements for the exclusion of telecom towers from specific areas or locations – which could be updated to reference wind energy facilities as appropriate.

³ *Energy Planning & Implementation Guidebook for Vermont Communities:*
<http://www.vnrc.org/energy/resources/energy-planning-implementation-guidebook-for-vt-communities/>.

Use. *This publication is intended only as a guide.* Model language offers a starting point for community discussion – but it needs to be adapted for local use, to suit local circumstances. The model provisions included here – which are based on a review of plans and bylaws from around the country – have been modified to apply in a Vermont context. In the same way, this language should be reviewed and modified to reflect your community's energy needs, priorities and objectives, and your community's local capacity to undertake and administer energy-related plans and programs. Related considerations are noted in the accompanying text.

This guide has been developed by the Southern Windsor County Regional Planning Commission under our Regional Energy Program, with funding from the U.S. Department of Energy and the Vermont Department of Public Service. Technical assistance for conducting energy baseline studies, GIS mapping, energy program development and for adapting these model policies and standards for local use, is available from the Regional Planning Commission. Please be sure to contact us as you get started.

Some common terms, defined:

Energy Conservation – Reducing energy use. This applies to measures, including changes in personal habits (e.g., turning off lights, driving less) that reduce the amount of energy consumed.

Energy Efficiency – Using less energy to perform the same functions and tasks. This applies to measures, such as the use of new technologies (e.g., LED lights, more energy efficient appliances) that use energy more efficiently and reduce waste.

Net-Metered System – An onsite generating system for local use that is connected to the power grid. The state defines this more specifically as a facility for the generation of electricity that is of no more than 500 kW capacity; operates parallel with facilities of the electric distribution system; is intended primarily to offset the customer's own electricity requirements; is located on the customer's premises or, for group net-metered systems, on the premises of a member of the group; employs a renewable energy source or is a qualified micro-combined heat and power system of 20 kW or less, that meets state definitions and may use any fuel source that meets air quality standards (30 V.S.A. §219a). Net metered systems include most smaller, renewable energy systems, and represent a form of decentralized or "distributed" energy generation.

Renewable Energy – (1) Energy available for collection or conversion from direct sunlight, wind, running water, organically derived fuels, including wood and agricultural resources, waste heat, and geothermal sources (24 V.S.A. §4302).
(2) Under the state's renewable energy programs, "renewable energy" means energy produced using a technology that relies on a resource that is being consumed at a harvest rate at or below its natural regeneration rate (30 V.S.A. §8002).

OVERVIEW

Municipal Energy Planning

Under the Planning and Development Act ("the Act"; 24 V.S.A. Chapter 117) Vermont municipalities are authorized, but not required, to develop and adopt comprehensive municipal plans. Communities that do plan must address eleven plan "elements" – including an **energy plan** that presents "an analysis of energy resources, needs, scarcities, costs and problems within the municipality," and statements of policy for the:

- *the conservation of energy, including programs, such as integrity standards for buildings, to implement that policy,*
- *the development of renewable energy resources, and*
- *patterns and densities of land use likely to result in conservation of energy.*

Some resources to consider when beginning the energy planning process and the analysis mentioned above are included below.

- U.S. Department of Energy: [Statewide energy statistics](#).
- Center for Rural Studies at the University of Vermont [Town by town data](#) (somewhat limited in regards to energy)
- Vermont Land Use Planning [Implementation Manual](#)
- Vermont Sustainable Jobs Fund [Renewable Energy Atlas of Vermont](#)
- [Efficiency Vermont](#)
- [Vermont Energy Investment Corporation](#)
- [Vermont Department of Public Service](#)
- [Vermont Department of Public Service \(DPS\) Energy Efficiency Division](#)
- [VECAN](#)
- [Renewable Energy Vermont](#)
- Vermont Natural Resources [Council Guidebooks](#)
- APA [Climate Change Policy Guide](#), 2011

The Act also highlights the following, generally stated **energy goal** – and several related goals – to be considered when developing municipal, regional and state agency plans:

To encourage the efficient use of energy and the development of renewable energy resources.

Local energy planning is both relevant and important! While many energy issues are national or global in reach, local government has control over its own energy consumption and resources, and can lead by example to reduce energy use and costs, and to help develop local energy options, to the benefit of the entire community.

Energy planning under the comprehensive municipal plan supports integrated policies and strategies for resource protection, transportation, land use, and community facilities and services. The municipal energy plan also forms the basis for related community energy programs and actions. Local land use regulations, action plans, and improvement programs – **including municipal energy programs and projects** – must conform to and implement plan policies and recommendations, as required under the Act.

Municipal plan policies – as adopted community standards – also provide the basis for local participation in state regulatory proceedings including Act 250 and, for energy facility development, Public Service Board (Section 248) hearings. Before the Public Service Board can issue a Certificate of Public Good (CPG), for most projects it must find that "the purchase, investment, or construction, with respect to an in-state facility, will not unduly interfere with the orderly development of the region, with *due consideration* having been given to the recommendations of the municipal and regional planning commissions, the recommendations of the municipal legislative bodies, and the land conservation measures contained in the plan of any affected municipality." ⁴ The municipal plan can be a useful guide in these proceedings – if plan policies are clear, are internally consistent (not contradictory), and are specific enough to apply to a particular project or project location within the community.

The municipal plan also supports community participation in long-range state and utility energy planning, including the update of the following plans, as required under state law:

- **Vermont Comprehensive Energy Plan**, updated every five years by the Department of Public Service (30 V.S.A. § 202b),⁵
- **Vermont Long Range Transmission Plan**, updated every three years by the Vermont Electric Company (VELCO) to address the long-term capacity and reliability of Vermont's electric transmission and distribution systems (under 30 V.S.A. § 218c),

⁴ "Due consideration" in this context has been interpreted by the PSB and the Vermont Supreme Court "to at least impliedly postulate that municipal enactments, in the specific area, are advisory rather than controlling (e.g., see *In re UPC Vermont Wind LLC* (2009) <http://info.libraries.vermont.gov/supct/current/op2007-456.html>).

⁵ As of this writing, the 2011 State Comprehensive Energy Plan is under development, for release in October. A number of options for public participation in the planning process have been provided. For more information go to the state energy plan website: <http://www.vtenergyplan.vermont.gov/>.

Related State Planning Goals:

(1) To plan development so as to maintain the historic settlement pattern of compact village and urban centers separated by rural countryside. ...

Public investments, including the construction or expansion of infrastructure, should reinforce the general character and planned growth patterns of the area.

(4) To provide for the 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.

(5) To identify, protect and preserve important natural and historic features of the Vermont landscape.

(9) To encourage and strengthen agriculture and forest industries.

(12) To provide for, finance and provide an efficient system of public facilities and services to meet future needs.

- **Utility Integrated Resource Plans (IRPs)** prepared by regulated utilities for review by the Vermont Public Service Board under state "least cost integrated planning" (LCIP) requirements (under 30 V.S.A. § 218c).

Opportunities for public involvement are provided during each plan update process, though public hearings or forums may be held outside of the region. ***Current state and utility energy plans also should be reviewed in the development of local energy plans– particularly for state or utility policies, programs and projects that may affect your community.*** For example, the current Vermont Long Range Transmission Plan identifies a number of proposed transmission projects in our region – including line and substation upgrades – to correct known system deficiencies.

Energy Coordinator or Energy Committee

The Act also provides towns with the ability to appoint an Energy Committee or Coordinator. An increasing number of Vermont towns are opting to create an energy committee. There are a few different ways in which an energy committee can be organized. The first is as an ad hoc committee, the second as a subcommittee to the planning or conservation committee and the third as a committee appointed by, and reporting to, the selectboard. Another option is the appointment of an Energy Coordinator. The coordinator functions similarly to a committee and may serve as an ex-officio, nonvoting member of the planning commission.

Tips for Success:

- Start with small, manageable projects that have highly visible results to build a repertoire of success for the community.
- Reach out to other successful committees for support and ideas.
- Ensure support of town officials by keeping them informed and up to date regarding the committee's activities as well as soliciting their input on projects.
- Recruit a diverse set of individuals to serve on the committee to ensure the constituent base is well represented.
- Gather a good sense of public desires and values in order to tailor projects to those aspects.

Municipal Energy Regulation

Vermont municipalities have limited authority to *directly* regulate energy facility development. In accordance with the Act (24 V.S.A. § 4413), a ***bylaw shall not regulate public utility power generating plants and transmission facilities that are regulated by the Vermont Public Service Board*** (under 30 V.S.A. § 248). This includes smaller "net-metered" facilities that are hooked into the power grid. It does not include off-grid systems, or systems that are not regulated by the PSB (e.g., solar thermal installations). Given this limitation, municipalities are beginning to develop more specific facility siting and development policies or standards, to be included or appended to their plans, for use in the review of projects before the Public Service Board, and for amending local bylaws as allowed under state law.

In sum, under 24 V.S.A. Chapter 117...

Municipalities may not:

- Regulate public utility power plants and transmission facilities regulated by the Public Service Board, including net-metered facilities.
- Regulate the height of roof-mounted renewable energy structures, including wind turbines with blades less than 20 feet in diameter, or rooftop solar collectors less than 10 feet high, that are mounted on complying structures, unless the bylaws provide specific standards for their regulation.
- Adopt bylaws that prohibit or have the effect of prohibiting the installation of solar collectors, clotheslines, or other energy devices based on renewable energy resources.

Municipalities are required to:

- Consider undue adverse impacts of development on the use of renewable energy resources under conditional use review.
- Adopt statutory variance criteria that apply specifically to renewable energy facilities.

Municipalities may, under local land use regulations:

- Provide for and regulate off-grid and other systems not regulated by the Public Service Board.
- Grant waivers to reduce dimensional requirements for energy conservation and renewable energy structures.
- Adopt regulations and standards of review that encourage energy conservation and more energy efficient development.
- Provide for and protect access to renewable energy resources (e.g., under site plan and subdivision review).
- Allow for planned unit development (PUD) to promote (or require) more energy-efficient forms of development, and the incorporation of renewable energy facilities.
- Provide "green development incentives" including regulatory incentives that encourage the use of low-embodied energy in construction materials, and planned developments that allow for reduced use of fuel for transportation, and increased use of renewable technologies. Incentives may include increased densities of development and expedited review.

A list of energy-related statutory sections found under Chapter 117 is attached.

ENERGY PLAN POLICIES

The following model energy plan goal and policy language should be reviewed and adapted for local use – not all policies presented here are appropriate for every community. Also, there is often a fuzzy line between policies and recommended actions – this language includes both. With some rewording, recommendations can be crafted into more broadly stated policies.

Energy Goals

- To ensure the long-term availability of safe, reliable and affordable energy supplies, to increase energy efficiency, and to promote the development of renewable energy resources and facilities in the Town of _____ to meet the energy needs of the community and region.
- To reduce energy costs, the community's reliance on fossil fuels and foreign oil supplies, and greenhouse gas emissions that contribute to climate change.
- To identify and limit the adverse impacts of energy development and use on public health, safety and welfare, the town's historic and planned pattern of development, environmentally sensitive areas, and our most highly valued natural, cultural and scenic resources, consistent with related development, resource protection and land conservation policies included elsewhere in this plan.

Energy Policies

The following policies are to be considered in undertaking municipal energy projects and programs, in updating the town's bylaws to address renewable energy development, and in the review of new or upgraded energy facilities and systems by the town and the Vermont Public Service Board under 30 V.S.A. §248 (Section 248).

Energy Planning

[Municipality] actively supports partnerships, strategies, and state and federal legislation that will ensure the affordable and reliable production and delivery of electrical power to the community, in conformance with community goals and objectives. It is our intent to work with utility providers, the Regional Planning Commission, and neighboring communities to plan for needed system upgrades and expansions to meet projected demand.

The town will participate in long-range utility planning and development, in cooperation with the Regional Planning Commission and neighboring communities, to ensure that local energy, resource conservation and development objectives are identified and considered in future utility development. This may include, but not be limited to participation in public forums or hearings associated with:

- Vermont Comprehensive Energy Plan (Vermont Department of Public Service)
- Vermont Long-Range Transmission Plan (Vermont Electric Power Company, Vermont System Planning Committee)
- Utility Integrated Resource Plans (IRPs)
- Vermont Public Service Board (Dockets).

Note: Participation in long-range utility planning helps ensure that local objectives and concerns are addressed in the earliest stages of energy and utility planning and project development. All the long-term plans referenced above include opportunities for public, regional and municipal input, though the public process is not always readily apparent. Ask for copies of current plans, get on distribution lists for notification, and keep an eye out for public announcements.

The [Legislative Body] will appoint an Energy Coordinator [Committee] to develop an Energy Action Plan as a supplement to the municipal plan, to more specifically quantify and track municipal energy consumption, and to recommend actions that the town and community should take to conserve energy, increase energy efficiency, promote local energy production from renewable resources, and to reduce energy costs and greenhouse gas emissions.

Note: Several towns in the region have already appointed local energy coordinators or have active energy committees, but a municipality doesn't need an energy committee to do energy planning. Town staff or municipal board members (Planning Commission, Conservation Commission) may pursue these same functions or actions.

Current and proposed municipal plans, policies, programs will be evaluated for their effect on energy use, and to determine how they can be updated or revised to promote reduced energy consumption, increased energy efficiency, and the sustainable use of local renewable energy resources.

The town will work in cooperation with local agencies, emergency service providers, and regional suppliers to develop emergency contingency plans that ensure access to critical energy supplies and measures to reduce nonessential energy consumption in the event of an abrupt energy shortage.

Energy Facility Development

The Planning Commission, in consultation with the Regional Planning Commission, will identify and map those areas of the municipality that are most suitable for renewable energy facility development (e.g., solar, wind, biomass, hydro) based on facility siting requirements and municipal energy, conservation and development policies and objectives.

Sample Language from the Energy Section of Thetford's Town Plan

Early Thetford settlers relied on hydropower for grinding flour and sawing lumber. Subsequently, Thetford Center, Post Mills, Rice's Mills, and several other locations in Town became thriving communities based on waterpower. No electricity is currently produced by hydropower but the potential still exists for projects at Union Village (600-1500 KW), Thetford Center (350 KW), Post Mills and Rice's Mills (100 KW) and the head of Lake Fairlee (50 KW). Together these projects could produce enough energy annually to supply Thetford's households, given 1kW per customer, but not its businesses.

The Planning Commission, in consultation with the Energy Coordinator [Committee], will prepare community standards for the siting and development of generation, transmission and substation facilities, to be appended to the municipal plan for reference by facility developers and local property owners, and for consideration in Section 248 proceedings. [**See attached addendum.**]

Note: Given that municipalities cannot regulate development subject to Public Service Board review under local bylaws, it's especially important that the municipal plan include clear, written siting and development standards that reflect municipal goals and objectives, for consideration by the Public Service Board and in developing local regulations, as allowed. It also helps to consolidate these policies in one place – for reference by developers (petitioners), the Public Service Board, local officials and community groups.

The municipality will participate in the Public Service Board's review of new and expanded generation and transmission facilities as necessary to ensure that local energy, resource conservation and development objectives are identified and considered in proposed utility development. This may include joint participation in collaboration with other affected municipalities and the Regional Planning Commission for projects that may have significant regional impact.

The Planning Commission, in consultation with the [Legislative Body], will develop guidelines to direct local participation in Section 248 proceedings for the review of utility projects located in [town] or in neighboring communities which may affect the town. The guidelines should reflect levels of participation or formal intervention in relation to the type, location, scale, and magnitude of a proposed project, and its potential benefits and impacts to the community.

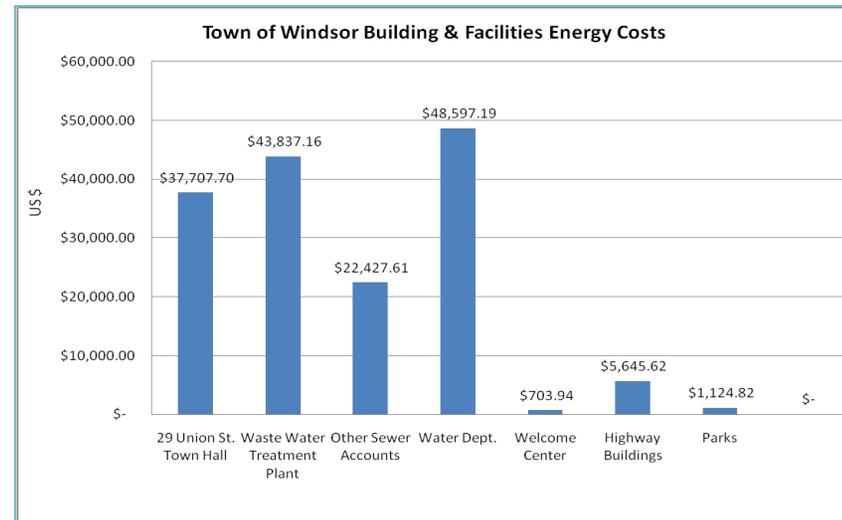
Note: Municipalities are not statutory parties to PSB proceedings but will, for most projects, receive notice of pending applications (petitions). A municipality can participate informally– e.g., by attending public hearings, raising concerns, providing written comments and recommendations, or by offering support for a project – or petition for formal party status as intervenors, with rights to appeal. For more information and guidance, contact the Public Service Department or refer to the PSB's "Citizens Guide to the Vermont Public Service Board's Section 248 Process": http://www.state.vt.us/psb/document/Citizens_Guide_to_248.pdf.

Energy Conservation & Efficiency

Local government will lead by example to increase energy efficiency and reduce overall energy consumption and costs to local taxpayers. Energy efficiency and conservation will be a primary consideration in all municipal construction projects, equipment purchases and facility operations. Accordingly the [Legislative Body], with the assistance of the Energy Coordinator [Committee, Planning Commission, Conservation Commission] and municipal employees, will:

- Conduct baseline energy studies and periodic energy audits or assessments of all municipal buildings and facilities to identify improvements that will reduce energy consumption and costs. This may include, but is not limited to:
 - An analysis of electricity, space heating and hot water usage for town halls, libraries, town garages, schools, wastewater treatment facilities, etc.
 - Municipal vehicle inventories and their associated fuel type and efficiency.

- Prioritize municipal energy efficiency projects and incorporate them into the municipal Capital Budget & Program.



Windsor Wastewater Facility Project Sample

An energy audit conducted in 2011 found that heating the primary anaerobic digester uses almost 10,000 of the 16,000 total gallons of fuel consumed at Windsor's wastewater facility. An investment of approximately \$12,000 to reclaim the methane from the digester and use it for heating would save approximately \$25,600 per year. According to this audit, it would take only 6 months to pay back the initial investment of this project.

- Track energy use and costs (e.g., through the EPA's free Energy Star® Portfolio Manager), and develop an overall energy budget to manage the town's energy consumption, which may also include the development of local generating capacity.
- Implement energy efficiency measures for existing and future facilities as opportunities arise, and incorporate priority efficiency improvements (e.g., facility retrofits, renovations, and equipment upgrades) in the town's capital budget and program.
 - One example of such would be efficiency upgrades at the local water treatment facility like grey water reuse applications or the installation of high efficiency pumps.
- Develop municipal procurement and purchasing policies that incorporate life-cycle costing (purchase, energy, operation, maintenance and disposal costs) for future purchases, and that emphasize products that are energy efficient (e.g., Energy Star® rated), available locally, durable, recyclable, nontoxic, and manufactured with post-consumer recycled material.
- Explore group or bulk purchasing options for energy-efficient products and equipment.
- Consider performance contracting with an independent energy service company to finance and install energy efficient retrofits or municipal renewable energy systems.
- Develop facility maintenance and operation policies that maximize energy efficiency while maintaining comfort levels for employees and visitors, to include building temperature, heating and air conditioning guidelines, electrical equipment use guidelines, interior and exterior lighting guidelines, and the use of energy management devices (e.g., sensors, timers). Examples include installation of day-lighting tubes, programmable thermostats, occupancy light sensors, smart strips and energy star appliances.
- Prioritize weatherizing municipal buildings before conducting any space heating energy efficiency improvements.

A Municipal Lighting Project Example from Hartford, VT

Hartford first conducted an inventory of the Town's existing outdoor public lighting. They found that of the 562 municipal funded fixtures they could remove 207, add 7, and provide efficiency lighting upgrades to approximately 300. This project is slated for completion by the end of 2010. The expected fixture and installation costs are approximately \$187,726 and the projected annual cost savings (due to reductions in KWHs consumed) are \$42,245. This project therefore has a projected payback of 4.4 years; however Efficiency Vermont is currently offering an Incentive for town's conducting such inventories and upgrades. In Hartford's case the incentives totaled \$92,100 which bring the payback period down to 2.3 years.

- Replace facility lighting with energy efficient compact fluorescent or LED bulbs and fixtures and, with the assistance of Efficiency Vermont and local utilities, evaluate options to improve the efficiency and reduce the costs of street, pedestrian, parking lot and public space lighting. Some of these options include the elimination of certain fixtures, the replacement of inefficient bulbs with more efficient ones, such as LEDs, and the utilization of lighting controls such as timers or light sensors.

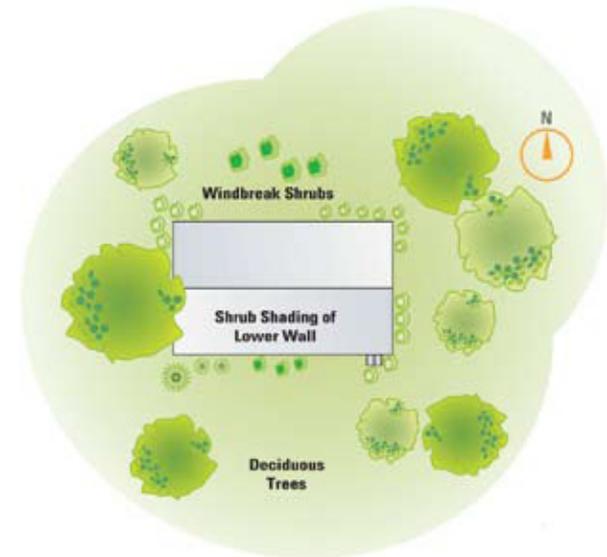
Note: Efficiency Vermont offers a step-by-step guide: "Improving Efficiency in Municipal Street and Public Space Lighting" available on its website, www.encyvermont.com.

- Develop energy-efficient landscaping and tree-planting plans for town-owned properties and rights-of-way. Trees can provide shade in the summer to help reduce cooling costs and act as a windbreak in the winter to assist in reducing heating costs.

Fuel economy can be increased by up to 3.3% (or up to \$0.11 per gallon) by keeping tires inflated to the correct pressure. Under inflated tires can reduce fuel economy by .3% for every 1psi drop in pressure.

Source: www.fueleconomy.gov

- Develop municipal vehicle purchase, maintenance and use policies, including minimum fuel efficiency standards for new vehicles. Consider alternative-fuel vehicles as available. One example of such a policy would be to ensure all municipal vehicles are up to date with tune ups and tire pressure checks in order to maximize fuel economy.
- Develop telecommute policies for selected employees to work from home.
- Provide incentives for municipal employees to live in town, to reduce commuting distances.



The town supports energy literacy, and voluntary energy conservation and efficiency programs for residential, commercial and industrial buildings, including home energy audit, retrofit and weatherization programs. The town will:

- Develop community education, outreach and informational programs, in cooperation with other groups and organizations, to illustrate and promote the benefits of energy conservation and energy efficiency.
- Work with local school teachers and administrators to promote energy literacy in the classroom, for example, in association with the Vermont Energy Education Program (VEEP).⁶
- Provide information on energy conservation techniques, energy-efficient products and efficiency and weatherization programs available to local residents and businesses.
- Develop community-based lighting design guidelines that promote energy efficiency, and reduce glare, light trespass, and light pollution or "sky glow."
- Consider establishing, by town vote, a municipal Property Assessed Clean Energy ([PACE](#)) program that provides loans to local residents, paid back through an assessment on their property, to help finance eligible energy efficiency projects.

New development and renovation projects must include measures to reduce energy consumption through site and building design, material selection and the use of energy-efficient lighting, heating, venting and air conditioning systems. The town will:

- Provide available information on energy efficient development to individuals and developers seeking municipal land use [zoning, building] permits.
- Amend local regulations to require that new development and renovations at minimum meets state commercial and residential energy building codes. This may include a provision that state-required certificates of code compliance be filed with the town prior to the issuance of a municipal certificate of occupancy.
- Amend local regulations to provide incentives (e.g., waivers, density bonuses) for development that exceeds minimum state efficiency standards (e.g., Energy Star or [Vermont Builds Greener](#) program).

Note: These rating systems include efficiency standards that exceed current state standards. Energy Star® is a program of the federal Environmental Protection Agency, administered in Vermont through Efficiency Vermont. The Vermont Builds Greener Program is a rating and certification program of the Vermont Building for Social Responsibility Group. Efficiency Vermont offers a number of efficiency design and construction guides, including a "Core Performance Guide" for commercial buildings.

⁶ Vermont Energy Education Program: <http://www.veep.org/>

- Amend site plan, subdivision and planned unit development regulations to incorporate more energy-efficient siting, building orientation and landscaping standards.
- Develop [update] municipal outdoor lighting standards to require lighting plans for larger development projects, and the use of energy-efficient lamps and fixtures, timers and sensors.
- Amend local regulations to require the inclusion of Low Impact Development (LID) techniques⁷ on site renovations or new construction to reduce the amount of storm water runoff that needs to be pumped or treated. Additionally, where possible, disconnect down spouts, sump pumps, and other building drains from municipal storm water systems.
- Support local and regional programs for energy audits and cost-effective weatherization services on all existing homes, with a priority on affordable housing.

Example Disconnection Provision from Ludlow's Sewer Works Ordinance

§6.21 No person shall make connection of roof down spouts, exterior foundation drains, areaway drains, or other sources of surface runoff or sump pumps or groundwater to a building sewer or building drain which in turn is connected directly or indirectly to public sanitary sewer.

Renewable Energy Resources

The town supports the development and use of renewable energy resources – including but not limited to wind, solar, biomass, methane (biogas), micro hydro, and co-generation – at a scale that is sustainable, that enhances energy system capacity and security, that promotes cleaner, more affordable energy technologies, that increases the energy options available locally, and that avoids undue adverse impacts of energy development on the local community and environment. The town will:

- Work with local schools to evaluate converting school heating systems to biomass (e.g., woodchip or pellet) systems through the Vermont Fuels for Schools Program.⁸

Note: Vermont Fuels for Schools (VFFS) is a statewide renewable energy-use initiative, administered through the Biomass Energy Resource Center, to promote and encourage the use of woodchip and other biomass heating systems in Vermont schools. To date, two schools in the region– Springfield High School and Weathersfield Elementary and Middle School – have converted to biomass heating systems. Free school evaluations are available.

⁷ Contact SWCRPC for copies of their numerous guidance documents on LID techniques

⁸ Vermont Fuels for Schools : <http://www.biomasscenter.org/services/programs/vermont-fuels-for-schools-vffs.html>

- Consider local property tax exemptions for renewable energy systems, as authorized under state statute (32 V.S.A. § 3845).
- Consider establishing by town vote, a Property Assessed Clean Energy (PACE) program that provides loans to local residents, paid back through an assessment on their property, to help finance eligible renewable energy projects.
- Evaluate municipal or community-based renewable energy generation, to include municipal or district biomass heating systems, and the installation of individual or group net metered generation facilities on town buildings and property to serve town facilities. Sources of funding for municipal power generation may include third-party financing, municipal funds, bonds, grants, and available government incentive programs.
- Evaluate available options and constraints for the development of local renewable energy sources, including net-metered solar, wind, small-scale biomass and micro-hydro systems.
- Map, in association with the Regional Planning Commission, those areas of town with the highest potential for siting renewable energy systems—including both utility and smaller-scale net-metered and off-grid systems— based on resource availability, technical siting requirements, and the community's resource conservation, land use and development objectives.
- Prepare local guidelines for the development of renewable energy facilities (including related access and transmission line extensions) for reference by developers and local property owners, and for consideration in Section 248 proceedings. Net-metered renewable energy facilities should be subject to the same minimum requirements as off-grid facilities.
- Amend local regulations to allow off-grid solar and wind systems as accessory uses in all districts in which structures are allowed, subject to specific use standards, and to incorporate district height and setback waiver provisions for such facilities where appropriate. Development standards should be the minimum required to address public health and safety, and potential adverse impacts to significant natural, historic and scenic features, public facilities, and neighboring properties and uses.
- Amend local regulations to provide for and protect access to renewable energy resources (e.g., solar, wind access) for existing and proposed development. This may include the creation of access overlay districts, provisions for lot and building orientation, and minimum access protection provisions.
- Amend site plan and subdivision regulations to provide for [require] more energy efficient forms of development, which may include siting, orientation, landscaping and pedestrian walkability or connectivity standards.

- Amend planned unit development regulations to provide incentives (e.g., density bonuses) for development that exceeds minimum state energy efficiency standards, and for integrating net-metered renewable energy systems in development design.

Transportation

[Town] supports ongoing and collective efforts to reduce transportation energy demand, vehicle miles traveled, fossil fuel consumption and greenhouse gas emissions. Accordingly the town will:

- Work with the Regional Planning Commission, neighboring communities and service providers to develop and promote regional park-and-ride facilities, rideshare programs and more convenient and affordable public transit services that provide links to major commercial, service and employment centers.
- In association with transit service providers, plan for and designate locations on existing and planned transit routes for the installation of public transit stops, including centrally-located, sheltered stops within walking distance of public facilities and services.
- Create a pedestrian-friendly Village Center area through the development of pedestrian and bicycle facilities and the management of motorized-traffic behavior. Utilize traffic calming techniques – such as lateral shifts, roundabouts, bulbouts, neckdowns – in order to reduce traffic speeds, increase safety and encourage pedestrian activity in the Village Center.
- All road reconstruction or expansion projects or new road construction projects shall provide “Complete Streets” that serve the needs of motor vehicles, public transportation services, bicyclists and pedestrians. This complete streets policy shall pertain to both town and private development streets.



Note: Complete streets legislation enacted in 2011 (Act 34) requires that the state or municipality consider "complete street principles" during all phases of transportation planning and project development. This legislation also requires the state to consider local and regional plans in determining whether a complete streets design is appropriate for a given state highway project.

- Develop [periodically update] municipal walkway and recreation path plans, and include planned right-of-way acquisitions, construction and improvement projects in the town's capital improvement program.
- Consider adopting an official map (under 24 V.S.A. §4421) that identifies the location of existing and planned highway, recreation path, and trail corridors for possible future acquisition, and for consideration in local development review proceedings.

Note: An official map is a regulatory map that is considered in the review of proposed development. If a mapped facility (e.g., a proposed trail or utility right-of-way) is shown on the map, the local review panel can deny an application that does not incorporate the planned facility in the subdivision or development of the property. However, the municipality must then take steps to acquire the land or interest in land (e.g., via an easement) within 120 days of the date of denial. It helps to have established reserve fund(s) for this purpose. If this is not done, the review panel must then review the application without considering the mapped facility.

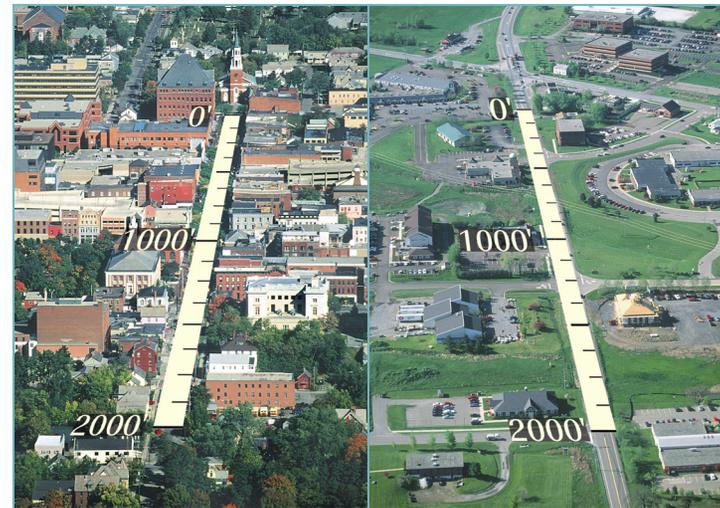
- In cooperation with local landowners, develop a town-wide network of walking trails and recreation paths that connect local neighborhoods to public facilities and destinations, and to regional trail networks.
- Develop or designate a centrally-located municipal parking lot in the downtown [village] that is connected to existing and planned pedestrian routes and transit stops, and provides local park-and-ride and park-and-walk opportunities.
- Provide bicycle racks at all municipal facilities open to the public, and in central downtown [village] locations.
- To the extent feasible, offer flexible work hours and telecommuting opportunities for municipal employees.
- Consider establishing, in partnership with local and regional service agencies, a volunteer driver program that offers rides for local residents and opportunities to coordinate group trips.
- Work with the Regional Planning Commission and larger employers in the area to promote "commuter friendly" policies and programs, which could include car and vanpooling programs, incentives for the use of public transit, flexible work hours, telecommuting opportunities, the participation in annual commuter challenges, such as Vermont's Way to Go Challenge, the installation of secure bike facilities and showers and, where appropriate, on-site housing for seasonal employees.
- Work with the Regional Planning Commission, utilities and local businesses to promote alternative fuel vehicles, for example to include bulk purchasing agreements or the development of strategically located infrastructure (e.g., vehicle fueling or charging stations).
- Work with local businesses and farmers to develop programs that support the local economy – for example a "buy local" campaign, a local business directory, a farmers market, or a vendors ordinance – to increase the availability of locally produced energy, food, goods and services.
- Adopt a no-idling policy or ordinance that limits vehicle idling on town and school property. For more information see www.idlefreevt.org.

- Evaluate and improve the performance of all municipal traffic signals in order to reduce vehicle delay and minimize idling.
- Incorporate Transportation Demand Management (TDM) techniques, such as transit passes, bus shelters, financial support for local bus services, sidewalks or other TDM measures into traffic mitigation options for large development proposals under review by the Development Review Board.

Land Use

[Town] promotes land use development patterns and densities that encourage improvements to energy efficiency and conservation. Accordingly the town will:

- Encourage development that maintains a historic settlement pattern of a compact village center that provides sidewalks, bicycle lanes and bus stops, surrounded by a rural countryside that supports a working landscape.
- Promote the rehabilitation and reuse of existing buildings and brownfield sites, and allow for compatible infill development, to accommodate higher density, pedestrian-friendly mixed use development within walking distance (e.g., 1/4 to 1/2 mile) of the downtown [village] center.
- Require new commercial, industrial, and higher density residential and mixed use development to locate within walking distance of the [downtown, village] center; or within designated areas of the community to be served by existing or planned infrastructure and public transit routes (e.g., industrial and office parks).
- Ensure new municipal and community facilities open to the public are located within walking distance of the downtown [village] center, or are accessible by public transit.
- Allow for expanded home-based businesses and cottage industries, especially in rural zoning districts, that provide opportunities for local residents to work from home.

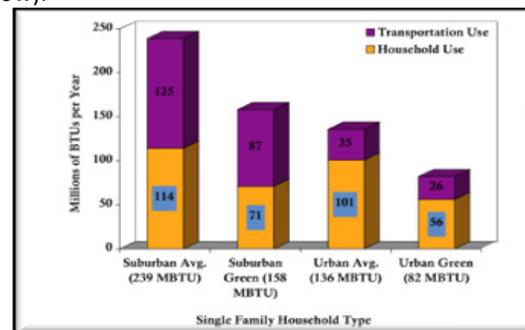


Source: VNRC/Brian Shupe Power Point Presentation given to Ludlow, 11/18/10

- Incorporate infrastructure and connectivity standards under site plan and subdivision review for pedestrian, bicycle and transit facilities.
- Reduce parking requirements for businesses and uses that maintain programs or facilities to reduce employee commutes in single occupancy vehicles, and for residential, business and community development projects that are located within walking distance of shared or public parking facilities or public transit stops.
- Adopt *maximum* parking standards or allow for a reduction of parking standards for the Village Center or Downtown areas.
- Establish an access management overlay district in order to promote improved pedestrian connections and shared commercial accesses for existing outlying shopping centers and strip development areas.
- Consider establishing a Form-Based Code for the downtown [village] center.
- Require that developers quantify and evaluate the energy impact of all major development proposals.
- Establish the Energy Committee as an Advisory Committee under 24 V.S.A. §§4433 & 4464 in order to assist the Appropriate Municipal Panel in review of applications with respect to energy standards in the land use bylaws.

Land Use Development Patterns Matter

Living in a pedestrian-friendly urban setting is far more effective at reducing energy consumption than living in suburban areas, even when compared to suburban households that use hybrid automobiles (see the table below).



Source: Jonathon Rose Companies, LLC for NRDC

Plan Addendum: Community Standards for Energy Facility Siting and Development

Note: The following standards are intended for consideration in the development of local bylaws, where applicable, and in the municipal review of energy projects before the Public Service Board. As noted earlier, the PSB must find that a proposed project "will not unduly interfere with the orderly development of the region with due consideration having been given to the recommendations of the municipal and regional planning commissions, the recommendations of the municipal legislative bodies, and the land conservation measures contained in the plan of any affected municipality." For determinations of scenic impact, the PSB uses the Act 250 "Quechee Test" which considers in part whether a project violates a "clear, written community standard intended to preserve the aesthetics or scenic beauty of an area"— and more specifically the project area. For consideration in regulatory proceedings, municipal policies or "community standards" should be specific in their application, clearly stated, and internally consistent. For example, no clear direction is provided by general statements to protect scenic ridgelines and to support wind development.

The language used is also important. In this context "shall" and "must" carry more weight as specific mandates, than "should" or "may" which are interpreted as recommendations or guidelines. Because the municipality has no direct authority, "should" – as a recommendation to the PSB for consideration – may be appropriate, but for added clarity, in certain cases "shall" or "must" or similar language may be needed. The following standards should be reviewed very carefully for local application and use.

These community standards are to be considered in undertaking municipal energy projects and programs, in updating the town's bylaws to address renewable energy development subject to local regulation, and in the review of new or upgraded energy facilities and systems by the town and the Public Service Board under 30 V.S.A. § 248 (Section 248 review).

Facility Development

Priorities. The following forms of energy development will be considered for support by the Town of _____, in order of priority:

1. Increased system capacity through state, utility and municipally-supported energy efficiency and conservation programs.
2. Small, onsite distributed energy projects, including Individual and group net-metered renewable energy projects and community-based projects that conform to municipal policies and standards.
3. In-place upgrades of existing facilities, including existing transmission lines, distribution lines and substations as needed to reliably serve the town and region.
4. New commercial, utility-scale energy facilities, including new transmission and distribution lines, substations, hydro dams, wind and solar farms, co-generation facilities and biomass plants.

Plan Conformance. New commercial, utility-scale generation facilities and proposed system upgrades, should be identified in or be consistent with the Vermont Comprehensive Energy Plan, the Vermont Long-Range Transmission Plan and the utility's Integrated Resource Plan (IRP). A new facility should be considered only after potential alternatives, including increased energy efficiency, distributed energy systems, and existing facility upgrades are evaluated and found to be insufficient to meet system reliability needs or projected demand.

Benefits. A demonstrated public need that outweighs adverse impacts to local residents and resources must be documented for municipal support of new, large-scale utility projects located within or which may otherwise affect the Town of _____. Facility development must benefit town residents, businesses, and property owners in direct relation and proportion to the impacts of the proposed development.

Impacts. New generation, transmission, and distribution facilities must be evaluated for consistency with community and regional development objectives, and to avoid undue adverse impacts to public health, safety and welfare, and significant cultural, natural and scenic resources identified by the community.

Decommissioning. All facility certificates or permits should specify conditions for system abandonment and decommissioning, including required sureties for facility removal and site restoration to a safe, useful, and environmentally stable condition. All hazardous materials and structures, including foundations, pads and accessory structures, must be removed from the site.

Facility Siting

Preferred Areas: New generation and transmission facilities shall be sited in locations that reinforce the community's traditional and planned patterns of growth, of compact [downtown, village] centers surrounded by a rural countryside, including working farm and forest land. The following areas have been identified by the town as suitable for the development of larger, utility-scale renewable energy and transmission facilities, consistent with this pattern of development, based on the municipal review of state energy plans, municipal participation in state energy plan development, an analysis of available renewable energy resources, technical facility requirements, and municipal resource conservation and development goals and objectives:

Note: The municipality should identify and map those areas suitable for large-scale energy development, as identified from the review of planned facility upgrades, to be referenced in the municipal plan, and/ or from a community-wide inventory and mapping project. This could also include specifying suitable zoning districts, as appropriate.

Prohibited (Exclusion) Areas. Because of their distinctive natural, historic or scenic value, and their special significance to the community, energy facility development shall be excluded from [prohibited within], and shall not be supported by the town in the following locations, as mapped by the municipality: [List – which may include some of the areas or resources noted below or, as noted above, could also reference certain zoning districts.]

- Floodways shown on Flood Insurance Rate Maps (FIRMs) – except as required for hydro facilities.
- Fluvial erosion hazard areas shown on Fluvial Erosion Hazard Area (FEHA) maps – except as required for hydro facilities.
- Wetlands shown on Vermont State Wetlands Inventory (VSWI) maps, or identified through site analysis.
- Rare, threatened or endangered species habitat or communities.
- The following ridgelines above ____ feet in elevation: [list]
- [Other as identified and mapped by the municipality.]

An excluded area must incorporate a buffer area of sufficient width to protect the resource values and integrity of the area.

Note: Any areas where utility development should be prohibited should be clearly stated and mapped. For example, as noted earlier, a general statement that "wind towers should not be located on scenic ridgelines" does not provide enough guidance to determine which ridgelines are of particular scenic value to the community. Several local plans reviewed prohibit the siting of telecommunication towers in specific locations – this language could be expanded to apply to wind towers as appropriate.

Conserved Areas. All new generation, transmission, and distribution facilities, including net-metered systems, shall be sited and designed to avoid or, if no other reasonable alternative exists, to otherwise minimize and mitigate adverse impacts to the following natural, cultural and scenic areas and resources identified by the community, consistent with related community standards:

- Historic districts, landmarks, sites and structures listed, or eligible for listing, on state or national registers.
- Public parks and recreation areas, including state and municipal parks, forests and trail networks.
- [State-designated] downtown, village and growth centers [or specified zoning districts or areas].
- State or federally designated scenic byways, and municipally designated scenic roads and viewsheds.
- Special flood hazard areas identified on National Flood Insurance Program maps – except as required for hydro facilities.
- Public and private drinking water supplies, including mapped source protection areas.
- Primary agricultural soils mapped by the U.S. Natural Resource Conservation Service.
- Necessary wildlife habitat identified by the state or through site analysis, including core habitat areas, migration and travel corridors. [Should more specifically reference any mapped resources.]
- Undeveloped ridgelines, headwaters and upland areas above [____] feet in elevation, including:[list]
- [Other locally designated natural, cultural, and scenic resources as identified and mapped by the municipality].

Note: The above lists are based on commonly noted areas of concern – they should be tailored to identify locally significant resources.

Public Health, Safety and Welfare

Setbacks. Except for transmission and distribution lines and hydro facilities, all energy facilities, including generation facilities, substations, net-metered facilities and accessory or ancillary structures, should meet minimum setback requirements for the zoning district(s) in which they are located. In addition:

- Net-metered and off-grid wind generation facilities must be set back from all property lines, public right-rights-of-way and overhead utility lines at least [1.1 -1.5] times the total facility height, as measured from the ground to the tip of the rotor blade at its highest point [unless easements are obtained from abutting property owners].
- Large-scale wind generation facilities [$> 100, 500$ kW], including wind farms, must be set back at least [1,000-1,500 feet] from all occupied buildings in existence or permitted at the time of application [unless easements are obtained from abutting property owners].
- Setback distances should be increased as necessary to mitigate adverse impacts to public health and safety, and to adjoining properties, rights-of-way, utility lines and uses, from potential equipment failure, noise, glare, shadowing or ice throw.

Note: Common setback requirements for wind facilities are intended to accommodate fall or tilt-down zones and to help mitigate noise and visual impacts, which decrease with distance. The setbacks for larger facilities also help mitigate low frequency noise and vibration, shadow flicker, blade shear and ice throw. Ranges commonly found in model bylaws are provided. Note also, however, that Public Service Department guidance in this area recommends setbacks of 1.1 times the tower height or less as determined from risk-based analyses, where this standard can't be met. The PSD has determined that greater setbacks are not necessary to address noise or other nuisances or hazards.

Height. Zoning district height limitations, where applicable, should be waived for renewable energy facilities as allowed under 24 V.S.A. § 4414, and as specified in the zoning bylaw. In addition:

- A net-metered wind facility must not exceed [120 - 150] feet in height, or [30 - 40] feet in height above obstructions located within 300 feet of the rotor, whichever is greater, as measured vertically from the ground to the tip of the rotor blade at its highest point.
- The minimum ground clearance for a wind turbine must be a minimum of 30 feet, as measured vertically from the ground to the tip of the rotor blade at its lowest point.
- A ground-mounted solar panel must not exceed [15-20] feet in height, as measured vertically from the ground to the top of the structure at its highest point.

- A roof- or building-mounted wind facility must not, as mounted, extend above the roofline more than [10 - 30] feet, as measured vertically from the roofline to the highest point of the facility, unless it is determined that additional height is necessary to provide clearance for safe operation, or to limit turbulence from surrounding structures.
- Roof-mounted solar installations must not exceed district height limits, unless height incentives (e.g., additional floors) are provided under local regulations to promote the use of roof-mounted systems in high density [downtown, commercial] zoning districts.
- Roof-mounted systems are exempt from any mechanical equipment screening requirements under local bylaws [except within the ____ design review/ historic district].

Note: Wind facility installations typically exceed maximum district height limits under zoning, as required for operation. Turbine effectiveness increases with height – especially with distance above trees, buildings and other obstructions that generate turbulence. While most model bylaws limit the height of "smaller" systems – in part to limit their visibility and avoid FAA lighting requirements (200+ feet) – many also allow for clearance above existing obstructions. At minimum, bylaws should include height exceptions for off-grid wind systems regulated by the municipality. If the bylaws don't include specific height standards, small roof-mounted wind facilities (with rotors less than 20 feet in diameter) and solar facilities (less than 10 feet high) cannot be regulated (under 24 V.S.A. § 4412). Also note that the Public Service Board has determined – as a rebuttable presumption – that wind facilities 150 feet or less in height will not have an undue adverse visual impact.

Access. New generation and transmission facilities shall be sited to minimize the need for and extent of new access roads and utility corridors.

- Existing highways and access roads shall be used to access facility sites wherever physically feasible. Highway access approval from the municipality is required to access a town highway.
- For large-scale projects that may impact town highways and traffic in the vicinity of the project during construction or operation, existing base-line traffic and road conditions shall be documented by the facility developer, to the satisfaction of the municipality. A traffic impact study also may be required, as specified under town bylaws. The facility developer shall be responsible for any highway improvements required to accommodate the project, and for repairing any damage to town highways resulting from the project.
- Facility access roads and utility corridors must be shared wherever physically feasible, and located to minimize site disturbance, resource fragmentation, the extension or creation of edge habitat into previously undisturbed areas, and related adverse visual and environmental impacts.

- All facilities shall be secured from unauthorized public access as necessary to ensure public safety.

Equipment. All facility equipment shall be designed, installed, operated and maintained to protect against structural or equipment failure that could endanger public safety.

- All facility equipment must be certified as meeting accepted industry safety, interconnection and performance standards as established by the National Electrical Code, Institute of Electrical and Electronic Engineers, Underwriters Laboratories, the American National Standards Institute (ANSI), or other accepted testing and certification facilities. For small wind facilities, this may include equipment certified by the Small Wind Certification Council (under AWEA Standard 9.1–2009)
- All wind turbines shall be equipped with automatic breaking, governing or feathering systems to prevent uncontrolled rotation, overspeeding, and excessive pressure on the tower structure, rotor blades, and turbine components. Net-metered wind systems must meet Vermont Public Service Board technical specifications.

Emergency Services.

- For installations of [100 - 500] kW or more, facility site plans, schematics, emergency response plans, and contact information must be filed with and reviewed by the fire department and other emergency responders. Emergency contact information must also be displayed onsite, in a prominent location.
 - a. Roof-mounted installations must be installed with adequate clearance to provide safe roof access by firefighters.

Noise. Audible noise generated by a new or upgraded facility shall not exceed the lesser of [45-60 dB(A)], or 5 dB(A) above the ambient noise level, as measured at the property line.

Note: Noise is a common issue in the review and siting of wind facilities, but other energy facilities – including transmission lines and substation equipment – can also generate audible "corona" noise from electrical discharges. For wind facilities, the American Wind Energy Association (AWEA) model bylaw recommends local standards or a maximum sound level of 60 db(A) as measured at the exterior of an occupied building, but many model ordinances specify 45 to 55 dB(A) at the property line, especially in rural settings where ambient sound levels are more typically around 35 dB(A). Some, as noted above, also specify a maximum increase in sound level over the ambient (background) level. These levels should be reviewed in relation to other adopted community noise standards.

Vermont has yet to enact statewide community noise level standards – noise is left to municipalities to regulate – but for large-scale wind projects the Public Service Board has set a precedent of 45 db(A), averaged over an hour, outside of an occupied residence. Tonal noise and low frequency sound levels and vibrations are often also cited concerns for large installations. Noise impacts decrease with distance, and can often be addressed through increased setbacks or equipment modifications.

Interference. Energy facility operation must not create conditions that reduce or interfere with public or private television, radio, telemetry, or other electromagnetic communication signals. No new or upgraded facility shall interfere with public safety communication systems.

Resource Conservation

Environmentally Sensitive Areas. New or relocated facilities, including generation facilities, utility corridors, and access roads and accessory structures, must be sited to avoid to the extent technically feasible, very steep slopes (>25%) mapped floodways, fluvial erosion hazard areas, [Class I, II] wetlands and, except for stream crossings, mapped surface waters and riparian buffer areas. In order to minimize the environmental impacts of facility development:

- b. Existing facilities should be upgraded on-site, or within an existing utility corridor, unless it is demonstrated that this is not technically feasible, or that another location will have less environmental impact. Expanded access and utility corridors adjacent to existing corridors are preferred over new locations.
- c. New high elevation facilities [>2,500 feet in elevation] must be designed, managed and regularly monitored to avoid or mitigate undue adverse impacts to headwaters and other surface waters, in conformance with state water quality, anti-degradation and stormwater management standards.
- d. New hydro facilities, including micro-hydro generation, must maintain sufficient flow (run of river) to avoid undue adverse impacts to water quality, local fisheries, and aquatic and riparian habitat.

Farm and Forest Land. New generation and transmission facilities must be sited to avoid the fragmentation of, and undue adverse impacts to the town's working landscape, including large tracts of undeveloped forestland, open farm land, and primary agricultural soils mapped by the U.S. Natural Resource Conservation Service.

- Generation and transmission facility development must not result in the clear cutting or fragmentation of large tracts of undeveloped forestland, including core forest habitat areas mapped by the state or municipality. Facilities should be sited and/or clustered at the edge of timber stands and core forest habitat, along property boundaries, and in otherwise disturbed areas.
- Forest biomass used for energy use must be sustainably managed and harvested in a manner that preserves critical forest habitat and long-term forest health.
- In agricultural areas, energy facilities, including wind towers, solar panels, and accessory structures, are to be located and clustered on the least productive portion of the site – in nonagricultural areas, along field and forest edges, or on otherwise disturbed areas –

to avoid fragmenting open farm fields, and to minimize facility encroachment on primary agricultural soils. Off-site mitigation should be required where necessary to mitigate the impacts of facility development on primary agricultural soils.

- New access roads and utility corridors must be kept to a minimum, shared where technically feasible, and located along forest and field edges, or in otherwise disturbed areas, as necessary to minimize site disturbance, resource fragmentation, and visual impacts, and to limit the introduction of edge habitat and invasive species. Access roads constructed along or within agricultural fields should be at the elevation of the field.
- A new or expanded generation, transmission and distribution facility on or in the vicinity of an operating farm shall not interfere with regular farming operations or accepted agricultural practices. Facilities located in agricultural areas must be fenced as necessary to prevent livestock access, consistent with landowner agreements. Site restoration after decommissioning must allow for continued agricultural use.

Wildlife. New or expanded facilities must be designed, constructed and operated without significant impacts to wildlife and necessary wildlife habitat, including core habitat areas, migratory routes and travel corridors, and to state or federally listed rare, threatened and endangered species as mapped or identified through site investigation.

- Baseline data and ongoing monitoring and mitigation should be required as recommended by the Vermont Agency of Natural Resources.

Scenic Resources. All new generation, transmission, and distribution facilities, including net-metered systems, shall be sited and designed to avoid or, if no other viable alternative location exists, to minimize and mitigate undue adverse visual impacts to the community's scenic resources, as viewed from public rights-of-way, public vantage points and adjoining properties, and particularly within or as viewed from designated scenic byway corridors, historic districts, and scenic roads and views mapped by the municipality.

- Utility scale and commercial generation and transmission facilities, including substations, should be upgraded or expanded onsite or within existing utility corridors wherever technically feasible, before new locations are considered, unless it is demonstrated that the new location will have less visual impact than the current location.
- New commercial, utility-scale generation and transmission facilities must be sited to avoid [prominent] locations within designated [mapped] scenic areas, including designated scenic byway corridors, historic districts, and locally designated scenic roads and views [scenic overlay districts]. These include: [list] Locations in the vicinity of these areas should be considered only if adverse visual impacts can be mitigated sufficiently to protect their scenic value.

- Generation facilities, utility lines, accessory structures and access roads must be located outside of or on the periphery of scenic views or viewsheds, so that they do not become predominant focal points. The apparent scale or size of the facility may be reduced by locating it as far from public vantage points as possible. The facility must not extend above the background horizon line, as viewed from public vantage points [except as required for operation].
- Landscaping, screening and selective line burial must be employed as necessary to preserve scenic views of particular importance to the community.
- Ground-mounted facilities must be sited or screened so that they are not highly visible from adjoining properties. Net-metered wind facilities must be sited to minimize their visual impacts on neighboring residential and public properties, as recommended in the Vermont Public Service Department's publication "Siting a Wind Turbine on Your Property." A system rated under these guidelines must score no more than "minimal impact" on residential and public properties.
- All structures must be designed using context-sensitive, non-reflective materials, unobtrusive colors, and textures that will blend the facility into its natural setting or surrounding environment. Wind facilities are to be finished in a neutral, non-reflective color (e.g., matte gray, off-white or white) so that they blend into a range of sky conditions.
- Lighting must be the minimum required for safe facility operation, and incorporate energy-efficient, shielded light fixtures that are cast downward to minimize light trespass, glare and sky glow.
- Large-scale wind projects (e.g., 200 feet or more in height) must be sited and designed to minimize the need for and amount of facility lighting and marking as required by the Federal Aviation Administration (FAA) – i.e., to incorporate an FAA-approved Obstacle Collision Avoidance System (preferred) or an FAA- approved lighting alternative that results in the least amount of visual disturbance.
- Energy generation facilities that include multiple installations (e.g., wind and solar farms) should include equipment of uniform design. For wind facilities this includes uniform tower type, height, number of blades, and direction of blade rotation. Towers or solar arrays should be clustered to the greatest extent feasible, while maintaining technical separation distances, to minimize their visual and environmental impacts.
- Onsite electrical connections should be buried to the extent technically and physically feasible, except where connected to the transmission or distribution system.

- No energy facility shall be used for purposes of advertising or display. Signs should meet local sign regulations, and be limited to required warning and safety signs and, for larger facilities, signs that identify the facility, the operator, and emergency contact information.

Historic Sites and Structures. Facility siting, construction and operation shall not cause significant adverse impacts to historical or cultural resources, including state or federally designated historic districts, sites and structures, and locally significant cultural resources identified in the municipal plan. This also includes previously unidentified archaeological sites discovered during site construction or operation.

- Consistent with guidelines published by the Secretary of the Interior and the Vermont Division for Historic Preservation, new or expanded generation, transmission and distribution facilities must be sited and designed so that they do not:
 - Require the demolition of a historic structure or disturb known or discovered archaeological sites.
 - Result in physical or structural damage, a significant visual intrusion, or pose a threat to the use of a historic structure.
 - Result in damage to or the removal of historic landscape features.
 - Create a significant visual intrusion into public views of a historic building, group of buildings, or historic landscape, especially as identified in the municipal plan.
 - Cause visual intrusion into a hillside that serves as a backdrop to a historic site or structure.
 - Create a focal point that would disrupt or distract from elements of a historic landscape.
 - Result in an significant intrusion in a rural historic district or historic landscape with a high degree of integrity.
 - Significantly impair a vista or viewshed from a historic resource that is a significant component of its historic character and history of use.
 - Visually overwhelm a historic setting, by being dramatically out of scale.
 - Isolate a historic resource from its historic setting, or introduce incongruous or incompatible uses, or new visual, audible or atmospheric elements.
- Net-metered systems located within historic districts or mounted on historic structures must meet the Secretary of the Interior's Standards for Rehabilitation, including specific standards for the retention of historic character, and for compatible additions and exterior alterations (e.g., see ITS Number 52, *Incorporating Solar Panels in a Rehabilitation Project*), and the following related standards:
 - The historic character of listed properties and structures is to be retained and preserved. Facility placement and design must not detract from the historic character of the site, or destroy historic landscaping features and materials.
 - Ground installations are preferred to roof-mounted installations on historic structures. To the extent functionally feasible, a ground-mounted system shall be installed in a location that minimize its visibility, such as a side or rear yard, and screened from the view of public rights-of-way and adjoining properties.

- Roof-mounted systems may be placed on new construction, non-historic buildings and additions.
- Solar panels should be integrated into the design of new construction or infill projects within the historic district to ensure cohesive design within the district's historic context.
- Solar panels and other roof- or wall-mounted structures must not be placed on the primary building facade(s), including a street-facing wall or roof, unless there is no other suitable location on the site or structure.
- Roof- or building-mounted systems on a historic structure must not physically damage the structure, alter its character-defining features (e.g., roof lines, dormers, cupolas and chimneys), or visually obstruct significant architectural features such as overlaying windows or architectural detailing.
- Roof-mounted Installations are to be placed below and behind parapet walls and dormers, on rear-facing roofs, where feasible. Panels are to be mounted flush with and at the same angle as the existing roof surface, parallel with the roofline.
- On a flat roof, a panel or wind systems must be set back from the roof edge as necessary to minimize its visibility. Solar panels must not be visible above the roofline of the primary facade. Panels and mounting systems must be compatible in color to established roofing materials to minimize their visibility.
- System installation systems must be reversible and not damage the historic integrity of the building. Attachment points should be minimized and allow for future system removal.

ENERGY BYLAW STANDARDS

As with energy policies and guidelines, the following bylaw standards are presented for community discussion, and need to be adapted for local use. Not all standards can, or should, apply everywhere. Some model standards (e.g., energy codes, solar access regulations) can be very technical – and therefore difficult to apply and enforce in communities with limited resources. The follow standards are crafted to be easily adapted and administered by local zoning administrators and review boards (appropriate municipal panels or AMPs). These standards are also specific to energy considerations under local bylaws. Other model bylaws and ordinances should be consulted for language pertaining to complete streets, and transit- and pedestrian-friendly development. The Regional Planning Commission is a good source of information and technical assistance. Finally – as with all proposed bylaw language – have your municipal attorney review it prior to adoption.

Purpose

The purpose of these standards is to promote energy efficient development, and to direct the siting and development of renewable energy facilities in the Town of [Town], as necessary to ensure that:

1. New development conforms to town plan goals, policies and objectives specific to energy conservation, increasing energy efficiency and renewable energy development.
2. New development is planned and designed for energy efficiency, and to accommodate the future installation of renewable energy systems.
3. Renewable energy facilities subject to municipal review meet minimum standards intended to protect public health, safety and welfare, public facilities and services, neighboring properties and uses, and the town's most significant natural, historic and scenic resources.

Purpose statements provide the context for applying and interpreting regulations. All bylaws are required to conform to and implement the municipal plan. This assumes that the plan has been updated to include specific policies and objectives for energy conservation, energy efficiency, and renewable energy facility development – for use in developing and applying local land use regulations, potentially local building ordinances, and for consideration under Public Service Board (Section 248) proceedings for new facility development.

Limitations and Application

As specified under the Vermont Planning and Development Act (24 V.S.A. §§ 4413, 4414):

1. No bylaw shall prohibit, or have the effect of prohibiting, the installation of solar collectors, clotheslines, or other energy devices based on renewable resources.
2. Bylaws shall not regulate public utility power generating plants and transmission facilities regulated by the Vermont Public Service Board under 30 V.S.A. §248.
3. The town may adopt zoning and subdivision bylaws that encourage energy conservation, that protect and provide access to renewable energy resources, and that provide regulatory incentives for renewable energy technology.

Given these limitations, the standards under this section shall apply to:

1. Energy facilities that are not regulated by the Public Service Board, including but not limited to off-grid wind and solar facilities, and solar thermal and biomass installations.
2. The municipal review of proposed renewable energy facilities subject to Public Service Board (Section 248) review, in association with municipal plan policies, which may serve as the basis for municipal participation in Public Service Board proceedings.
3. The protection of access to renewable energy resources to the extent allowed under state law.
4. The promotion of energy-efficient forms of development, and renewable energy facilities – including the identification or designation of suitable locations for the installation of renewable energy facilities under site plan or subdivision review.
5. Planned Unit Developments (PUDs) that are designed to promote energy efficient development or the incorporation of individual or group net-metered renewable energy facilities in development design.

Note: While the town has limited authority to regulate building efficiency and the development of energy generation and transmission facilities under its land use regulations, it does have the ability to regulate off-grid renewable energy facilities, and to accommodate and promote energy efficient development, access to renewable energy resources, and locations for the siting new renewable energy facilities under site plan and subdivision review. Local bylaws can also be referenced in the municipal review of projects before the Public Service Board, to help ensure that all energy development is consistently addressed by the community.

General Regulation – Energy Efficiency

Minimum Requirements. New buildings and additions at minimum shall meet applicable state energy codes for residential and commercial development, including Vermont's Commercial Building Energy Standards (CBES) and Residential Building Energy Standards (RBES) in effect at the time of application.

1. The zoning administrator shall provide information about state energy codes at the request of the applicant.
2. State-required certificates of code compliance shall be filed with the town prior to the issuance of municipal certificates of occupancy [compliance].

Incentives. Incentives for development that exceeds minimum state efficiency standards, or for the incorporation of renewable energy facilities in development design, may be considered by the [AMP] for planned unit development under Section ____.

Vermont's Residential Building Energy Standards, most recently amended in 2005, apply to all new homes, and additions over 500 square feet. The Vermont Residential Energy Code Handbook is available for download from the Public Service Department's web site: http://publicservice.vermont.gov/energy/ee_files/rbes/energy_code_handbook_09-04.pdf

The state's Commercial Building Energy Standards apply to all new commercial buildings and to residential buildings of four stories or more. More information and copies of the commercial energy code are available through the department's web site: http://publicservice.vermont.gov/energy-efficiency/ee_commstandards.html.

Under state code requirements, certificates of code compliance must be sent to the Department of Public Service and the municipal clerk, for the municipality in which the property is located.

General Regulation – Access to Renewable Energy Resources

Access Protection. New development, including new structures, additions, landscaping, fencing and screening, shall not be located in a manner that obstructs solar or wind access to existing or permitted renewable energy installations on adjoining properties.

Waivers. In order to protect access to wind and solar energy resources, the [AMP] may, for development under appeal or subject to site plan, conditional use or subdivision review:

1. Increase required setback distances from side or rear property lines as necessary to preserve solar or wind access for an existing renewable energy facility on an adjoining property.
2. Reduce minimum required setback distances for the siting of a new renewable energy facility on a property as necessary to access onsite solar or wind energy resources, as allowed under 24 V.S.A. § 4414(8). Accordingly, the [AMP] may reduce required setback distances by no more than [50% - 90%] if it finds that:
 - a. The reduction is the minimum necessary to access solar or wind energy required for efficient and cost-effective system installation, maintenance and operation.
 - b. There are no other viable sites on the property to locate the facility, consistent with technical requirements, and other applicable municipal siting requirements under these regulations [and related plan energy facility siting standards].
 - c. Adverse impacts to the adjoining property, including but not limited to safety hazards, noise impacts, visual impacts, shadow flicker or glare, can be adequately mitigated through siting, equipment modifications, landscaping or screening. For wind towers, an easement from the adjoining property owner may be required as necessary to address potential physical encroachments on the adjoining property in the event of tower collapse.

Note: "Renewable energy access" can be generally defined as "the availability of, or unobstructed access to, a renewable energy resource." Access provisions most commonly apply to solar access rights, under state solar access laws and local regulations, but it can also be applied to wind and other renewable energy resources. Vermont has not yet adopted specific resource access or easement statutes but § 4414(8) of Chapter 117 (Access to renewable energy resources) allows municipalities to "adopt zoning and subdivision laws to encourage energy conservation and to protect and provide access to" renewable energy resources. Bylaws must establish associated standards of review. The above language is intended to provide minimum access protection for existing installations that predate adjoining development. This in effect freezes the building envelope on an adjoining property to that in existence at the time a system was installed, without specifically requiring a recorded easement. It gives system owners some redress under the regulations, if impacted by adjoining development.

Specific Use Standard – Renewable Energy Facilities

Note: *These standards apply to systems that do not require a Certificate of Public Good from the Vermont Public Service Board, but are nevertheless intended to be consistent with the siting standards presented above, to ensure that all facilities are given similar treatment based on their scale and potential impacts. Because these regulations apply to only very small facilities, most applications could be handled through an expedited administrative review process – e.g., as accessory structures that require only a zoning permit, if they meet applicable siting criteria.*

Siting Limitations. Renewable energy facilities are allowed in all zoning districts [in which structures are allowed], with the exception of the following areas or locations which, because of their unique and distinctive natural, historic or scenic character and significance to the community, or because of known environmental hazards, are not suitable for facility installation.

- Regulated floodways shown on Flood Insurance Rate Maps (FIRMs).
- Fluvial erosion hazard areas shown on Fluvial Erosion Hazard Area (FEHA) maps [ground-mounted facilities].
- Wetlands shown on Vermont State Wetlands Inventory (VSWI) maps, or identified through site investigation.
- Rare, threatened or endangered species habitat.
- Areas of steep slopes [as more specifically defined under the local bylaw, e.g., 25%].
- The following ridgelines above ____ feet in elevation: [list].
- [Other as identified in the municipal plan.]

Permitted Uses. For purposes of these regulations, a single proposed small-scale renewable solar or wind energy facility – including a solar thermal system, a solar photovoltaic (PV) or a wind system with a nameplate capacity of [5-15] kW or less – that is intended to serve the principal use of the property and meets the following standards, shall be considered an allowed accessory structure in all zoning districts [in which structures are allowed], subject to review by the Administrative Officer [Zoning Administrator] and the issuance of a zoning permit. These systems include:

1. Solar or wind facilities to be mounted on buildings or structures (with the exception of historic structures) which, as mounted, do not exceed maximum district height requirements [by more than 10 feet]. Facilities mounted on non-conforming structures will not be considered to increase the degree or amount of nonconformance.
 - a. The application for a roof-mounted system shall also include written certification from the system designer or installer that the roof is structurally able to support system weight, and associated snow and wind loads.

*Note: **Small is relative** – "small scale facility" can be defined in a number of ways, depending on the type of facility and the context. The ranges presented here – for nameplate capacity, facility height, etc. – reflect those found in ordinances for facilities intended to serve individual residences, small businesses and farms. Nationally, "small" often applies to much larger systems, up to 100 kW. Vermont's maximum system capacity for net-metered systems (including group systems) is now 500kW.*

Vermont's Small Scale Renewable Energy Incentive Program (for net-metered projects) currently applies to residential solar PV and wind systems up to 10kW – though larger systems may be considered. It also applies to commercial/industrial solar PV systems up to 25 kW and wind systems up to 80kW. The state recently enacted a simplified registration process for solar PV systems up to 5kW, for which a certificate of public good may be "deemed approved." Systems up to 15kW are exempted from some utility net-metering requirements.

Other common definitions of "small-scale" are based on wind tower height (e.g., less than 150 feet) or a rotor's "swept area" (e.g., 50 to 100 ft²) or the number of wind towers or ground-mounted mounted solar arrays (e.g., one or two).

Prior to adopting regulations, you should do some research with local system suppliers to more specifically define what "small scale" means for your community – keeping in mind that, because the town can only regulate off-grid systems, these will likely be very small indeed.

2. Individual ground-mounted solar and wind facilities [on lots of one acre or more] that meet the following requirements:
 - a. The facility is not located in a prohibited area identified under Subsection ____.
 - b. A ground-mounted solar facility must meet minimum district setback requirements from property lines and rights-of-way, unless waived by the [AMP] under Section ____ (Access); and shall not exceed a total height of [15-20] feet, as measured vertically from the ground to the highest point of the structure.
 - c. A ground-mounted wind energy facility shall not exceed a total height of [80-150] feet, or a maximum height of [30-40] feet above obstructions (e.g., structures, tree canopies) within 300 feet of the tower, which ever is greater, as measured vertically from the base of the tower at ground level to the top of the rotor blade at its highest point. The facility shall be set back at least [1.1 - 1.5] times the total facility height from all property lines, overhead utility lines, and public rights-of-way unless waived by the [AMP] under Section ____ (Access). A minimum clearance of 30 feet is required between the ground and the rotor blade tip at its lowest point. Supporting guy wires must be located at least [10-20] feet from all property lines.

Note: As noted previously, the effectiveness of a wind turbine increases with height from the ground. Generally at least 30 feet of clearance is needed over tree lines, buildings, and other obstructions that can block wind or cause turbulence that will affect system performance. The minimum residential wind system height under the state's Renewable Energy Incentive Program is 80 feet. Many small systems are less than 120 feet but, given the region's varied terrain, a higher height allowance may be appropriate by right, or under a separate AMP waiver provision. The PSB has adopted a rebuttable presumption that net-metered wind facilities up to 150 feet in height do not have an undue adverse visual impact on surrounding properties.

Under most ordinances reviewed, minimum required setback distances were slightly higher than the total facility (tower and rotor) height. This addresses the potential fall or tilt-down zone for wind towers, and potentially most noise concerns, given that noise impacts decrease with distance.

- d. A wind facility shall not cause shadow flicker on any occupied building located in the vicinity of the property [unless the affected property owner gives written consent, as submitted with the application].

Note: "Shadow flicker" results from shadows cast by turning rotor blades. For smaller systems this is rarely a problem – and where it occurs, it can usually be addressed through facility siting (e.g., by increasing a setback) or with landscaping.

- e. Noise levels generated by a wind facility shall not exceed [45-55 db(A)] [5 dB(A) above the ambient sound level], as measured at property lines. [A turbine must be certified to have an AWEA-rated sound level of 40, 45, 50 dB(A) or less].

Note: Since noise is a common concern, new small wind systems are built to be quiet, and do not generate the low frequency sounds and vibrations associated with larger, utility-scale facilities. As a result, some ordinances now reference "AWEA sound level ratings" for tested equipment. Under AWEA standards, equipment sound levels are measured at a distance of 60 meters from the rotor hub, excluding background sound, and are then assigned a sound level rating, generally from 40 to 55 db(A). Accompanying tables can then be used to calculate the overall sound level for given equipment ratings based on background levels and distance from the rotor. http://www.awea.org/learnabout/smallwind/upload/AWEA_Small_Turbine_Standard_Adopted_Dec09.pdf

- f. Ground-mounted facilities must be sited or screened so that they are not highly visible from adjoining properties. [Wind facilities should be sited and screened to score no higher than a "minimal impact" rating for residential and public impacts under the Public Service Department's "Siting a Wind Turbine System on Your Property."]

Note: Total screening from surrounding properties may not be possible, especially for wind systems. If visibility is an issue, the facility should be reviewed by the AMP. At minimum, applicants should be given the Public Service Department's publication "Siting a Wind Turbine on Your Property." This includes guidelines for siting small wind systems to minimize their visual impacts, and a scoring and rating system to identify overall level of impact on residential and public properties.



http://publicservice.vermont.gov/energy-efficiency/ee_files/wind/psb_wind_siting_handbook.pdf

- g. A ground-mounted solar installation shall not cast glare onto adjoining properties.
- h. The installer must certify in writing that the facility as installed meets manufacturer's specifications and accepted industry safety and performance standards, as established by the National Electrical Code, Institute of Electrical and Electronic Engineers, Underwriters Laboratories, American National Standards Institute, or similar testing and certification facilities. [Small wind systems must meet the American Wind Energy Association's Small Wind Turbine Performance and Safety Standard (AWEA 9.1–2009) and applicable technical specifications established by the Vermont Public Service Board for net metered projects]. The applicant shall forward a copy of system specifications to the Fire Department.

Note: All ordinances reviewed require some type of code compliance for both wind and solar installations. Net-metered systems must meet utility connection requirements and Public Service Board equipment specifications. National standards and certifications for these types of facilities are still under development. An independent organization, the Small Wind Certification Council (SWCC), was recently established to certify small wind turbine safety and performance, under the AWEA standard noted above, and is in the process of testing a number of turbines (www.smallwindcertification.org). Several organizations publish codes for solar PV system components, coordinated through the Solar America Board for Codes and Standards www.solarabcs.org. For net-metered PV systems, the state references the National Electrical Code, the Institute for Electrical and Electronic Engineers, and UL standards. Firefighters especially face some risk from roof-mounted PV systems—many ordinances require that they be copied on system specs.

- i. Line connections between a ground-mounted facility and the principal structure must be buried.
- j. Facility lighting or use of the facility for display or advertising purposes is prohibited.

Site Plan [Conditional Use] Review. All other renewable energy facilities regulated by the municipality must receive site plan [conditional use] approval from the [AMP] prior to the issuance of a zoning permit. Site plan [conditional use] review and approval by the [AMP] is also required prior to the issuance of a zoning permit for any renewable energy facility located in the following areas, to avoid undue adverse impacts to the community's most significant natural, historic and scenic resources:

- Historic districts, sites and structures listed, or eligible for listing on state or national registers, including [list of historic districts].
- Designated scenic byway and road corridors [list]
- Scenic views and vistas, as shown on the town's scenic resources map.
- Primary agricultural soils as mapped by the U.S. Natural Resource Conservation Service.
- Surface water and wetland buffers, as required under Section ____.
- Critical wildlife habitat areas [as shown on the town's wildlife habitat map and/or as specifically defined in the bylaw].

Renewable energy facilities regulated by the municipality that require site plan [conditional use] review by the [AMP] must meet the following standards:

1. **Environmentally Sensitive Areas.** In order to minimize the environmental impacts of facility development, new renewable energy facilities must meet:
 - a. Minimum setback distances from surface waters and wetlands, as required for all new development under Section ____, unless waived by the [AMP] under Section ____ (Waivers). New hydro facilities, including micro-hydro generation, should maintain sufficient flow (run of river) to avoid undue adverse impacts to water quality, local fisheries, and aquatic and riparian habitat.

- b. Applicable requirements for development within Special Flood Hazard Areas (SFHAs) as shown on National Flood Insurance Program (NFIP) maps and regulated by the municipality under Section _____. No renewable energy structure, except for a hydro facility, shall be located in a regulated floodway.
 - c. [Other as defined by the municipality.]
2. **Farm and Forest Land.** New generation and transmission facilities must be sited to avoid wherever feasible, or to otherwise minimize and mitigate the fragmentation of and adverse impacts to the town's working landscape, including large tracts of undeveloped forestland, open farm land, and primary agricultural soils mapped by the U.S. Natural Resource Conservation Service.
- a. In agricultural areas, ground-mounted renewable energy facilities, including wind towers, solar panels, and accessory structures, shall be sited and clustered on the least productive portion of the site, in non-agricultural areas, along field and forest edges, or on otherwise disturbed areas, to minimize encroachments on open farm fields and to, to the extent feasible, to avoid siting a facility on primary agricultural soils.
 - b. The facility must be accessed from an existing access serving the property, unless otherwise approved by the [AMP] as necessary to meet technical facility siting requirements. New access roads are to be located along forest and field edges, or in otherwise disturbed areas, as necessary to minimize site disturbance, resource fragmentation, and visual impacts, and to limit the introduction of edge habitat and invasive species. Access roads constructed along or within agricultural fields should be constructed at grade with the elevation of the field.
 - c. Facilities located in agricultural areas should be fenced as necessary to prevent livestock access, consistent with landowner agreements. Site restoration after facility decommissioning and removal must allow for continued agricultural use of the site.
 - d. A renewable energy facility shall be sited to avoid core forest areas and critical forest habitat. [List mapped/inventoried resources.]
 - e. For farm and forest land enrolled in state or municipal tax stabilization programs, or subject to permanent conservation easements, facilities shall be sited to meet applicable program requirements and restrictions.
3. **Wildlife Habitat.** New or expanded facilities shall be designed, constructed and operated to avoid significant adverse impacts to wildlife and necessary [critical, significant] wildlife habitat, including core habitat areas, migratory routes and travel corridors, and state or federally listed rare, threatened and endangered species as mapped by the state or municipality, or identified through site investigation. Buffer zones of sufficient width must be provided as necessary to protect identified habitat values. [List/refer to mapped and inventoried resources.]

4. **Scenic Resources.** Energy facilities shall be sited and designed to avoid or, if no viable alternative location exists, to otherwise minimize and mitigate undue adverse visual impacts to the community's scenic resources, as viewed from public rights-of-way, public vantage points and adjoining properties, and particularly within or as viewed from designated scenic byway corridors, historic districts, and scenic roads or views mapped by the municipality.
- a. Ground-mounted facilities are to be sited or screened so that they are not highly visible from adjoining properties. Ground-mounted net-metered wind facilities must be sited in accordance guidelines intended to minimize visual impacts included in the Vermont Public Service Department's publication "Siting a Wind Turbine on Your Property." A system rated under these guidelines shall have no more than a "minimal impact" on residential and public properties.
 - b. Landscaping and screening shall be required as necessary to preserve scenic views of particular importance to the community, and to minimize visual impacts to adjoining properties. This may include the use of existing topography and vegetation, or a combination of plants, natural or architectural screening materials to either screen the facility from view or visually blend it into its surroundings.
 - c. All structures must be designed using context-sensitive, non-reflective materials, colors, and textures that will blend the facility into its natural setting or surrounding environment. Wind facilities should be finished in a neutral, non-reflective color (e.g., matte gray or white) so that they blend into a range of sky conditions.
 - d. Exterior lighting shall be avoided [except as required for safe facility operation, and shall incorporate energy-efficient, shielded light fixtures that are cast downward to minimize light trespass, glare and sky glow].
 - e. Onsite electrical connections must be buried to the extent physically feasible, except where connected to the transmission or distribution system.
 - f. No facility shall be used for purposes of advertising or display. Signs must meet applicable sign requirements under Section ____, and be limited to required warning and safety signs.
5. **Historic Sites and Structures.** Facility siting, construction and operation shall not cause significant adverse impacts to historical or cultural resources, including state or federally designated historic districts, sites and structures, and locally significant cultural resources identified in the municipal plan. This also includes previously unidentified archaeological sites uncovered during site construction or operation.

Renewable energy facilities located within historic districts or mounted on historic structures must meet the Secretary of the Interior's Standards for Rehabilitation, including specific standards for the retention of historic character, and for compatible additions and

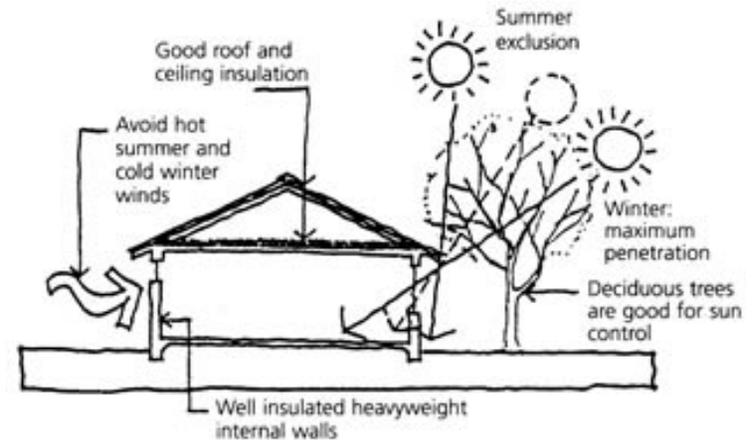
exterior alterations (e.g., see ITS Number 52, *Incorporating Solar Panels in a Rehabilitation Project*), and the following related standards:

- a. The historic character of listed properties and structures must be retained and preserved. Facility placement and design must not detract from the historic character of the site, or destroy historic landscaping features and materials.
- b. Ground installations are preferred to roof-mounted installations on historic structures. A ground installation, to the extent functionally feasible, must be installed in a location that minimizes its visibility, such as a side or rear yard, and be screened from view of public rights-of-way and adjoining properties.
- c. Roof-mounted systems may be placed on new construction, non-historic buildings and additions.
- d. Solar panels must be integrated into the design of new construction or infill projects within the historic district to ensure cohesive design within the historic context.
- e. Solar panels and other roof- or wall-mounted structures must not be placed on the primary building facade(s), including street-facing walls and roofs, unless there is no other suitable location on the site or structure.
- f. Roof- or building-mounted systems on a historic structure must not physically damage the structure, alter its character-defining features (e.g., roof lines, dormers, cupolas and chimneys), or obstruct significant architectural features such as overlaying windows or architectural detailing.
- g. Roof-mounted Installations are to be placed below and behind parapet walls and dormers, on rear-facing roofs where feasible. Panels are to be mounted flush with and at the same angle as the existing roof surface, parallel with the roof line. On a flat roof, a panel or wind system must be set back from the roof edge as necessary to minimize its visibility from public rights-of-way. Solar panels must not be visible above the roofline of the primary facade. Panels and mounting systems must be compatible in color to established roofing materials to minimize their visibility.
- h. System installation must be reversible and not damage the historic integrity of the building. Attachment points should be minimized and allow for future system removal.

Site Plan Review – Energy

Site layout [in the _____ zoning districts] shall be designed to create optimum conditions for energy efficient development and the future installation of ground- or building-mounted renewable energy systems. Accordingly:

1. New structures and landscaping shall not be located on the site in a manner that obstructs solar or wind access to existing principal buildings or to existing renewable energy installations on adjoining properties. Setback distances from side or rear property lines may be increased by the [AMP] under Section ____ (Access) as necessary to preserve solar or wind access to adjoining properties.
2. A principal building shall be oriented, to the extent physically feasible given physical site constraints [and existing or planned development pattern], to maximize its southern exposure and solar gain during winter months (preferably within 15° [30°] of true south) to accommodate passive solar construction.
3. A principal or accessory structure shall [should] be oriented to maximize solar access for the installation of a roof-mounted solar thermal and photovoltaic system, if space on the site for a ground-mounted system is limited, or shaded by existing development on neighboring properties.
4. A mix of deciduous and evergreen vegetation shall be incorporated in site design, in relation to seasonal sun angle, to effectively shade principal structures and parking areas during summer months, except as required to accommodate roof-mounted solar installations, and to maximize solar gain for passive solar heating during winter months. Windbreaks should also be incorporated in site design as needed to shield principal buildings from prevailing winds (e.g., on the north or northwest side of the principal building) unless this interferes with an existing or planned wind facility.
5. As specified in state law (27 V.S.A. §544), no covenants, deed restrictions, declarations or similar binding agreements attached to the property shall prohibit, or have the effect of prohibiting, the installation of renewable energy devices, including outdoor clotheslines and renewable energy facilities approved by the Vermont Public Service Board or the municipality.
6. The site plan shall [should] designate one or more areas of the property that are suitable for ground- or building-mounted renewable energy installations that meet the requirements of Section ____ (Renewable Energy Facilities), unless the site is to be served by an offsite, group net-metered renewable energy facility, [or is located in the _____ districts]. Minimum required setback distances may be reduced by the [AMP] as necessary to accommodate onsite systems, as provided under Section ____ (Access).



Source: Passive Solar Heating Fact Sheet, *Your Home Technical Manual* 4th ed. Commonwealth of Australia, 2010 (www.yourhome.gov.au/technical/fs45.html).

Conditional Use Review – Access, Utility Capacity

Solar and Wind Access. New development, including new structures, additions, landscaping, fencing and screening, shall not be located in a manner that obstructs solar or wind access to existing or permitted renewable energy installations on adjoining properties.

1. Minimum required setback distances may be increased or reduced by the [AMP] as necessary to accommodate onsite renewable energy systems or to protect resource access for existing offsite renewable energy systems, as provided under Section ____ (Access).

Utility Capacity. New development shall not exceed the capacity of existing and planned [municipal] utility systems, including generation and transmission systems, to serve the proposed development.

1. For development with high energy demand that could adversely affect existing or planned utility system capacity or service, the [AMP] may require documentation of the utility's ability and intent to serve the proposed project, and incorporate related conditions of approval for energy efficiency, on-site generation, or project phasing, consistent with any applicable requirements imposed by the utility or the state, as necessary to mitigate known service or facility impacts.

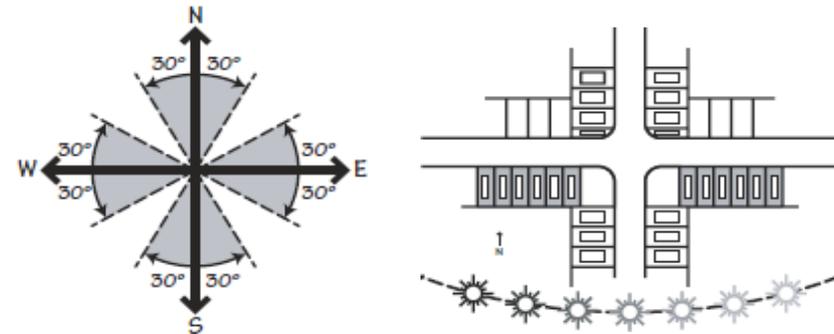
Note: "Ability to serve" letters from utility companies are often required for development under Act 250 review. This covers larger projects, but not necessarily all development that could significantly increase energy demand. This type of provision may be of use especially in communities with municipally-owned utilities (e.g., Ludlow), community generation or district hearing, or larger group-net-metered facilities that are intended to serve a development.

Subdivision Regulations – Solar Access

New subdivisions shall incorporate, to the greatest extent feasible, street layouts, lot configurations, landscaping, and building envelopes that maximize solar access (southern exposure) for proposed building lots, to accommodate both passive solar construction and active solar collector (thermal and/or photovoltaic) systems.

1. The subdivision plan or plat for proposed building lots shall be designed and laid out according to the standards of this section, and shall indicate designated locations for individual or group-metered systems.
2. Planned developments in which [60-80%] of the building lots have solar access, or are served by a group net-metered system installed by the subdivider, are eligible for a density bonus under Section ____ (Planned Unit Development).
3. Property owner agreements shall incorporate language regarding solar access protection and, where applicable, provisions governing the ownership and maintenance of group-net metered systems.

Street Layout. The majority of streets in the subdivision shall be oriented to maximize solar access to adjoining lots, as topographic conditions and existing street orientations allow, preferably within 15 degrees of the true east-west axis. Intersecting streets are to be aligned as closely as possible to the true north-south axis.



Source: Portland Oregon Solar Access Regulations

1. In the following low density districts [specify], this requirement may be waived as long as building lots [envelopes] are oriented to maximize southern exposure.

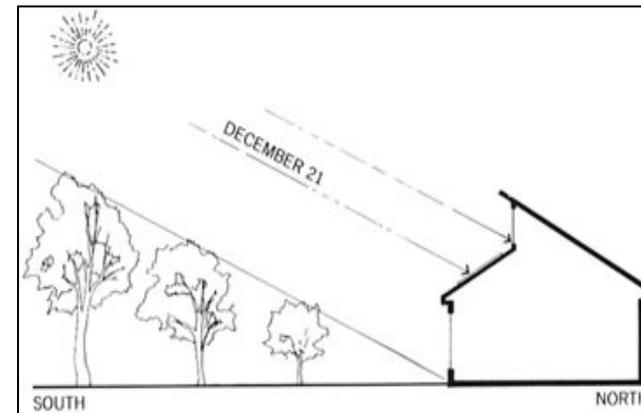
Lots. Building lots [envelopes] shall be oriented and sized to maximize unobstructed southern exposure for passive or active solar energy installations.

1. Building lots and common open land intended for solar installations should be concentrated on south facing slopes. Other designated open space areas should be sited on north facing slopes.
2. Lots intended to accommodate ground-mounted systems must be large enough to meet system setback requirements under Section ____ (Renewable Energy Facilities) [or municipal plan facility siting standards], to provide unobstructed solar access to individual lots, and to avoid obstructing solar access to adjoining lots within and adjacent to the subdivision.

3. Options for building lot configuration include:
 - a. Minimizing the width of lots along east-west oriented streets to maximize the number of lots and buildings with direct southern exposure for passive solar construction, particularly for higher density, multistory development, or if the lots are to be served by a group net-metered system; or
 - b. Widening lot width (in relation to depth) along east-west oriented streets, so that rooflines parallel the street, as necessary to maximize southern exposure and gain, particularly for individual roof-mounted systems.

Building Orientation and Design. Buildings [building envelopes] shall, to the extent physically feasible given site constraints, be oriented and designed so that:

1. South walls face open yard areas, or other unobstructed open space, to maximize solar access and to avoid shadowing from other buildings, structures or vegetation at winter solstice (on or around December 21st).
2. Passive solar building features (e.g., glazing, overhangs, or direct gain systems) can be integrated into building layout and design.
3. Active solar collector systems (e.g., roof- or ground-mounted systems) can be integrated into site or building design.



Source: Cornell University Dept. of Architecture,
<http://courses.cit.cornell.edu/arch261/index.html>

Access Protection. Buildings, accessory structures and landscaping [building envelopes] shall be sited on subdivided lots in a manner that protects solar access to adjoining lots – i.e., that will not shade the south yard of an adjoining lot by more than 25% at any time of the year.

Landscaping. Subdivision landscaping plans shall incorporate energy-efficient, solar-friendly landscaping, to include wherever feasible:

1. The retention of existing vegetation and the use of evergreen trees to serve as wind breaks, particularly to the north or northwest of building sites – unless this has the effect of obstructing solar or wind access for an existing or proposed energy installation.
2. Deciduous trees to be located on the southern and western side of building lots [envelopes] to provide shade during summer months and solar access during winter months. Trees should be sited to avoid shading roof-mounted solar installations.
3. Deciduous street trees, planted at a maximum of 50-foot intervals.
4. Trees plantings around and within common or public parking areas that are sufficient to buffer prevailing winds, shade parking spaces during summer months, and reduce summer heat and glare.

Subdivision – Renewable Energy Installations

Applicants are encouraged [required] to integrate the siting of renewable energy facilities in subdivision layout and design, including net-metered wind and solar installations that meet the standards of this section. Incentives for the integration of renewable energy systems in subdivision design, and for energy efficient development, are available for Planned Unit Developments under Section ____ (Planned Unit Development).

Site Designation. Designated location(s) for planned renewable energy facilities shall be suitable for the intended facility and shown on the subdivision plat or plan submitted with the application. Sites for solar collector facilities shall be designated in accordance with applicable solar access standards under Section ____ (Solar Access).

Facility Siting. Proposed facility sites shall be consistent with Section ____ (Renewable Energy Facilities) [and "Municipal Renewable Energy Facility Guidelines" as most recently amended]. These include, but may not be limited to the following:

- No ground-mounted renewable energy system shall be sited within mapped floodways [special flood hazard areas], fluvial erosion hazard areas, wetlands, required surface water or wetland buffers, steep slopes, or other excluded locations under Section ____ (Renewable Energy Facilities) [or as identified and defined in the municipal plan].
- For roof-mounted systems, buildings at minimum shall be constructed to be "system-ready."
- Ground-mounted facilities shall meet minimum setback requirements for the district(s) in which they are located, and for the type of facility, unless reduced by the [AMP] under Section ____ (Access) of the zoning bylaw.
- Individual systems shall be sited on building lots [within designated building envelopes].
- A group net-metered system may be located in a common open space area designated on the subdivision plan [plat] for this purpose, as long as it occupies no more than [25 -50] percent of the subdivision's total designated open space area, and it results in no undue adverse impacts to conserved resources or designated uses under Section ____ (Open Space) of these regulations.
[Note: should be consisted with related open space requirements under the regulations.]

Certification. A copy of the Certificate(s) of Public Good issued by the Public Service Board for the facility must be filed with the municipality prior to facility installation.

Planned Unit Development– Purpose

As provided in state law (24 V.S.A. § 4417), the following regulations pertaining to planned unit developments are intended to encourage [require]:

... [to be added to your existing list]

- Compact pedestrian-oriented development, to promote a mix of residential and/or nonresidential uses, especially within walking distance (1/4 to 1/2 mile) of the downtown [village] center.
- Efficient use of public facilities and infrastructure.
- Encourage and preserve opportunities for energy efficient development [and the development of distributed renewable energy generation facilities to supply planned development.]

Planned Unit Development – Clustering

The DRB, at the request of the applicant, may modify or waive zoning district dimensional requirements to allow for the clustering of building lots or units in one or more areas of the subdivision [site] that are physically suited for higher density development, without increasing the allowed overall density of development, as necessary to:

1. Achieve a more -energy efficient, pedestrian-friendly pattern of development that minimizes the extent of new infrastructure required, and maximizes pedestrian and bicycle access and connections to individual lots or units within the subdivision [development], and to existing or planned sidewalk, recreation path or transit facilities within walking distance of the proposed subdivision [development].
2. Maximize access to renewable energy resources, including solar access under Section ____ (Solar Access)
3. Accommodate the installation of renewable energy systems, including group-net metered system under Section ____ (Renewable Energy Installations).

Planned Unit Development – Energy Density Bonus Incentive

The DRB may, at the request of the applicant, consider granting one or more density bonuses according to the following schedule for clustered development, under listed objectives, if the applicant clearly demonstrates that the developable portion of the parcel(s) and supporting roads, infrastructure, facilities and services can accommodate higher densities of development. Density bonuses, as applied in combination, shall not increase the overall density of development by more than [100 – 200% – *or even higher, to truly serve as an incentive*], based on the number of dwelling units for residential development or the maximum building coverage for nonresidential development.

1. **Renewable Energy Access or Development.** Density bonuses for development that promotes renewable energy development will be considered as follows:
 - a. **Solar Access.** A density bonus of [25% to 50%] may be considered for planned development in which [60%-80%] of the building lots or units are oriented to maximize solar access under Section ____ (Solar Access).
 - b. **Group Net-Metering.** A density bonus of up to [25%-50%] may be considered for planned development that incorporates [includes installation of] a group net-metered renewable energy facility (e.g., solar collectors, wind turbines) [that is designed to provide at least five percent of the average annual energy consumption of each unit within the development], subject to facility approval by the Vermont Public Service Board.
2. **Energy Efficient Building Design.** A density bonus of up to [25%-50%] may be considered for PUDs [or PRDs] that incorporate one or more of the following design elements, as certified by a qualified professional architect or engineer licensed by the state:
 - a. Energy efficient building design that exceeds minimum state energy efficiency requirements for residential and commercial buildings (e.g., LEED, Energy Star Homes, Vermont Builds Greener Program).
 - b. Residential development in which single family dwelling units do not exceed 1,500 square feet, and or two- and multi-family dwelling units do not exceed 1,200 square feet of habitable floor area.

Note: Planned development provisions – and density bonuses in particular – vary widely, based on development objectives and review procedures particular to each community. The language here is provided only as an example. It is not sufficient on its own for adoption, but needs to be adapted and tailored to conform to your existing or proposed planned unit development standards. For more assistance in this area, contact the Regional Planning Commission.

Energy-Related Planning Statutes

Vermont Planning & Development Act (24 V.S.A. Chapter 117)

§ 4302 Purpose; goals

(a) General purposes. It is the intent and purpose of this chapter to encourage the appropriate development of all lands in the state by the actions of its constituent municipalities and regions, with the aid and assistance of the state, ... to encourage the development of renewable energy resources; ...

(c) In addition, this chapter shall be used to further the following specific goals:

(4) To provide for safe, convenient, economic and energy efficient transportation systems ...

(7) To encourage the efficient use of energy and the development of renewable energy resources. [2003]

§ 4303 Definitions

....

(24) "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. [2003]

§ 4322 Planning commission; membership

...

If a municipality has an energy coordinator under subchapter 12 of chapter 33 of this title, the energy coordinator may be a nonvoting ex officio member of the planning commission.

§ 4325 Powers and duties of planning commissions

Any planning commission created under this chapter may:

...

(4) Undertake capacity studies and make recommendations on matters of land development ... the conservation of energy and the development of renewable energy resources...

§ 4345 Optional powers and duties of regional planning commissions

Any regional planning commission created under this chapter may:

(1) ... work with regulated utilities, the department of public service, the department of public safety, potential developers of distributed power facilities, adjoining regional planning commissions, interested adjoining regional entities from adjoining states, and citizens of the region to propose and evaluate

alternative sites for distributed power facilities that might provide uninterrupted local or regional power at least for identified critical service providers in time of extended national, statewide, or regional power disruption or other emergency.

...

(6) Undertake studies and make recommendations on land development, ... the conservation of energy and the development of renewable energy resources,

§ 4345a Duties of regional planning commissions

...

(5) Prepare a regional plan ...

...

(14) Appear before the public service board to aid the board in making determinations under 30 V.S.A. §248.

§ 4347 Purposes of a regional plan

A regional plan shall be made with the general purpose of guiding and accomplishing a coordinated, efficient and economic development of the region which will, in accordance with the present and future needs and resources, best promote the health, safety, order, convenience, prosperity and welfare of the inhabitants as well as efficiency and economy in the process of development. This general purpose includes, but is not limited to recommending a distribution of population and of the uses of the land for urbanization, trade, industry, habitation, recreation, agriculture, forestry and other uses as will tend to:

...

(3) promote an efficient and economic utilization of drainage, energy, sanitary and other facilities and resources;

(4) promote the conservation of the supply of food, water, energy and minerals;

(5) promote the production of food and fiber resources and the reasonable use of mineral, water, and renewable energy resources; ...

§ 4348a Elements of a regional plan

(a) A regional plan shall be consistent with the goals established in section 4302 of this title and shall include but need not be limited to the following:

...

(3) An energy element, which may include an analysis of energy resources, needs, scarcities, costs and problems within the region, a statement of policy on the conservation of energy and the development of renewable energy resources, and a statement of policy on patterns and densities of land use and control devices likely to result in conservation of energy;

...

(5) A utility and facility element, consisting of a map and statement of present and prospective local and regional community facilities and public utilities, whether publicly or privately owned, showing existing and proposed ... power generating plants and transmission lines, ..., and recommendations to meet future needs for those facilities, with indications of priority of need;

...

(7) A program for the implementation of the regional plan's objectives, including a recommended investment strategy for regional facilities and services based on a capacity study of the elements in this section;

(b) The various elements and statements shall be correlated with the land use element and with each other. ...

§ 4382 The plan for a municipality

(a) A plan for a municipality may be consistent with the goals established in section 4302 of this title and compatible with approved plans of other municipalities in the region and with the regional plan and shall include the following:

(1) A statement of objectives, policies and programs of the municipality to guide the future growth and development of land, public services and facilities, and to protect the environment;

(2) A land use plan, consisting of a map and statement of present and prospective land uses, indicating those areas proposed for ... public and semi-public uses and open spaces reserved for flood plain, wetland protection, or other conservation purposes; and setting forth the present and prospective location, amount, intensity and character of such land uses and the appropriate timing or sequence of land development activities in relation to the provision of necessary community facilities and service;

...

(4) A utility and facility plan, consisting of a map and statement of present and prospective community facilities and public utilities showing existing and proposed ... power generating plants and transmission lines, ..., and recommendations to meet future needs for community facilities and services, with indications of priority of need, costs and method of financing;

...

(7) A recommended program for the implementation of the objectives of the development plan;

...

(9) An energy plan, including 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, a statement of policy on patterns and densities of land use likely to result in conservation of energy;

Energy-Related Bylaw Statutes

Vermont Planning & Development Act (24 V.S.A. Chapter 117)

§ 4303 Definitions

(24) "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.

§ 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.

§ 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.

(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.

§ 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.

(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.

§ 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 ...

§ 4417 Planned unit development

(a) Any municipality adopting bylaws 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.

§ 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.

§ 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.