

Narrative and Background: Model Solar Zoning Ordinance for New Hampshire



Introduction

Many New Hampshire communities are considering land use regulations for solar arrays. The expansion of solar power development has been a rapid and promising answer to a number of energy issues. Distributed solar systems provide clean energy and promote local jobs for installation. As part of the greater energy system (the grid) they can be a keystone for resiliency goals by forming the foundation of micro-grids. Solar energy can provide an inflation resistant long term source of electricity, particularly in conjunction with the rapidly expanding options for electricity storage. Innovations in regulation allow for municipalities, neighbors, and other parties to invest in solar energy through group net metering even if the array is not located on the site of the participant. Finally, commercial scale solar systems may provide additional benefits such as tax revenue and technological development to host communities.

The market, technological and regulatory advances as well as the steep decline in costs means an acceleration in development of these facilities. Given the legitimate questions of host communities, this Model Solar Zoning Ordinance provides municipal leaders with a framework to consider the land use impacts of solar development in conjunction with other community goals to help develop a coherent strategy for regulating solar land uses. As a relatively new technology, there are many questions and concerns and it is

critical to insure that regulations for solar installations are balanced against a municipality's legitimate concerns and adhere to statutory requirements. A community that fails to educate itself and overreacts out of fear or a lack of knowledge, may unnecessarily limit taking advantage of the opportunities in this expanding energy field.

This Model document builds on existing work in the state of New Hampshire. The effort herein provides a framework for communities to permit and regulate a wide range of systems to complete the picture for regulating solar in NH. The approach for the Model provides basic education about the scale of arrays and suggests a step-by-step approach to developing reasonable ordinances and regulations based on traditional regulatory methods.

Solar Siting Policy at the Municipal Level

Concerns about solar installations are generally related to natural resource and visual impacts. Accordingly, we have presented an approach to zoning that is unique to these solar specific concerns. This approach is based on NH law and meant to be part of a comprehensive community policy regarding solar.

There are benefits for allowing solar installations in your community. All systems are part of a comprehensive state and national policy to provide clean domestic energy to support lower emissions and local economic development. Small residential systems provide citizens with energy independence and cost savings. Permissive siting regulations are part of a greater community commitment to environmental and economic development objectives.

Tax agreements allowed under NH law allowing for payments in lieu of taxation ("PILOTs") may be part of larger systems installations. For these systems, the benefit to cost calculation clearly falls on the side of substantial benefits to the community - there are very few impacts on municipal services, as there is no need for water, sewer, minimal risk of emergency response, etc.

As communities continue to explore resilience planning and emergency management, the role of renewable energy and micro-grids cannot be understated. Initial site planning may not be able to accommodate micro-grid development, but large arrays are the basic foundation for future opportunities to provide long-term stable electricity to the community. Having larger arrays present in the community can lay the ground work for the development of a power supply for critical municipal infrastructure in the future. The Stafford Hill project (below) is an example of this.



Green Mountain Power and the City of Rutland have installed the Stafford Hill plant (Left). This is a solar and battery system that can disconnect from the grid and supply critical power to an emergency shelter during long outages.

As with any project where professionals try to provide a wide range of options and considerations we note that not all situations can be anticipated or prognosticated. Further, in order to ensure professionals can continue to educate and generate thought on the part of people seeking to be educated, we must differentiate between education and professional advice. As such we offer a wide ranging caution:

Disclaimer: This product is not intended to be legal, financial or public health advice. It is solely meant to be helpful information and examples of issues and ideas about the subjects discussed. For issues related to specific legal, financing, and/or other issues you may have, please consult with your licensed professional in your jurisdiction.

Developing a coherent approach to reasonable regulating solar land uses

To begin, the community should determine which solar applications will be regulated. In most cases, roof mounted installations should be allowed by right, unless located within an historic district where some level of review may be required. Ground mounted systems come in a number of different sizes, from solar trackers (which can reach up to 25 – 30 feet tall) to ground panels which may be shorter, but can range in size from a few hundred square feet of area to thousands of square feet for utility scale developments. Every community has its own priorities and developing clear definitions is critical as this will drive where each category of use is permitted, what level of regulations will be applied, and enable solar development to be in step with the municipality's overall goals and objectives.

For the purposes of this model ordinance and to the extent possible, we have assumed a community in NH with diverse zones that include low-density residential agricultural to high density village zoning. We have added commercial and industrial zones to round out the zoning and potential locations. Every town and city in NH is unique and the any regulatory scheme must be tailored to your community's existing land uses, master plan goals and land availability. Naturally, we must all consider political realities but these are beyond the scope of this Model Solar Zoning Ordinance.

- Planning Considerations: Develop a policy strategy for permitting and regulating large-scale solar.
 - This plan should consider the impacts and benefits of siting solar in the community.
 - Community-based issues to consider relate to community goals for job creation, participation in the clean energy economy and community prestige.
 - Traditional land use issues to consider relate to parcel size, zones and abutting land uses, existing electrical infrastructure and impacts to natural and visual resources.
 - Direct economic issues relate to tax revenues versus cost of services, participation by the municipality in group net metering projects, and highest and best use for larger undeveloped and underdeveloped parcels.

Solar Basics

Basic information to consider when approaching solar regulations:

- The average home in NH uses approximately 7,400 kilowatt hours (“kwh”) per year.
- To supply this average home, a solar array would have to be approximately 6,000 watts or 6 kilowatts (“kW”) in size.
- Most existing solar panels average about 300 watts per panel and are average 3.2 x 5.4 feet in dimension.
- Using these averages, a 6 kW array would consist of 20 panels and have dimensions of 26.5 x 13 or approximately 350 square feet. (An average parking space is 180 sq. ft.)
- A roof mounted system adds about 3-4 lbs. per square foot when including mounting hardware.
- Ground mounted arrays are racked in rows with separation between the rows to allow for sunlight to reach all rows.
- Racking systems provide for spaces between panels that allows snow and rainwater to fall between panels. These gaps vary based on the racking. (See the appendix for images of this).
- The number of panels in a row will affect the distance between rows. The more panels, the higher the array, the wider the distance between rows to accommodate the all-season sun angle.
- Mounting components generally have a very small footprint on or in the soil, and the gaps allow for snow and rain to drain between panels and rows. As such, the bulk of solar systems are not generally considered to be impervious in the same manner as a traditional structure.
- For large ground mounted arrays, the rule of thumb for standard technology systems (fixed mount with crystal silicon-based PV panels) mounted on relatively flat land is about 4-5 acres for 1 megawatt (MW) of capacity.
 - Using our standard panel size from above, this represents approximately 3,333 panels.
- Mounting systems are developing fast and improving rapidly. “In ground” mounting systems can be screwed into the ground, pile driven, set in concrete. (See appendix for images of ground mount technology).
- “On ground” mounting systems include ballasted systems (often used on brownfields or capped landfills to protect the integrity of the cap). (See appendix).

Statutory Authority and Limitations

New Hampshire permits the regulation of solar energy systems but provides a unique context for this use. Local governments can enact ordinances that permit solar systems

but should be careful to consider the favorable treatment such uses have under NH law and insure that their approach does not conflict with these statutes.¹

- **NH RSA 477** allows municipalities to enact planning and zoning regulations that protect access to energy sources and that encourage the use of solar skyspace easements.
- **NH RSA 477:51** contains model language for solar easements that can be used in the case a property owner wants to pursue the option.
- **NH RSA 672:1, I and III-a** recognize that planning and zoning regulation is the responsibility of local government, but declares a statewide interest in regulations to encourage energy efficient development patterns, including adequate access to direct sunlight for solar energy uses, and declare that installation of solar and other renewable energy systems **shall not be unreasonably limited by the use of municipal zoning power or by the “unreasonable interpretation” of such powers except where necessary to protect the public health, safety, and welfare.**
- **NH RSA 672:1, III-d** clarifies that “unreasonable interpretation” of municipal zoning ordinances includes failure of municipal authorities to recognize that renewable energy systems are accessory uses and **that prohibition of such accessory uses cannot be inferred from an ordinance that does not specifically address such uses.**
- **NH RSA 674:17** enables municipalities to adopt zoning ordinances designed to, among other purposes, encourage installation of solar and other renewable energy systems and to protect access to energy sources by the regulation of orientation of streets, lots and buildings, establishment of height and setback requirements, limitation on height and setback of vegetation, and encouragement of the use of solar skyspace easements.
- **NH RSA 674:36, II-k** enables municipalities to regulate the subdivision of land to encourage the installation and use of solar and other renewable energy systems and to protect access to energy sources by the regulation of orientation of streets, lots and buildings, establishment of height and setback requirements, limitation on height and setback of vegetation, and encouragement of the use of solar skyspace easements.
- **NH RSA 674:2, III-n** enables municipalities to include an energy section in their master plans.

¹ New Hampshire Residential Rooftop Solar PV Permitting, Zoning and Interconnection Guide, January 2015, NHOEP and others.

- **NH RSA 72:61-72** enables a town or city to make exemptions on assessed values for solar energy systems from property taxes.

Solar Collection Systems and Historic Districts

If your community has adopted a Historic District(s), it is possible to provide for regulations that allow for solar collection systems in certain circumstances and still preserve the intent of these regulations. See NH 674:45-50. There are several helpful guides for communities confronting this issue including work from the National Renewable Energy Lab.²

Some considerations for allowing solar collection systems within NH Historic Districts:

- Ground mounted systems:
 - Allow for ground mounted systems that respect the building's historic setting.
 - Systems should be mounted in inconspicuous locations, such as side and rear yards, low to the ground and screened to limit visibility.
- For new construction and additions:
 - Allow for placement where the location is compatible with the historic building and its setting and where such installations are integrated into the building materials and design such that they are minimally visible.
- Other considerations:
 - Locate solar collection systems on non-historic buildings and additions on the site.
 - Require, to the maximum extent practical, that systems are not visible from public ways. Installations on building surfaces that face public ways should be limited. Locations behind dormers or on rear facing roof planes should be permitted.
 - Require materials and colors that blend into the building design and colors to minimize conflict with the historic character of the building and the district.
 - Avoid multi-roof systems and disjointed installations.
 - Installations on flat roof locations should be screened in keeping with the character of the building or setback from the edge of the roofline.
 - Building integrated systems, such as tiles and other materials that mimic building components should be permitted.

Considering these provisions will allow a community to balance solar installations with the goals and objectives of historic resources.

² Implementing Solar PV Projects on Historic Buildings and in Historic Districts: <https://www.nrel.gov/docs/fy11osti/51297.pdf>

NH Model Solar Zoning Ordinance

Introduction: The text of this model reflects a comprehensive approach to systems of all sizes from residential to large power generation systems. The model divides uses based on their land use size. Your municipality may use all or some of these proposed definitions to regulate solar systems based on the impacts and land uses within specific zones in the community as appropriate.

The sizes and capacities used in this model are meant to be a balanced approach based on the “average community” and the industry standard sizes for arrays. The sizes we choose are based on a number of factors, such as the array capacity and incentives, regulatory and engineering requirements and specific technologies. They are meant to be a balanced and “average” approach for the different sized arrays we expect to see in New Hampshire. We are providing regulations based on the nature of the land use impacts which, in turn, is based on the size and location of the system within most communities.

No community should necessarily adopt this ordinance “as is” for a number of reasons but primarily because it attempts to provide the broadest treatment of a large range of solar land uses – from 10,000 square feet to 150 acres in size. This ordinance applies to all arrays but is mostly intended to provide regulation for larger arrays. A community using this model will need to carefully review each size in the definitions and decide what sizes to permit and where to permit these systems. A careful review will consider the impact, size and available land for development. Additional criteria could be the location of electric utility infrastructure and brownfields or similar sites that can co-locate arrays.

The ordinance must be adapted to your ordinance structure for a table of permitted uses or a list of permitted uses. Both are presented here to provide some guidance. The large number of definitions are meant to reflect the challenge of balancing approaches to regulating a wide range of solar systems. At first glance, the number of definitions may seem complex but we have tried to provide a template that includes all possible uses regulated by impact and size. Some communities may not be appropriate for the largest sized systems or may want to consider combining definitions to simplify the ordinance. In general, the goal is to allow large-scale solar in areas where appropriate in accordance with a community’s objectives.

Size Considerations

Solar Collection System Size:

In general, a 250 kW array that is ground mounted takes up about 1 acres of flat ground. A 250 kW array would be comprised of 833 panels with a capacity of 300 watts each.

For larger arrays – the minimal areas – not considering restrictive features is as follows:

- 1 MW = 4 acres.
- 5 MW = 20 acres.
- 10 MW = 40 acres.
- 30 MW = 120 acres.

Authority and Purpose

- This solar collection system ordinance is enacted in accordance with RSA 674:17(I)(j) and the purposes outlined in RSA 672:1-III-a as amended. The purpose of this ordinance is to accommodate solar energy collection systems and distributed generation resources in appropriate locations, while protecting the public's health, safety and welfare. The Town intends to facilitate the State and National goals of developing clean, safe, renewable energy resources in accordance with the enumerated polices of NH RSA 374-G and 362-F that include national security and economic and environmental sustainability.

Definitions:

- **Rated Nameplate Capacity** – Maximum rated alternating current (“AC”) output of solar collection system based on the design output of the solar system.³
- **Solar Land Coverage** – is defined exclusively for the purposes of calculating the footprint of the land area occupied by the components of a solar array. The Solar Land Coverage is the land area that encompasses all components of the solar collection system including but not limited to mounting equipment, panels and ancillary components of the system. This definition does not include access roads or fencing and is not to be interpreted as a measurement of impervious surface as it may be defined in this ordinance.⁴
- **Solar Collection System** - Includes all equipment required to harvest solar energy to generate electricity. The Solar Collection System includes storage devices, power conditioning equipment, transfer equipment, and parts related to the functioning of those items. Solar Collection Systems include only equipment up to (but not including) the stage that connection is made to the utility grid or site service point.

³ While the sum of the DC output of the modules may be more directly related to the physical size of the system and number of panels used, we have elected to use the AC output as the benchmark. AC capacity is used for system sizing with respect to incentives and regulatory requirements. This conclusion balances the nature of the array's purpose (residential, commercial etc) and provides a consistent use of terms across other regulations that apply to solar systems. This connection (AC capacity to zoning definitions) allows the community to communicate and regulate with a consistent and familiar set of system sizes and categorize them as a land use appropriately.

⁴ This is an important distinction since the nature of the coverage is not consistent with other lot coverage approaches. While panels and other accessory components may be impervious themselves, they are either of limited area or not affixed directly to the ground. In addition, the nature of the installation hardware always includes gaps and slopes to facilitate water and snow filtration to ground cover that is dispersed evenly throughout the site.

- **Roof Mount** – A solar collection system that is structurally mounted to the roof of a building or other permitted structure, including limited accessory equipment associated with system which may be ground mounted. For purposes of calculating array sizes or solar land coverage under the solar definitions in this section, roof mounted portions shall not be included if the system is made up of both roof and ground mounted systems, the roof mounted portions shall also be excluded.
- **Ground Mount** – A solar collection system and associated mounting hardware that is affixed to or placed upon (such as ballasted systems) the ground including but not limited to fixed, passive or active tracking racking systems.
- **Carport Mount** – Any solar collection system of any size that is installed on the roof structure of a carport over a parking area.

Use definitions:⁵

- **Residential Solar:** Any ground mounted or roof mounted solar collection system primarily for on-site residential use, and consisting of one or more free-standing, ground or roof mounted, solar arrays or modules, or solar related equipment, intended to primarily reduce on-site consumption of utility power and with a rated nameplate capacity of 10 kW AC or less and that is less than 500 square feet solar land coverage.
- **Community Solar:** A use of land that consists of one or more free-standing, ground mounted solar collection systems regardless of nameplate capacity that is up to 100 kW AC and that is less than 1 acre of solar land coverage.
- **Accessory Agriculture Solar:** Any ground mounted or roof mounted solar collection system designed to primarily reduce on-site consumption of utility power and without a limit to the rated nameplate capacity or solar land coverage provided the existing agricultural use is preserved at the time of installation.⁶

⁵ Note on Definitions and Terms: We have attempted to find names that reflect our traditional land uses and typical ordinance parlance. From the smallest systems (residential) through medium (community and commercial) to the larger (industrial) and largest (utility) we have tried to tie these names to our understanding of the scope and size of typical uses and how/where we permit such uses.

⁶ Specific Definitions for Agriculture: This approach is meant to permit some freedom for existing agricultural uses to have their own systems with minimal regulation and larger systems with a balanced approach. It is tied to the preservation of the existing agricultural use to minimize conversion. There is no limit to future conversion of the property. This approach supports agriculture without promoting the conversion of agriculture to solar.

- **Primary Agriculture Solar:** Any ground mounted solar collection system that is partially used to reduce on-site consumption of utility power and with a rated nameplate capacity up to 1 MW AC in size or has a solar land coverage in excess of 5 acres provided the existing agricultural use is preserved at the time of installation.
- **Commercial Solar:** A use of land that consists of one or more free-standing, ground mounted solar collection systems with a rated nameplate capacity of up to 1 MW AC and that is less than 5 acres in solar land coverage.
- **Large Commercial Solar:** A use of land that consists of one or more free-standing, ground mounted solar collection systems with a rated nameplate capacity of between 1 MW and 5 MW that is between 5 and 25 acres in solar land coverage.
- **Industrial Solar:** A use of land that consists of one or more free-standing, ground mounted solar collection systems regardless of nameplate capacity that is between 25 acres and 50 acres in solar land coverage.
- **Utility Solar:** A use of land that consists of one or more free-standing, ground mounted solar collection systems regardless of nameplate capacity that is over 50 acres in solar land coverage and less than 30 MW in rated nameplate capacity.
- **Solar Power Generation Station:** Any solar collection system that is over 30 MW in nameplate capacity. In no case shall a Solar Power Generation Station exceed 150 acres.

Table of Uses Permitted:

Consider permitting solar uses based on the existing zoning within the community. Some communities may be comfortable with large-scale solar in many zones and some may choose to limit solar installations within commercial and industrial districts. By defining the uses above, communities can decide where different sized arrays should be allowed. The ordinance should also note that a solar installation may be a primary or an accessory use to the property.

Here is an example of how a community might address these different scales of solar arrays within a standard table of uses:

	Zoning District					
	Village /High Density	Residential	Rural Residential	Residential Agricultural	Commercial	Industrial
Accessory Residential Solar	P	P	P	P	P	P
Community Solar	X	P	P	P	P	P
Accessory Agricultural Solar	X	P	P	P	P	P
Primary Agricultural Solar	X	X	CUP	P	P	P
Commercial Solar	X	x	CUP	CUP	P	P
Large Commercial Solar	X	X	X	CUP	CUP	CUP
Industrial Solar	X	X	X	X	CUP	CUP
Utility Solar	X	X	X	X	CUP	CUP
Solar Power Generation Station	X	X	X	X	X	CUP

- P = Use permitted by right with building and electrical permit.
- CUP = Use permitted by Conditional Use Permit.⁷
- X = Use prohibited.

Specific Solar System Requirements and Exemptions:

- A ground-mounted Accessory Residential Solar system over 15 feet in height at any point shall be located in rear yard between the primary structure and rear lot line. All other ground mounted systems located in the front yard shall be reasonably screened from abutting residential properties.
- Non-residential Carport Mounted solar collection systems over parking areas are permitted in all zones without a Conditional Use Permit – site plan review may be required in accordance with the Town Regulations.
- Roof Mounted solar collection systems of any size are permitted in all zones without a conditional use permit except within a Historic District. District regulations should be amended to appropriately allow solar installations.
- Municipal Systems: All solar collection systems for municipal use are exempt from land use regulations pursuant to NH RSA 674:54.

Additional Provisions Regarding Solar Collection Systems:

- Building Height: Roof mounted solar collection systems shall be exempt from building height limitations.
- Lot Coverage: Ground-mounted solar collection systems shall/shall not⁸ be considered as part of the maximum required lot coverage limitations but shall

⁷ Some towns may be accustomed to Special Exceptions for specific land uses. We respect this tradition but feel that the Planning Board Conditional Use Process provides more flexibility and streamlines the by requiring review by only one local land use board.

⁸ This issue is a challenging factor in these ordinances. The town must consider the underlying purposes of lot coverage or usage requirements. To the extent they relate to stormwater management, such a restriction would be overly burdensome. To the extent they relate to aesthetics, neighboring land uses and other impacts there may be a reasonable justification for limitations on area used but careful consideration should be given to the unique nature of solar.

not be considered impervious surface. Impervious surface limitations as related to stormwater management for solar collection systems shall be addressed in accordance with this ordinance.

Additional Permitted Sites:

The Town should consider adding a section that permits privately owned and operated solar collection systems on town properties that have excess land and may be a part of a town policy to realize the benefits of participating in a solar development. Here is an example of sites that may be considered if present in the community. Although governmental land uses are usually exempt, these locations are listed to permit the siting of privately owned or operated solar collection systems under a lease arrangement.

Solar Collection Systems of any size shall be permitted on the following sites:

- Water Treatment Plant: Map xx Lot xx.
- Wastewater Treatment Plant: Map xx Lot xx.
- Transfer Station / Capped Landfill: Map xx Lot xx.
- School Facilities: Map xx Lot xx.
- Active Recreation Field: Map xx Lot xx.

Solar Collection System Conditional Use Permit:

Note: The level of detail required for a proposed solar installation should be thought through carefully. Engineers and surveyors are very expensive and such costs could needlessly create a barrier to installation. In most cases, the use of tax maps, GIS, USGS, Google Earth and other resources provide enough detail to create a hand drawn or computer generated site plan for local land use board review. The hiring of professionals should be limited to larger projects or when critical environmental areas are present. Landscape architects or professional landscapers can be engaged at reasonable rates to address aesthetic concerns.

Requirements for granting a Conditional Use Permit (CUP):

- CUP Criteria

Standards of Review: Following a fully noticed public hearing on the proposed use, the Planning Board may issue a Conditional Use Permit, if it finds, based on the information and testimony submitted with respect to the application, that:

 - a. The use is specifically authorized by Section X as a conditional use;
 - b. The development in its proposed location will comply with all applicable requirements of the Site Plan Regulations not otherwise covered in this section, as well as specific conditions established by the Planning Board.
 - c. The use will not materially endanger the public health or safety;

- d. Required screening shall be maintained during the operative lifetime of the Solar Collection System Conditional Use Permit.
 - e. In granting a conditional use permit pursuant to this section, the Planning Board may impose any reasonable conditions or restrictions deemed necessary to carry out the intended purpose of this ordinance.
- Site Plan Review Regulations Applicable
 - The specific requirements for a Conditional Use Permit shall pre-empt any similar requirement in the Site Plan Review Regulations.
 - System Layout
 - A detailed sketch or plan showing the installation area of the site.
 - A detailed sketch of any land clearing or grading required for the installation and operation of the system.
 - The location of all equipment to be installed on site including utility connection point(s) and equipment. To the maximum extent practical all wiring associated with the utility connection shall be underground.
 - All equipment locations, except for utility connections, shall comply with required setbacks.
 - Equipment Specification
 - All proposed equipment or specifications must be included with the application.
 - Such information can be supplied via manufacturer's specifications or through detailed description.
 - Emergency Response
 - Access to the site for emergency response shall be provided and detailed on the plan.
 - A narrative or manual for municipal Fire Department detailing response guidance and disconnection locations necessary for fire response.
 - Additional industry guidance documents that provide information about safety procedures for specific equipment on site shall be provided as needed to insure adequate public safety.
 - Contact information for the solar collection system owner/operator shall be posted on site at the access way and provided and updated to the municipality.
 - Natural Resource Impacts and Buffers
 - Solar collection systems shall be visually screened through the preservation of existing vegetation or through a landscaped buffer in accordance with the following.
 - Plan: The buffering plan shall indicate the location, height and spacing of existing vegetation to be preserved and areas where

- new planting will be required.
 - All solar systems shall have a reasonable visual buffer as required in the site plan review regulations from public ways and neighboring commercial/residential uses based on the viewsheds, contours of the land and abutting land uses.
 - Areas that are within the viewshed of significant value as identified in the Master Plan⁹ shall include additional reasonable mechanisms to mitigate from a continuous and uninterrupted view of the system.
- Fencing shall be installed, if required, by the electric code or the utility. Additional security or fencing may be required if the location of the system presents a safety concern for abutting land uses.
 - Primary Agriculture Solar should minimize impacts to farmland activities and Prime Farmland Soils (as defined and delineated by soil survey and definition of NH NRCS). Dual use arrangements (solar and farming activities are encourage where practical).
 - Land Clearing
 - Land clearing shall be limited to what is necessary for the installation and operation of the system and to insure sufficient all-season access to the solar resource given the topography of the land.
 - Following construction, cleared land areas must be restored with native species that are consistent with the use of the site as a solar collection system (such as slow growth or low ground cover).
 - Erosion control measures during construction shall be detailed as required.
 - Additional Requirements for Large Commercial, Industrial and Utility (LC/I/U) Solar:
 - A detailed pre-construction and post-construction plan identifying existing vegetation and areas to be cleared with specific identification of locations of buffer areas adjacent to neighboring uses and public ways.
 - LC/I/U systems that disturb more than 10 acres of previously undisturbed land shall provide a natural resource inventory that details site conditions and habitat and mitigation efforts to reduce impacts to important species and habitat.

⁹ Towns should consider identifying these viewsheds as part of the Master Plan to provide the legal basis for such considerations and to alert developers about these areas of the community.

- Efforts and practices that can provide for a dual use of the site should be explored if feasible and encouraged where appropriate.
 - The applicant shall demonstrate effective stormwater infiltration along with erosion control measures and soil stabilization.

 - Electrical Requirements.
 - All systems not connected to the grid shall be approved by the electrical inspector or Building Inspector, as required.
 - Grid-tied systems shall file a copy of a final approved interconnection shall be filed with the municipality prior to operation of the system.

 - Glare
 - A statement detailing potential significant glare onto abutting structures and roadways estimating the interaction of sun to panel angle, time of year and visibility locations.
 - Based on the above information, the Planning Board may require reasonable mitigation. Mitigation may include angle of panels, details on the anti-reflective nature of the panel coating or any additional specific screening to minimize resulting impacts.
 - Mitigation through anti-reflective coatings shall have an index of refraction equal to or less than 1.30.
- Glare is measured by an index – the included standard is lower than the index of water and standard anti-glare windows in most houses. Many panels already are manufactured with this coating as it increases output and reduces O&M costs.
-
- Noise
 - Estimates of any equipment noise on the site based on equipment specification materials (such as inverters).
 - Noise levels at the property line shall be in accordance with the municipal noise ordinance or at reasonable levels given the location of the facility with due consideration to the surrounding land uses and zone.

 - Setbacks
 - Solar collection systems shall be considered structures and shall comply with building setback requirements from lot lines for the entire system – including the panels. Tracking systems shall have the setback measured from the point and time where the array is closest to the lot line. No portion of a system may cross into the setback.

 - Stormwater
 - Ground mounted systems that are required to secure a New Hampshire Department of Environmental Services Alteration of Terrain (AoT) Permit in accordance with NH RSA 485:17 shall secure such permit accordingly.

- The final Permit issued by NH DES shall be incorporated by reference into the final Town approval and shall be enforceable by the Town in accordance with this zoning ordinance.
 - No further local review of stormwater and erosion control shall be required where a project is required to secure the NH DES AoT Permit
 - Ground mounted systems not requiring NH DES AoT Permit. Where a ground mounted system does not require an AoT permit the following shall apply:
 - Ground mounted systems that require land clearing and grubbing of mature forested cover to accommodate more than 30% of the solar land coverage area, provided such area of clearing and grubbing is also larger than 1 acre, the proposed system shall include a management plan for stormwater that is directly related to the impact of the solar collection system.
 - Ground mounted systems where the solar land coverage area is larger than 1 acre and located on slopes of greater than 5% shall include a management plan for stormwater.
 - The stormwater management plan shall include the following.
 - The stormwater study shall take into account the nature of the solar panel installation and how the spacing, slope and row separate can enhance infiltration of stormwater. Percolation tests or site specific soil information may be provided to demonstrate recharge can be achieved without engineered solutions.
 - Additional information, if required, shall calculate potential for concentrated flows of runoff due to the panels, slope, soil type and the impacts of other true impervious areas (such as equipment pads and roadways).
 - Required for all systems:
 - All ground mounted systems shall be constructed in accordance with Best Management Practices for erosion and sedimentation control during the pre-construction, construction and post-construction restoration period.
 - Post construction: For purposes of enhancing natural stormwater management, site conditions and plantings post-construction shall include insure that areas of soil compaction have been restored to more natural conditions. Plantings shall be native species and are recommended to beneficial habitat to song birds, pollinators and/or foraging species in order to maintain a healthy surface and subsurface habitat that can attenuate stormwater on the site.
- Lighting

- On site lighting shall be minimal and limited to access and safety requirements only. All lighting shall be downcast and shielded from abutting properties.
- Buffer Plan
 - As deemed appropriate, all applications shall submit a detailed buffering plan demonstrating how the proposed ground mounted solar installation will be incorporated into the local landscape so that effective screening is provided along public ways and from abutting views. The use of evergreens are recommended. The use of existing or created topography is encouraged to reduce visual impacts.

Note: Examples of buffered systems:



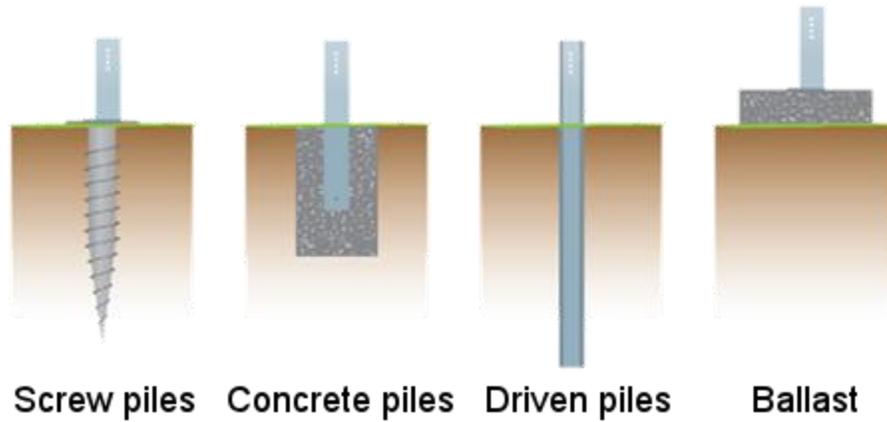


- Abandonment and Decommissioning
 - Solar Collection Systems shall be deemed to be abandoned if operations have discontinued for more than 6 months without written consent of the municipality (such as for reasons beyond the control of the owner/operator). An abandoned system shall be removed and the site restored within 6 months of abandonment.

Appendix:

This appendix includes images and information about several types of solar installations and equipment.

Mounting Hardware:



Source: Ionvia Technologies: Different types of mounting hardware and ground impacts.



Completed installation showing gaps between panels



Ballasted system, showing distance between rows and the ballast blocks.



Racking equipment – prior to panel installation.



Commercial Carport Mounting



Residential Ground mounted system.



Pole mounted system – agricultural site.



Tracker Mounted Residential System: Courtesy Revision Energy