



GUIDANCE FOR MUNICIPAL ENHANCED ENERGY PLANNING STANDARDS

Vermont Department of Public Service

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Introduction

Thank you for your interest in enhanced energy planning. Act 174 of 2016 gives communities and regions this option as a way to give municipal and regional plans greater weight in the Section 248 process. The Vermont Department of Public Service (Department or DPS) is providing the following guidance for municipalities to understand best practices for writing enhanced energy plans that will meet the standards for achieving an affirmative determination of energy compliance. While participation in siting decisions may be one motivation for communities, the Department also hopes that the process of analyzing your municipality's energy consumption and generation will be interesting and helpful not only for participation in siting decisions but also in making your community more efficient and affordable.

This document provides guidance for municipalities preparing plans for submission to the Department¹, or their regional planning commission for a determination of energy compliance under Act 174 (a voluntary process). It provides instructions about how municipalities can meet the [determination standards](#), issued by the Department in November 2016. This is a companion guide to two other documents:

1. The [Municipal Determination Standards](#) –there are instructions in the standards which are not repeated here, so please read the standards before work begins to amend a plan.
2. Planners should also read the [Overview document](#) that was released with the standards. It provides useful context regarding the purpose of Act 174, enhanced energy planning, what substantial deference means, and other issues.

Though there are many details to work through, at its core, the process of enhanced energy planning consists of three major tasks:

- 1) Understanding your municipality's **current energy use and setting targets for the future** that are in alignment with state energy goals;
- 2) Deciding **how to reach the targets** through “pathways,” or implementation actions; and
- 3) Preparing **maps** to help guide renewable energy development in the municipality or region.

This document is a step-by-step guide that provides methods, data sources, possible pathways, and guidance on how to meet the standards. It is organized, as the standards are, into three main sections: 1) analysis and targets; 2) pathways and implementation actions; and 3) mapping.

It is our sincere hope that this enhanced energy planning process is a productive and informative process for municipalities, and remember – there are resources available to help you succeed. Please do not hesitate to contact Department staff or your regional planning commission with questions and clarifications. The Department looks forward to engaging in a dialogue with planners as they move forward.

¹ Municipalities may also submit their plans directly to the Department for a determination, until July 1, 2018, if their region's plan has not yet received its own affirmative determination from the Department.

Section 1: Analysis and Targets

As noted in the determination standards themselves, regional planning commissions are developing analyses and targets under contract with the Department, and these are expected to satisfy the *Analysis and Targets* standards. Additionally, regions are tasked with breaking out their analyses and targets for their municipalities. Municipalities will be provided with analyses and targets derived from regional figures no later than April 30, 2017.

A municipality seeking a determination of energy compliance from the Department may either use the analyses and targets developed by their regional planning commission or develop their own analyses and targets. **Municipalities that use their region's analyses and targets will meet the municipal *Analysis and Targets* determination standards.** Municipalities that choose not to use their region's analysis and targets will need to meet the same set of *Analysis and Targets* standards as the regions, per the regional guidance and expectations outlined in that document. For municipalities interested in developing their own analyses and targets, the regional guidance document is available [here](#).

The process of analysis and target setting is intended to provide planners with an overview of current energy use in the transportation, heating, and electric sectors, and with a sense of the trajectories and pace of change needed, which can be translated into concrete actions in the *Pathways* section below. Targets provide regions and municipalities with milestones along the way toward a path of meeting 90% of their total energy needs with renewable energy. Targets for generation can be compared with the potential generation from areas identified as potentially suitable in the *Mapping* standards exercise below to give communities² a sense of their ability to accommodate renewable energy that would meet their needs.

Section 2: Pathways (Implementation Actions)

Pathways (or implementation actions) are steps that communities need to take to reach the targets they established in Section 1. Municipalities will have varying needs and abilities in this area, which means they can select different combinations of actions to reach those targets. For example, more compact municipalities, where buildings are closer together, may focus more on improving bike and pedestrian infrastructure in order to meet transportation targets; whereas small rural municipalities may focus more on electrification of the vehicle fleet. Below are many ideas about what municipalities can do to implement their plans and achieve targets established for efficiency, transportation, compact land use, and renewable generation. Municipalities can select ideas that fit, and come up with their own; though all plans seeking determination need to meet the standards, the actions below are not required steps that all plans must include. This section will be further improved after the Department has compiled best practices from municipalities that have received a determination of energy compliance.

Municipalities must demonstrate a commitment to achieving each standard by adopting both policies and implementation pathways that contain clear, action-oriented language.

Pathways Standard 6

Does your plan's energy element contain a statement of policy on the conservation and efficient use of energy?

6A. Does the plan encourage conservation by individuals and organizations?

While municipalities cannot control the use of energy by individuals and organizations, they can serve as a resource, lead by example, and encourage individuals and organizations to conserve and use energy efficiently. Through the Energy Efficiency Utilities, there are many programs and incentives available to reduce energy use. Municipalities should identify and promote the resources available to individuals, businesses, and organizations. Examples of programs and resources that could be incorporated into plans include:

- Coordinate with and promote Energy Efficiency Utility (EEU) programs and the state Weatherization Assistance Program for low-income households and encourage residents to participate.
- Co-sponsor and organize weatherization workshops for homes and businesses with EEUs.
- Identify available electric, natural gas, and deliverable fuel (oil, propane) Energy Efficiency Utility program resources and make web links available on municipal websites.
 - Electric EEU – Efficiency Vermont (statewide) and City of Burlington Electric Department (funded through the electric energy efficiency charge)
 - Natural Gas EEU – Vermont Gas Systems (funded through the natural gas energy efficiency charge)
 - Unregulated Fuels – Thermal Energy and Process Fuel programs
- Work with partner organizations and EEUs to offer workshops and educational opportunities to businesses on efficiency in new construction, retrofits, and conservation practices.
- Identify large energy usage customers (including large businesses, manufacturing facilities, and schools) as a target audience and encourage participation in commercial and industrial EEU programs.
- Facilitate a workshop and/or conduct building walk-throughs for owners of rental housing (including farm labor housing) to encourage implementation of energy efficiency.
- Encourage residents to hire Efficiency Excellence Network (EEN) contractors when completing energy efficiency projects by including links to the EEN on municipal websites³.
- Municipalities: form or continue to support a local energy committee or coordinator.
- Facilitate strategic tree planting to maximize energy benefits.⁴

6B. Does the plan promote efficient buildings?

Thermal energy use, or heat, in buildings accounts for approximately 30% of all energy consumed by Vermont's end users and is the second largest contributor to greenhouse gas emissions. This energy is largely provided by burning fossil fuels. However, biomass and bioheat provide a small portion of Vermont's thermal energy use. The residential sector accounts for 60% of Vermont's thermal fuel consumption, commercial 29%, and industrial 11%.

In addition to reducing greenhouse gas emissions, weatherization and fuel switching can save Vermonters money and create local jobs. The state has established an ambitious goal of making 20% of homes – or 80,000 units – efficient by 2020. Municipalities can play a vital role in helping to achieve this

³ Information about EEN is here: <https://www.encyvermont.com/tips-tools/questions-answers/what-is-een>

⁴ Information on Arbor Day Foundation's Energy-Saving Trees program is available at <http://arbordayest.org/>

goal as well as encouraging efficiency in commercial and industrial buildings. Specific actions are included below.

- Promote the use of Vermont’s residential building energy label/score.
- Promote the use of the residential and commercial building energy standards by distributing code information to permit applicants and ensuring code compliance⁵.
- Promote benchmarking (using the free EPA Portfolio Manager tool and/or with assistance from the EEU’s) for commercial buildings.
- Include policies that promote or require residential Act 250 projects to follow the residential stretch energy code.
- Include policies that require commercial Act 250 projects to follow commercial stretch energy guidelines.
- Promote the construction of net-zero ready buildings by including a discussion of such buildings in the plan and identifying educational opportunities as an implementation action.
- (Municipalities Only) Provide energy code and energy efficiency program information when residents apply for municipal land use permits that include alterations or construction of a building.
- (Municipalities Only) Require that energy code certificates be submitted to the town for all new building construction as well as for existing buildings (additions, alterations, renovations and repairs).

Stretch Energy Codes

Vermont has Residential Building Energy Standards (RBES) and Commercial Building Energy Standards (CBES). Stretch energy codes are those that achieve greater energy savings than the base codes (RBES and CBES) by include more stringent air leakage, and insulation requirements, for example.

The residential stretch energy code applies to all Act 250 projects and can be adopted by municipalities.

The commercial stretch energy guidelines are used by the Natural Resources Board for commercial Act 250 projects.

- (Municipalities Only) Review and consider adoption of the state’s stretch energy code as the baseline energy code.
 - (Municipalities Only) Provide incentives (e.g. density bonuses) to developments located in an area identified as appropriate for growth that exceed the state’s stretch energy code.
 - Promote the use of landscaping for energy efficiency.

6C. Does the plan promote decreased use of fossil fuels for heating?

Thermal energy use accounts for approximately 30% of all energy consumed by Vermont’s end users, is primarily fossil-fuel based (oil, kerosene, natural gas, and propane), and is the second-largest contributor to greenhouse gas emissions. Municipalities should promote actions that decrease the use of fossil fuels for heating and increase the use of electricity and alternative fuels to provide more efficient space heating and cooling and reduce carbon dioxide emissions. Increased efficiency will save individuals and

⁵ Residential standards available at http://publicservice.vermont.gov/energy_efficiency/rbes. Commercial standards available at http://publicservice.vermont.gov/energy_efficiency/cbes.

organizations money on their heating and cooling bills. A variety of possible actions are discussed below and are divided into the type of fuel or system. Municipalities should not feel constrained by the list below. Different municipalities will find these various strategies more or less achievable.



Indoor piece of heat pump unit



Heat Pumps:

- Promote the use of cold climate heat pumps with education/presentations in coordination with the EEU's/electric utilities.
- Support the use of ground-source heat pump heating and cooling systems for new construction.
- (Municipalities Only) Identify municipal buildings that would be good candidates for cold climate heat pumps and develop a plan and schedule to add the heat pumps to those buildings.

Energy Transformation In the Renewable Energy Standard

- The Renewable Energy Standard requires utilities to help reduce customer fossil fuel use through “energy transformation projects” such as weatherization, and incentives for heat pumps and electric vehicles. Municipalities should coordinate with their utilities to deliver these services in the most effective way, particularly for municipal-owned utilities.

Outdoor piece of heat pump unit

District Wood Heating

- Identify potential locations for wood-fired district heating⁶. For example, locations with a high concentration of buildings (two or more buildings) with space for a central heat plant and/or where there is a large building that could be an anchor for an district heating system that also supplies heat to neighboring buildings.
- Identify managed forest lands closest to the identified potential district heat locations that could supply wood chips to the project.⁷
- Identify town businesses that make, sell, and/or transport wood chips and/or wood pellets that could be used in a district heat system.



*Montpelier District Heating Plant
Photo Credit: Gary Hall*

Wood Heating for Individual Homes and Businesses

- Encourage, promote, and incentivize advanced wood heating⁸ by: supporting the conversion of existing fossil fuel heating systems to wood; encouraging local manufacturing of advanced wood heat technology; supporting development of wood fuel delivery infrastructure; supporting development of sustainable forestry and procurement services; expanding wood fuel processing facilities, encouraging bulk wood pellet delivery systems; and providing training and education on the benefits of heating with efficient, clean wood energy systems.
- Promote wood stove change-out programs that take older non-EPA certified stoves out of service and replace them with more efficient and lower emitting cord and pellet stoves.
- Encourage new construction to install advanced wood heating equipment.
- Participate in education campaigns to provide best practices on cordwood and wood pellet selection, storage, and combustion to promote the most efficient, clean, and cost-effective use of wood heating technology while protecting human and environmental health.
- Identify any businesses that have a year-round need for process heat. Encourage these businesses to look into wood fired-fired combined heat and power

⁶ District heating is a system for distributing heat generated in a centralized location for two or more homes and/or buildings' heating requirements.

⁷ Biomass availability should consider the following:

1. Forestland by ownership type (federal, state, municipal, farm, corporate, and other private (parcels 1-50 acres vs. 50+ acres)
2. Accessible forestland removed from harvesting due to physical constraints such as slope, elevation, wetlands, stream buffers, etc.

⁸ Advanced wood heating denotes wood heating that: 1) utilizes highly efficient combustion technology, 2) produces low levels of emissions, 3) supports healthy forest ecosystems, and 4) consumes local wood.

- (Municipalities Only) Identify municipal buildings that would be good candidates for wood pellet or chip heating and develop a plan and schedule to convert those buildings to wood heat.

Bioogas: Farm, Non-Farm, and Landfill Methane

- Municipalities that are remodeling their waste treatment facilities should consider including anaerobic digestion with methane capture as part of their treatment systems.
- Vermont Gas is planning to launch a new voluntary green pricing program for Renewable Natural Gas (RNG)⁹. Promote the enrollment in the program among large users in your municipality, for example at food-processing facilities.
- Municipalities should encourage the development of the biomethane sector by supporting proposals for appropriately sited, cost-effective biomethane production facilities and related infrastructure.
- Identify potential producers of food and farm waste (farms, food processors, restaurants/schools/institutions with food waste) that could potentially host a farm or food waste digester.

6D. Does the plan demonstrate the municipality’s leadership by example with respect to the efficiency of municipal buildings?

Municipalities should lead by example and demonstrate to individuals and organizations the benefits of building efficiency. Support for municipalities wishing to improve the efficiency of their own buildings is available through Efficiency Vermont (except in Burlington, where the Burlington Electric Department provides efficiency services)¹⁰. Municipalities leading by example can consider the actions identified below.

Implement Energy Efficiency in Municipal Buildings

- Conduct a baseline energy study of how much energy municipal buildings (including schools) use.
- Conduct building energy audits of municipal structures.
- Assess the life cycle costs of potential energy improvements during design and construction planning. For example, investment in a new, efficient heating system may be more expensive up front, but more economical to operate over time¹¹.
- Incorporate weatherization/energy efficiency projects into the municipal Capital Budget and Program.
- Implement weatherization/energy efficiency projects in municipal buildings.
- Enroll municipal buildings into energy certification programs.
- Develop policies for evaluating investments in infrastructure that consider energy efficiency, for example making purchasing decisions with life cycle analysis and building operation guidelines in mind.

⁹ More information on RNG and Vermont Gas is available at <https://vermontgas.com/innovation/renewable-natural-gas/>.

¹⁰ For support in assessments, financing, rebates, and education, visit <https://www.encyvermont.com/services>.

¹¹ The National Institute of Standards and Technologies’ Building Life Cycle Cost Program offers free calculation tools to help analyze potential capital investments in buildings.

- Implement low-impact development and/or green infrastructure practices/strategic landscaping to shade buildings and reduce temperatures, thereby increasing overall efficiency.
- Develop policies so that if investing in new municipal buildings, municipalities strongly consider locations that will give people the option to get to those buildings without driving – for example, by putting a new town hall near the post office or school or other village/downtown location instead of distant from the town center.

Increase the Use of Renewable Sources for Heating in Municipal Buildings

- Municipalities should continue to replace older fossil-fired heating systems with high-efficiency, cold-climate heat pumps, geothermal heat, or advanced wood heating systems (including wood-fired district heat). They should survey municipally owned buildings and target the largest fossil fuel-consuming locations, and locations that use the most fossil fuel per square foot, and should prepare life-cycle cost-benefit analysis studies that consider the cost of replacement relative to energy savings and environmental benefits. The age and useful life of the existing heating systems should also be weighted when determining which projects to undertake first.

6E. Other

Please use the notes section to describe additional approaches that your municipality is taking.

If your municipality is implementing additional approaches that meet the intent of Standard 6, but are not covered under 6A-D, please describe them further in the notes section.

Pathways Standard 7 - Transportation

Does your plan’s energy element contain a statement of policy on reducing transportation energy demand and single-occupancy vehicle use, and encouraging use of renewable or lower-emission energy sources for transportation?

Transportation fuels account for the largest portion of energy use in the state and are the largest contributor to the state’s total greenhouse gas emissions, at 47%. Transportation is simultaneously a tremendous challenge and a tremendous opportunity.

The state has established ambitious goals including reducing single-occupancy vehicle trips, increasing bicycle and pedestrian trips, increasing the number of park-and-ride spaces, and increasing the use of rail for freight. Making significant progress on these goals will be critical for reducing transportation energy usage and increasing renewables in Vermont.

In addition to these goals, municipalities will have articulated their own goals and targets through the analysis and target-setting process described above (either by incorporating the analyses and targets developed by their regional planning commission or by developing their own). Local planners have powerful tools at their disposal to reduce the need for transportation and to plan for adequate infrastructure for options such as public transit, carpooling, biking, and walking. These strategies should be combined with aiding Vermonters’ switch to renewable fuels, particularly electricity and biodiesel. (Developing strategies for creating compact, mixed-use development centers – which is closely tied to the need for transportation – is discussed in more detail in Pathways Standard 8, below.)

Transportation planning has long been a part of local and regional planning, so it is very likely that much of local planning work already touches on the areas of public transit, transportation choices like walking or biking, and fuel switching. When submitting your plan, please list the page numbers where these items appear even if they are in the transportation rather than the energy section.

7A. Does the plan encourage increased use of public transit?

Public transit includes bus routes, car and van pools, school bus routes, and services for elderly and disabled people. Maximizing ridership should be a major priority for towns. The following strategies are ways that municipalities may meet this standard. Municipalities need not include every one of these elements to meet the standard, but should select those elements more applicable to their needs.

- Present an overview of public transit available in your municipality including information about regional transit providers and the major routes they offer.
- Identify challenges and opportunities for public transit, particularly focusing on a review of routes and route schedules to ensure that they are addressing needs of the community.
- Provide an assessment of potential ridership in rural and urban or village areas, access to maintenance facilities, cross-regional coordination between schedules, and marketing.
- Assess the need for inter-city routes (similar to offerings of Greyhound) connecting the municipality or region with other metropolitan areas.
- Present strategies that respond to needs and opportunities identified in the analysis, such as:
 - Maximize ridership for public school busses and minimize use of private vehicles for student transport.
 - Work with public transit providers in your region to promote full utilization of existing routes and where necessary, identify and develop new public transit routes.
 - Integrate park and rides with transit routes.
 - Plan and advocate for access to public transit, especially during for Act 250 proceedings for larger developments.

7B. Does the plan promote a shift away from single-occupancy vehicle trips through strategies appropriate to the municipality?

The rural character of Vermont presents unique challenges to creating alternatives for single occupancy vehicles. While public transit can meet the needs of some commuters, municipalities that work to provide and coordinate a range of options and alternatives to single occupancy vehicles will be most successful in cutting emissions in the transportation sector. Again, municipalities need not include every one of these elements to meet this standard, but should select those elements more applicable to their needs. For example, very small municipalities which are far from rail need not consider rail, but should consider bus or public transit connections to passenger rail outside the region.

- Provide an assessment of the number of park-and-ride spaces in your municipality, and explore opportunities to expand the number of spaces and provide greater connectivity between public transit and park-and-ride locations.
- Identify any structural barriers to telecommuting such as internet connectivity and speed.

- Assess current rail connectivity and whether there are opportunities to provide connections to rail or rail service expansion.
- Promote the [Go Vermont webpage](#), which provides ride share, vanpool, public transit, and park-and-ride options.
- Support employer programs to encourage telecommuting, carpooling, vanpooling, walking, and biking for employees' commute trips. Encourage employers to offer such programs and provide information on tax benefits that may be available for doing so.
- Municipalities should seek to provide employees with the necessary equipment and training to facilitate conference calls, webinars, and other virtual meetings and information sharing.
- Municipalities should consider installing Automatic Vehicle Location (AVL) equipment in school buses, plows and other vehicles, to reduce idling and mileage across their own vehicles.
- Educational initiatives or grants related to any of the above strategies.

7C. Does the plan promote a shift away from gas/diesel vehicles to electric or other non-fossil fuel transportation options through strategies appropriate to the municipality?

To meet state energy goals, municipalities must both reduce the number of vehicle-miles-traveled (through the strategies discussed above), and switch to renewable, non-fossil-fuel transportation options. The state has adopted specific goals for getting more electric vehicles (EVs) on Vermont's roads. Agencies are working to promote electric vehicles (EVs) and related infrastructure, and alternative fuels such as biofuel. For EVs, major barriers to adoption by consumers include a lack of awareness, the need for charging infrastructure, and the need to make vehicles more available through dealers. Regional and municipal planners have unique tools to address these barriers because of their ability to lead by example, connect with local employers and vehicle dealers, and identify prime locations for charging stations.

For alternative fuels, particularly biodiesel, municipalities can promote their use through consumer education and through encouraging local fueling stations to offer biofuel blends. Municipalities should consider any of the following pathways that are relevant to them.

Promoting Consumer Awareness of the Benefits of and Access to EVs and Alternative-Fuel Vehicles

- Work with local employers and nonprofit partners such as the Vermont Energy and Climate Action Network and Vermont League of Cities and Towns to encourage broader implementation of EV incentives, such as free or reduced parking costs for EV and fuel-efficient vehicle owners and preferential access to parking spaces limited in supply.
- Promote the [Drive Electric Vermont webpage](#), which connects users to financial incentives, dealers, and recharging stations for EVs.
- Contact local vehicle dealers to encourage them to offer EV and fuel-efficient vehicles by both sale and lease. Encourage local media and chambers of commerce to provide positive visibility for supplying EVs.
- Partner with Drive Electric Vermont, nonprofit organizations, vehicle dealers, and/or state agencies to organize high-visibility events where people can see and test drive EVs, such as county fairs, energy fairs, and summer festivals. Events should also leverage local newspaper and public access coverage to showcase local residents and organizations that are helping to propel the transition to EVs.

- Municipalities should lead by example by replacing some of their publicly owned vehicles with plug-in hybrid or plug-in all-electric vehicles, which often have a lower “total cost of ownership” than conventional vehicles..
- Encourage major employers in your municipality that operate private fleets (for example garbage collection, public transit, colleges and universities, or milk transportation) to switch some of their vehicles to electric or biodiesel-fueled vehicles. Help build awareness of related grant opportunities.
- Host a “show and tell” day featuring different kinds of EVs and giving people interested in purchasing them an opportunity to talk with fellow community members who own them.

Deploying EV Infrastructure at Workplaces and Key Public Locations

- Assess current access to public and workplace charging (to the extent known) in your municipality and identify strategic locations in busy areas (large employers or areas of high visitation in downtowns) where charging stations should be added or expanded.
- Municipalities should partner with Drive Electric Vermont, the Vermont Clean Cities Coalition, and other organizations to promote the expansion of workplace charging, in particular by continuing funding for incentives that help employers cover the costs of installing charging stations.
- Municipalities should provide charging stations at prominent publicly owned locations such as municipal or school parking lots. Municipalities may develop their own charging stations, or work with private companies, such as ChargePoint, Green Mountain Power’s EVgo program, SemaCharge or Greenlots, to develop stations at public facilities. Make charging stations accessible to the public where possible.
- Promote existing EV charging infrastructure in town, for example by including a map on the municipal website.
- Municipalities should encourage the electric utility operating in their service area to invest in charging infrastructure and to build awareness of charging opportunities as part of their strategy for complying with the state’s Renewable Energy Portfolio Standard
- Municipalities should promote and seek grants to fund the installation of DC fast-charging infrastructure at strategic locations along major travel corridors and in transit hubs such as park-and-ride locations.
- Plan, advocate for, and consider requiring the installation of Electric Vehicle charging infrastructure as part of new or redevelopment, especially for developments subject to Act 250.

Biodiesel and Renewable Natural Gas

- Municipalities that purchase diesel fuel (for example, for use in school buses and snow plows) should use the highest biodiesel blend available without compromising the manufacturer’s engine warranty. All manufacturers fully warranty their engines with the use of B5, a blend of 5% biodiesel and 95% diesel.
- Support the development of additional refueling stations for alternative fuels for both private and public transportation fleets by sharing station development costs between public and private interests.
- Work with the Clean Cities Coalition to encourage large fleets to switch to natural gas use where biodiesel is impractical, in areas of the state where natural gas is available. Encourage the use of renewable natural gas through Vermont Gas’s forthcoming renewable natural gas green pricing program.

- Public and private stakeholders should continue to develop a sustainable biofuels industry in Vermont to enable the production and use of biofuels for transportation, agricultural, and thermal applications.

7D. Does the plan facilitate the development of walking and biking infrastructure through strategies appropriate to the municipality?

Active transportation (biking and walking) offers significant health benefits and requires no outside energy resources. Many short trips that currently require a vehicle could be completed by walking or biking. Research has shown that people walk and bicycle more often when safe and convenient infrastructure, such as bicycle lanes, safe crossings, pedestrian paths, and sidewalks are available (“complete streets”). When transportation projects are proposed the needs of pedestrians, bicyclists, and users of all ages and abilities should be evaluated as part of project planning. As implementers of transportation projects, municipalities are uniquely positioned to put “complete streets” concepts into effect. However, there is much more education and training needed at both the state and local level to ensure that the complete streets concept is well implemented.

- Update municipal road standards (for maintenance and new construction) to reflect complete streets principles.
- Municipalities should identify key areas where improvements to bike and pedestrian access would be beneficial (in downtown and suburban areas for example) and work to improve access and infrastructure in those areas. They should also focus on closing gaps in the transportation network, for example by providing corridors between important school and work destinations and nearby housing or between schools/colleges and downtowns or village centers.
- Municipalities should apply for state grants including the VTrans Local Projects section grants and Vermont Department of Health grants for active transportation projects including bike and pedestrian infrastructure, improved signage, bike racks, and crosswalk improvements.

7E. Does the plan demonstrate the municipality’s leadership by example with respect to the efficiency of municipal transportation?

Municipalities should lead by example and demonstrate to individuals and organizations the benefits of energy efficiency in transportation. This could be accomplished through some of the actions listed above, and those below.

- Allowing certain employees to telecommute through municipal policies.
- Installing electric vehicle charging infrastructure on municipal properties.
- Purchasing plug-in hybrid or plug-in all-electric municipal and fleet vehicles when possible, and choosing the most fuel-efficient models if EVs are not practicable.
- Establishing minimum fuel efficiency standards for the purchase of new vehicles.
- Provide incentives for employees who commute using methods alternative to single occupancy vehicles, e.g. walking, biking, public-transit, and carpooling.

7F. Other

Please use the notes section to describe additional approaches that your municipality is taking.

If your municipality is implementing additional approaches that meet the intent of Standard 7, but are not covered under 7A-E, please describe them further in the notes section.

Pathways Standard 8

Does your plan's energy element contain a statement of policy on patterns and densities of land use likely to result in conservation of energy?

Vermont has a long-standing goal of maintaining the historic settlement pattern of compact village and urban centers surrounded by rural countryside. Although this standard is aimed at promoting the efficient use of energy in heating, transportation, and shared infrastructure, compact development has a number of other benefits, including reduced development pressures on agricultural lands, continued productivity of forests, preserved habitat areas, increased housing options, the preservation of historic buildings, a strong Vermont brand, economic efficiency, and more physically active and healthy communities. With these benefits in mind, there are several ways in which density is promoted through existing statute and state, regional, and local programs and policies. This standard is intended to work in concert with those existing structures which include, but are not limited to the following:

- Municipal and regional planning in accordance with 24 V.S.A. § 4302(c)(1)
- Adoption of municipal zoning bylaws in accordance with 24 V.S.A. § 4411
- State designation of centers in accordance with 24 V.S.A. Chapter 76A. The Vermont Agency of Commerce and Community Development's Designation Program administers the Downtown, Village Center, New Town Center, Neighborhood Development Area, and Growth Center designations.
- Municipal and regional participation in Act 250, specifically with respect to Criteria 10 and 9L

The Department anticipates that if municipalities are actively participating in these statutory frameworks (community planning) and programs, they will likely meet this standard without any additional changes to their plans. However, planners should provide the Department with a description of what they are doing in this area, and page references to their plan where these concepts are implemented.

8A. Does the plan include land use policies (and descriptions of current and future land use categories) that demonstrate a commitment to reducing sprawl and minimizing low-density development?

The reduction of sprawl and low-density development not only reduces energy consumption but also can improve the local and regional economy. Municipalities should clearly identify in their plans and future land use maps those areas where growth and development are encouraged. These areas should not extend significantly beyond existing walkable settlements.

- Prepare a physical plan for infill and new development in locations where growth is encouraged to show the desired pattern and character of development, networks of streets and passageways, and any proposed public parks and buildings.
- Adopt regulatory tools to support walkable development including access management, design review, required multiple stories in downtowns, eliminate or reduce parking requirements, requiring parking to be located on the side or back of buildings, or limiting building sizes along

highways which can facilitate walkable connections between buildings and to existing settlements.

- Adopt local policies and ordinances to limit water and sewer services to those areas of town where additional development will not contribute to sprawl.
- Prepare a plan for improving pedestrian and bike connections.
- Implement the local bike/pedestrian plan through ongoing investments structured through a capital budget and program.
- Update local bylaws to require that new development include pedestrian and bike-friendly infrastructure and connect to the existing and planned pedestrian and bike networks.
- Review and update zoning and development regulations to reflect the vision and goals of the municipal plan.
- Promote a working landscape outside of designated growth and residential areas, e.g. by working with land trusts and landowners of farm and forest tracts to conserve key parcels of land.
- Promote low-impact development and green infrastructure practices to reduce local temperatures and shade building surfaces.

8B. Does the plan strongly prioritize development in compact, mixed-use centers when physically feasible and appropriate to the use of the development, or identify steps to make such compact development more feasible?

The power to direct development to village and urban centers rests almost entirely with towns and regions through local planning and regulation, state and local investments and incentives, and Act 250 regulation. There are many well-documented strategies that municipalities can employ to realize this goal.

Households within a compact, mixed-use center typically use less energy than those located in outlying areas. The energy savings are realized through reduced vehicle-miles-traveled and generally smaller homes, which require less energy to heat and cool. Transportation energy use can be further reduced by locating services such as shopping or daycare within walking or biking distances to the places that people work and live. This enables people to either choose an alternative to driving a single-occupancy vehicle or to significantly reduce the length of their drive.

- Adopt a capital budget and program based on long-term public facility needs to ensure the infrastructure necessary for compact development, e.g. sewer and water, pedestrian and biking facilities, parking, etc., envisioned in the municipal plan is provided in an orderly way.
- Identify a compact center in the municipal plan and contact the Department of Housing and Community Development for assistance in applying for state designation. Explore water and sewer options to enable compact development in villages that where the lack public facilities limits revitalization and growth.
- Tourism-based municipalities where transportation energy use is due to travel to the community from elsewhere should discuss options to reduce energy from transportation that are specific to them. For example, expanding rail or mass-transit access, installing EV charging, and promoting car-sharing.

8C. Other

Please use the notes section to describe additional approaches that your municipality is taking.

If your municipality is implementing additional approaches that meet the intent of Standard 8, but are not covered under 8A-B, please describe them further in the notes section.

Pathways Standard 9

Does your plan's energy element contain a statement of policy on the development and siting of renewable energy resources?

The following standards are interrelated with the mapping exercise under standards 10-14 below. It will be helpful to read through and complete the mapping exercise first, even if you are obtaining and using maps from your regional planning commission.

9A. Does the plan evaluate (estimates of or actual) generation from existing renewable energy generation in the municipality?

Regional planning commissions will be providing this information to their municipalities.

As background, this standard, and Mapping Standard 11, requires presentation of information on existing renewable generators in the municipality (this information will be provided to municipalities by regional planning commissions, but is also available from the Department's spreadsheet of generators that have received permits as well as from the [Vermont Energy Atlas](#), which allows for searching of generator information by size, type, and location, all of which can be exported to spreadsheets that can then be used to sort and summarize generator information). These sources will provide estimates of permitted (as a proxy for installed) capacity, but further calculations will need to be made to understand potential production from those generators. Larger generators (> 500 kW) are likely to have provided actual production information to the Department, which can be provided upon request.

Capacity Factors

Given that renewable energy generation facilities do not produce power at 100% of their installed capacity (the sun doesn't shine 24 hours a day), a "capacity factor" must be applied to approximate the actual power output of the facility.

Capacity factors are a ratio of the facility's actual power output over time to the full potential of the facility over the same time were it possible to operate at the installed capacity.

Solar	MWh of energy = (number of MW) * (8760 hours per year) * (0.14 capacity factor)
Wind	MWh of energy = (number of MW) * (8760 hours per year) * (0.35 capacity factor)
Hydro	MWh of energy = (number of MW) * (8760 hours per year) * (0.40 capacity factor)

The generator data through September 2016 has been provided to the regional planning commissions, which can further break it out for their municipalities. Municipalities should include information in their

plans on installed renewable generation capacity, along with estimates of, or actual production from, these generators.

9B. Does the plan analyze generation potential, through the mapping exercise (see Mapping standards, below), to determine potential from preferred and potentially suitable areas in the municipality?

Regional planning commissions will be providing this information to their municipalities.

As background, the mapping exercise in Section 3 will help planners to estimate the potential for renewable generation from different sources.

Solar: Planners should begin by estimating the generation potential from rooftop solar. One methodology for estimating rooftop potential is to multiply the number of residential and commercial structures that could host a roof-mounted solar system by an average system size for each type of structure. In Bennington County, for example, the following methodology was used:

Type of structure	# of structures suitable for rooftop solar	Average size of rooftop system	Total capacity
Residential	3,500 (25% of total)	4 kW	14 MW
Small Commercial (<40K sf)	500 (25% of total)	20 kW	10 MW
Large Commercial (>40K sf)	50 (50% of total)	200 kW	10 MW

The number of structures with solar-compatible rooftops will vary based upon the physical characteristics of the rooftops (age, roof pitch and direction, structural issues, shading) as well as ownership considerations. Note that the [2015 Vermont Commercial Stretch Building Energy Standards](#) when applied in Act 250 require the incorporation of renewable energy (primarily rooftop solar) for commercial buildings with a footprint > 20,000 square feet. A more detailed discussion of considerations, as well as updated potential estimates by state, is available [here](http://www.nrel.gov/docs/fy16osti/65298.pdf): <http://www.nrel.gov/docs/fy16osti/65298.pdf>.

For ground-mounted solar, municipalities should estimate the amount of solar that could be developed in their preferred and potentially suitable areas. One methodology for estimating ground-mounted solar potential is to divide the number of acres available in these types of locations (from the Mapping exercise in Section 3) by the amount of acreage required for a solar facility (8 acres per MW). Once you have that figure, you can multiply it by the number of hours in the year and the capacity factor of solar in Vermont to estimate the amount of production from solar in these areas, as follows:

Ground-mounted solar potential	
Capacity (megawatts, or MW)	= acres available in preferred and potentially suitable areas / 8 acres per MW of solar
Generation (megawatt-hours, or MWh)	=MW of solar potential capacity from above x 8760 hours per year x 0.14 solar capacity factor

Wind: The area occupied by a wind project depends upon its scale. Projects involving single residential- or commercial-scale turbines may only directly impact the ground under the area of the foundation, particularly if access roads are not required. These projects are generally located on-site at homes, farms, businesses, and institutions, so the land area required is often just correlated to the size of the parcel on which they are sited.

Utility-scale [projects involving multiple large wind turbines generally requires 0.75-4 acres per MW](#) of direct impact area (temporarily and permanently disturbed area due to physical infrastructure development), or 14-75 acres of total area (land associated with the complete wind project).

One way of estimating wind potential is to divide the number of acres identified in preferred and potentially suitable locations for wind (from the Mapping exercise in Section 3) by the amount of acreage required to site a wind facility (4 acres per MW of direct impact area). Once you have that figure, you can multiply it by the number of hours in the year and the capacity factor of wind in Vermont to estimate the amount of production from wind in these areas, as follows:

Wind potential	
Capacity (megawatts, or MW)	= acres available in preferred and potentially suitable areas / 4 acres per MW of wind
Generation (megawatt-hours, or MWh)	=MW of wind potential capacity from above x 8760 hours per year x 0.35 wind capacity factor

Wind potential is also very site-specific, so other approaches for estimating wind potential may be suitable, depending on municipal preferences.

Hydro: For hydropower, identify existing, non-powered dam sites where a generator could be installed – or existing hydropower sites where equipment could be upgraded or expanded to provide additional generation – and the potential nameplate capacity and potential production¹². In performing this exercise, it is important to gain a familiarity with the relative time and expense involved with permitting hydropower projects, which are reviewed at the federal level.¹³

Biomass and Methane: Production estimates for biomass combined heat and power¹⁴, biomass district heat, and methane generators will be extremely site specific. Rather than estimate production potential from these resources, it may be most useful for planners to identify potential sites (large institutional users of heat, clusters of buildings that could be connected by steam or hot water pipes, medium and large farm operations, food waste processors and large sources of institutional food waste, landfills, and

¹² The Undeveloped Hydroelectric Potential of Vermont, Appendix A, and Potential Sites: Lori Barg, Community Hydro, 2008; see also The Development of Small Hydroelectric Projects in Vermont: VT Agency of Natural Resources

¹³ Act 165 Report: A Report to the Vermont General Assembly on Progress Toward an MOU Program for Expediting Development of Small and Micro Hydroelectric Projects: VT Department of Public Service (2014)

¹⁴ New electric generation from wood should include combined heat and power technology to maximize efficiency. Electric-led wood generation should be avoided.

wastewater treatment plants) and discuss the relative availability of such feed stocks/sites in the municipality.

9C. Does the plan identify sufficient land in the municipality for renewable energy development to reasonably reach 2050 targets for renewable electric generation, based on population and energy resource potential (from potential resources identified in the Mapping exercise, below), accounting for the fact that land may not be available due to private property constraints, site-specific constraints, or grid-related constraints?

If N/A, please describe how you are working with your regional planning commission to ensure overall regional objectives are achieved.

In order for Vermont to reach its long-term energy targets, it will need a variety of generation resources including wind, solar, hydro, and biomass (either imported or domestically produced). These sources all generate energy at different times of day and times of year, and can balance one another. Building the grid sufficient to meet Vermont's needs with only one resource type, would be far more expensive than building a grid that can rely on diverse resources.

Generation Targets: Municipalities should consider developing generation targets complementary to state energy goals, by examining future generation needs and considering population (as a proxy for load) and energy resource potential. These targets should be used as a tool to understand the potential land use requirements associated with different scenarios.

The Department has provided a spreadsheet tool, *Generation_Scenarios_Aid.xlsx*, to assist regional planners in developing their preferred set of targets and further breaking these down for municipalities. Municipalities are allowed to submit plans that do not include specific targets for utility-scale wind.

Sufficient Land for Solar: In Standard 9B, above, municipalities identified solar and wind resource potential from preferred and potentially suitable areas. For ground-mounted solar, an estimate of potential was based on an average of 8 acres/MW. In order to account for the fact that land in the preferred and potentially suitable areas may not ultimately be available or suitable for siting solar, municipalities should build a contingency into their calculations of whether they have identified sufficient land in these areas to meet targets. One method to determine sufficient land for ground-mounted solar is to adopt a contingency figure of 60 acres per MW of target generation. By substituting "60" for "8" in the ground-mounted solar potential calculation above, you will be able to determine whether you have identified enough land in preferred and suitable areas to meet your selected targets. This allows for the fact that some property owners may not be interested in hosting solar, that interconnection costs may be high in some locations, that competition between possible sites will encourage low-cost and thoughtful siting, that some suitable areas may be small or awkwardly shaped, etc.

Sufficient Land for Wind: For municipally identified wind targets, sufficient land is defined as 25 acres per MW of target generation. For example, if a municipality has selected a target of 1 MW of new wind, at least 25 acres should be identified in preferred and potentially suitable areas. In this example, only around 3-4 acres would actually be required to accommodate 1 MW of wind, but by planning based on 25 acres/MW, municipalities will be accounting for contingencies such as property owners not

interested in leasing their land, interconnection costs that may be too high in some locations, and unsuitability of certain sites after site-specific evaluation.

9D. Does the plan ensure that any local constraints (locally designated resources or critical resources, from 12B and 12C under Mapping) do not prohibit or have the effect of prohibiting the provision of sufficient renewable energy to meet state, regional, or municipal targets?

If N/A, please describe how you are working with your regional planning commission to ensure overall regional objectives are achieved.

Municipalities may add locally designated resources or critical resources to the known and possible constraint layers in the Mapping Standards (see Mapping Standards 12B and 12C). These will ultimately flow through to the Primary and Secondary Resource Potential maps, and can have the effect of designating areas as possibly or likely unsuitable for renewable energy development. However, if the constraints would have the effect of preventing the state, region, or town from reaching its selected targets, the plan will not meet this standard. Providing maps, narratives, and even supporting documentation (like natural or scenic resource inventories) describing locally designated resources and the analysis of generation potential (Standard 9B) is critical for this criteria. A municipality may restrict development in certain areas, but there must be sufficient land left in the preferred and potentially suitable areas to meet selected targets.

For example, if a municipality were to seek to elevate agricultural soils from a possible to a known constraint based on plan policies – resulting in such areas disappearing not only from the Primary Resource Potential but also the Secondary Resource Potential maps – it would be incumbent upon the municipality to prove that there are sufficient preferred or potential areas elsewhere to accommodate enough solar to reach the municipality’s solar targets.

9E. Does the plan include statements of policy to accompany maps (could include general siting guidelines), including statements of policy to accompany any preferred, potential, and unsuitable areas for siting generation (see 11 and 12 under Mapping, below)?

Land Conservation Measures: While the maps are extremely important to show where resources, constraints, and unsuitable areas exist, it is also necessary to include text in the plan that describes these mapped elements. Specifically, plans must include descriptions of land conservation measures as well as specific policies that say where development should and shouldn’t happen, and why. These are what the Public Service Board will review when they are looking to understand whether a project will interfere with orderly development of the region, which is one of the criteria reviewed during the Section 248 process. Moreover, it is essential that such land conservation measures and policies are not only specific but also written in clear and unqualified language, articulating mandatory terms, for example by using the terms *shall* (not *should*) and *must* (not *may*). Both the locations and the reasoning behind their selection (for either preferred, potential, or unsuitable areas) should be described in the plan and reflected in the policies.

Unsuitable Areas: When municipalities designate areas as unsuitable for certain types and scales of renewable energy generation, having clear policies becomes particularly important. Municipalities must treat renewable energy generation facilities in a similar manner to other types and scales of

development, in terms of allowable land uses in particular areas. This will not be reflected in the maps, but must be articulated in the policies. For example, if a plan designated certain land as unsuitable for all development because it is above 1,700' feet and within priority forest blocks necessary for landscape scale connectivity, it would therefore be acceptable to designate as unsuitable for a type and/or scale of renewable energy technology.

Preferred Locations: Municipalities are encouraged to designate preferred areas for siting particular types and/or scales of renewable generation, for example, former gravel pits or brownfields (see Mapping Standard 12E). Municipalities may choose to encourage certain design or other guidelines for how they would like to see projects developed in these locations, keeping in mind that some of these locations might already be challenging to cost-effectively develop, particularly if remediation of the site is required. Such guidelines should be written into the policies of the plan. In addition to guidelines for development of renewable generation in preferred areas, plans could similarly require renewable energy be incorporated when certain types of parcels or facilities are being developed or redeveloped. For example, a policy could encourage or require the examination of the potential for a solar array when redevelopment of a brownfields site is proposed.

9F. Does the plan maximize the potential for renewable generation on preferred locations (such as the categories outlined under 11E [Municipal Standard 12E] in the Mapping standards)?

Municipalities are strongly encouraged to identify preferred locations for the siting of renewable energy generation facilities. By clearly identifying types of locations that are preferred (for example rooftops (and other structures), parking lots, previously developed sites, brownfields, gravel pits, quarries, and Superfund sites) and especially by mapping specific such locations, municipalities are sending a message to potential developers that these are the locations where they would like to see development occur. The identification of both preferred and unsuitable – along with the middle ground of “potential” – areas also lays out a vision for future energy development in your municipality that can be understood and applied in a regulatory proceeding.

Furthermore, municipalities are being asked under this standard to demonstrate a commitment to prioritizing renewable generation in preferred locations. This can be done not only by identifying preferred locations (generally, as well as specific parcels), but also by having a discussion in the plan of the relative amount of the municipality’s renewable generation target that could potentially be sited in such locations, alleviating siting pressure on the unsuitable and even the potential (but not preferred) locations.

There are several additional actions a municipality may take to ensure that the potential of those preferred areas is maximized. Municipalities can:

- Show support for solar systems sited on the built environment by participating in Section 248 proceedings when appropriate projects are being proposed for preferred areas.
- Promote and/or structure policies and incentive programs to promote installation of solar projects where there is electric demand, and on locations where the land has already been built impacted (e.g. roofs, parking lots, landfills).

- Support updates to municipal building standards and energy codes that promote incorporation of solar photovoltaics for new construction and major renovations. (This policy is applicable if preferred locations include rooftops.)
- Promote or adopt building code requirements that require passive solar design and siting principles to be incorporated into new buildings that have a large hot water load (i.e. laundromats, hotels).

9G. (Municipalities Only) Does the plan demonstrate the municipality’s leadership by example with respect to the deployment of renewable energy?

Municipalities are required to lead by example and demonstrate their commitment to the development of renewable energy generation facilities, though this can vary depending on their capacity to undertake such initiatives. Actions that towns could take to show such commitment include:

- The installation of solar thermal or photovoltaic systems on town buildings or parcels, where practicable, to offset municipal electric use.
- Facilitation of the development of community-led projects.
- Engagement of the community in the planning, design, and benefits of a community based project.
- Entering into a net metering credit purchase agreement with a renewable generation facility.

Please note that this list is not exhaustive, it merely gives a few possible options.

9H. Other

Please use the notes section to describe additional approaches that your municipality is taking.

If your municipality is implementing additional approaches that meet the intent of Standard 9, but are not covered under 9A-G, please describe them further in the notes section. See below for examples of additional approaches.

- Encourage the development of locally controlled renewable energy projects as a way to strengthen community support for otherwise challenging-to-site projects.
- Encourage utilities to offer customers the option of making renewable energy project loan payments on their utility bills.
- Provide firefighters with basic training in fighting fires on structures that have solar installed.
- Provide training to solar installers on the latest fire and electric safety codes, to increase safety and help to secure solar generation.
- Establish construction practices for project-related roads and other practices that facilitate low-cost decommissioning and effective soil and site reclamation.

Section 3: Mapping

Act 174 requires plans to identify potential areas for the development and siting of renewable energy resources and areas that are unsuitable for siting those resources or particular categories or sizes of those resources. It also requires that the standards address the potential generation from these areas.

Regional planning commissions must develop their own maps (already underway through support being provided to regions by the Department), and then break out the maps for their municipalities. All regional planning commissions must supply completed maps to their municipalities by April 30, 2017,

though many are expected to do so much sooner. **Municipalities can use their region-provided maps to meet the municipal *Mapping* standards.**

For municipalities interested in developing their own maps or adding additional constraint layers to the maps developed by the regional planning commissions, please see the mapping section of the regional guidance document that is available [here](#). It is important to note that municipalities seeking a determination of energy compliance from the Department and not using the maps provided by their regional planning commission must ensure that its approach, if applied regionally, would not have the effect of prohibiting any type of renewable generation technology in all locations, i.e. they must plan for all types of renewable generation facilities. Types in this case means categories of renewable generation (e.g. solar, wind, biomass, hydro), and does not require that all scales of a given technology be accommodated.

Mapping Standard 14 (Municipalities Only)

Municipalities seeking a determination of energy compliance from the Department and not using their region’s maps only: Does the plan ensure that its approach, if applied regionally, would not have the effect of prohibiting any type of renewable generation technology in all locations?

This standard only applies to municipalities if they are seeking a determination from the Department, and then *only if they are not using their region’s maps*. It does not apply to municipalities seeking a determination from their regional planning commission, nor does it apply to municipalities coming to the Department but using their region’s maps. Pursuant to Act 174, municipalities coming to the Department for a determination may only do so until July 1, 2018, and then only if their regional planning commission has not yet received its own determination. If a municipality comes to the Department for a determination but decides to use its own maps, they need to demonstrate that their approach to siting will not undermine the region’s ability to meet its requirement to allow for the siting of all types of renewable generation technologies. That is, a municipality’s approach, if applied in each and every municipality in the region, would not ultimately result in a particular type of renewable generation technology being effectively excluded from the entire region. Types in this case means categories of renewable generation (e.g. solar, wind, biomass, hydro), and does not require that all scales of a given technology be accommodated.