Energy Efficiency Model Bylaw Examples - Lamoille Region

Background and Need:

Energy efficiency is the most cost-effective strategy for reducing heating and cooling bills. Buildings account for roughly two-thirds of Vermont's total energy needs and one-third of emissions. Efficiency saves consumers money while making homes and businesses more comfortable and easier to maintain. Energy efficiency is providing, and will continue to provide, regional cost savings and reliability benefits.

Another one-third of energy consumption in Vermont comes from transportation. For this reason, location is a crucial energy efficiency consideration. Housing in villages and towns provide a walkable lifestyle that reduces emissions because energy is saved when cars are driven fewer miles. Homes in compact settlement patterns in walking distance to daily needs is an old way of living that can achieve energy efficiency while providing more affordable housing options.

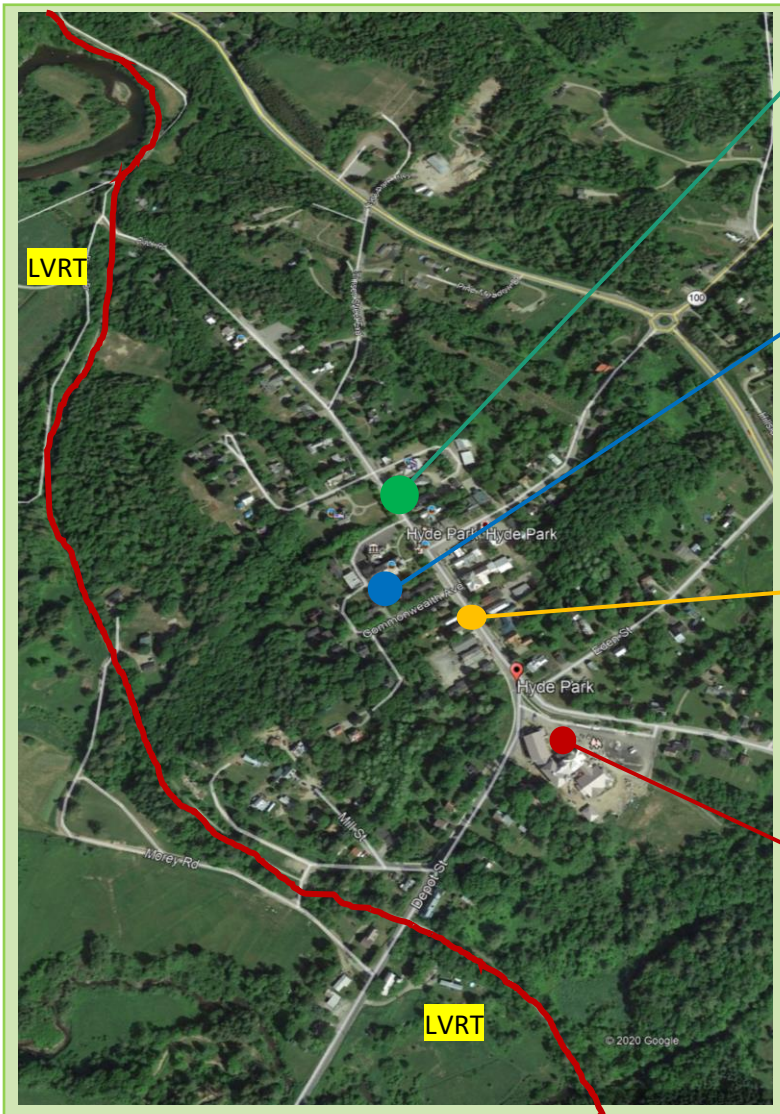
Getting Started:

Establish a Town Energy Committee.
All-volunteer committees help towns to focus their efficiency efforts. They work with municipal staff and officials, businesses and residents in their communities to implement energy-savings and clean energy projects. They help to weatherize town buildings, install solar on schools and homes, and advance transportation options.

Appoint a Town Energy Coordinator.
Vermont law enables municipalities to appoint town energy coordinators to advise select boards on energy issues. In his first 7 months on the job, Hartford's Energy Coordinator saved the town enough money to cover his first year's salary. *(Source VT Energy Dashboard).*

Follow guidance in your Municipal Plan.
Energy Use and Efficiency is addressed in a Town's Municipal Plan. This section of the plan analyzes energy use, identifies efficiency opportunities, including land use and transportation strategies, and potential renewal energy resources.

Use the municipal zoning bylaw to implement energy efficiency based the community's desires and needs.



Efficiency is 'built-in' traditional development patterns like the Village of Hyde Park's

Energy Efficiency Delivers Community Benefits

- Avoided infrastructure costs
- reduced need for services
- healthier residents
- lower energy demand and reduced emissions

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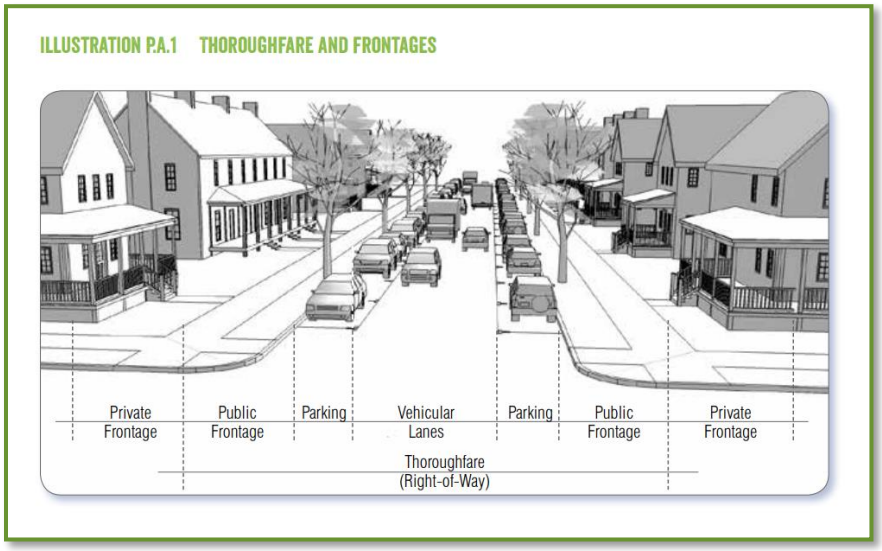
Using the Zoning Bylaw to Shrink the Community's Energy Footprint:

Reducing distances people must drive lowers emissions and can make housing more affordable. Zoning regulations that support compact, walkable development may include standards for maximum lot sizes, shared driveways, parking behind buildings and space for pedestrian infrastructure in front of buildings, minimum building heights, front doors and windows that face the street, and requirements that new development connect to existing development and to planned pedestrian and bike networks.

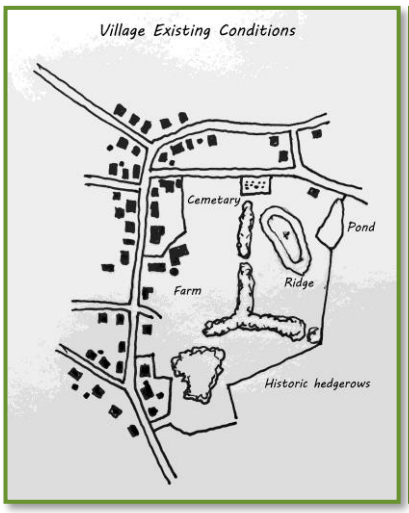


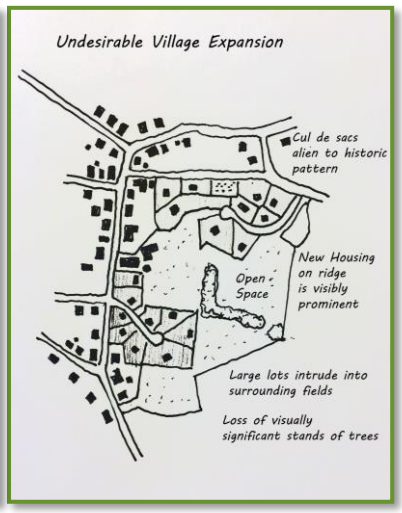
Above: Zoning shapes how, where and what buildings get built; Left: Riverside Flats Character-based Development Regulations, Town of Jericho Land Use and Development Regulations

Create and reinforce compact walkable development patterns. Fostering walkable downtowns, village centers and neighborhoods can revitalize existing communities, while preventing the development and fragmentation of farm and forest land and protecting natural resources. Vermont's historic centers provide walkable access to schools, libraries, recreational facilities, stores, and restaurants.

Encourage compact efficient development on village and town lots. A compact 2-story house built to standard material dimensions requires a smaller foundation and is more cost-effective to build and to heat and cool. Duplexes and triplexes that share walls are even more efficient and cost-effective to construct and lowering the cost new housing makes it more affordable.

Address historic preservation. Include historic preservation and adaptive reuse provisions to allow for economically viable uses of historic structures and avoid their demolition. Vermont's historic structures define the state's character but also represent a wealth of 'embodied energy'. Modern building materials, especially aluminum, vinyl and plastic, are much more energy consumptive than traditional materials such as masonry and wood. The embodied energy in existing historic structures has been spent, so replacing them with new buildings – especially new buildings constructed with modern materials – represents wasted energy.





Vermont's historic buildings largely define the state's traditional, and more efficient, settlement pattern. This greater efficiency is due to the compact nature, walkability, and ease for service by transit, in contrast to more contemporary, lower-density development patterns.

Above, replicating and extending historic village patterns of development is sometimes referred to as 'Smart Growth'.

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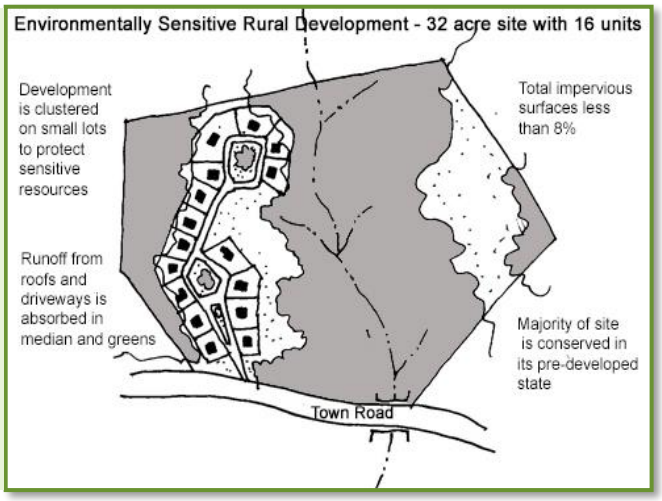
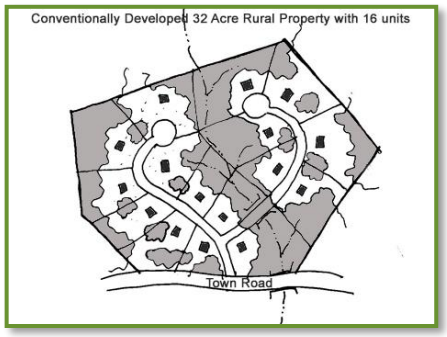
Strengthen agricultural and forest industries, minimize conflicts of development with these industries, and plan new development for efficient delivery of costly public services.

The flip-side of 'smart growth' is keeping the state's rural landscape intact. Maintaining large tracts of healthy forests and productive farmland provides the contrast with the built environment that defines Vermont's traditional settlement pattern and ensures long term access to local food supplies and forest products. The importance of these two land-based resources from an energy standpoint is an important means of addressing Vermont's energy goals.

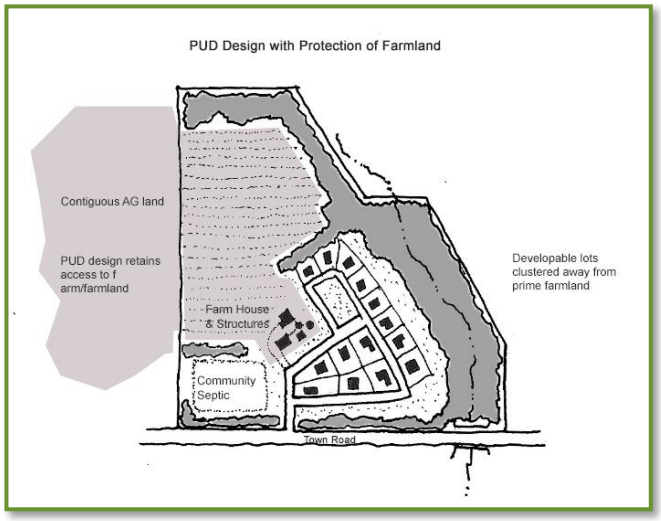


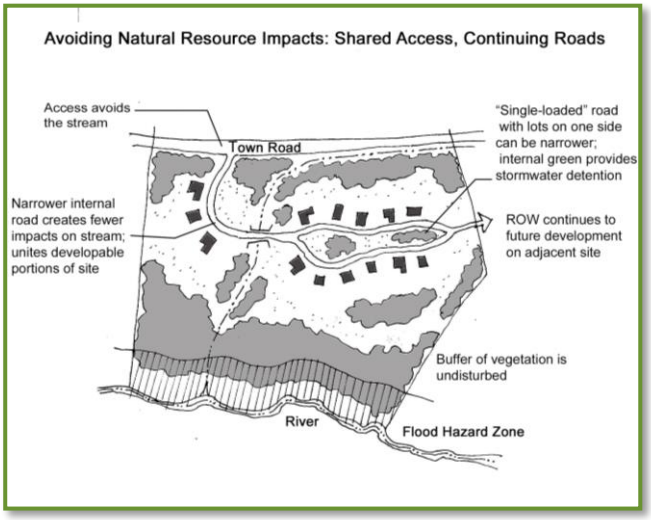


Conventional development is costly to maintain and service. Taxpayers bear the costs of mitigate the water quality impacts that result from disturbance or loss of fragile and finite resources.

Include Planned Unit Development (PUD) or conservation subdivision standards to facilitate clustering, limit the amount of infrastructure and maintain a specified percentage of the property as open space. (50-80% is not uncommon in Vermont). Require a landscape design and maintenance plan to:

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





New development sited to protect agricultural land, water quality, and scenic resources (below, far left); and for connectivity to future development (below, left) helps to maintain rural landscapes.

Pursue Electrical and Thermal Efficiency at public buildings, properties and in Town-owned rights-of-ways (ROWs). Municipalities that lack zoning can implement electrical and thermal enhancements in publicly owned buildings and properties. The significant energy and cost savings this provides can demonstrate and model the benefits of these technologies and strategies. This may encourage political support for their more widespread use through adoption of an ordinance or zoning. Municipalities can:

- Conduct audits of building energy use, publicize findings and pay-back to implement the scope of recommendations;
- Convert streetlights to LEDs for energy savings, cost savings, improved lighting, and less light pollution;
- Install a public EV charging station at a municipally owned building;
- Install bike racks at public properties such as schools, libraries, Town Offices and gathering spaces like Town Commons;
- Plant street trees in public ROWs in Villages and Towns for shade and stormwater mitigation, more pleasant pedestrian conditions, and traffic calming (in State ROWs requires a Memorandum of Municipal Agreement with VTRANS).

Energy Efficiency Model Bylaw Examples - Lamoille Region

Use the Zoning bylaw to address transportation efficiency. Standards can include:

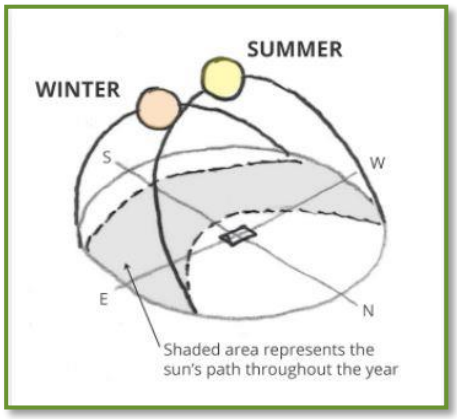
- Installing public EV charging stations;
- requiring bicycle racks or lockers;
- ensuring connections to existing or planned sidewalks, bicycle lanes and paths;
- requiring transit shelters where appropriate.

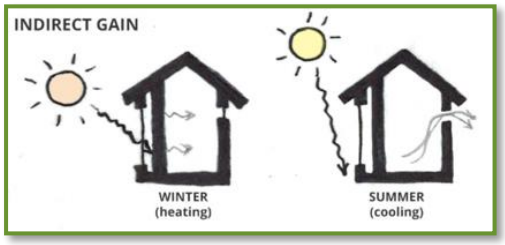
Use the Zoning bylaw to provide energy-related site development standards. Since a significant portion of the state's total energy demand comes from buildings, a zoning bylaw that incentivizes development to meet energy efficiency standards is a great step in reducing our total energy and climate footprint. State statute (24 V.S.A. § 3101) allows towns to create such codes and regulations. It is important to note that it is often easier to pass policies that incentivize energy efficiency, rather than policies that require it. These can include:

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

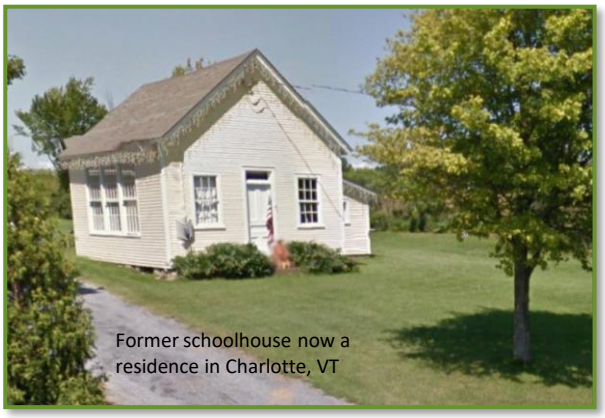
Sustainable Design and Development Site Performance Standards: Passive Solar and Lighting Systems

- In passive systems, collection and storage of solar energy is built into the structure (no pumps or moving parts).
- Suitable for all locations, but easiest with new construction and in rural areas. (In village settings massing of existing buildings may limit solar access to neighboring properties, particularly in winter, to properties immediately to the north).
- Solar energy can also provide natural daylighting. Careful design and placement of windows and clerestory can greatly reduce the energy required for daytime lighting.





Right, large south-facing windows in old schoolhouses around Vermont maximize natural lighting.



Buildings oriented close to true South (within 30 degrees) can use windows on the south wall, sunrooms, thermal mass (such as thick wall of concrete, brick, quarry tile, or water) that conducts heat slowly to the interior space, and adequate insulation to capture a building's space heat.

Sustainable Design and Development Site Performance Standards: Active Solar Systems employs equipment such as collector panels, pumps, and fans. Suitable in all locations. Use zoning to maximize its effectiveness by encouraging/requiring:

- Massing of buildings that is considerate of solar access to neighboring properties, particularly allowing sun during winter to properties immediately to the north;
- Buildings of a size and orientation to minimize blocking of sunlight on public spaces such as sidewalks;
- Orient windows to make the best use of passive solar heating and provide cross ventilation.
- Encourage use of primary roof planes that face solar south to allow for installation or retrofit with solar panels.
- In villages and neighborhoods encourage development and redevelopment that consider how rooflines fit with the solar orientation of streets. Gable roofs and shorter buildings can be more appropriate on the south sides of streets while gable end roofs and taller buildings can be more suited to the north side.
- On retrofits, encourage solar systems to be integrated with a water-heating system already in place, so that the existing system can provide backup heating when there is not enough solar energy.

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Sustainable Design and Development Site Performance Standards: Geothermal

Geothermal energy is appropriate for some sites. This approach uses heat pumps that take advantage of the relatively constant temperature below the frost line of 45-55 ºF through use of water from a well or that has circulated through underground pipes. In winter, the heat pump "extracts" and upgrades heat from the water circulated by the pump and distributed throughout the building. The resulting cooled water is returned to the earth to be re-warmed. The system is reversed in the summer. When a single well can be drilled deep enough for sufficient heat exchange, this well commonly also serves as the domestic water well. Geothermal can work for larger commercial projects. However, multiple wells may be needed.

Geothermal Energy Planning Considerations:

- In some instances, installing an open loop system, the most common and efficient type of geothermal, can be as simple as drilling a new well or deepening an existing well.
- More typically, a geothermal system will be more costly to install than a conventional heating and cooling system. If dual use of the well for domestic water is feasible this difference is greatly reduced.
- The additional costs are typically paid back in 5-10 years in in energy savings. System life is estimated at 25 years for the inside components and 50+ years for the well or ground loop.
- **Ground source heat pumps greatly contribute to high efficiency building design, but they may be best suited to new-build projects.**

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

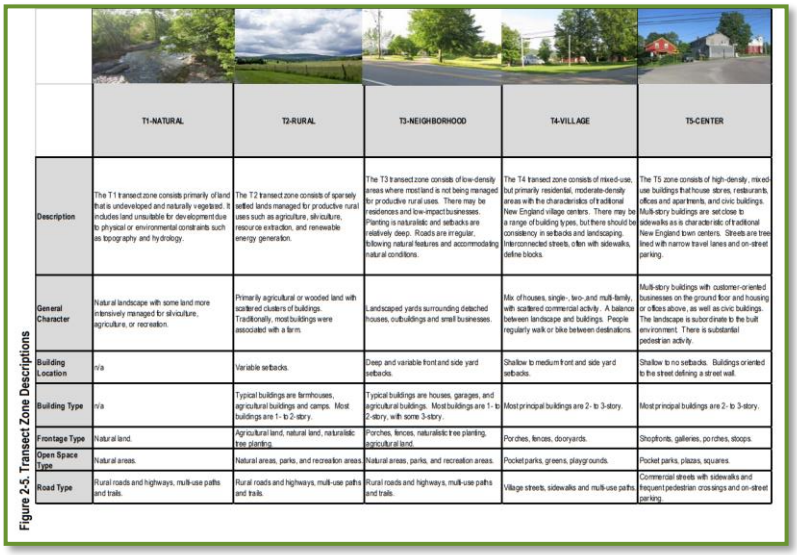
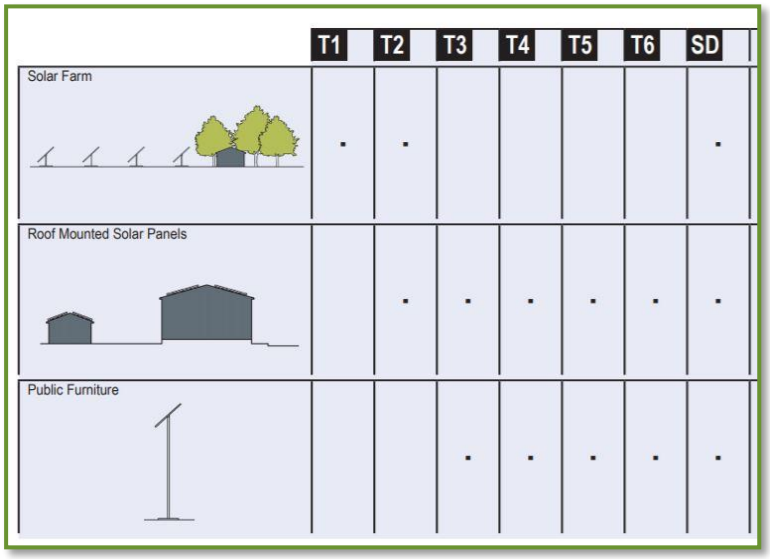


Figure 2-5. Transect Zone Descriptions

	T1-NATURAL	T2-RURAL	T3-NEIGHBORHOOD	T4-VILLAGE	T5-CENTER
Description	The T1 transect zone consists primarily of land that is undeveloped and naturally vegetated. It includes land unsuitable for development due to physical or environmental constraints such as topography and hydrology.	The T2 transect zone consists of sparsely settled lands managed for productive rural uses such as agriculture, silviculture, resource extraction, and renewable energy generation.	The T3 transect zone consists of low-density areas where most land is not being managed for productive rural uses. There may be residences and low-impact businesses. Planting is naturalistic and setbacks are relatively deep. Roads are irregular, following natural features and accommodating natural conditions.	The T4 transect zone consists of mixed-use, but primarily residential, moderate-density areas with the characteristics of traditional New England village centers. There may be a range of building types, but there should be consistency in setbacks and landscaping. Interconnected streets, often with sidewalks, define blocks.	The T5 zone consists of high-density, mixed-use buildings that house stores, restaurants, offices and apartments, and civic buildings. Multi-story buildings are set close to sidewalks as is characteristic of traditional New England town centers. Streets are tree lined with narrow travel lanes and on-street parking.
General Character	Natural landscape with some land more intensively managed for silviculture, agriculture, or recreation.	Primarily agricultural or wooded land with scattered clusters of buildings. Traditionally, most buildings were associated with a farm.	Landscaped yards surrounding detached houses, outbuildings and small businesses.	Mix of houses, single-, two- and multi-family, with scattered commercial activity. A balance between landscape and buildings. People regularly walk or bike between destinations.	Multi-story buildings with customer-oriented businesses on the ground floor and housing or offices above, as well as civic buildings. The landscape is subordinate to the built environment. There is substantial pedestrian activity.
Building Location	n/a	Variable setbacks.	Deep and variable front and side yard setbacks.	Shallow to medium front and side yard setbacks.	Shallow to no setbacks. Buildings oriented to the street defining a street wall.
Building Type	n/a	Typical buildings are farmhouses, agricultural buildings and camps. Most buildings are 1- to 2-story.	Typical buildings are houses, garages, and agricultural buildings. Most buildings are 1- to 2-story, with some 3-story.	Most principal buildings are 2- to 3-story.	Most principal buildings are 2- to 3-story.
Frontage Type	Natural land.	Agricultural land, natural land, naturalistic tree planting.	Porches, fences, naturalistic tree planting, agricultural land.	Porches, fences, dooryards.	Shopfronts, galleries, porches, stoops.
Open Space Type	Natural areas.	Natural areas, parks, and recreation areas.	Natural areas, parks, and recreation areas.	Pocket parks, greens, playgrounds.	Pocket parks, plazas, squares.
Road Type	Rural roads and highways, multi-use paths and trails.	Rural roads and highways, multi-use paths and trails.	Rural roads and highways, multi-use paths and trails.	Village streets, sidewalks and multi-use paths.	Commercial streets with sidewalks and frequent pedestrian crossings and on-street parking.

Source: Form-based Overlay District Westford Land Use and Development Regulations



Source: Smartcode Module: Renewal Resources – Solar Energy https://transect.org/modules.html

Right Place, Right Technology.

Zoning according to a rural to urban transect provides a unified approach for integrating renewables in predictable and context-appropriate/sensitive ways in a municipality. Each zone along the transect has a distinct character, and component standards reinforce each other to intensify this character.

The table (above right) shows opportunities for the placement of types of solar-powered devices within the transect. Solar access should be protected in the T2 and T3 zones; this may be more difficult in T4-T5 density. At the community scale, solar orientation should be considered when planning a hamlet or village, so that each lot receives optimum exposure. If this is not feasible, the code may require a percentage of lots, especially in the T3 zone, to be oriented for solar energy. A solar dish engine system utilizes collectors tracking the sun on two axes, while concentrating the energy at the focal point of a separate dish.