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Solar Ready, Climate Resilient: Best Practices + Recommendations for

SOLAR ZONING IN THE HUDSON VALLEY

HOW TO SOLAR NOW

BUILDING A SMART SOLAR FUTURE

ACKNOWLEDGMENTS

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INTRODUCTION

This "how to" guide sets forth a series of best practices and recommendations for developing and updating local zoning laws to facilitate smart solar energy system development at all scales in the Hudson Valley. It empowers communities to take advantage of their solar energy resources as they translate local policies and goals into clear, enforceable plans and regulations.

New York's energy grid is evolving to incorporate increasing amounts of renewable and distributed energy resources. State targets and programs to promote solar energy development at all scales—from residential rooftop and community solar projects to large, "utility-scale" facilities that sell electricity wholesale and interconnect to high-voltage transmission lines—will continue to incentivize solar in the Hudson Valley for the foreseeable future.

Local zoning laws play a critical role in siting local clean energy to meet renewable energy goals and rise to the challenge of the climate crisis. They directly influence the amount of solar energy that gets built. Increasing the supply of renewable energy is the path to meeting the region's energy needs and reducing greenhouse gas emissions that cause climate change. This shift to renewable energy is necessary not just to reduce emissions from energy production, but to electrify transportation systems and heating and cooling in the built environment—greater contributors to climate change than energy generation.

Municipalities in New York State have the authority to regulate solar projects less than 25 megawatts (MW) in size and to oversee their review and approval under applicable local laws and the State Environmental Quality Review Act (SEQRA). Generally, larger projects reviewed at the state level also must comply with local law.

Therefore, Hudson Valley municipalities should proactively enact or update zoning laws to regulate and guide development of solar energy systems. In this way, they will be in a "solar ready" rather than reactive position. Solar ready zoning promotes "smart from the start" solar energy system development that ensures the preservation of community character and natural resources while maximizing the economic, environmental and public health benefits of clean energy.

This guide is a companion to ***Clean Energy, Green Communities: A Guide to Siting Renewable Energy in the Hudson Valley*** (Scenic Hudson, 2018), which presents a strategic approach to renewable energy siting to reduce conflicts and promote successful development. Together, both guides support stakeholder decision-making in the interest of making the Hudson Valley a regional model and leader in responding to the climate crisis by promoting accelerated renewable energy development while simultaneously preserving important natural assets and community character.

1: BE PRO-SOLAR

RECOMMENDATIONS

- ✓ **Establish or update municipal solar policy to promote smart solar energy system development in line with community values and priorities.**
- ✓ **The policy should state clear support for smart solar energy system development.**
- ✓ **The policy should be included in a comprehensive plan or established by a resolution of the municipal legislature.**
- ✓ **To secure community-wide support, the policy should be established through a transparent process that provides opportunity for meaningful public input.**
- ✓ **The benefits and priorities to be achieved under the solar policy also should be included in the "purpose and intent" section of a solar zoning law.**

Solar energy systems convert sunlight directly into electricity without burning fossil fuels and the greenhouse gas emissions that cause climate change. As public interest in climate resiliency, environmental protection and energy independence grows, Hudson Valley communities are increasingly identifying— and prioritizing—solar energy system development to achieve all of these goals.

Embracing smart solar energy development is an integral part of an overall strategy for emissions reductions and economic development. A local policy that sets clear priorities around solar energy objectives sends the message that a community is open to the environmental and economic benefits it delivers.

Smart solar energy planning can also help to achieve energy justice and eliminate inequality in access to clean energy. An energy justice approach involves both eliminating the fossil-fuel based system and transitioning to clean, renewable energy, while ensuring that disadvantaged communities have equal access to clean energy and its environmental and financial benefits. Municipal leaders can use their land use planning authority to steer potential projects to sites that will benefit disadvantaged communities and find community support. Smart solar energy planning also ensures that solar energy systems are developed through a streamlined permitting process to lower barriers and costs.

Municipalities can update existing comprehensive plans to include a pro-solar policy. A comprehensive plan is a document that establishes development and land use goals for a community. It also identifies the actions and steps necessary to achieve those goals. A comprehensive plan lays the policy foundation for zoning, which in turn provides the regulatory standards and process for maximizing benefits while minimizing the impacts of development.

Alternatively, a municipality may choose to adopt a resolution setting forth its general policy on solar energy. This can be the first step in the development or updating of a solar zoning law. In the resolution, the municipal legislature can charge an existing board or an ad hoc solar zoning task force with creating or recommending new regulatory provisions that promote smart solar energy system development in the community. Either way, the policy should include a straightforward intent to promote smart solar energy development in pursuit of economic, sustainability and equitable goals.

Through either method, by setting a foundation for decision-making adopted through an open, public process, the policy can help avoid conflicts when individual projects are proposed.

☼ BEST PRACTICES

Cite the goals and benefits of pro-solar energy policy in the zoning law. These may include:

- Taking advantage of the solar resource
- Reducing air and water pollution
- Protecting public health
- Reducing greenhouse gas emissions and mitigating climate change
- Supporting state renewable energy goals
- Supporting local economic development and employment
- Supporting local clean energy production
- Reducing dependence on fossil fuel energy generation
- Increasing energy security and diversifying the supply of energy resources in the municipality and the state
- Decreasing energy costs for community residents
- Supporting customer choice in energy supply
- Promoting environmentally and economically beneficial solar development while preserving community character
- Maximizing the use of existing built infrastructure to site solar energy system development
- Optimizing use of areas prioritized for redevelopment or density development for solar energy production
- Promoting opportunities for co-location of existing land uses and solar energy development
- Providing opportunities for farmers to generate additional revenues while maintaining agricultural production
- Maximizing solar energy system deployment while avoiding and minimizing potential conflicts with other municipal goals, such as the protection and preservation of:
    - agricultural soils and productive farmland
    - forested areas and wildlife habitat
    - wetlands, waterways and water quality
    - historic resources
    - designated public scenic resources
    - community character

RECOMMENDATIONS

- ✓ **Review all relevant municipal plans and codes to assess how solar energy system development is currently regulated, if at all, and identify gaps and barriers to smart solar energy system development.**
- ✓ **Summarize results of this initial review in a written report to serve as the starting point for developing new regulations.**
- ✓ **As new law is developed, ensure that it does not contain any conflicts with existing provisions that can create ambiguities.**
- ✓ **Determine whether to develop a new, stand-alone code section to regulate solar energy system development or to integrate solar provisions into existing zoning and other local laws.**

This step is critical for identifying potential roadblocks to solar energy system development in current municipal plans and regulations. Regulatory barriers may include provisions for permitted uses, dimensional and development standards, and definitions that would restrict solar development as applied.

Following this exercise, new policies and provisions can be developed that focus on maximizing smart solar energy deployment while minimizing impacts. A written record of the items reviewed, as well as notes on their relevance and applicability to solar energy development, should be kept for reference during development of a new or revised solar law.

☼ BEST PRACTICES

Existing municipal plans and laws that should be reviewed include:

- The comprehensive plan
- Zoning law
- Zoning map
- Historic preservation codes
- Stormwater laws
- Floodplain regulation
- Agricultural protection plans and provisions
- Tree-clearing laws
- Steep slope or ridgeline protection provisions
- Open space plans
- Natural resources inventories
- Local Waterfront Revitalization Plans
- Any other existing and relevant local codes and documents

RECOMMENDATIONS

- ✓ **Provide clear definitions.**
- ✓ **Base definitions in the solar law on a combination of solar energy system type and use.**
- ✓ **Include definitions for all potential combinations of solar energy systems that the municipality plans to permit and regulate.**

To prevent misinterpretation and unintentional barriers to solar energy development, it is very important to establish clear and simple definitions for all of the different solar energy systems a municipality intends to regulate. These systems should be defined by a combination of their type and use.

The energy produced by solar energy systems can be used primarily on-site, primarily off-site or both. Under land use classifications, this means solar energy systems can be an accessory use, a principal use, or a secondary/co-principal use.

An accessory use is a use that is incidental to and customarily found in connection with the principal use of land. Today, residential rooftop solar installations as well as on-site systems to provide energy to commercial and industrial land uses meet this definition and should be encouraged under local zoning and building codes.

A principal use is the primary land use on a site. Since by definition it is the only use, this will always be a ground-mount system located by itself on a lot or parcel.

A secondary or co-principal use is another use on a parcel that is not subordinate or customary. Permitting this type of solar energy system can help promote innovative design, take advantage of opportunities to co-locate solar with existing land uses, and maximize the availability of clean energy. For example, a community solar project can be installed on the roof of an existing commercial or office building and not only provide its subscribers credit for energy generated, but also provide energy for the building's tenants.

Building-integrated systems are simply part of the use classification of the structure in which they are embedded.

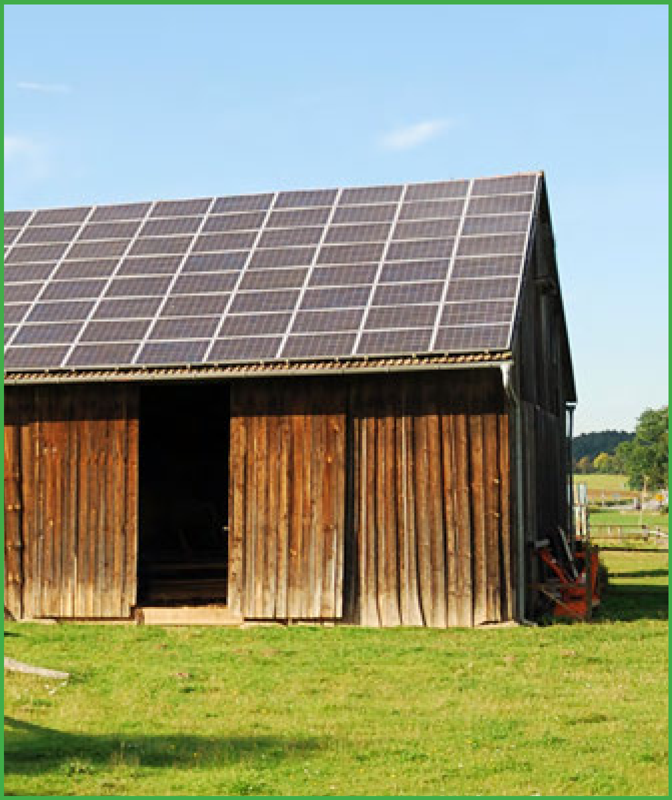
HOW TO SOLAR NOW

There are **three main types** of solar energy systems:

BUILDING-INTEGRATED SOLAR ENERGY SYSTEM
a solar energy system incorporated into a building envelope, such as roofs, skylights, windows and facades.

GROUND-MOUNT SOLAR ENERGY SYSTEM
a solar energy system structurally mounted or installed on the ground.

ROOFTOP-MOUNT SOLAR ENERGY SYSTEM
a solar energy system structurally mounted to the roof of a building or structure.



☼ BEST PRACTICES

Recommended solar zoning definitions, based on the combination of type and use:

- Solar energy system: A system, along with its components and subsystems, including any associated storage component that converts solar energy into electric energy suitable for use through semi-conductor (photovoltaic) materials.[1]
- Building-integrated solar energy system: a solar energy system incorporated into a building envelope, such as roofs, skylights, windows and facades.
- Rooftop-mount solar energy system: a solar energy system structurally mounted to the roof of a building or structure.
- Ground-mount solar energy system: a solar energy system structurally mounted or installed on the ground.
- Accessory use solar energy system: a rooftop-mount or ground-mount solar energy system that produces energy primarily for on-site use.
- Secondary/co-principal use solar energy system: a rooftop-mount or ground-mount solar energy system that is co-located with another use and that produces energy primarily for off-site use, but also may provide electricity on-site use.
- Principal use solar energy system: a ground-mount solar energy system that produces energy for off-site use and is the site's sole land use.

[1] Besides photovoltaic (PV), other types of solar energy systems that may be addressed in local land use law or building codes include solar thermal (hot water) systems, which include a solar collector and a heat exchanger (which transfers heat to another substance, i.e. water or gas) that heats or preheats water for building heating systems or other hot water needs, such as for residential or commercial purposes; and solar hot air systems, which use solar collectors to provide direct supplemental space heating by heating and recirculating building air. Concentrated solar power (CSP), which uses mirrors and lenses to concentrate sunlight, creating thermal energy and drive an engine (steam turbine) connected to a generator, is not generally used in the Northeastern U.S.

RECOMMENDATIONS

✓ **An understanding of the types and sizes of solar systems that are common in the New York solar energy market is critical to municipal planning and zoning for solar.**

Solar energy systems are modular and scalable and come in many different sizes to meet many different levels of energy needs. The size, type, and location of proposed solar projects are heavily influenced by several factors. These factors include: the intended user(s) of the energy produced; the price paid for the energy; additional financial incentives available to certain projects in different regions of the state and for different customer sectors; and the interconnection and permitting processes that must be followed for different types and sizes of projects. These factors result in several general system size "cut-offs" identifiable within the current New York solar energy market:

Up to 25 kW:

Such systems can be rooftop- or ground-mount, and are usually accessory uses. This cutoff is influenced by the availability of the New York Unified Solar Permit, which is applicable to projects of 25 kW or less.

Up to 750 kW[2]:

Such systems can be rooftop- or ground-mount, and may be accessory or secondary uses. This cutoff is influenced by financial incentives available in the upstate region under the NY-Sun Program administered by the New York State Energy Research and Development Authority (NYSERDA).

Up to 5 MW[3]:

Up to 5 MW : Such systems can be rooftop or ground-mount, with larger systems likely being ground-mount since system size is constrained by roof size. This cutoff also is influenced by financial incentives available under the NY-Sun Program, as well as compensation for energy produced by community solar projects (which are likely to fall within this size category). Projects above and below 5MW also are subject to different utility interconnection procedures that influence a developer's choice of system size.

Up to 20 MW:

These projects are most likely ground-mount principal use and are influenced by different levels of interconnection processes required by the New York Independent System Operator (NYISO) for wholesale solar energy generation projects above and below 20 MW.

Projects 25 MW or larger are subject to a State certification process.

This results in projects just below that threshold, sized to undergo local review, or projects 25 MW and larger. In addition, projects 20MW or larger may opt into the State review process. Either way, these projects are very large ground-mount principal uses, and provide wholesale energy to the grid. Current state law requires that proposals reviewed by the state must comply with applicable local laws unless those laws are unreasonably burdensome. It is in the best interests of communities to assess the potential for such large-scale solar development (20 MW and above) in their jurisdiction and adopt reasonable laws to ensure that local priorities are addressed in the state review process.

[2] Equivalent to 500 kW in AC rating.
[3] Equivalent to 7.5 MW in DC rating.

HOW TO SOLAR NOW

What is a **megawatt**, anyway?

Solar energy systems often are described by a number of "kW" or "MW." You may also see a project described by how much energy it can generate, measured in "kWh" or "MWh," or by how many homes it can power. For example, a typical 5 MW community solar project can power more than 800 homes in New York. What does that mean? And how do they figure that out?

The solar photovoltaic (PV) cells that convert the sun's energy into electricity are usually 6" by 6" squares. Typically, they are connected to one another in panels of 60, 72, 98 or even more cells. Different size panels are used for different applications—e.g., smaller panels for residential rooftop installations, bigger panels to supply energy to commercial or industrial users, and the largest panels for utility-scale wholesale power generation.

Solar panels are assigned a rating that indicates the amount of power they produce under industry-standard test conditions. This rating is expressed in kilowatts (kW). A watt (W) is a unit of power, and power is the rate at which energy is produced or consumed. 1,000 W = one kW; and 1,000 kW = one MW. A higher rating corresponds with more power production.

Solar photovoltaic cells produce direct current (DC) voltage, which must be converted to alternating current (AC) for delivery to the grid for use. The AC rating of a solar panel or system will always be lower than its DC rating because of losses associated with this conversion.

Solar panels are connected in arrays to build systems. A solar energy system includes the arrays and their racking or mounting system, as well as "balance of system" (BOS) components such as inverters (which convert the DC electricity produced by the panels into AC electricity), interconnection equipment and even batteries, which can provide storage or backup power.

Solar energy system size or "capacity" is also measured in kilowatts (kW) or megawatts (MW). Capacity refers to the electric power output for which a solar PV energy system is rated. As a general rule, the capacity of smaller solar energy systems is expressed in kW of DC. For larger systems, it is measured in MW of AC. Generally, the physical size of a system increases as its capacity increases. Large, ground-mount systems typically require 5-10 acres of land per MW.

Energy—measured in watt-hours (Wh), kilowatt-hours (kWh) or megawatt-hours (MWh)—is the power produced over time by a solar energy system. The actual amount of electricity produced by a solar PV system depends on many factors, such as the direction and angle of the panels and the amount of available sunlight. Higher-rated panels are necessary where sunlight is of more limited duration (such as in New York), as compared to sunnier parts of the country. Nevertheless, New York's potential for solar energy generation is great.

A solar PV system in the state will produce an estimated 1,200 kWh/kW/Year. According to the Solar Energy Industry Association (SEIA), based on an estimate of average annual electricity consumption per home in New York of 7 MWh/Home/Year, an average of 160 homes can be powered by a MW of solar energy. Therefore, a 5 MW community solar project is estimated to power 800 homes.

RECOMMENDATIONS

- ✓ **Identify preferred sites for solar energy development and assess development feasibility.**
- ✓ **Identify "land-sparing" opportunities for co-location of solar energy systems and beneficial re-use of previously disturbed areas.**
- ✓ **Identify low-conflict sites for larger ground-mount solar energy systems.**
- ✓ **Assess development feasibility of identified sites based on site topography and interconnection potential.**
- ✓ **Inventory existing and previously proposed solar energy system development.**
- ✓ **Identify potential areas and development sites for the various types of solar energy systems and record their location, size, adjacent land uses and applicable zoning district as a baseline for development of solar zoning.**

Conducting a municipality-wide review to identify preferred sites and assess their development potential for solar energy systems is another important step in planning how and where to permit solar energy development in a new or updated solar zoning law. This assessment should include (1) consideration of the kinds of solar energy systems that could be developed based on a knowledge of the market, (2) an analysis of the locations and areas where they could be sited, and (3) consideration of which types and locations are preferred.

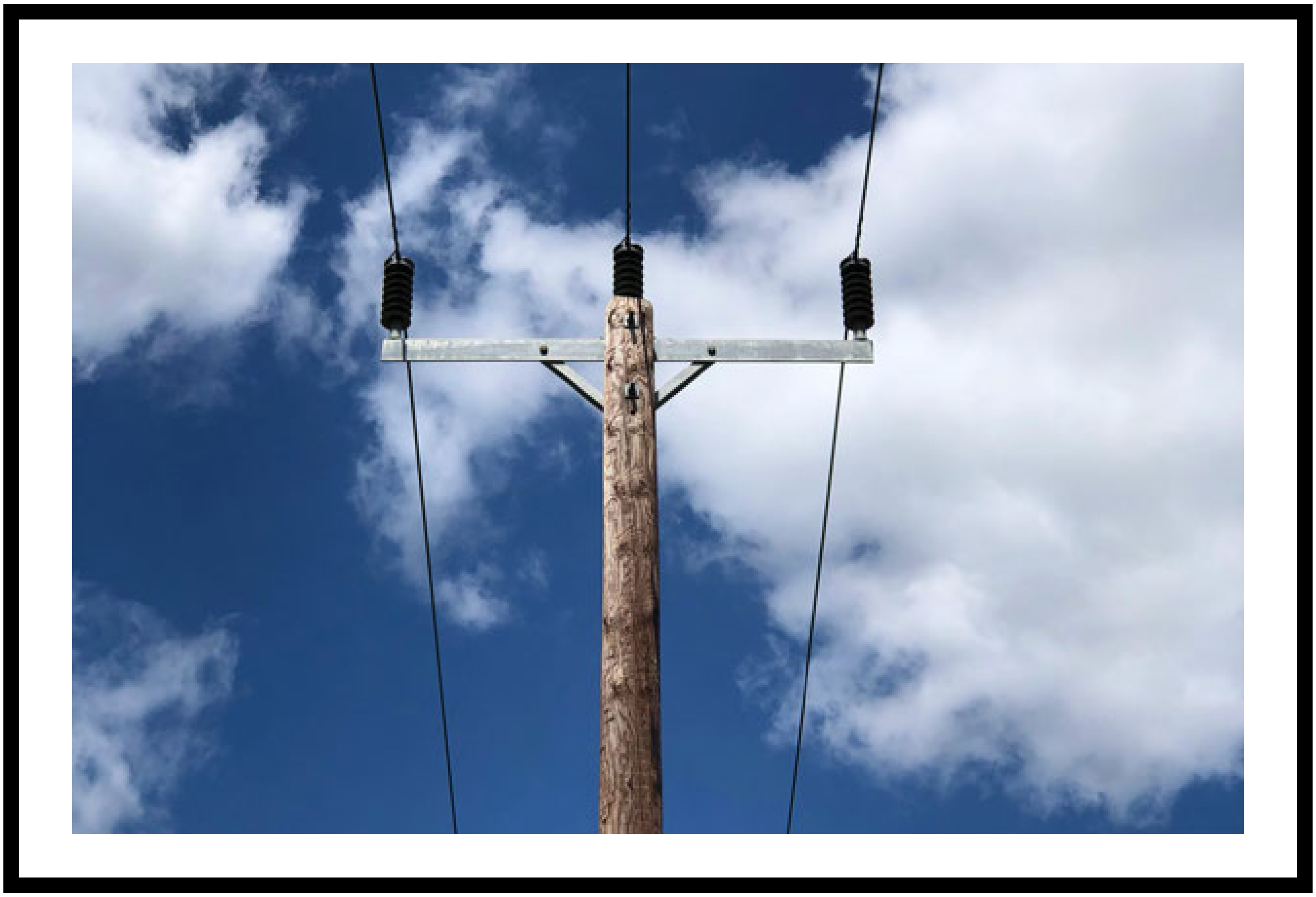
Solar energy system development should first be prioritized on rooftops of existing structures and previously disturbed areas in order to minimize conflicts and maximize opportunities for co-location. Using available on-line or other maps and data, a municipality may inventory the existing roof space and previously disturbed areas in its jurisdiction, including parking lots, brownfields and closed landfills. Installation of canopy solar on parking lots provides energy, shade for cars and can be paired with electric car charging stations. Previously disturbed sites or brownfields or other contaminated sites also can be good locations for renewable energy projects. The cleanup and reuse of contaminated or other previously disturbed properties for renewable energy generation can provide many benefits: preserving greenfields, reducing blight, raising property values and creating jobs. In addition, many of these sites are located near existing electric transmission lines and access roads.

In order to incentivize solar development, SEQRA designates certain solar energy projects located on previously disturbed areas as Type II actions, which are not subject to review. These include: (1) installation of solar energy arrays where such installation involves 25 acres or less of physical alteration on the following sites: closed landfills, brownfield sites, certain inactive hazardous waste sites, currently disturbed areas at publicly-owned wastewater treatment facilities and sites zoned for industrial use, and parking lots or parking garages; and (2) installation of solar energy arrays on an existing structure provided it is not listed on the National or State Register of Historic Places or located within a district listed on these registers or determined eligible for listing. Municipalities should consider whether the potential for these incentivized projects exists within their jurisdiction.

As much as possible, solar energy systems should be sited to avoid significant natural assets such as wetlands and water resources, prime agricultural soils, designated important wildlife habitat, and mature forested areas that provide critical habitat, migratory pathways, water quality benefits and significant carbon sequestration. Under these siting principles, an assessment of such environmental constraints is important to identify preferred sites for development of principal use ground-mount systems in particular. In addition to consideration of agricultural and natural resources, an inventory and map of important and formally designated visual resources and public scenic areas, as well as listed or eligible historic buildings and districts within the municipality, should be made to further inform decision-making on where and how to permit solar energy system development.

Favorable surface topography and aspect are threshold factors for identifying suitable sites for ground-mount solar energy development. Although racking systems for solar energy systems are designed to be flexible and array layouts can be designed to maximize efficiency for many different situations, in general the most ideal location for solar development is a flat, cleared site with a south-facing slope. Preferred and low-conflict sites should be assessed for their compatibility with these indicators.

Floodplains may be useful locations for solar energy systems, which can be designed to withstand flooding. These areas can present an optimal combination of surface topography, land area and land prices to support solar energy. Projects should be designed to ensure that any facility in a flood prone area will both withstand floods and will not result in any increases in erosion or flood heights or velocities. Design requirements would include elevation of the lowest edge of all PV panels, electrical service equipment and other structures above the flood water surface elevation; erosion protection; sufficient structural stability to withstand scour; flow-through fencing; and proper grading. Project layout should avoid impacts to important resources such as riparian habitat. Municipalities should assess existing floodplain regulations and solar development potential in these mapped areas.



Interconnection is one of the most important physical considerations and represents one of the critical fixed costs of a project. It is the process by which an electric generating facility is allowed to connect to and supply power to the grid. The grid includes both the bulk transmission of electricity and its distribution to end users. The bulk transmission system is made up of the high-voltage power lines that send energy from power plants to local substations, while the distribution system consists of the local poles and wires that send power to residential and business customers from the substations. System impact studies are required before a facility is allowed to tie into the electricity grid by utilities or the grid operator.

To be feasible, sites for distributed energy projects—such as a 5MW community solar project—must be near a 3-phase electric distribution line that has spare capacity and appropriate voltage. New York utilities (e.g., Central Hudson and Con Edison) have provided on-line hosting capacity maps that provide this information for developers and the public.[4] "Hosting capacity" is a utility's estimate of the amount of new distributed generation (DG) resources that can be connected to the grid without endangering its reliability or voltage quality for other customers, and without having to upgrade the system. As system size increases, the availability of sufficient capacity in the distribution lines to interconnect solar energy systems becomes critical.

Hosting capacity information, though intended for use by developers, can be a useful tool for informing local planning and zoning. Decision-makers can direct their planning efforts toward areas where solar energy system development is most likely, based on capacity in the distribution lines. NYSERDA expects projects in the 750kW to 5MW range (likely in the form of community solar) to experience the greatest growth in New York between now and 2025. For ground-mount projects in this range, at a rule of thumb of 5-10 acres/MW, municipalities should conduct an analysis to identify potential least-conflict sites of 2-50 acres with interconnection potential to the distribution system as informed by hosting capacity maps.

[4] The Department of Public Service maintains a webpage with links to utility hosting capacity maps and other resources. https://www3.dps.ny.gov/W/PSCWeb.nsf/All/6143542BD0775DEC85257FF10056479C?OpenDocument

In areas where hosting capacity currently is limited, upgrades may be made to increase capacity and open up sites to solar energy development. The State is currently undertaking a grid study to identify necessary upgrades to both distribution and transmission lines to achieve renewable energy targets. Therefore, municipalities should consider permitting solar energy development as an allowed use in certain otherwise capacity-constrained areas in order to encourage such upgrades and direct development to them. It is also important to understand that land use planning for solar energy takes place within the context of a complex and changing energy grid. In addition to zoning permissions and site constraints, different locations may present different levels of benefits (or impacts) to the electric system that will affect a proposed project's desirability and profitability.

For very large systems, the site must provide the opportunity for the infrastructure and connection necessary to step up the voltage to levels carried by transmission lines. "Utility-scale" solar energy facilities—i.e., large solar projects that sell energy wholesale directly to the grid—generally require connection to such high-voltage transmission lines through a new or existing substation. Such systems require sites that are of sufficient size (contiguous areas of available land with willing sellers at acceptable cost and terms) and topography (clear and unobstructed southern exposure), and are proximate to transmission lines that have sufficient capacity to handle the energy produced and enable developers to obtain the permits necessary to construct and operate the facility. Municipalities should conduct additional analysis to assess whether the potential exists for such large, "utility-scale" projects within their jurisdiction.

If data is available, a survey of all existing and/or proposed solar development would also be very helpful when considering where, how and whether to permit and encourage additional development.

6: REGULATE RIGHT

RECOMMENDATIONS

- ✓ **Align permitting requirements with potential land use impacts.**
- ✓ **Clearly identify the permits required for various kinds of solar energy systems in order to create a transparent and consistent development review and approval process.**
- ✓ **Require a building or zoning permit for any type of solar energy system.**
- ✓ **Adopt the Unified Solar Permit to regulate rooftop and ground-mount solar energy systems of 25kW or less.**
- ✓ **Require site plan approval for solar energy systems in cases where it is important to understand the arrangement, layout and proposed use of a site as compared to its current characteristics, and specify the elements relevant to solar energy systems that must be shown on site plans for approval.**
- ✓ **Require minor site plan approval for projects between 25 and 750 kW, and major site plan approval for projects greater than 750kW.**
- ✓ **Require special use permit approval for solar energy systems in cases where compliance with additional special use standards is necessary to ensure that the facility will not negatively impact adjacent land uses and community character.**
- ✓ **Consider whether to require a special use permit for ground-mount projects between 25 and 750 kW in more sensitive areas where it is important to ensure they are sited and designed to be compatible with their surroundings, such as in historic or low-density residential districts.**
- ✓ **Require special use permit approval for projects greater than 750 kW.**
- ✓ **Develop separate use-specific standards for solar energy systems that provide confidence to permit them broadly.**
- ✓ **Assess the potential for large "utility-scale" solar development (20 MW and above) in the municipality and adopt reasonable laws to ensure that local priorities are addressed in the state review process.**

The various types and scales of solar energy systems have different potential land use impacts. In turn, the level of impacts of each system should dictate the level of review required for approval and permitting. Projects with fewer impacts warrant a simpler, more streamlined permitting process, while larger projects should receive more scrutiny. To facilitate early information sharing in the review process, municipalities should hold pre-application meetings with solar developers.

Building-integrated systems do not create any additional land use impacts beyond those created by the structure into which they are incorporated. Rooftops provide space for solar development that does not increase impervious surface area or occupy “greenfields”; therefore, they generally have no or minimal land use impacts. The size of ground-mount systems is not constrained in the same manner as rooftop-mount or building-integrated systems. It can vary greatly, from one or a few solar panels to utility-scale facilities with multiple rows of arrays sited on many acres. Small, ground-mount systems used to provide energy to the principal use on a previously developed site can be expected to have minimal impacts, but they may necessitate more detailed review with increased size. Larger ground-mount and “utility-scale” solar developments can have significant land use implications. They typically require 5-10 acres of land per MW of capacity. Thus, rooftop and smaller-scale installations can be permitted in a more abbreviated process, while site plan and/or special use permit review will be appropriate for larger-scale projects.

There are several types of permitting processes available. The level of permitting required should align with potential land use impacts.

Building permit:
An approval that allows construction to proceed. Building-integrated solar energy systems are generally subject only to building and electrical code compliance.

Unified Solar Permit:
New York developed this model as a way for municipalities to expedite and streamline the permitting process for smaller solar energy systems meeting certain criteria. A municipality must pass legislation to adopt it. Among other requirements, eligible systems must: have a rated capacity of 25 kW or less; not be subject to review by a historic or architectural review board, or require a variance (or have already received one); and be mounted on a permitted roof structure, legal accessory structure or ground-mounted on the applicant’s property.

Site plan approval:
As defined by state law, a site plan is a “rendering, drawing, or sketch prepared to specifications and containing necessary elements, as set forth in the applicable zoning ordinance or local law, which shows the arrangement, layout and design of the proposed use of a single parcel of land as shown on said plan.” The purpose of requiring site plan review and approval is to ensure that a proposal meets development standards specified in the zoning code, including bulk and area limits, parking, signage, landscaping or other requirements.

Site plan review allows for consideration and approval of specific design features, which can be adjusted to mitigate potential impacts on neighboring land uses. The reviewing board may approve, approve with modifications or disapprove a site plan application. Under state law, the reviewing board also has authority to impose “such reasonable conditions and restrictions as are directly related to and incidental to a proposed site plan.” The need for a public hearing is up to the municipality, as provided in its code. A municipality can distinguish between minor or major site plan review depending on the size of proposed solar energy systems, and may consider adopting different procedures for each. The former can provide a more streamlined process for smaller systems likely to have fewer impacts, while the latter (including a public hearing requirement) would be appropriate for larger systems.

☼ BEST PRACTICES

Items that should be shown on a site plan set for a solar energy system include, as applicable:

- Property lines and physical features, including roads (if applicable) for the project site
- Zoning district designation
- Adjacent land uses on contiguous parcels within a certain radius of the site boundary
- Site grading, vegetation clearing, erosion and sediment control, and permanent stormwater control plans (if any)
- Large trees proposed to be removed
- Layout of the solar electric array, showing the number of solar panels on each roof face or in each ground-mount array, and including applicable setback and other bulk and area standards
- All other proposed site plan elements, including access roads, landscaping, lighting, signage and fencing
- An electrical diagram showing location of all solar energy system components, including solar panels, inverters, interconnection, disconnects and utility meter
- An equipment specification sheet documenting all proposed system components, including racking system details
- For roof-mount solar energy systems: structural/mounting details stamped by a professional engineer (PE) or registered architect (RA) as required by New York State law
- For ground-mount solar energy systems: an elevation drawing showing maximum height of system components
- For ground-mount solar energy systems: an operation and management plan, including specifications for mechanical and or/chemical vegetation management plans
- If applicable, location and layout of all energy storage system components
- Name, address and contact information of the project applicant, property owner, proposed or potential system installer, and proposed or potential system operator (where applicable)

Special/conditional use permit approval:
As defined by state law, this grants "authorization of a particular land use which is permitted in a zoning ordinance or local law, subject to requirements imposed by such zoning ordinance or local law to assure that the proposed use is in harmony with such zoning ordinance or local law and will not adversely affect the neighborhood if such requirements are met." The reviewing board also may impose reasonable restrictions and conditions as are directly related to and incidental to the special use permit. State law requires that the reviewing body hold a public hearing on the application. Special uses usually require review and approval of a site plan in addition to a demonstration of compliance with special use permit criteria. Standards and criteria may be developed for solar energy systems in addition to existing special use permit and site plan standards, or as a stand-alone set of standards that substitute for any existing regulations. These additional standards can help mitigate concerns over potential impacts on community character and avoid conflicts with other development priorities.

Recommendations for conditions and criteria related to addressing potential visual and community character impacts and the protection of agricultural resources, two common issues associated with solar energy system developments, are discussed below.

7: HAVE A VISION

RECOMMENDATIONS

- ✓ **Set solar energy system visibility standards based on potential impacts and public input.**
- ✓ **Allow rooftop-mount solar energy systems and co-located systems on previously disturbed sites (such as parking canopies) to be visible.**
- ✓ **Exempt rooftop solar energy systems from visual screening requirements otherwise applicable to rooftop installations such as HVAC, refrigeration or other mechanical systems.**
- ✓ **Encourage use of siting and design techniques to minimize visibility of ground-mount solar energy systems.**
- ✓ **If desired, align default screening requirements applicable to ground-mount systems with general landscaping requirements for other land uses.**
- ✓ **Do not require absolute screening of solar energy systems.**
- ✓ **Provide the reviewing agency with authority to assess potential visual impacts and impacts to community character from solar energy systems in special use permit review and to require additional screening and visual impact mitigation as a condition of approval in the case of significant adverse impacts.**
- ✓ **Adopt smart siting and design guidelines for rooftop-mount and ground-mount solar system installations on historic buildings and in historic districts to preserve historic integrity.**

One of the main objections to solar energy systems is their appearance—the perception that they are "ugly" or "industrial looking." Despite broad support for clean solar energy, many people say they simply do not want to see it. For others, however, it has become a symbol of sustainability, climate resiliency and energy independence. To them, its rapid proliferation demonstrates a commitment to reducing carbon emissions from energy production and to mitigating climate change.

The determination of how to treat the visibility of solar energy systems in a zoning law is a matter of municipal policy that should be informed by public input. Issues to be considered include:

1. Whether to allow certain solar energy systems to be fully visible;
2. How to address solar energy systems located on historic buildings or in historic districts;
3. Whether to require default vegetative screening requirements for ground-mount systems—and if so, what level of screening to require and what viewpoints (if any) to include in the requirements; and
4. What designated aesthetic resources and important community character values should be addressed through special permit conditions and environmental review.

Like permitting requirements, measures required to mitigate the visibility of solar energy systems should be related to the level of potential adverse impacts. Building-integrated solar systems have no visual impacts. Obviously, parking canopy systems, where viewers will be using the areas under and among the arrays, will be visible. A rooftop-mount installation on an existing building is not likely to create any additional physical or visual impacts that significantly diminish aesthetic value. Zoning regulations that require rooftop-mount solar energy systems to be screened from routine view from public rights-of-way can have significant impacts on the ability to mount or site them for efficient performance and make them costly. It is not necessary for municipal zoning codes to include a default vegetative or other screening requirement for rooftop-mount solar energy systems in the absence of any demonstrated significant and adverse aesthetic impact. In order to promote their development, the best practice is to allow building-integrated and rooftop-mount solar energy systems, as well as parking canopies and other co-located projects, to be visible.

Measures exist to avoid impacts from rooftop solar energy systems to historic districts and buildings, thus protecting their integrity and historic value. For systems on designated historic buildings or in historic districts—which can result in energy cost savings for these historic resources—*Clean Energy, Green Communities* recommends following installation guidelines from the National Park Service and National Renewable Energy Laboratory that mitigate any adverse impact on the resources' integrity. These guidelines recommend (among other things) using ground-mount panels sited to be inconspicuous, setting solar panels back from the edge of flat roofs, locating panels on a single roof in a pattern that matches its configuration, and ensuring that solar panels, support structures and conduits blend into the resource. Application of such design and placement techniques can achieve compatibility between the historic property and a new clean energy system.

However, for projects that remain visible, municipalities must decide whether to require some level of vegetative or other screening by default. In developing code requirements, the impacts of provisions—such as placement and screening requirements—should be carefully considered because of their potential to restrict solar collection. Although the solar resource in the Hudson Valley is good, the efficiency of panels installed in the Northeast will already be less than elsewhere in the U.S., such as the Southwest. Severe or complete restrictions on a solar installation's visibility can affect its functionality and affordability.

Small, accessory ground-mount solar systems are particularly susceptible to overly restrictive screening requirements. As long as applicable bulk and area requirements are met, additional screening should not be required because it can cause shading and impact the system's efficiency. Likewise, requiring measures to completely screen ground-mount projects from view of every road and neighboring property line may be unduly restrictive. It adds to the cost, may cause shading and can prohibit their installation altogether. If a municipality determines that some level of visual screening is necessary for ground-mount solar energy systems by default, the best practice is to impose landscaping or screening requirements similar to those for other land uses.

Municipalities can provide reviewing agencies—e.g., planning and zoning boards—with express authority to assess the potential visual impacts of proposed solar energy projects and act to protect important public scenic resources and community character or places where the view contributes to the integrity and identity of a historic site. In the case of demonstrated significant adverse impacts to designated aesthetic resources or community character, additional vegetative or other screening requirements can be imposed by a reviewing agency through special permit conditions and/or SEQRA. As always, if demonstrated significant adverse impacts are not mitigatable, the reviewing agency may deny an application.

Designated **aesthetic resources**

Robert Rodriguez, Jr.

Designated aesthetic resources include those identified for their beauty through a local, state or federal process and formally recognized as a matter of public record. According to state policy, an aesthetic impact occurs "when there is a detrimental effect on the perceived beauty of a place or structure." A significant aesthetic impact causes a "diminishment of the public enjoyment and appreciation of an inventoried resource, or...impairs the character or quality of such a place."

Community character is the sense of place that defines an area. It is made up of man-made and natural features, visual aspects and landscapes, existing buildings and structures (and their uses), and current activities, services and policies. Community character may be impacted by:

- Significant changes to the visual aspects of an area
- Development of different scale, or in sharp contrast to the existing built environment, resulting in increased odors, lights, noise or traffic
- Significant new demand for public services
- Loss of designated public resources
- Removal or change to significant portions of the natural landscape (both in terms of size and importance to the community)

Negative impacts on important scenic resources or community character from ground-mount solar energy systems can be minimized or mitigated substantially through sensitive siting, design and attention to an installation's aesthetics. Techniques such as keeping facility components at a low profile; using natural topography, screening and setbacks; and locating projects in areas of low scenic value can be used to reduce or eliminate the visibility of ground-mount solar energy projects.

RECOMMENDATIONS

- ✓ **Align agricultural protection policies with solar energy development.**
- ✓ **Use definitions in local agricultural protection provisions that are consistent with SEQRA guidance, NY Agriculture & Markets Law, and federal law.**
- ✓ **Encourage siting and design of solar energy systems to avoid, minimize and mitigate impacts to agricultural lands to the greatest extent practicable.**
- ✓ **Require site plan/special use permit applications in agricultural lands to identify Prime Farmland and Farmland of Statewide Importance on the site plan.**
- ✓ **Adopt appropriate special use conditions to mitigate impacts to agricultural lands.**
- ✓ **Adopt provisions that require incorporation of the most recent version of the NYSDAM Guidelines for Solar Energy Projects – Construction Mitigation into development plans and applications for approval of solar energy systems sited on agricultural lands.**
- ✓ **Promote installation of solar energy systems for on-farm use, and encourage situations that support agriculture and solar energy production simultaneously.**

Both solar energy systems and farms are best sited on flat, open lands with great amounts of solar insolation. Although statistics show that if less than 1% of the world's agricultural land was converted to solar panels it could power the globe, project-specific conflicts may arise when facilities are proposed in current or former agricultural lands. Municipalities concerned about potential impacts to their agricultural lands should adopt zoning to help align agricultural protection policies with solar energy system development. *See the Appendix for a discussion of federal and state agricultural protection policies*.

Zoning provisions for agricultural resources can be designed to address—and avoid or mitigate—the potential impacts to agricultural lands, such as loss of prime or important agricultural soils, loss of local productive capacity, fragmentation of farmland, and impacts on adjacent and/or surrounding agricultural practices. In developing regulatory provisions meant to optimize farmland protection while promoting solar energy development, a municipality should engage with the community—especially farmers—and consider the following:

1. Does the community have an existing farmland and agricultural protection plan?
2. Is farmland already under pressure and being reduced in the area?
3. Will loss of farmland change community character?
4. Would the community seek to prevent other types of development on this land; if not, why should it treat solar energy development differently?
5. To what extent does agriculture support the local economy?
6. Could incorporation of solar energy systems for on-farm use and/or energy generation for sale help support agriculture in the community?

Solar energy systems do not necessarily pose the same level or type of risk to agricultural lands and practices as new residential or commercial development. Low-impact solar development methods can minimize grading and soil compaction. The soil beneath panels may even improve, depending on system design, and help increase the possibility of resuming agricultural activities following the life of the solar facility. In this way, solar energy systems are differentiated from other land uses and development, such as residential or commercial, which result in the permanent conversion of farmland and loss of agricultural soils. Finally, municipalities also should require that a decommissioning plan address the potential return of the land to agricultural use.

Solar systems can be sited, designed and laid out to comply with site assessment and soil identification standards in order to protect or minimize impacts to prime farmland and agricultural activity. They can be located on areas of poor soil quality, fallow fields or unused portions of farms. To help make such design decisions, agricultural soils maps for the site of a proposed solar energy system should be included as a required element of a site plan set.

Solar energy projects need not always displace agricultural uses on a site or irreversibly take up valuable farmland. If properly sited, designed, constructed and operated, solar facilities in agricultural areas can provide support for nearby pollinator-dependent crops, furnish an income stream for farmers to continue farming on other lands, and even allow for co-location of energy and agricultural production. The potential exists for combining solar projects with agricultural operations. “Agro-photovoltaics,” “dual-use farming,” or “co-location” of solar energy and food production is becoming more viable and desirable.

Studies demonstrate that such practices, while they result in slight reductions in production for each commodity individually, actually result in an increased efficiency for a piece of land as a whole. Crops grown under solar panels help reduce temperature and increase panel efficiency, do better due to partial shading (rather than being in direct sun), require less water and are protected from frost. In addition, solar energy systems can be compatible with grazing activities by providing shade and cover for livestock. However, no policies or financial incentives currently exist in New York to help mitigate the additional costs of installing systems that can accommodate both agricultural and energy production. Municipalities should consider how to incentivize their co-location at the local level, both through zoning requirements and in the project review process.

Solar systems can include native vegetation and plants beneficial to pollinators beneath the panels, improving the health of bees and other species threatened by habitat loss, pesticides, poor nutrition, disease and other factors. Insects and birds attracted by the vegetation under solar farms in turn benefit nearby pollinator-dependent crops. In addition, use of native vegetation helps with controlling stormwater and erosion. Municipalities can encourage solar energy system development that demonstrates a benefit to adjacent agricultural locations, such as use of pollinator-friendly vegetation. New York has a Pollinator-Friendly Solar Act, however it currently contains no standards. Municipalities may use resources from other states with robust pollinator and solar programs, such as Vermont and Minnesota, to help inform seed mixes and treatment of vegetated areas in and among proposed solar arrays.

Finally, revenues from solar development on one part of a farm can make it possible for a farmer to continue operations on the remainder of the property. In the face of shrinking profits and increasing farm bankruptcies, some farmers see leasing a portion of their lands for solar energy system development as a way to diversify and guarantee a certain amount of income.

☼ BEST PRACTICES

Examples of special use permit criteria for solar energy systems proposed on agricultural lands include:

- Will not impose significant negative impacts on surrounding agricultural uses
- Will not impose significant negative impacts to remaining on-site agricultural operations
- Will not result in unnecessary soil erosion or loss that could limit agricultural productivity
- Will not result in unnecessary soil compaction that reduces agricultural productivity resumed after the life of the solar energy system
- Will not result in the spread of noxious weeds or invasive species
- Will not destabilize agricultural land use patterns in the larger area.

RECOMMENDATIONS

- ✓ **Allow solar energy systems broadly, subject to appropriate permitting requirements, conditions and development standards**
- ✓ **Clearly identify the zoning districts in which solar energy systems are allowed, as well as the kinds of solar energy systems allowed in each district.**
- ✓ **Allow building-integrated solar energy systems in all zoning districts, subject to relevant building and electric code requirements.**
- ✓ **Allow rooftop-mount solar energy systems as accessory and co-principal/secondary uses in all zoning districts, subject to any additional standards for historic districts and buildings, and site plan review depending on system size.**
- ✓ **Allow ground-mount solar energy systems as accessory uses in all zoning districts, subject to the Unified Solar Permit, site plan, or site plan plus special use permit review depending on system size.**
- ✓ **Allow accessory use ground mount solar energy systems on the same lot as the principal use, and on adjacent lots for extra flexibility.**
- ✓ **Allow ground-mount solar energy systems as co-principal/secondary uses in a broad range of appropriate districts, subject to site plan or site plan plus special use permit review depending on system size.**
- ✓ **Allow ground-mount solar energy systems as principal uses in appropriate districts, subject to site plan or site plan plus special use permit review depending on system size.**

To maximize development of responsibly sited and designed solar energy systems, the different kinds and sizes of solar energy systems should be allowed broadly, subject to appropriate permitting review and development and use conditions.

Municipalities should maximize situations where as-of-right development is allowed—such as for building-integrated, roof-mount, small ground-mount systems, and parking lot canopies or other low-impact configurations. Allowing small rooftop- and ground-mount solar as a use permitted as-of-right and/or as designated permitted accessory uses subject to a minimal permitting process in all zoning districts will encourage their development. In addition, streamlining the approval process will reduce a municipality's staff time and resources, and minimize soft costs for developers.

A larger, ground-mount principal use system, which has the potential for more impacts or is located in a more sensitive zoning district, can be allowed as a special use. However, these systems do not cause the noise, traffic or pollution associated with typical regulated industrial or commercial uses that would mandate permitting them only in such districts. Therefore, limiting large-scale solar energy systems to industrial and commercial zoning districts does not make sense—they do not need water or sewer connections or access to major transportation infrastructure, and available properties in these districts are likely urban, small and expensive.

Solar energy systems are also unlike traditional fossil fuel power plants, which require substantial amounts of water for steam turbines as well as parking and traffic accommodations for on-site personnel and fuel delivery via truck, rail or pipeline. Once constructed, solar facilities are relatively quiet and non-polluting, and they generally have no on-site employees—all of which makes them more compatible within residential districts or other areas where land use with a minimum of impacts and service needs makes sense. Municipalities should carefully consider which types of solar energy systems should be deemed as special uses and must obtain special use permits. Such a requirement may unnecessarily discourage smaller projects by imposing additional cost and time through public hearing and other obligations.

BEST PRACTICES

To determine where solar systems should be allowed, first review the purposes of each existing zoning district—e.g., residential, commercial, industrial or agricultural. Next, examine existing and planned land use patterns in those districts, and then assess where and what kinds of solar energy systems are compatible with those purposes and patterns. To make this determination, policy makers should be familiar with the different kinds of solar energy systems and their potential land use impacts. A final decision on where to allow solar energy systems should be informed by the assessment of preferred sites and their development potential.

To permit certain solar energy systems in an area smaller than an entire existing zoning district—or across zoning districts—municipalities may consider use of an overlay zone. An overlay zone is a zoning district that is applied over one or more existing zoning districts, establishing additional or stricter standards and criteria for covered properties in addition to those of the underlying zoning district. Typically, the uses permitted by an overlay zone are subject to use-specific standards in addition to those for the underlying district. A "solar overlay" could be a way to add certain solar energy systems as an allowed use in designated portions of the jurisdiction. If an overlay zone is established, be sure to review the underlying district standards and clarify those that remain applicable.

Another potential zoning tool for allowing solar energy systems, subject to additional scrutiny, is through a floating zone. A floating zone is a zoning district that delineates conditions that must be met before that zoning district is approved and applied to an existing piece of land. Floating zones can be used to plan for future land uses that are anticipated or desired, but are not confirmed. This tool, which requires a site- and project-specific action by the municipal legislature, may be appropriate for the largest size solar energy systems.

RECOMMENDATIONS

✓ **Set dimensional standards that provide an appropriate and flexible building envelope for various kinds of solar energy development**

Bulk regulations are the combination of controls (lot size, floor area ratio, lot coverage, open space requirements, yards, height limits and setbacks) that normally determine the maximum size and placement of a building on a site. They also regulate density and discourage overcrowding. Solar energy system development is distinct from traditional land use development, which consists mostly of buildings and associated infrastructure (parking lots, water and sewer connections, access roads). If overly restrictive as applied, traditional dimensional standards can impede solar development, which requires flexibility in layout and design to maximize efficiency and financial viability.

To work properly, solar PV energy systems need access to sunlight, optimum positioning (south and tilted at an angle), and airflow to moderate temperatures and maintain efficiency. As a best practice to promote solar, municipalities should offer exemptions from existing bulk and area requirements in the underlying zoning district and/or create permissive provisions specific to solar energy systems. More restrictive standards can be applied in more sensitive areas, such as dense residential zones or historic districts.

At a minimum, set area and bulk standards for the various types of solar energy systems that align projects with existing development standards, and do not impose more restrictive requirements than those applicable to other development in a district.

ROOFTOP-MOUNT SOLAR ENERGY SYSTEMS

RECOMMENDATIONS

✓ **Do not impose height restrictions for rooftop solar energy systems on pitched roofs beyond underlying building height restrictions.**

✓ **Avoid requiring the flush-mounting of installations on flat roofs, exempt rooftop-mount solar from existing building height restrictions, and/or provide for additional height allowance for systems on flat roofs.**

✓ **Align any roof coverage requirement with fire code setback requirements.**

All rooftop-mount solar energy system installations need space between the roof and solar panels to allow for air circulation and cooling. These systems will be required to comply with all applicable construction codes—including building, electric, plumbing and fire—which may already impact system dimensions. In general, rooftop solar systems on pitched roofs will not exceed the height of the roof because of the need for adequate setback from the ridgeline to prevent wind loading. Solar panels installed on flat roofs must be tilted to be efficient, and can be double-sided to collect energy reflected off the roof itself. (This may require additional height.) Building height restrictions can prevent installation of flat rooftop-mount systems if the roof is already at maximum allowed height and an exception is not allowed.

GROUND-MOUNT SOLAR ENERGY SYSTEMS

HEIGHT_ RECOMMENDATIONS

- ✓ **Avoid an overly restrictive height restriction for smaller, accessory ground-mount systems. State resources suggest a height allowance of at least 10 feet for residential systems and 15 feet for systems supporting commercial, business and industrial uses.**
- ✓ **Consider a height limit of at least 20 feet for larger ground-mount systems, and provide an exemption for canopy systems.**

Ground-mount accessory systems for residential use are likely to be constructed using smaller solar panels. Nevertheless, existing height restrictions as applied to accessory solar energy system structures may be overly restrictive if an exemption is not provided. Parking canopy solar systems must be permitted at a height to allow clearance for emergency vehicles, snow plows, etc. Likewise, canopy solar systems co-located with agricultural uses must be high enough to maximize plant growth and/or allow for grazing animals or farm equipment to fit beneath them. Larger ground-mount systems for commercial and industrial users, built as secondary uses or constructed as principal use systems, are likely to use larger solar panels and may include tracking systems. Therefore, they will require height allowances that ensure maximum efficiency. State resources suggest a height allowance of at least 10 feet for residential systems; 15 feet for systems that support commercial, business and industrial uses; and 20 feet for larger or "utility-scale" ground-mount systems.

SETBACKS_ RECOMMENDATIONS

- ✓ **Avoid applying principal building setbacks to accessory ground-mount solar energy systems.**
- ✓ **To encourage the development and use of accessory ground-mount solar energy systems, allow a modest encroachment into the setback and exempt solar from counting toward accessory use maximums, if they exist.**
- ✓ **Apply the same standards and criteria—i.e. setbacks and yard placement requirements—for all other permitted accessory uses to accessory use ground-mount solar energy systems, or consider allowing exemptions to encourage accessory solar energy systems.**

Setbacks are usually established to mitigate aesthetic, noise and sometimes safety concerns, and to minimize impacts on adjacent properties. Photovoltaic solar panels are constructed of glass (silicon) and common metals such as aluminum and copper wiring. With the exception of certain technologies, such as thin-film solar products, they do not contain potentially toxic substances. In their manufacturing and operation, solar facilities (including fencing requirements) are subject to electrical and safety standards. There are no significant electromagnetic field (EMF) impacts associated with solar systems. They generate EMF at levels similar to household appliances at close proximity, and it dissipates with increasing distance, posing no health risk to neighboring uses.

Inverters generally produce the only noise in a solar system—at a level of 45 decibels at 10 meters, slightly less than a refrigerator. Solar installations that move to track the sun also can generate a low level of noise, but it is rarely audible above ambient sounds outside the facility's fenced area.

Solar panels need to absorb light in order to convert it to energy. To maximize absorption, they use non-reflective glass, which makes solar panels generally less reflective than water or windows. If concerns arise that a particular system may cause glare at certain times of the day or year, a glare analysis can be conducted during a project-specific review.

Municipalities should establish setbacks that help alleviate such concerns, but are not so restrictive that they limit the places where solar energy systems can be sited. Reducing existing principal and accessory use setback requirements can help to ensure sufficient access to sunlight, especially for ground-mount systems. Excessive front yard setbacks can result in issues for physically connecting a solar energy system to distribution lines located along roadways. They may even make it necessary to erect a large number of new utility poles, resulting in significant visual impacts. Municipalities should consider providing for flexibility in the review process in establishing setbacks for larger ground-mount systems.

LOT COVERAGE_ RECOMMENDATIONS

- ✓ **Exempt accessory ground-mount solar from lot coverage restrictions that apply to buildings and impervious surfaces.**
- ✓ **Exempt ground-mount systems from lot coverage/impervious surface calculations as long as the ground beneath them is maintained as pervious.**
- ✓ **Require larger ground-mount systems to comply with existing stormwater control requirements as assessed during the review and approval process.**

Lot coverage maximums limit how much of a lot's area can be built upon. It is often defined by the amount of impervious surface created. Impervious surface is the hard, man-made surface coverage that prevents water infiltration into the ground. Lot coverage limitations are generally meant to limit both development density and stormwater impacts. As noted previously, rooftop-mount solar energy systems do not add to impervious surface. Ground-mount solar energy systems do not completely cap the ground, so they do not prevent water absorption. The racking for ground-mount systems usually consists of steel beams or ground screws driven into the earth. In situations where the ground cannot be penetrated, such as on landfills, a ballast system is used. Parking lot canopy systems are supported by reinforced concrete foundations.

Ground-mount accessory solar energy systems are distinct from other accessory uses, such as buildings or sheds, because stormwater will continue to infiltrate the uncompacted and vegetated ground beneath them. Therefore, accessory ground-mount systems should not be included in the underlying lot coverage or impervious surface calculations as long as the ground under the system is pervious (e.g., grass or other vegetation). To limit barriers to installation, municipalities should consider exempting accessory ground-mount solar systems from counting as impervious coverage because it would prohibit them on properties that have already met or are close to the allowed impervious coverage limit.

Larger, secondary- and principal-use ground-mount systems likewise do not prevent stormwater infiltration. However, rain that falls on solar panels will run down to the dripline and eventually fall to the underlying surface, potentially causing localized erosion and/or scour in certain heavy rain events. Access roads for such facilities can and should be made pervious. The main source of impervious surface at ground level will be the concrete pads supporting the inverters; however, this area will be considerable only in the largest projects. Both the construction and operation of large ground-mount systems will be subject to erosion, sediment control and stormwater management requirements. A project that does not result in significant amounts of permanent impervious surface or changes to site hydrology will not require post-construction stormwater management, but may nevertheless require erosion and sediment control practices during construction, depending on the amount of site disturbance.

LOT SIZE_ RECOMMENDATIONS

✓ **If lot size requirements are imposed, set them in relation to decisions made regarding how and where to permit the various kinds and sizes of solar energy systems expected in the market and their space requirements.**

Minimum or maximum lot size requirements are another common methodology used in zoning laws to regulate density of typical land use development. Setting a restrictive maximum lot size can unintentionally prohibit development of principal use ground-mount solar energy systems in a community. Likewise, a very large minimum lot size will limit the number of available sites and kinds of projects that are financially feasible. To provide flexibility and innovation in solar energy project development, such restrictions should be avoided. If lot size requirements are desired, they should be set by applying the rule of thumb that ground-mount solar energy systems typically require 5-10 acres of land per MW to the typical sizes of projects in the New York market, and the types of projects the municipality both wishes to promote and can host.

RECOMMENDATIONS

✓ **Impose reasonable decommissioning and restoration requirements for solar facilities**

✓ **Solar regulations should require a decommissioning plan for larger solar energy systems—i.e., those for which it requires site plan and/or special use approval. The plan should include:**

- >> **Information and plan for the facilities and structures to be removed**
- >> **Information and plan for any facilities to remain in place**
- >> **A restoration plan to return the site to desired condition for another use**
- >> **A schedule for decommissioning and restoration**
- >> **Protection plans for soil, disturbed areas and surface water during decommissioning and restoration**
- >> **A waste stream management plan**

✓ **Municipalities should consult with legal counsel on whether to require a financial security for decommissioning and/or restoration at the time of permitting**

Solar energy systems are expected to have an operational lifespan of 20-40 years, after which the aging panels will no longer be efficient. (Solar panels can be almost entirely recycled at the end of their productive life; the Solar Energy Industries Association recently launched a national solar panel recycling program.) Decommissioning refers to the removal of project structures, while restoration or reclamation refers to activities used to return the site to pre-disturbance conditions. Decommissioning may occur when a solar energy system is formally shut down or otherwise ceases operation.

Even with loss of efficiency, facilities may still produce enough energy to justify their continued operation. Additionally, the panels on obsolete systems may be replaced, extending an existing system's lifespan. As technology improves, new systems will likely remain in operation longer. All of these factors make it difficult to determine whether and when a solar energy system may need to be decommissioned. By requiring a decommissioning plan as part of the review and approval process, municipalities can be fully prepared. In addition, municipalities should consult with legal counsel on whether to require a financial security for decommissioning and/or restoration at the time of permitting.

12: BE SOLAR READY

RECOMMENDATIONS

- ✓ **Include solar access and solar ready design requirements to maximize active and passive solar opportunities**
- ✓ **Include solar ready concepts in zoning and subdivision ordinances, such as lot size and orientation requirements, to enable new development to maximize passive and active solar opportunity.**
- ✓ **Consider providing incentives in zoning and subdivision codes to encourage private investment in solar systems for new development projects.**
- ✓ **Consider mandating solar ready construction, and that some or all new buildings must include solar energy systems**

Solar access is the unobstructed access to direct sunlight on a lot or building through the entire year, including access across an adjacent property's air rights, for the purpose of capturing direct sunlight to operate a solar energy system. If there are no solar access protections in place, a site's existing and future solar potential may be reduced or eliminated by trees, new buildings or other obstructions. Many existing buildings are rendered unsuitable for solar because of their size, orientation or rooftop configuration. Existing development regulations can unintentionally limit a property owner's ability to install a solar energy system. Furthermore, the solar resource may be physically blocked by buildings or trees on adjacent properties.

Encouraging and prioritizing solar ready buildings, lots and developments is an easy and low-cost way to ensure that future buildings and communities will be well-suited for active and passive solar elements and ready to maximize their solar potential. This will make it easier and more cost-effective to utilize passive solar techniques and adopt active solar technologies in the future. Thoughtful subdivision and site plan standards can help to ensure that solar access is protected for existing and future solar energy systems.

A community can include solar site design provisions in subdivision or site plan requirements to ensure that any future development is optimally laid out for solar. For example, the provision could require that buildings be constructed with southern exposures and street and lot orientation on an east-west axis, ensuring adequate sunlight access. Requiring proper lot and building orientation to maximize passive solar design in new developments is a low-cost way to ensure that new construction is well-suited for solar energy development and energy efficiency. Municipalities also may adopt incentives such as fee waivers, density bonuses (which allow the development of additional lots or square footage if the applicant guarantees installation of solar energy systems on each new residence or building), or reduction in minimum parking requirements to encourage solar energy system accommodation. Municipalities also can sanction the use of solar easements, which are voluntary agreements that allow property owners to protect their access to sunlight by limiting the height or location (or both) of trees or permissible development on a neighboring property.

Going a step further, municipalities can require a certain percentage of homes or buildings in new developments to meet some or all of their energy needs with active solar energy systems. Legislation requiring that all new development include solar energy systems have been enacted in California and Massachusetts.

Federal And State Agricultural Protection Policies

Numerous federal and state policies that protect and promote agriculture are relevant and applicable to solar energy system development.

Natural Resources Conservation Service (NRCS) Soils Classification

In the interest of preventing impairment of American agriculture, the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture (USDA) keeps a current inventory of the country's prime and unique farmland, so its extent and location is mapped and known. In New York, three farmland classes are recognized: Prime Farmland, Prime Farmland if Drained and Farmland of Statewide Importance.

As defined by federal code, *Prime Farmland* has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops, and is available for these uses—i.e., not developed. *Prime Farmland if Drained* meets all of the criteria of Prime Farmland except for the depth to its seasonal high water table. *Soils of Statewide Importance* do not meet the Prime criteria, but exhibit other designated land capabilities. These are considered "highly productive soils" and correspond with Mineral Soil Groups 1 to 4 as identified by the New York State Department of Agriculture and Markets. Soil maps for New York include information on these classifications to help inform decision-making that may impact farmland soils.

Agricultural Districts

In New York, agriculture also is protected and encouraged under the Agriculture & Markets Law (AML) through creation of Agricultural Districts designated in a state and county nomination and adoption process. Landowner incentives and protections available within Agricultural Districts help keep land in farming and prevent its conversion to non-agricultural uses. In Agricultural Districts, installation of solar energy systems that provide electricity for on-farm use are considered "farm equipment" and warrant a minimal and streamlined approval process. Agricultural Districts established under state law are distinct from local zoning districts that may be classified as agricultural.

State Environmental Quality Review Act Impact Assessment

SEQRA review includes an evaluation of potential impacts on agriculture for any kind of proposed action. Actions above a certain size threshold and located partially or fully within an Agricultural District are classified as Type I: They require preparation of a Full Environmental Assessment Form (Full EAF). For proposed actions that do not meet Type I criteria and are classified as Unlisted, the Short EAF may be used and also requires information on whether agricultural land uses occur on or near the site. If the site of a proposed action is located fully or partially within an Agricultural District, or agricultural lands consisting of highly productive soils are present, this information must be included on the Full EAF. Municipalities may require use of the Full EAF for Unlisted Actions.

Under SEQRA, guidance from the New York State Department of Environmental Conservation (NYSDEC) states that "agricultural lands" are those that "currently have, or have had within the past 5 years, active agricultural activity on them." NYSDEC also states that "highly productive soils" include Prime Farmland and Farmland of Statewide Importance. The Full EAF also provides for assessment of whether the proposed action may impact "agricultural resources," defined as "the land and on-farm buildings, equipment, manure processing and handling facilities and processing and handling facilities that contribute to the production, preparation and marketing of crops, livestock and livestock as a commercial enterprise, including a commercial horse boarding operation, a timber operation, compost, mulch or other biomass crops, and a commercial equine operation" by the AML. These definitions, as recommended by NYSDEC, can be incorporated into zoning code provisions that address agricultural protection to provide consistency between the SEQRA review process, the AML, and federal and local laws.

To assess the potential agricultural impacts of a proposed action, the Full EAF requires evaluation of whether:

- Highly-productive soils will be taken out of agriculture and converted to non-farm use
- Access to agricultural land will be limited
- Soils on active agricultural lands will be excavated, removed or compacted
- Agricultural land will be irreversibly converted to non-agricultural uses
- Agricultural activities will be disrupted
- The proposed action will increase development pressure on other farmland

Municipalities reviewing solar energy system proposals under SEQRA should use these standards to determine the significance of potential impacts. Under SEQRA, agencies must choose alternatives that avoid or mitigate such impacts to the greatest extent practicable.

NYS Department of Agriculture and Markets (NYSDAM) Guidelines for Solar Energy Projects –

Construction Mitigation for Agricultural Lands

The New York State Department of Agriculture & Markets (NYSDAM) has issued guidelines that apply to solar energy projects when there is ground disturbance within agricultural lands, including areas both "inside the fence" (where agricultural use may recommence after decommissioning of a solar energy project) and "outside the fence" (where agricultural use will continue or resume after construction of a solar energy project). These guidelines, which must be incorporated into project plans and applications, include requirements for:

- Hiring an environmental monitor
- Construction, including treatment of topsoil
- Building of access roads, trenching and fencing
- Post-construction restoration in areas where agricultural use will continue or resume
- Monitoring and remediation over a complete growing season
- Decommissioning

The guidelines are updated periodically. Municipalities can require compliance with the most recent version of the NYSDAM guidelines as a condition of site plan/special use permit approval.

Agriculture & Markets Law (AML) § 305(4) Review

The AML requires that before NYSERDA advances any funds under the NY-Sun Program to support a proposed solar energy project in an Agricultural District, it must provide notice to NYSDAM and certify that adverse agricultural impacts will be minimized or avoided to the maximum extent practicable.
In this process, NYSDAM evaluates a proposed project and considers whether it would have an unreasonably adverse effect on the continuing viability of farm enterprises within the Agricultural District or on any state environmental plans, policies or objectives. NYSDAM may propose mitigation measures, which can include conditions to ensure the viability of and access to continuing agricultural uses, decommissioning and restoration plans to return a site to its preconstruction condition, and compliance with its guidelines.

RESOURCES

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A Regional Response to Climate Change: Scenic Hudson's Role in the Hudson Valley's Transition to Renewable Energy, July 2019
https://www.scenichudson.org/wp-content/uploads/2019/10/A-Regional-Response-to-Climate-Change-2019-2.pdf

Scenic Hudson's Roadmap to a Clean Energy Future for the Hudson Valley
https://www.scenichudson.org/wp-content/uploads/2020/01/roadmap-to-clean-energy-future.pdf

NY Renewable Energy Policies and Programs

NY Clean Energy Standard
https://www.nyserda.ny.gov/All-Programs/Programs/Clean-Energy-Standard

NYSERDA NY-Sun Program
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Local Government Solar Toolkits

NYSERDA New York Solar Guidebook for Local Governments
https://www.nyserda.ny.gov/All%20Programs/Programs/Clean%20Energy%20Siting/Solar%20Guidebook

Solar Energy: SolSmart's Toolkit for Local Governments
https://www.solsmart.org/solar-energy-a-toolkit-for-local-governments/

Planning and Zoning for Solar

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Available at: https://www.dos.ny.gov/lg/publications.html

New York Town Law Article 16: Planning and Zoning
https://www.nysenate.gov/legislation/laws/TWN/A16

New York Village Law Article 7: Building Zones
https://www.nysenate.gov/legislation/laws/VIL/A7

New York General City Law Article 3
https://www.nysenate.gov/legislation/laws/GCT/A3

Visual Resources and Impact Mitigation

DEC Program Policy: DEP-00-2 Assessing and Mitigating Visual and Aesthetic Impacts (Updated 12/13/2019)
https://www.dec.ny.gov/permits/115147.html

Agricultural Resources and Solar

New York State Department of Agriculture & Markets, Guidelines for Solar Energy Projects – Construction Mitigation for Agricultural lands (Revision 10/19/2019)
https://agriculture.ny.gov/system/files/documents/2019/10/solar_energy_guidelines.pdf

New York State Department of Agriculture & Markets, Guideline for Review of Local Laws Affecting Small Wind Energy Production Facilities and Solar Devices (9/18/12)
https://agriculture.ny.gov/system/files/documents/2019/11/guidelines_for_solar_and_small_wind_energy_facilities.pdf

U.S Department of Energy, Office of Energy Efficiency and Renewable Energy, Farmer's Guide to Going Solar
https://www.energy.gov/eere/solar/farmers-guide-going-solar

Pollinator-Friendly Solar

New York Pollinator-Friendly Solar Act
https://www.nysenate.gov/legislation/bills/2017/s6339

The Center for Pollinators in Energy
https://fresh-energy.org/beeslovesolar/

University of Vermont Extension: Pollinator-Friendly Solar Resources
https://www.uvm.edu/extension/agriculture/pollinator-friendly-solar

Minnesota Board of Water and Soil Resources: BWSR Habitat Friendly Solar Program
https://bwsr.state.mn.us/bwsr-habitat-friendly-solar-program

Maryland Department of Natural Resources: Solar Generation Facilities - Pollinator-Friendly Designation
https://dnr.maryland.gov/pprp/Pages/pollinator.aspx

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https://nysolarmap.com/

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GLOSSARY OF TERMS

Active solar energy collection uses electrical or mechanical equipment to convert solar irradiance to heat or electricity.

Alternating current is the standard electric current for power grids worldwide, where the electric charge flow periodically reverses itself. Solar PV energy systems generate direct current (DC) electricity which must be converted to AC by an inverter for use by consumers.

Behind the meter (BTM) generation refers to a customer-sited renewable energy system that is connected to the utility grid through a customer's utility meter. A BTM system provides power that can be used on-site without passing through the meter. Examples include home solar panel systems and small wind turbines that generate electricity used on the premises. Excess generation can be sent through the meter and to the grid for credit on electricity bills (net metering).

Building-integrated solar energy systems are integrated into the architectural components of a structure. PV cells are incorporated into building materials such as roofing materials, facades or glass.

Capacity, measured in MW (or KW) refers to the electric power output for which a generating system, plant, or unit is rated.

Centralized generation means the large-scale or "utility-scale" generation of electricity at centralized facilities. These facilities are usually located away from end-users and connected to a network of high-voltage transmission lines.

Community Choice Aggregation (CCA) is a municipal energy procurement model that replaces the utility as the default supplier of electricity for virtually all homes and small businesses within your jurisdiction. CCA puts control of choosing an energy supplier in local hands. By pooling demand, communities build the clout necessary to negotiate lower rates with private suppliers and are able to choose cleaner energy.

Community Solar provides those who cannot otherwise purchase and install a solar PV system with an opportunity to gain access to clean energy. There are various models: community members can own shares in a solar PV system, own panels, subscribe to receive solar power, or purchase output from an off-site energy system to offset their own electricity bills, among other models. It Community solar can lower costs and barriers to solar energy access for residents and businesses. Community solar projects vary in size and may be roof-mounted or ground-mounted.

Direct current is a direct, constant flow of electricity in one direction.

Distributed Energy Resources (DER) are sources of electric power, including distributed generation, energy storage technologies, or any combination thereof, that is capable of exporting active power to a utility's system. DER can include sources connected to the distribution system as well as the transmission system.

Distributed Generation (DG) are generating facilities that supplement on-site load or are non-centralized electric power production facilities.

The **Distribution System** is made up of the local poles and wires sending power to customers like homes and businesses.

The **electric or power grid** is the means through which power is generated, transmitted, and distributed to the end user. It is the electrical power system network comprised of the generating plants, the transmission lines, the substation, transformers, the distribution lines and the consumers.

Energy, measured in MWh (or KWh), is the amount of energy produced (from capacity) over time.

An **Energy Storage System (ESS)** is a mechanical, electrical, or electrochemical means to store energy and release electrical energy, and its associated electrical inversion device and control functions, that may be stand-alone or paired with distributed generation at a point of common coupling. New York has adopted an energy storage goal of 1,500 MW by 2025, expanding to 3,000 MW by 2030. Therefore, an increasing number of both stand-alone and "solar plus storage" proposals can be expected in the future. Therefore, municipalities should consider adopting code provisions for this land use as well. NYSERDA has issued a Battery Energy Storage System Guidebook with a Model Law, Model Permit, and Inspection Checklist: www.nyserda.ny.gov/All%20Programs/Programs/Clean%20Energy%20Siting/Battery%20Energy%20Storage%20Guidebook

Farmland of Statewide Importance meets certain criteria established within each state. In New York, Farmland of Statewide Importance soils are the soils that do not meet all the criteria for Prime Farmland or Prime Farmland if Drained, but are mineral soils in certain land capability classes, which is a classification that provides a general indication of the suitability of soils for most kinds of field crops.

Federal Energy Regulatory Commission (FERC) is the United States federal agency that regulates the transmission and wholesale sale of electricity in interstate commerce.

A **front-of-meter system** provides power to off-site locations. The power provided by a front-of-meter system must pass through an electric meter before reaching an end-user. An example of a front of meter system is a utility-scale solar energy facility. Transmission and distribution lines also sit front of meter.

Ground-mounted solar energy systems are installed directly in or on the ground.

Insolation is the amount of radiant energy from the sun that strikes a given surface area over a period of time.

Interconnection is the technical and procedural requirements necessary to connect an electricity-generating system to the grid.

Net-Metering is achieved by allowing a customer's meter to spin in the reverse and forward directions. When the customer's generator is producing less energy than the customer is using, the electric meter will measure the energy passing from the utility to the customer and spin in the forward direction. When the customer's generator is producing more energy than the customer is using, the electric meter will measure the excess energy passing from the customer to the utility and spin in the backward direction. The surplus energy is subtracted, or "netted," from the energy supplied by the utility to the customer, thus "net metered." Net metering allows electricity customers to take credit for the energy that their PV system produces and pay an electric bill based only on the net amount of electricity that the customer had to purchase from the utility.

New York Independent System Operator (NYISO) is the agency that operates New York State's bulk electricity grid, administers New York's wholesale electricity markets, and provides comprehensive reliability planning for New York's bulk electricity system.

New York State Standardized Interconnection Requirements (NYSSIR): The New York State Standardized Interconnection Requirements for new DER units with a nameplate capacity of 5 MW or less connected in parallel with a utility's distribution system.

New York State Energy Research and Development Authority (NYSERDA) was created as a public benefit corporation in 1975 under the State Public Authorities Law. Its mission is to advance innovative energy solutions in ways that improve New York's economy and environment. It is governed by a 13-member Board, and provides objective information and analysis, technical expertise, and support to promote energy efficiency and the use of renewable energy sources.

Passive solar energy collection uses site and building design to maximize the lighting and space heating benefits of solar radiation.

Photovoltaic (PV) solar systems convert sunlight into electricity through semi-conductor materials. PV technology is very scalable and can be designed to provide energy to a range of uses. PV cells are packaged into panels that can be mounted on rooftops or the ground, or incorporated into building materials.

Prime farmland means land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor without intolerable soil erosion. The parameters for Prime Farmland are national. To qualify, soils must meet specific criteria with respect to a number of soil properties, including temperature, moisture regime, erodibility, pH, water table, permeability, rock fragment content, and others. Soils that are designated as Prime Farmland if Drained meet all the prime farmland critieria except for depth to seasonal high water table, and are suitable for drainage.

Public Service Commission (PSC) is the governing body that regulates the rates and services of the utilities providing electric (and other) service within New York state.

Remote Net-Metering for renewable energy systems allows the electricity generated to be distributed among many utility accounts. In New York, utilities must allow farm and non-residential customers the ability to apply the excess net metering credits they earn under Net Metering to other accounts they own. The account to which the renewable energy system is connected is called the Host Account and must be a commercial or a farm account. Residential customers cannot take advantage of remote net metering.

Roof-mounted solar PV systems consist of solar arrays attached to a roof.

Solar Thermal Systems use radiant heat from the sun to warm fluid, such as water or antifreeze, in a series of tubes or panels that are typically roof mounted to heat water or to cool and/or heat buildings.

Transmission is the bulk movement of electrical energy from a generating site, such as a power plant, to an electrical substation.

“Utility-scale” solar energy systems are identified by the purpose of the energy produced, which is sale for commercial gain, not to offset electricity usage at a particular facility.
The energy is typically sold at wholesale prices to energy companies, rather than end-users. These are typically very large developments, and are interconnected with transmission lines through substations.

The **Value of Distributed Energy Resources (VDER), or the Value Stack**, is a mechanism to transition away from net-metering to a different way to compensate distributed energy resources like solar PV projects. VDER compensates projects based on when and where they provide electricity to the grid and includes value for avoided carbon emissions, cost savings to utilities and customers, and other benefits from DER.

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