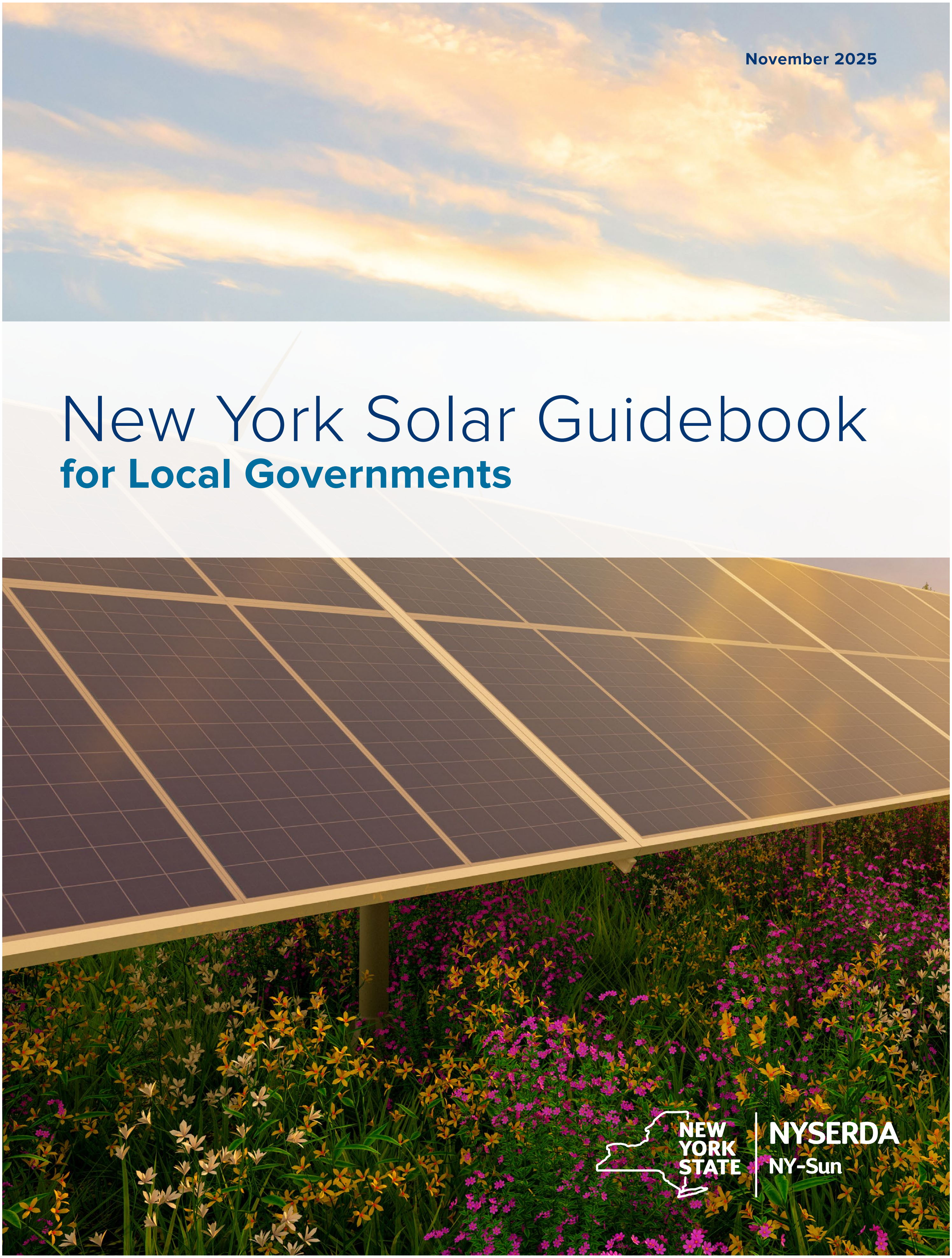
November 2025

New York Solar Guidebook
for Local Governments



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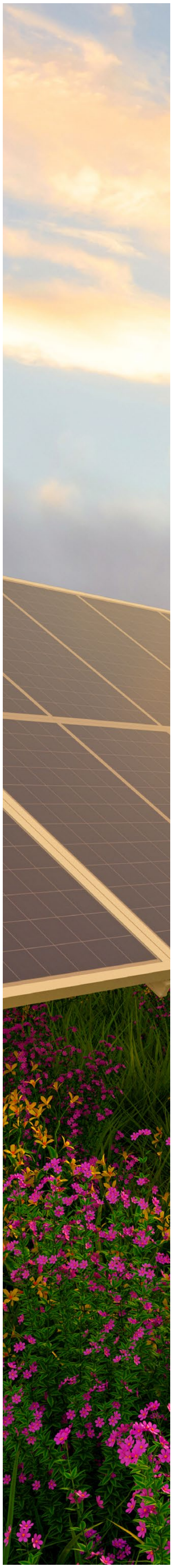

New York Solar Guidebook

Assisting local governments across New York State in navigating and managing solar energy development in their communities.

The New York Solar Guidebook is a compilation of information, tools, and step-by-step instructions to support local governments with the development, installation, and maintenance of solar energy projects in their communities. This guide covers the most pressing issues in New York State's solar market today, addressing topics such as:

- Understanding the basics of solar energy technology, equipment, and terminology
- Land-use tools for siting solar while protecting farmland
- Navigating solar installations on agricultural lands
- Step-by-step instructions on completing a State Environmental Quality Review (SEQR) for solar projects
- New York State's Real Property Tax Law Section § 487
- Payment-in-Lieu-of-Taxes (PILOT) Agreements for community solar projects larger than 1 MW
- Decommissioning solar energy systems
- Using the Model Solar Energy Local Law to assist in drafting local solar laws and regulations for your community
- Leasing underutilized municipal land for solar development through the Municipal Solar Procurement Toolkit
- Understanding the permitting and inspection process for solar photovoltaic (PV) installations through the New York State Unified Solar Permit. This section has been updated to incorporate the 2020 NYS Uniform Fire Prevention and Building Code (Uniform Code)
- Rooftop access and ventilation requirements for residential and nonresidential solar installations. This section has been updated to incorporate the 2020 NYS Uniform Code

You can download specific chapters of the New York Solar Guidebook at nyserda.ny.gov/SolarGuidebook.

NYSERDA offers free technical assistance to local governments implementing the Guidebook's policies and best practices. The NYSERDA team will work one-on-one with local governments to address solar permitting, zoning, property taxes, SEQR, or any other issues regarding solar projects. Local government officials can request free technical assistance at **nyserda.ny.gov/SolarGuidebook** or email questions to **cleanenergyhelp@nyserda.ny.gov**.

The NYSERDA team looks forward to partnering with communities across the State to help them meet their solar energy goals.

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NYSERDA offers objective information and analysis, innovative programs, technical expertise, and support to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce reliance on fossil fuels. NYSERDA professionals work to protect the environment and create clean energy jobs. A public benefit corporation, NYSERDA has been advancing innovative energy solutions since 1975.

Section 1

Acronyms

Acronyms

The following acronyms are used frequently throughout this Guidebook.

AC - Alternating Current

AHJ - Authorities Having Jurisdiction

CEQR - City Environmental Quality Review

DC - Direct Current

DPS - Department of Public Service

EAF - Environmental Assessment Form

EIS - Environmental Impact Statement

EGC - Equipment Grounding Conductor

FEAF - Full Environmental Assessment Form

GEC - Grounding Electrode Conductor

kW - Kilowatts

NEC - National Electrical Code

NYSDEC - New York State Department of Environmental Conservation

NYSERDA - New York State Energy Research and Development Authority

DEP - NYC Department of Environmental Protection

OCPD - Overcurrent Protective Device

ORES - Office of Renewable Energy Siting and Electric Transmission

PILOT - Payment-in-Lieu-of-Taxes

RPTL - Real Property Tax Law

REV - Reforming the Energy Vision

PV - Photovoltaic

SEQR - State Environmental Quality Review

Section 2

Solar Basics and Frequently-Asked-Questions

Understanding the basics of solar energy technology, equipment, and terminology.

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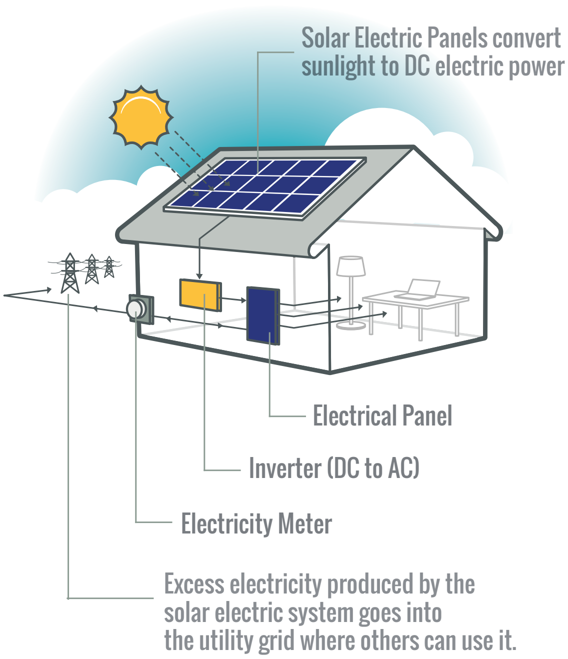
Section Contents

1. Solar Basics

An introduction to the common equipment and terminology used in solar technology. Topics of discussion include solar PV systems, solar terms, system components, net metering, and financial considerations with regards to solar development.

1.1 Solar PV Systems



Solar photovoltaic (PV) systems convert the energy in sunlight into electrical current, which can power electric loads, be fed back to the electric grid, or be stored in batteries. All solar PV systems consist of the same basic components but vary widely in terms of size and complexity. Solar PV systems should not be confused with solar thermal systems, which are a separate technology that captures the sun's thermal energy to heat water and air.

When sunlight strikes a solar PV array, electrons in the array are agitated into motion, creating direct current (DC). The electrical current flows along conductors from the array to an inverter. The inverter transforms the DC into alternating current (AC), which powers most common electrical appliances. The AC flows through conductors to the site's electric service panel, and then to individual branch circuits and loads. If the solar PV system is grid-tied (connected to the electric grid) and produces more electricity than is used at the site, the excess current is pushed back into the utility grid. This basic description of a solar electric system applies to most residential installations.

Solar PV systems can be defined based on the size of the project and its position in relation to the grid. Based on the size of a solar facility, they can be residential, commercial, or utility scale.

1.1.1 Distributed Energy Resources (DERs)

Distributed energy resources are technologies like solar, wind, and battery energy storage that generate or store electricity for homes and buildings to manage their energy use, or to serve local energy demand directly on the electric grid. A DER project produces up to 5 megawatt alternating current (MW AC) or less and must have a customer(s), known as the "offtaker," to purchase the electricity. Most DER projects are residential/commercial rooftop solar projects, small ground mounted solar, or commercial solar projects.

Rooftop and Small Ground-mounted Solar

These small residential ground-mounted and/or rooftop solar systems are the smallest PV systems ranging between 5kW AC and 1 MW AC provide electricity for on-site consumption. Most of New York's solar PV installations are residential, utility grid-tied. New York State's Standardized Interconnection Requirements (SIR) detail two application processes. One is for systems that are up to 50kW and the second process is for PV systems that are up to 5MW. The cutoff for residential solar net metering as established by the NYS Public Service Commission (PSC) is 25kW. Over a hundred thousand New Yorkers have already put solar panels on their homes or businesses. Many buildings or parcels, however, are not suited for solar panels due to shading, roof condition, or other factors. Community solar may be a more attractive option for owners of sites with these conditions, as well as for renters.

1.1.2 Commercial Scale Solar

Commercial PV systems are larger than residential systems and they range between 1 to 5 MW AC. These systems are ground-mounted, with 4-6 acres of land needed per MW depending on site constraints and zoning considerations. Commercial PV systems are permitted at the local level through State Environmental Quality Review (SEQR) and any other municipal requirements. Commercial PV Systems will apply for interconnection via the NYS SIR process. These projects produce energy that is in front of the meter. Front-of-the-meter systems provide power to the grid that is used by surrounding community rather than providing electricity for use on-site. A common example of commercial scale solar is community solar.

Community Solar

Community Solar (also called Community Distributed Generation [CDG] solar) is a program that allows renters, homeowners, and business owners access to the benefits of solar without having to install panels on their own home or business. It is a collection of solar arrays installed in an offsite location that produces energy for the local power grid. These facilities provide opportunities for renters, homeowners, businesses, and municipalities to subscribe to a portion of community solar energy projects and earn credits on their electric bill each month. They often look for financing through the NY-Sun program.

NY-Sun, New York State's initiative to add more than 10 gigawatts (GW) of installed solar capacity in New York State by 2030, is a partnership between public and private entities to expand affordable DER projects in NYS. They provide incentives, financing, and educational programs and assistance for homeowners, renters, businesses, and local governments. NY-SUN encourages and supports the installation of solar arrays to generate clean and renewable energy statewide.

1.1.3 Large Scale Renewables (LSR)/ Utility Scale Solar

Large-scale renewable solar projects (also called utility-scale solar) are larger projects that typically have a nameplate capacity of more than 5 MW AC and/or interconnect to the power system at 34.5 kV levels or greater. The power generated by these facilities is injected into the transmission system and sold through the New York Independent System Operator’s energy market. These projects are described as “in front of the meter” providing energy directly to the grid. Utility scale solar is permitted at the state level in the Office of Renewable Energy Siting and Electric Transmission (ORES) under the Department of Public Services (DPS).

Solar energy projects larger than 25 MW and any co-located energy storage systems require environmental review and permitting under the Renewable Action Through Project Interconnection and Deployment (RAPID) Act, which was approved on January 17, 2024.[1] The RAPID Act repealed the previous Section 94-c of the Executive Law, which was intended to establish an expedited review and permitting process with uniform permit standards for New York State renewable energy projects under the Accelerated Renewable Energy Growth and Community Benefit Act of 2021, in place of the procedures set forth in Article X of the Public Service Law. Section 94-c was established to expedite the greenhouse gas reduction and renewable energy generation targets of the Climate Leadership and Community Protection Act (CLCPA), enacted on April 1, 2020.

The RAPID Act also repealed the previous Article VIII of the Public Service Law which governed the environmental review and permitting of major steam electric generation siting. In lieu, the RAPID Act created a new Article VIII (“Siting of Renewable Energy and Electric Transmission”) that provides for a one-stop shop for the environmental review and permitting of both major renewable energy generating facilities and major electric transmission facilities by the Office of Renewable Energy Siting and Electric Transmission (ORES), which transferred from the Department of State (DOS) to the Department of Public Services (DPS). All existing functions, powers, obligations, and duties granted to ORES by Section 94-c continue to remain with ORES together with any new functions, powers, duties, and obligations set forth in the RAPID Act. The RAPID Act will continue to maintain all the environmental review and permitting requirements under Section 94-c established by ORES’ 19 NYCRR Part 900 regulations until new regulations are established.

Further, for large scale projects, NYSERDA issues yearly solicitations for Renewable Energy Standard (RES) requests for proposals to accelerate progress towards NYS’s target of generating 70 percent of New York State’s electricity from renewable sources by 2030. The program seeks to procure Tier 1 eligible Renewable Energy Certificates (RECs) from eligible facilities that enter commercial operation on or after January 1, 2015. The RES was enacted by the Clean Energy Standard that requires utilities and other load serving entities in the State to procure Tier 1 renewable energy credits. RECs are a certificate that represents one megawatt hour (MWh) of electricity generated from a renewable energy source used to substantiate environmental claims related to energy use, such as for compliance with a State-mandated renewable compliance program, or for a “voluntary” claim such as a climate action pledge.

[1] A.B. A8808B, 2024-2025 transportation, economic development and environmental conservation budget, 2023-2024 Leg. Sess. (New York. 2024). https://legislation.nysenate.gov/pdf/bills/2023/A8808B. Accessed on July 17, 2024.

1.2 Solar Terms

The following terms are frequently used when discussing solar energy and associated technologies.

Alternating current: AC describes one type of electric charge flow. The AC stream of charges periodically reverses itself, whereas direct current (DC) describes a stream of electrons that moves in one direction only. AC is the standard electric current for power grids worldwide. Solar electric cells capture particles of light and convert them into DC electricity. An inverter translates DC into AC for consumers to use in their homes and businesses.

Ampere: Abbreviated as amp, this unit is used to measure electric current.

Azimuth: Direction of a solar array in relation to the equator where North is 0 degrees and the angle increases as you move clockwise. Aligning the modules with the azimuth of the building or property's most southern-facing edge will maximize system output by accounting for panel efficiency and utilizing available space.

Balance-of-system: BOS costs refer to the costs of all aspects of a solar PV installation, except the cost of the modules and inverters. BOS costs include all wiring and miscellaneous materials, along with soft costs, such as time and administrative costs associated with selling and signing a contract, system design and permitting, installation labor costs, inspections, travel to and from the installation site, and other costs of doing business. These costs account for as much as 50 percent of the total solar PV system installation. New York State has focused on reducing BOS costs to reach its goal of installing 6 gigawatts of solar by 2025.

Direct current: DC describes the direct, constant flow of electricity. Unlike AC, DC does not periodically reverse direction. A solar PV system comes equipped with an inverter that converts DC into AC, the standard electric current for power grids in the United States.

Energy payback: Gauges how long it will take to recover the energy originally required to manufacture a solar PV system. Because most solar PV systems last 25+ years, there is a pronounced net environmental benefit over the system's life span. The U.S. Department of Energy estimates an energy payback of 1-4 years for rooftop solar PV systems. The original energy used is often referred to as embedded energy.

Feed-in tariff: FITs are long-term generation contracts that have favorable terms designed to encourage the production of renewable energy by individuals and businesses. FITs are typically offered for long periods of time, such as 10, 15, or 20 years.

Inverter: A key component of any solar PV system that converts direct current (DC) electricity into alternating current (AC) electricity, which is the standard current in the United States.

Kilowatt: kW is a unit of measure that equals 1,000 Watts and is the main mechanism for measuring the size or capacity of a solar PV system. The Watt is named after Scottish inventor and mechanical engineer James Watt (1736 – 1819).

Kilowatt-hour: 1 kWh is equivalent to the electricity generated or consumed at a rate of 1,000 Watts over the period of one hour.

Megawatt-hour: 1 MW is equivalent to the electricity generated or consumed at a rate of 1,000,000 Watts over the period of one hour.

Net metering: A common feature of grid-connected solar PV systems whereby excess electricity produced by a solar array is fed back into the utility grid. System owners can earn credits on future energy bills for the excess electricity their systems generate. The credits can then be used later when homeowners need power from the local utility, such as at night or on cloudy days.

Power purchase agreement: PPAs are becoming a popular way for homeowners to take advantage of solar power without the financial responsibility associated with installation costs. Under the agreement, a third party installs the solar PV system and the homeowner agrees to buy the electricity (kWh) it generates, typically at a rate lower than what the utility offers.

Photovoltaic: PV technology converts solar energy into direct current electricity. The technology uses semiconducting materials that exhibit the photovoltaic effect, a naturally occurring phenomenon in which photons of light emitted from the sun knock electrons off their valence shell into a higher state of energy, creating electricity. A solar PV system uses solar panels, which are composed of a number of solar (PV) cells, to convert sunlight directly into electricity.

Photovoltaic cells: PV cells are thin layers of semiconducting material that are usually made of silicon. When the silicon is exposed to light, an electrical charge is generated. Solar (PV) cells form the basis of a solar PV panel, which together make up a solar PV system.

Remote net metering: A variation on net metering whereby a solar PV system's production is credited to an electricity consumer(s) located at a different physical site.

Solar photovoltaic (PV) systems: A technology that converts sunlight directly into electricity. A PV system is made up of solar modules (panels), which are made up of solar cells.

Solar thermal systems: A technology that uses sunlight to heat water or air. In contrast to a solar PV system, a solar thermal system uses mirrors to concentrate sunlight to produce heat.

1.3 System Components

1.3.1 Modules

A solar PV module or "solar panel" is an electrical generation device that produces DC current when exposed to sunlight. Most modules consist of 60-72 small, conjoined solar cells, an aluminum frame, and a tempered glass front piece. Modules are roughly three feet by five feet and are mounted in either a portrait (a vertical rectangle) or landscape orientation (a horizontal rectangle). In monocrystalline modules, individual cells are made from single pieces of silicon. Polycrystalline modules feature cells made from multiple pieces of silicon.

Installers wire together multiple modules to combine their voltage. Multiple strings of modules can be combined to add their current (amperage).

The size of solar PV systems is typically given in rated DC capacity at standard test conditions (STC). For example, a system with 10 modules rated at 300 Watts each is a 3,000-Watt (3 kilowatt) system. Most solar PV modules come with a manufacturer's production warranty of 25 years and are expected to have a useful life of approximately 30 years.

A SolarWorld Polycrystalline module (left) and a SunPower Monocrystalline module (right)

Source: SolarWorld and SunPower

1.3.2 Inverter

All utility grid-tied solar PV systems have at least one inverter, which converts DC to AC. Most residential solar PV systems have one or two string inverters, which are connected to one or more strings of modules. Inverters are generally mounted vertically on basement, garage, or exterior walls, and can be located indoors or outdoors.

Microinverters are a special type of inverter that are mounted on the underside of individual solar PV modules. Unlike string inverters, each microinverter services only 1-2 modules, which permits greater flexibility in system design.

Most solar PV professionals describe system size in terms of module capacity (kilowatts DC), whereas most electric utilities refer to system size by inverter capacity (kilowatts AC).

A Fronius String Inverter (left) and an Enphase Microinverter (right)
Source: Fronius and Enphase

1.3.3 Balance of System Components

"Balance of system" (BOS) generally refers to all equipment in a solar PV installation except the modules and inverter. (Occasionally, inverters are included in the term.) BOS components include racking, conductors, conduit, disconnects, fuses, mounting hardware, combiner boxes, and occasionally batteries.

BOS Components: A Square D Fusible AC Disconnect (left) and a MidNite Solar Rapid Shutdown Device (right)
Source: Square D and MidNite Solar

1.3.4 Racking

Residential solar PV arrays are mounted to roofs using specially-designed aluminum racking systems. Typically, L-shaped brackets are connected to the roofing members of a house with lag bolts. Long aluminum rails are bolted onto the L-feet, and individual modules are attached to the rails with clamps. All roof penetrations must be flashed to prevent leaks and roof damage[2], and the system designer must ensure that the roof is structurally strong enough for the additional load of a PV system. Any necessary replacement or repair work on a roof must be done prior to the installation of the solar PV system.

A Solar Electric Racking System

Detail of an L-Foot with a SnapNrack Flashing

On pitched rooftops, the racking system must be mechanically anchored to the roof structure. On a flat roof, system designers may choose to use a ballast mounting system. Instead of using lag bolts to anchor the racking to the building's structural members, heavy concrete blocks weigh down the array. Ballasted systems are less likely to create leaks in the roof membrane but add substantial weight and may be too heavy for some roofs.

Solar electric arrays are also commonly ground-mounted. Arrays can be mounted on racking directly on the ground, or atop a metal pole. As with roof mounts, metallic racking must be bonded (made electrically continuous to provide a path for fault currents). When designing a ground-mounted system, the designer must account for soil conditions. Voltage drop is a concern for ground mounted systems, which often have long conductor runs.

Ground-mounted solar PV arrays sometimes include tracking equipment, which rotates the array throughout the day to follow the sun's trajectory. Tracking may occur along one or two axes. The additional energy produced by these systems must be weighed against their additional cost, complexity, and maintenance.

1.3.5 Conductors

Conductors (wire) coming from the modules are typically factory-assembled "PV Wire" with a factory-formed termination (see NEC 690.31). These factory leads are labeled "PV Wire" or "Type USE-2" and are rated to withstand all weather conditions. They are then spliced with standard building wire, using appropriate connectors and enclosures. The standard building wire is installed in raceway (conduit) to its next point of connection. Under certain conditions, conductors may be direct burial or part of a cable assembly. NEC 690.32 and NEC 310 provide guidance on allowable conductor types and methods.

The maximum allowable voltage for residential solar PV systems is 600 volts DC, but nonresidential systems may run up to 1,000 volts DC (NEC690.7(C)). Conductors must be protected from accidental contact. When exposed, they must be installed in raceway (such as conduit), or otherwise rendered inaccessible. For example, the exposed conductors on the back side of a ground-mounted array must be guarded or located at least eight feet above ground.

1.3.6 Raceway (Conduit)

Raceway includes conduit, boxes, fittings, and enclosures that provide a pathway and protection for individual conductors. All raceway systems must be suitable for the environment in which they are installed. All metal raceways must be bonded to form part of the equipment grounding conductor.

All DC conductors that enter a structure must be installed in a metal raceway NEC 690.31(G) or MC cable that meets NEC 250.118(10). Flexible and nonmetallic conduits may be permitted under certain conditions. In addition to NEC 690, refer to Chapter 3 of the NEC for types of permitted conduits and uses.

[2] Section 1503.2 of the International Building Code, Section 903.2 of the International Residential Code.

1.3.7 Battery Backup

Most residential solar PV systems are utility grid-tied, but do not include a battery backup system. In the event of a blackout or grid failure, such solar PV systems de-energize and do not function until grid power is restored, as required by NYS' Standardized Interconnection Requirements (SIR; www3.dps.ny.gov/W/PSCWeb.nsf/All/DCF68EFCA391AD6085257687006F396B).

Off-grid ("stand-alone") solar PV systems are not connected to the grid. Solar PV output is stored in a battery bank, which provides power to the site's electric loads. In addition to a battery bank, these systems include one or more charge controllers, which determine the amount and rate of power that can be stored and drawn from the battery bank.

Battery-backup solar PV systems are utility grid-tied and include a battery system that is used in the event of grid failure. Due to the high cost and additional complexity, battery backup on solar PV systems is currently rare. Section 690.71 of the NEC contains additional requirements for solar PV systems with batteries.

1.4 Net Metering

Solar electric systems are a distributed generation (DG) technology that currently qualifies for net metering in New York State. Any power produced by a solar PV system that isn't consumed on-site is pushed into the utility grid. The solar PV system owner receives a credit for this production on their monthly utility bill. Utilities typically install a meter at solar PV sites, which tracks the amount of electricity taken from and fed into the grid. The site owner is billed for only the net electricity consumed. Nonresidential solar PV systems can credit their production to off-site electric accounts through remote net metering, but this type of arrangement is outside the scope of this document.

1.5 System Design

The design of a PV system is critical for optimizing energy output and increasing efficiency. Design considerations will determine the position of individual modules as well as how modules will impact those around it.

1.5.1 Capacity Factors

Capacity factors are a fundamental concept in the world of solar energy that every solar system owner should grasp. These factors play a crucial role in assessing the efficiency and performance of your solar panel system. In this section of the NYSERDA Solar Guidebook, we will delve into the intricacies of solar capacity factors, why they matter, and how they impact your solar power system.

At its core, a solar capacity factor is a measure of how efficiently a solar panel system generates electricity over time compared to its maximum potential. It is expressed as a percentage, ranging from 0% to 100%. A solar capacity factor of 100% would mean that your system consistently operates at its full potential, producing electricity at its maximum capacity throughout the day. In reality, various factors influence a solar panel's output, causing its capacity factor to fluctuate.

Shedding Light on Solar Energy Efficiency

Imagine your solar panel as a gigantic lightbulb, illuminating your home with clean, renewable energy. But just as not all lightbulbs shine at full brightness all the time, solar panels don't operate at maximum capacity around the clock. To demystify this concept, let's draw a parallel between your solar panel and a 60W lightbulb.

Capacity Factor: A Watt-Hour Tale

When we talk about a solar panel's capacity factor, we're essentially measuring how effectively it harnesses sunlight throughout the day. It's analogous to how efficiently a lightbulb uses electricity. To illustrate this, consider a 60W lightbulb turned on for one hour. In that time, it consumes 60 watt-hours (Wh) of electricity. If this same lightbulb were to run continuously for 24 hours, it would consume a total of 1,440Wh. Now, think of the capacity factor as a percentage. For the lightbulb that's only on for one hour a day, its capacity factor can be viewed as 4.2%. This percentage reflects how often it's operating at full blast compared to its maximum potential.

Consistency of Wattage: A Key Clarification

Here's where clarity becomes crucial. While the lightbulb may be on for just one hour a day, during that hour, it is still running at its full 60W capacity, not at a diminished 2.5W despite the light being off the remaining 23 hours of the day. This is because the capacity factor is independent of duration of time. The capacity factor is a measure of the total watt-hours generated relative to the maximum potential of the system, not the wattage of the system/panel itself. In other words, the capacity factor tells us how much energy we're harvesting relative to what we could theoretically harvest if our solar panel operated at maximum output all day long.

It's important to note that this analogy, while helpful, doesn't imply that the solar panel generates energy like the lightbulb consumes it. Instead, the solar panel captures sunlight and converts it into electricity, while the lightbulb consumes electricity to produce light. The analogy serves to make the concept of capacity factor more relatable.

Adjusting for Diminished Sunlight: Dimming the Bulb

Now, let's delve into the scenario where the sun's angle is lower, akin to dimming the lightbulb. Imagine you've turned down the brightness of your 60W lightbulb to 30W. This dimming reduces the bulb's energy consumption and, similarly, when the sun's angle is lower or the weather conditions are less favorable, your solar panel generates electricity at a reduced rate.

Just like dimming the lightbulb impacts the amount of light it emits, factors like shading, cloud cover, and the sun's angle can dim the output of your solar panel. In such situations, your solar panel's capacity factor may decrease, indicating that it's operating at a fraction of its maximum potential.

Understanding solar capacity factors in these terms can help you appreciate the ebb and flow of solar energy generation. By maximizing your system's capacity factor through careful design and siting, proper installation, and maintenance, you can ensure that your solar panel shines as brightly as possible, harnessing the sun's energy efficiently and cost-effectively.

Factors Affecting Solar Capacity

Several factors can cause your solar panel system's capacity factor to vary. Weather and climate play a significant role, as cloudy days, rainy weather, and snow cover can reduce the amount of sunlight your solar panels receive, ultimately lowering their capacity factor. Additionally, shading from nearby trees, buildings, or structures can obstruct sunlight, diminishing your system's output and capacity factor.

The angle and orientation of your solar panels also affect how they capture sunlight. Optimal positioning maximizes your capacity factor. Regular maintenance is crucial to ensure that your solar panels are functioning at their best. Neglected systems may experience reduced capacity factors over time.

Why Does the Capacity Factor Matter?

Understanding your solar panel system's capacity factor is essential for several reasons. It allows you to assess the efficiency of your system, with a high-capacity factor indicating that your system is performing well and a lower one potentially signaling the need for adjustments. Knowing your capacity factor also helps you estimate how much energy your solar panels will produce over a year, aiding in financial planning and energy budgeting. Moreover, a higher capacity factor means more energy production, which translates to greater savings and a faster return on your solar investment.

Optimizing Your Solar Capacity Factor

To make the most of your solar panel system, consider optimization strategies such as proper installation to ensure your solar panels are installed at the right angle and orientation. Regular maintenance is also crucial to keep your solar panels clean and in good working order, maintaining optimal efficiency. Installing trackers which will allow the module to move in the direction of sunlight and has the potential to increase energy production by about 23%.[3] You can use solar monitoring systems to track your system's performance and make adjustments as needed. Bifacial panels can also increase the capacity factor by absorbing light that is reflected off the surface below the panels. Additionally, consider adding energy storage solutions to store excess energy for use during low-capacity factor periods.

[3] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9478504.2

Understanding solar capacity factors empowers you to make informed decisions about your solar panel system and maximize its benefits. By taking these insights into account, you can harness solar energy effectively and contribute to a sustainable energy future.[4]

1. Rooftop systems
   Rooftop systems on pitched roofs should not be higher than the highest point of the roof; system on flat roofs should not extend beyond the height of the parapet, a low protective barrier along the edge of a roof. Shading can obstruct energy generation for rooftop PV systems if there is nearby vegetation or infrastructure that creates a shadow over the system for a prolonged period of time. Selecting the optimal tilt will ensure that the capacity factor is high and the PV system is safe. Rooftop system modules are often tilted between 5-15 degrees to prevent wind uplift along the edge of the system. The higher the angle of the tilt, the more sensitive the panel becomes to uplift, which can potentially damage the mounting infrastructure.
2. Ground mounted facilities
   Ground mounted facilities should consider the maximum height of the surrounding vegetation to ensure that shading is minimized. Herbaceous plants may need to be mowed while shrubs and trees may need to be trimmed to ensure they do not reduce the output of the solar facility. Fixed tilt ground mounted modules are typically tilted at 25-35 degrees but this may vary based on specific siting considerations.

1.5.2 Ground Cover Ratio

Ground cover ratio (GCR) is a ratio between the module area to land area. It is measure of how tightly the rows of solar panels are packed onto the site. A GCR value of zero suggests infinite spacing between rows, while a value of 1 means there is no space between panels. The ground cover ratio can impact system output. For example, if the GCR is high, shading can occur. The shadow from one panel will reduce the output of a neighboring panel. Designing a solar system with a GCR that minimizes shading, will optimize system output. This is dependent on the panels being used, latitude, and other geographic conditions.

1.6 Financial Considerations

Most homeowners view the installation of a solar PV system as a financial investment. Over time, the power it produces generates savings on their electric bills.

1.6.1 Incentives

Although the costs of residential solar PV systems have fallen significantly in recent years, they still typically cost tens of thousands of dollars. The project cost includes the modules, inverters, balance of system components, and “soft costs,” such as installation and administrative labor, customer acquisition, and engineering.

Several incentives make projects more affordable for homeowners. NYSERDA’s NY-Sun Incentive Program administers a step-down megawatt block incentive program.[5] Visit the NY-Sun Program Site for the most up-to-date information regarding available incentives. For information regarding tax credits, we encourage you to speak with your tax advisor.

Other incentives may exist at the local level, including real property tax exemptions, and a real property tax abatement program in New York City. Unlike most residential home improvements, most solar PV installations in New York State do not increase the taxable value of a home.[6] However, local governments can opt out of this exemption. One excellent resource to navigate incentives is www.dsireusa.org. Customers should consult a tax advisor to determine their eligibility for tax credits.

1.6.2 Purchase Types

Many homeowners choose to buy a solar PV system with cash, or by taking out a loan. As the system owners, they can apply for all applicable tax credits. Installation companies typically offer a 5 to 10-year warranty, and some manufacturers offer extended warranties. An increasing variety of loans are available to help customers finance the purchase of solar PV systems.

[4] https://www.nrel.gov/pv/pv-bifacial-irradiance-toolkit.html
[5] http://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun
[6] https://www.tax.ny.gov/research/property/assess/manuals/vol4/pt1/sec4_01/sec487.htm

Leasing a solar PV system is another common option. With this model, a third-party company (often the installation contractor) is responsible for installing, operating and maintaining a solar PV system at the customer's site. Customers sign long-term leases (typically 20 years) and make monthly payments to the company that owns the solar PV system. In return, customers receive all electricity produced by the system. At the end of the lease term, the homeowner typically has the option of renewing the lease, purchasing the equipment at fair market value, or having the system owner remove the equipment. The company that owns the solar PV system receives most of the tax benefits.

A third option is a power purchase agreement (PPA). It is similar to a lease, but instead of paying a flat monthly fee, customers pay for the amount of electricity actually produced by the solar PV system.

2. Frequently Asked Questions

2.1 Project Revenue

2.1.1 What is the difference between a "Large-Scale Renewable" project and a "Distributed Energy Resource" project?

Solar energy projects in New York State are divided into two general categories; large-scale renewables (LSR) and distributed energy resources (DER). LSR projects, also known as "utility-scale solar," are typically larger than 5 MW_{ac}, and are built with the primary purpose of supplying wholesale electricity to the grid. A DER project is 5 MW_{ac} or less and must have a customer(s), known as the "offtaker," to purchase the electricity. Most DER projects are community solar projects, residential/commercial rooftop solar projects, or small ground mounted solar.

2.1.2 What are Renewable Energy Certificates? Do All Projects Qualify?

A renewable energy certificate (REC) is a certificate created by a tracking system, such as the New York Generation Attribute Tracking System (NYGATS), that represents the environmental attributes of one megawatt hour of electricity generated from a renewable source like solar or wind. RECs are used to substantiate environmental claims related to renewable energy use, such as for compliance with a State-mandated renewable compliance program, or for voluntary claims such as a climate action pledge. As such, RECs provide a tradable, traceable means for claiming the benefits of renewable electricity generation. In New York, under the Order Adopting the Clean Energy Standard, only eligible large-scale renewable facilities are able to generate Tier 1 RECs.[7]

2.1.3 How do large-scale solar projects make money?

Large-scale solar projects rely on two main streams of income to generate revenue and continue operations: 1. the sale of electricity generated by the renewable generator, typically either sold in the NYISO market (wholesale) or sold to an offtaker under a contract called a power purchase agreement, which compensate projects based on the power they generate, and 2. the sale of RECs to NYSERDA or another offtaker, which provides compensation for the project's environmental attributes. Through annual Renewable Energy Standard solicitations, NYSERDA seeks to purchase eligible RECs from renewable energy projects under long-term contracts to provide these projects with a predictable revenue stream via selling their RECs. Once a project is operational and transfers RECs to NYSERDA, they can then be sold to Load-Serving Entities, such as utilities, for compliance under the Clean Energy Standard. NYSERDAs contracts with renewable energy developers for the purchase of RECs provide financial security for the developers' projects and, once operational, the RECs can be used by utilities to comply with environmental standards. It is important to note that projects do not receive payments from NYSERDA until they are operational and producing energy.[8]

2.1.4 How are DER projects compensated for the energy the produce?

New York State began a transition away from net metering. The New York State Public Service Commission (PSC) established the Value of Distributed Energy Resources (VDER) or the Value Stack. Compensation under the Value Stack is based on the actual benefits a resource provides to New York's electric grid and is in the form of bill credits. This is determined by a DER's energy value, capacity value, environmental value, demand reduction value, and locational system relief value. Refer to NYSERDA's Value Stack webpage for more information.

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[7] http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B44C5D5B8-14C3-4F32-8399-F5487D6D8FE8%7D

[8] https://www.nyserda.ny.gov/All-Programs/Clean-Energy-Standard/LSE-Obligations

2.1.5 What incentives are offered for solar projects under the Inflation Reduction Act of 2022?

Signed into law in August 2022, the Inflation Reduction Act (IRA) introduced several important federal policy mechanisms to promote the growth of clean energy across the United States. The IRA introduced and expanded eligibility for federal tax credits, and provided funding for grants and loans. Grants and loans have limited funding available, though the federal tax credits will be available to eligible projects for at least the next 10 years. The main tax credits available are the Investment Tax Credit (ITC) and the Production Tax Credit (PTC), which are also able to be claimed by tax-exempt entities such as local governments. The ITC allows project owners to apply a percentage of the project's engineering, procurement, and construction costs (such as the panels, inverters, and racking equipment) as a credit towards their income taxes, or as direct pay for eligible tax-exempt organizations. The ITC is a one-time dollar-for-dollar reduction, and typically does not cover "soft" development and financing costs. The current ITC rate can range between 6% to 70% based on project eligibility criteria. The PTC allows project owners to earn tax credits over 10 years based on the total energy produced by renewable energy projects. The current PTC rate can range between 0.5 cents/kilowatt-hour to 3.35 cents/kilowatt-hour based on project eligibility criteria and is revised annually. While grants and low-interest loans were also funded by the IRA, several programs have already awarded the available funding. These incentives may be modified or extended as energy policies evolve and new guidance is released. Check the IRS's Inflation Reduction Act webpage to receive the latest updates.

2.2 Local Benefits

2.2.1 What is RPTL §487?

New York State Real Property Tax Law (RPTL) Section §487 provides a 15-year exemption from real property taxation for renewable energy systems, including solar. This statute only applies to the value that a solar PV system adds to the overall value of the property; landowners with an installed renewable energy system continue to pay property tax on their homes and land. Property owners must also continue to pay special district taxes (such as a fire district tax payment, but could also include a library, sewer, water, or ambulance tax). The exemption has been a cornerstone of the State's efforts to meet its clean energy goals, providing essential economic incentives for solar. Local taxing jurisdictions do have the option to opt out of RPTL §487 and make the system fully taxable; however, projects may not be financially viable at full taxation. If a jurisdiction opts out of RPTL §487, it must opt out for systems of all sizes, not just large-scale, and must file copies of the local law opting out of RPTL §487 with both the New York Department of Taxation and Finance and NYSERDA.

2.2.2 What are PILOTs and Host Community Agreements?

If a taxing jurisdiction does not opt out of RPTL §487, it may enter into a payment-in-lieu-of-taxes (PILOT) agreement with solar project developers– an annual payment which provides local governments revenue that would otherwise not have been available if projects are deterred due to the cost of real property taxes. A PILOT cannot exceed the value of taxes that would be paid without the exemption. To negotiate a PILOT agreement, taxing jurisdictions must notify solar developers of their intent to require a PILOT within 60-days after being notified of the developer's intent to construct a project in their community or have a law or resolution that mandates PILOT agreements for solar systems. PILOT payments can also be paired with Host Community Agreements (HCAs), which provide certain benefits directly to the municipality hosting the project, and can be uniquely adapted for each municipality. Unlike PILOTs, which are typically distributed with constraints similar to tax revenue, HCAs are flexible and can be allocated as the host community sees fit.

2.2.3 Why should solar projects receive tax breaks?

Even while receiving a property tax exemption under RPTL 487, a solar project can generate economic benefits in a community by spurring development including creating jobs, reducing emissions and other harmful pollutants from entering the atmosphere, and generating supplemental income for farmers and landowners, which will help grow the tax base. Solar development can take place on existing or abandoned commercial sites, brownfields, landfills, agricultural lands, former industrial sites, and otherwise underutilized sites. Often, this land is generating minimal or no income for the municipality. By choosing to develop solar on this land, municipalities can turn underutilized sites into valuable and revenue-generating land, with the flexibility to direct PILOT payments or HCAs where the need is greatest. Full taxation typically discourages solar project development and would cause communities to miss out on opportunities to fund local infrastructure and public services. Once installed, renewable energy systems do not create significant increased demands on municipal services or infrastructure, so renewable projects accompanied by PILOT payments usually provide a net benefit to the host community.

2.2.4 Is solar a good use of farmland?

Solar can be developed on farmland in a way that maintains the current economic benefits to the community and preserves prime farmland. In addition, solar projects can be designed with co-use in mind, as developers are more proactively designing project layouts that include fencing and water access for sheep, pollinator friendly landscaping for honey production, and compatible native vegetation for soil and water erosion prevention.

When solar is developed on farmland, it often supplies the landowner with significantly higher income than they would have received without solar on the land, and can support the continuation of agricultural practices on farms with distressed economics, including ensuring that farms retain local ownership. As such, the local community benefits from PILOTs, HCAs, and land lease payments. These lease payments can provide farmers with 20 years or more of guaranteed financial security, diversifying their income while preserving the land for future use. Unlike alternative types of development, such as residential construction, after decommissioning at the end of a solar energy system's useful life, agricultural land can be returned to its original state and farming may resume.

In many instances, even while supporting solar, the land can continue to be used for agricultural operations such as livestock grazing, beekeeping, cultivation of certain crops, or planting of pollinator-friendly vegetation under and around the panels. New York has seen an emergence of solar projects that incorporate wildflowers and native plants to support bees, hummingbirds, and insects, and which may increase the future productivity of soil. Increasing the habitat for pollinators supports agricultural production and is great for New York's food supply.[9] Other options include planting shade-tolerant crops and elevating solar panels to allow farm equipment to pass safely underneath.[10] See Solar Installations on Agricultural Lands for additional information.

2.2.5 My region is often overcast or cloudy. Does solar really make sense in New York?

Yes! It is a common misconception that solar only works well in climates where there is abundant sunshine. Solar panels do not require perfectly sunny weather to generate electricity, and modern solar resource datasets allow developers to accurately estimate the amount of sunshine at a given location. Solar PV technology continues to become more efficient, enabling solar projects to generate in the absence of strong, direct sunlight, and increasing the viability of project locations throughout New York. Additionally, the cooler temperatures in New York actually make panels more efficient. Combined with the strong demand for renewable energy throughout New York, availability of suitable land, and supportive policies, solar makes sense in most areas of the state.[11]

2.3 Safety

2.3.1 Are solar panels toxic?

Solar panels largely consist of widely-used and non-toxic components, including an aluminum frame, tempered glass, and various common plastics. The most common type of solar panel consists of crystalline silicon PV cells which generate electricity when exposed to light. These non-toxic crystalline silicon cells consist almost entirely of silicon, one of the most common elements in the Earth's crust.[12]

Cadmium-based thin-film solar panels are the second most common type of panel (accounting for less than 15% worldwide), however NYSERDA is not aware of any of these installations currently in New York.[13,14] While cadmium is toxic, the form of cadmium used in these types of solar panels is cadmium telluride (CdTe), which has 1/100th the toxicity of elemental cadmium. When a CdTe panel is exposed to fire, the glass panels absorb the cadmium such that more than 99.9% of the cadmium is stored in the glass itself and not released into the environment. CdTe panels have also passed the EPA's Toxic Characteristic Leaching Procedure test, which tests the potential for crushed panels in a landfill to leach hazardous substances into groundwater.

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[9] "New York State's First Pollinator-Friendly Solar Farm." Cypress Creek Renewables, ccrenew.com/news/jefferson-solar-ribbon-cutting/.

[10] "Overview of Opportunities for Co-Location of Solar Energy Technologies and Vegetation." National Renewable Energy Laboratory, www.nrel.gov/docs/fy14osti/60240.pdf.

[11] Bobby Magill Follow "Rooftops in Cloudy Places Could Be Solar Gold Mines." Climate Central, 15 Apr. 2016, http://www.climatecentral.org/news/cloudy-places-could-be-solar-gold-mines-20253.

[12] "Health and Safety Impacts of Solar Photovoltaics." NC Clean Energy Technology Center, May 2017, https://nccleantech.ncsu.edu/wp-content/uploads/2018/10/Health-and-Safety-Impacts-of-Solar-Photovoltaics-2017_white-paper.pdf.

[13] https://data.ny.gov/Energy-Environment/Solar-Electric-Programs-Reported-by-NYSERDA-Beginn/3x8r-34rs

[14] "Crystalline Silicon Photovoltaics Research." Energy.gov, https://www.energy.gov/eere/solar/crystalline-silicon-photovoltaics-research

Some minor system components, including solder, may contain toxic chemicals at extremely low concentrations. Analysis performed by the North Carolina Clean Energy Technology Center did not find a potential toxicity threat from leaching, even in worst case scenarios (hurricane, fire, tornado, etc.), indicating an insignificant threat to human health and the environment.

Solar installations must conform to state fire safety and electric codes and they pose little or no risk of contaminating the soil or ground water.

2.3.2 Can solar panels break and release toxic materials?

The most common solar panel failure modes include glass breakage and various failures of internal electrical connections, neither of which would result in the release of any materials to the environment. Solar panels are constructed primarily of silicon or cadmium telluride, tempered glass, and metals. Similar to a car windshield, when solar panels experience a catastrophic event, the panels typically stay fully intact, thus not releasing any materials into the environment.

Additionally, reputable solar panel manufacturers will ensure that their equipment is certified to applicable performance and safety standards including those established by the International Electrotechnical Commission (IEC) and Underwriters Laboratory (UL).

2.3.3 Should we be worried about electromagnetic fields (EMF) associated with solar?

There are two kinds of EMF; “ionizing fields,” which are high level and harmful, and “non-ionizing,” which are low-level and generally harmless. Non-ionizing radiation comes from computers, appliances, cell phones, and wireless routers, whereas ionizing radiation comes from harmful sources such as UV lights or X-rays. EMF from solar systems are non-ionizing, similar to that of your household appliances. Studies show that the exposure level within the array or at the fenced boundary of a system falls well below recommended exposure limits. This exposure level decreases even more as you move away from the system, and is nonexistent at night when the system is not producing energy. Ultimately, EMF from solar systems is extremely insignificant and cannot be associated with a health effect.[15]

2.3.4 Do solar panels create glare? I’m worried about the visual impacts for my town and aviation.

Solar panels are designed to be dark colors, usually black or blue, that absorb the sunlight to create electricity. If panels were reflecting the sun, or creating glare, they would not be effective. PV panels are designed with anti-reflective coating to increase panel efficiency and keep the level of reflected light around 2% - less than the reflectivity of water. Airports around the world have been installing PV arrays to provide onsite generation, and studies show that glare from the solar arrays is a negligible issue.[16]

2.3.5 Do solar panels create high ambient temperatures in their surroundings?

The theory that a functioning solar PV array increases the ambient temperature of its surroundings is known as the “heat island” effect. The “heat island” effect proposes that solar panels create a darker landscape that reflects less light, and therefore creates a localized area of increased heat. Few studies have been conducted on the subject, but it has been generally concluded that the area surrounding a large-scale solar array is unlikely to experience a net heating change from the panels. It is, however, possible to see some heating occur under the panels themselves. This can be mitigated with proper implementation of vegetative cover instead of gravel.[17] With any PV array, the significance of the heating depends on the location of the array, time of the year, and surrounding environment.[18, 19]

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15 STUDY OF ACOUSTIC AND EMF LEVELS FROM SOLAR PHOTOVOLTAIC PROJECTS.” Massachusetts Clean Energy Center, https://www.masscec.com/resources/study-acoustic-and-emf-levels-solar-photovoltaic-projects.

16 https://www.mdpi.com/1996-1073/10/8/1194/pdf

17 “Beneath Solar Panels, the Seeds of Opportunity Sprout.” NREL, www.nrel.gov/news/features/2019/beneath-solar-panels-the-seeds-of-opportunity-sprout.html.

18 “Clean Energy Results, Questions and Answers, Ground Mounted Solar Photovoltaic Systems.” Energy Center, June 2015. http://www.mass.gov/eea/docs/doer/renewables/solar/solar-pv-guide.pdf

19 “Analysis of the Potential for a Heat Island Effect in Large Solar Farms.” Columbia University, http://www.clca.columbia.edu/13_39th%20IEEE%20PVSC_%20VMF_YY_Heat%20Island%20Effect.pdf

2.3.6 Does the fire department need special equipment to handle solar panel fires?

No special equipment is needed to handle solar panel fires, just proper training. Solar panels, like any electrical device, can be a fire hazard themselves or act as a physical barrier that hinders the ability of firefighters to put out an unrelated fire. Project developers and municipalities must ensure the local fire department is aware of the installation and informed about the procedures for de-electrifying the system and responding to incidents. In addition, the New York State Fire Code directly addresses solar PV installations, requiring clear labeling, instructions, setbacks, and safety features.

2.3.7 Are solar panels recyclable?

Solar panel recycling and disposal is not yet a major consideration in New York State, as most installations are newly operational and have a minimum 25-year expected useful life. It is, however, important to plan for the disposal of solar systems at the end of their useful life. Currently, there are no regulations requiring the recycling of solar panels in New York State, but it is best practice to reuse or recycle system components. Solar panels are classified as "general waste," which means that they can be placed in a landfill. Solar panels can contain trace amounts of toxic materials, but research shows that they generally do not pose a threat in landfills.[20]

Some solar energy system components, such as metal racking, can readily be reused or salvaged. Solar PV recycling is still in its infancy, though the ultimate goal is to recycle solar panels and recover any materials that may be reused or sold. At present, this is costly, but the industry is advancing; a 2016 study by the International Renewable Energy Agency (IRENA) estimates that recyclable materials in old solar modules will be worth $15 billion in recoverable assets by the year 2050.[21] Some examples of recycling opportunities in the United States include: Cascade Eco Minerals, Cleanlites, Echo Environmental, and First Solar.

2.3.8 Do solar PV systems generate noise?

Solar panels are noise-free and residential solar inverters are quieter than a refrigerator. Large-scale, ground-mounted systems may have minor noise associated with the transformers and inverters within the array as well as the electrical equipment used as required for utility interconnection. A study conducted by Massachusetts Clean Energy Center evaluating the noise and electric-magnetic fields at utility-scale solar facilities running at optimum capacity, concluded that all sounds produced by the PV equipment were inaudible (no louder than background levels) when measured 50 to 150 feet from the property boundary.[22]

2.4 Environmental Considerations

2.4.1 How are threatened and endangered species protected?

Threatened and endangered species (T&E) are accounted for and protected throughout the life of a solar project. First, the NYS Department of solar projects must conduct an initial screening with the U.S. Fish and Wildlife Service (USFWS), and coordinated with Environmental Conservation (DEC) and New York Natural Heritage Program (NYNHP), to identify if T&E species are present in the project area. In consultation with the DEC and USFWS, developers must identify if there are potential impacts to endangered or threatened species from facility construction, operation, or maintenance, and work with the DEC and/or USFWS to first avoid, then minimize, and then mitigate unavoidable impacts. Concerns related to direct and indirect habitat loss, mortality, breeding, and wintering and migration patterns of bird and bats are all addressed during the permitting process informs the final design of the project and mitigation measures. Examples of potential mitigation measures include construction buffers around known bald eagle nests, avoiding disturbing sensitive habitat, and developing conservation funds to offset any unavoidable impacts.

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[20] Deign, Jason. "Landfilling Old Solar Panels Likely Safe for Humans, New Research Suggests." Greentech Media, Greentech Media, 3 Apr. 2020, www.greentechmedia.com/articles/read/solar-panel-landfill-deemed-safe-as-recycling-options-grow.

[21] "End-of-Life Management, Solar Photovoltaic Panels.", International Renewable Energy Agency, https://www.irena.org/DocumentDownloads/Publications/IRENA_IEAPVPS_End-of Life_Solar_PV_Panels_2016.pdf

[22] Massachusetts Clean Energy Center- Study of Acoustic and EMF Levels from Solar Photovoltaics Projects https://files.masscec.com/research/StudyAcousticEMFLevelsSolarPhotovoltaicProjects.pdf

2.4.2 Do solar panels contribute to bird loss?

The misconception that solar projects are a major contributor to bird loss has stemmed from concentrated solar thermal systems. This type of solar system, which constitutes a small percentage of US solar capacity and is located almost exclusively in the Southwest, uses mirrors to focus solar energy in order to power a steam generator. Bird loss in this situation occurs when birds fly through concentrated light reflection. Solar projects in New York, which use solar panels to convert sunlight into energy, do not reflect light or act as a mirrors. Due to this major design difference, there is a minimal impact on avian species.[23]

2.4.3 Do solar panels affect water runoff, wetlands, or waterbodies at the site?

In-service solar energy facilities do not leach any chemicals or pollutants into the environment[24,25,26]. Federal, state, and local regulations are in place to ensure that solar arrays are constructed in ways that protect wetlands, waterbodies, and other water resources. Rooftop solar systems have little to no effects on the direction or flow of water. Ground- mounted systems are designed to manage runoff using deep-rooted vegetation such as “pollinator-friendly” grasses and wildflowers, or topographical features such as gravel diaphragms to reestablish sheet flow, swales, or stormwater ponds, which can provide a net water quality benefit.

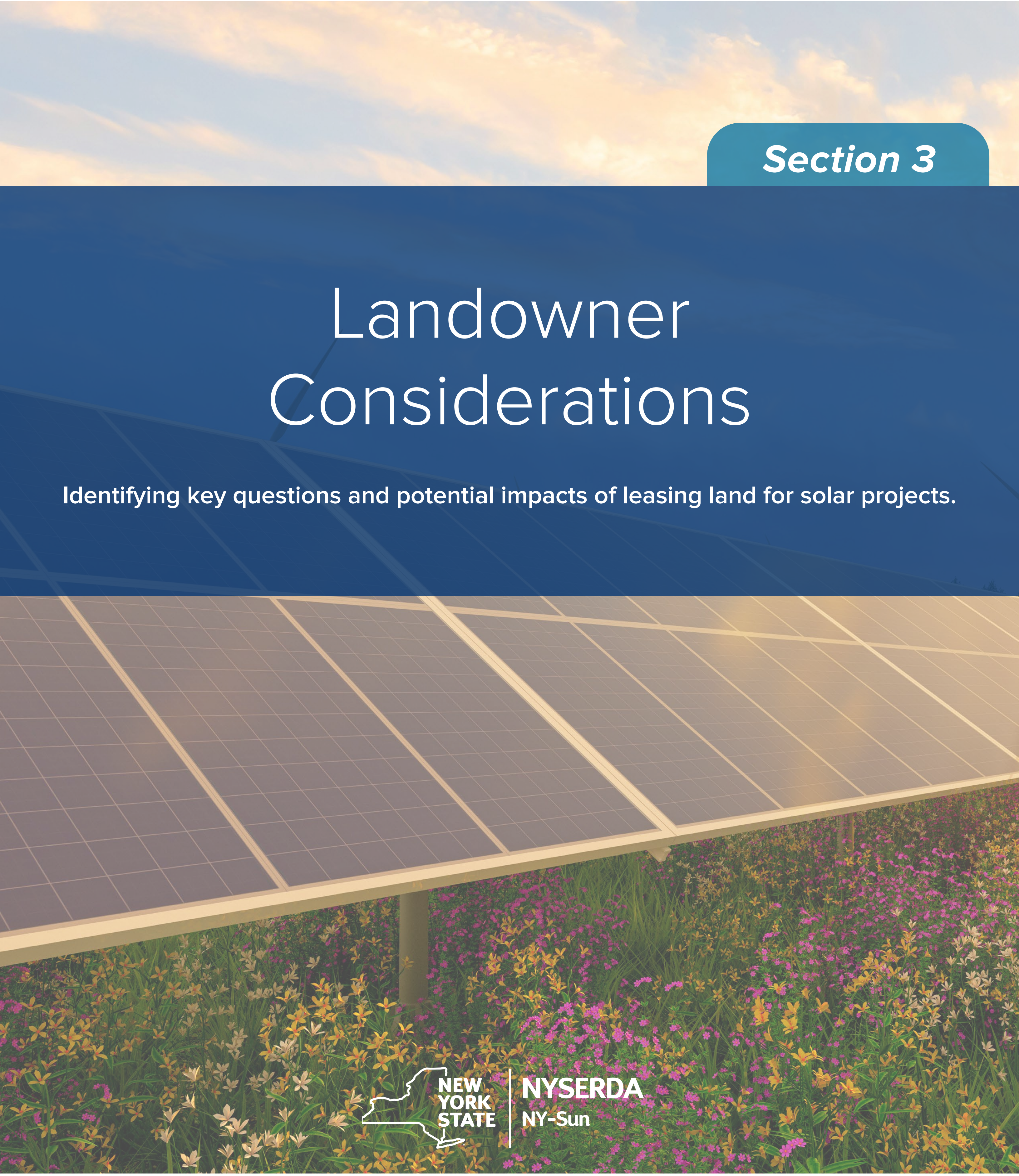
Various state agencies also maintain requirements and relevant guidance on this topic:

- DEC’s State Pollutant Discharge Elimination System (SPDES) website details permit requirements for stormwater discharge. The SPDES General Permit was updated in 2025 to include specific provisions for solar energy projects. Further, DEC’s 2018 Solar Panel Construction Stormwater Permitting/SWPPP Guidance and the 2024 NYSEIA letter have been replaced by updates to the SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-25-001), which details the stormwater requirements related to solar development in the state.
- The Department of Agriculture and Markets’ Guidelines for Solar Energy Projects includes guidance related to drainage, construction, and decommissioning for solar installations on agricultural lands.
- DEC and U.S. Army Corps of Engineers (USACE) / Environmental Protection Agency (EPA) are responsible for preserving, protecting, and conserving state and federal jurisdictional wetlands and waterbodies respectively. These agencies require permits for regulated activities in jurisdictional wetlands and waterbodies.

Questions?

If you have any questions regarding solar basics, please email questions to cleanenergyhelp@nyserda.ny.gov or request free technical assistance at nyserda.ny.gov/SolarGuidebook. The NYSERDA team looks forward to partnering with communities across the state to help them meet their solar energy goals.

[23] “A Review of Avian Monitoring and Mitigation Information at Existing Utility Scale Solar Facilities.” Environmental Science Division, Argonne National Laboratory, Apr. 2015, http://www.evs.anl.gov/downloads/ANL-EVS_15-2.pdf.
[24] https://www.epa.gov/hw/solar-panel-frequent-questions
[25] https://cleanpower.org/wp-content/uploads/gateway/2022/08/ACP_FactSheet_SolarCommunity_220830.pdf
[26] https://scholarship.law.columbia.edu/sabin_climate_change/217/



Section 3

Landowner Considerations

Identifying key questions and potential impacts of leasing land for solar projects.

Section Contents

Overview

When deciding to lease land for solar, landowners have many factors to consider before committing. Throughout this section, we provide landowners with the necessary information to take their solar development project to the next step by discussing the topics of site selection, solar leases, typical lease payment structures, easements, agricultural assessments, conversion penalties, agrivoltaics, and other potential impacts and considerations when in the decision-making process.

1. Solar For Your Land

The size of a solar installation is measured by its capacity to produce energy. In New York, 1-megawatt alternating current (MW AC) installation will generate between 1,152,000 and 1,394,000 kilowatt hours (kWh) each year depending on its location.[1] This amount of electricity would meet the annual needs of well over 100 single family homes in our region.[2] A kWh is how electricity usage is measured on your utility bill. A 1-MW AC system will generally require about five acres of land for 3,000 to 4,000 individual solar panels and likely cost $2 to $3 million to build.

Solar PV systems built on open land (ground mounted) will connect directly to the electric grid and will have their own utility meter. For a community scale solar facility (projects less than 5MW), the amount of land desirable for a lease generally ranges from 10 to 30 acres, depending upon the size of the solar array. Large scale renewable (LSR) projects (typically greater than 5 MW) typically use at least 100 acres so the individual parcel size sought after by the developer may be more variable.

Solar panels are typically warrantied for 25-35 years, but a system can last longer if maintained well and the market factors support the continued operation expenditures. Solar leases range from 20 to 30 years with optional extension periods once the initial term ends but only if the facility owner wishes. It's not unusual for the total potential lease period to be 40 years when accounting for the options to extend. See Solar Lease Phases and Considerations.

1.1 Is your property a good candidate for solar?

Solar developers typically search for land that is undeveloped, open, and flat near existing distribution or transmission lines with available capacity. Solar facilities must be able to connect to the electricity grid safely and reliably without jeopardizing the existing connections or service. Evaluating nearby interconnection is the first step to determine if a parcel is a good candidate for solar.

Interconnection Considerations

Small residential solar systems up to 50 kW can be connected to single-phase electric distribution lines. Single-phase distribution lines deliver power to residential homes. Solar facilities between 50kW and 5 MW AC must be near a three-phase electric distribution line (ideally less than 2,000 feet away), with enough capacity and appropriate voltage to accommodate the proposed solar facility. It is usually not cost-effective to connect a small project to a very high-voltage transmission line because the cost to connect typically increases with the voltage of the line.

LSR projects connect to the grid by connecting directly to a substation or using a transmission line that is usually at least 34.5 kilovolts (kV) or higher. Transmission lines move electricity at higher voltage compared to electric distribution lines. Higher voltage lines reduce energy losses over long distances. Substations are high-voltage electric facilities used to control and protect the electricity being transmitted by the power lines.

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[1] NREL PVWatts Calculator https://pvwatts.nrel.gov/index.php
[2] Electricity use in homes - U.S. Energy Information Administration (EIA)

Interconnection Commentary:

In addition to getting land use, environmental permits, and approvals from the responsible permitting authorities, the developer is responsible for working with utility companies to understand if and how the proposed solar project can be safely connected to the grid using distribution or transmission lines.

Three-phase distribution lines deliver power to commercial and industrial companies at a steady, constant rate. NYS Department of Public Service (DPS) developed the Standard Interconnection Requirements (SIR), for solar projects 5 MW and smaller. SIR is an application process for distributed energy resource (DER) projects, with or without battery energy storage systems, that look to connect to the grid. Solar projects below 50 kW usually qualify for expedited approval procedures with simplified requirements.

Proposed utility scale LSR projects must be evaluated and approved by the New York Independent System Operator (NYISO).

Interconnection costs can be quite high and the point (location) of interconnection is perhaps the most important site consideration for solar developers. During the due diligence phase (detailed in section 2.2 below), the solar developer will evaluate the interconnection potential during the interconnection application process and consultation with the utility company through a number of reviews and studies. Keep in mind that developers are subject to the mandates and requirements specified by the utility company and/or the NYISO's Open Access Transmission Tariff process.

Landowners interested in understanding whether their land might be attractive to developers can start by using online hosting capacity maps available from the electricity utilities using the following links: Distribution Line Hosting Capacity Map (scroll to the bottom to find links for your utility) and Transmission Lines Map. Distribution Line Hosting Capacity Maps show the location of the single-phase lines and three-phase lines. Keep in mind that the distribution map is a snapshot in time that is updated routinely. Thus, they are only an approximate summary of the hosting capacity. Only a formal consultation between the developer and the utility company or NYISO can provide a complete picture of capacity on the lines and the need for any required upgrades.

Distribution Line Hosting Capacity Maps Commentary:

If the distribution hosting capacity map shows that a 3-phase line has little remaining capacity to connect additional solar arrays, it doesn't always mean that interconnection is not possible. It may mean the line or substation may require significant, often costly upgrades, before interconnection is possible. If that is the case, the solar developer would need to pay for the cost of these upgrades. Little or no remaining capacity may also mean that another project may need to drop out of the queue to open up availability.

Solar Laws Consideration

It is important to understand your municipality's local solar law, if one has been adopted. You can search for local laws through the NYS Department of State's website based on municipality type or name, the law number, or the date the law was filed. Use keywords like "solar" or "utility scale solar" in your search. Alternatively, check with your municipality directly. Your municipality's website may provide you direct access to any enacted solar laws. See Chapter 8 of the Solar Guidebook to learn more about solar laws.

Environmental Considerations

Developers will conduct a desktop review of mapped environmental features before deciding on leasing. Environmental considerations include reviewing soils, floodplains, wetlands, waterbodies, cultural, historic, and archaeological resources, threatened and endangered species and habitats, etc. on the parcel. Reviewing mapped features does not replace the need for formal delineations, field surveys, and/ or agency consultations and a deeper dive will be required during the permitting process. Scenic Hudson has developed an interactive mapping tool that helps communities in the Hudson Valley Region get the most out of solar with minimal impacts to precious resources. The Nature Conservancy's Long Island Solar Road Map similar covers Long Island. NYSERDA's Integrated Energy Data Resource mapper can also help evaluate solar development feasibility.

Finding a Solar Developer

To find a solar developer that may be interested in your parcel, look for solar projects that have been permitted or constructed near your parcel.

If you are looking for residential or small commercial solar developers, review NYSERDA's list of solar contractors to explore developers that are located in or serve your county. NYSERDA's database in NYSERDA's Community Solar Map is another resource to identify completed distributed generation projects and their developers across the state.

If you are looking to find solar developers who are interested in constructing LSR projects near you, review New York State Office of Renewable Energy Siting and Electric Transmission's (ORES) website which lists project notices of intent, applications that currently under review, and permitted applications. You can view projects on ORES' map to see which permitted projects are closest to you. Review NYSERDA's Open NY's Database for completed large-scale renewable projects across the state.

Whether you are looking for a residential, commercial, or large-scale solar developer, be sure to reach out to several developers for quotes, read through reviews, and ask for insight from people that who have worked with them. Keep in mind, as in any other industry, developers have different business models, experience, and reputations.

2. Solar Lease Phases and Considerations

New York's solar market is growing fast and demand for feasible locations to install solar energy systems is high. Across New York State, solar developers are contacting farmers and landowners to secure long-term land leases for siting solar arrays. In some cases, solar developers work with land agents to identify potential projects. Land agents locate properties suitable for solar using their expertise on real estate, solar valuations, and various mapping software programs.

A well-crafted lease will deal with all facets of the solar facility operation from its inception to its decommissioning (including restoration). It will address the duration of the agreement, the total acreage affected, ownership of the solar project equipment, responsibility for taxes and utilities, indemnity and liability insurance, access, the developer's right to give tours of or otherwise use the facility (including, possibly, continued agricultural operations), decommissioning of the system at the end-of-life, and every other aspect of the relationship between the landowner and developer. Several of these issues are covered in more detail in the sections that follow.

To most landowners, the critical elements of the lease include provisions dealing with payments (how much, when, and under what conditions), duration of the lease (including renewal clauses), and the owner's right to continue to use the property for farming, hunting, or other purposes that aren't in conflict with the project. From the standpoint of the developer, the one of the most important aspect of the solar lease is that it secures the exclusive right to use defined sections of the property for development, installation, operation, and maintenance of the solar facility and related equipment.

A conversation with the landowner can begin in a number of ways including: phone calls, post cards, or a letter of intent (LOI) that contains the developer's contact information and expressed interest in leasing the property. **We strongly recommend asking an attorney to review any documents (letters of intent, agreements, leases, easements, etc.) before signing it.**

2.1 Letter of Intent

Many developers prefer to send a letter of intent (LOI) that expresses their interest in leasing the land. A LOI is a preliminary letter or agreement that includes the potential lease arrangements and will typically include provisions that state the landowner can't engage with another solar developer and requires the landowner to keep all information about the project confidential. The developer may also include financial commitments or an estimated timeframe. If the landowner is interested, the developer may look to organize an initial site visit to examine the amount of available land and talk specifics in person. Some LOIs are for informational purposes only while others may be legally binding.

2.2 Option to Lease Agreement

If the landowner expresses interest in leasing their property, the developer and the landowner will negotiate an Option to Lease Agreement (Option Agreement) that will include an option payment. This is a binding document that will outline the proposed lease area, the preferred method for site access, any site-specific requests that the landowner makes, and provides the developer with time to do *due diligence*. The location of the solar facility (proposed lease area) will be determined by mutual consent. The proposed lease area is often a fraction of the area that is covered under the option agreement.

Due diligence is a process whereby the developer assesses whether or not the property is technically and financially appropriate for the installation of a solar facility.

Option Periods (sometimes called Development Term/Phase) is the length of time covered by the Option Agreement. These Option Periods often range between one and five years depending on how advanced the development project is, interconnection study results, regulatory permitting, financing, developer business plan, etc.

The option agreement does not bind the developer to develop the project and similarly does not commit the developer to any payments to the landowner beyond the option period. The option agreement will detail the terms of the solar lease if the solar developer determines that the parcel is desirable for the project and the project meets the permitting, financial, and other contingencies. It has similar provisions to the LOI: exclusivity and confidentiality.

Due Diligence

During the Option Period the solar developer will work to determine the viability of the site. This includes:

- Securing other land parcels/ easements if needed
- Interconnection application and communications with the utility company to ensure there is capacity on the electric grid and the project can be safely connected without jeopardizing the reliability of service (or identifying what service upgrades may be necessary)
- Conducting site visits to determine the environmental and construction feasibility of the site [e.g., wetlands and waterbodies delineations, state and federally listed species habitat surveys, topography surveys, American Land Title Association (ALTA) and/or the National Society of Professional Surveyors (NSPS) surveys), etc.]
- Evaluating the title to ensure any existing rights-of-way (ROW), easements, leases, mortgages etc. do not impact the project area
- Obtaining any required local, state, county, or federal land use and environmental permitting approvals
- Marketing the anticipated power output
- Evaluating property tax obligations
- Securing project financing

It is common at the early stages of development for a developer to be unsure about the exact location of infrastructure. The design of the solar facility may shift to accommodate things uncovered during the due diligence period or to accommodate permit requirements. However, during this phase the landowner can exclude certain areas from development consideration.

During the Option Period, the landowner may receive a one-time payment or request to be paid according to a set schedule (monthly, semiannually, annually), which may include incremental increases, to encourage a developer to act quickly to determine the project's feasibility to ensure the land is not held up for an indefinite amount of time. A developer is unlikely to make significant investments in real estate until they are confident with the feasibility of the project; therefore, option agreements typically include modest fees. During this time, the landowner is typically allowed to continue to use the land so long as they provide access to the leased area for the various environmental and construction feasibility studies /surveys to determine the viability of the project.

Consider the following items while negotiating the Option to Lease Agreement:

- Continued use of the land for farming, hunting, or other recreation rights
- Repair damages (property or crops) from surveys during development and the option period
- Notice of inspections/site visits
- Frequency and amount of option payments
- Clear timeframes
- Inflation and escalation

- Encourage the use of agrivoltaics
- Discuss preferred ground cover and vegetation management options
- Insurance & indemnity provisions
- Use of pesticides and herbicides
- Contact information
- Mineral/ below surface rights
- Property tax increases that would be paid by the developer over the life of the project

The Option Agreement should contain provisions that detail how and when the developer will notify the landowner if the project will not proceed.

Option to Purchase

Some developers may be willing to enter into an Option to Purchase Agreement instead of leasing the land.

2.3 Solar Lease Agreement

It is common for the option agreement and solar lease agreement to be negotiated concurrently, where the option agreement expires at a certain date and the developer either decides to execute a lease agreement or cancel any rights to the property. If the developer proceeds with the project (secured financing and regulatory permits) the solar lease will go into effect. The solar developer is essentially "exercising the option."

A solar lease agreement is a long-term written contract between the landowner and the developer that spells out the landowner's rights and obligations and the rights and duties of the developer. It details the duration of the lease, payment terms, tax and liability issues, rights of access, etc. The lease covers construction, operations, maintenance, and decommissioning of the facility area. Leases should be carefully developed so they clearly address issues important to the project developer and landowner all the way through project decommissioning. While some of these issues will also be governed by the permitting authority, the solar lease is the only legal agreement that requires the landowner's assent.

In some cases, the original parties to a lease will change throughout the life of the project, so it is important that all potential issues are clearly spelled out to prevent future misinterpretation. For example, the lease should contain provisions discussing what happens if the developer's company is acquired by another company, assigns away its interest in the lease, defaults on its loan, or declares bankruptcy. The lease should state that if that happens, the lease terms will remain valid and unchanged. Similarly, if the developer / company takes out a loan for the renewable energy project, defaults on the loan, and the developer/company's lender takes over the lease, the terms of the solar lease should not change. In the event of bankruptcy, the lease should automatically be transferred to the developer/ company's successor. The solar lease agreement should also detail what happens to the lease should the landowner sell their property or become bankrupt.

Developer's Lease Goals

- Long-term with clearly defined amendment rights and extension options
- Well-defined, unimpeded rights to access and use of the property or project area for all potential project development, construction, maintenance, operation, and decommissioning activities
- Well-defined payment structure that spreads the real estate costs over the life of the project and is tied to predictable metrics, such as land acreage or solar project power output
- The ability to transfer the lease

Landowner's Lease Goals

- Fair and adequate compensation for use of the property (or project area) and loss of certain rights
- Well-defined, clearly delineated, and clearly established rights for continuing uses (including access rights) on the property (this includes clarity on restrictions put on the leased acreage on the location of panels, inverters, access roads, etc.)
- Default terms and responsibilities of the developer at the end of the project
- Indemnification in any lawsuits related to the use of the land for the solar facility
- No responsibility for any increased taxes or agricultural conversion penalties (see Section 5 of this chapter)

2.3.1 Construction

Construction can take between 6 months to a few years depending on the size of the project. This is dependent on procurement, seasonal construction requirements/restrictions related to state or federally listed species, work availability, and financing. Construction includes site clearing, installation, grading, and improvement of roads, installation of temporary structures (laydown yards, stormwater pollution prevention measures), fencing, solar racking and modules, inverter pads, transmission equipment, overhead or underground wires, reseeding, and often vegetation plantings.

2.3.2 Operation

Operation of the facility begins when the solar facility is actively generating electricity and connected to the grid. The planned period of operation is usually between 20 and 40 years. During this time, the developer is responsible for making sure the facility will be maintained and running as expected. Maintenance activities include mowing vegetations, cleaning panels, thermographic testing for wire faults, inverter maintenance, system checks, and repairs if needed.

The solar lease may include a provision that details the optional renewal period to extend operations. The optional renewal clause gives the developer an option to allow the facility to run for an additional 5 to 10 years, usually without having to renegotiate the lease agreement.

2.3.3 Decommissioning

Decommissioning of the facility is the removal of the solar facility (the above and below ground infrastructure) and restoring to land to pre-exiting conditions. See Chapter 7: Decommissioning Solar Panels Systems of NYSERDA's Solar Guidebook for additional information. In the solar lease agreement, make sure that there are provisions that specify who is responsible for dismantling the facility if the developer/ company is no longer in business, the panels are damaged/ no longer producing power, or if the solar array ages out and is no longer viable. Keep in mind that the land use permit (obtained from the local municipality or from New York State depending on the size of the solar project) will detail decommissioning requirements that the developer will also need to abide by.

Unless the landowner prefers an alternative outcome, the lease should require the property be returned to its pre-leased condition and any damages caused by removal are repaired. Decommissioning provisions should also include details on what triggers decommissioning, the timeframe required for decommissioning, and consequences for failing to remove the solar facility per the agreement.

Restoration occurs after removal of the project components. The land should be returned to the original condition it was in before the installation of the solar facility. Consider what – if any –- part of the facility you would like to remain after decommissioning (e.g., access roads, vegetation, etc.). Ensure the solar lease agreement details who will be responsible for site restoration.

Below are some of the items a landowner should consider when negotiating a solar lease agreement:

- Clear delineation of area leased for solar and permitted uses within that area
- Continued use of the remaining land for farming, hunting, or other recreation rights
- Agrivoltaics
- Tax implications
- Farmland preservation / agricultural conservation programs
- Selling your property
- Clear timeframes
- Utilities (water, electric, telecommunications, etc. if used by the solar facility though this is very unlikely)
- Property damage during construction, maintenance, operation, or decommissioning
- Property maintenance and notification methods
- Frequency and amount of lease payments, including during option and construction periods
- Inflation and escalation
- Insurance & indemnity provisions

- Use of pesticides and herbicides
- Contact information
- Mineral rights
- Termination clauses
- Inclusion of battery energy storage systems

Prior to signing a solar lease agreement with a solar developer, landowners should examine possible tax consequences and issues associated with the solar facility. Again, we strongly recommend asking an attorney to review the LOI, Option to Lease Agreement, and Solar Lease Agreement before signing it.

3. Easements and Rights-of-Way (ROW)

A solar project developer may seek to secure land rights that do not necessarily require a lease or purchase of land, including the following:

- The right to install, maintain, and repair underground cables or overhead transmission lines connecting the solar facility to substations and, ultimately, to the power grid
- The right to build or improve existing roads or access points for the solar facility
- The right to cross non-leased land for construction, operation, and maintenance of the solar facility and related equipment
- The right to produce noise or other minor nuisances that the construction or operating activities may create
- The right to use property for off-site mitigation to address assumed impacts within the leased area that cannot be mitigated on site

An easement is a right to use property for a defined use. Easements are commonly used for project development needs on land that will not include solar arrays, substations, or other major project construction and operation features, but that provides rights to adjoining land. An easement is a nonpossessory property interest that gives the holder—in this case, the developer—a right of use over the property, or that prevents landowners from doing something that is otherwise lawful, but that would be detrimental to the solar project. Because easements legally transfer ownership or interest of property rights, they must be in writing and filed with the proper municipality or county recorder. The easement will run in perpetuity (forever) unless the instrument granting the easement provides for a term of years.

3.1 Neighbor Agreements and Variances

Neighbor agreements (sometimes called participation agreements) are written agreements between developers and landowners whose property is directly adjacent to a project. Like easements and ROWs, neighbor agreements usually involve compensation to a landowner and are considered mitigation for a quantifiable impact to the landowner. Quantifiable impacts typically addressed by neighbor agreements include visual, and general construction nuisances. Landowners are not typically compensated for their general dislike of a project; however, public involvement and testimony is a standard part of the land-use permitting process in New York State and provides an opportunity for a landowner to share concerns about a project and shape the decision process.

Variances are used to address a land-use regulation when a developer wishes to get an exception to the local law to site a solar project less than 25MW. A common example is when solar arrays or other project features are sited within a setback zone. In these instances, a developer may seek a variance from the local Zoning Board of Appeals. If the variance requested impacts a non-participating landowner (one not under a lease or other property agreement with the developer), the local jurisdiction may request to see proof of a neighbor agreement and the associated compensation. The local jurisdiction will require a developer to obtain all necessary variances before reviewing a permit application, or before it issues a decision on a permit application.

4. Typical Solar Payment Structures

Lease rates vary based on the location of the parcel, acres and slope of land available, proximity to and cost of interconnection, ease of permitting and construction, stability of the regional weather, and other factors.

If you are approached by a developer or have interest in leasing your land, research the going rate for land leases in your area (though note that lessees are usually required to sign non-disclosure agreements so this information may not be readily available). Contact multiple solar developers to gauge interest in your land. Do research online about solar lease rates and consider working with a real estate professional that has expertise negotiating on behalf of landowners with solar companies.

There are a number of ways to collect payments for a solar facility sited on your land.

4.1 Fixed Sum Per Acre Lease Rates

Fixed sum per acre is the most common type of payment option during both the option phase and the solar lease agreement. The developer will offer an annual payment as defined by dollars per acre. As a landowner, ensure the occupied acres are clearly defined in the lease agreement. Keep in mind that the land under option is likely larger than the land that will be “occupied” and under the solar lease. Consider including a map and legal description of the leasable premise to avoid confusion.

4.2 One-Time, Lump-Sum Payment

This type of payment structure is common in the option phase. While this type of contract is not a common arrangement in a solar lease arrangement it may be satisfactory to both parties if the landowner is in need of immediate cash and willing to forego the prospect of a steady income stream, and the developer has the ability to release a large amount of cash up front. This arrangement is most common for easements and ROWs.

4.3 Nameplate Capacity

A less common solar lease payment structure is based on the nameplate capacity. Nameplate capacity is the estimated capacity the installed solar facility can generate under optimal conditions. The lease arrangement will offer a flat payment rate per unit of capacity (usually in MW) of the facility installed on the property, again, made on an annual basis. As a landowner, you should review the local market rates. This payment structure is not used for the option phase of the project.

4.4 Royalty Payments

Some solar lease agreements may offer the landowner royalty payments. Royalties or revenue-sharing models are payments based on the actual production of the solar equipment installed on the property. If this is how you prefer payment, consider the basis of the payment. Royalty payments can be made based on the nameplate capacity (per in MW), per kilowatt-hours (kWh) of power produced, per “gross proceeds” from electricity sales, “net revenue” from power sold, etc. Work with a lawyer and/ or financial advisor to understand and help project the best, average, and worse case projections. Determine if you want to include a minimum payment provision to secure against downside risk (if the facility does not perform up to expectations, e.g., cloudy year). Royalty payments are not very common in the solar industry during any phase of development.

5. Agricultural Assessments

Under the NYS Agriculture and Markets Law, if a landowner receives an agricultural assessment and converts the land to a nonagricultural use, the landowner may be subject to a monetary payment for converting the land. A conversion of land is “an outward or affirmative act changing the use of agricultural lands” (AML §301(8)). Renewable energy facilities (including agrivoltaics facilities) are not seen as agricultural use and would require a conversion payment for changing the use of agricultural lands.

Municipal assessors are responsible for tracking conversions when they occur. Landowners are also required to notify the assessor within 90 days whenever a parcel receiving an agricultural assessment is converted to a nonagricultural use. A penalty of up to $1,000 can be levied against a landowner who fails to report the conversion. To fully understand the impact of these factors, landowners are urged to consult with an attorney and their municipal assessor before signing any documents.

In addition to the one-time penalty, the lessee will lose the tax exemption associated with the ag assessment. The developer will usually cover this increase in taxes (be sure it's stipulated in the lease agreement) but note that the lessee may also lose their tax exemption on land adjacent to but not included in the lease agreement (this increase in taxable property can also be negotiated with the developer).

5.1 Conversion Payment

The landowner on record is responsible for paying the conversion payment. Your assessor can work with you to determine what the conversion payment may cost. Make sure you know where the solar array will be placed on your property so that a comparative analysis of benefited acres versus total converted acres, by mineral, organic, and farm woodland soil groups, can be determined. Solar developers typically cover this conversion payment; landowners should ensure it be included as a part of the solar lease. See Section 2.3 Solar Lease Agreement of this chapter for more information.

5.2 Solar Panels and Taxes

A solar energy system is "real property" once it has been permanently affixed to land or a structure [Real Property Tax Law (RPTL) § 102(12)(b); 8 Op. Counsel SBEA No. 3]. The definition of "real property" also includes a "power generating apparatus" [RPTL §102(12)(f)]. As such, it is taxable unless it qualifies for an exemption (RPTL § 300). The assessor must determine the contributory value of the solar array to the value of your property. If the value of the converted acreage devoted to the solar array increases, it may affect your taxes. An increase in taxable value may affect your county, town, village, and school taxes as well as other taxes that may be levied, such as highway, fire, ambulance, library, lighting district, drainage district, and other taxes and levies. It may also affect special district taxes for municipal water and sewer districts if the land is no longer predominantly used for agricultural purposes. The developer is typically responsible for covering the increase in taxes.

5.3 Exemptions from School, County, Town, and Village Taxes

There is an exemption statute in State Law that applies specifically to renewable energy systems: Section 487 of the RPTL. Section 487, which also covers wind power systems and farm waste energy systems, provides a 15-year exemption from real property taxation for the increase in value resulting from the installation of a qualifying system. However, the statute allows municipalities and school districts to opt-out of this exemption. Opting out from the exemption means that the municipality or school district chooses to include these renewable energy systems when assessing property taxes. To find out if your county, town, village, and/or school district has opted out, talk to your local tax assessor and/or review the Department of Taxation and Finance exemption list. Leases beyond 15 years will likely have an effect on your tax liabilities going forward. Absent the exemption, the local government may seek to value the solar array at full value. This assessment would again depend upon the contributory value of the solar array on your property at year 16. Even after the 15-year period, the developer and not the landowner should be responsible for the taxes on the value of the array, just as they are responsible for payment of any negotiated PILOT agreement in the interim. See Chapter 6 of the Solar Guidebook: PILOT and RPTL 487.

6. Agrivoltaics Considerations

New York State Agricultural Technical Working Group (A-TWG) defines agrivoltaics as "a simultaneous use of land for solar photovoltaic power generation and agricultural production of 'crops, livestock, and livestock products' as that phrase is defined by Agriculture & Markets Law (AML) §301(2)."[3] Agrivoltaics can present an opportunity for landowners to incorporate agricultural practices within a solar facility to continue existing farm operations, explore new agricultural opportunities, or enable a third party to utilize the land under the panels.

[3] New York State Energy Research and Development Authority (NYSERDA). "Growing Agrivoltaics in New York State: Advancing Understanding of Opportunities to Integrate Renewables into Working Landscapes," NYSERDA Report Number 23-25. Prepared by WSP USA and Agrivoltaic Solutions LLC. 2023. https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/Research/Other-Technical-Reports/23-25-Agrovoltaics-in-New-York--acc.pdf

This section is provided to support landowners in understanding considerations for development of an agrivoltaics project, from planning and design through management. Agrivoltaics is an emerging practice in New York and globally, with active research ongoing. Solar grazing is the most developed of these emerging practices. To stay informed, visit https://www.nyserda.ny.gov/Agrivoltaics and resources from A-TWG.

6.1 Lease Agreement and Insurance Requirements

Make sure the lease agreement includes provisions that discuss planned and unplanned visits by all parties, which may include various people associated with the developer (inspection and maintenance crews, people responsible for vegetation management, etc.) and the landowner (who may farm the property themselves or rent the property to someone else to farm, researchers, etc.). For planned site visits, detail how to contact each other and how much notice is required. For unplanned visits, provide guidance to the other parties as to what precautions to follow. Agree that the other parties will be notified as soon as possible before the unplanned visit occurs and/or immediately after one has occurred. Work with an attorney to ensure the lease agreement details this.

The lease agreement should also specify the insurance that the landowner and solar developer must carry and the terms under which either party is liable for specific types of damage. Likewise, the contract between the farm manager/grazer and the solar developer should stipulate insurance required for each party. It will be important to communicate with your insurance provider before entering a lease or contract to make sure you are covered under a new or existing policy. Insurance providers are generally unfamiliar with agrivoltaic practices, which means communication will be important for coming to appropriate terms. Factors that will impact coverage include the project's specific design, the type of farm equipment used onsite, and the type of agriculture (e.g., livestock, field crops, etc.) that will be onsite.

The solar developer will require the farm manager/grazer to obtain insurance protecting against damage to the solar equipment and solar site. The cost of this insurance will vary from project to project. In the context of solar sheep grazing, the 2021 Mount Morris Agrivoltaic Study estimates $5,000/year for such insurance, based on a project proposing to graze 9,540 lambs on 1,060 acres.[4] For a project grazing 100-ewes on 25-acres, North Carolina Cooperative Extension estimates $300/year.[5] This is in addition to other policies that the grower/grazer would likely hold, such as livestock insurance and professional liability insurance. Make sure you work with your insurance company to understand their options. Who actually pays any increases in insurance coverage levied on landowners can be negotiated with the developer. All people permitted access to the site post-construction may have to undergo safety training.

6.2 Parcel Evaluation

Review your municipality's zoning laws to understand how agricultural practices may be incorporated with the solar facility. Perhaps there are less stringent zoning standards that can be applied if the solar facility includes agrivoltaics. A solar developer and/or an agrivoltaics consultant can help to carefully evaluate your property to determine the best place to incorporate agriculture. They will look at the environmental characteristics on your parcel including delineated wetlands or waterbodies and high value farmland (Mineral Soils Group 1 - 4).

6.3 Solar Facility Design and Construction

While cables need to be buried in accordance with National and State regulations, understanding where and how deep the electric lines are buried is important to avoid impacting them during planting and harvesting. Ensure the developer takes measures to minimize soil compaction. Follow best practices and DEC guidance to protect stormwater resources. Refrain from using herbicides, insecticides, and fungicides whenever possible. The design of a dual-use solar facility should consider the panel height, width, and turning clearances for farm equipment.

Construction of solar facilities can impact soils, from grading to accidental topsoil/subsoil mixing to irregular compaction throughout the site, and on the aisles used to transport supplies. For agrivoltaics projects, pre-construction soil sampling inside and outside the selected solar site can then be used to assess damage and the success of mitigation.

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[4] Grasby, S., K. Campbell, J. Shiflett, M. MacKenzie, N. Manapol, R. McCann, L. Hain, and L. Fox. "Mount Morris Agrivoltaic Study. Co-locating Solar and Agriculture at the Mount Morris Ridge Solar Energy Center." 2021. https://solargrazing.org/wp-content/uploads/2022/01/MountMorris-AgrivoltaicReport-FINAL_PRINT_ready.pdf

[5] North Carolina Cooperative Extension. "Sheep Grazing Solar Farm Budget," NC Choices. 2021. https://cefs.ncsu.edu/resources/sheep-grazing-solar-farm-budget-template/

Consider negotiating decompaction or other soil improvements at the end of construction.

Discuss revegetation options with the solar company; some ground covers are optimal for grazing, while others may work better around agricultural crops.

Check solar panel height restrictions and work with the developer to obtain waivers as needed to support agrivoltaics practices.

Discuss improvements to the solar facility design to accommodate farming practices: water access, 120/240 volt electrical access for farm equipment, interior fencing either for rotational grazing and ways to protect high-voltage equipment, etc.

Consider the type of fence you would like around the sit. While the solar project is required to comply with the National Electric Code (NEC) fencing requirements, there is some leeway in the regulations provided the design meets the NEC standards. Increasing fence height an additional foot may help with deer incursions. Would a wildlife friendly fence (fencing with 4 - 8 inch gap at the bottom to allow wildlife to access the site) be acceptable? Note, wildlife friendly fences may not be compatible with solar grazing activities. See *Considerations for "Grazing-Ready" Solar Facilities: Planning for Integration of Sheep* for more information.

Fence location will dictate the size and type of equipment that can move between aisles in the solar array; fences must be far enough from the panel edge to allow for the turning radius of both tractor and implements. If your local solar ordinance allows, placing the fence within the setback will allow more use of available land for your agrivoltaics project.

6.4 Post Construction

Ensure that all personnel understand site access protocols and all site-specific safety precautions. Consider sustainable weed and pest management strategies. Consider adding language to the lease agreement to speak to this.

6.5 Economic Considerations

As agrivoltaics is a nascent space, efforts are underway to better understand cost implications for the farm manager/grazer. The need to change farming practices could have implications for the farm manager/grazer's bottom line, though these costs can be mitigated by site design decisions such as increased spacing between panel rows or increasing the height of the panels, which are costs borne to the developer. It will be important to discuss with the solar developer how integration of agricultural activities can be incorporated into the site design. Talk with developers to determine what agricultural expenses they may or may not subsidize, such as seeds or livestock, or related to the offset of solar operations and maintenance expenses if a grazing enterprise is used to maintain vegetation surrounding panels. Financial returns from agrivoltaics enterprises is an area of active research. A 2019 survey of 14 solar sheep graziers across the eastern U.S. conducted by researchers at Cornell University found a net income of $509/acre was common for solar sheep grazers in NYS, while $262/acre was common across the broader eastern U.S.[6]

6.6 Agrivoltaic Activities

Crop Production:

- The type, placement, and height of the solar arrays may impact crop selection, shading, water needs, and plant height, etc. Ask the developer if the panels will be fixed tilt, vertical mount or single axis trackers. What angle and orientation will the panels be? Understand how high the leading edge of the panels will be. The leading edge is the horizontal edge of the panel that is the closest to the ground. For single axis tracker arrays, understand how high the pivot height (how high the panels are when flat) will be, and what the maximum tilt is (the closer to 90 degrees the tilt is, the wider the aisles will be in the morning and evening). Review the local zoning code to determine if there are height restrictions on solar panels. It may be possible to request a waiver. Ask if the developer will be willing to coordinate tracking with major field operations, tabling or tilting the arrays to allow for agrivoltaics greater tractor access, or provide anti-tracking during certain weeks of crop growth when sunlight is critical to yield.
- Consider how shade will impact crop growth rate, growth period, and production. Select crops that will not grow taller than the leading edge to ensure they will not compromise the productivity of the panels.

[6] Kochendoerfer, N., LA. Hain, and M. Thonney. "The Agricultural, Economic and Environmental Potential of Co-Locating Utility Scale Solar with Grazing Sheep," Atkinson Center for a Sustainable Future, Cornell University. 2019. https://bpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/c/9310/files/2020/12/Atkinson-Center-report-2018_Final-22l3c5n.pdf.pdf

- Consider what farm equipment you would use between the panels and if the spacing will accommodate movement effectively. Talk with the developer about harvest season and the tasks that surround it. If equipment is needed, ensure there is enough space for it to navigate the solar facility without impacting the solar infrastructure (i.e., panels, the fence, the inverters, and other electrical components).
- Access to water is an important aspect to discuss with the developer. Is there water for irrigation on site? Will a truck be needed to bring the water? If so, will the truck have enough space to safely drive between the panels? Will an irrigation system need to be included as a part of the facility design? If so, who will maintain it? How frequently will you need to water?
- Review the topography of your property to understand the natural drainage of the site. Determine if any changes need to be made to ensure the selected crops can thrive. Does the site contain drainage tiles? If so, will they be impacted during construction of the solar facility. Discuss this with the developer.
- Consider your plan to manage any areas not in crop production and associated costs.
- Consider regenerative agricultural practices[7] to increase biodiversity, create drought resistant soils, increase soil health and fertility, boost crop yields, and increase nutrients available to the plants.

Bee Keeping:

- Consider a native, non-invasive, low growing seed mix that can support the bees from spring through the fall. Evaluate the plant growth seasonally and determine who will be responsible for reseeding if it is needed. Mowing may be needed to keep the vegetation under the leading edge of the panels. Work with the developer to establish a clear schedule that ensures the bees are provided for and the productivity of the panels is not compromised.
- Consider the placement of the apiaries. Will it be installed outside of the gated solar facility or within its bounds? If it is within the fenced boundary, how often will the hives need to be checked, moved, etc.? How far from the electrical equipment and property boundaries will it be located?
- It can be helpful to review co-utilization plans submitted to the Office of Renewable Energy Siting and Electric Transmission (ORES) as part of New York's permitting process for "largescale" renewables to understand how developers are framing potential apiary projects. The Foothills Solar Project and Greens Corners Solar Project plans both provide some context for understanding apiary considerations.
- Review the NYS Department of Agriculture and Markets resources on beekeeping in NYS. Consult with your local beekeeping organization for additional guidance.

Animal Agriculture:

In New York, and elsewhere in the United States and Europe, solar projects have successfully implemented grazing dual-use solar approaches by incorporating livestock—predominantly sheep to date—on-site at solar projects, where the animals are able to graze and forage underneath and around solar arrays.

NYSERDA has developed *Considerations for "Grazing-Ready" Solar Facilities: Planning for Integration of Sheep* in 2024 to support integration of design and construction elements at the facility planning and design stage to help promote "grazing-ready" site conditions that enable integration of grazing at any point in the lifespan of a solar facility. The guide is intended to help encourage discussions among the farming and solar development communities to expand farmer involvement in agrivoltaics. While the guide focuses on sheep, many concepts are relevant for considering other types of animal agriculture; such as fencing considerations that inhibit predation, water availability, and reviewing seed mixes for toxicity. The Solar Grazing Checklist for Shepherds and Solar Site Managers is another relevant resource.

While sheep grazing or integration of poultry don't typically require adjustments to panel height, there may be design modifications needed to accommodate other types of animals, like cattle or pigs, which can increase project costs (poultry may require netting to keep birds off the panels). Note that some animals, like goats, are not generally compatible with solar arrays, unless special measures are taken to keep them from jumping onto the panels, chewing exposed wires, and potentially causing other damage. It will be important to talk with solar developers early in site planning to explore options.

[7] NRDC 2021. Regenerative Agriculture 101. https://www.nrdc.org/stories/regenerative-agriculture-101

Consider what farm equipment you would use between the panels and if the spacing will accommodate movement effectively. Consider what facility access you need and if there is accommodation for loading and unloading of trucks and trailers for delivery of water, supplies, and for movement of animals.

For livestock, development of a grazing management plan is important to outline how grazing and forage will be managed for animal and ecosystem health. The plan should include a description of post-construction site conditions (vegetation, soils, hazards and risks, location of grazing areas, grazing period and schedule, conflict mitigation strategies, risk mitigation strategies, restrictions [(dogs, horses, etc.),.]), and expected communication between the landowner, solar facility owner/developer and the sheep owners. One example in NYS is the Morris Ridge Solar Energy Center Preliminary Sheep Pasture Rotation and Grazing Plan.

In some areas, there are graziers who may be available to graze your land if you're not interested in doing it yourself.

For additional information, review the Considerations for Agricultural Lands in the Solar Guidebook.

7. Other Considerations

7.1 Site Design – Interconnection and Access Roads

As discussed in the previous section, solar arrays must be connected to the electrical grid. This may require the installation of power poles. Landowners should make sure that pole placement and the height of the wire will not interfere with their ability to farm the land. Keep in mind that all suggested changes to the placement and height of the poles will need to be approved by the utility company.

Road placement is another important consideration since the design may interfere with the use of standard agricultural equipment. Siting roads and power lines near field edges is often preferable for the farmer or landowner.

Further, make sure the access road is constructed so that it does not shed water onto your fields and that the finished grade does not interfere with normal drainage patterns. Ask about the material used to finish the surface of the access road. Will the size of the stone interfere with the operation of your equipment if some of it ends up in your field? Determine if the access road can be used by you and your farm equipment to access the property outside of the solar facility. If so, ensure the design serves both your needs and that of the solar company as much as possible. Be sure to discuss these aspects of the construction of the solar project with the developer before you sign the lease.

7.2 Site Design – Agricultural Lands

Can the solar arrays be placed on land that is not suited for agricultural production, such as support land, sloping pasture, or underutilized areas of the farm? There are a number of possibilities that should be explored. Think about how the siting of a solar array on your property can benefit your farm operation and ask questions. See the Solar Installations on Agricultural Lands section of NYSERDA's Solar Guidebook for more considerations.

Additional Resources

Brocket, Daniel; Johnstonbaugh, Edward. "Landowner Leasing for Utility Scale Solar Farms." Penn. State Univ. Extension, September 2019.

European Academies' Science Advisory Council (EASAC) Policy Report 44. "Regenerative Agriculture in Europe. A Critical Analysis of Contributions to European Union Farm to Fork and Biodiversity Strategies." April 2022.

Shannon Ferrell. "Solar Leasing for Agricultural Lands." National Agricultural Law Center. April 4, 2018. [webinar]

Ferrell, Shannon L. "Understanding Solar Energy Agreements." National Agricultural Law Center Production," 2019.

Hannum, Erin. "Solar Leasing: A Guide for Agricultural Landowners in the Pacific Northwest." American Farmland Trust and Farms Commons.

Kirk Hall, Peggy; Bachelor, Evin, Romich, Eric. "Farmland Owner's Guide to Solar Leasing." National Agricultural Law Center, August 2019.

"Guide to Land Leases for Solar." Solar Energy Industries Association. July 2016.

"Leasing Your Farmland for Wind & Solar Energy Development: A Beginner's Guide for Farmers." New York Farm Bureau. December 2016.

World Economic Forum. "What is Regenerative Agriculture?" Oct 2022.

New York State Energy Research and Development Authority (NYSERDA). "Growing Agrivoltaics in New York State: Advancing Understanding of Opportunities to Integrate Renewables into Working Landscapes," NYSERDA Report Number 23-25. Prepared by WSP USA and Agrivoltaic Solutions LLC. 2023. https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/Research/Other-Technical-Reports/23-25-Agrovoltaics-in-New-York--acc.pdf

https://www.maine.gov/dacf/ard/resources/docs/solar-farm-grazing-best-management-practices-vfinal.pdf

American Solar Grazing Association: https://solargrazing.org/

Questions?

If you have any questions regarding landowner considerations, please email questions to cleanenergyhelp@nyserda.ny.gov or request free technical assistance at nyserda.ny.gov/Siting. The NYSERDA team looks forward to partnering with communities across the State to help them meet their solar energy goals.

Section 4

Solar Installations on Agricultural Lands

Navigating the development of solar projects in accordance with local and New York State agricultural policies.

Section Contents

1. Solar and Agriculture in New York

In 2019, New York State (NYS) adopted the Climate Leadership and Community Protection Act ('Climate Act'), a landmark bill which codified ambitious and comprehensive climate and energy targets for the State. The Climate Act established sweeping decarbonization targets for the electricity sector, requiring New York to achieve 70% renewable electricity by 2030, and 100% emissions-free electricity by 2040. As of 2020, approximately 27.4% of the State's electricity generation came from renewable sources,[1] highlighting the need for significant expansion of New York's renewable capacity – including solar, on- and offshore wind, and other technologies – in the coming years.

Solar installations of all types will continue to play a key role in helping New York achieve its aggressive climate and energy goals. To that end, NYSERDA has and will continue to utilize a comprehensive approach to solar deployment, supporting a range of projects including ground mounted, rooftop, and canopy solar installations, as well as projects sited on landfills, brownfields, and other underutilized lands. Among these approaches, large-scale ground mounted solar is a necessary and instrumental strategy for achieving the State's mandated goal of 70% renewable electricity by 2030.

Ground mounted solar is of keen interest to communities and local governments due to its associated and/or perceived land use related impacts. Ground mounted solar installations typically occupy 4-8 acres per megawatt (MW); as such, project sizes can range from tens to hundreds of acres. In New York, the discourse around land use impacts of solar has increasingly focused on agricultural lands, perhaps unsurprising given that there are approximately 7 million acres of farmland, making up about 20 percent of the state's land area.[2] Agricultural lands are often identified as suitable locations for large-scale ground mounted solar development. Reasons include the physical characteristics of the land (relatively flat, minimal shading, cleared of vegetation), proximity to important grid infrastructure (high voltage transmission lines, substations, existing roads), social and economic considerations (fewer residential or commercial neighbors, lower land costs), and other factors.

It is important to acknowledge that prioritization and preservation of agricultural lands is a foundational principle for NYS. According to the NYS Constitution, "the policy of the State shall be to conserve and protect its natural resources and scenic beauty and encourage the development and improvement of its agricultural lands for the production of food and other agricultural products" (NYS Const. Art. XIV § 4). This exact constitutional provision also creates an inextricable link between agricultural conservation and the State's clean energy transition, noting that New York's conservation policies must "include adequate provision for the abatement of water and air pollution" alongside "the protection of agricultural lands."

As such, recognizing the importance of balancing clean energy development and the protection of our agricultural lands and industries, this section explores the interplay between solar and agriculture in NYS, including:

- Local considerations and approaches to balancing solar and agriculture, such as planning and zoning.
- Introductory strategies and suggestions for project siting, including "dual-use" approaches and other methods of mitigating impacts to agricultural lands.
- State agencies, programs, and policies relevant to the intersection of solar development and agricultural lands.
- Resources and guidance for local governments

[1] NYSERDA. Clean Energy Standard Annual Progress Report: 2020 Compliance Year. January 2022. https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/Clean-Energy-Standard/CES-2020-annual.pdf

[2] Farmland Protection." Agriculture and Markets, https://agriculture.ny.gov/land-and-water/farmland-protection.

2. Balancing Solar and Agriculture Locally

When looking to balance solar and agriculture at the local level, it is important to understand the role of local governments in land use planning and regulation and in approving development applications. NYS has empowered local governments to adopt land use plans, regulate land uses, and review and approve development proposals through their various local boards. The process of addressing solar and agriculture at the local level begins with planning, proceeds to zoning and land use regulation changes, and includes addressing siting considerations for solar projects on agricultural land.

2.1 Comprehensive Planning

To promote a balance between solar development and agricultural protection, local governments should address each topic in the municipality's comprehensive plan. A comprehensive plan, also referred to as a master plan, is a written document that contains goals, objectives, and strategies to guide a community's future development. Formally adopted by the local legislature, the comprehensive plan steers the municipality's physical and economic development and accommodates its social, environmental, and regional concerns. Local governments engage in land use planning to inventory a community's need and assets, develop a shared vision for the future, and build consensus and support for actions that will implement the plan. NYS's zoning and planning enabling acts require land use regulations to be "in accordance with a comprehensive plan" or "in accordance with a well-considered plan." (NYS Village Law § 7-704; Gen. City Law § 20(25); Town Law § 263)

Comprehensive plans often incorporate environmental, economic, and sustainability strategies, including language to address balancing solar development and agricultural protection and policies that support opportunities for local farmers and related businesses. Specifically, strategies can be designed to remove barriers for solar development and mitigate impacts on agricultural lands. Whether a municipality is updating an existing comprehensive plan or developing a new plan, there are many ways that the plan can recognize both agriculture and renewable energy siting interests. The local legislature may direct a special board to prepare the comprehensive plan and lead a public engagement effort. This board should include, but not be limited to, agricultural landowners, agricultural business owners, and other interested stakeholders to provide insights and technical expertise.

As an initial step of the planning process, the special board should conduct an existing conditions study to guide the planning effort (see "Agricultural Sources for Existing Conditions Studies" commentary box). It is imperative that this study include agricultural considerations to help determine suitable areas for responsible solar development within a community. Specifically, the planning effort must consider applicable county agricultural and farmland protection plans created under Article 25-AAA of the Agriculture and Markets Law.

Commentary: Agricultural Sources for Existing Conditions Studies

- Land in NYS Certified Agricultural Districts by tax parcel, https://agriculture.ny.gov/land-and-water/agricultural-districts.
- Land receiving Real Property Agricultural Value Assessment by tax parcel, https://www.tax.ny.gov/research/property/assess/valuation/ag_overview.htm.
- United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS) Cropland Data Layer (CDL), https://www.usgs.gov/centers/fort/science/usda-national-agricultural-statistics-service-cropland-data-layer-0?qt-science_center_objects=0#qt-science_center_objects.
- Multi-Resolution Land Characteristics (MRLC) Consortium data, https://www.mrlc.gov/.
- USDA soil mapping, https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/survey/
- Farms Under Threat: The State of States map, https://csp-fut.appspot.com/.

Community engagement is an essential step in the process to ensure the development of successful clean energy policies and planning activities. Buy-in from all stakeholders—including citizens, local officials and board members, local businesses, developers, environmental leaders, residents, community-based organizations, and local media—is critical to the effort's success and long-term implementation. Empowering various stakeholders to share local knowledge and preferences strengthens the process' outcomes. The implementation of several methods of public engagement to engage all citizens in the process also increases confidence and support for the resulting plan.

Using gathered information from the studies and community engagement effort, a municipality should then develop long-term solar energy and agricultural goals, along with related shorter-term objectives. A sample goal may be to "Balance solar development and continued agricultural operations." Corresponding objectives may include:

- Minimize siting of ground mounted solar arrays on farmland identified for protection (see "Commentary: Identifying Farmland for Protection").
- Prioritize solar development on farming areas with less productive soils.
- Allow solar projects in agricultural areas if mitigation for agricultural impacts have been identified and addressed.
- Encourage solar and other renewable energy production that is compatible with agricultural-related businesses and/or continued agricultural use of the land.

After selecting goals and objectives, the municipality should identify strategies or actions to accomplish each objective. For example, a locality may commit to identifying agricultural lands for protection and then review and modify zoning and/or land use regulations to minimize impacts to those lands.

For more information regarding comprehensive planning, consult NYSERDA's Clean Energy and Your Comprehensive Plan Guide, available at: www.nyserda.ny.gov/ComprehensivePlan.

2.2 Zoning and Land Use Regulation

In accordance with the comprehensive plan, local governments can amend their zoning and land use regulations to pursue a balanced approach to regulating solar and agriculture. Municipal zoning laws may be updated to address the installation, operation, maintenance, and decommissioning of solar energy systems in a way that protects priority agricultural resources and land uses. In establishing regulations to promote this balance, municipalities should consider their methodology options for identifying and protecting priority agricultural lands (see "Identifying Farmland for Protection" commentary box). While municipalities have sole permitting authority for solar projects under 25 MW, it is required for the Office of Renewable Siting and Electric Transmission (ORES) to consider any applicable local law when making a permit determination. More information regarding ORES's regulation can be found here https://dps.ny.gov/ores.

Commentary: Identifying Farmland for Protection

When considering how best to promote a balance between clean energy development and agricultural preservation, it is important to have clear, reasonable definitions regarding priority farmland for protection. Multiple factors may be considered:

- **Existing and/or historic land use:** Examining current and historic agricultural use can provide a clear and realistic assessment of priority farmland based on the land's productivity.
- **Parcel size and proximity:** Identifying and prioritizing large and/or contiguous parcels can preserve agricultural productivity and avoid agricultural fragmentation.
- **Soils:** Analysis based on soil quality is a prominent method for identifying priority agricultural lands.

There are a variety of existing local, state, and federal agricultural land classifications based on different criteria, which municipalities may use to identify and prioritize agricultural land for protection. Classifications and definitions may include:

- **Mineral Soil Groups (MSG) 1-4:** Mineral Soil Groups were established to create a uniform statewide land classification system based on the differences in soil productivity. The rating methodology is based on the differences in the inherent ability of soils to support crop production. MSG 1-4 are recognized as having the highest value based on soil productivity and capability.
- **Prime Farmland:** Soils with the best combination of physical and chemical characteristics for producing food, fiber, and/or other crops. Parameters for Prime Farmland are established on a federal basis and may include cultivated land, pastureland, forestland, or other lands.
- **Prime Farmland if Drained:** Soils which meet all necessary criteria for the Prime Farmland classification other than depth to water table. This may include lands similar to those included in the Prime Farmland definition.
- **Farmland of Statewide Importance:** Soils that do not meet the criteria for Prime Farmland or Prime Farmland if Drained, but which are classified as mineral soils in priority land capability classes. Parameters for Farmland of Statewide Importance are established on a state-by-state basis. These soils may also be referred to as "Farmland of Statewide Significance."
- **Farmland of Local Importance:** Soils that do not meet the criteria for the above classifications, but which are considered of local importance to produce food, fiber, or other crops. These soils may be identified and/or classified by the appropriate local authority and may include lands that have been designed for agricultural use by local law.

Once priority agricultural lands have been identified, zoning and land use regulations can be updated to include agriculture-specific requirements, such as special use permit standards for avoiding, minimizing, and mitigating agricultural land impacts; construction and/or decommissioning requirements for systems on priority soils; or provisions encouraging dual-use.

Specific examples of local law requirements pertaining to solar development on agricultural lands may include:

- Requiring adherence to the NYS Department of Agriculture and Markets (NYSAGM) Guidelines for Solar Energy Projects-Construction Mitigation for Agricultural Lands.
- Requiring project owners to implement dual-use solar strategies to the maximum extent feasible or otherwise offset any loss of agricultural activity.
- Adding a provision that permits the Reviewing Board to waive or modify certain bulk and area standards that result in unintended consequences.
- Encouraging consultation with a local or regional agricultural preservation board as part of the application review process.

Municipalities looking to implement requirements for solar on agricultural lands should consider how their current land use regulations, including bulk and use requirements, may be adapted to incentivize or promote preferred types of solar development. For example, a municipality might allow for relaxed setback or lot coverage requirements for projects which implement a compatible agricultural use underneath or around the solar arrays.

To learn more about zoning for solar, including example language and provisions related to balancing solar and agricultural land uses, access the Model Solar Law in NYSERDA's Solar Guidebook for Local Governments.

Commentary: Local Regulations and On-Farm Solar

In planning and establishing requirements for solar installations on agricultural lands, municipalities should be mindful of existing guidelines in NYS that encourage solar energy installations which support farm operations in Agricultural Districts.

In accordance with NYS Agriculture and Markets Law and related guidance, solar energy installations which generate no more than 110% of a farm's needs are classified as "on-farm" equipment. NYSAGM has developed guidelines for evaluating local laws with respect to impacts for on-farm clean energy projects, to ensure that on-farm solar energy installations are not subject to "overly restrictive" requirements. As such, municipalities should consider implementing land use regulations which encourage and promote farm-friendly solar energy development.

In accordance with these guidelines, reasonable local regulations for on-farm solar development include:

- Requiring a building/zoning permit and adherence to the NYS Uniform Fire Prevention and Building Code.
- Utilizing a streamlined site plan review process that involves a shorter review period and fewer submission requirements.

"Overly restrictive" requirements for on-farm solar installations may include:

- Extensive site plan regulations.
- Special use permit regulations.
- Nonconforming use requirements.
- Height restrictions and excessive setbacks from buildings and property lines.
- A Full Environmental Assessment Form (EAF) [on-farm solar development is considered a Type II action under the State Environmental Quality Review process, which does not require EAF preparation].
- Visual impact assessment requirements.
- Prohibiting the construction of on-farm solar generated electricity to offset the energy demands of the farm.

For more information, access the NYSAGM Guidelines for Review of Local Laws Affecting Small Wind Energy Production Facilities and Solar Devices at: https://agriculture.ny.gov/system/files/documents/2019/11/guidelines_for_solar_and_small_wind_energy_facilities.pdf.

3. Solar and Agriculture as Compatible Land Uses

Agrivoltaics is the combination of solar development with land management philosophies rooted in conservation and agriculture to create a multifunctional system with a variety of ecological, agricultural, and energy benefits. It occurs when agricultural or conservation uses are incorporated on land used for solar projects to create a harmonious development that benefits the farmer or agricultural community at-large. The New York State Agricultural Technical Working Group (A-TWG) defines agrivoltaics as "a simultaneous use of land for solar photovoltaic power generation and agricultural production of 'crops, livestock, and livestock products' as that phrase is defined by Agriculture & Markets Law (AML) §301(2).[3]" The term dual-use solar, is a type of co-utilization or "agrivoltaics" (a portmanteau of agriculture and photovoltaics).

Dual-use approaches are of increasing interest to landowners and communities who may have concerns about the development of solar on agricultural lands, for reasons such as:

- Community character: Dual-use approaches offer mutually beneficial outcomes for communities and landowners concerned about impacts to local agriculture, whether the concerns are aesthetic or economic in nature. These approaches can support local farmers, preserve continued agricultural use of the land, and ensure continued contributions to the local agricultural economy.
- Permanent farm loss: According to the American Farmland Trust, over 253,000 acres of agricultural land across New York was developed or compromised between 2001 and 2016,[4] 78% of which was converted to low-density residential (LDR) development. In contrast with LDR and other development types, solar does not require a full or permanent conversion of lands away from agricultural production.
- Future agricultural potential: Dual-use solar approaches are designed to ensure ongoing and future viability of the land for agricultural production (minimizing impervious surfaces, chemical applications, and other long-term development impacts). When paired with robust decommissioning and site mitigation requirements, dual-use solar can ensure that agricultural lands can be returned to productivity at the end of the project's useful life.

A study was conducted by Michigan Technological University in efforts to analyze the difference in public support for conventional solar and dual-use solar. As a result of this study, it showed that 81.8% of the total respondents look more favorable upon solar development in their community if it was paired with agriculture. While not feasible for every solar project, this result shows how local acceptance can be improved while continuing solar developments.[5]

Additionally, dual-use solar can also provide meaningful direct benefits to farmers, including a steady revenue stream that helps smooth impacts from market volatility. The Federal Government recognizes these benefits and incentivizes them through programs like the U.S. Department of Agriculture's Rural Energy for America Program (REAP).[6]

This section highlights four prevailing models of dual-use solar which are in various stages of research, development, and deployment throughout New York and elsewhere: solar grazing, crop production, pollinator-friendly approaches, and conservation approaches. These four models form a spectrum of complementary land uses which may be incorporated to mitigate impacts of solar development on agricultural lands. The feasibility of each dual-use model greatly varies and needs to be assessed on a site-by-site basis.

Grazing and crop production are the most prominent agricultural dual-use techniques in terms of maintained active agricultural productivity, while pollinator-friendly and conservation approaches provide more passive agricultural and impact mitigation benefits. This section discusses each model separately, addressing model-specific design, construction, establishment & maintenance, community, and feasibility criteria for each.

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[3] New York State Energy Research and Development Authority (NYSERDA). "Growing Agrivoltaics in New York State: Advancing Understanding of Opportunities to Integrate Renewables into Working Landscapes," NYSERDA Report Number 23-25. Prepared by WSP USA and Agrivoltaic Solutions LLC. 2023. https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/Research/Other-Technical-Reports/23-25-Agrovoltaics-in-New-York--acc.pdf

[4] American Farmland Trust. State of the States: Agricultural Land Conversion Highlight Summary: New York. 2020.

[5] Pascaris, Alexis S, Schelly, Chelsea, Rouleau, Mark, and Pearce, Joshua M. Do Agrivoltaics Improve Public Support for Solar Photovoltaic Development? Survey Says: Yes!. United States: N. p., 2021. Web.

[6] USDA REAP. Renewable Energy Systems and Energy Efficiency Improvements Assistance. https://www.rd.usda.gov/files/REAP%20fact%20sheet%20MA.CT_.RI_.pdf.

3.1 Guiding Principles for Dual-Use Solar

Solar installations should strive to meet baseline standards that ensure compatibility and enhance landscapes, ecosystems, and communities. As with traditional solar development, dual-use solar must consider factors such as existing zoning regulations and land use considerations, interconnection feasibility, road access to the solar project, the location's slope, and the installation costs. In addition, dual-use solar projects should strive to minimally impact the farmland's quality and productivity and be designed to achieve agricultural benefits while aiming to be economically attainable.

Key benefits of dual-use solar approaches may include:

- Collaboration between solar developers, local farms, and agricultural organizations that benefits all parties.
- Improvements in soil health and water retention.
- Farmland preservation viability, and intergenerational transfer.
- Investments in farm infrastructure and equipment.
- Land use optimization and integrated farm management.
- Opportunities for research on land management and agronomic practices.

3.2 Grazing Dual-Use Solar Approaches

In New York, and elsewhere in the United States and Europe, solar projects have successfully implemented grazing dual-use solar approaches by incorporating livestock on-site at solar projects, where the animals are able to graze and forage underneath and around solar arrays. To date implementation of dual-use strategies have largely focused on sheep grazing. However, efforts are underway to explore additional dual-use opportunities, such as with grazing cattle. Silicon Ranch Corporation, for example, was awarded a $1.8 million grant in 2020 from the Solar Energy Technologies Office (SETO) to explore pasture-based cattle grazing under solar panels, including analysis of the impact of the solar panels on cattle, solar equipment, and the grassland ecosystem under the panels.[7]

The use of grazing sheep has emerged across the United States as a cost-competitive alternative to solely mechanical and chemical control of vegetation under solar panels, because it requires minimal changes to common ground-mount solar configurations. Animal grazing can be an attractive option for communities that host solar infrastructure because it supports continued agricultural land use, aligns with sustainability mandates, and, when managed with sound grazing practices, sheep can perform as well as mechanical mowing equipment in both cost and efficiency. Solar facility operators do not generally need to adjust panel heights and spacing to integrate sheep grazing within a solar facility but may need to make other modifications to facility layout, design, and infrastructure to successfully host a viable grazing operation.

Furthermore, the use of prescribed sheep grazing within solar facilities helps to develop perennial vegetation and contributes to soil health.[8,9] Grazing can support diverse plant, insect, and pollinator habitats. In addition to improving environmental outcomes, grazing sheep flocks at solar facilities can help New York farmers to realize new economic benefits.[10] The practice may lower the barrier of entry for beginning and underserved farmers and allow new farm businesses to contribute to the economy while improving the viability of their overall farm operation.[11]

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[7] SETO 2020 – Solar and Agriculture. https://www.energy.gov/eere/solar/seto-2020-solar-and-agriculture.

[8] Amsili, J.P., H.M. van Es, R.R. Schindelbeck, K.S.M. Kurtz, and D.W. Wolfe, G. Barshad. 2020. Characterization of Soil Health in New York State: Summary. New York Soil Health Initiative. Cornell University, Ithaca, NY. https://bpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/6/7573/files/2018/04/Characterization-of-Soil-Health-in-New-York-State-Summary-Report.pdf

[9] NYSAGM (New York State Department of Agriculture and Markets). 2023. Agricultural Environmental Management Planning Resources. Tier 2: Pasture Management Worksheet. https://agriculture.ny.gov/system/files/documents/2022/07/aem_tier2_pasture-management.pdf.

[10] Kochendoerfer, N., and M.L. Thonney. 2021. Grazing Sheep on Solar Sites in New York State: Opportunities and Challenges. Scope and scaling-up of the NYS sheep industry to graze ground-mounted photovoltaic arrays for vegetation management., Cornell University Atkinson Center for a Sustainable Future, Ithaca, NY. https://bpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/c/9310/files/2021/03/Solar-Site-Sheep-Grazing-in-NY-v2.1.pdf.

[11] Kochendoerfer, N., A. Hain, & M. Thonney. 2019. The agricultural, economic and environmental potential of co-locating utility scale solar with grazing sheep, Atkinson Center for a Sustainable Future, Cornell University Ithaca, NY. https://bpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/c/9310/files/2020/12/Atkinson-Center-report-2018_Final-22l3c5n.pdf.pdf.

Case Study: Solar Grazing in Central NY

Cascadilla Community Solar Farm: Cornell University researchers are conducting ongoing solar grazing research at the institution's 18 MW solar project in Ithaca, NY. A collaboration between the University's Animal Science Department and the Cornell School of Integrated Plant Science, this research project is focused on both agricultural and ecological outcomes of solar grazing, including optimal grazer densities and stocking rates, creation of pollinator (bees) and predator insect (ladybugs) habitats, and soil carbon sequestration.

To-date, preliminary data has supported the viability of solar grazing on this site for flocks of up to 150 ewes, demonstrating numerous positive outcomes and externalities, including:

- Increased income for the flock owner, as well as new on-site labor requirements during the growing season.
- Excellent health and welfare outcomes for the grazing sheep.
- High conception rates for sheep bred and grazed on-site, leading to the sale of 134 lambs and the retention of another 106 lambs to expand the grazing flock.
- Avoidance of panel shading due to vegetative growth.
- Creation of diverse pastures, including many native and perennial species.
- Provision of habitat for a variety of pollinator and other insect species.

To read more about the research conducted at the Cascadilla Community Solar Farm, visit: https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/c/9310/files/2021/03/Solar-Site-Sheep-Grazing-in-NY-v2.1.pdf

NYSERDA has developed *Considerations for "Grazing-Ready" Solar Facilities: Planning for Integration of Sheep* to support integration of design and construction elements at the facility planning and design stage to help promote "grazing-ready" site conditions that enable integration of grazing at any point in the lifespan of a solar facility. The guide is intended to help to educate the solar development community, substantiate co-location of animal agriculture with solar, and encourage discussions among the farming and solar development communities to expand farmer involvement in agrivoltaics.

The guide does not cover development of a grazing management plan, which would include site-specific standards for daily management and operations. However, it will be important for this plan to be developed at a later project phase by the solar developer; engineering, procurement, and construction (EPC) contractor; and operations and maintenance contractor, in collaboration with the farmer/flock manager servicing the solar facility. Example plans in New York State include the Morris Ridge Solar Energy Center Agricultural Integration Plan: Managed Sheep Grazing & Beekeeping and the Horseshoe Solar Agricultural Integration Plan. It will also be important for collaborators to clearly delineate where responsibilities lie for maintenance activities (e.g., maintenance of an installed well, vegetation management outside of grazing periods, etc.).

Grazing Dual-Use Examples[12]

- **Newfield Solar (Newfield, NY):** Nexamp's Newfield Solar is a 5 MW community solar array located on 30 acres, where all landscaping maintenance is performed by sheep, in the warmer months, via a contract with a sheep farmer.[13]
- **Cornell University's Musgrave Research Farm (Aurora, NY):** During a research trial in 2018, a flock of 56 sheep provided all vegetation management at Cornell's 22-acre, 4 MW solar farm. Researchers noted numerous positive outcomes from this trial, including the cost-effectiveness and decreased labor-intensity of solar grazing compared to traditional solar landscaping.[14]
- **Maple Ridge Meats (Benson, VT):** This cattle farm and commercial slaughterhouse features a 150 kW solar array under which cattle graze.[15]

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[12] American Solar Grazing Association (ASGA), Guide to Farming Friendly Solar, https://solargrazing.org/wp-content/uploads/2019/06/On-Pasture-Co-location-of-solar-agriculture.pdf

[13] O'Connor, Kelsey, The Ithaca Voice, Sheep Get to Work Maintaining Newfield Solar Array, May 21, 2019, https://ithacavoice.com/2019/05/sheep-get-to-work-maintaining-newfield-solar-array/

[14] Koechendoerfer, Nikola, et al. Atkinson Center for a Sustainable Future, Cornell University "The agricultural, economic and environmental potential of co-locating utility scale solar with grazing sheep". 2019. https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/c/9310/files/2020/12/Atkinson-Center-report-2018_Final-22l3c5n.pdf.pdf

[15] AgriTech Tomorrow, Agriculture + Solar, the Perfect Pair for Modern Farming, https://www.agritechtomorrow.com/article/2023/06/agriculture-solar-the-perfect-pair-for-modern-farming/14626

Case Study: Bancroft Station Solar Farm (Early County, GA)

The Bancroft Station Solar Farm, a 102.5 MW project developed by Silicon Ranch, has partnered with nearby White Oak Pastures to incorporate sheep grazing and free-range chickens as part of the solar farm's restorative land use strategy. This mutually beneficial partnership has allowed White Oak Pastures, once a solely cattle-focused operation, to further expand its presence as a leader in pasture-raised livestock and regenerative agricultural practices.

In Spring 2020, White Oak introduced a flock of over 400 sheep to the solar farm, a first step in its plan to eventually introduce 1,000 or more grazing animals on the site. The flock is intended to graze on a rotational schedule throughout Bancroft Station's 700 acres, land which was historically used for peanut and cotton production, as well as cattle grazing.

Only months after the sheep were introduced to the solar farm, White Oak added a flock of over 7,000 free-range chickens to the rotational grazing schedule at Bancroft Station. The introduction of chickens to the site brings about additional mutual benefits, including natural pest control, as well the solar arrays providing shade and protection from predators.

For additional information, please visit:

- Natural Resources Defense Council: "Sheep (and Soil Scientists) Juice Up the Solar Farm" https://www.nrdc.org/stories/sheep-and-soil-scientists-juice-solar-farm
- The National Provisioner: "White Oak Pastures has become a leading advocate for regenerative animal agriculture" https://www.provisioneronline.com/articles/110046-white-oak-pastures-has-become-a-leading-advocate-for-regenerative-animal-agriculture
- Silicon Ranch: "#bignEWES: Welcome to Bancroft Station's new workforce" https://www.siliconranch.com/bignewes-welcome-to-bancroft-stations-new-workforce/

3.3 Crop Production Dual-Use Solar Approaches

Crop production dual-use solar projects, sometimes more directly referred to as agrivoltaics, are designed to accommodate the cultivation and production of vegetables and other crops, as well as other farm activities, beneath or around solar panels and other system components. This approach allows for the prioritization of a site's continued agriculture use, as the project may be designed to enable both solar production and crop yields. Depending on the growing climate and crops selected, this dual-use approach can even provide key agricultural benefits, including increased soil moisture retention and reduced heat stress on crops.

Although a number of studies have examined this approach in Europe, crop production dual-use has yet to be deployed at scale throughout the United States. There are currently a multitude of test sites across the US examining viability and system design considerations for crop production dual-use; in most cases, these projects remain in a research phase. Available data and research from sites in the United States has demonstrated that shade-tolerant, temperate climate crops including spinach, kale, swiss chard, broccoli, cauliflower, cabbage, peas, and bush beans can successfully grow under solar panels.[16] Additionally, the same research has shown that some root vegetables, such as carrots, potatoes, and radishes, can also be grown under panels with a longer growth period.

It is imperative that proposers of crop production dual-use projects examine the site or region's growing history to understand and learn from previous successes and failures, which may help assess crop suitability and future growing potential.

[16] Dual-Use: Crops and Livestock Considerations, https://ag.umass.edu/clean-energy/fact-sheets/dual-use-crop-livestock-considerations

Case Study: Crop Cultivation Meets Solar in the Northeast

University of Massachusetts Amherst Research Farm (South Deerfield, MA): For over a decade, Professor Stephen Herbert of UMass Amherst has been studying crop cultivation underneath an elevated 25 kW solar array at the University's Crop and Animal Research and Education Center in South Deerfield, MA.

Though his research initially focused on cultivating pasture for livestock grazing underneath the solar array, Professor Herbert's work has shifted to explore opportunities for vegetable production under the University's solar panels. In various trials, his team has demonstrated successful growth of kale, swiss chard, beans, broccoli, and other crops underneath the solar array.

Professor Herbert's research found that the benefits of crop cultivation underneath solar arrays may be particularly noticeable during a dry, hot growing season, when shade from the panels can help reduce heat stress and contribute to higher yields.

Additionally, having received a grant from the US Department of Energy in 2020, the University will be expanding its dual-use solar research at up to eight additional farms through Massachusetts, with intent to study a variety of new crops including pumpkins, winter squash, berries, and others.

To read more about UMass Amherst's ongoing and forthcoming dual-use solar research, visit: https://ag.umass.edu/clean-energy/research-new-initiatives/dual-use-solar-agriculture

Crop Production Dual-Use Solar – Planning, Design, and Feasibility Criteria:

Design	• Include farmers in the design process from the start. • Design solar site to integrate viable farming activities throughout project life. • Consider the impact the system will have on the microclimate under the panels and between the rows of panels, the anticipated available sunlight, and any changes to soil moisture & temperature. • Design the site with the future in mind, considering the land's current and anticipated farming uses, capabilities, and needs.
Construction	• Install solar arrays in a minimally impactful manner[17] and consider the height and width of farm equipment that will be used on the site. • Remediate any soil and site impacts in accordance with state regulations before construction completion.
Establishment & Maintenance	• Develop any solar equipment maintenance and vegetation management plans with farmer cooperation to ensure compatibility with the site's planned agricultural activities and to minimize disturbances to agricultural uses.
Community Impacts	• Crop production dual-use promotes farmland preservation, production, and investment. • Can create education, training, employment, and income opportunities for new and existing farmers. • May increase community support and acceptance for solar development.
Feasibility	• Crop production dual-use is largely in early stages of research and development, including a variety of pilot and demonstration projects. As such, it may not be feasible for every project in NYS. • Project-specific feasibility may depend on criteria including, but not limited to: - Incremental capital and operating costs of the solar facility's design, equipment, hardware, labor, etc. to accommodate crop production. - Increased costs associated with crop cultivation (labor, equipment, etc.). - Finding knowledgeable experts on how to develop a successful dual-use project.

Crop Production Dual-Use Examples:[18]

- Jack's Solar Garden is a 1.2 MW agrivoltaic project in Boulder County, Colorado with research partnerships with the National Renewable Energy Laboratory (NREL), Colorado State University, and the University of Arizona. Research includes looking at crop production and irrigation to study different crop yields at different locations throughout the solar site. The site has seen success with lettuce, sage, and raspberries all being grown under the panels. There are multiple research projects currently ongoing at the site.[19]
- Since 2016, researchers at the Biosphere 2 Agrivoltaics Learning Lab in Oracle, Arizona – a collaborative effort between the University of Arizona, the National Renewable Energy Laboratory (NREL), and other partners – have studied crop cultivation under solar panels. Their research (focused on crops suitable for dryland, such as tomatoes and peppers) has identified a number of potential benefits, including increased crop yields, more efficient water use, and improved temperature regulation.
- The Fraunhofer Institute has a research farm at Lake Constance, Germany, where they installed 720 bi-facial solar panels (catching rays from above and below) on a third of a hectare of cropland. After the first year, the combined yield of food and electricity was 60 percent higher per square meter than it would have been had food and electricity been harvested on two separate fields.[15]

[17] https://openei.org/wiki/InSPIRE/Primer
[18] Case Study: Jack's Solar Garden – AgriSolar Clearinghouse. https://www.agrisolarclearinghouse.org/case-study-jacks-solar-garden
[19] AGROPHOTOVOLTAICS increases land use efficiency by over 60 percent. pv Europe. (2017, November 29). Retrieved December 13, 2022, from https://www.pveurope.eu/solar-modules/agrophotovoltaics-increases-land-use-efficiency-over-60-percent

3.4 Pollinator-Friendly Dual-Use Approaches

Pollinator-friendly approaches involves the practice of seeding and maintaining pollinator-friendly plants, such as wildflowers and native species, within a solar project site to create a large pollinator habitat in which bees and/or native pollinators can thrive. There are two categories of pollinator-friendly approaches: (1) solar projects that have active apiaries onsite that are attended to by beekeepers, and (2) solar projects that create habitat for native pollinators.

The NYS Pollinator-Friendly Solar Act was passed unanimously in 2018. This legislation directed the Commissioner of the NYS Department of Agriculture and Markets (NYSAGM) to develop guidelines for vegetation management plans for use by citizens, corporations, or other groups who claim that their property, including solar electric generating systems, is pollinator friendly or provides benefits and protection to pollinators. NYSAGM issued their NYS Utility Corridor Pollinator Habitat Guidelines in 2020 to provide the minimum criteria for a site to be considered "pollinator friendly," available here, https://agriculture.ny.gov/utility-corridor-pollinator-habitat-guidelines.

NYSAGM also offers other pollinator protection resources, including a Pollinator Protection Plan that recommends the development of Voluntary Best Management Practices for all pollinator stakeholders, including beekeepers, growers, landowners, state agencies and the general public. Access the plan at https://agriculture.ny.gov/plant-industry/pollinator-protection.

Additionally, pollinator scorecards can be used to assess site suitability and design for pollinators. A pollinator scorecard uses science-based standards to evaluate qualities beneficial to pollinators in the context of a solar development project. Many states have adopted pollinator scorecards for use in the planning and permitting process. Fresh Energy, a non-profit that promotes pollinator friendly plantings on solar sites, has created a model scorecard for this assessment, which is available at https://fresh-energy.org/wp-content/uploads/2020/01/Pollinator_FriendlySolar_Scorecard.pdf.

Pollinator-Friendly Dual-Use Solar – Planning, Design, and Feasibility Criteria:

Design	• Use vegetation mixes that provide overwintering habitat and season-long pollen and nectar. • Implement site-adjacent features, such as trim/fence vegetative corridors, basins and wetlands, in lieu of inside array fencing. • In selective portions of the array where appropriate, plant forbs like clover and asters instead of grasses (e.g., between rows of panels, as opposed to on the margins). • For solar apiaries, there is an additional consideration of where the apiary will be located on the solar project site. Some apiaries are located within the fenced facility area, oftentimes the apiary is in its own fenced-in area on the perimeter of the project for ease of access to the beekeeper and to create a buffer from Operations & Maintenance personnel.
Construction	• Install vegetation mixes after solar project construction is complete. • Avoid seed mixes that are pre-treated with pesticides and herbicides. • If placing a solar apiary onsite, it may be beneficial to consult with a beekeeper to see if there are any needs that could be best addressed during the construction process.
Establishment & Maintenance	• Allow for one to three years for vegetation mixes to establish roots and control the density of fast-growing plants. • Begin long-term maintenance by year three, which may consist of spot mowing, strip disking, spot spraying and controlled use of selective herbicides to promote plant regrowth and reduce competition from woody and other vegetation.
Community Impacts	• Vegetation may provide food, cover, and nesting habitat for small mammals, birds, reptiles, and amphibians. • Vegetation can significantly reduce erosion due to healthy, deep root systems. • Reduced use of fertilizers, herbicides, and pesticides may help maintain and improve water quality. • Perennial planting improves soil health and sequesters carbon. • Pollinator-friendly dual-use solar promotes continued production and investment.
Feasibility	• Pollinator-friendly dual-use solar is highly feasible and occurring throughout New York. • This approach may require certain project design and maintenance criteria – such as designing and/or procuring appropriate local seed mixes – but is unlikely to significantly affect project costs.

Pollinator-Friendly Dual-Use Examples

- **NYS Department of Environmental Conservation (Stamford, NY):** DEC installed a 44 kW solar array that includes a pollinator garden planted underneath the panels along with two large bee colonies at its Region 4 Stamford office. The solar array will offset approximately 56% of the building's annual electricity needs.[20]
- **Underhill Community Solar Farm (Poughkeepsie, NY):** The first operational community solar farm in the Central Hudson Gas & Electric utility service territory, the Underhill project offers nearly 20 acres of native pollinator-friendly habitat. This habitat aids in food production, including the locally made honey and craft beers produced at nearby Plan Bee Farms and Brewery.[21]
- **Eagle Point Solar (Jackson County, OR):** A collaboration between Pine Gate Renewables and Old Sol Apiaries, this 9.9 MW solar farm saw 41 acres of land turned into pollinator-friendly habitat and is now home to 48 honeybee hives.[22]

[20] NYS Department of Agriculture and Markets. "New York State Issues Guidelines to Promote Creation of Pollinator Habitats on Commercial Properties." June 22, 2020. https://agriculture.ny.gov/news/new-york-state-issues-guidelines-promote-creation-pollinator-habitats-commercial-properties

[21] Watson, Emily. The Poughkeepsie Journal. "Pollinator-friendly solar practices can benefit farmers: Valley Views", Opinion. February 9, 2018. https://www.poughkeepsiejournal.com/story/opinion/2018/02/09/pollinator-friendly-solar-practices-can-benefit-farmers-valley-views/308033002/

[22] Davis, Rob. Fresh Energy. "Case Study: The 9.9 MW Solar Project in Science Magazine." June 2, 2021. https://fresh-energy.org/case-study-the-9-9-mw-solar-project-in-science-magazine

3.5 Conservation Dual-Use Approaches

While the construction of solar projects almost always involves an invariably degree of short-term land and other disturbances, responsibly developed solar projects can offer a variety of ecological and biodiversity benefits, which may not otherwise be realized on lands remaining in conventional agricultural use. The conservation dual-use approach recognizes that there are meaningful benefits to utilizing underlying land for creating or replenishing habitat. Solar projects featuring conservation approaches are designed in consultation with conservation organizations focused on restoring ecosystem vitality and function through sustainable site design and long-term conservation efforts. Conservation dual-use solar projects should be customized to regional and site-specific needs, including but not limited to:

- Protection of species categorized as endangered, threatened, or another special conservation status.
- Removal and/or mitigation of invasive species.
- Avoidance of biologically sensitive areas, such as nesting or reproductive areas.
- Creation of new habitat designed to support biodiversity.

The following guiding principles should steer the design and evaluation of conservation dual-use solar sites:

1. Prioritize habitat connectivity and quality and wildlife migration within the area's broader watershed and ecosystem.
2. Identify and implement baseline measures for ecosystem value.
3. Strive for net-positive outcomes on and off site.

Case Study: Conservation and Large-Scale Solar

Topaz Solar Farm (San Luis Obispo County, CA): Nestled in the grasslands of California's Carrizo Plain, the Topaz Solar Farm is one of the world's largest solar energy facilities, with a rated capacity of 550 megawatts. It is also the site of ongoing research examining the impacts of responsible land use and conservation strategies on biodiversity at solar facilities.

Primarily sited on both active and fallow dry-land farmed fields, the Topaz project implemented several conservation dual-use approaches during and after project construction, including:

- Eliminating the use of fertilizers and rodenticides
- Ceasing annual tilling and land disturbance
- Inclusion of wildlife corridors throughout the project design
- Implementation of fencing designed to provide valuable habitat for the San Joaquin kit fox (an endangered species), while excluding larger predators
- Reseeding of project areas with a native seed mix (locally sourced from grasslands of the Carrizo Plain)
- Pre-construction biodiversity training for workers, as well as daily biological field monitoring
- Rotational livestock grazing for vegetation management

To-date, these approaches have created positive outcomes in terms of biodiversity and conservation goals for the project. In comparison to nearby Stewardship Lands which are not part of the Topaz project, areas underneath and around the solar arrays have demonstrated increased vegetative species diversity, as well as increased live vegetative groundcover (important from a dust control perspective). The facility has also seen a continued presence of San Joaquin kit foxes on-site, demonstrating the value of effective project design and management on endangered or threatened species.

To read more about the conservation approaches in place at the Topaz Solar Farm, please visit: https://www.researchgate.net/publication/325572446_Best_Practices_in_Responsible_Land_Use_for_Improving_Biodiversity_at_a_Utility-Scale_Solar_Facility

Conservation Dual-Use Solar – Planning, Design, and Feasibility Criteria:

Design	• Improve on-site hydrology through the construction of green infrastructure like bioswales. • Reintroduce native and pollinator flora, as well as small mammal habitat, and integrate all in solar site design. • Consult local/regional expertise to ensure the site is tailored to the local habitat, species, and conservation goals.
Construction	• Complete construction in a minimally impactful manner, including through low-impact selective cutting plans and burying lines. • Any soil and site impacts should be promptly remediated and improved.
Establishment & Maintenance	• Manage the site first and foremost as a restored ecosystem, not as a solar array. • Minimize pesticide use and mechanical maintenance in the solar maintenance plan.
Community Impacts	• Helps protect and improve sensitive ecosystems on and surrounding the site. • Decommissioning plans should address ecosystem restoration and protection at end of system lifecycle.
Feasibility	• Highly Dependent on site-specific and/or regional considerations and needs. • Reliant on certain design and maintenance considerations which will affect project costs and logistics, including but not limited to: - Consultation with knowledgeable local or regional experts - Project-specific environmental research and studies - Changes to site design to minimize or mitigate impacts to environmental resources

Conservation Dual-Use Example

- **Demonstration project at the National Wind Technology Center (Boulder, CO):** In 2010, NREL began conducting studies on restorative vegetation at its 1.1 MW solar array in Colorado. Situated on grassland habitat, the site was revegetated using a local seed mix designed to achieve positive ecological outcomes. Over a 3-year period, researchers found that revegetation using native species was "not only possible, but [could] achieve ground cover sufficient to control erosion and to begin to restore wildlife habitat."[23]
- **"Solinator Garden" (Fort Collins, CO):** This 1 MW solar farm, built by Solaris Energy and Namasté Solar, features a pollinator garden along the perimeter of the system and a flower and grass blend spread through the site.

[23] NREL. Native Vegetation Performance under a Solar PV Array at the National Wind Technology Center. May 2017. https://www.nrel.gov/docs/fy13osti/56290.pdf

4. Solar and Agriculture in NYS Programs and Regulations

4.1 Office of Renewable Energy Siting and Electric Transmission (ORES)

Given the importance of balancing solar and agriculture for local governments, this section highlights critical and relevant requirements as they appear in the state-level renewables siting process administered by the Office of Renewable Energy Siting and Electric Transmission (ORES). This information is intended to aid local governments in understanding the degree to which agricultural resources are considered by ORES.

In April 2020, the NYS legislature enacted the Accelerated Renewable Energy Growth and Community Benefit Act (the Act) to advance renewable energy development pursuant to the State's ambitious climate and energy goals. This legislation created ORES to serve as a central office responsible for implementing a consolidated and timely review and approval process for major renewable energy generating facilities, inclusive of solar. Under the Act, new renewable facilities with a nameplate capacity of 25 MW or more must obtain a permit through ORES. In April 2024, the Renewable Action through Project Interconnection and Deployment (RAPID) Act updated ORES responsibilities and moved the office to the Department of Public Service.

ORES utilizes a set of regulations and uniform standards and conditions in reviewing and permitting major renewable generating facilities. These standards and conditions were developed based on the comprehensive certificate conditions established under the Article 10 and previous 94-c permitting process, as well as in consultation with numerous state agencies and public input.

Agricultural lands, impact mitigation, and consultation with NYSAGM are highlighted throughout the ORES application and review process, including but not limited to the following standards and requirements:

- Applicants must submit a robust assessment of the project study area in order to catalogue and examine agricultural impacts.
- Projects proposed on active agricultural lands consisting of MSG 1-4 shall adhere to NYSAGM's *Guidelines for Solar Energy Projects-Construction Mitigation for Agricultural Lands* to the maximum extent practicable, and must hire an independent, third-party agricultural monitor approved by ORES/NYSAGM to oversee compliance with agricultural conditions and requirements.

ORES regulations also require applicants to provide a list of relevant substantive local laws and requirements applicable to the facility's construction and operation which may include local zoning and land use regulations pertaining to agricultural lands. If granted approval, the applicant shall be required to construct and operate a permitted facility in accordance with applicable local laws unless ORES determines that the laws are unreasonably burdensome.

For more information about ORES, including regulations and permit applications, visit https://dps.ny.gov/ores.

4.2 NYS Department of Agriculture and Markets (NYSAGM)

4.2.1 Solar Installations in State Certified Agricultural Districts

Article 25AA of NYS Agriculture and Markets Law (AML) provides a bottom-up approach to protecting farmland by establishing State Certified Agricultural Districts (Agricultural Districts). Landowners petition the County Legislature to include their farmland in an Agricultural District, affected municipalities are notified, a public hearing is held, and the County Legislature creates or modifies an Agricultural District by removing or adding land to the District. Farm operations located within an Agricultural District receive certain benefits, including limited protection from eminent domain, condemnation, and unreasonably restrictive local rules, regulations, laws, and ordinances; an agricultural assessment (see NYS Department of Taxation and Finance section below); protection from private nuisance lawsuits; and other benefits. A landowner receiving annual agricultural assessments inside an Agricultural District commits their land to an agricultural use for the next five years. Farmland outside Agricultural Districts are generally not eligible for other Agricultural District benefits and protections. The following sections further detail protections in place for farm-related solar projects, the environmental review process for solar projects in Agricultural Districts, and Notice of Intent (NOI) process for solar projects sited in Agricultural Districts.

Learn more about the Agricultural District Law at https://agriculture.ny.gov/system/files/documents/2020/01/summary-agrdistrict-law.pdf.

4.2.1.1 Farm-Related Solar in Agricultural Districts

As previously covered, in accordance with NYS AML, solar installations in Agricultural Districts which are considered on-farm equipment are protected from unreasonably restrictive local laws. NYSAGM considers solar projects to be “on-farm” equipment when they are designed, installed, and operated so that the anticipated annual total amounts of electrical energy generated does not exceed 110% of the anticipated annual electricity needs of the farm. Solar equipment is considered on-farm buildings in jurisdictions where local law classifies this equipment as structures or buildings. To ensure that electrical output from solar equipment does not exceed the 110% threshold, an initial energy assessment may be required to separate farm-related electricity consumption from other uses. If solar equipment is connected by remote net metering, combined multiple meters must determine the on-farm equipment’s electrical needs.

4.2.1.2 State Environmental Quality Review (SEQR) for Solar Projects in Agricultural Districts

Due to a solar project's potential impacts on sensitive land, actions in State Certified Agricultural Districts generally require more stringent environmental review. Upon receiving an application for a solar project, the relevant municipal board must determine whether it will engage in discretionary decision making ("[all] decisions of an agency to approve, fund, or directly undertake an action that may affect the environment"[24]), which may establish the project as subject to State Environmental Quality Review (SEQR). If the project is deemed subject to SEQR review, the board must classify the project under one of three SEQR action "types": Type I, Type II or Unlisted. Action type may depend on project size and, to some extent, proximity to sensitive environmental or social-cultural resources.

A non-agricultural use, such as a solar project which is not "on-farm" equipment, occurring wholly or partially within an Agricultural District is a Type I action if it exceeds 25 percent of any Type I threshold established under SEQR. For example, a Type I threshold of 10 acres for a particular physical alteration would be reduced to 2.5 acres in an Agricultural District, elevating review for any solar installation requiring more than 2.5 acres of land in an Agricultural District to a Type I action unless the installation is deemed "on-farm" equipment or building. NYSAGM may be an Interested Agency in the SEQR process and may become an Involved Agency depending on the nature of the impact.

To learn more, access the 'SEQR for Solar' section of NYSERDA's Solar Guidebook for Local Governments.

4.2.2 Notice of Intent (NOI) Process

NYSAGM considers non-residential solar arrays to be commercial facilities; accordingly, any such project located in a State Certified Agricultural District receiving funding from NYSERDA under the Clean Energy Standard or the NY-Sun Commercial/Industrial Program must complete the Notice of Intent (NOI) process as detailed in NYS AML Section 305(4).

The project sponsor is required to submit a completed NOI Form to NYSERDA to examine and address the project's impacts on land, farm enterprises, and agricultural resources in the Agricultural District, and to demonstrate how project impacts may be avoided or minimized. NYSERDA will determine if sufficient information has been provided and submit this information to NYSAGM. The NOI process allows NYSAGM to conduct detailed, site-specific reviews of relevant filings, and to recommend project changes, mitigation strategies, or remedial action where necessary.

Additionally, in conjunction with NYSAGM, NYSERDA has adopted program rules that require certain projects to make an agricultural mitigation payment to the agricultural and farmland viability protection fund[25], based on both the size of the project and the extent to which the project overlaps with priority high-quality soils. This requirement incentivizes projects to minimize impacts on high quality agricultural lands, while simultaneously providing monetary contributions that will contribute to agricultural and farmland protection activities pursuant to Article twenty-five-AAA of the Agriculture and Markets Law.

For more information about the NOI process, visit https://agriculture.ny.gov/land-and-water/notice-intent-requirement.

For more information about agricultural mitigation requirements for projects participating in a NYSERDA incentive program, visit:

- NY-Sun Program: https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Contractors/Resources-for-Contractors.
- NYSERDA Solicitations for Large-Scale Renewables: https://www.nyserda.ny.gov/All-Programs/Clean-Energy-Standard/Renewable-Generators-and-Developers/RES-Tier-One-Eligibility/Solicitations-for-Long-term-Contracts.

4.2.3 NYSAGM Guidelines for Solar Energy Projects – Construction Mitigation for Agricultural Lands

NYSAGM provides guidance for minimizing solar energy project construction impacts on agricultural lands via their *Guidelines for Solar Energy Projects - Construction Mitigation for Agricultural Lands* resource. These guidelines are highly technical and are designed to ensure the future and continued agricultural productivity of agricultural lands hosting solar projects.

Currently, adherence to the guidelines is required for all projects located in a State-Certified Agricultural District which are participating in a NYSERDA solar incentive program, including the NY-Sun Commercial/Industrial Program, as well as any Tier 1 Solicitation for Large-Scale Renewables. Projects permitted through ORES are also required to adhere to the guidelines. Additionally, as suggested in the Model Solar Law located in this Solar Guidebook, local governments may choose to require adherence to the guidelines for all ground-mounted solar installations located on highly productive or priority soils, such as MSG 1-4.

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[24] NYS Department of Environmental Conservation. The SEQR Handbook, Fourth Edition. 2020. https://www.dec.ny.gov/docs/permits_ej_operations_pdf/seqrhandbook.pdf

[25] https://www.nysenate.gov/legislation/laws/STF/99-PP*2

The NYSAGM Guidelines are highly prescriptive, addressing agricultural impacts throughout the lifespan of a solar project by including requirements for key stages of project development, including:

- **Project Construction**: addresses treatment of topsoil, trenching and underground cable management, soil drainage management, and other topics.
- **Post-construction Restoration:** covers disposal of construction debris, site repair, soil decompaction, vegetation management, and other topics.
- **Monitoring and Remediation:** examines any continued impacts to site ecology and productivity during the growing season(s) following project construction.
- **Project Decommissioning:** ensures adequate removal of equipment (to specific depths), replacement of topsoil, agricultural restoration, and other actions.

To access these guidelines, visit: https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/NY-Sun/Contractor-Resources/NYSAGM-guidelines-for-solar-construction-mitigation-ag.pdf.

4.2.4 Farmland Protection Plans

Pursuant to Administrative Rule 1 NYCCR 390, NYSAGM provides funding for municipalities and counties to develop agricultural and farmland protection plans in conjunction with the Cornell Cooperative Extension, local farmers, and other stakeholders. These plans, which are intended to identify priority lands and areas for preservation within the community, must:

- Include a statement of the municipality's goal(s) with respect to agricultural and farmland protection.
- Identify the general location of any lands or other designation of areas that are proposed to be protected.
- Analyze the lands or areas to be protected, such as their value to the agricultural economy of the municipality, their open space value, the level of conversion pressure being experienced, and the consequences of possible conversion.
- Describe activities, programs, and strategies intended to be used by the municipality to promote continued agricultural use, including how they are to be financed, and which may include but not be limited to revisions to the municipality's comprehensive plan.
- Describe and identify other municipal and county planning and land use programs, if any (such as economic development, zoning, and comprehensive land use planning), which may be shown to complement and be consistent with the municipal agricultural and farmland protection plan, as well as identification of any plans, policies, or objectives which are inconsistent with or conflict with the plan.

For more information on Farmland Protection Planning and Implementation Grants visit: https://agriculture.ny.gov/land-and-water/farmland-protection.

4.3 NYS Department of Taxation and Finance

4.3.1 Agricultural Assessments

An agricultural assessment is an adjustment to a property's assessed value based on a land's ability to produce a crop, livestock or livestock product associated with eligible Farm Operations rather than full development value. The property tax that will be paid by the owner is based on agricultural assessment adjustments associated with production values of soil in active agricultural production. Land inside and outside of an Agricultural District may be eligible for an agricultural assessment. To qualify, farmers must produce crops, livestock, or livestock products on seven or more acres of land and have average annual gross sales of $10,000 or more for the prior two years. Land with less than seven acres in agricultural production must have average gross sales of $50,000 or more for the prior two years. Farmland that has received an agricultural assessment must remain in agricultural use for the next five years if located inside an Agricultural District or eight years if located outside of an Agricultural District.

For more information regarding agricultural assessments, visit:

- NYSAGM Agricultural Assessments Information: https://agriculture.ny.gov/land-and-water/tax-credits-and-agricultural-assessments#agricultural-assessment-information.
- Department of Tax & Finance Agricultural Assessment Information: www.tax.ny.gov/research/property/assess/valuation/agindex.htm.

4.3.2 Converting Farmland to Solar

AML Section 301(8) defines "conversion" as "an outward or affirmative act changing the use of agricultural land" to a nonagricultural use. When a conversion occurs or updates are necessary, the landowner is responsible to notify town assessor. A conversion penalty will likely be imposed if farmland located within an Agricultural District is converted to a nonagricultural use within five years of an agricultural assessment, or eight years if located outside of an Agricultural District. Conversion penalties are equal to five times the taxes saved in the most recent year that the land received an agricultural assessment, plus interest.[26] No conversion penalty is imposed if agricultural land is converted for oil, gas, or wind energy development that does not support agricultural production. However, because solar energy is not included in this exemption, a conversion payment would apply if the electrical output of solar equipment substantially exceeds (e.g., is more than 110% of) a farm's anticipated electrical needs.

When only a portion of a parcel is converted to a nonagricultural use, the assessor apportions the real property tax assessment and the agricultural assessment, determines the tax savings attributable to the converted portion, and computes the conversion payment based on that portion. If the remaining land within a parcel is used for agricultural purposes and the eligibility criteria are met, that land may still receive an agricultural assessment. Assessors can work with landowners to determine the conversion payment. Landowners should know where solar projects are sited on their land to work with the associated Soil and Water Conservation District to revise the amended Soil Group Work Sheet, which will enable a comparative analysis of benefited acres versus total converted acres by mineral, organic, and farm woodland soil groups.

Conversion payments are added to the converted land's taxes. Properties may be subject to a tax sale if conversion payments are not made. These payments generally become the landowner's responsibility at the time of conversion, although solar project developers will typically cover these costs as a part of their contract with the landowner.

Finally, landowners must notify the assessor within 90 days whenever a parcel receiving an agricultural assessment is converted to a nonagricultural use. Failure to notify may result in a penalty of two times the payments owed, up to a maximum of $1,000.

For more information regarding agricultural land conversions, access the Department's Conversion of Agricultural Lands guidance at: https://www.tax.ny.gov/research/property/assess/valuation/ag_conversion.htm.

4.4 NYS Working Groups

4.4.1 Agricultural Technical Working Group

Early in 2021, NYSERDA organized and hosted the first meeting of the NYS Agricultural Technical Working Group (A-TWG). The A-TWG was founded to identify opportunities, navigate conflicts, and promote best practices around issues at the intersection of solar development and agriculture, with consideration of other land use concerns.

A-TWG members represent a variety of stakeholder groups, including agricultural land and farm advocates, solar developers and operators, climate and environmental organizations, local government officials, academia, and state agencies. The group's intention is to bring together science and socio-economic subject matter experts to develop collaborative advice, guidelines, or other products which consider the State's agricultural land and farm economy while responsibly advancing the State's renewable energy and greenhouse gas emissions reduction goals.

The A-TWG acts as a forum where stakeholders can openly communicate concerns, identify information needs, and learn of actions being taken by the State and other stakeholders to improve outcomes around solar and agriculture. The group also serves as an advisory body to relevant state agencies and other participating entities, providing advice and guidance to help steer efforts to advance responsible renewable energy development while appropriately balancing the needs and contributions of New York agricultural operations, lands, and farmers.

The A-TWG has formed three separate specialist committees each with its unique focus. one committee is focused on advancing agrivoltaics that is beneficial to farmers and their communities to encourage further development of solar while maintaining and demonstrating viable commercial agriculture operations. A second committee provides input on NYSERDA's Smart Solar Siting Scorecard for NYSERDA's Tier 1 Solicitation for Large-Scale Renewables to encourage a balanced approach between renewable energy siting and other New York State policies, goals, and objectives. The third and newest committee is the Regional Agronomic Impacts from Solar Energy Specialist Committee, or the RAISE Committee.

[26] AML 305(1)(d), AML §306(2)(a)(i): https://www.nysenate.gov/legislation/laws/AGM

The purpose of this specialist committee is to support the A-TWG in its advisory function to the State of New York and other participating entities, and to provide advice and guidance to help steer efforts to advance renewable energy development in a responsible way that supports New York State's agricultural operations, lands, farmers, and communities. In carrying out its mission, the RAISE Committee will advise and inform development of a study (or suite of studies) that can be undertaken to assess the relative benefits and impacts of solar energy development on regional farmland economies.

For more information regarding the A-TWG, including meeting materials and announcements, visit: www.nyatwg.com/.

4.4.2 Farmland Protection Working Group

Adopted in April 2021, the State's Fiscal Year 2021/2022 Budget included a provision to establish a statewide Farmland Protection Working Group (FPWG). The FPWG was tasked with recommending strategies to minimize the impacts of renewable energy development on productive agricultural soils and working farms, and to facilitate and promote input from local governments in the renewable energy siting process. The FPWG, which held its first meeting in December 2021, is administered by NYSAGM, and included executive representation from state agencies including NYSDEC, NYSERDA, ORES, and the NYS Department of Public Service. Other appointed Working Group members included representatives from local and county governments, farm advocates, and County Agriculture and Farmland Protection Boards. In 2022, the FPWG published an interim report which focused on strategies to integrate renewable energy sources into working landscapes with minimal impact on agriculture, including the need for more research; the potential for financial incentives; and proposed tools for State and local governments. The Interim Report can be found online at agriculture.ny.gov/land-and-water/2022-interim-report-new-york-state-farmland-protection-working-group.

For more information regarding the Farmland Protection Working Group, visit: https://agriculture.ny.gov/land-and-water/farmland-protection-working-group.

5. Resources for Local Governments

The following guidance documents, resources, and articles provide additional information for local governments looking to implement a balanced approach toward regulating solar development on agricultural lands.

5.1 Solar and Agriculture Guidance Documents

Farmland Solar Policy Design Toolkit
U.S. Department of Agriculture (2020)
https://farmandenergyinitiative.org/wp-content/uploads/2020/08/Final-FSPP-Toolkit-Report.pdf

Farmer's Guide to Going Solar
Solar Energy Technologies Office, DOE Office of Energy Efficiency & Renewable Energy
https://www.energy.gov/eere/solar/farmers-guide-going-solar

Smart Solar Siting Principles and Examples of Land Use Laws that Support Renewable Energy While Protecting Farmland
American Farmland Trust (2019)
https://s30428.pcdn.co/wp-content/uploads/2019/05/AFT-Smart-Solar-Siting-Principles-and-Examples-of-Local-Solar-Laws-that-Protect-Farmland.pdf

Low-Impact Solar Development Strategies Guidebook
InSPIRE
https://openei.org/wiki/InSPIRE/Guidebook

Commercial Solar Development on Farmlands
Sustainable Development Code (2020)
https://sustainablecitycode.org/brief/commercial-solar-development-on-farmlands-2/

Considerations When Leasing Agricultural Land to Solar Developers
Cornell University (2019)
http://ccetompkins.org/resources/considerations-when-leasing-agricultural-lands-to-solar-developers

Sustainable Farm Energy
Cornell Small Farms Program (2019)
https://smallfarms.cornell.edu/projects/farm-energy/

5.2 New York Regional Resources

Solar Ready, Climate Resilient: Best Practices and Recommendations for Solar Zoning in the Hudson Valley
Scenic Hudson (2020)
https://www.scenichudson.org/wp-content/uploads/2021/01/solar-zoning-in-the-hudson-valley.pdf

Planning for Offsite Solar Energy Projects
NYS Tug Hill Commission (2020)
https://tughill.org/wp-content/uploads/2020/02/Planning-for-Offsite-Solar-Energy-Projects.pdf

5.3 Dual-Use Solar Information and Resources

Combining Solar Photovoltaic Energy and Agriculture Production
NYSERDA
https://www.nyserda.ny.gov/PutEnergyToWork/Industry-Energy-Solutions/Agriculture/Agrivoltaics

Agrivoltaics
Fraunhofer Institute for Solar Energy Systems
https://www.ise.fraunhofer.de/en/key-topics/integrated-photovoltaics/agrivoltaics.html

AgriSolar Clearinghouse
Connecting businesses, land managers, and researchers with trusted resources to support the growth of co-located solar a nd sustainable agriculture
https://www.agrisolarclearinghouse.org/

Smart Solar Siting for New England: Policy Strategies for Farmland Protection
American Farmland Trust (2020)
https://s30428.pcdn.co/wp-content/uploads/sites/2/2020/09/NE-SSS-Solar-Policy-Strategies-for-Farmland-Protection-FINAL.pdf

How Community Solar Supports American Farmers
Solar Energy Industries Association (2020)
https://www.seia.org/sites/default/files/2020-02/SEIA-Report-Community-Solar-Support-American-Farms-2020.pdf

Solar and Agricultural Land Use
Solar Energy Industries Association (2019)
https://www.seia.org/sites/default/files/2019-11/Solar%20Ag%20Land%20Usage%20FactSheet%202019-PRINT.pdf

Clean Energy Home
UMass Amherst, The Center for Agriculture, Food and the Environment
https://ag.umass.edu/clean-energy

Impacts and Opportunities from Large-Scale Solar Photovoltaic (PV) Electricity Generation on Agricultural Production
Environmental Quality Management Journal (2019)
https://onlinelibrary.wiley.com/doi/abs/10.1002/tqem.21629

Examining the Potential for Agriculture Benefits from Pollinator Habitat at Solar Facilities in the United States
Environmental Science and Technology (2018)
https://pubs.acs.org/doi/pdf/10.1021/acs.est.8b00020

Solar Panels Cast Shade on Agriculture in a Good Way
Science Daily (2019)
https://www.sciencedaily.com/releases/2019/07/190729123751.htm

Growing Crops Under Solar Panels? Now There's a Bright Idea
Wired (2021)
https://www.wired.com/story/growing-crops-under-solar-panels-now-theres-a-bright-idea/?utm_source=facebook&utm_medium=news_tab&utm_content=algorithm

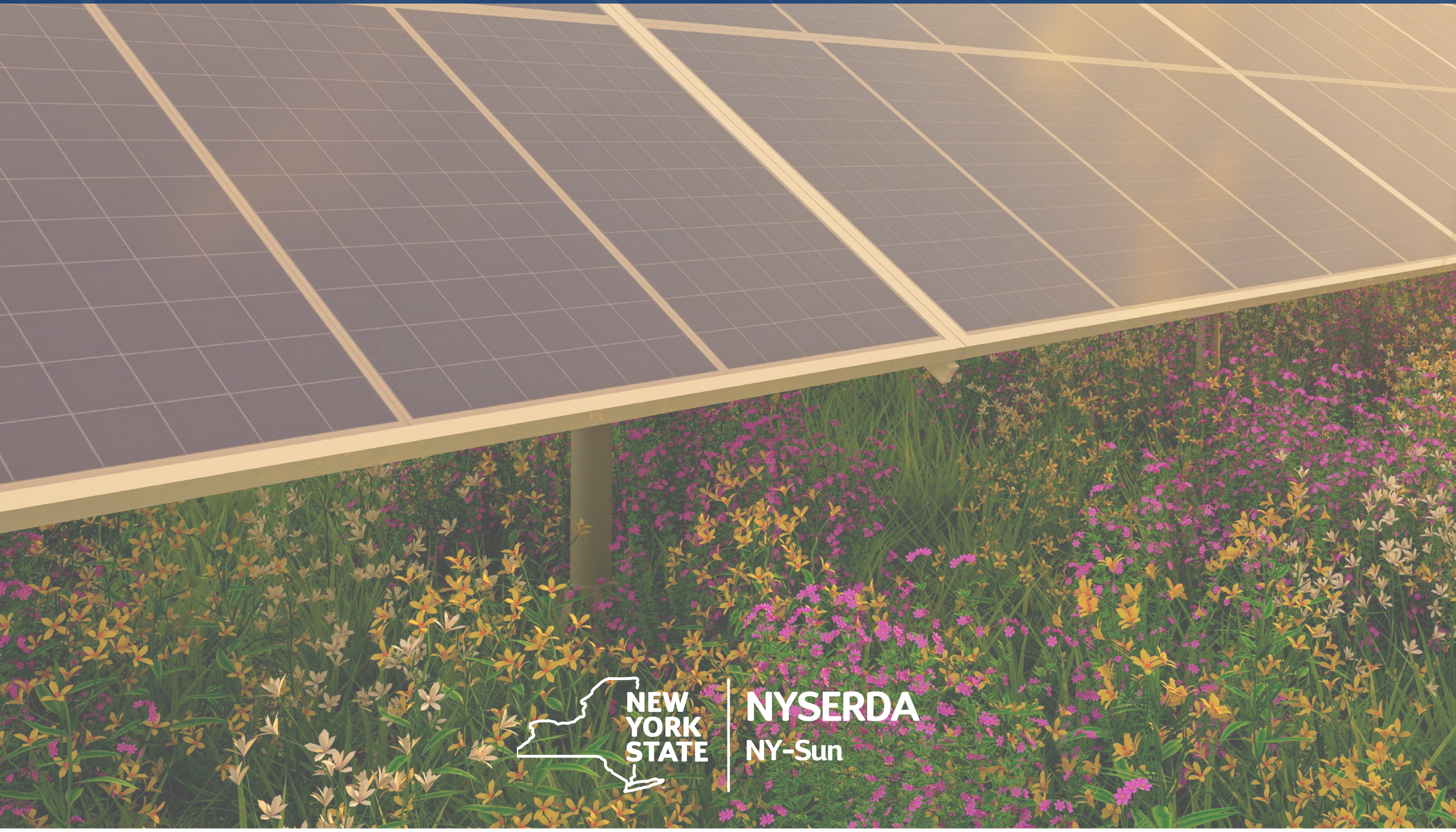
Questions?

If you have any questions regarding the solar Installations on agricultural lands, please email questions to cleanenergyhelp@nyserda.ny.gov or request free technical assistance at nyserda.ny.gov/SolarGuidebook. The NYSERDA team looks forward to partnering with communities across the state to help them meet their solar energy goals.

Section 5

State Environmental Quality Review (SEQR) for Solar

Background information and step-by-step instructions for municipalities in the SEQR process for large-scale solar energy systems.



Section Contents

Overview

When beginning solar development in your respective community, municipalities must participate in a State Environmental Quality Review (SEQR) for rooftop and ground-mount solar photovoltaic (PV) energy systems less than 25MW. Throughout this section, we provide readers with an overview on the SEQR process, with step-by-step instructions for large solar projects and the background on SEQR regulations.

Additionally, we include sections on preparing the environmental assessment form (EAF), agency coordination, solar developer guidance and a list of frequently asked questions (FAQs) regarding the process.

Intended Use

This document is intended to be used in conjunction with the New York State Department of Environmental Conservation (NYSDEC) SEQR Handbook, and has been reviewed by NYSDEC. References to specific sections of the SEQR Handbook are included as hyperlinks throughout this document. Users are encouraged to click on hyperlinked words to access relevant sections of the SEQR Handbook and other resources, such as the SEQR Regulations.[1]

To make this guidance document more relevant for solar energy projects supported by NYSERDA, it assumes that projects would be sited and designed in a manner that will avoid any significant environmental impacts. This by no means reduces the level of evaluation that is required to make a determination of significance. Rather, it assumes that the outcome of the rigorous process of review, coupled with good site selection on the part of the project developer and good guidance from the municipal board, will result in the avoidance of significant environmental impacts.

Users of this document are encouraged to first review Section 1, “SEQR Quick Reference Guide,” which summarizes the steps a municipal board completing the SEQR process for a solar energy project must complete. This section includes references to other sections of this document if readers require more information. Other sections of this document provide step-by-step instructions to fill out SEQR forms and answer questions that are specific to solar energy systems.

NYSERDA offers free technical assistance to municipalities completing the SEQR process for solar energy systems. To request assistance, email cleanenergyhelp@nyserda.ny.gov.

1. SEQR Quick-Reference Guide

This quick-reference guide summarizes the SEQR process steps a Lead Agency must complete for a typical large-scale solar project. (This guidance document assumes a municipal board will serve as Lead Agency.)

Most solar projects in NY-Sun’s Commercial and Industrial programs are 2-5 MW AC ground-mount systems. Ground-mount installations require approximately five acres of land per megawatt. As a result, these systems tend to be located in rural areas on flat to gently sloping farmland. Due to the limited area of impact associated with solar panel support structures, much of the land can be maintained as grassland between and beneath the panels.

Since solar developers prefer the most economical projects, they are incentivized to avoid significant impacts to wetlands, threatened and endangered species habitat, and archeological/historic sites. Solar installations do not require lighting and water and sewer services. They do not increase population and school-age children that can impact services provided by the community, county and State. Once constructed, the amount of traffic entering or leaving a solar installation is minimal. As a result, many of the environmental impacts are avoided by design or simply do not exist due to the nature of the installations. However, municipalities may still struggle with issues of land use compatibility, protection of agricultural lands and visual impacts.

[1] For example, the hyperlink “6 NYCRR 617.7(d)” in this document references Title 6, Chapter VI, Part 617, Section 7, Paragraph (d) of the New York Codes, Rules and Regulations.

1.1 Step-by-Step Instructions for Large-Scale Solar Projects

The following list describes the steps a municipal board serving as Lead Agency must complete for a large-scale solar project.

1.1.1 Step 1: Is the Project Subject to SEQR?

- There must be a discretionary action by a municipal board or council, such as a site plan review, to trigger the SEQR process (Actions subject to SEQR)
- If subject to SEQR, determine if the solar project is a:
  > Type I Action (SEQR Handbook; NYS regulation)

  > Type II Action (SEQR Handbook; NYS regulation)

  > Unlisted Action (SEQR Handbook)
- The municipal board should undertake an initial review of the Applicant's site plan to look for obvious problems with environmental impacts and/or missing information.

1.1.2 Step 2: Prepare Environmental Assessment Form

- The Applicant prepares Part 1 of the t (EAF) and provides it to the Lead Agency for review. Use the online version of the EAF linked to the NYSDEC database. Workbooks, which provide instructions and examples for preparing the EAF, are on the NYSDEC website.
- For Type I Actions, a Full EAF is required (FEAF, Part 1). If more than one agency is involved, coordinated review for the establishment of the Lead Agency is required.
- For Unlisted Actions, a Short EAF may be used, but the municipal board may require the use of a Full EAF if it feels that it will provide more complete information to evaluate possible impacts. Coordinated review is not required but may be advisable to facilitate the environmental review process and to obtain permits or approvals quickly.

1.1.3 Step 3: Initiate Coordinated Review

- To initiate coordinated review, the municipal board submits to all Involved Agencies Part 1 of the EAF, along with project plans and a coordination letter indicating the municipal board's intent to serve as Lead Agency.
- Lead Agency must be agreed upon within 30 days of transmitting this information.

1.1.4 Step 4: Identify and Evaluate Environmental Impacts

- The municipal board, serving as Lead Agency, prepares Parts 2 and 3 of the EAF. The Lead Agency may request technical assistance from the applicant to complete Part 2, but completion of Parts 2 and 3 are the responsibility of the Lead Agency.
- Parts 2 and 3 of the Short EAF (SEAF, Parts 2 & 3).
- Parts 2 and 3 of the Full EAF (FEAF, Part 2) and (FEAF, Part 3).

1.1.5 Step 5: Discuss Project Changes to Reduce Impacts

- This step is only required if the evaluation in Step 4 reveals "at least one significant adverse environmental impact." 617.4(a)(1)
- The municipal board reviews significant environmental impacts with the Applicant to determine if project changes can be incorporated to minimize or eliminate the impacts.

1.1.6 Step 6: Determine Significance of Environmental Impacts

- The municipal board determines the significance of the remaining environmental impacts identified in Step 4 by applying the criteria in the SEQR regulations and guidance in the SEQR Handbook.
- The municipal board makes a Determination of Significance, issuing a negative or positive declaration (Part 3 of the Short or Full EAF).

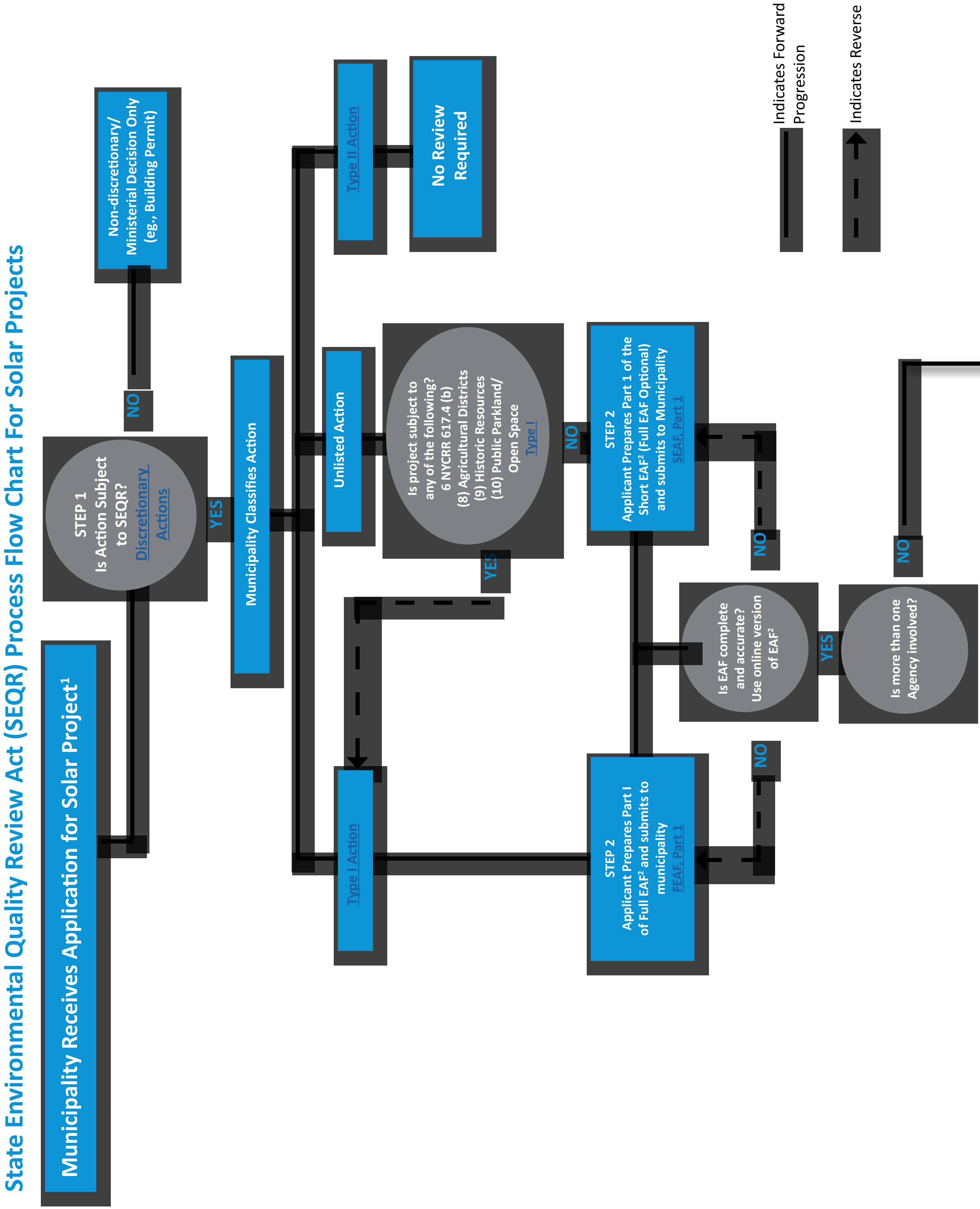
1.1.7 Step 7: File Negative Declaration

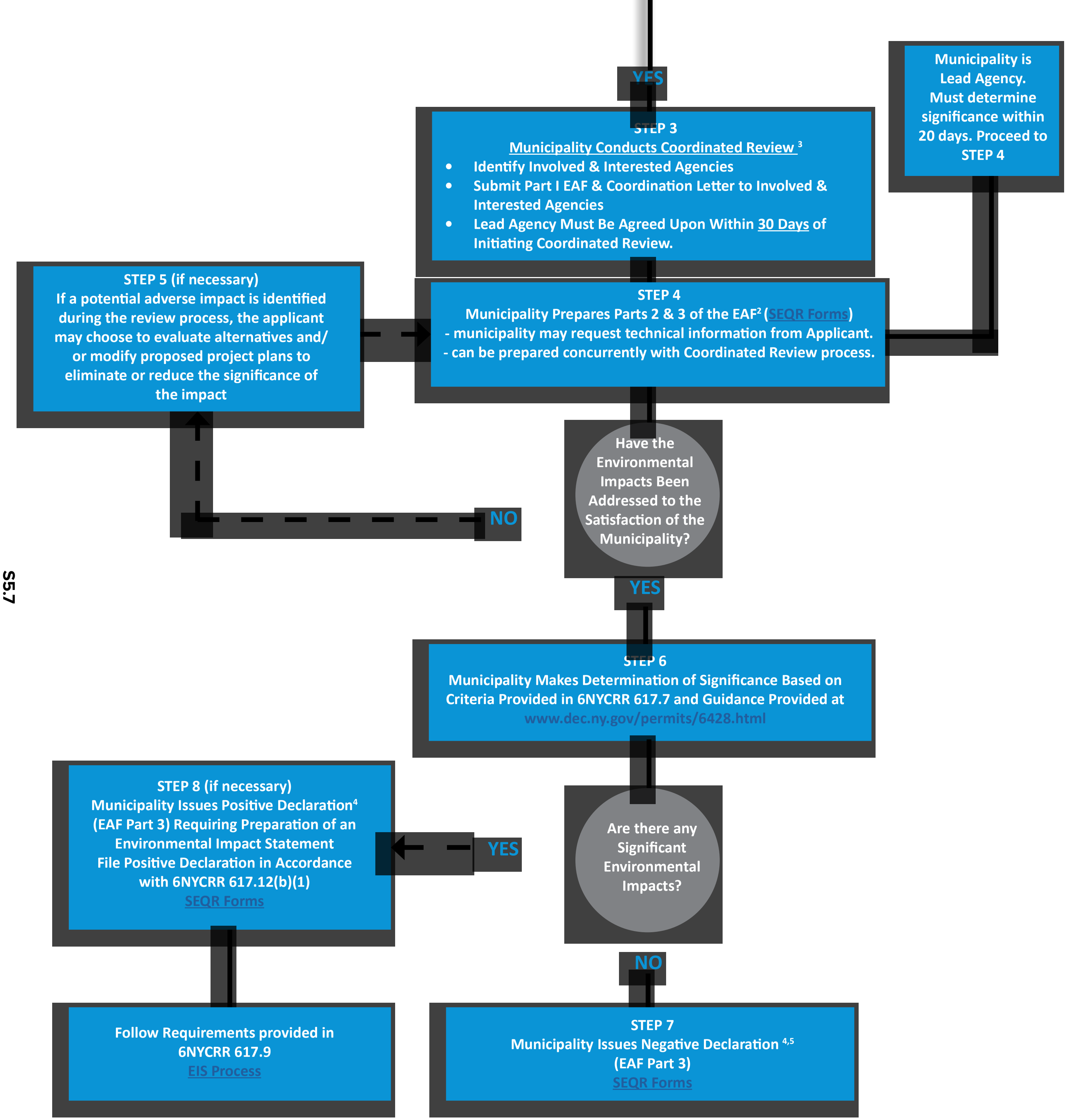
- Negative Declaration for an Unlisted Action - Filed with the Lead Agency
    - > Conditioned Negative Declaration (See 6 NYCRR 617.7(d))
- Negative Declaration for a Type I Action

1.1.8 Step 8: Positive Declaration

- Issuing a Positive Declaration requires the preparation of an Environmental Impact Statement (EIS).
- Information on preparing an EIS is provided in the SEQR Handbook.

1.2 SEQR Flowchart for Large-Scale Solar Projects





SEQR Flow Chart Footnotes

1.) This process assumes that the municipality within which the project occurs will serve as Lead Agency.

2.) Environmental assessment forms and the EAF workbooks that provide guidance on preparing the forms can be found at https://dec.ny.gov/regulatory/permits-licenses/seqr/eaf-workbooks

3.) Coordinated review is required for all Type I Actions involving more than one involved agency (6 NYCRR 617.6 (b) (2) (i). Although the SEQR regulations provide an option for Uncoordinated Review of Unlisted Actions, it is recommended that Coordinated Review be conducted for both Type I and Unlisted Actions involving more than one Involved Agency to complete SEQR in a timely manner. Uncoordinated review requires each agency to conduct their own SEQR process that can result in unnecessary delays.

4.) Memorialized by resolution during a meeting of the involved municipal board taking action on the project. Typically, the Board will prepare a resolution that declares Lead Agency and makes the Determination of Significance (Positive or Negative Declaration). This can all be done at the same meeting.

5.) Municipality Files Negative Declaration for a Type I Action with:
- Chief Executive Officer of the Political Subdivision in Which the Action is Located
- Lead Agency
- All Involved Agencies
- Any Person Requesting a Copy
- The Applicant
- Published in the Environmental Notice Bulletin

For Unlisted Actions, Negative Declaration is filed with the Lead Agency and Must be Made Available to the Public Upon Request

2. Background on the SEQR Regulations

2.1 Background

SEQR applies whenever a State or local government agency (including districts and special boards and authorities) must approve or fund a privately or publicly sponsored action. It also applies whenever an agency directly undertakes an action. Solar projects less than 25MW must go through the SEQR process. For these solar projects, the relevant agency is likely to be the local planning board or zoning board of appeals where a site plan application, or special use permit, is involved. The relevant agency may be the local legislative body if the project needs rezoning or that body has reserved for itself the authority to review particular applications. Solar projects 25MW or greater will be reviewed by the Office of Renewable Energy Siting and Electric Transmission (ORES).

SEQR requires all State and local government agencies to consider the environmental impacts and social and economic factors of specified actions. The State and local agencies must consider the environmental significance of any action they have discretion to approve, fund or directly undertake. SEQR regulations provide a systematic process to identify and consider environmental factors early in the planning of an action, allowing the opportunity to modify projects to avoid adverse impacts.

The SEQR process begins as soon as an agency or local government receives an application for an action or funding. The relevant municipal board must first determine if an action is a Type I, Type II or Unlisted Action. Type I and Unlisted Actions require further review under SEQR; Type II Actions require no further action under SEQR.

2.2 Types of SEQR Actions

Type I Actions are defined in SEQR regulations as those likely to have "at least one significant adverse environmental impact." Type I Actions are listed in the statewide SEQR regulations, or can be listed in an Involved Agency's SEQR procedures. The Type I list contains numeric thresholds; any actions that equal or exceed one or more of the thresholds results in a Type I designation. A Type I Action always requires the completion of a Full EAF and coordinated review if more than one agency is involved, but a Type I designation does not mean that an Environmental Impact Statement must be prepared.

Type II Actions are those with no significant adverse environmental impact, or ones that have been statutorily exempted from SEQR review. Type II Actions do not require preparation of an EAF, a negative or positive declaration, or an EIS. Any action or class of actions listed as Type II in the SEQR regulations requires no further processing under SEQR.

Unlisted Actions are those that do not appear on the Type I nor Type II lists. In many instances, this requires interpretation of the regulation because not all projects fit neatly into the classifications provided in the regulations but may still meet the intent. This interpretation is at the discretion of the Lead Agency and Involved Agencies. However, because these interpretations can be legally challenged, municipalities should review the SEQR Handbook guidance (Type I Actions and Type II Actions) and seek legal counsel as necessary.

Unlisted Actions represent the largest category of actions to be reviewed under SEQR. Although these actions are less likely to have a significant adverse environmental impact than Type I actions, this does not imply that an Unlisted Action will never have such an impact.

Review of an Unlisted Action may proceed using a Short EAF (see Section 5.0 for tips on preparing the EAF). A reviewing agency may require at its discretion that a Full EAF be completed and coordinated review procedures be followed. Examples include:

- There are potential adverse impacts that could be more thoroughly investigated by using a Full EAF and coordinating review; or
- An agency has special concerns regarding a sensitive resource within its jurisdiction; or
- An agency is uncertain about the concerns of other Involved Agencies and decides to coordinate review; or
- The action falls just below the applicable Type I threshold; or
- Anytime the agency judges that the Type I procedures would be more helpful.

2.3 NYSDEC Amendments to the SEQR Regulations Effective January 1, 2019

Under current SEQR regulations, the majority of commercial, ground-mount solar projects are considered Unlisted or Type I Actions. NYSDEC has adopted amendments to SEQR to be effective January 1, 2019 that impact the review procedures of solar projects. The Department adopted a new Type II category, to be codified at 6 NYCRR § 617.5 (c) (14) & (15), to read as follows:

2.3.1 627.5(14)

Installation of solar energy arrays where such installation involves 25 acres or less of physical alteration on the following sites:

(i) closed landfills;

(ii) brownfield sites that have received a Brownfield Cleanup Program certificate of completion ("COC") pursuant to ECL § 27-1419 and 6 NYCRR § 375-3.9 or Environmental Restoration Project sites that have received a COC pursuant to 6 NYCRR § 375-4.9, where the COC under either program for a particular site has an allowable use of commercial or industrial, provided that the change of use requirements in 6 NYCRR § 375-1.11(d) are complied with;

(iii) sites that have received an inactive hazardous waste disposal site full liability release or a COC pursuant to 6 NYCRR § 375-2.9, where the Department has determined an allowable use for a particular site is commercial or industrial, provided that the change of use requirements in 6 NYCRR § 375-1.11(d) are complied with;

(iv) currently disturbed areas at publicly-owned wastewater treatment facilities;

(v) currently disturbed areas at sites zoned for industrial use; and

(vi) parking lots or parking garages;

2.3.2 617.5(15)

Installation of solar energy arrays on an existing structure provided the structure is not:

(i) listed on the National or State Register of Historic Places;

(ii) located within a district listed in the National or State Register of Historic Places;

(iii) been determined by the Commissioner of the Office of Parks, Recreation and Historic Preservation to be eligible for listing on the State Register of Historic Places pursuant to sections 14.07 or 14.09 of the Parks, Recreation and Historic Preservation Law; or

(iv) within a district that has been determined by the Commissioner of the Office of Parks, Recreation and Historic Preservation to be eligible for listing on the State Register of Historic Places pursuant to sections 14.07 or 14.09 of the Parks, Recreation and Historic Preservation Law.

Projects that meet the criteria will require no further SEQR review.

3. SEQR Process Overview

This section provides additional information on how to direct solar projects through the SEQR process. The SEQR regulations and the SEQR Handbook provide detailed guidance on the entire SEQR process and should be referenced for any specific questions regarding applicability, process and legal concerns.

3.1 Defining the SEQR Action

Upon receiving an application for a solar project, the relevant municipal board must determine whether SEQR applies to the project (will there be discretionary decision-making on the part of the municipal board) and, if so, the "type" of SEQR action that will be undertaken. This part of the process is Step 1 in the Quick-Reference Guide.

3.1.1 SEQR Action

The first step in the SEQR process is to determine whether the solar project is subject to SEQR. For SEQR to apply, there must be an action on the part of a State, county or local governmental agency to approve, permit, fund, or directly undertake a project. Relative to the approval of solar projects, it must be determined if the project requires a discretionary action (SEQR Actions) on the part of the local board having jurisdiction. For most commercial ground- mount facilities, the action would be a site plan review by the local planning board. The process could also involve a special use permit or even a zoning change. For rooftop installations and residential projects, which are common non-discretionary actions, a building permit may be the only approval required. Non-discretionary actions are not subject to SEQR, but all discretionary actions are subject to SEQR—except for renewable energy projects greater than 25 MW which are permitted under ORES. There may be a circumstance where the project requires only a building permit and, therefore, no requirement for SEQR review by local government, but requires a permit from the State (for example, a wetland permit). Under these circumstances, the State agency would have to address SEQR, but the local municipal board would not.

3.1.2 Classifying the SEQR Action

As identified in Section 3.2, there are three types of SEQR actions: Type I, Type II and Unlisted. Classifying actions by type focuses largely on the size of the project and to some extent the proximity to sensitive environmental or social-cultural resources. Thresholds are defined for Type I and Type II actions. Actions not falling under one of these categories are referred to as Unlisted.

Thresholds that would classify a solar project as a Type I action include:

- The physical alteration of 10 acres or the expansion of any existing solar facility by 5 acres or more.
- An Unlisted Action that includes a nonagricultural use occurring wholly or partially within an Agricultural District (certified pursuant to Agriculture and Markets Law, article 25-AA, sections 303 and 304) and exceeds 25 percent of any threshold established in this section. (For example, the threshold for physical alteration of 10 acres would be reduced to 2.5 acres in an Agricultural District, so any solar installation within an Agricultural District requiring more than 2.5 acres of land would be elevated to a Type I action.)
- An Unlisted Action (unless the action is designed for the preservation of the facility or site) occurring wholly or partially within, or substantially contiguous to, any historic building, structure, facility, site or district or prehistoric site that is listed on the National Register of Historic Places, or that has been proposed by the New York State Board on Historic Preservation for a recommendation to the State Historic Preservation Officer for nomination for inclusion in the National Register, or that is listed on the State Register of Historic Places. See the definition of "substantially contiguous" in the SEQR Handbook.
- An Unlisted Action, that exceeds 25 percent of any threshold in this section, occurring wholly or partially within or substantially contiguous to any publicly owned or operated parkland, recreation area or designated open space, including any site on the Register of National Natural Landmarks pursuant to 36 CFR part 62, 1994 (see section 617.17 of this Part). See the definition of 'substantially contiguous'.

See a full list of Type I actions at 617.4.

It is anticipated that most commercial ground-mount solar projects will be classified as Unlisted or Type I Actions. Rooftop projects that involve discretionary decision-making (more than a building permit) are likely to be Unlisted Actions, unless an historic structure is involved. However, the following Type II action might apply:

- Construction or expansion of a primary or accessory/appurtenant, nonresidential structure or facility involving less than 4,000 square feet of gross floor area and not involving a change in zoning or a use variance and consistent with local land use controls, but not radio communication or microwave transmission facilities (6 NYCRR 617.5(c)(7)).

Small residential projects may meet the thresholds for the following Type II action:

- Construction, expansion or placement of minor accessory/appurtenant residential structures, including garages, carports, patios, decks, swimming pools, tennis courts, satellite dishes, fences, barns, storage sheds or other buildings not changing land use or density (6 NYCRR 617.5(c)(10)).

The complete list of Type II actions is found at 6 NYCRR 617.5. While not required, it is a recommended practice that the Lead Agency add a note to the project file indicating that the project was considered under SEQR and met all the requirements for a Type II action.

3.2 SEQR Roles and Responsibilities

3.2.1 Lead Agency

This guidance document assumes that the municipal board exercising a discretionary approval for a large-scale solar project will serve as Lead Agency. The Lead Agency has the greatest control over the environmental review process and the greatest responsibility for ensuring SEQR procedures are thoroughly and appropriately followed. More information on Lead Agency responsibilities is available in Chapter 3 of the SEQR Handbook. Decisions based on limited or incomplete information can lead to legal challenges, especially for controversial projects, based on claims of an arbitrary and capricious decision. The potential for a “bad” decision on the part of the Lead Agency can be minimized by following accepted industry standards for investigations, requiring the preparation of the EAF using NYSDEC’s on- line version (that is linked to important environmental data bases that auto-fill portions of the form (see Section 5 for more information on preparing EAFs)), and seeking the review or advice of resource agencies, such as NYSDEC and other State, regional and local agencies, some of which may be involved in the project.

The Lead Agency is also responsible for the following:

- Classifying the project (Type I, Type II, or Unlisted Action).
- Selecting the appropriate EAF for evaluation of the impacts.
- Conducting Coordinated Review with Involved and Interested Agencies, if applicable.
- Preparation of Parts 2 and 3 of the EAF. (The applicant may provide technical assistance to the Lead Agency, but completion of Parts 2 and 3 are the responsibility of the Lead Agency.)
- Issuance of a Determination of Significance (a Positive or Negative Declaration).
- Filing notices.
- If a Positive Declaration is issued, follow requirements in 6 NYCRR 617.9 regarding the preparation of an Environmental Impact Statement.

3.2.2 Involved Agency

An Involved Agency is any agency directly undertaking the project, or one that is responsible for approval, permitting or funding. In the case of solar projects subject to SEQR, the municipal board would likely have the greatest review authority over the project. Other Involved Agencies could include NYSERDA, given its role providing financial incentives, and other State and county agencies that would need to approve, permit or fund the project. If coordinated review is required, the municipal board would likely initiate the coordinated review process with the Involved Agencies to confirm its role as the Lead Agency. It is the responsibility of the Involved Agencies to review Part 1 of the EAF and provide their guidance on potential impacts. See Section 4.3.1 for a list of common Involved Agencies.

If the SEQR process proceeds under Uncoordinated Review, each Involved Agency must conduct their own environmental review (preparation of an EAF) and make a Determination of Significance. No Involved Agency may undertake an action (approval, funding, permitting) without completing SEQR. If any Involved Agency issues a Positive Declaration, a coordinated review will be required.

3.2.3 Interested Agency

An Interested Agency is any agency that may have an interest in a project or its environmental review process outcome, but is not directly undertaking, approving, permitting or funding the project. Interested Agencies do not have a

required role in the coordinated review process and cannot be a Lead Agency. Interested Agencies will often provide information pertinent to the resource with which they are concerned and serve as a valuable resource in the Lead Agency's process of determining the significance of impacts

Interested Agencies may have a permit or related approval to issue for the project, but it is non-discretionary. Examples of this might include a NYS Department of Transportation Highway Work Permit, or county planning board review under Section 239-m of the general municipal code. Another common Interested Agency is the NYS Office of Parks, Recreation and Historic Preservation (also referred to as the State Historic Preservation Office, or SHPO). This office reviews projects for their impacts on cultural resources and issues their determination, which is not binding on the Lead Agency. Although the SEQR process does not apply to federal agencies, they can be Interested Agencies if the project involves federal permits. The U.S. Army Corps of Engineers is a well-known Interested Agency due to its jurisdiction over wetlands and Waters of the United States. See Section 6 for more information on agency coordination and Section 4.3.1 for a list of common Interested Agencies.

3.2.4 The Public

The SEQR regulations do not require public input, but the SEQR process provides an opportunity for public input when a Positive Declaration is issued. Local laws determine the level of public input. SEQR documentation (EAF, Positive or Negative Declaration) must at least be filed with the Lead Agency and be available for public review upon request. The public will have a limited role in the SEQR process for most solar projects. If the SEQR review for a project results in a Negative Declaration, there is no specific step in the SEQR process that provides an opportunity for public review and feedback on the environmental impacts of the project, other than the Determination of Significance being filed with the Lead Agency and made publicly available upon request. However, all projects that require site plan review typically require a public hearing. The public can then review the environmental impacts and other documentation and provide comments. Since a municipal board usually serves as Lead Agency, this process may help to shape the Determination of Significance.

3.2.5 Applicant

The Applicant's role in the SEQR process for a solar project is extensive. It is the Applicant's responsibility to provide complete and accurate information on project impacts. This may require numerous studies and coordination with agencies and other experts. The Applicant must prepare Part 1 of the EAF and provide it to the Lead Agency for its review. In cases where the Lead Agency does not possess the necessary expertise to complete Parts 2 and 3 of the EAF, it may request technical assistance from the Applicant, or contract with a third-party consultant to assist in this review. However, the Lead Agency is ultimately responsible for its own analysis and all decisions made.

The Applicant should also remain flexible and creative in the site design process to avoid significant environmental impacts. This may require upfront work such as a wetland delineation, habitat assessment, and cultural resources survey. A pre-application meeting with municipal officials is recommended to identify any concerns of the municipality early-on in the process. Applicants can then remove from their plans any problems that would lead to one or more significant environmental impacts and a Positive Declaration, which would require the completion of the EIS.

3.3 Establishing Lead Agency

For all Type I actions involving more than one Involved Agency and Unlisted Actions where coordination with the Involved Agencies is desired, Lead Agency must be established through the Coordinated Review process (Step 3 of the SEQR process). When there is only one Involved Agency or when the Uncoordinated Review option is chosen for Unlisted Actions, there is no coordination process. This section discusses these processes in more detail.

3.3.1 Identify Involved and Interested Agencies

Regardless of whether Coordinated or Uncoordinated Review is required or chosen, it is good practice to identify all the Involved Agencies along with their roles in the permitting, funding, or approval process for the project. Preparation of Part 1 of the EAF and the associated research is helpful in identifying what additional permits and approvals might be needed. It is the Applicant's responsibility to assist the municipal board in identifying the involved and Interested Agencies. A typical list of involved and Interested Agencies includes the following:

- NYSDEC – permits for wetlands, waterbodies, and threatened and endangered species.
- NYS Department of Transportation – work on State roads and right of way.
- NYS Department of Agriculture and Markets – impacts to farmland within an Agricultural District.
- NYS Department of State – work within the Coastal Zone.
- NYS Office of Parks, Recreation and Historic Preservation (State Historic Preservation Office): consultation for historic and archeological resources.
- U.S. Army Corps of Engineers: permits for wetlands and waters of the U.S. (Note: federal agencies are not subject to SEQR but may serve as an Interested Agency)
- U.S. Fish and Wildlife Service: consultation for threatened and endangered species.
- County Planning & Farmland Protection Board: Section 239-m referral and Agricultural District impacts.
- New York City Department of Environmental Protection: work within the NYC Watershed.
- NYSERDA: funding via NY-Sun financial incentives.

3.3.2 Prepare the Environmental Assessment Form (EAF)

Step 2 of the SEQR process is likely to be combined with Step 1 in the form of a site plan application. Preparation of Part 1 of the EAF is typically required as part of the site plan review application requirements. If the municipal board has not already, it would be very helpful for future applications to provide guidance on the contents for a site plan application and any special considerations for SEQR. For example, some communities require the preparation of a Full EAF regardless of the classification of the project (Type I or Unlisted).

The Applicant will prepare Part 1 of the EAF. Unless directed otherwise, the Applicant will use the Short EAF for Unlisted Actions and a Full EAF for Type I Actions. Information on how to prepare the EAF is provided in Section 5.

Communication between the Applicant and the municipal board should begin early on so the Applicant is clear on what is required for the application. The municipal board should provide an initial determination on the type of SEQR action (Type I, Type II or Unlisted) so the applicant can submit the correct EAF.

3.3.3 Coordinated Review

Step 3 of the SEQR process is to designate the Lead Agency. If the municipal board is the only Involved Agency, there is no required coordination. Unlisted Actions with multiple agencies can be progressed under Uncoordinated Review, whereby each agency is responsible for completing SEQR on their own (described further in Section 4.4.3), or can proceed under Coordinated Review. A project will likely proceed in a more efficient manner by using Coordinated Review for projects with multiple Involved Agencies. For Type I Actions, Coordinated Review is required.

The municipal board reviewing the project would initiate Coordinated Review by submitting Part 1 of the EAF along with a project location map, project plans, and a letter indicating the municipal board's intent to serve as Lead Agency to all Involved Agencies, requesting concurrence. It is common practice to include the Interested Agencies in this submittal. The Interested Agencies may provide comments but they cannot participate in the establishment of Lead Agency. The process can take up to 30 days to complete. By regulation, a Lead Agency must be agreed upon within 30 days of the Involved Agencies receiving the request. The process can be expedited if desired and agreed to by the Involved Agencies. Some suggestions include:

- Include a statement at the end of the Lead Agency request letter that states the undersigned Involved Agency has no objection to the municipal board serving as Lead Agency and provide a signature line.
- Contact the Involved Agencies and obtain a response by email.

If an Involved Agency does not respond to the request within 30 days, it can be assumed that the Agency has no objections. To keep a clear record of the SEQR process and the decisions being made, it is important for the municipal board to memorialize the Lead Agency designation by resolution.

Challenges to Lead Agency are rare. If a challenge occurs, many times the Involved Agencies can resolve the dispute by direct communication. If after 30 days there is no agreement on Lead Agency, then the disputing parties can request that the NYSDEC Commissioner designate Lead Agency in accordance with 6 NYCRR 617.6(b)(5).

3.3.4 Uncoordinated Review

For an Unlisted Action, the municipal board may proceed with the SEQR process on its own via Uncoordinated Review. Each Involved Agency must complete their own SEQR process. The benefit of this approach includes less effort on the part of the municipal board and the potential to bypass the 30-day period to establish Lead Agency. This approach may be desirable when timing is a critical factor for local approvals and funding deadlines. Conversely, this approach could lead to a longer approval process for the project due to the need for each agency to complete SEQR on their own. For projects with several Involved Agencies, this approach is not recommended. Review Chapter 6 in the SEQR Handbook for additional information on SEQR timeframes.

3.4 Determine Significance

The Lead Agency is responsible for evaluating the impacts of a project and must complete its own analysis by preparing Parts 2 and 3 of the EAF. The Lead Agency may request technical assistance from the Applicant or contract with a third-party consultant, but the Lead Agency is ultimately responsible for its own analysis and decisions. If the Applicant has the expertise, either directly or through a consultant, they may want to consider preparing Parts 2 and 3 immediately following the preparation of Part 1 to provide technical assistance to the Lead Agency concerning the size of impacts.

It is not necessary to wait until Lead Agency has been established. The municipal board will have the responsibility of reviewing the Applicant's documentation and ensuring that a thorough evaluation has been performed. Based on the results of Parts 2 and 3, the municipal board must determine if any of the impacts are significant, which will lead to the issuance of either a Positive Declaration (EIS required) or a Negative Declaration (SEQR process ends).

3.4.1 Prepare Parts 2 and 3 of the EAF

Step 4 of the SEQR process involves the evaluation of the impacts of the project on the environment through the preparation of Parts 2 and 3 of the EAF. Details on how to prepare these forms are provided in Section 5. Impact evaluation can be highly subjective and biased. It is the municipality's duty to protect the health, safety and welfare of the community, and as such it should carefully review the results of this process. NYSDEC's EAF Workbook provides useful information to determine if an impact is small or moderate to large. Part 2 of the EAF provides subcategories of questions and thresholds that are indicative of moderate to large impacts. Additionally, links to the EAF Workbook are provided to help answer specific questions. The municipal board should not ignore common sense and general concerns that are important to the community. Checking moderate to large indicates that there is the potential for a significant impact that needs to be resolved through additional study and discussion in Part 3.

Part 3 of the EAF is the opportunity to strengthen the record by discussing the impact in greater detail, providing additional studies and perhaps making design changes/incorporating best management practices to minimize or eliminate the impact (Step 5 of the SEQR process). Common documentation provided in Part 3 includes the following:

- Wetland Delineation Report
- Threatened and Endangered Species Habitat Assessment
- Cultural Resources Survey
- Visual Impact Assessment
- Farmland Protection Strategy

Depending on the municipal board's experience reviewing technical reports, coordination with Involved and Interested Agencies may be critical to reaching a conclusion on the magnitude of the impact. Many municipalities require the Applicant to provide documentation from various agencies providing their opinion on impacts or the presence/absence of important resources. This might include:

- Jurisdictional determination from the U.S. Army Corps of Engineers to address the presence/absence of wetlands and other Waters of the United States
- Correspondence from NYSDEC concurring with the results of a habitat assessment.
- Opinion from SHPO on historic and archeological impacts.

Such information and guidance from the Involved and Interested Agencies provides closure on certain issues or may raise new concerns that in either case will inform the Lead Agency's decision.

3.4.2 Review Significance Criteria

Step 6 of the SEQR process involves a review of the SEQR significance criteria to evaluate whether the project warrants additional review through the preparation of an EIS. The SEQR regulations require that the Lead Agency issue a Positive Declaration if it is determined the project may have one or more significant adverse environmental impacts. The SEQR Handbook provides guidance to determine significance. Creating a legally defendable determination of significance requires consideration of the following factors described in the SEQR Handbook:

- the entire action (see Segmentation in Chapter 2 of the SEQR Handbook);
- the environmental assessment form (EAF);
- any other information provided by the Applicant, including the underlying application;
- the criteria for determining significance found in 617.7(c); and
- any input from Involved and Interested Agencies, organizations or the public.

The criteria identified in 617.7(c) should be used by the municipal board to determine whether the project must proceed to an EIS. An indication of the need for an EIS is the need for mitigation. Mitigation is an additional level of protection that typically must be developed through the continued local approval process. Mitigation assumes that an impact is significant and must be reduced through special measures. A Negative Declaration cannot incorporate mitigation because issuance of a Negative Declaration means a project has no significant impacts. As a result, there are no conditions placed on the project to address environmental concerns. These issues should have all been addressed through design and best management practices. However, the SEQR regulations (617.7(d)) do allow the Lead Agency to issue a Conditioned Negative Declaration, which stipulates that no significant adverse environmental impact will occur if the Applicant fulfills certain conditions placed on the solar project. Mitigation should not be confused with the actions taken by a project sponsor to modify project plans as part of the review process, thereby avoiding or eliminating a potential adverse impact.

3.4.3 Notification Requirements

Steps 7 and 8 of the SEQR process involve the filing of the Determination of Significance. The SEQR Handbook provides requirements for a Negative Declaration. The signature portion of EAF Part 3 serves as the Negative or Positive Declaration. The municipal board should adopt its Negative or Positive Declaration by resolution, at which time the documents must be filed as follows (more information on notices and filings is in the SEQR Handbook):

- Negative Declaration for an Unlisted Action - Filed with the Lead Agency
- Conditioned Negative Declaration for an Unlisted Action – Lead Agency must publish a notice in the Environmental Notice Bulletin and provide at least a 30-day public review period starting from the publication date.
- Negative Declaration for a Type I Action or a Positive Declaration - the Lead Agency must retain a copy in its own files and provide notice to, and file a copy of the declaration with:
    - > The chief executive officer of the political subdivision in which the action will be principally located;
    - > The Applicant, when there is one;
    - > All Involved Agencies;
    - > Individuals or groups who have requested a copy; and
    - > The Lead Agency must also file the notice of the declaration for publication in the Environmental Notice Bulletin (ENB).

4. Preparing the Environmental Assessment Form (EAF)

Once the municipal board has determined if an action is Type I or Unlisted under SEQRA, the appropriate form must be completed. These forms are located on the NYSDEC website. From this page, the user can navigate to both the EAF Mapper Application and the EAF Workbook.

The EAF Mapper application generates partially completed EAF forms by utilizing GIS to complete certain geographic questions. The use of the EAF Workbook, although not required, is an excellent guide to completing all three parts of either the Short or Full EAF.

Part 1 of the FEAF provides details that help the municipal board understand the location, size, type, and characteristics of the proposed project. Part 1 can be completed by the Applicant using information prepared as part of a submission for approval along with maps, plats, or other studies. The Workbook provides background information, links to data and maps that will help the Applicant locate information needed to answer the questions.

Part 2 of the FEAF is used by the municipal board to identify potential impacts that may result from the project. The municipal board may ask the Applicant for clarification of information provided in Part 1, or for additional information.

Part 3 is used by the municipal board to determine if the potential adverse impacts identified in Part 2 are significant or not, and whether a draft environmental impact statement (DEIS) will be prepared. If the municipal board determines that a DEIS shall be required, Part 3 is also used to identify the scope (topics to be considered in more detail) for that evaluation. Part 3 is also used to help the municipal board identify whether the Applicant has addressed the potential adverse impacts as part of the project design. The municipal board is responsible to ensure it has the appropriate information to evaluate and determine the significance of the action.

The guidance related to Parts 2 and 3 of the FEAF is not found in regulation, but it provides invaluable information as to whether an impact is considered large or significant (and the difference between the two). It also provides certain thresholds and examples of how to identify if an impact is small, moderate or large. Using the criteria outlined in the guidance assists the municipal board in making its determination of significance utilizing a methodical, defensible approach.

4.1 Using the Online Tools

Links to all SEQRA forms, including the FEAF and SEAF, can be found on the NYSDEC website. These forms are supported by the following browsers: Firefox, Internet Explorer 9 & above, Google Chrome and Safari. In addition, computers must have Acrobat Reader to fill out and save the forms. If necessary, forms can be printed out and completed manually.

4.1.1 How to use EAF Mapper and Create the Project Review Area

The recommended sequence to complete Part 1 of either a FEAF or SEAF is as follows:

A. Go to the NYSDEC webpage.

B. Scroll to NYSDEC EAF Mapper to utilize the EAF Mapper Application. Although not required, it is recommended that you enter the forms through the Mapper Application. This saves time by prefilling several Part 1 questions on both the SEAF and the FEAF.

   a. Navigate to the specific project location utilizing any of the following:

      - Use the drop-down menus to enter the county and town where the project is located and zoom in to the particular site;
      - Use the 'Locate Address' tab to enter a specific address;
      - Use the 'Go To' Place tab to enter a place name.

   b. Define the specific project site boundary. Zoom in to the general area where the project is located. You may locate your project in two ways:

      - If tax parcel information is available for the project location, it will appear when you zoom in far enough on the map. Click on the "Select Tax Parcel" button and click on the desired tax parcel on the map to select it.

- If tax parcels are not available, or if the project location is larger than a single parcel, use the “Draw Polygon” button to draw a boundary around the project site. In both cases (tax parcel or polygon), the project site will be shaded to show the extent and boundaries selected.

c. After locating the project site and its boundaries, a report can be generated by clicking the FEAF or SEAF button in the bottom-right corner of the EAF Mapper.

Clicking the button for the Short EAF or Full EAF prompts EAF Mapper to return a fill-in, savable PDF with many location- based questions in Part 1 already populated.

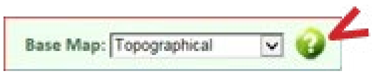
d. Always save the prefilled form to your network before completing the remaining questions in Part 1.[2]

C. Continue responding to Part 1 questions using the EAF Workbook as a guide.

4.1.2 How to use the NYSDEC Environmental Resource Mapper

Additional responses to questions in the EAF can be found using the NYSDEC Environmental Resource Mapper (NYSDEC Environmental Mapper). This tool identifies freshwater wetlands, federal wetlands, water features, State-listed endangered or threatened plants and animals, and significant natural communities on or near a project site.

For help using this tool, click on the question mark icon found on the upper right-hand corner of the page for step-by-step instructions.



A. Navigate to the project site or area by address, municipality, county or zip code.

B. Using the layers and legend tab on the left choose the resources to be mapped. Note: clicking “All Layers” will provide the most complete data for a site or area.

C. The map of the site or area will be generated.

D. The layers and legend tab also includes links to other wetland layers, information on permits and contacts for more information, if needed.

4.1.3 Other Useful Resources

The EAF Workbook contains many links and sources of additional information that can be helpful to complete each part of the EAF. Each question in the EAF includes a hyperlink to the EAF Workbook that provides more detail on the information that is requested in a specific question. This information is presented in narrative descriptions, examples and additional links.

Useful links found on the NYSDEC SEQR homepage include:

- 6 NYCRR Part 617, State Environmental Quality Review (SEQR): The section of New York Codes, Rules and Regulations on SEQR.
- Stepping Through the SEQR Process: A step-by-step guide to the SEQR process
- SEQR Publications: Publications pertaining to SEQR
- “EIS on the Web” Requirement: A resource to access Environmental Impact Statements.
- Critical Environmental Areas: Provides a list of such areas in each county.
- DEC Commissioner Decisions on Lead Agency Disputes: Overview with the Commissioner’s decisions on Lead Agency disputes.
- State Environmental Quality Review Act - Adopted Amendments 2018: The NYSDEC website for adopted amendments to streamline the SEQR process.

[2] The pre-filled answers cannot be changed. Applicants should add supplemental information if they believe a “yes” response to an EAF mapper result is incorrect. If the EAF mapper provides a “no” answer, both Applicants and municipalities can be confident that the environmental feature in question is not present or adjacent to the site.

4.2 Part 1 of the EAF

Part 1 of the FEAF provides details that help the municipal board understand the location, size, type and characteristics of the proposed project. Part 1 can be completed by the Applicant using information prepared as part of a submission for approval along with maps, plats, or other studies.

Questions in Part 1 of the FEAF are organized into the following major headings:

A. Project and Sponsor Information

B. Government Approvals

C. Planning and Zoning

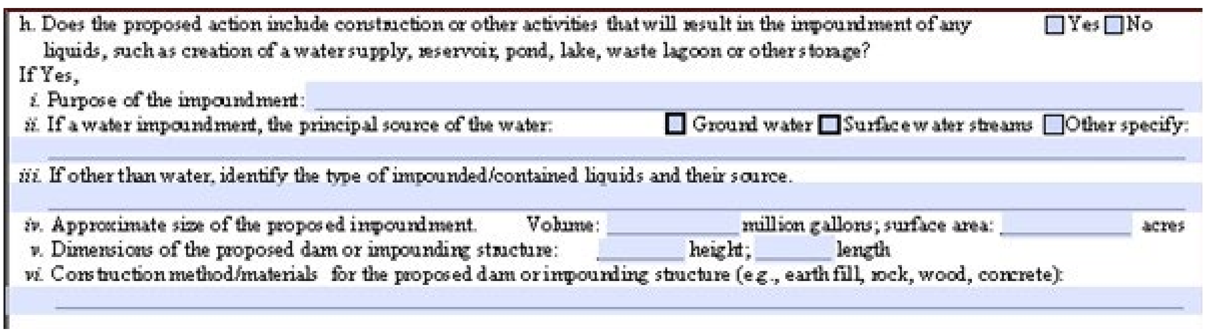
D. Project Details

E. Site and Setting of Proposed Action

F. Additional Information

G. Verification

Each question includes a hyperlink to the EAF Workbook, which provides more detail on the information that is requested by a specific question. For example, a question in Section D, "Project Details" (Question D.1.h) is pasted below. The Workbook provides further explanation of the term "impoundment," how to identify the source of an impoundment, and pertinent links to potential permits.



h. Does the proposed action include construction or other activities that will result in the impoundment of any liquids, such as creation of a water supply, reservoir, pond, lake, waste lagoon or other storage? ☐ Yes ☐ No

If Yes,

i. Purpose of the impoundment: _____

ii. If a water impoundment, the principal source of the water: ☐ Ground water ☐ Surface water streams ☐ Other specify: _____

iii. If other than water, identify the type of impounded/contained liquids and their source. _____

iv. Approximate size of the proposed impoundment. Volume: _____ million gallons; surface area: _____ acres

v. Dimensions of the proposed dam or impounding structure: _____ height; _____ length

vi. Construction method/materials for the proposed dam or impounding structure (e.g., earth fill, rock, wood, concrete): _____

Another example is taken from Section E, "Site and Setting of Proposed Action Designated Public Resources on or Near Project Site" (Question E.3). This section of Part 1 was generated though the EAF Mapper link using a random location in Saratoga County, New York, and a series of auto-filled responses. The affirmative response to E.3.f alerts the Applicant as well as the municipal board that additional information is needed to identify the nature and extent of potential archeological resources. Guidance in the EAF workbook provides a link to the NYS Cultural Resources Information System (CRIS), an on-line tool maintained by the New York State Historic Preservation Office (SHPO).

E.3. Designated Public Resources On or Near Project Site

a. Is the project site, or any portion of it, located in a designated agricultural district certified pursuant to Agriculture and Markets Law, Article 25-AA, Section 303 and 304? ☐ Yes ☑ No
If Yes, provide county plus district name/number: ____

b. Are agricultural lands consisting of highly productive soils present? ☐ Yes ☐ No
i. If Yes: acreage(s) on project site? ____
ii. Source(s) of soil rating(s): ____

c. Does the project site contain all or part of, or is it substantially contiguous to, a registered National Natural Landmark? ☐ Yes ☑ No
If Yes:
i. Nature of the natural landmark: ☐ Biological Community ☐ Geological Feature
ii. Provide brief description of landmark, including values behind designation and approximate size/extent: ____

d. Is the project site located in or does it adjoin a state listed Critical Environmental Area? ☐ Yes ☑ No
If Yes:
i. CEA name: ____
ii. Basis for designation: ____
iii. Designating agency and date: ____

e. Does the project site contain, or is it substantially contiguous to, a building, archaeological site, or district which is listed on, or has been nominated by the NYS Board of Historic Preservation for inclusion on, the State or National Register of Historic Places? ☐ Yes ☐ No
If Yes:
i. Nature of historic/archaeological resource: ☐ Archaeological Site ☐ Historic Building or District
ii. Name: ____
iii. Brief description of attributes on which listing is based: ____

f. Is the project site, or any portion of it, located in or adjacent to an area designated as sensitive for archaeological sites on the NY State Historic Preservation Office (SHPO) archaeological site inventory? ☑ Yes ☐ No

g. Have additional archaeological or historic site(s) or resources been identified on the project site? ☐ Yes ☐ No
If Yes:
i. Describe possible resource(s): ____
ii. Basis for identification: ____

h. Is the project site within fives miles of any officially designated and publicly accessible federal, state, or local scenic or aesthetic resource? ☐ Yes ☐ No
If Yes:
i. Identify resource: ____
ii. Nature of, or basis for, designation (e.g., established highway overlook, state or local park, state historic trail or scenic byway, etc.): ____
iii. Distance between project and resource: ____ miles.

i. Is the project site located within a designated river corridor under the Wild, Scenic and Recreational Rivers Program 6 NYCRR 666? ☐ Yes ☑ No
If Yes:
i. Identify the name of the river and its designation: ____
ii. Is the activity consistent with development restrictions contained in 6NYCRR Part 666? ☐ Yes ☐ No

The Applicant should work through each question using the EAF Workbook to complete Part 1 of the FEAF. The Applicant should submit this form along with a site map and any other information or studies (Section F. Additional Information) that will help the municipal board understand and evaluate the project.

4.3 Parts 2 and 3 of the EAF

Part 2, "Identification of Potential Impact," and Part 3, "Evaluation of Impacts and Determination of Significance," are the responsibility of the Lead Agency. Part 2 helps the Municipal board inventory the potential resources that could be affected by the proposed action. The DEC website offers guidance to complete Part 2, as well as the Part 2 form. Again, this section refers to Part 2 of the FEAF. Following general instructions, there are a series of topical questions followed by sub-questions. Links on the first page of Part 2 provide helpful information to evaluate scale, context and impact.

When trying to identify an impact and its relative size, it is often easier to evaluate the sub-questions first. Each major question includes a hyperlink to the appropriate section of the EAF Workbook, and back to relevant questions in Part 1, as well as examples and thresholds that can be used in the evaluation. The municipal board will use this information to determine if there will be no impact or a small impact, or a moderate-to-large impact.

If "No or small impact may occur" was checked for all 18 questions in Part 2, the municipal board only needs to check the appropriate box on Part 3 and sign it. The DEC website offers guidance to complete Part 3, as well as the Part 3 form. If any question was checked "Moderate to large impact may occur," the Lead Agency must include a discussion for each question identified as such to determine how significant the moderate to large impact may or may not be.

According to the EAF Workbook, this discussion should evaluate the importance of the impact, take into account any design element or project changes and provide the reason(s) why the impact may, or will not, result in a significant adverse environmental impact. Based on the evaluation, the municipal board must check the appropriate box indicating a positive or negative declaration and sign the form.

Check the appropriate box to indicate a Negative Declaration, Conditioned Negative Declaration, or Positive Declaration.

5. Agency Coordination

This section explores some of the more common environmental issues that may arise during the SEQR process for solar projects and the agencies associated with them. As discussed in Section 4.3.3, agency coordination is a key component of the SEQR process. Coordination helps the municipal board identify important environmental and social-cultural resources that may be affected by the project. These agencies can provide closure on certain environmental issues and will help support the record of decision, resulting in a more legally defensible outcome.

Many of the resources discussed in this section are applicable to ground-mount installations only. However, cultural resources can be impacted by all types of solar installations (e.g. rooftop installations on historic structures).

5.1 Wetlands and Waterbodies

In New York State, wetlands are primarily regulated by three agencies: U.S. Army Corps of Engineers (USACE), NYSDEC, and the Adirondack Park Agency (APA). This section will focus on USACE and NYSDEC, which also regulate streams and other waterbodies..
A separate section is devoted to APA involvement.

Wetlands are one of the most commonly encountered regulated environmental resources in New York State. Wetland regulations significantly limit what can be done within wetland boundaries or buffers. Wetlands should be avoided to the greatest extent practicable. Streams are regulated by USACE as Waters of the United States. The State regulates streams in accordance with Article 15 of the Environmental Conservation Law, administered by NYSDEC. Other waterbodies like lakes and reservoirs may also be regulated by USACE and/or NYSDEC

For the purposes of complying with SEQR, the potential presence of wetlands and waterbodies can initially be identified through mapping. NYSDEC's Environmental Resources Mapper identifies wetlands regulated under the State Freshwater Wetlands program and all mapped streams and their water quality classification. If a State-regulated wetland or waterbody occurs on a project site, it is likely that NYSDEC will be an Involved Agency.

The Environmental Resources Mapper also provides mapping from the U.S. Fish and Wildlife Service National Wetland Inventory. This tool helps identify the potential presence of wetlands on a given site. All Waters of the U.S. are regulated by USACE. The definition of waters of the U.S. includes many wetlands and streams. However, the determination of federal jurisdiction has become much more complicated over the years. It is important to note that there is no recognized regulatory federal wetland or stream mapping in the U.S. For a site to be properly identified, consult the 1987 Corps of Engineers Wetland Delineation Manual and Regional Supplement to the Corps of Engineers Wetland Manual: Northcentral and Northeast Region, Version 2.0 (January 2012). The municipal board should expect the Applicant to provide a wetland delineation map for the site with surveyed boundaries. It is the Lead Agency's responsibility to understand the magnitude of impact as part of its determination of significance. If federal wetlands or other Waters of the U.S. are present, it is good practice to include USACE as an Interested Agency.

5.2 Threatened and Endangered Species

Certain species of plants and animals are protected as threatened and endangered species under State and/or federal regulations. Federally listed species are protected under the federal Endangered Species Act of 1973 (ESA; 16 U.S.C. § 1531 et seq.). The agencies responsible for implementing the ESA are the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. Solar projects in New York are likely to require coordination with only the U.S. Fish and Wildlife Service. An initial screening for threatened and endangered species is available through its Information for Planning and Consultation. The Applicant can use this website to input specific information on site location and receive a listing of species that may occur in the area. The website is not intended to identify whether a species is present. If species are identified, it becomes necessary to perform a habitat assessment to first determine if the site is suitable for the species and, if so, further investigation may be necessary to determine presence/absence.

State-listed species are regulated by NYSDEC under 6 NYCRR Part 182. The potential presence of threatened and endangered species is addressed in Part 1 of the EAF. Preparing the EAF using the interactive form will result in a link to the protected species database and will automatically populate the question on the EAF. In addition, an initial screening for protected species can be conducted by viewing the Environmental Resources Mapper. If the mapper indicates the potential presence for protected species, the next step is to contact the NYS Natural Heritage Program for additional information.

5.3 Cultural Resources

For the purposes of SEQR, the term "cultural resources" refers to historic and archeological resources. This includes specific sites that are listed on the State and National Register of Historic Places. These resources are protected under Section 106 of the National Historic Preservation Act of 1966 (36 CFR Part 800) and the NYS Historic Preservation Act of 1980 (Article 14 of the Parks, Recreation and Historic Preservation Law), implemented through the 14.09 State Regulations. Section 106 requires federal agencies to consult with the State Historic Preservation Office (SHPO) for all federal actions. For solar installations, this would most commonly occur when a wetland or stream impact permit is required from USACE. The 14.09 regulations require the same for State agency actions. Local governments are not directly subject to these consultation requirements at either the federal or State level. Indirectly, projects requiring State or federal approvals cannot move forward without consultation and the SEQR process itself requires a sufficient evaluation of the impact on cultural resources. As a result, coordination with SHPO during the SEQR process is highly encouraged and commonly practiced. Additionally, Unlisted Actions that occur within historic sites are elevated to Type I Actions.

Initial review of potential impacts on cultural resources can be completed by accessing SHPO's Cultural Resource Information System (CRIS), where a mapping program will zoom in to the subject site, and existing Register and Register Eligible sites are identified, along with a site sensitivity map for archeological resources.

5.4 Agricultural Resources

Ground-mount solar installations are commonly sited on agricultural land. In New York State, agricultural land in certain areas of the State are protected under the Agriculture and Markets Law, specifically Article 25AA of the Agricultural Districts Law. Part 1 of the EAF requires a calculation of the impact to productive agricultural soils regardless of whether the project is located in a State-certified Agricultural District. Applicants may wish to consult the Department of Agriculture and Markets document *Guidelines for Agricultural Mitigation for Solar Energy Projects*.

The NYSERDA factsheet *Understanding Solar Installations in Agricultural Districts* provides guidance on frequently asked questions. The NYS Department of Agriculture and Markets may be an Interested Agency in the SEQR process and may become an Involved Agency depending on the nature of the impact. If a project is located in an Agricultural District, the following regulations/review processes may apply:

- Penalty for conversion of land to non-agricultural uses (excludes on-farm equipment where the solar installation does not exceed 110% of the farm's energy use).
- Notice of Intent – This would apply to solar installations that are primarily intended for off-farm use and are specific to governmental actions.
- Farmland Protection Plans – Local farmland protection plans may provide specific recommendations for conserving agricultural lands.

5.5 Coastal Zone

Certain activities within the State's Coastal Zone are regulated under the NYS Coastal Management Program (CZM), administered by the NYS Department of State (NYSDOS). Part 1 of the EAF will determine whether a project is located within the State Coastal Zone and if a Local Waterfront Revitalization Plan exists. State agencies are required to provide certification that their actions do not significantly impact State coastal policies as provided in 19 NYCRR Part 600. Federal agencies are required to comply with State policies and must coordinate with NYSDOS for federal coastal consistency review in accordance with U.S. Department of Commerce regulations (15 CFR 930.57). Relative to solar projects within the coastal zone, NYSDOS is an Interested Agency if their only involvement is consistency review. Those municipalities with approval Local Waterfront Revitalization Plans (LWRP) are directly responsible for reviewing the consistency of the project with State policies.

5.6 New York City Watershed

Certain solar projects within New York City are subject to the City Environmental Quality Review Act (CEQR). This guidance document does not provide details on this process, but additional information can be found at CEQR. Most solar installations in New York City are rooftop installations that typically require only building permits.

Actions within the NYC Watershed are regulated by the NYC Department of Environmental Protection (DEP) and may be subject to NYC DEP permitting. The SEQR process still applies within the NYC watershed, outside the City limits. However, within the watershed, DEP would become an Involved Agency. The DEP funds and implements a Long-Term Watershed Protection Program to preserve the quality of New York City's water supply. A map of the NYC Watershed is provided at Watershed Map.

5.7 Adirondack Park

The Adirondack Park Agency (APA) administers the Adirondack Park Agency Act (Executive Law, Article 27), the Freshwater Wetlands Act (Environmental Conservation Law, article 24) within the Adirondack Park and, for private lands within the Adirondack Park, the Wild Scenic and Recreational Rivers System Act (Environmental Conservation Law, article 15, title 27) (APA Act). In general, municipalities approving solar projects within the Park may not be subject to SEQR but would be subject to the APA regulations that guide land use. See guidance provided in the SEQR Handbook (Type II Actions).

6. Solar Developer Guidance

6.1 Design Considerations

Like any development project, the design and location of a solar project has a direct effect on the size and significance of potential impacts. The Lead Agency is responsible to determine the significance of any impacts in the SEQR process. A pre-application meeting with municipal officials is recommended to identify any concerns of the municipal board early-on in the process. This may also allow the municipal board an opportunity to declare its intent to serve as Lead Agency, and to determine the need for a Short EAF or Full EAF in the case of an Unlisted Action.

Important design considerations for siting a solar array include:

- Proximity to electrical interconnection points
- Slope (avoidance of steep slopes)
- Aspect (the direction the panels face)
- Land area (sufficient area is required for large arrays)
- Lack of other environmental constraints (e.g., avoid siting in wetlands, critical environmental areas, etc.

Simply avoiding the Type I thresholds (See section 3.2) does not guarantee a project will not have significant impacts. During project siting and design, the following questions should be addressed to identify other impacts that must be considered:

- What are the limits of disturbance?
- Is the project located in or near a federal or State wetland?
- Are there threatened and/or endangered species in or near the project site?
- Are there cultural resources on or adjacent to the site such as historic districts and structures and archeologically sensitive areas?
- Is the project located in a coastal zone?
- Is it adjacent or within public parkland or public open space?
- Is the project in a Critical Environmental Area?
- Is the site in an agricultural district certified by NYS Agriculture and Markets?

If the site contains one or more of these resources, an Applicant may want to consider design modifications to avoid any impacts.

A developer should also determine the following as they may result in additional Involved Agencies under SEQR.

- Is the project located in New York City?
- Is the project located in the New York City watershed?
- Is the project located in the Adirondack Park?

If a project is located within New York City, it is subject to the CEQR (City Environmental Quality Review). CEQR is New York City's process for implementing SEQR, and by law can be no less stringent than its State counterpart. CEQR is governed by SEQRA, NYC's Executive Order No. 91 (43 RCNY, Chapter 6), and the CEQR Rules of Procedure. Some of the primary practical differences between CEQR and SEQRA are that CEQR provides guidance on selection of a Lead Agency, adds scoping requirements, and promotes the use of the City's CEQR Technical Manual in conducting environmental reviews (62 RCNY, Chapter 5).

Projects located in the New York City watershed may require a permit from the Department of Environmental Protection. The most likely trigger for a permit related to solar projects on this list is "a land clearing or land grading project, involving two or more acres, located at least in part within the limiting distance of 100 feet of a watercourse or wetland, or within the limiting distance of 300 feet of a reservoir, reservoir stem or controlled lake or on a slope exceeding 15 percent." The complete list of activities governed by these regulations can be found at NYC Watershed Regulations.

A solar project located on private land in the Adirondack Park may require a permit if it is a new land use or development within a critical environmental area or designated river area, or if the project will involve wetlands or will be greater than 40 feet in height. If energy derived from a solar power project will be sold for use off the project site, a permit for a major public utility use or commercial use may also be required.

6.2 Useful Resources

There are several resources available to developers and municipalities to assist them in collecting data to conduct an environmental review of a site and complete the SEQR process. The Quick Reference Guide (Section 2) and Preparing the EAF (Section 5) of this guidance document includes a series of links to the SEQR forms and regulations and numerous online tools.

Some of the key links are described below:

- EAF Workbook: The DEC has prepared the Workbooks to assist Applicants, project sponsors and reviewing agencies with the completion of the EAF. The Workbook contains background information, links to data and maps, and answers to questions a reviewing agency may have. They should be considered source books to assist and guide Applicants and reviewers involved in a SEQR review.
- DEC SEQR Webpage: A general page providing information about the SEQR regulations, SEQR enforcement, SEQR forms and workbooks.

- SEQR Handbook: The SEQR Handbook is the standard reference book for state, county and local government officials; environmental consultants; attorneys; permit Applicants; and the public at large.
- NYSDEC EAF Mapper: The NYSDEC's mapper tool auto-populates a series of answers in both the SEAF and FEAF, based on the project location.
- NYSDEC Environmental Resource Mapper: An additional mapping resource based on NYSDEC databases. This map provides information on natural features such as wetlands, natural communities, rare plants and animals, and other water resources.
- CRIS: The Cultural Resource Information System website allows users to screen a site for the location of historic structures or districts and archeological sensitivity using the SEARCH tab. CRIS should be used to submit project information for review for projects in archaeologically sensitive areas. Consult the New York State Historic Preservation Office for more information.

6.3 Process Guidance

Although not required, it is recommended that the Applicant schedule a pre-application meeting with the relevant municipal board to identify early on the known concerns related to the site and other guidance the municipal board may offer, such as which EAF form to complete. Upon receiving a solar project application, a municipal board will follow the steps in the SEQR Flow Chart for Solar Projects (Appendix A). This flowchart is a useful guide for Applicants to understand regulatory timeframes under SEQR and the responsibilities of both the municipal board and the Applicant.

7. Frequently Asked Questions (FAQs)

We provide the most frequently asked questions about the SEQR process. Additional guidance and other SEQR topics are found in NYSDEC's SEQR Handbook.

7.1 How does the SEQR process get started?

SEQR is triggered when an Applicant or developer submits a project application or plan to a municipal board. That agency is responsible for determining if a project is a Type I, Type II or Unlisted Action and following the appropriate procedures to complete the SEQR process.

7.2 Who enforces SEQR?

SEQR is self-enforcing; each government agency is responsible to comply with SEQR regulations. The Department of Environmental Conservation is charged with issuing regulations regarding the SEQR process, but DEC has no authority to review the implementation of SEQR by other agencies.

If an agency makes an improper decision or fails to undertake a proper review, citizens or groups who can demonstrate harm from such a failure may take legal action against the agency under Article 78 of the New York State Civil Practice Law and Rules. Project approvals may be rescinded by a court and a new SEQR review process may be required. New York State's court system has consistently ruled in favor of strong compliance with SEQR provisions (SEQR, Enforcement).

7.3 What are Type I, Type II and Unlisted Actions?

A Type I action is an action or class of actions that is more likely to have a significant adverse environmental impact than other actions or classes of actions. Type I actions are listed in the statewide SEQR regulations (617.4) or listed in any Involved Agency's SEQR procedures. The Type I list in 617.4 contains numeric thresholds; therefore, any actions that will equal or exceed one or more of the thresholds in this list would be classified as Type I. A Type I Action always requires the completion of a Full EAF.

Type II actions represent actions or classes of actions which have been found categorically to not have significant adverse impacts on the environment, or actions that have been statutorily exempted from SEQR review. Type II actions require no further action or documentation under SEQR. Type II actions are listed under Part 617.5 and require no further processing under SEQR.

Unlisted Actions are actions that are neither Type I or Type II. They generally do not require the completion of a FEAF nor coordinated review. However, to avoid having each Involved Agency prepare its own SEQR review separately, NYSERDA will require coordinated review procedures for both Type I and Unlisted Actions.

7.4 Is a large-scale ground-mount solar energy system a Type I, Type II Unlisted Action? What about a large-scale rooftop solar energy system?

The existing SEQR regulations do not specifically classify solar installations on the Type I or Type II lists. The appropriate municipal board must apply the criteria found in the Type I list to determine if a solar installation is a Type I or Unlisted Action. Large-scale ground-mount PV systems do not meet the criteria of a Type II action under Part 617.5. Typical thresholds on the Type I list (617.4) that might impact the determination include:

- Physical alteration of more than 10 acres
- Unlisted Actions occurring wholly, partially in or substantially contiguous to any historic building or site
- Unlisted Actions that are non-agricultural uses occurring in a state-certified Agricultural District

Thresholds of interest related to rooftop systems on the Type I list that might impact the determination would generally be limited to an Unlisted Action occurring wholly, partially in or substantially contiguous to any historic building or site.

The NYSDEC has adopted amendments to the SEQR regulations including changes to the Type II list that affect solar projects. Please see FAQ 12 below.

7.5 What are the most common environmental impacts of large-scale ground-mount PV systems?

Environmental impacts will depend on the specific circumstances of each project, including location, size and natural features. Common Type I (617.4) thresholds related to ground-mount installations that Lead Agencies may review include those listed in the previous answer. A Type I Action does not necessarily mean an EIS will be required. While a Type I Action is more likely to have a significant adverse environmental impact, every Type I Action does not require an EIS.

7.6 What is the difference between a "short" Environmental Assessment Form and a "full" one? When is the "full" form required?

A Short Environmental Assessment Form (SEAF) is used when evaluating Unlisted Actions. As the name implies, it is a shorter form with fewer questions than the Full EAF. A Full Environmental Assessment Form is used to evaluate Type I Actions, as it requires more in-depth responses. A reviewing municipal board can request that a FEAF be completed for an Unlisted Action, but a Type I Action always requires a FEAF.

7.7 What is an "Environmental Impact Statement"?

An Environmental Impact Statement (EIS) is a document used by municipalities, project sponsors and the public that systematically considers significant adverse environmental impacts, alternatives, and mitigation measures for a proposed project. The EIS is typically prepared by the Applicant (solar developer), although it can be prepared by the Lead Agency.

The decision to prepare an EIS is the result of the issuance of a positive declaration by the Lead Agency. Both Type I and Unlisted Actions can result in a positive declaration and preparation of an EIS depending on the unique circumstance of a project. Please note that while a Type I Action is more likely to have an adverse impact on the environment, it does not mean that every Type I action requires an EIS.

7.8 I am a municipal official. What are my SEQR responsibilities if a developer wants to build a solar project in my jurisdiction?

As the municipal official where the project will occur, you are responsible to determine if an Action is a Type I, Type II or Unlisted Action, and to initiate Lead Agency coordination procedures as required under Part 617.6. Once the appropriate municipal board is designated as Lead Agency, it is responsible for making a determination of significance and issuing a positive or negative declaration by completing Part 2 and Part 3 of the EAF. A final determination on a project cannot be made on a project until SEQR is complete. For instance, site plan approval on a project cannot be granted before SEQR has been completed. Please refer to Local Official's Guide to SEQR for more information on the role of local boards in the SEQR process.

7.9 I am a solar developer. What am I required to do for the SEQR process?

As an Applicant, you are required to provide a completed Part 1 of the SEAF or FEAF along with any accompanying maps and project information that the reviewing municipal board requests. Once the Lead Agency is established, it must complete Parts 2 and 3 of the SEAF or FEAF. The Lead Agency may request that the Applicant provide relevant information it may need to make a determination of significance and issue a positive or negative declaration under SEQR. If a positive declaration is issued, the Lead Agency will require the preparation of the Environmental Impact Statement.

7.10 I am solar developer. What if the town where my project is located will not serve as Lead Agency?

Although it is preferred that the agency principally responsible for approving, permitting, or funding an action assume the role of Lead Agency, any Involved Agency can serve as Lead Agency. As a funding agency, NYSERDA is an Involved Agency under SEQR and may serve as Lead Agency.

7.11 I am a solar developer in New York City. Do I have to complete both the City Environmental Quality Review (CEQR) and the State Environmental Quality Review (SEQR)?

Like SEQR, CEQR reviews are triggered when an agency has a discretionary approval of an action or project. CEQR is New York City's process for implementing SEQR, and by law can be no less stringent than its State counterpart. CEQR adapts and refines the State rules to take into account the special circumstances of New York City. CEQR is governed by SEQRA, NYC's Executive Order No. 91 (43 RCNY, Chapter 6), and the CEQR Rules of Procedure. Some of the primary practical differences between CEQR and SEQRA are that CEQR provides guidance on the selection of a Lead Agency, adds scoping requirements, and promotes the use of the City's CEQR Technical Manual in conducting environmental reviews (62 RCNY, Chapter 5).

Therefore, for projects physically located in New York City, an Applicant must follow the CEQR process. For more information, please consult the CEQR FAQs.

7.12 Is NYSDEC changing the SEQR regulations for solar projects? What are the changes?

Information on the adopted SEQR amendments are located on the NYSDEC website at State Environmental Quality Review Act- Adopted Amendments 2018. These new amendments took effect January 1, 2019.

627.5(14)

Installation of solar energy arrays where such installation involves 25 acres or less of physical alteration on the follow sites;

- closed landfills,
- brownfield sites that have received a Brownfield Cleanup Program certificate of completion (COC) pursuant to ECL 27-1419 and 6 NYCRR 375-3.9 or Environmental Restoration Project sites that have received a COC pursuant to 6 NYCRR 375-4.9, where the COC under either program for a particular site has an allowable use of commercial or industrial, provided that the change of use requirements in 6 NYCRR 375-1.11 are compiled with.
- sites that have received an inactive hazardous waste disposal site full liability release or a COC pursuant to 6 NYCRR 375-2.9, where the Department has determined an allowable use for a particular site is commercial or industrial, provided that the change of use requirements in 6 NYCRR 375-1.11 are compiled with,
- currently disturbed areas at publicly-owned wastewater treatment facilities
- currently disturbed areas at sites zoned for industrial use
- parking lots or parking garages

617.5(15)

Installation of solar energy arrays on an existing structure provided the structure is not:

- listed on the National or State Register of Historic Places;
- located within a district listed in the National or State Register of Historic Places;
- been determined by the Commissioner of the Office of Parks, Recreation and Historic Preservation to be eligible for listing on the State Register of Historic Places pursuant to sections 14.07 or 14.09 of the Parks, Recreation and Historic Preservation Law; or
- within a district that has been determined by the Commissioner of the Office of Parks, Recreation and Historic Preservation to be eligible for listing on the State Register of Historic Places pursuant to sections 14.07 or 14.09 of the Parks, Recreation and Historic Preservation Law.

7.13 I read this guidance document but still have questions. How can I get help?

Additional information regarding the SEQR process can be found on the NYSDEC website. This webpage includes links to forms, handbooks and the regulations. Some of the most pertinent include:

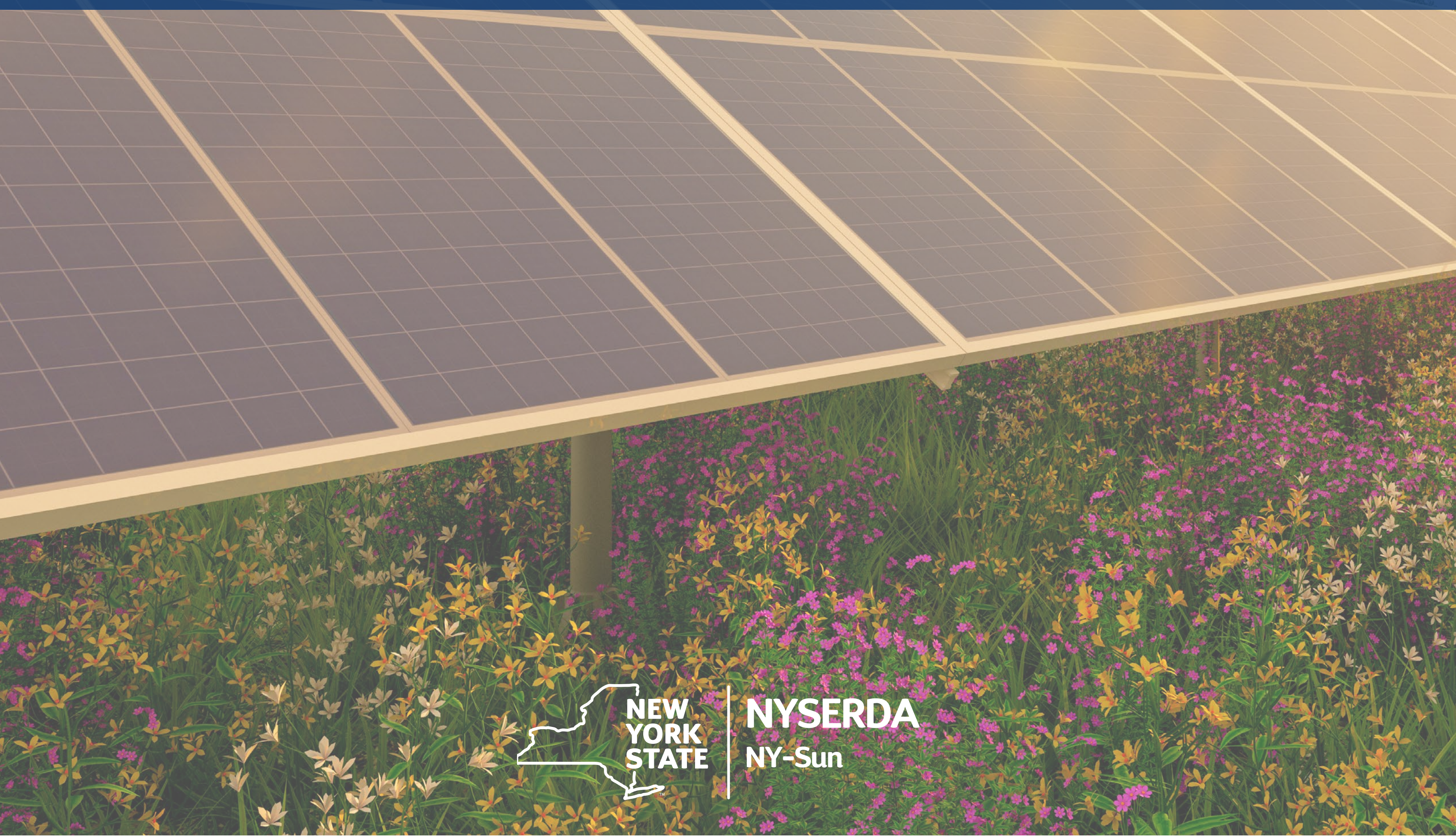
- Introduction to SEQR
- The SEQR Handbook
- The EAF Workbooks
- SEQR Publications

Questions?

If you have any questions regarding the SEQR process for large-scale solar energy systems, please email questions to cleanenergyhelp@nyserda.ny.gov or request free technical assistance at nyserda.ny.gov/SolarGuidebook. The NYSERDA team looks forward to partnering with communities across the state to help them meet their solar energy goals.

Section 6

New York State's Real Property Tax Law § 487 and Solar Payment-In-Lieu-Of-Taxes (PILOT)



Section Contents

1. Introduction

Over 30 states offer some form of tax exemption for renewable energy and 22
of those states mandate property tax exemptions for 100 percent of the value of solar energy project over 10 or more years. These property tax exemptions are designed to be a valuable incentive for the development of renewable energy generation projects. The margins on solar projects tend to be slim and property tax exemptions are vital to ensuring renewable energy projects remain viable. New York's Real Property Tax Law (RPTL) § 487 contains tax exemptions for renewable energy projects, including solar, wind, and energy storage constructed prior to January 1, 2030.

RPTL § 487 was passed to help New York achieve its goals of reaching 70% renewable energy generation by 2030 and a zero-emission electricity sector by 2040. The renewable energy tax exemption automatically applies in each municipality unless the local government opts out of RPTL § 487. Property tax exemptions are generally advantageous incentive tools for local governments because they offer no direct subsidies to developers and the exemptions only go into effect after the developer or property owner has developed and constructed the project. Even with the property tax exemptions, local governments are still able to generate revenue from renewable energy projects through payment-in-lieu of tax (PILOT) agreements. Encouraging renewable energy projects with PILOTs has benefits beyond the cash flow opportunities it offers to local governments. Renewable energy projects can improve local air quality by offsetting carbon-emitting energy generation sources, leading to better health outcomes for residents, and reduce the cost of electricity.

Payment-in-lieu of taxes (PILOTs) are an alternate revenue source that allows municipalities to receive annual payments from renewable developers in place of property taxes for projects eligible for property tax exemptions. PILOTs are typically negotiated with the developer for each project and are generally structured to provide a fixed cash flow to municipalities once the project is in operation. The tax exemptions offered by RPTL § 487 can serve as a valuable incentive to attract renewable developers who might otherwise not choose to invest due to taxes. Used in conjunction with RPTL § 487, PILOTs will allow local governments to earn revenue that would otherwise not be available if renewable energy projects are deterred by the cost of real property taxes.

Table 1: PILOTs versus Real Property Taxes

PILOTs	Real Property Taxes
Typically cost per megawatt ($/MW)	Percentage of assessed property value
Agreement term may not exceed 15 years (except if negotiated with an Industrial Development Agency), providing certainty around future payments developer will be required to make	Property assessment estimated using appropriate valuation method (e.g., discounted cash flow, market comparable, or cost-based approach) to calculate property tax
Total cost must not exceed the value owed if subjected to property tax	Annual growth in property taxes is capped at the lesser of 2% or the rate of inflation
Flexibility in determining cost developer will pay, though time needed to negotiate agreement	Mandated approach to applying property taxes, with no flexibility

This section will highlight the various considerations for solar energy projects and the RPTL § 487, and the opportunities available for local governments to create new revenue streams. This resource will focus primarily on solar energy projects, though these topics are also applicable to other renewable energy technologies. By the end of this document, the reader should know the options available for encouraging solar project development in their communities, how PILOT agreements can be implemented, and which stakeholders should be engaged to enact effective PILOTs that benefit affected tax jurisdictions (ATJs). In addition, this section provides resources for further research, other existing guidance and templates, and the relevant legislation that informs the content of this document. The section is organized as follows:

- A summary of jurisdictions that do not collect property tax revenue for renewable energy projects;
- The details of RPTL § 487, including how it is applied, and the provisions related to opting out of the law;
- PILOTs, the opportunities they offer to local governments, and a comparison with PILOT programs in other states;
- The financial advantages of solar projects implemented under the RPTL;
- A description of how PILOTs are negotiated and implemented, the impact of the tax cap on potential PILOT revenue; and

- The role Industrial Development Agencies' (IDAs) can play PILOT agreements.

The following content is for informational purposes only. The content does not, and is not intended to, constitute legal or tax advice. Readers should consult with their attorney or tax advisor prior to taking, or refraining from taking, any particular action on the basis of the information contained therein.

2. Real Property Tax Law § 487

The New York State Real Property Tax Law § 487 (RPTL § 487) offers properties located in the state containing renewable energy systems, including solar systems, that are designed to provide heating, cooling, hot water, or mechanical, chemical, or electrical energy, with a 15-year real property tax exemption.[1] The tax exemption only applies to the renewable energy system components themselves, and not the underlying land value.

What qualifies as solar energy equipment under RPTL § 487?

Eligible solar energy equipment includes collectors, controls, energy storage devices, heat pumps, heat exchangers, and other materials, hardware or equipment necessary for the collection and conversion of solar radiation into thermal, mechanical, chemical or electrical energy, or for the storage, distribution, or protection of such energy. Insulation systems associated with solar or wind energy installations and that are above and beyond the energy efficiency standards required by law (e.g. insulation and insulated glazing) are also eligible solar energy equipment. Materials excluded from RPTL § 487 eligibility include pipes, controls, insulation, or other equipment that are part of a building's normal heating, cooling, or insulation equipment.

Solar projects must be constructed prior to January 1, 2030 to be eligible for the tax exemption.

How is an exemption granted for a solar project under RPTL § 487?

The owner of a solar system must fill out an exemption form, RP-487,[2] and submit two copies of the application to the assessor of the appropriate taxable jurisdiction prior to the taxable status date of the applicable county, city, town, or village. The taxable status date in most communities is March 1.[3] Once approved by the assessor, an exemption is granted. Solar and wind projects are eligible if they are existing or have been constructed between January 1, 1991 and January 1, 2030. Battery energy storage projects are eligible if they are constructed between January 1, 2018 and January 1, 2030.

How long does the property tax exemption last for?

The property tax exemption lasts for 15 years after the energy project is placed in service, unless the property is owned by New York State or a New York State department or agency (partial tax exemption). For property owned by the State or a state department, the property tax exemption for the qualified equipment is permanent (full tax exemption). After the exemption ends, a project is subject to real property taxes. Solar and wind projects may be assessed using an appropriate valuation method such as an income-based approach, cost-based approach, or market comparables to assess the remaining property value. This topic is further discussed in the Comparison of Taxation & PILOTs section.

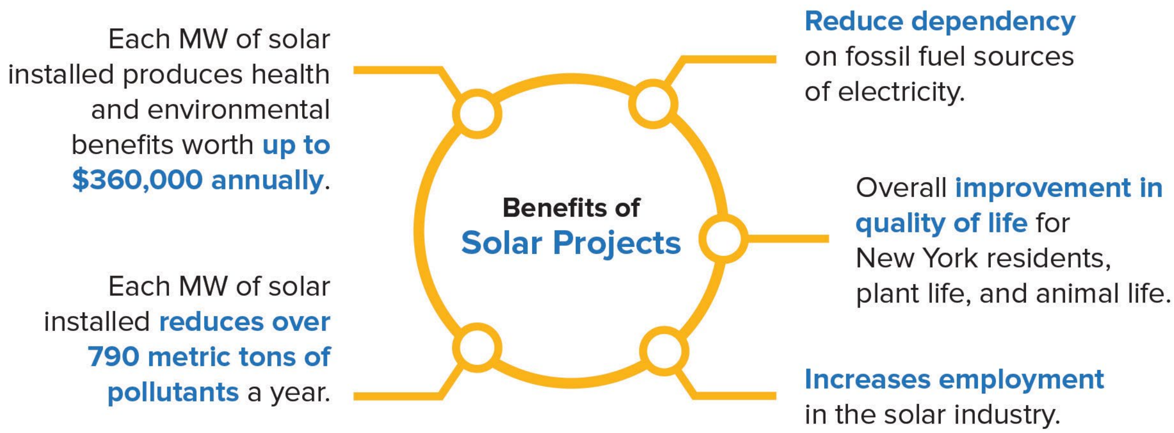
How long does the property tax exemption last for?

The property tax exemption lasts for 15 years after the energy project is placed in service, unless the property is owned by New York State or a New York State department or agency (partial tax exemption). For property owned by the State or a state department, the property tax exemption for the qualified equipment is permanent (full tax exemption). After the exemption ends, a project is subject to real property taxes. Solar and wind projects may be assessed using an appropriate valuation method such as an income-based approach, cost-based approach, or market comparables to assess the remaining property value. This topic is further discussed in the Comparison of Taxation & PILOTs section.

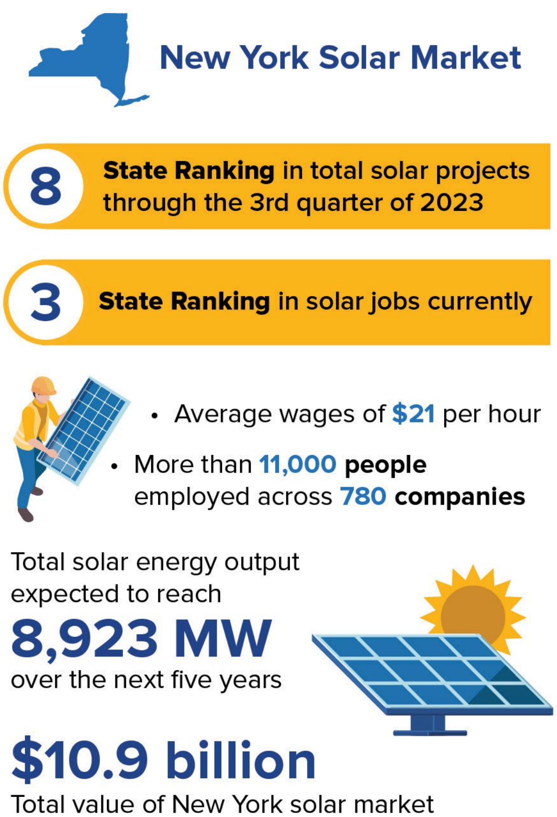
[1] New York Real Property Tax Law Section 487 - Exemption From Taxation for Certain Solar or Wind Energy Systems or Farm Waste Energy Systems (public.law).
[2] Form RP-487:2/20:Application for Tax Exemption of Wind Energy Systems or Certain Other Energy Systems:rp487 (ny.gov)
[3] Property tax calendar (ny.gov)

What are the benefits of RPTL § 487 tax exemptions?

Figure 1: Benefits of Promoting Renewable Energy Projects



The benefit of the RPTL § 487 tax exemption is that there is a greater likelihood that solar projects will get built. If a solar developer is choosing between different municipalities, they will be more likely to invest where their costs are lower due to the exemption. Although municipalities would be eligible to generate property taxes from projects by opting out of RPTL § 487, the municipalities might not find any substantial increase in property tax revenue since developers will be less incentivized to build projects where systems are fully taxable as many solar projects will not be financially viable if they have to pay full property tax on the project. However, jurisdictions with RPTL § 487 exemptions are allowed to negotiate payment-in-lieu-of-taxes (PILOTs) with system owners. Additionally, other spinoff effects such as increased local employment and further economic development can result in additional local tax revenue.



New York State has one of the fastest growing solar markets in the country.[4] Through the third quarter of 2023, New York State ranked 8th in the nation in total solar projects (4th in 2022). Total solar energy output is expected to reach 8,923 MW over the next five years.

The solar industry in the state has employed more than 11,000 people across 780 companies. New York is currently ranked 3rd in solar jobs, many which are either local or regional with average wages of $21 per hour. According to the Solar Energy Industries Association (SEIA), the total value of the solar market in New York is over $10.9 billion.[5]

Encouraging solar projects also leads to numerous environmental and health-related benefits. As a zero-emission source of energy, solar projects can significantly reduce pollutants such as greenhouse gas emissions (GHGs) and criteria air contaminants (CACs). CACs can cause a variety of health problems such as asthma or more serious ailments.[6] These pollutants are typical of combustible energy sources such as natural gas, which as of 2021 was responsible for generating 71% of New York's electricity.[7] Table 2 An analysis of the impacts of solar projects shows that each 1 MW-ac of solar installed in New York can generate between $220,000 to $360,000 annually in health and environmental benefits.[8]

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[4] State-By-State Map | SEIA
[5] New York.pdf (seia.org)
[6] Environmental Impacts of PP.pdf (wi.gov)
[7] U.S. Energy Information Administration - EIA - Independent Statistics and Analysis

Table 2: Annual Value of Reduced Emissions per MW of Solar Installed in New York State

	Min	Max
Total Health Savings	$34,688	$78,149
Total Environmental Savings	$184,371	$282,491
Total Non-Monetary Value (per MW-year)	**$219,059**	**$360,640**

Replacing fossil fuel-based energy generation sources with solar power can improve health outcomes and improve overall quality of life for New York residents. Beyond the direct health impacts to humans, reducing emissions also contributes to improved plant and animal life in New York. Thousands of square miles of protected land in New York, in addition to agricultural areas, would be impacted by pollutants from fossil fuels. For example, agricultural output can be reduced due to more extreme weather and higher temperatures.

What property tax exemptions are offered in other states?

Many states offer some form of tax exemption for renewable energy; some are specific to certain technologies, while others do not require exemptions to be for certain types of renewable energy. About 22 states, excluding New York, mandate property tax exemptions for 100 percent of the value of solar energy project over 10 or more years. Other states which offer incentives, and have strong solar development include California, New Jersey, and Massachusetts. California offers an exclusion for new solar projects added to a property, meaning that it will not result in an increase of a property's existing assessment. Massachusetts offers an exemption for up to 20 years after construction, at which point the owner must pay the property tax on the full value. New Jersey offers an exemption similar to New York, in that 100% of the assessed value of the solar power system is exempt from property taxes.

Can local governments opt out of the Real Property Tax Law § 487 exemptions?

RPTL § 487 automatically applies, ensuring that local governments that want to use tax exemptions as incentives do not have to take any action. Local governments that do not want to use tax exemptions can opt out of the RPTL § 487 by passing a law or resolution to opt out of RPTL § 487 and filing copies of the local laws and resolutions to the Department of Taxation and Finance and NYSERDA. If a municipality has opted out, all applicable solar and energy storage projects in its jurisdiction are subject to local property taxes. However, municipalities are not allowed to selectively apply the RPTL § 487 exemption to different projects.

Should local governments wish to opt back in to the RPTL § 487 exemption after opting out, they can do so by repealing the local law, ordinance, or resolution that implemented the opt out, and then provide a copy to the New York State Department of Taxation and Finance and NYSERDA.

NYSERDA maintains a list of county and municipal governments which have opted out of the RPTL § 487. For an up-to-date list, please reference the Tax Department's Opt-out exemption listing.

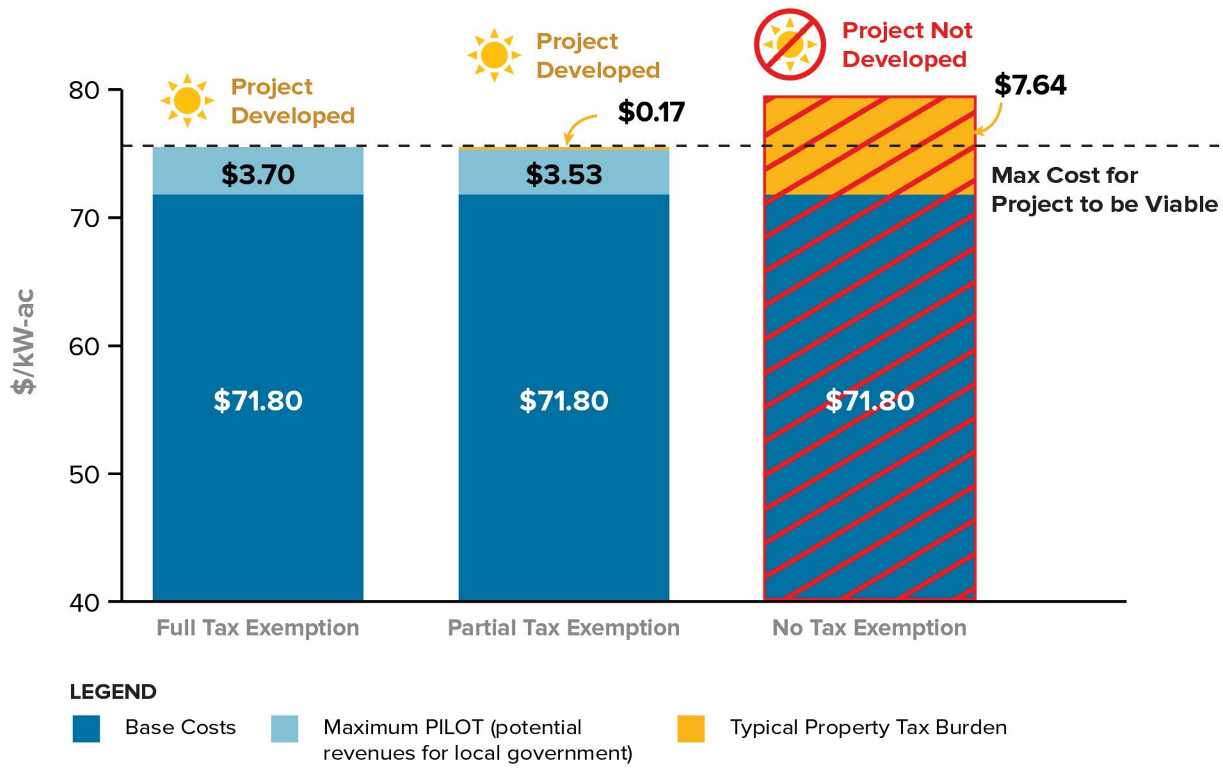
[8] The Environmental Protection Agency (EPA) produced a tool called AVoided Emissions and geneRation Tool (AVERT), which calculates the impact of reduced emissions by renewable energy technology. AVERT was used to calculate the marginal impact of new solar projects in New York. The emissions impacts were monetized using the social cost of emissions published by the EPA and the EPA's CO-Benefits Risk Assessment (COBRA) tool.

[9] Environmental savings are estimated based on the EPA's social cost of carbon contained within December 2023's "Report on the Social Cost of Greenhouse Gases: Estimating Incorporating Recent Scientific Advances". The social cost of carbon recognized by the EPA is being revisited, though there is not an updated recommended value published. Federal policy is directing federal agencies to avoid monetizing climate damages when making decisions or crafting regulations. The social cost of carbon may change over time, and in the absence of the federal guidance, state or local agencies may choose to adopt their own standard for the social cost of carbon.

3. Payment-in-Lieu of Taxes

Payments-in-lieu of taxes (PILOTs) are annual payments which are used in place of property taxes. PILOTs can be structured in ways that are appropriately scalable for different project types. In power generation projects, sizing of projects is based on nameplate capacity, typically in megawatts (MW), and PILOTs generally are structured in $/MW-ac. PILOTs are flexible financial agreements, and may generate cash savings to developers, relative to paying property taxes, which promotes project implementation. PILOTs may be negotiated directly between the taxing jurisdictions and developers or through a local or county Industrial Development Agency (IDA). See the section titled IDAs & PILOTs for more details on IDA PILOTs.

Figure 2: Illustration of Net Present Value of Potential Developer Costs



Assumptions:

Estimated average assessed property tax rate of 3.1% (representative of NYS, excluding NYC).

Property tax follows discounted cash flow methodology for solar and wind systems exceeding 1 MW.

30% ITC claimed (prevailing wage and apprenticeship requirements are met).

Pricing based off avg. solar project in NY from 2021-2023.

How do PILOT agreements benefit renewable energy resources like solar?

Many towns in New York make use of PILOT agreements to tax solar projects and other renewable energy generation facilities. Traditional property taxes can be expensive for developers and PILOT agreements provide a cost-saving opportunity that can make solar projects more economically feasible. Figure 2demonstrates the levelized cost of generation, per kW-ac, for solar projects over a 30-year lifecycle. Without a tax exemption, the levelized cost exceeds the anticipated revenues the project would be able to earn, resulting in the project not being developed, and no property tax is earned by the local government. However, with a partial or full property tax exemption, developers have favorable project economics, and local governments have an opportunity to earn revenues on developed projects through PILOT agreements.

PILOT agreements also provide renewable energy developers with a more predictable tax burden when financing and planning their projects. Property taxes can be impacted by various factors, such as local land values, prevailing tax rates, and inflation, among others. PILOT agreements provide a predictable payment schedule based on the installed capacity of the solar project. PILOT agreements will also result in municipalities generating revenue that may not otherwise be available due to property tax exemptions.

PILOT Key Facts:

- PILOTs offer local governments an alternative source of revenue;
- PILOTs improve solar energy project economics by offering a stable alternative to property taxes;
- PILOT terms under RPTL 487 may not exceed 15 years; PILOTs negotiated with IDAs have the flexibility to extend beyond 15 years;
- Local governments have flexibility in negotiating PILOTs with developers and/or IDAs.

What are some examples of successful PILOT agreements?

PILOT agreements have been used to incentivize growth in renewable energy, commercial, and residential real estate development. According to data from the New York State Office of the Comptroller, over $800 million in PILOT payments have been made to a variety of local IDAs, as of 2021. 151 approved projects included wind or solar in the project name, and 85 of which have been categorized as clean energy projects. The 85 clean energy projects receiving incentives from IDAs across New York are generating $9.5 million of revenue for local governments and created 1,290 full-time equivalent construction jobs.[10] In the December 2020 IDA Grants and Loans Program survey, of 60 responses from IDAs, incentives were approved for 68 clean energy projects in 2020 alone, with a combined generation capacity of 870 MW.[11] The value of revenues earned and jobs created could increase substantially given New York's leading solar industry status.

The former Caswell Road landfill in Dryden. Photo Credit: Casey Martin / The Ithaca Voice

The Dryden Tompkins solar installation in the Town of Dryden was a successful solar PILOT project that included a 10% electricity price discount below existing utility rates.

There are numerous examples of successful solar PILOT projects. An example of a successful solar PILOT project is the Dryden Tompkins solar installation in the Town of Dryden.[12] The solar project included two sites at closed landfills, an innovative technique to leverage underutilized open areas. Based on the project details listed on the Tompkins County IDA website, the project owner pays $8,000/MW-ac/year on the 18 MW installation. According to the IDA database published by the Office of the State Comptroller, the PILOT payments from this specific project match taxes foregone in property taxes.[13] The installation is large enough to power over 4,000 homes. The project also delivers a 10% electricity price discount below existing utility rates.

How are PILOT negotiations initiated?

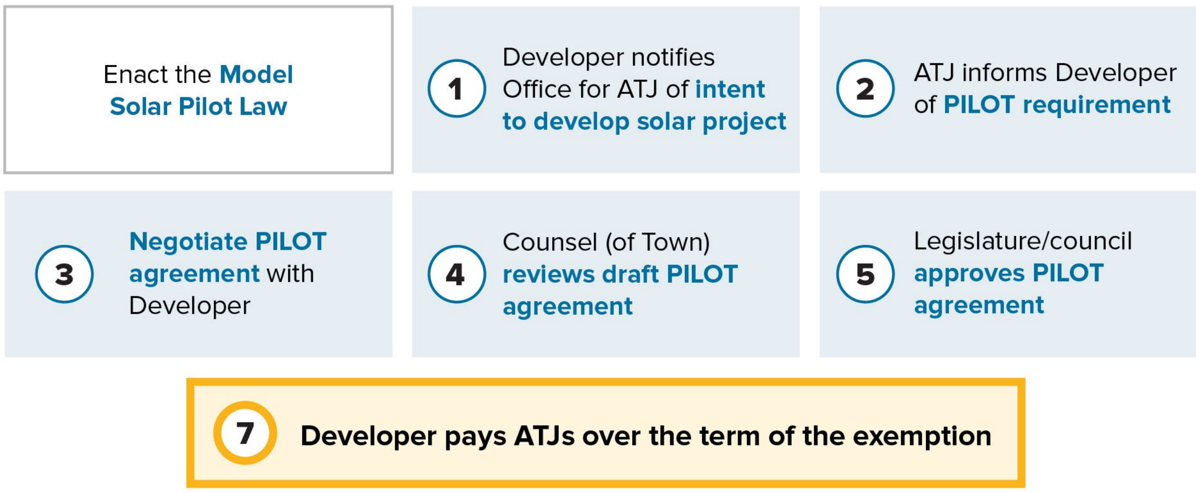
A local jurisdiction should enact a version of the Model Solar PILOT Law, available on NYSERDA's Solar Guidebook web page.[14] This gives the jurisdiction the legal authority to establish a uniform policy that governs PILOT agreements with solar developers. The model law is a template and is intended to be advisory only. It is recommended that jurisdictions seeking to enact a version of the Model Law or resolution seek legal advice before doing so.

[10] IDA Impact Analysis - New York State Economic Development Council (nysedc.org)
[11] Performance of Industrial Development Agencies in New York State 2023 Annual Report (Data for Fiscal Year Ending 2021) (ny.gov)
[12] Former Dryden landfill may see new life as solar array - The Ithaca Voice
[13] Financial Data for Local Governments (state.ny.us)
[14] New York State Solar Guidebook - NYSERDA

The owner or developer of a system must provide written notification of the intent to construct a solar energy system prior to beginning construction. This step is typically completed after securing necessary permits to initiate construction of the solar energy system. The written notification must include a copy of a letter sent to the highest-ranking official of the taxing jurisdiction, must explicitly reference subdivision 9 of section 487, and must clearly state that unless the taxing jurisdiction responds in writing within 60 days with its intent to require a PILOT agreement, the project shall not be obligated to make such payments. NYSERDA has published two versions of the model PILOT agreement on its Solar Guidebook website.[15]

Upon receipt of the written notification, a local government has 60 days to notify the owner or developer in writing of the intent to require a PILOT contract. If the local government has a law or resolution passed that mandates PILOT agreements for solar systems, the existing law or resolution is considered sufficient notification to the owner or developer.[16] If a project is located under multiple tax jurisdictions, the PILOT is divided amongst local governments based on their respective share of the total tax rate that would have been applicable to the project, if it were taxable when it began operations. Annual payments made by the project owner to each jurisdiction should be specified in the final PILOT agreement. PILOT agreement frameworks are discussed further below. Examples of the PILOT agreement can be found in Appendix B and C of this chapter.

Figure 3: PILOT Negotiation Process for Local Jurisdictions



Is there a framework available for PILOT agreements?

Examples of PILOT agreement frameworks can be found in Exhibit B of NYSERDA's Model PILOT Agreements.[17] There are two versions of the template, which can also be found in Appendix C and Appendix D of this chapter. One is specific to projects in one taxing jurisdiction, and another version is applicable to projects in multiple taxing jurisdictions. Governments can utilize the template that has been mostly pre-populated with inputs for jurisdiction details such as, $/MW cost of the PILOT and annual escalation. However, the model template agreement can be tailored to meet a jurisdictions needs, and need not be adopted as it is provided. Jurisdictions should seek legal advice before implementing PILOT agreements with the model template. The model law exempts projects smaller than 1 MW-ac as the amount of PILOT revenue may not justify the cost of negotiating the PILOT. The model law contains several stipulations governing the PILOT agreements, which can include:

- Property owners with a solar energy system must enter into a PILOT agreement with the relevant local authority, except for residential systems and those not eligible for tax exemptions under RPTL § 487 (4).
- The lessee or licensee of a property owner can enter into the PILOT agreement on behalf of the property owner if they own or control the solar energy system.
- The appropriate official, such as the town supervisor or assessor, must notify the property owner within sixty days upon receiving notification of their intent to install a solar energy system, informing them about the mandatory requirement for a PILOT agreement under the local law.
- Compliance with state and local codes is still necessary for installing solar energy equipment or systems, and this local law does not grant any authorization for project. All solar energy systems must file a Real Property Tax Exemption application under RPTL § 487 to be eligible for tax exemption.

[15] New York State Solar Guidebook - NYSERDA
[16] New York Model Solar Energy System PILOT Law, accessible at New York State Solar Guidebook - NYSERDA
[17] https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/NY-Sun/Solar-PILOT-Model-Law.docx

Each PILOT agreement shall also include:

- Name and contact information of the owner of the solar energy system;
- The Section-Block-Lot (SBL) number for each parcel(s) where solar energy system will be located;
- The capacity of the solar energy system and adjustments to annual payments if the capacity changes;
- Agreement that the solar energy system is exempt from real property taxes for the duration of the 15-year PILOT agreement;
- Restriction on assignment of the PILOT agreement, with certain exceptions. Specifically, the project owner cannot be transferred ("assigned") to another entity unless that entity is an affiliate of the project owner, is financing the project, or has agreed in writing to accept all payment obligations of the owner;
- Option for the owner to record a notice with the local government (i.e., through the City/Town Clerk) of the agreement at their expense, with cooperation from the municipality;
- Annual payment amount based on capacity;
- Yearly escalation percentage for the annual payment, starting from the second year; and
- Consequences of non-payment, including potential cancellation of the PILOT agreement and taxation of the system at its full assessed value.

What happens if a project occurs in multiple taxing jurisdictions?

If a project is built in multiple taxing jurisdictions, the negotiation and implementation of a PILOT agreement can become more complex. Each jurisdiction involved may have its own policies, rates, and requirements for entering into PILOT agreements. One way around having to negotiate with multiple jurisdictions is through Industrial Development Agencies (IDAs). See section below on IDAs.

If the project developer or owner elects to negotiate separately with each jurisdiction the project takes place in, they will need to coordinate with representatives from each jurisdiction to understand their specific requirements and expectations for the PILOT agreement. Each agreement may come with its own terms, payment structure, and duration. The developer or owner will need to manage and keep track of each agreement separately.

Managing multiple PILOT agreements over the project's duration can be administratively complex and may require dedicated resources to ensure all obligations are met. In some cases, PILOT agreements may require public hearings and approvals by the local governing bodies of each taxing jurisdiction. The developer will need to navigate the approval processes in each jurisdiction.

Once the PILOT agreements are in place, the developer or owner must ensure compliance with the terms and conditions specified in each agreement. Additionally, they may need to provide separate reporting and documentation to each taxing jurisdiction as required, depending on the terms of each agreement.[18]

What are the limitations to PILOTs?

PILOTs negotiated under RPTL § 487 may not exceed a 15-year term, starting from the date when the benefits of the property tax exemption first came into effect, which aligns with the duration of the property tax exemption. The PILOT's value is limited to be equal to or lesser than the value of property taxes owed if the exemption was not in effect.

[18] New York Solar Guidebook - Solar Payment-in-lieu-of-Taxes (Pilot) (ny.gov)

4. IDAs & PILOTs

What is an IDA?

Industrial Development Agencies (IDAs) are public benefit corporations established by the Industrial Development Agency Act of 1969, governed by Article 18-A of the General Municipal Law.

The main purpose of an IDA is to promote economic welfare and development by assisting in the acquisition, construction, improvement, and maintenance of manufacturing, infrastructure, and renewable energy, facilities to create job opportunities and enhance general prosperity in New York. Each IDA operates independently as a public benefit corporation, established at the request of a sponsoring municipality and acts in the interest of that local government and its residents.[19]

IDAs are typically governed by boards consisting of three to seven members, appointed by the governing board of each sponsoring municipality. The composition of the board may include representatives from various entities such as local government, school boards, organized labor, and business groups, but there is no requirement for proportional representation. Before approving any project with proposed financial assistance exceeding $100,000, IDAs are required to hold a public hearing.

IDAs can offer several benefits to private developers and companies to encourage them to relocate, expand, or remain within their jurisdictions, such as:

- The ability to acquire, own, and dispose of property;
- Issuing debt directly to private companies;
- Exemptions from property taxes and mortgage recording taxes for the real property owned by IDAs; and
- Exemptions from state and local sales taxes for purchases made in support of approved projects.

How do IDAs interact with local taxing jurisdictions?

Local governments generally establish IDAs, which are expected to act in the interest of the local governments. IDAs own real properties that benefit from exemptions from real property taxes, which are then passed on to the businesses they assist. To recapture some of the forgone property taxes, IDAs use PILOTs, paid by recipients of IDA benefits, to affected taxing jurisdictions (ATJs), based on the proportion of taxes each jurisdiction would have been paid if property taxes were applied. The proportions in the PILOT agreement can vary from the default tax share if it is agreed to in writing by all the affected taxing jurisdictions.

IDAs are required to establish a uniform tax exemption policy (UTEP) with input from affected taxing jurisdictions. The policy includes guidelines for claiming real property, mortgage recording, and sales tax exemptions, considering factors like job creation, tax exemption value, reimbursement obligations, and the impact on existing businesses and economic development projects.

If an IDA is involved in facilitating a PILOT agreement, the developer may work with multiple IDAs corresponding to each affected jurisdiction to streamline the negotiation process.

What is the general process for IDAs to enact PILOTs?

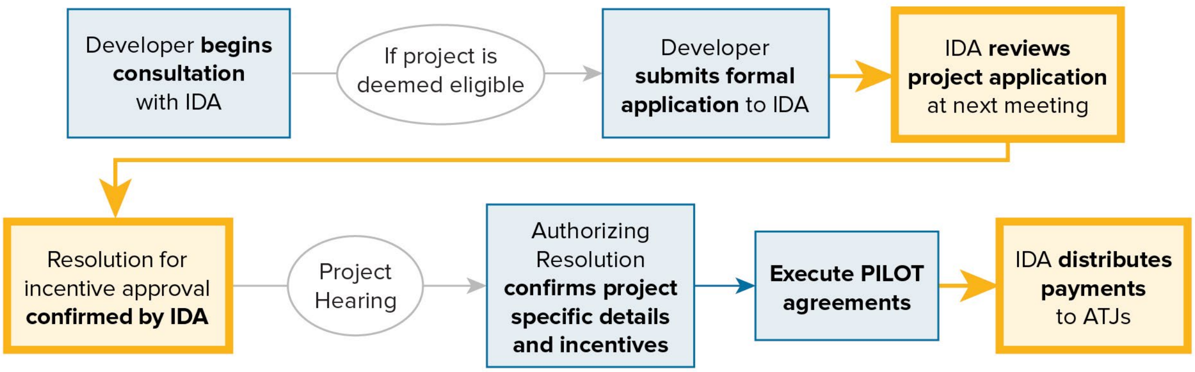
Pursuant to General Municipal Law (GML) § 874, “property acquired by [an IDA] or under its jurisdiction or control or supervision” enjoys an exemption from property taxes. However, such real property remains subject to special assessments, direct assessments, and user fees despite the IDA’s ownership or involvement. IDAs rarely agree to a 100 percent exemption from property taxes for a project.

[19] Industrial Development Agencies in New York State: Background, Issues and Recommendations (ny.gov)

The IDA will normally negotiate payment schedule for the PILOT agreement with a developer. An IDA has the authority to negotiate any PILOT agreement it deems appropriate. A PILOT agreement does not have a minimum or maximum term, though IDAs typically limit them from 10 to 20 years. PILOT payments may be fixed dollar amounts or utilize a percentage of assessed value. These agreements will typically include an escalation factor to increase the payments over time, to compensate for annual inflation.

The specific terms of PILOT agreements will vary by IDA and the process can vary significantly as well, though they share many common elements. An example process flowchart is shown below from the Fulton County IDA.

Figure 4: IDA PILOT Process Flowchart



Project reviews can begin before the formal application process. Developers will work with the IDA to demonstrate that the project meets the eligibility criteria for IDA financial incentives under the GML. If eligible, the developer is advised to have their legal counsel contact IDA counsel to determine a project's financing structure. At this point, the developer can submit a draft application for review by the IDA. The IDA Board will review the application, calculate the real property tax exemption requested by the developer, and add as an agenda item for the next IDA Board meeting. These are regularly scheduled meetings with published dates, so developers can access this information online. At the IDA Board meeting, a representative of the project is required to attend and answer questions about the project for IDA Board Members. This is followed by a public hearing where members of the public are invited to attend and ask questions about the project.

> The IDA PILOT process is summarized from the Fulton County IDA website on the approvals process for financial incentives.

After the public hearing, the Board reviews the application, and indicates whether the project can proceed. The IDA adopts a resolution that designates the project operator (e.g., the developer) and authorizes the PILOT. Depending on the project size there may be future steps to grant the PILOT. If a PILOT has been approved, then the IDA finalizes a PILOT agreement executed by the IDA, the developer, and all affected taxing jurisdictions, and the PILOT officially begins. At this time, the developer has to pay the IDA Administrative Fee and Counsel Fee which can vary depending on the IDA.

Are IDAs subject to the same limitations as local taxing jurisdictions for PILOT agreements?

IDAs in New York are not subject to the same limitations as local taxing jurisdictions for PILOT agreements. IDAs have a significant degree of discretion in negotiating PILOT agreements, and the criteria used to determine PILOTs can differ among IDAs. This discretion allows IDAs to tailor the terms of the agreements to suit the specific needs and goals of the projects they are supporting.

The difference in flexibility and discretion allows IDAs to negotiate and structure PILOT agreements in a way that may not be possible for local taxing jurisdictions, offering unique incentives to businesses and development projects that seek their assistance. It can also lead to potential competition among IDAs as they strive to attract businesses with different tax incentive packages.

IDAs can also offer longer term PILOT agreements than local agreements. They may also be authorized to negotiate solar PILOT agreements on behalf of all taxing authorities within its jurisdiction, streamlining the negotiation process.

The UTEP may also include specific guidelines for renewable energy facilities. IDAs can issue debt in the form of bonds on behalf of a project operator. The project operator is responsible for the debt, though the IDA provides access to the municipal bond market. The municipal bond market refers to the debt issued by municipalities in the United States, typically at lower rates than those offered by commercial banks. For example, as of March 2024, the average 1-year Municipal Bond yield was 2.96%.[20] A 1-year, AAA rated Corporate Bond yielded 5.03%.[21] Loans from commercial lenders are typically offered with a higher premium from the Treasury rate. The ability to issue debt at competitive rates can be a significant differentiator when it comes to implementing PILOTs.

While IDAs are required to adopt a UTEP, they can deviate from it with a written explanation and notification to affected taxing jurisdictions. Although local government approval is not mandatory for deviations, IDAs must review and respond to any issues raised.

What are the opportunities and challenges of negotiating through an IDA for local governments?

Negotiating PILOT agreements through an IDA can streamline approvals, offer competitive financing terms through municipal bonds, and provide other support to solar projects. Collectively, IDA projects have generated billions of dollars in development and tax revenue in New York.[22] However, these benefits may come at a cost to local governments, as PILOTs must be equal to or lower than equivalent property taxes. PILOTs also come with additional compliance and management costs.

IDAs have significant discretion in negotiating PILOT agreements, and the criteria for determining PILOTs vary among IDAs, causing competition among them for businesses. This is an opportunity for them to negotiate individually-tailored agreements for each project, rather than a one-size-fits-all approach.

Outside of clean energy projects, IDAs engage in other forms of community economic development. For instance, IDAs have partnered with local community colleges in efforts to bolster workforce development. One example is the Rockland County IDA, which partnered with Rockland Community College to fund three internship positions within Rockland County.[23]

Table 3 below summarizes the opportunities and challenges of negotiating PILOT agreements through an IDA for local governments.

Table 3: Opportunities and Challenges for Local Governments to Negotiate PILOTs through an IDA

Opportunities	Challenges
Streamlined negotiation process	Reduced tax revenue for jurisdictions due to IDA administrative fees
Provide access to additional debt financing, workforce development, and infrastructure improvements	Additional monitoring required to ensure accountability and transparency
Increase competitiveness through more flexible PILOT terms to attract projects	

What are the opportunities and challenges of negotiating through an IDA for developers?

Negotiating PILOT agreements and obtaining project approvals without an IDA is often a laborious and time-consuming process for developers of solar projects. Project location, sizing, and jurisdiction are some of the many considerations that can be unique to each project. As such, negotiating through an IDA leverages an established local entity to streamline this process. The considerable discretion afforded to IDAs in negotiating agreements can potentially lead to concerns about transparency and accountability, leading to additional monitoring and compliance requirements that are borne, at least in part, by the local government.

Recent legislation such as Chapters 708, 766 and 799 of the Laws of 2022 add reporting requirements intended to increase the transparency of IDA negotiations, changes in tax policy, and the expiration of PILOT agreements.[24] Collectively, these rules will increase the reporting requirements for developers entering into PILOT agreements with IDAs.

[20] United States Rates & Bonds - Bloomberg
[21] Moody's Seasoned Aaa Corporate Bond Yield (AAA) | FRED | St. Louis Fed (stlouisfed.org)
[22] Performance of Industrial Development Agencies in New York State, 2020 Annual Report
[23] Rockland Community College partners with IDA to support workforce development - Mid Hudson News
[24] New Laws Affecting Industrial Development Agencies and Authorities (harrisbeach.com)

In addition to the administrative review required for PILOT agreements, IDAs may charge fees for PILOTs. For example, the Rockland County IDA charges a 1% fee of the total PILOTs payable.[25] The precise fee charged varies by IDA. Other IDAs may charge fees for legal review of PILOT agreements, or percentages of total project cost. This adds to the total project costs and can be significant, depending on the size of the project.

Table 4 below contains opportunities and challenges of negotiating PILOTs with IDAs for developers.

Table 4: Opportunities and Challenges of Negotiating PILOTs with IDAs for Developers

Opportunities	Challenges
Streamlined approval for certain projects	Can be significant variability in the incentives and assistance offered by different IDAs to solar developers
Can receive more attractive tax incentives	Additional fees charged by the IDA to cover administration of the PILOT
Receive access to additional debt financing, workforce development, and infrastructure improvements	

5. Comparison of Taxation & PILOTs

This section considers the implications of taxing projects and PILOT agreements described above.

Which taxing jurisdictions can enter/negotiate PILOTs?

All local taxing jurisdictions in the State of New York can enter into PILOT agreements.

What happens if a solar project is not exempt from property taxes?

If a solar project is not exempt from property taxes, the project developer or owner will be required to pay property taxes on the solar project. The property taxes would be based on the assessed value of the solar project, which can be estimated using an income-based method such as the discounted cash flow, a market-based approach such as the market comparables method, or a cost-based approach. The appropriate methodology is determined by the municipal jurisdiction that the project is located in. Property taxes are estimated including any associated infrastructure or land improvements. RPTL 575-b provides for the discounted cash flow (DCF) Appraisal Tool developed by the Department of Taxation and Finance to value solar and wind energy projects. At the time of writing, the statute was being challenged in court and amendments to the statute were being considered by the State legislature; as such, this law may no longer apply or may had been substantively revised. The amount of property taxes owed will depend on the local property tax rate and the assessed value of the solar project. Depending on the approach taken, the assessed value typically considers factors such as the project type, the size and capacity of the solar project, its NYISO Zone (NYISO Zones have different energy pricing),[26] its overall market value, its tax load, and its annual ground lease payment (if applicable).

Paying property taxes on the solar project can impact the project's financial viability. Property taxes represent an ongoing cost that will need to be factored into the project's financial projections and revenue calculations.

The property tax burden may be substantial, making it challenging for the project to remain competitive with other renewable energy sources or conventional electricity generation methods. Projects will need greater revenue streams to be financially viable with property taxes, which may result in renewable energy projects not being developed or being developed in other areas where exemptions are in place.

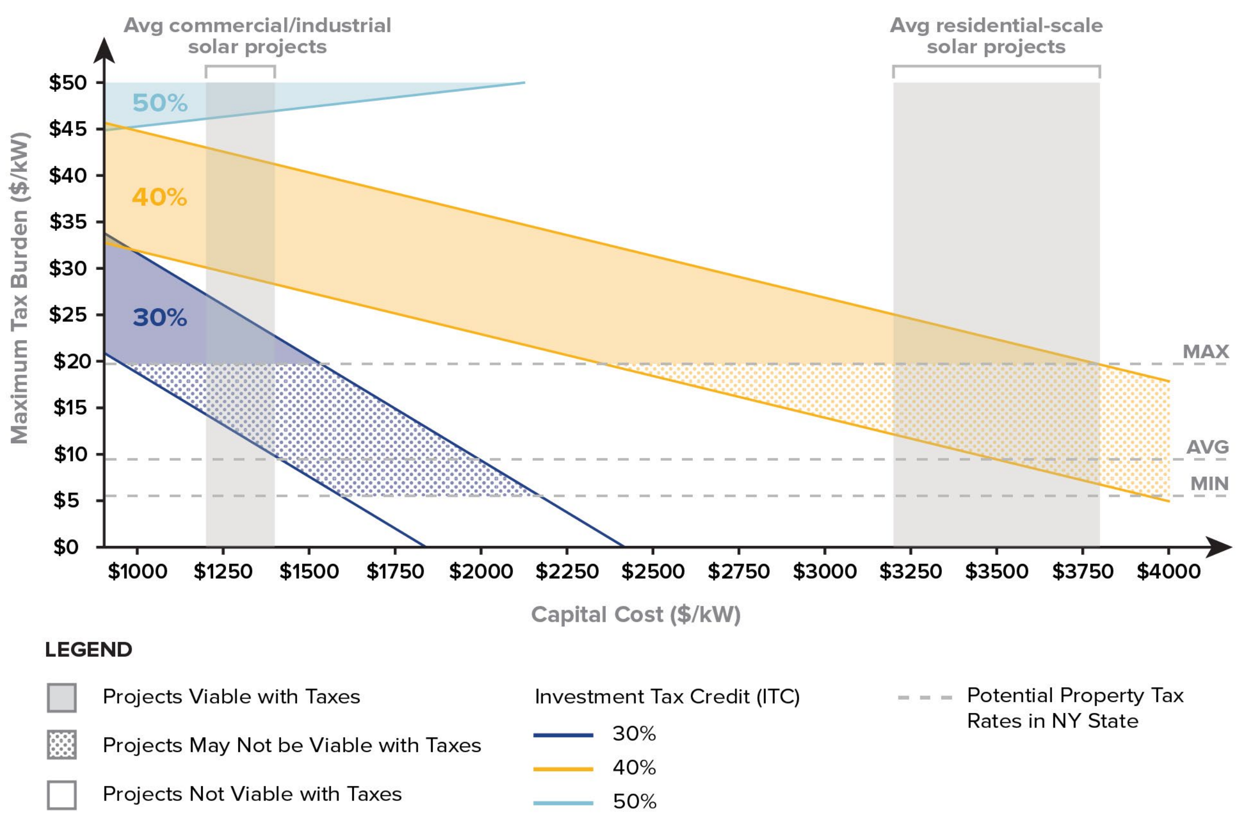
[25] https://rocklandida.com/wp-content/uploads/2023/10/IDA-Fee-Schedule-For-PILOTs-2023.pdf
[26] ISO Maps - NYSEG

How would taxes be applied to a solar project?

Projects can be subject to multiple property taxes based on any applicable taxes for towns, villages, counties, school districts, and special districts. A project in a given taxing jurisdiction will be subject to the applicable local property tax rate, which must be standardized by applying the equalization rate.[27] The equalization rate distributes taxes between overlapping jurisdictions.[28] For example, several towns may be included in a school district, and are thus subject to the school district's property tax in addition to the town's property tax. The equalization is applied to the market value of the town, relative to the market value of the school district, to arrive at a tax rate.

Once equalized, all applicable tax rates can be summed and divided by 1000 to determine the applicable tax load per MW. Next, multiplying this value by the project's appraised value (determined using an appropriate valuation method selected by the local municipal tax assessor) estimates the taxes owed. The property tax rate applied can significantly impact the economics of solar projects without the property tax exemption. Figure 5 below shows the maximum potential tax burden, framed in net present value $/kW, that solar projects could bear and still be viable with varying levels of the investment tax credit (ITC) benefits. Even with ITC benefits, projects operate on slim margins and developers will be attracted to areas where they know they will receive property tax exemptions. It is likely that many commercial or industrial scale projects (>1 MW capacity) may not be financially feasible given the potential range of property taxes across New York state. Smaller-scale projects tend to be even more costly and likely would not be developed, even with a 30% investment tax credit if the project was subjected to property taxes. Capital costs, investment tax credit eligibility requirements, and property tax rates are significant drivers for developers when determining where to invest.

Figure 5: Maximum Property Taxes for a Solar Project to Remain Viable



[27] Official Addresses (ny.gov)
[28] Understanding the Equalization Rate: A guide for property owners (ny.gov)

How do PILOT agreements impact the tax revenue of local governments?

PILOTs are designed to add to the tax revenue of a municipality by unlocking greater value in undeveloped or available land. Renewable energy facilities such as solar energy systems do not use typical town services such as public schools, municipal water, sewer, etc. and therefore offer an opportunity to create tax revenue without increasing the municipality's costs.

However, PILOTs may limit the ability for local governments to increase their property tax revenue while PILOTs are in effect. All local governments outside of New York City and all independent school districts outside of Buffalo, New York City, Rochester, Syracuse, Yonkers, and Utica are subject to the property tax cap, which limits property taxes from increasing by more than 2% or the rate of inflation, whichever is less.[29]

PILOTs are treated as another source of tax revenue, which offset the need to increase property taxes for the jurisdiction under the tax cap. The tax cap has to take into account how quickly the PILOT escalates. This rate is included in the negotiated PILOT agreement. When a PILOT is starting or is escalating at a rate greater than the inflation factor, the new fiscal year tax levy limit is reduced. All else remaining equal, property taxes may need to decrease. For the duration of a PILOT agreement, as long as PILOTs grow at or below the inflation factor, the tax levy limit will remain unimpacted or continue to grow. Once a PILOT phases out, the tax levy limit will increase in the next fiscal year to account for the loss of PILOT revenue.[30]

PILOTs can impact the property tax cap if their growth is at the upper boundary of the tax levy limit. These tax levy limits are adjusted to both account for new taxable property or improvements on existing property (tax base growth factor or quantity change factor) and the allowable levy growth factor. The tax base growth factor is designed to adjust the prior year tax levy to reflect the larger base of properties from which tax revenue can be received. The allowable levy growth factor, meanwhile, is the lesser of 2% or the inflation factor, as measured by the percent change in Consumer Price Index (CPI) for the 12-month period ending 6 months before the next fiscal year relative to the prior 12-month period.[31]

What happens at the end of the PILOT?

After the PILOT and the partial exemption under RPTL § 487 ends, a project is subject to real property taxes. Solar and wind projects exceeding 1 MW must apply a valuation method such as those discussed above (i.e., income-based, market-based, or cost-based approach), depending on the tax assessors in the municipality where the project is sited. Using a discounted cash flow approach will take into account the existing age of the asset, which will result in a reduced property tax burden as an asset ages. Governments will receive revenues after the PILOT ends in the form of real property taxes.

Can the tax cap be overridden?

The tax cap is meant to be a safeguard against excessive tax increases, and it aims to encourage fiscal responsibility. While overrides are possible, the process requires passing a local law with the approval of at least 60 percent of the total voting power of the governing body. This ensures that local governments and school districts carefully consider the implications of exceeding the tax cap and justify the need for additional revenue.

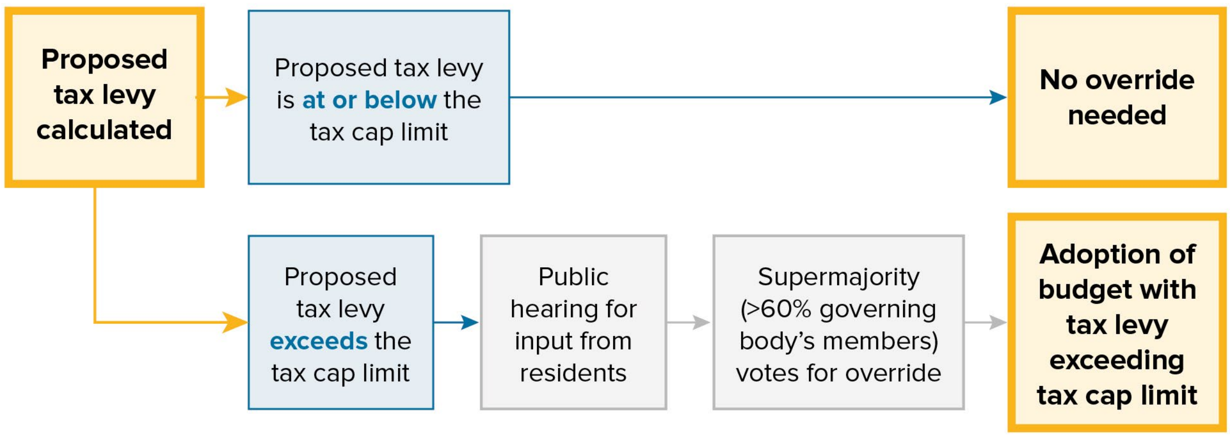
The tax cap can be overridden by local governments (counties, cities, towns, villages) and school districts by performing the following steps:[32]

1. The local government or school district calculates its proposed tax levy for the upcoming fiscal year while considering the tax cap limit;
2. If the proposed tax levy is at or below the tax cap limit, no override is needed. The local government or school district can adopt the budget with a simple majority vote;
3. If the proposed tax levy exceeds the tax cap limit, an override of the tax cap is required to adopt the budget. To override the tax cap, a supermajority vote is needed. For most local governments and school districts, a supermajority is defined as 60% or more of the governing body's members voting in favor of the override;

[29] Property Tax Cap Instructions (ny.gov)
[30] Tax Cap Questions (nysed.gov)
[31] inflation-and-allowable-levy-growth-factors.pdf (ny.gov)
[32] capguidelines.pdf (ny.gov)

4. Before voting on an override, local governments and school districts are required to hold a public hearing to allow residents to provide input on the proposed budget and tax levy increase; and
5. If the necessary supermajority vote is achieved, the local government or school district can adopt the budget with a tax levy that exceeds the tax cap limit.

Figure 6: Tax Cap Override Flowchart



The specific steps required will vary slightly between towns, villages, and counties. Please consult the resources in Footnote 33 above for more information on the procedures needed to pass tax cap override legislation.

6. Summary

RPTL § 487 increases the flexibility of local governments to collect taxes for renewable energy projects within their jurisdiction. Local governments may decide to maintain the property tax exemption to encourage greater solar development or opt out and collect property taxes on developments within their jurisdiction. The flexibility of opting out of property tax exemptions, combined with the ability to negotiate PILOT agreements, gives governments substantial autonomy and ability to attract diverse investments from developers and IDAs for renewable energy projects.

Some key takeaways for municipalities include:

- Tax exemptions are useful incentive tools for localities since they do not require direct subsidies, and are only given after a developer has made their investment to construct and operate a project;
- A municipality may opt out of the RPTL § 487 tax exemption by passing a local law or regulation and filing a copy of the law with the New York Department of Taxation and Finance and NYSERDA;
- If local governments have opted out, but would like to reinstate the exemption, they are able to do so by repealing the local law, ordinance, or legislation, and filing it with the Department of Taxation and Finance and NYSERDA;
- If a local government has not opted out to the RPTL § 487 exemption, they can generate revenue from PILOTs;
- PILOT agreements can be negotiated either between local governments and developers or between an IDA and the developer; these agreements can incentivize development and generate tax revenue;
- Introducing PILOTs can substantially improve solar project economics, relative to property taxes as shown in Figure 2;
- A solar project's viability may be impacted by the applicable property tax rate; Figure 5 illustrates that even projects receiving ITC incentives may not be viable with property tax rates in New York;
- After the PILOT terms expire, a municipality will be able to collect property taxes from the previous exempt facility, and be able to increase their tax levy; and
- PILOT agreements should ensure that prescribed increases are below the 2% property tax cap applicable to all local governments outside of New York City and all independent school districts outside of Buffalo, New York City, Rochester, Syracuse, Yonkers, and Utica.

The revenue from PILOT agreements go primarily to the city, county, or school district; agreements should be carefully negotiated to ensure the needs of the local jurisdictions are evaluated.

Appendix A: Acronyms

Term	Definition
BIDs	Business Improvement Districts
CPI	Consumer Price Index
IDAs	Industrial Development Agencies
GML	General Municipal Law
PILOTs	Payments-in-Lieu of Taxes
RPTL	Real Property Tax Law
SBL	Section-Block-Lot

Appendix B: Model Solar PILOT Law

New York Model Solar Energy System PILOT Law

§1. Title

This Local Law [if for a school district, change "Law" to "Resolution" throughout this document] may be cited as the "Solar Energy System PILOT Law of the [Village/Town/City/County/School District] of ____________________________, New York."

§2. Purpose

This Local Law [Resolution] is adopted to ensure that the benefits of the community's solar energy resource are available to the entire community, by promoting the installation of solar energy generating equipment through a payment-in-lieu-taxes (PILOT), granting reduced costs to system developers and energy consumers, and providing a revenue stream to the entire community.

§3. Authority [IF MUNICIPALITY]

This Local Law is adopted under the authority granted by

1. Article IX of the New York State Constitution, §2(c)(8),
2. New York Statute of Local Governments, § 10 (5),
3. New York Municipal Home Rule Law, § 10 (1)(i) and (ii) and §10 (1)(a)(8), and
4. New York Real Property Tax Law § 487(9).

§3. Authority [IF SCHOOL DISTRICT]

This Resolution is adopted under the authority granted by New York Real Property Tax Law § 487(9).

§4. Definitions

1. "Annual Payment" means the payment due under a PILOT Agreement entered into pursuant to Real Property Tax Law § 487(9).
2. "Annual Payment Date" means January 1st of each year [September 1st for school districts].
3. "Capacity" means the manufacturer's nameplate capacity of the Solar Energy System as measured in kilowatts (kW) or megawatts (MW) AC.
4. "Owner" means the owner of the property on which a Solar Energy System is located or installed, or their lessee, licensee or other person authorized to install and operate a Solar Energy System on the property.
5. "Residential Solar Energy Systems" means a Solar Energy System with a nameplate generating capacity less than 50 kW AC in size, installed on the roof or the property of a residential dwelling (including multi-family dwellings), and designed to serve that dwelling.
6. "Solar Energy Equipment" means collectors, controls, energy storage devices, heat pumps and pumps, heat exchangers, windmills, and other materials, hardware or equipment necessary to the process by which solar radiation is (i) collected, (ii) converted into another form of energy such as thermal, electrical, mechanical or chemical, (iii) stored, (iv) protected from unnecessary dissipation and (v) distributed. It does not include pipes, controls, insulation or other equipment which are part of the normal heating, cooling, or insulation system of a building. It does include insulated glazing or insulation to the extent that such materials exceed the energy efficiency standards required by New York law.

7. “Solar Energy System” means an arrangement or combination of Solar Energy Equipment designed to provide heating, cooling, hot water, or mechanical, chemical, or electrical energy by the collection of solar energy and its conversion, storage, protection and distribution.

§5. PILOT Required

1. The owner of a property on which a Solar Energy System is located or installed (including any improvement, reconstruction, or replacement thereof), shall enter into a PILOT Agreement with the [Village/Town/City/County/School District] consistent with the terms of this Local Law [Resolution], except for
    a) Residential Solar Energy Systems
    b) Solar Energy Systems that do not seek or qualify for an exemption from real property taxes pursuant to Real Property Tax Law § 487(4).
2. The Lessee or licensee of any owner of a property required to enter into a PILOT Agreement by this section, which owns or controls the Solar Energy System, may enter into the PILOT Agreement on behalf of the owner of the property.
3. Upon receipt of any notification from an owner or other person of intent to install a Solar Energy System, the [title of appropriate official, e.g., Town Supervisor, Superintendent, Building Inspector] shall immediately, but in no case more than sixty days after receipt of the notification, notify the owner or other person of the mandatory required for a PILOT Agreement pursuant to the terms of this Local Law [Resolution].
4. Nothing in this Local Law [Resolution] shall exempt any requirement for compliance with state and local codes for the installation of any solar energy equipment or a solar energy system, or authorize the installation of any solar energy equipment or a solar energy system. All solar energy systems must file a Real Property Tax Exemption application pursuant to Real Property Tax Law § 487 to receive a tax exemption.

§6. Contents of PILOT Agreements

1. Each PILOT Agreement entered into shall include
    a) Name and contact information of the Owner or other party authorized to act upon behalf of the Owner of the Solar Energy System.
    b) The SBL number for each parcel or portion of a parcel on which the Solar Energy System will be located.
    c) A requirement for fifteen successive annual payments, to be paid commencing on the first Annual Payment Date after the effective date of the Real Property Tax Exemption granted pursuant to Real Property Tax Law § 487.
    d) The Capacity of the Solar Energy System, and that if the Capacity is increased or increased as a result of a system upgrade, replacement, partial removal or retirement of Solar Energy Equipment, the annual payments shall be increased or decreased on a pro rata basis for the remaining years of the Agreement.
    e) That the parties agree that under the authority of Real Property Tax Law § 487 the Solar Energy System shall be considered exempt from real property taxes for the fifteen-year life of the PILOT Agreement.
    f) That the PILOT Agreement may not be assigned without the prior written consent of the [Village/Town/City/County/School District], which consent may not be unreasonably withheld if the Assignee has agreed in writing to accept all obligations of the Owner, except that the Owner may, with advance written notice to the [Village/Town/City/County/School District] but without prior consent, assign its payment obligations under the PILOT Agreement to an affiliate of the Owner or to any party who has provided or is providing financing to the Owner for or related to the Solar Energy System, and has agreed in writing to accept all payment obligations of the Owner.

g) That a Notice of this Agreement may be recorded by the Owner at its expense, and that the [Village/Town/City/County/School District] shall cooperate in the execution of any Notices or Assignments with the Owner and its successors.

h) That the Annual Payment shall be

i) For Solar Energy Systems with a Capacity greater than 1 MW, $ _________ per MW of Capacity.

i) That the Annual Payment shall escalate _____ percent (___%) per year, starting with the second Annual Payment.

j) That if the Annual Payment is not paid when due, that upon failure to cure within thirty days, the [Village/Town/City/County/School District] may cancel the PILOT Agreement without notice to the Owner, and the Solar Energy System shall thereafter be subject to taxation at its full assessed value.

§7. Severability

Should any provision of this Local Law [Resolution] be declared by the courts to be unconstitutional or invalid, such decision shall not affect the validity of this Local Law [Resolution] as a whole or any part thereof other than the part so decided to be unconstitutional or invalid.

§8. Effective Date

This Local Law [Resolution] shall be effective upon its filing with the Secretary of State in accordance with the Municipal Home Rule Law, and shall apply to all solar energy systems constructed.

Appendix C: Solar PILOT Model Agreement Single Jurisdiction

PAYMENT IN LIEU OF TAXES AGREEMENT

FOR SOLAR ENERGY SYSTEMS

between

[NAME OF TAXING JURISDICTION]

and

[NAME OF OWNER]

Dated as of ______________________________ , 2017

RELATING TO THE PREMISES LOCATED AT ______________________________ ,

(TAX MAP ______________________________)

IN ______________________________ COUNTY, NEW YORK.

PAYMENT IN LIEU OF TAXES AGREEMENT
FOR SOLAR ENERGY SYSTEMS PURSUANT TO REAL PROPERTY TAX LAW § 487

THIS AGREEMENT FOR PAYMENT IN LIEU OF TAXES FOR REAL PROPERTY, effective as of the date on the cover page, above, by and between [ENTER OWNER NAME] (the "Owner"), a __________________________ Owner, with a principal place of business located at ____ [ENTER ADDRESS]; and [choose ONE as appropriate]

the [ENTER SCHOOL DISTRICT NAME], (the "School District"), a school district duly established with a principal place of business located at _______________________________________ [ENTER ADDRESS];

the [Village/Town/City] of____________________________, New York, (the "Town"), a municipal corporation duly established in __________________ County with a principal place of business located at ____ [ENTER ADDRESS];

the County of ___________________________, New York, a municipal corporation duly established with a principal place of business located at _______________________________________ [ENTER ADDRESS] (the "County");

the School District/Town/County is herein referred to as the "Taxing Jurisdiction." Owner and the Taxing Jurisdiction are collectively referred to in this Agreement as the "Parties" and are individually referred to as a "Party."

RECITALS

WHEREAS, Owner has submitted a Notice of Intent to the Taxing Jurisdiction that it plans to build and operate a "Solar Energy System" as defined in New York Real Property Tax Law ("RPTL") Section 487 (1)(b) (herein the "Project") with an expected nameplate capacity ("Capacity'') of approximately ____ Megawatts AC on a parcel of land located within the Village/Town/City at ____________________ and identified as SBL # ________________, as described in Exhibit A (herein the "Property"); and;

WHEREAS, the Taxing Jurisdiction has not opted out of RPTL Section 487; and

WHEREAS, pursuant to RPTL Section 487 (9)(a), the Taxing Jurisdiction has indicated its intent to require a Payment in Lieu of Taxes ("PILOT") Agreement with the Owner, under which the Owner (or any successor owner of the Project) will be required to make annual payments to the Taxing Jurisdiction for each year during the term of this Agreement; and

WHEREAS, the Owner has submitted or will submit to the assessor of the (Village/Town/City) a RP-487 Application for Tax Exemption of Solar or Wind Energy Systems or Farm Waste Energy Systems, demonstrating its eligibility for a real property tax exemption pursuant to RPTL Section 487; and

WHEREAS, the Parties intend that, during the term of this Agreement, the Project will be placed on exempt portion of the assessment roll and the Owner will not be assessed for any statutory real property taxes for which it might otherwise be subjected under New York law with respect to the Project.

NOW THEREFORE, for and in consideration of the mutual covenants hereinafter contained, the receipt and sufficiency of which are hereby acknowledged, the Parties hereby agree as follows:

1. Representations of the Parties.

(a) The Owner hereby represents, warrants, and covenants that, as of the date of this Agreement:

1. The Owner is duly organized, and a validly existing ________________ (corporation, limited liability company, etc.) duly authorized to do business in the State of New York, has requisite authority to conduct its business as presently conducted or proposed to be conducted under this Agreement, and has full legal right, power, and authority to execute, deliver, and perform all applicable terms and provisions of this Agreement.

2. All necessary action has been taken to authorize the Owner's execution, delivery, and performance of this Agreement and this Agreement constitutes the Owner's legal, valid, and binding obligation enforceable against it in accordance with its terms.

3. None of the execution or delivery of this Agreement, the performance of the obligations in connection with the transactions contemplated hereby, or the fulfillment of the terms and conditions hereof will (i) conflict with or violate any provision of the Owner's Certificate of Incorporation, Certificate of Formation, bylaws or other organizational documents or of any restriction or any agreement or instrument to which the Owner is a party and by which it is bound; (ii) conflict with, violate, or result in a breach of any applicable law, rule, regulation, or order of any court or other taxing jurisdiction or authority of government or ordinance of the State or any political subdivision thereof; or (iii) conflict with, violate, or result in a breach of or constitute a default under or result in the imposition or creation of any mortgage, pledge, lien, security interest, or other encumbrance under this Agreement or under any term or condition of any mortgage, indenture, or any other agreement or instrument to which it is a party or by which it or any of the Owner's properties or assets are bound. There is no action, suit, or proceeding, at law or in equity, or official investigation before or by any government authority pending or, to its knowledge, threatened against the Owner, wherein an anticipated decision, ruling, or finding would result in a material adverse effect on the Owner's ability to perform its obligations under this Agreement or on the validity or enforceability of this Agreement.

(b) The Taxing Jurisdiction hereby represents, warrants, and covenants that, as of the date of this Agreement:

1. The Taxing Jurisdiction is duly organized, validly existing, and in good standing under the laws of the State of New York and has full legal right, power, and authority to execute, deliver, and perform all applicable terms and provisions of this Agreement.

2. All necessary action has been taken to authorize the Taxing Jurisdiction's execution, delivery, and performance of this Agreement, and this Agreement constitutes the Taxing Jurisdiction's legal, valid, and binding obligation enforceable against it in accordance with its terms.

3. No governmental approval by or with any government authority is required for the valid execution, delivery, and performance under this Agreement by the Taxing Jurisdiction except such as have been duly or will be obtained or made.

4. There is no action, suit, or proceeding, at law or in equity, or official investigation before or by any government authority pending or, to its knowledge, threatened against the Taxing Jurisdiction, wherein an anticipated decision, ruling, or finding would result in a material adverse effect on the Taxing Jurisdiction's ability to perform its obligations under this Agreement or on the validity or enforceability of this Agreement.

2. Tax Exemption; Payment in Lieu of Real Property Taxes.

(a) Tax-Exempt Status of the Project Facility. Pursuant to RPTL 487 the Parties hereto agree that the Project shall be placed by the Taxing Jurisdiction as exempt upon the assessment rolls of the Taxing Jurisdiction. A Real Property Tax Exemption Form (RP 487) has or will be filed with the Assessor responsible for the Taxing Jurisdiction and the Project is eligible for exemption pursuant to RPTL 487 (4).

(b) Owner agrees to make annual payments to the Taxing Jurisdiction in lieu of real property taxes for the Project for a period of fifteen (15) consecutive fiscal tax years; annual payments may not exceed the amounts that would otherwise be payable but for the RPTL 487 exemption. Such 15-year term shall commence on the first taxable status date selected by Owner following commencement of the construction of the Project (the "Commencement Date"), and shall end the fifteenth fiscal year following the Commercial Operations Date. The first annual payment shall be in the amount of $__________ per Megawatt AC of Capacity (the "Annual Payment"). Thereafter Annual Payments will escalate by _____ percent (___%) per year. Based on the Capacity of _____ Megawatts AC, Annual Payments to be made by Owner during the term of this Agreement shall be as listed in Exhibit B. Each Annual Payment will be paid to the Taxing Jurisdiction in accordance with Section 5 of this Agreement; and the annual payment amount and payment date will be noted on an annual bill issued by the Taxing Jurisdiction to the Owner, provided that any failure of the Taxing Jurisdiction to issue such a bill shall not relieve Owner of its obligation to make timely payments under this section.

(c) Owner agrees that the payments in lieu of taxes under this Agreement will not be reduced on account of a depreciation factor or reduction in the Taxing Jurisdiction tax rate, and the Taxing Jurisdiction agrees that the payments in lieu of taxes will not be increased on account of an inflation factor or increase in the Taxing Jurisdiction tax rate, all of which factors have been considered in arriving at the payment amounts reflected in this Agreement.

3. **Change in Capacity at Mechanical Completion: Adjustments to Payments.** To the extent that the Capacity of the Project is more or less than the ______ Megawatts AC on the date when the Project is mechanically complete and Owner has commenced production of electricity, the payments set forth in Exhibit B will be increased or decreased on a pro rata basis.

4. **Change in Capacity After Mechanical Completion: Adjustments to Payments.** If after the Completion Date the Capacity is increased or decreased as a result of the replacement or upgrade or partial removal or retirement of existing Project equipment or property or the addition of new Project equipment or property, the Annual Payments set forth in Exhibit B shall be increased or decreased on a pro rata basis for the remaining years of the Agreement.

5. **Payment Collection.** (depending on the type of jurisdiction – choose ONE)

Payments for the School District shall be made payable to the ________________ School District and mailed to the School District, c/o the Superintendent's Office, located at [ENTER SCHOOL DISTRICT ADDRESS] and are due no later than September 15th of each year.

Payments for the Town shall be made payable to the Town of ________________ and mailed to the Town of ________________, c/o the Town of _______________ Supervisor's Office, located at [ENTER TOWN ADDRESS] and are due no later than February 15th of each year.

Payments for the County shall be made payable to the County Treasurer and mailed to the County of ________________, c/o [ENTER COUNTY ADDRESS], and are due no later than February 15th of each year.

All late payments shall accrue interest at the statutory rate for late tax payments under New York Law. Owner shall pay the reasonable attorney fees, court and other costs incurred by the Taxing Jurisdiction in the collection of the unpaid amounts. All payments by the Owner hereunder shall be paid in lawful money of the United States of America.

6. **Tax Status. Separate Tax Lot.** The Taxing Jurisdiction agrees that during the term of this Agreement, the Taxing Jurisdiction will not assess Owner for any real property taxes with respect to the Project to which Owner might otherwise be subject under New York law, and the Taxing Jurisdiction agrees that this Agreement will exclusively govern the payments of all such taxes, provided, however, that this Agreement is not intended to affect, and will not preclude the Taxing Jurisdiction from assessing, any other taxes, fees, charges, rates or assessments which the Owner is obligated to pay, including, but not limited to, special assessments or special district assessments, fees, or charges for services provided by the Taxing Jurisdiction to the Project. Nothing in this Agreement shall limit the right of the Owner to challenge the assessment of the Project pursuant to the RPTL.

7. **No Assignments Without Prior Notice; Binding Effect.**

(a) This Agreement may not be assigned by Owner without the prior written consent of the Taxing Jurisdiction; such consent may not be unreasonably withheld if the Assignee has agreed in writing to accept all obligations of the Owner. The restrictions on assignment contained herein do not prohibit or otherwise limit changes in control of Owner. If Owner assigns this Agreement with the advance written consent of the Taxing Jurisdiction, the Owner shall be released from all obligations under this Agreement upon assumption hereof in writing by the assignee, provided that Owner shall, as a condition of such assignment and to the reasonable satisfaction of the Taxing Jurisdiction, cure any defaults and satisfy all liabilities arising under this Agreement prior to the date of such assignment. A Notice of this Agreement may be recorded by Owner and the Taxing Jurisdiction shall cooperate in the execution of required Assignments with the Owner and its successors. Owner may, with advance written notice to the Taxing Jurisdiction and without prior consent, assign this Agreement to an affiliate of Owner or to any party who has provided or is providing financing to Owner for the construction, operation and/or maintenance of the Project.

(b) Binding Effect. This PILOT Agreement shall inure to the benefit of, and shall be binding upon, the Taxing Jurisdiction, the Owner and their respective successors and assigns.

8. **Statement of Good Faith.** The Parties agree that the payment obligations established by this Agreement have been negotiated in good faith in recognition of and with due consideration of the full and fair taxable value of the Project.

9. **Additional Documentation and Actions.** Subject to applicable laws and regulations, each Party will, from time to time hereafter, execute and deliver or cause to be executed and delivered, such reasonable additional instruments and documents as the other Party reasonably requests for the purpose of implementing or effectuating the provisions of this Agreement. Owner shall pay all reasonable attorneys' and consulting fees incurred by the Taxing Jurisdiction to review and negotiate any such instruments or documents.

10. **Notices.** All notices, consents, requests, or other communications provided for or permitted to be given hereunder by a Party must be in writing and will be deemed to have been properly given or served upon the personal delivery thereof, via courier delivery service, by hand, or by certified mail, return receipt requested. Such notices shall be addressed or delivered to the Parties at their respective addresses shown below.

If to Owner:

With a copy to:

If to the Taxing Jurisdiction:

Attn: Superintendent
Mayor
Town Supervisor
County

With a copy to:

Any such addresses for the giving of notices may be changed by either Party by giving written notice as provided above to the other Party. Notice given by counsel to a Party shall be effective as notice from such Party.

11. **Applicable Law.** This Agreement will be made and interpreted in accordance with the laws of the State of New York. Owner and the Taxing Jurisdiction each consent to the jurisdiction of the New York courts in and for the County in which the Project is located regarding any and all matters, including interpretation or enforcement of this Agreement or any of its provisions. Accordingly, any litigation arising hereunder shall be brought solely in such courts.

12. Termination Rights of the Owner. Owner may terminate this Agreement at any time by Notice to the Taxing Jurisdiction. Upon receipt of the Notice of Termination, the Project shall be placed on the taxable portion of the tax roll effective on the next taxable status date of the Taxing Jurisdiction. Owner shall be liable for all PILOT payments due in the year of termination, except that if Owner is required to pay any part-year real property taxes, the PILOT payment for that year shall be reduced pro rata so that the Owner is not required to pay both PILOT payments and real property taxes for any period of time.

13. Termination Rights of Taxing Jurisdiction. Notwithstanding anything to the contrary in this Agreement, the Taxing Jurisdiction may terminate this Agreement on thirty (30) days written notice to Owner if:

(a.) Owner fails to make timely payments required under this Agreement, unless such payment is received by the Taxing Jurisdiction within the 30-day notice period with interest as stated in this Agreement

(b.) Owner has filed, or has had filed against it, a petition in Bankruptcy, or is otherwise insolvent;

14. Remedies; Waiver And Notice.

(a.) No Remedy Exclusive. No remedy herein conferred upon or reserved to Party is intended to be exclusive of any other available remedy or remedies, but each and every such remedy shall be cumulative and shall be in addition to every other remedy given under this Agreement or now or hereafter existing at law or in equity or by statute.

(b.) Delay. No delay or omission in exercising any right or power accruing upon the occurrence of any breach of an obligation hereunder shall impair any such right or power or shall be construed to be a waiver thereof, but any such right or power may be exercised from time to time and as often as may be deemed expedient.

(c.) No Waiver. In the event any provision contained in this Agreement should be breached by any party and thereafter duly waived by the other party so empowered to act, such waiver shall be limited to the particular breach so waived and shall not be deemed to be a waiver of any other breach hereunder. No waiver, amendment, release or modification of this Agreement shall be established by conduct, custom or course of dealing.

15. Entire Agreement. The Parties agree that this is the entire, fully integrated Agreement between them with respect to payments in lieu of taxes for the Project.

16. Amendments. This Agreement may not be effectively amended, changed, modified, altered or terminated except by an instrument in writing executed by the parties hereto.

17. No Third Party Beneficiaries. The Parties state that there are no third-party beneficiaries to this Agreement.

18. Severability. If any article, section, subdivision, paragraph, sentence, clause, phrase, provision or portion of this Agreement shall for any reason be held or adjudged to be invalid or illegal or unenforceable by any court of competent jurisdiction, such article, section, subdivision, paragraph, sentence, clause, phrase, provision or portion so adjudged invalid, illegal or unenforceable shall be deemed separate, distinct and independent and the remainder of this Agreement shall be and remain in full force and effect and shall not be invalidated or rendered illegal or unenforceable or otherwise affected by such holding or adjudication.

19. Counterparts. This Agreement may be simultaneously executed in several counterparts, each of which shall be an original and all of which shall constitute but one and the same instrument.

Executed by the undersigned as of the day and year first written above, each of whom represents that it is fully and duly authorized to act on behalf of and bind its principals.

By:

Name

Title

Date

TAXING JURISDICTION OF

____

Superintendent/Supervisor/County Official

Date

EXHIBIT A

Description of Land

EXHIBIT B

Year	Payment Amount

Appendix D: Solar PILOT Model Agreement Multiple Jurisdictions

PAYMENT IN LIEU OF TAXES AGREEMENT

FOR SOLAR ENERGY SYSTEMS

between

[NAME OF TAXING JURISDICTIONS]

and

[NAME OF OWNER]

Dated as of ____________________________ , 2017

RELATING TO THE PREMISES LOCATED AT ____________________________ ,

(TAX MAP ____________________________)

IN ____________________________ COUNTY, NEW YORK.

PAYMENT IN LIEU OF TAXES AGREEMENT
FOR SOLAR ENERGY SYSTEMS PURSUANT TO REAL PROPERTY TAX LAW § 487

THIS AGREEMENT FOR PAYMENT IN LIEU OF TAXES FOR REAL PROPERTY, effective as of the date on the cover page, above, by and between [ENTER NAME OF OWNER] ("Owner"), a ______________________ Owner, with a principal place of business located at [ENTER OWNER ADDRESS]; the [ENTER SCHOOL DISTRICT NAME], (the "School District"), a school district duly established with a principal place of business located at [ENTER SCHOOL DISTRICT ADDRESS]; the [Town/Village/City] of ________________, New York, (the "Town"), a municipal corporation duly established with a principal place of business at [ENTER TOWN ADDRESS]; and the County of __________, New York, a municipal corporation duly established with a principal place of business at [ENTER COUNTY ADDRESS] (the "County").

The School District, Town and County are herein collectively referred to as the "Taxing Jurisdictions." Owner and the Taxing Jurisdictions are collectively referred to in this Agreement as the "Parties" and are individually referred to as a "Party."

RECITALS

WHEREAS, Owner has submitted a Notice of Intent to each of the Taxing Jurisdictions that it plans to build and operate a "Solar Energy System" as defined in New York Real Property Tax Law ("RPTL") Section 487 (1)(b) (herein the "Project") with an expected nameplate capacity ("Capacity'') of approximately ____ Megawatts AC on a parcel of land located within the Town/Village/City at _______________ and identified as SBL # ____________, as described in Exhibit A (herein the "Property"); and;

WHEREAS, none of the Taxing Jurisdictions have opted out of RPTL Section 487; and

WHEREAS, pursuant to RPTL Section 487 (9)(a), the Taxing Jurisdictions have indicated their intent to require a Payment in Lieu of Taxes ("PILOT") Agreement with the Owner, under which the Owner (or any successor owner of the Project) will be required to make annual payments to each of the Taxing Jurisdictions for each year during the term of this Agreement; and

WHEREAS, the Owner has submitted or will submit to the assessor of the (Town/Village/City) a RP-487 Application for Tax Exemption of Solar or Wind Energy Systems or Farm Waste Energy Systems, demonstrating its eligibility for a real property tax exemption pursuant to RPTL Section 487; and

WHEREAS, the Parties intend that, during the term of this Agreement, the Project will be placed on exempt portion of the assessment roll and the Owner will not be assessed for any statutory real property taxes for which it might otherwise be subjected under New York law with respect to the Project.

NOW THEREFORE, for and in consideration of the mutual covenants hereinafter contained, the receipt and sufficiency of which are hereby acknowledged, the Parties hereby agree as follows:

1. Representations of the Parties.

(a) The Owner hereby represents, warrants, and covenants that, as of the date of this Agreement:

1. The Owner is duly organized, and a validly existing ____________ (corporation, limited liability company) duly authorized to do business in the State of New York, has requisite authority to conduct its business as presently conducted or proposed to be conducted under this Agreement, and has full legal right, power, and authority to execute, deliver, and perform all applicable terms and provisions of this Agreement.

2. All necessary action has been taken to authorize the Owner's execution, delivery, and performance of this Agreement and this Agreement constitutes the Owner's legal, valid, and binding obligation enforceable against it in accordance with its terms.

3. None of the execution or delivery of this Agreement, the performance of the obligations in connection with the transactions contemplated hereby, or the fulfillment of the terms and conditions hereof will (i) conflict with or violate any provision of the Owner's Certificate of Incorporation, Certificate of Formation, bylaws or other organizational documents or of any restriction or any agreement or instrument to which the Owner is a party and by which it is bound; (ii) conflict with, violate, or result in a breach of any applicable law, rule, regulation, or order of any court or other taxing jurisdictions or authority of government or ordinance of the State or any political subdivision thereof; or (iii) conflict with, violate, or result in a breach of or constitute a default under or result in the imposition or creation

of any mortgage, pledge, lien, security interest, or other encumbrance under this Agreement or under any term or condition of any mortgage, indenture, or any other agreement or instrument to which it is a party or by which it or any of the Owner's properties or assets are bound. There is no action, suit, or proceeding, at law or in equity, or official investigation before or by any government authority pending or, to its knowledge, threatened against the Owner, wherein an anticipated decision, ruling, or finding would result in a material adverse effect on the Owner's ability to perform its obligations under this Agreement or on the validity or enforceability of this Agreement.

(b) The Taxing Jurisdictions hereby represent, warrant, and covenant that, as of the date of this Agreement:

1. The Taxing Jurisdictions are each duly organized, validly existing, and in good standing under the laws of the State of New York and has full legal right, power, and authority to execute, deliver, and perform all applicable terms and provisions of this Agreement.
2. All necessary action has been taken to authorize each of the Taxing Jurisdiction's execution, delivery, and performance of this Agreement, and this Agreement constitutes each of the Taxing Jurisdiction's legal, valid, and binding obligation enforceable against it in accordance with its terms.
3. No governmental approval by or with any government authority is required for the valid execution, delivery, and performance under this Agreement by the Taxing Jurisdictions except such as have been duly or will be obtained or made.
4. There is no action, suit, or proceeding, at law or in equity, or official investigation before or by any government authority pending or, to its knowledge, threatened against the Taxing Jurisdictions, wherein an anticipated decision, ruling, or finding would result in a material adverse effect on the Taxing Jurisdictions' ability to perform its obligations under this Agreement or on the validity or enforceability of this Agreement.

2. Tax Exemption; Payment in Lieu of Real Property Taxes.

(a) Tax-Exempt Status of the Project Facility. Pursuant to RPTL 487 the Parties hereto agree that the Project shall be placed by the Taxing Jurisdictions as exempt upon the assessment rolls of the Taxing Jurisdictions. A Real Property Tax Exemption Form (RP 487) has or will be filed with the Taxing Jurisdictions and the Project is eligible for exemption pursuant to RPTL 487 (4).

(b) Owner agrees to make annual payments to the Taxing Jurisdictions in lieu of real property taxes for the Project for a period of fifteen (15) consecutive fiscal tax years; annual payments may not exceed the amounts that would otherwise be payable but for the RPTL 487 exemption. Such 15-year term shall commence on the first taxable status date selected by Owner following commencement of the construction of the Project (the "Commencement Date"), and shall end the fifteenth fiscal year following the Commercial Operations Date. The first annual payment shall be in the amount of $__________ per Megawatt AC of Capacity (the "Annual Payment"). Thereafter Annual Payments will escalate by _____ percent (___%) per year. Based on the Capacity of _____ Megawatts AC, Annual Payments to be made by Owner during the term of this Agreement shall be as listed in Exhibit B. Each Annual Payment will be paid to the Taxing Jurisdictions in accordance with Section 5 of this Agreement; and the annual payment amount and payment date will be noted on an annual bill issued by the Taxing Jurisdictions to the Owner, provided that any failure of the Taxing Jurisdictions to issue such a bill shall not relieve Owner of its obligation to make timely payments under this section.

(c) Owner agrees that the payments in lieu of taxes under this Agreement will not be reduced on account of a depreciation factor or reduction in the Taxing Jurisdictions' tax rate, and the Taxing Jurisdictions agree that the payments in lieu of taxes will not be increased on account of an inflation factor or increase in the Taxing Jurisdictions' tax rate, all of which factors have been considered in arriving at the payment amounts reflected in this Agreement.

(d) The Taxing Jurisdictions shall be paid their portion of the Annual Payment based on their respective share of the total tax rate that would have been applicable to the Project if it were taxable on the Commencement date, and each anniversary of the Commencement date thereafter.

3. Change in Capacity at Mechanical Completion: Adjustments to Payments. To the extent that the Capacity of the Project is more or less than the ______ Megawatts AC on the date when the Project is mechanically complete and Owner has commenced production of electricity, the payments set forth in Exhibit B will be increased or decreased on a pro rata basis.

4. **Change in Capacity After Mechanical Completion: Adjustments to Payments.** If after the Completion Date the Capacity is increased or increased as a result of the replacement or upgrade or partial removal or retirement of existing Project equipment or property or the addition of new Project equipment or property, the Annual Payments set forth in Exhibit B shall be increased or decreased on a pro rata basis for the remaining years of the Agreement.

5. **Payment Collection.**

Payments for the School District shall be made payable to the ________________ School District and mailed to the School District, c/o the Superintendent's Office, located at [ENTER SCHOOL DISTRICT ADDRESS] and are due no later than September 15th of each year.

Payments for the Town shall be made payable to the Town of ________________ and mailed to the Town of ________________, c/o the Town of _______________ Supervisor's Office, located at [ENTER TOWN ADDRESS] and are due no later than February 15th of each year.

Payments for the County shall be made payable to the County Treasurer and mailed to the County of ________________, c/o [ENTER COUNTY ADDRESS], and are due no later than February 15th of each year.

All late payments shall accrue interest at the statutory rate for late tax payments under New York Law. Owner shall pay the reasonable attorney fees, court and other costs incurred by any of the Taxing Jurisdictions in the collection of the unpaid amounts. All payments by the Owner hereunder shall be paid in lawful money of the United States of America.

6. **Tax Status. Separate Tax Lot.** The Taxing Jurisdictions agree that during the term of this Agreement, the Taxing Jurisdictions will not assess Owner for any real property taxes with respect to the Project to which Owner might otherwise be subject under New York law, and the Taxing Jurisdictions agree that this Agreement will exclusively govern the payments of all such taxes, provided, however, that this Agreement is not intended to affect, and will not preclude the Taxing Jurisdictions from assessing, any other taxes, fees, charges, rates or assessments which the Owner is obligated to pay, including, but not limited to, special assessments or special district assessments, fees, or charges for services provided by the Taxing Jurisdictions to the Project. Nothing in this Agreement shall limit the right of the Owner to challenge the assessment of the Project pursuant to the RPTL.

7. **No Assignments Without Prior Notice; Binding Effect.**

(a) This Agreement may not be assigned by Owner without the prior written consent of the Taxing Jurisdictions; such consent may not be unreasonably withheld if the Assignee has agreed in writing to accept all obligations of the Owner. The restrictions on assignment contained herein do not prohibit or otherwise limit changes in control of Owner. If Owner assigns this Agreement with the advance written consent of the Taxing Jurisdictions, the Owner shall be released from all obligations under this Agreement upon assumption hereof in writing by the assignee, provided that Owner shall, as a condition of such assignment and to the reasonable satisfaction of the Taxing Jurisdictions, cure any defaults and satisfy all liabilities arising under this Agreement prior to the date of such assignment. A Notice of this Agreement may be recorded by Owner and the Taxing Jurisdictions shall cooperate in the execution of required Assignments with the Owner and its successors. Owner may, with advance written notice to the Taxing Jurisdictions and without prior consent, assign this Agreement to an affiliate of Owner or to any party who has provided or is providing financing to Owner for the construction, operation and/or maintenance of the Project.

(b) Binding Effect. This PILOT Agreement shall inure to the benefit of, and shall be binding upon, the Taxing Jurisdictions, the Owner and their respective successors and assigns.

8. **Statement of Good Faith.** The Parties agree that the payment obligations established by this Agreement have been negotiated in good faith in recognition of and with due consideration of the full and fair taxable value of the Project.

9. **<u>Additional Documentation and Actions</u>.** Subject to applicable laws and regulations, each Party will, from time to time hereafter, execute and deliver or cause to be executed and delivered, such reasonable additional instruments and documents as the other Party reasonably requests for the purpose of implementing or effectuating the provisions of this Agreement. Owner shall pay all reasonable attorneys' and consulting fees incurred by the Taxing Jurisdictions to review and negotiate any such instruments or documents.

10. **<u>Notices</u>.** All notices, consents, requests, or other communications provided for or permitted to be given hereunder by a Party must be in writing and will be deemed to have been properly given or served upon the personal delivery thereof, via courier delivery service, by hand, or by certified mail, return receipt requested. Such notices shall be addressed or delivered to the Parties at their respective addresses shown below.

    If to Owner:

    With a copy to:

    If to the Taxing Jurisdictions:

    Attn: Superintendent
    Mayor
    Town Supervisor
    County

    With a copy to:

    Any such addresses for the giving of notices may be changed by either Party by giving written notice as provided above to the other Party. Notice given by counsel to a Party shall be effective as notice from such Party.

11. **<u>Applicable Law</u>.** This Agreement will be made and interpreted in accordance with the laws of the State of New York. Owner and the Taxing Jurisdictions each consent to the jurisdiction of the New York courts in and for the County in which the Project is located regarding any and all matters, including interpretation or enforcement of this Agreement or any of its provisions. Accordingly, any litigation arising hereunder shall be brought solely in such courts.

12. **<u>Termination Rights of the Owner</u>.** Owner may terminate this Agreement at any time by Notice to the Taxing Jurisdictions. Upon receipt of the Notice of Termination, the Project shall be placed on the taxable portion of the tax roll effective on the next taxable status date of the Taxing Jurisdictions. Owner shall be liable for all PILOT payments due in the year of termination, except that if Owner is required to pay any part-year real property taxes, the PILOT payment for that year shall be reduced pro rata so that the Owner is not required to pay both PILOT payments and real property taxes for any period of time.

13. **Termination Rights of Taxing Jurisdiction.** Notwithstanding anything to the contrary in this Agreement, the Taxing Jurisdictions may terminate this Agreement on thirty (30) days written notice to Owner if:

(a.) Owner fails to make timely payments required under this Agreement, unless such payment is received by the Taxing Jurisdictions within the 30-day notice period with interest as stated in this Agreement

(b.) Owner has filed, or has had filed against it, a petition in Bankruptcy, or is otherwise insolvent;

14. **Remedies; Waiver And Notice.**

(a.) No Remedy Exclusive. No remedy herein conferred upon or reserved to Party is intended to be exclusive of any other available remedy or remedies, but each and every such remedy shall be cumulative and shall be in addition to every other remedy given under this Agreement or now or hereafter existing at law or in equity or by statute.

(b.) Delay. No delay or omission in exercising any right or power accruing upon the occurrence of any breach of an obligation hereunder shall impair any such right or power or shall be construed to be a waiver thereof, but any such right or power may be exercised from time to time and as often as may be deemed expedient.

(c.) No Waiver. In the event any provision contained in this Agreement should be breached by any party and thereafter duly waived by the other party so empowered to act, such waiver shall be limited to the particular breach so waived and shall not be deemed to be a waiver of any other breach hereunder. No waiver, amendment, release or modification of this Agreement shall be established by conduct, custom or course of dealing.

15. **Entire Agreement.** The Parties agree that this is the entire, fully integrated Agreement between them with respect to payments in lieu of taxes for the Project.

16. **Amendments.** This Agreement may not be effectively amended, changed, modified, altered or terminated except by an instrument in writing executed by the parties hereto.

17. **No Third Party Beneficiaries.** The Parties state that there are no third-party beneficiaries to this Agreement.

18. **Severability.** If any article, section, subdivision, paragraph, sentence, clause, phrase, provision or portion of this Agreement shall for any reason be held or adjudged to be invalid or illegal or unenforceable by any court of competent jurisdiction, such article, section, subdivision, paragraph, sentence, clause, phrase, provision or portion so adjudged invalid, illegal or unenforceable shall be deemed separate, distinct and independent and the remainder of this Agreement shall be and remain in full force and effect and shall not be invalidated or rendered illegal or unenforceable or otherwise affected by such holding or adjudication.

19. **Counterparts.** This Agreement may be simultaneously executed in several counterparts, each of which shall be an original and all of which shall constitute but one and the same instrument.

Executed by the undersigned as of the day and year first written above, each of whom represents that it is fully and duly authorized to act on behalf of and bind its principals.

By:

Name

Title

Date

TAXING JURISDICTION OF

____

Superintendent/Supervisor/County Official

Date

EXHIBIT A

Description of Land

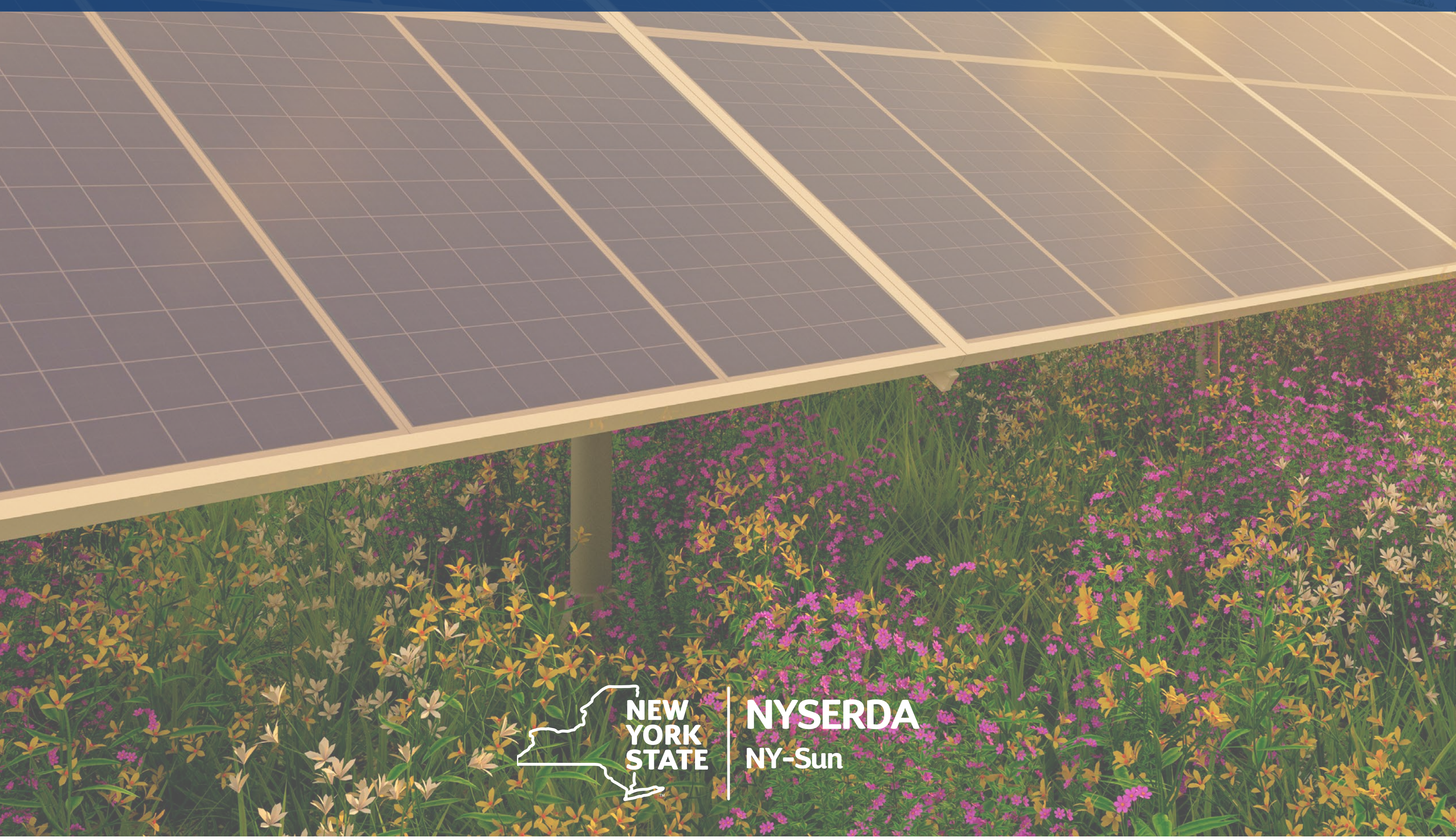
EXHIBIT B

Year	School District Payment Amount	Town Payment Amount	County Payment Amount

Section 7

Decommissioning Solar Panel Systems

Information for local governments and landowners on the decommissioning of large-scale solar panel systems.



NEW YORK STATE | NYSERDA NY-Sun

Section Contents

1. Executive Summary

Decommissioning is an important aspect of the cradle-to-grave lifecycle planning for all renewable energy projects. With proper planning, local authorities ensure project owners are both committed to the responsible management of equipment disposal and financially equipped to complete the decommissioning process. Successful decommissioning is contingent on careful planning, which starts prior to the renewable energy project's construction, and thorough execution to ensure safety, environmental responsibility, and regulatory compliance with a goal to return the land to pre-construction condition so that the land may be repurposed for future use.

This document is intended to equip local governments with the knowledge for decommissioning renewable energy projects such as, solar photovoltaic (PV) systems, including a discussion on other options at the end of a renewable project's useful life, including repowering and recycling. This chapter will provide readers with the information needed to manage decommissioning activities for community scale renewable projects in their jurisdictions. Local governments can find template decommissioning plans in the Model Solar Energy Local Law.[1]

In New York State, utility scale renewable energy projects exceeding 25 MW (also referred to as major or large-scale renewable energy facilities/projects) are permitted at the State level through the Office of Renewable Energy Siting and Electric Transmission (ORES), which require decommissioning plans. Decommissioning plans include important information such as, removal of facilities/ equipment, the roles and responsibilities for project owners and stakeholders, conditions that trigger the decommissioning process, timing to complete decommissioning activities, cost estimates, and enforcement mechanisms. Renewable energy projects less than 25 MW are permitted at the local level and often require decommissioning plans. Most solar energy projects in New York State are community scale renewable energy projects (less than 5 MW).[2]

Financial and non-financial enforcement mechanisms provide municipalities with means to ensure the project owner is responsible for covering decommissioning costs. Estimation of decommissioning costs should be based on reasonable assumptions of long-term inflation to avoid excessively burdening project owners with large surety bonds or decommissioning trusts. Licensed engineers and cost estimating professionals should be retained by project owners to generate accurate decommissioning cost estimates.

Local governments should target the best practices discussed in this chapter to maximize the benefits from renewable energy projects, including:

- Reducing environmental impact of projects;
- Ensuring adequate planning occurs prior to decommissioning; and,
- Reducing the burden on landfills by encouraging recycling or resale of decommissioned projects.

Decommissioning includes the removal of equipment and structure, repurposing, recycling, or disposal of materials, and restoration of the project site. Another option for the end-of-life (EOL) of a renewable energy project is continued use via reuse, refurbishment, or repowering. **Table 1** below summarizes these options for the end of a project's useful life. While the recycling market is still emerging, future technological improvements may increase the viability of commercial recycling for renewable energy projects or expand opportunities for renewable energy projects to continue operations through the reuse, refurbishment, or repowering of equipment.

1 New York State Solar Guidebook - NYSERDA
2 Statewide Distributed Solar Projects: Beginning 2000 | State of New York

Table 1 | Options at the End of Initial Useful Life of a Renewable Energy Project

Continued Use	Decommissioning
Reuse: Continue to use and maintain the equipment beyond its useful life either at the project site or as part of a new project, such as residential use. Anticipate degradation in output over time.	**Recycling:** Recover high value materials such as metals and glass, between **80%-90%**[3] of the weight of a solar panel or wind turbine made of recyclable materials.
Refurbishment: The operator may make repairs to a solar panel to extend its lifespan. This can be challenging due to finding older parts or sufficiently experienced labor for older technologies.	**Repurpose:** Use components, or parts of components to create new products. For example, wind turbine blades have been used in the construction of pedestrian bridges. This is not a high-volume option.
Repowering: Retrofitting or replacing components of the system to restore or improve the project's output. For solar, this is typically performed through installing new solar panel arrays and inverters. For wind, this can be accomplished by upgrading blades or even replacing the towers and foundation based on technological improvements.	**Disposal:** Landfill disposal is the least expensive option, though it has significant environmental drawbacks. Some solar panels contain fully enclosed, but trace amounts of lead and cadmium,[4] and may be considered hazardous waste under USEPA legislation.[5] Certain states have enacted policies to limit solar panel waste.

This chapter is for informational purposes only. The content does not, and is not intended to, constitute legal, financial, or tax advice. Readers should consult with their attorney, financial, and/ or tax advisor prior to taking, or refraining from taking, any particular action on the basis of information contained herein.

2. Introduction

At the end of a renewable energy project's initial service life, it can be decommissioned (removed) or repowered (using existing infrastructure with newer equipment). Decommissioning is the process of removing renewable energy projects, ancillary equipment, and related structures from a site and restoring the land to its pre-construction condition so that the land may be repurposed for future use. Given the low impact of renewables on the environment, land can be repurposed for various uses at the end-of-life (EOL). Decommissioning takes place after a renewable energy facility has been abandoned or reaches the end of its lifespan – on average after 25 to 30 years of operations. As the number of renewable energy projects has grown rapidly, the need to plan for the EOL considerations have become more important.

While many renewable energy projects are still young, some of the older projects are approaching their EOL. According to OpenNY's Solar Electric Programs supported by NYSERDA, over 8,000 megawatts-dc (MW-dc) have been installed since 2000. The earliest projects installed are now reaching 20 years of service and are approaching the end of their initial useful life, though the average age of all projects is about six years. Approximately 2,200 MW of onshore wind turbines have also been installed since 2000, some of which will be approaching EOL in the next five years. Battery energy storage system (BESS) is a newer technology, which has more time before those projects need to be decommissioned.

Even though decommissioning takes place long after a project is designed and constructed, a renewable energy developer is required to prepare plans for the decommissioning of their project during the planning and permitting phase, prior to project construction. Projects smaller than 25MW usually need to submit decommissioning plans, depending on local requirements.

Model Decommissioning Plan: Local officials should consult the template Model Solar Energy Local Law on NYSERDA's website, which includes a template decommissioning plan that local jurisdictions can be customized as needed.

[3] WINDExchange: End of Service Wind Turbine Guide (energy.gov)
[4] Most solar panels in New York State are crystalline silicone (c-Si) and not cadmium telluride based, Technology Trends | Energy Markets & Policy (lbl.gov)
[5] End-of-Life Solar Panels: Regulations and Management | US EPA

The decommissioning plans must include decommissioning surety bonds or another form of financial assurance that would secure either all or part of the costs required for decommissioning. The purpose of financial assurance is to provide the landowner of a renewable energy site, among other stakeholders, with proof that a decommissioning plan can fully be carried out in line with projected costs. The specific requirements for decommissioning are subject to the expected useful life of the equipment, the size of the project (defined in MW), and the rules and regulations of the state and local jurisdictions. Currently, there are no decommissioning requirements at the State level for solar and wind energy projects that are less than 25 MW.

Projects that are larger than 25 MW and any co-located system storing energy generated from such a renewable energy system prior to delivering it to the bulk transmission system are permitted through the Office of Renewable Energy Siting and Electric Transmission (ORES) which established procedural and substantive requirements for permits for the siting, design, construction, operation, compliance, enforcement, and modification of major renewable energy projects pursuant to Title 16 of the New York Public Service Law. ORES requirements specify the need for a decommissioning plan.

There are specific decommissioning requirements for battery energy storage systems, which can be found in *New York State Battery Energy Storage System Guidebook*.[6] Many local authorities are directing project owners to commit to the responsible management for removal, disposal and/or recycling of equipment and the costs associated with those processes. Successful decommissioning is contingent on careful planning from the outset, and thorough execution to ensure safety, environmental responsibility, and regulatory compliance with a goal to return the land to a similar state in a sustainable manner.

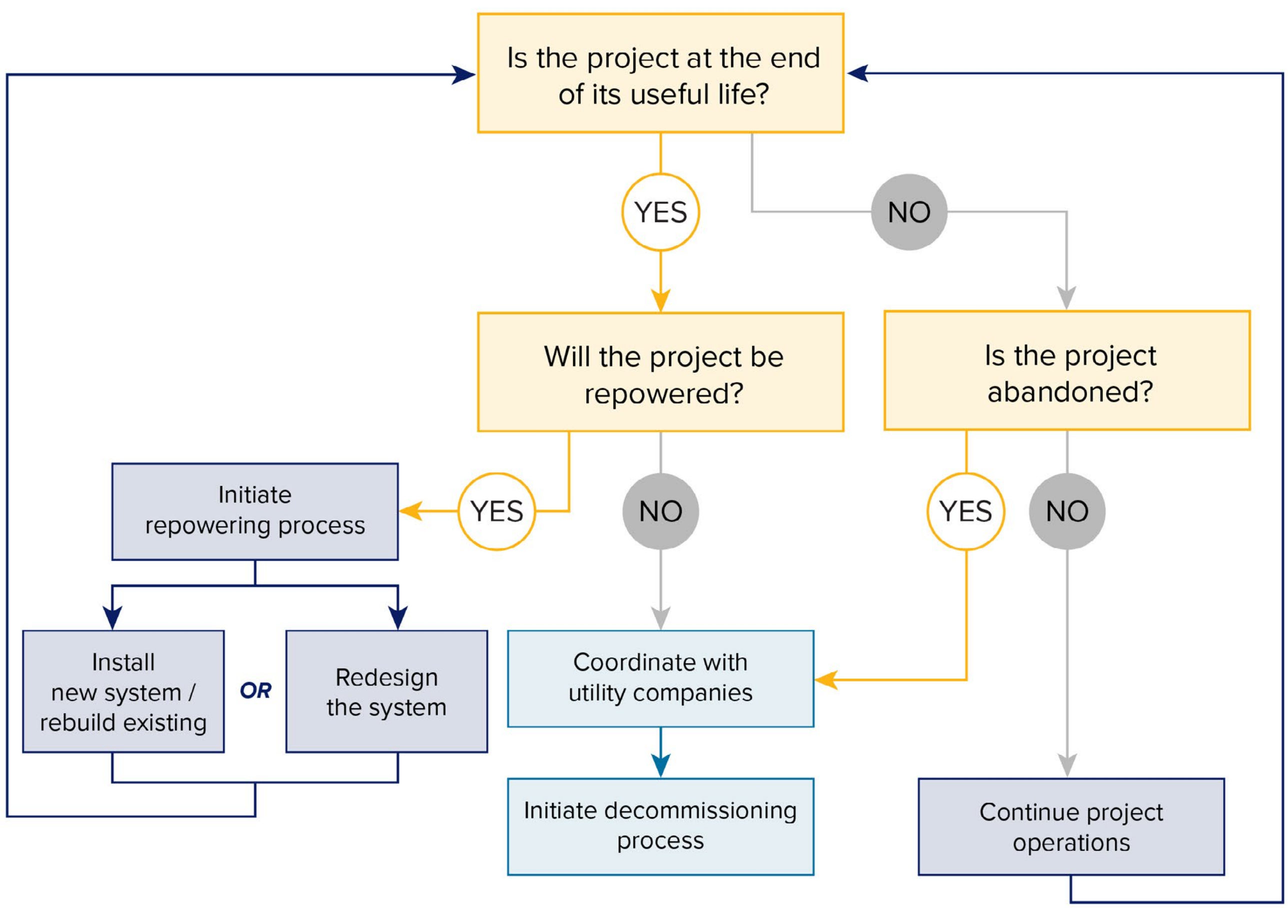
This chapter will provide an overview of decommissioning and associated activities as they relate to renewable energy projects. In this document, "**renewable energy projects**" include solar, onshore wind, and battery storage energy projects, and **exclude offshore wind energy projects**, unless otherwise noted.

6 New York State Battery Energy Storage System Guidebook

3. What options are available at the end of a renewable energy project's useful life?

There are two options available at the end of a renewable energy project's service life: repower utilizing existing infrastructure, which requires less capital expenditure; or remove the facility. Figure 1 below illustrates the EOL considerations and the decommissioning process for renewable energy projects.

Figure 1 | Renewable Energy Project's End of Useful Life Decision Process



4. Decommissioning Projects

What is decommissioning?

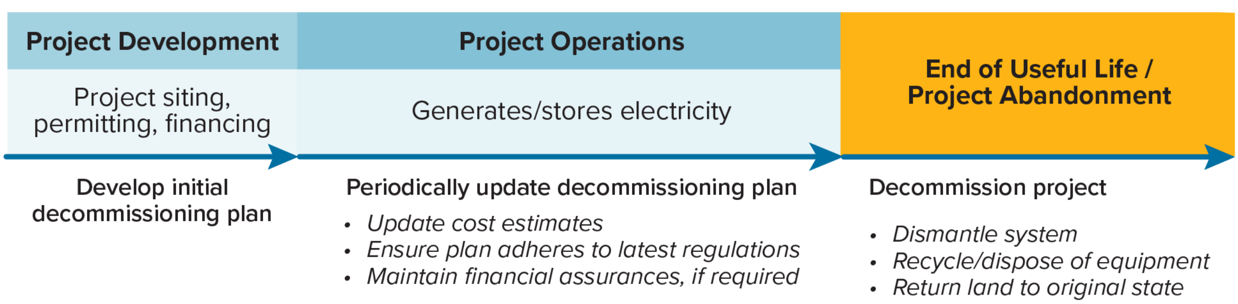
Decommissioning is the process of removing a renewable energy project and returning the project site to its original state through remediation and restoration.

Decommissioning is the process of removing an abandoned or EOL renewable energy project and remediating the land to its pre-construction condition. It includes the removal of the facility infrastructure and all ancillary components (i.e., solar panels or wind turbines, posts, electric wiring, fencing, inverters and transformers, substations, operations and maintenance building, foundations, access roads, generation tie line infrastructure, etc.) and the stabilization and re-vegetation of the site. Although the decommissioning process itself occurs at the closure of a renewable energy project, it involves planning for it from the beginning of the project as well and throughout the life of the project as shown in ***Figure 2***. The specific requirements for decommissioning can vary by jurisdiction, and local governments have a fair amount of latitude in determining decommissioning processes for renewable energy projects. Large renewable energy projects (25 MW or more) require a decommissioning plan that complies with local government decommissioning regulations, if any, as part of ORES permitting and approval in the project development phase. As such, it is important for local governments to adopt decommissioning requirements into their local laws that meet the needs of their communities.

What is abandonment?

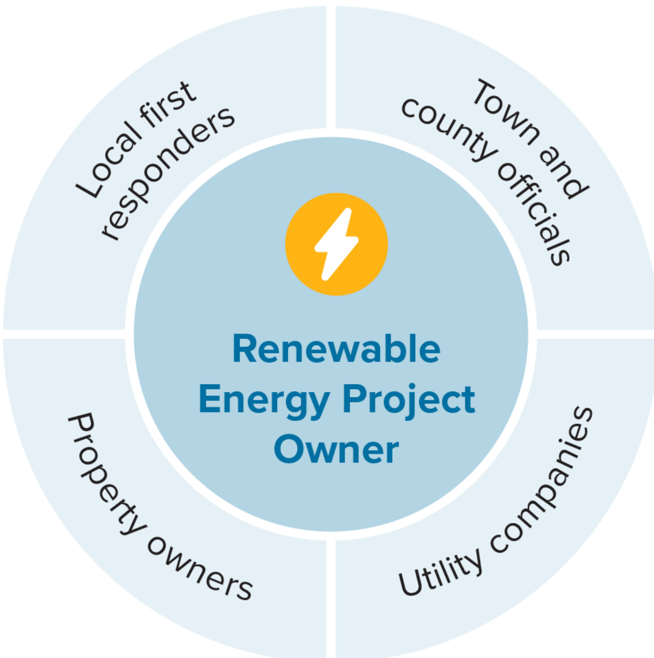
Abandonment is when a renewable energy facility is inactive (not producing energy) for a defined period of time. Precise timelines and definitions of abandonment are determined by local jurisdiction in local law but is typically considered 6-12 months of inactivity. If the energy facility's installation activities are inactive beyond the period allotted by local regulation, it must be decommissioned.

Figure 2 | Decommissioning Process Overview



Who is involved during decommissioning?

Figure 3 | Potential Stakeholders in Decommissioning a Renewable Energy Project



The goal of decommissioning is the safe and efficient removal of all renewable energy facility components and restoration of the site to conditions as close to pre-construction characteristics as possible, including restoration of native vegetation, habitat and/or land use. As such, the same safety protocols that are used during construction should be used during decommissioning. Decommissioning activities involve potential impacts on numerous stakeholders and the surrounding environment.

Figure 3 shows the many stakeholders that might need to be engaged before or during the decommissioning process.

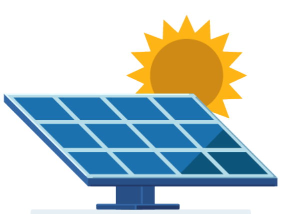
Prior to the commencement of any decommissioning activities, it is recommended to notify relevant stakeholders including government officials, emergency personnel, the facility's property owner, the landowner(s) and the local utility service provider(s). While it is not required to notify all potential stakeholders, this is considered a best practice. Notification may be in the form of letters, newspaper notices, updates on the project owner's website, or direct communication.

As part of the changes introduced by the Climate Act and Renewable Action Through Project Interconnection and Deployment (RAPID) Act, stakeholder engagement, environmental assessments, and any other consultations with the public or other agencies are conducted while the project is in the initial permitting and siting stage. Decommissioning activities should not require additional permits or consultations.

When should a project be decommissioned?

The timing of decommissioning depends on the useful life of the critical equipment. The average lifespan of renewable energy projects is between 20-30 years, with newer solar panels lasting as long as 30-35 years. The decision to decommission a renewable energy project may be based on the site's permits, the economic viability of the project, and existing power purchase agreements (PPAs) in place governing the project's output.

Table 2 | Typical Lifespan of Renewable Energy Projects



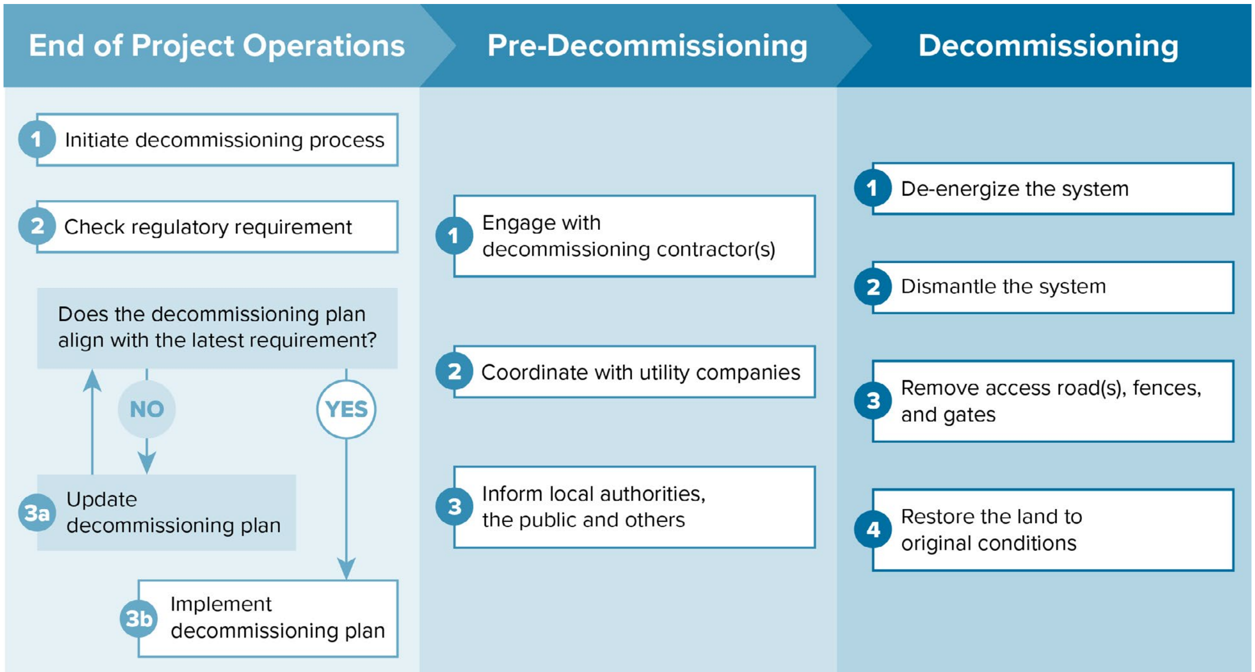
Solar PV	Onshore Wind Turbines	Battery Energy Storage Systems
30-35 years (though typical performance warranty length is 25-30 years)[7]	Approximately **30 years**[8]	Approximately **15-20 years** (depending on battery type)[9]

[7] End-of-Life Management for Solar Photovoltaics | Department of Energy
[8] Benchmarking Anticipated Wind Project Lifetimes: Results from a Survey of U.S. Wind Industry Professionals | Energy Markets & Policy (lbl.gov) (lbl.gov)
[9] Cost Projections for Utility-Scale Battery Storage: 2023 Update

What types of activities are involved in decommissioning?

Decommissioning-related activities can be divided into: activities that take place at the end of project operations, pre-decommissioning activities, and decommissioning activities. Pre-decommissioning activities include developing and updating decommissioning plans, obtaining bonds, letters of credit, or sureties, and paying management fees. Decommissioning generally includes dismantling the system and restoring the land.

Figure 4 | Activities from End of Operations Through Site Restoration

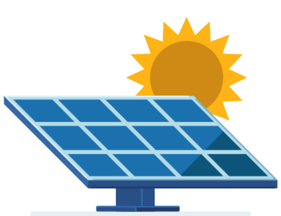


When renewable energy projects are being permitted, the submitted decommissioning plan will detail and govern the triggers, timing, and requirements for decommissioning a project. This ensures that all necessary steps for decommissioning are acknowledged by the project stakeholders before it is constructed, and there is an agreement in place to return the developed land back to its original state at the end of the project's life.

Decommissioning should not entail additional permitting or applications before decommissioning activities begin.

Original State | Unlike other types of real estate development, at the end of a solar project's lifecycle, the land it is sited on must be restored to pre-existing conditions.

Solar PV Decommissioning Activities



Dismantling activities include disassembling and transporting the equipment from a renewable energy project. Specific activities for solar projects include panel removal, posts & rack removal, and removal of inverters or other major equipment.

Restoration, remediation, and disposal activities include grading, seeding disturbed areas of ground, site restoration, conducting site decompaction (if applicable), and site monitoring with the aim of restoring land to its pre-project condition after infrastructure is removed. Its "pre-project" condition may vary depending on the type of land where the project is located, so developers and local governments should ensure the correct standard is met for decommissioning and restoration. If the solar facility is within a state-certified Agricultural District and seeking funding from NY-Sun or awarded a Tier 1 Renewable Energy Certificate Agreement from NYSERDA's Large-Scale Renewable program,[10] the project owner must notify New York State Department of Agriculture and Markets (NYSAGM) prior to decommissioning and follow specific decommissioning guidelines set forth in NYSAGM's Guidelines for Solar Energy Projects - Construction Mitigation for Agricultural Lands.[11] Stormwater basin

[10] https://www.nyserda.ny.gov/All-Programs/Large-Scale-Renewables/RES-Tier-One-Eligibility
[11] Guidelines for Solar Energy Projects - Construction Mitigation for Agricultural Lands

related infrastructure is also removed, and basins are filled in. Disposal entails trucking components to recycling centers or landfills. Precise restoration needs will depend on the project and the agreements in place between the developer and the landowner. Some infrastructure, such as roads and utility infrastructure, may remain in place. Utility infrastructure may include electrical distribution, fiber optic communication equipment.

Dismantling solar projects can take 12 months or more, depending on the size of the project. New York State does not currently have a time limit for when decommissioning must occur. Local governments have the authority to set decommissioning timelines for projects within their jurisdiction.

Onshore Wind Turbine Decommissioning Activities

For wind projects, the turbines, blades, turbine foundation, meteorological tower, collection system, and other civil works are dismantled in the removal phase. Similar to solar facility decommissioning, civil infrastructure may remain in place, depending on the agreement in place with the landowner.[12] Wind projects permitted under Article 10 or ORES must adhere to a decommissioning and restoration plan approved by the applicable siting authority. Those projects are also required to provide the municipality(ies) with letters of credit or security bonds that will cover the cost of decommissioning in the event of abandonment by the facility owner.

Disassembling, demolishing, and removing wind turbine components and conducting site restoration can take between 6 and 24 months, depending on the size of the project. Some jurisdictions require projects to be fully decommissioned within 12 months of inactivity, or abandonment.

Battery Energy Storage Systems Decommissioning Activities

For battery energy storage systems, integrated battery storage units, inverter/transformer stations, support piers and foundations, electrical cable and conduits, and perimeter fencing are dismantled in the removal phase. While the *New York Battery Energy Storage Guidebook* does not prescribe precise agricultural mitigation guidelines, it is recommended to follow the guidance available for solar facilities: if the project is sited on Mineral Soils Groups 1 – 4, the project owner must notify NYSAGM prior to decommissioning and follow specific restoration, monitoring, and remediation guidelines.

Decommissioning activities of battery energy storage systems typically begin within 12 months of the project ceasing operation and are anticipated to be completed within 6 - 12 months of start of decommissioning, depending on the size of the project. For more information, please refer to *New York State Battery Energy Storage System Guidebook*.[13]

What is included in a decommissioning plan?

A decommissioning plan is typically required for renewable energy projects during the conditional use or zoning approval permitting period. It includes an estimate of the costs for decommissioning and may have a section on financial security. An example of a decommissioning plan can be found in the Model Solar Energy Local Law chapter of this Guidebook. If a renewable energy project that is larger than 25 MW is located on land that is not owned by the project owner (applicant), a decommissioning plan and guaranty/security agreement (if one is obtained) between the applicant and landowner is often included in a permit application to the ORES process.

A final decommissioning plan should include:[14]

- Contact information for all parties (landowner; solar developer; authorities having jurisdiction; and any known sources of services, such as recycling programs and emergency service providers);

Decommissioning activities are not anticipated to occur until project end of life, and regulatory requirements may change.
As such, before commencing any decommissioning activities, the project owner shall update the decommissioning plan in accordance with appropriate local, state, and federal requirements at the time of decommissioning. It is also common to require updates to the decommissioning plan, cost estimates, and any bond or other financial surety amounts every five years.

[12] Guidelines for Wind Energy Projects – Construction Mitigation for Agricultural Lands
[13] New York State Battery Energy Storage System Guidebook
[14] Decommissioning solar energy systems WEB.pdf (cfra.org)

- Any warranted recycling of PV panels or other components that were provisioned as part of the original procurement; any bonds to take back PV panels or other equipment (if applicable);
- Estimated lifespan of the project;
- Conditions that trigger the decommissioning (certain date, end of lease, system inoperative for 12 months, any other);
- Time period within which the decommissioning must be completed (e.g., 12 months or more; likely similar to how long it took to construct the project);
- Scope of work for decommissioning, which often includes removing all equipment,[15] grading to restore water runoff characteristics, restoring ground cover (seed), or otherwise restoring the land to its original condition unless the landowner wishes to retain any of the infrastructure or improvements;
- Roles and responsibilities of the landowner, developer, and any other parties clearly delineated;
- Estimated cost of decommissioning (both the gross cost, considerations for inflation, and the cost net of any salvage value); and,
- Financial surety such as bond, letter of credit or another instrument.

For battery energy storage system specific decommissioning plan requirements, please refer to *New York State Battery Energy Storage System Guidebook*.[16]

What are New York State requirements for decommissioning?

There are several places where stakeholders may find information on decommissioning renewable energy projects that is specific to New York.

Projects smaller than 25 MW are permitted at the local level, so decommissioning requirements are specified by each municipality in the regulations that govern renewable energy projects. The Model Solar Energy Local Law Chapter of this Guidebook has model language that municipalities can consider for inclusion in their renewable energy laws. NYSERDA's model solar energy law also includes a model decommissioning plan that local municipalities can reference or look to include as a part of their land use regulations.

Renewable energy projects larger than 25 MW and any co-located energy storage systems require a decommissioning plan as part of the environmental review and permitting process under the RAPID Act, which was enacted on April 20, 2024 as part of the FY 2025 Executive Budget Legislation.[17] The RAPID Act repealed the previous Section 94-c of the Executive Law, which was intended to establish an expedited review and permitting process with uniform permit standards for New York State renewable energy projects. It also repealed the previous Article VIII of the Public Service Law which governed the environmental review and permitting of major steam electric generation siting. The RAPID Act will continue to maintain all the environmental review and permitting requirements under Section 94-c established by ORES' 19 NYCRR Part 900 regulations until the new regulations are finalized in 2025. Based on the requirements of 16 NYCRR Part 1101, decommissioning cost estimates included in decommissioning plans should include the gross cost of decommissioning, plus a 15% contingency cost. The plan should also include a net decommissioning cost estimate in present day dollars, which is the gross cost (including contingency), less the total estimated salvage value of project components.[18]

ORES requires that developers of major renewable energy facilities include a Final Decommissioning and Site Restoration Plan in their compliance filing while seeking a building permit. The plan must include a decommissioning cost estimate, and proof that letters of credit or other financial assurance approved by ORES have been obtained in an amount equal to the decommissioning cost estimate. The letters of credit or other appropriate financial assurance must be provided to ORES after one year of project operation and updated every fifth year to include any changes to the structure of the financial assurance. These updates are intended to account for inflation or other cost increases to the initial decommissioning estimate.[19]

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[15] 94-c regulations no longer govern large scale projects; these regulations transferred to 16 NYCRR Part 1100 and Part 1101 which require components to be removed four feet below grade in agricultural land and three feet below grade in non-agricultural land.
[16] New York State Battery Energy Storage System Guidebook
[17] A.B. A8808B, 2024-2025 transportation, economic development and environmental conservation budget, 2023-2024 Leg. Sess. (New York. 2024). Governor Hochul Announces Historic Investment of the FY 2025 State Budget Accessed on December 15, 2024.
[18] 16 NYCRR Part 1101
[19] 16 NYCRR Part 1100

Decommissioning is a critical step in returning land to its original state, considered the state prior to construction. ORES regulations allow project owners to negotiate the conditions of the land at the end of the project life. The advantage of renewable energy projects over fossil fuel energy is that they do not emit harmful airborne or leak-prone pollutants where they generate energy. So, when decommissioning is completed, land that was once residential, or even arable agricultural land, can be more easily returned to that purpose.

The decommissioning estimate must include the removal of all project components up to four feet below grade in agricultural land or three feet below grade in non-agricultural land and the removal and restoration of access road locations, if appropriate.[20]

The ORES website contains several valuable resources on permitting for renewable energy projects, from application guidance, webinars, and presentations on submitting permit applications to the new streamlined procedure.[21] Local governments and developers can access their site to learn more about applications and the permitting process. They also publish application status updates on their website, which can provide valuable insight into decommissioning opportunities and challenges.[22]

Finally, it is important to note that the precise decommissioning requirements may vary for solar, wind, and battery storage energy projects, depending on the local jurisdiction.

What are typical decommissioning costs?

Decommissioning plans require a cost estimate that is project specific, as each renewable energy project will have unique characteristics that result in variations in cost estimates. All costs and renewable energy capacities noted here are in alternating current (ac), unless otherwise noted. The following cost estimates were produced from an examination of over 100 solar decommissioning cost estimates produced within New York between 2021-2024 for projects exceeding 1 MW-ac. The average decommissioning cost estimate, prior to contingencies or salvage value, for solar projects was approximately $50,000 (2024$) per MW-ac.[23] The average inflation rate for these projects was 2.1% with the range between 10% and 25%.

*Table 3 | Breakdown of Typical Decommissioning Costs for Solar Projects, 2024$/MW**

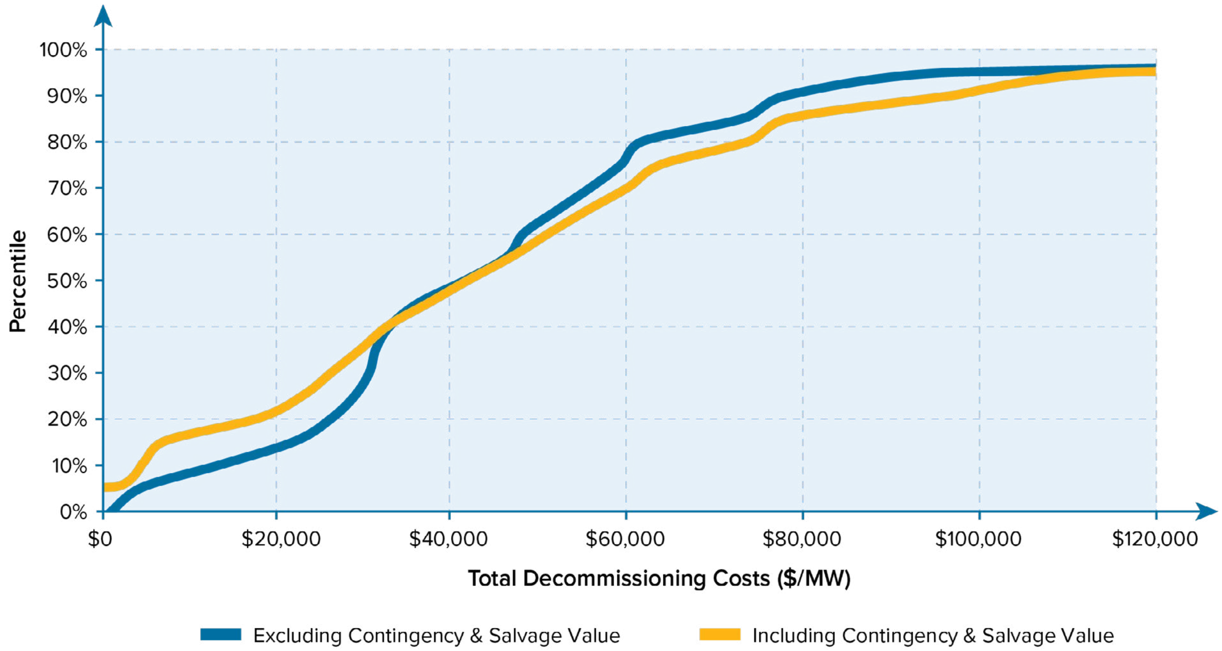
	Low[24]	Median	Average	High[25]
Pre-Decommissioning Activities	$254	$1,823	$5,696	$30,572
Dismantling & Disposal Activities	$2,787	$24,257	$28,741	$60,126
Site Restoration & Remediation Activities	$1,581	$11,732	$13,519	$32,056
Total Decommissioning Costs, Excluding Contingency & Salvage Value	**$4,547**	**$41,548**	**$47,823**	**$98,149**
Contingencies	$2,539	$17,768	$28,422	$78,536
Salvage Value	$5,047	$19,143	$27,949	$59,146
Total Decommissioning Costs, Including Contingency & Salvage Value	**$1,094**	**$41,860**	**$51,383**	**$117,260**

**Values in bolded rows will not sum since they represent percentile values, not totals*

[20] 16 NYCRR Part 1100
[21] Resources | Office of Renewable Energy Siting (ny.gov)
[22] Permit Applications | Office of Renewable Energy Siting (ny.gov)
[23] Original source for this data is a NYSERDA internal database
[24] The low estimate used in the analysis are representative of the 5th percentile for cost estimates.
[25] The high estimate used in the analysis are representative of the 95th percentile for cost estimates.

Figure 5 shows the distribution of the examined decommissioning cost estimates for solar projects within New York in 2023. From these projects, 95% of the estimates had a cost less than $100,000 per MW before contingencies and salvage value.

Figure 5 | Distribution of Typical Decommissioning Costs Estimates for Solar Projects in New York, 2024$/MW-ac



There was limited data on decommissioning cost estimates for onshore wind energy projects from NYSERDA's internal data, and as a result they are not included in the decommissioning cost discussion here.

Some decommissioning planning costs are incurred before the project even enters operations, such as the initial decommissioning plan writing and cost estimation, and legal and financial costs to obtain any financial sureties required. However, the vast majority of costs are incurred when the project is decommissioned, disposed, or recycled at the end of its useful life.

How does inflation impact decommissioning costs?

Since decommissioning costs are not incurred until years after the initial decommissioning cost estimate, it is important to recognize there will be growth in costs over time. Inflation is used to measure the average change in prices over time, allowing for the estimation of costs into the future. Decommissioning cost estimates are typically prepared in present day dollar terms, without inflation, because of the uncertainty around future prices. However, municipalities require developers to bond for the current decommissioning cost plus an added amount to capture inflation.

> For a more detailed discussion of inflation and how it is measured, see the accompanying NYSERDA Inflation Primer.

Recent periods of high inflation - driven in part by the COVID-19 pandemic and supply chain shock - have highlighted inflation's impact on project costs and brought it to the forefront of industry discussions. It is important to remember that reported inflation numbers represent a point-in-time estimate measuring the change in prices relative to the previous year. While there may be variability in year-over-year estimates due to changing market forces, the Federal Reserve strives to maintain price stability by targeting a long-run inflation target of 2%.[26] Since inflation can play a significant role in the required bonded amount due to the compounding effect, it is important to remember over longer-term horizons, inflation has tended to remain at or around 2%. Short term inflation forecasts can be found through various institutions including the Federal Reserve, commercial banks and other financial institutions, and economic research think tanks.

[26] The Fed - Why does the Federal Reserve aim for inflation of 2 percent over the longer run?

The two statistical agencies that produce inflation estimates are the Bureau of Economic Analysis (BEA) and the Bureau of Labor Statistics (BLS). The BEA produces key measures of inflation, such as the Consumer Price Index (CPI) and the Producer Price Index (PPI). The BEA produces the Implicit GDP Deflator, a national level inflation measure that also has forecasts published by the White House Office of Management and Budget.[27] For a more detailed discussion of inflation rates and escalation, consult the Inflation Primer in Appendix A.

What are the financial mechanisms used to ensure decommissioning activities take place?

Financial mechanisms can be effective means to ensure compliance with decommissioning requirements. Financial assurance mechanisms for decommissioning are obtained prior to the start of decommissioning, and may be held by a financial institution, the local government, or the third-party landowner.[28] For renewable energy projects permitted at the state level (through ORES), financial assurances are to be provided after one year of operations. Financial assurance requirements will vary for projects permitted at the local level. The amount of the financial assurance should be equal to the estimated cost of decommissioning, minus salvage value. Projects permitted at the state level must include a security agreement between the applicant and the landowner if the project is not located on the applicant's property. Local governments have several options when it comes to what type of compliance mechanism to require. The types of financial mechanisms for decommissioning include decommissioning trusts or escrow accounts, removal or surety bonds, and letters of credit. Selection of any specific financial mechanism may have consequences beyond the scope of this document and as such local governments are advised to obtain legal counsel and/or financial advice with respect to such a decision.

For a local example, see the General City Law. The laws and regulations around enforcement mechanisms are described in several places in the General City Law, particularly Article 3, 27-a, 27-b, and 33.[29]

Town of Geneva* | Local Penalties

The Town of Geneva's Code Chapter 130 states that projects that fail to implement the decommissioning plan within the allotted 180-day period following the end of electricity production may be subject to various financial penalties.** The Town may provide for the restoration of the site in accordance with the decommissioning plan and recover expenses from the owner and/or operator, or from the performance bond obtained at the outset of the project. Further liens may be applied to the property, and any unrecovered costs are assessed against the property, and collected in the same manner as other taxes.

**The Town of Geneva is chosen for illustrative purposes only and is not intended to be representative of local government policies around the state.*
***Source: Town of Geneva Legislation through 08-08-2023*

What are letters of credit?

Letters of credit are documents that assure payment based on certain conditions being met. In the case of decommissioning, renewable energy developers may obtain letters of credit that, should they fail to fully remove their system, entitles the landowner or Authority Having Jurisdiction (AHJ) to payment so they may decommission the installation themselves. The letter of credit should include terms such as the conditions for payment, supporting documentation needed from the landlord, and an expiration date. It must be renewed or replaced over the life of the project until decommissioning obligations are met. Banks typically require a pledge of securities or cash as collateral for issuing a letter of credit.[30]

A letter of credit is an agreement between three parties:

1. The issuer (bank or financial institution issuing the letter);
2. The customer of the issuer (applicant/ project owner); and
3. The beneficiary (obligee/ AHJ).

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[27] White House Office of Management and Budget, Table 10.1
[28] 16 NYCRR Part 1101
[29] NYS Open Legislation | NYSenate.gov
[30] Letter of Credit (LoC) in Renewable Energy Project Finance (renewablesvaluationinstitute.com)

Letters of credit act as a financial guarantee to the AHJ, who can call on the letter under specified conditions, (e.g., if the developer defaults on decommissioning or abandons the renewable project), and as an interest-accumulating loan for the project owner. The financial institution has no obligation to ensure the successful completion of the project and solely focuses on financial compliance. Banks also collect a fee for service, typically a percentage of the size of the letter of credit.[31]

According to ORES regulations, letters of credit for major renewable energy facilities must be provided after one year of system operation, and every five years thereafter.[32]

What are decommissioning trusts or escrow accounts?

Trusts or escrow accounts are two financial assurance options that are utilized to meet the expected cost of decommissioning at the end of the renewable energy project's lifecycle. An AHJ may require the project owner to either post full funding for decommissioning at the beginning of the project's life or according to a fee schedule set out in the use permit approval.

The specific terms of the account, such as the payment amount and frequency, can be included in the land lease agreement or use permit. If applicable, the provisions of the trust or escrow account will be described in the decommissioning plan.

A renewable energy project owner may deposit funds into a cash escrow account maintained by a federally insured financial institution. Once the project owner fulfills the decommissioning requirements set by the AHJ at the end of the facility's life, the bank will release the funds deposited in the cash escrow account back to the developer. If the solar project is abandoned or not decommissioned according to local regulations, the bank will grant the AHJ access to the cash escrow account to complete the decommissioning process.

What are removal or surety bonds?

Providing bonds is another way for renewable energy developers to ensure sufficient funds are available for decommissioning. The amount of the bond should equal the total decommissioning costs for the project and must remain valid until all decommissioning obligations are met. If the timing or costs of decommissioning changes over the course of the project, then the bond must be renewed to reflect the new conditions. A removal or surety bond is a special type of performance bond.[33]

A surety bond is an agreement between three parties:

1. The "obligee" requiring the bond - here, the AHJ;
2. The "principal" purchasing the bond (applicant/ project owner); and
3. The "surety" guaranteeing the payment of valid claims against the bond (a bank or other financial institution).[34]

The main advantage from the principal's (project owner's) standpoint is that a surety bond does not require a large initial upfront cash payment, tie up the principal's working capital, or credit line. In the case of renewable projects, this could potentially be for a period of many years. If the principal does not meet their obligations as defined in the decommissioning plan, the bond ensures that funds will be available to cover the cost of decommissioning.

This bond also applies should the principal abandon the facility during its' useful life (where abandonment is defined in the decommissioning agreement), so it protects the obligee throughout the entire duration of the project. If the project owner violates the terms or conditions of the bond, the AHJ can file a claim against the bond. A surety bond reduces the risk of financial burdens on the local government in the long-term by requiring bonds at the outset of the project.[35]

What are the non-financial mechanisms used to ensure decommissioning activities take place?

Local governments have several options to enforce decommissioning of renewable energy projects through legal means which can supplement the financial mechanisms described above. These include decommissioning provisions in land use regulations, land-lease agreements, or abandonment and removal clauses.

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[31] Decommissioning of Solar Sites: A Key Consideration of the Project - SolUnesco
[32] 50-States-of-Solar-Decommissioning-2023-Snapshot-NCCETC-2024.pdf (ncsu.edu)
[33] What are performance bonds? | Allianz Trade (allianz-trade.com)
[34] What is a Surety Bond? Surety Bonds Explained. (suretybondsdirect.com)
[35] Solar Decommissioning Bonds (thehortongroup.com)

How can land use regulations be used to ensure decommissioning activities take place?

Special-use permits are another option for local governments that can be issued to renewable energy project developers. Once a local government determines a solar panel system is abandoned (as defined by the decommissioning plan or by the local law) and has provided written notice (within a legislated time frame) to the owner, it can take enforcement actions, including imposing civil penalties/fines, and removing the system.

Local governments can issue a variance (a re-zoning of a property) for an agreed-upon term with the project developer. For example, if a solar energy system has an expected lifespan of 30 years, then a variance can be granted for that time period. If it is not renewed at the end of that 30-year term, the site would no longer comply with local zoning, and the jurisdiction could then use their regular zoning enforcement authority to require the removal of the project.

What are decommissioning provisions in land-lease agreements?

Renewable energy installations are often located on private land where the project owner negotiates a land-lease agreement with the landowner. For these kinds of projects, the decommissioning requirements can vary depending on the preferences of the landowner. For example, the landowner may prefer a buyout clause rather than a full decommissioning of a renewable energy project.[36] Or, if access roads are built in the project construction phase, leaving them after decommissioning could be negotiated in the land-lease agreement. The landowner could also assign responsibility in the case of abandonment: such a clause could mean the developer is responsible for paying the costs of removal, if they abandon the project.

What are abandonment and removal clauses?

Rather than apply financial penalties directly in cases of abandonment, abandoned renewable energy projects may be re-zoned under abandonment and renewal clauses in lease agreements. Then, abandoned renewable energy projects would be classified as zoning enforcement violations, and project owners are required to remove equipment or face penalties, fines, or liens on the property. To maximize the effectiveness of these clauses, the local government must clearly include a definition of abandonment: how long must a project be out of service to be considered abandoned, a reasonable timeline for removal of the renewable energy system, and clearly define "removal" based on other remediation or reclamation requirements.

What happens to dismantled renewable energy equipment?

After renewable energy equipment has been dismantled, there are three main ways to deal with the equipment: recycling, repurposing, or disposal.

Recycling or resale involves the re-use of some or all materials that comprise a renewable energy facility. Both of these options ensure the recovery of resources which will reduce waste, minimize the environmental impacts, and the total energy needed to mine, transport, refine virgin materials, and manufacture new renewable energy equipment.

Approximately 95% of a PV panel is recyclable and between 85 to 90% of a wind turbine is comprised of materials that can currently be commercially recycled. Products recovered through recycling, including rare earth and precious metals and recyclable plastics, can be used for domestic manufacturing or listed for resale in the commodity market. Domestic recovery of these resources can reduce U.S. dependence on foreign imports and alleviate resource constraints.

The bulk of the unrecycled materials in wind turbines are fiber-reinforced composites (carbon fiber and fiberglass). These materials can be found in various forms in wind turbine blades, nacelle covers, and the cover for the hub that connects the blades to the wind turbine.[37] However, much of a wind turbine can be recycled, since it is composed of metals or electrical components that are readily recyclable. This section focuses on recycling solar PV panels since there are currently a limited number of facilities able to recycle or resell wind turbine blades in the US.

[36] [What Happens At The End Of A Solar Lease? (palmetto.com)]
[37] U.S. Department of Energy. "Wind Turbine Sustainability." https://www.energy.gov/eere/wind/wind-turbine-sustainability

What materials are typically found in solar panels and wind turbines?

Solar panels and wind turbines may both offer positive economic value at the end of their service lives, based on salvage values for the project components. Most solar panels in New York use crystalline silicon (c-Si) cells.

c-Si solar panels contain easily recyclable materials including:[38]

- Glass, which accounts for between 55%-80% of the mass of panels;
- Aluminum, which accounts for between 8%-22% of the mass of panels;
- Copper, which accounts for between 0.5%-4% of the mass of panels; and
- Plastic, which accounts for between 1%-3% of the mass of panels.[39]

While glass and aluminum make up the majority of the mass of recyclable materials, these materials tend to be of low value in secondary markets. Other valuable materials can be found in smaller quantities in solar panels, though these materials may be more difficult to extract for recycling, including:

- Silicon, which accounts for between 2%-5% of the mass of panels;
- Tin, which accounts for less than 0.2% of the mass of panels;
- Lead, which accounts for less than 0.1% of the mass of panels; and
- Silver, which accounts for less than 0.1% of the mass of panels.[40]

Wind turbines also have a majority of material by mass that can be recycled. Wind turbines are comprised of the following materials:

- Steel, which accounts for between 66%-80% of the mass of turbines;
- Fiberglass, resins, and plastic, which accounts for 11%-16% of the mass of turbines;
- Iron, which accounts for 5%-17% of the mass of turbines;
- Copper, which accounts for 1% of the mass of turbines; and
- Aluminum, which accounts for less than 2% of the mass of turbines.[41]

The value of these materials per ton fluctuates depending on prevailing market conditions. Silicon can be recycled, potentially for reuse in solar panels, but it is an expensive, energy intensive process to do so. Silver and copper are valuable materials used in a variety of industrial processes and account for a significant portion of the value of recycled materials from c-Si solar panel. Mounting piles, racking, and even transformers may also be recycled at the end of the solar panel's service life.

Many decommissioning plans include forecasted costs for these goods but recognize that it is impossible to predict the market price for commodities up to 30 years in the future. This highlights the need to update decommissioning cost estimates on an ongoing basis.

Decommissioning plans typically include options for salvage and resale of project components since many objects will retain significant residual value at the end of initial useful life. For example, the Decommissioning Cost Analysis for the Dakota Range Wind Project compares the full cost of decommissioning with salvage and part resale scenarios.[42] Certain parts are sold for scrap, while others are resold because they have been purchased later in the project's life. The plan includes the gearbox, generator, and blades among items that can potentially be sold to offset decommissioning costs.

It is likely that progress will be made on recycling and disposal options for projects over the next few years, as shown by the variety of government regulations, scientific research, and industry initiatives being explored. This means that local governments will need to stay abreast of policies and practices to ensure that projects are decommissioned properly. Salvage value and resale impact the financial bottom line of developers, but recycling or reselling can also reduce the burden on community landfills.

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[38] https://www.epa.gov/hw/solar-panel-recycling

[39] Mulazzani, Andrea, Panagiotis Eleftheriadis, and Sonia Leva. 2022. "Recycling c-Si PV Panels: A Review, a Proposed Energy Model and a Manufacturing Comparison" Energies 15, no. 22: 8419. https://doi.org/10.3390/en15228419.

[40] Mulazzani, Andrea, Panagiotis Eleftheriadis, and Sonia Leva. 2022. "Recycling c-Si PV Panels: A Review, a Proposed Energy Model and a Manufacturing Comparison" Energies 15, no. 22: 8419. https://doi.org/10.3390/en15228419.

[41] https://www.nrel.gov/docs/fy17osti/66861.pdf

[42] appendixp.pdf (sd.gov)

Where can renewable energy equipment be recycled?

As of December 2024, there are 29 facilities with solar recycling capabilities across the United States.[43] The closest facility to New York State is Electronic Recyclers International (ERI) in Lincoln Park, New Jersey. ERI processes crystalline silicon (c-Si), the most common type of solar panel used in New York, and cadmium telluride (CdTe) panels for recycling.[44]

Most first-generation wind turbine blades are treated as waste and destined for landfill. However, there have been some efforts at developing alternatives for turbine blade recycling. Some options include:

- Mechanical recycling, where blades are ground or shredded into materials that can be repurposed;
- Thermal decomposition recycling, where heat is used to recover glass fibers that can be upcycled into new composite products; or
- Repurposing, which involves the direct use of the decommissioned turbine blade to create pedestrian bridges, playgrounds, benches, or other goods.[45]

Carbon Rivers

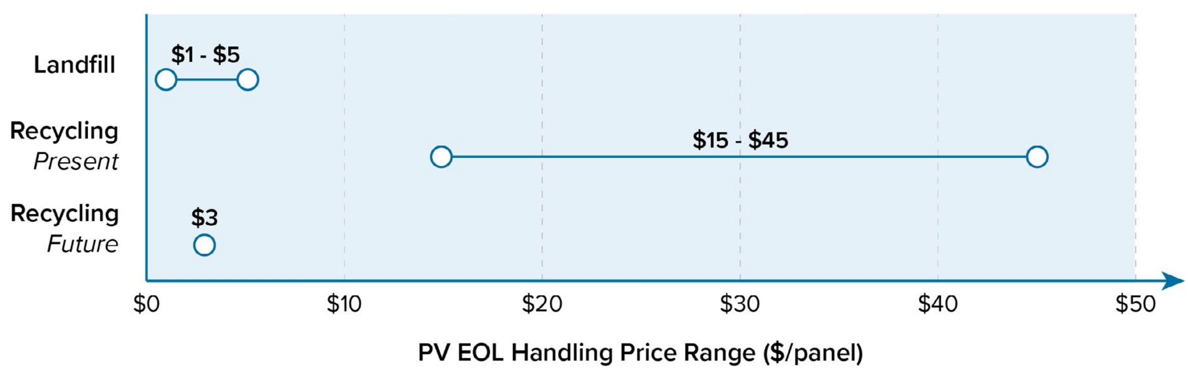
A Tennessee company, Carbon Rivers, has commercialized a process to recover clean, mechanically intact glass fiber from decommissioned wind turbine blades.* In addition, Veolia North American runs a program that turns turbine blades into cement.**

**Source: US Department of Energy "Carbon Rivers Makes Wind Turbine Blade Recycling and Upcycling a Reality With Support From DOE"*
***Source: Chemical & Engineering News "How can companies recycle wind turbine blades"*

What is the cost to recycle PV panels?

The current economics of PV panel EOL handling are unfavorable to recycling. The cost to recycle PV panels is significantly higher than landfill tipping fees. Recycling one solar panel costs $15 to $45—significantly more than the $1 to $5 per-panel cost of sending it to a landfill,[46] and significantly more than the anticipated value of recovered materials, estimated at $2 per panel.[47] The Solar Energy Technologies Office (SETO) has announced a new target to bring the cost of recycling solar panels to about $3 per panel by 2030.[48]

Figure 7 | PV EOL Handling Price Range



[43] Mulazzani, Andrea, Panagiotis Eleftheriadis, and Sonia Leva. 2022. "Recycling c-Si PV Panels: A Review, a Proposed Energy Model and a Manufacturing Comparison" Energies 15, no. 22: 8419. https://doi.org/10.3390/en15228419.
[44] Solar Energy Technologies Office. U.S. Department of Energy. "*Solar Manufacturing Map.*" Solar Manufacturing Map | Department of Energy Accessed on July 19, 2024.
[45] WINDExchange: End of Service Wind Turbine Guide (energy.gov)
[46] Hutchingson, 2023. Bloomberg Law. "*States Weigh Making Industry Pay Millions For Solar Panel Waste.*" https://news.bloomberglaw.com/environment-and-energy/states-weigh-making-industry-pay-millions-for-solar-panel-waste
[47] https://www.nrel.gov/docs/fy21osti/74550.pdf
[48] Iaconangelo, 2022. E&E News. "*What happens to used solar panels? DOE wants to know.*" https://www.eenews.net/articles/what-happens-to-used-solar-panels-doe-wants-to-know/#:~:text=The%20Solar%20Energy%20Technologies%20Office,solar%20power%20by%20decade's%20end.

What is salvage value?

The salvage value is the estimated value of an asset at the end of its useful life. Renewable energy projects have many components, including steel, copper, aluminum, silver, silicon, and others. These materials can retain their value and be sold to recyclers during the decommissioning phase of solar or wind projects.

Salvage value is determined by the quantity of a solar or wind project's constituent elements, taking into account the cost to process these materials. These prices tend to fluctuate since they are used in industries other than renewable energy. In order to maximize published salvage values, materials must be cleaned, cut, and prepared according to Institute of Scrap Recycling Industries (ISRI) standards. Current values of salvaged materials can be found by visiting recycling and scrap indexes and websites online.

Some jurisdictions allow salvage values to be subtracted from total decommissioning costs to estimate the net cost of decommissioning, reducing the financial burden on project developers. However, developers should carefully note the requirements of the jurisdiction they fall under when constructing a project. To protect against fluctuations in the value of materials, certain jurisdictions may require a buffer on the value of salvage estimates to account for price changes over the lifespan of the project. Since project decommissioning costs are typically updated every five years, current estimated prices may not reflect future market conditions. Monitoring costs and including a buffer can help protect against price volatility in recyclable material prices.

Are there state or federal regulations mandating the recycling of renewable energy equipment?

Currently there are no federal statutes or regulations that mandate recycling-based recovery of solar PV panels in the U.S. However, state- and industry-led policies have started to emerge to address EOL PV panel management concerns. Washington, New Jersey, North Carolina, and California are the only U.S. states with laws or regulations that directly address PV panel recycling.[49]

In addition, there are global and national voluntary industry standards that may encourage environmentally sustainable EOL management decisions of PV.[50] There are no current federal or state regulations around wind turbine recycling since these processes are still in their infancy.

What opportunities and challenges exist in the resale market?

Solar PV Panels

Used solar panels can be redeployed as replacement parts for or add-ons to existing systems, utilized in off-grid systems and repurposed into new, lower energy consuming builds. The secondary market in the U.S. has been gaining momentum in recent years. The volume of used panels listed for resale has increased by almost threefold.[51]

The resale price of solar panels increased by 29 percent in the U.S. over the three-year period, indicating an emerging secondary solar panel market.[52]

Solar system owners could conduct hardware audits during decommissioning to determine if resale is feasible. Typically, panels can be resold if they are:[53]

- Functional;
- Capable of producing power for a minimum of 10-12 years;
- The degradation rate is equal to an average of 0.5 to 1.9% per year over the panels' total years of operation; and
- Free of defects.

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[49] Curtis et al, 2021. NREL. "*Solar Photovoltaic Panel Recycling: A Survey of U.S. Policies and Initiatives.*" https://www.nrel.gov/docs/fy21osti/74124.pdf

[50] Curtis et al, 2021. NREL. "*Solar Photovoltaic Panel Recycling: A Survey of U.S. Policies and Initiatives.*" https://www.nrel.gov/docs/fy21osti/74124.pdf

[51] Pickerel, January 2024. Solar Power World. "*Remarketed solar panels are retaining resale value, EnergyBin report finds.*" https://www.solarpowerworldonline.com/2024/01/remarketed-solar-panels-are-retaining-resale-value-energybin-report-finds/

[52] Schmid, January 2024. EnergyBin. "*2023 PV Panel Price Index - Secondary Solar Market.*" https://resources.energybin.com/solar-resources/2023-pv-panel-price-index-secondary-solar-market

[53] Schmid, June 2023. EnergyBin. "*Resell or Recycle: A Guide for Handling Used Solar Panels.*" https://resources.energybin.com/solar-resources/resell-or-recycle-a-guide-for-handling-used-solar-panels.

Onshore Wind Turbines

As of February 2025, there is limited information on wind turbine resale. As noted above, many turbine blades are landfilled at EOL. However, there are increasing efforts to recycle, or potentially reuse wind turbines once they have reached their initial useful life.

Battery Energy Storage Systems

As batteries degrade over time, their cycle time and ability to recharge will decrease, until they are no longer economically viable. Refurbishing or reconditioning batteries for second use is an arduous process. First, batteries need to be tested to determine usability. The batteries must then be assembled into panels suitable for use. Coupling batteries of varying conditions can require more advanced control systems, which remains a significant challenge. The cost savings and the performance of reconditioned batteries need to be significant enough to make refurbishing appealing compared to purchasing new batteries. The discounted cost of reconditioned batteries relative to new ones must offset increased integration costs and reduced performance relative to new ones for a robust market to develop for these reconditioned batteries, as costs for new batteries continue to fall and performance continues to improve. Designing for reuse at the outset could reduce refurbishment costs substantially and increase the commercial viability of reuse and resale. Refurbished battery system applications in the U.S. are also currently limited to pilot demonstrations and small projects, which also affects resale value.[54]

What industry-led initiatives are available?

There are several industry-led initiatives that developers should consider at the end of the system performance period.

Certain solar panel manufacturers require recycling commitments in purchase agreements. This ensures that solar panels aren't landfilled at the end of their initial useful life.

International voluntary stewardship standards such as National Sanitation Foundation/American National Standards Institute (NSF/ANSI) 457 provide a detailed description on how to reuse or recycle PV panels and inverters instead of disposing them. Specifically, the NSF/ANSI 457 standard establishes sustainable performance criteria and corporate performance metrics, which include categories for EOL management and corporate responsibility, exemplify sustainable leadership in the solar market.[55] In addition, there are also U.S. national industry-led efforts from the Solar Energy Industries Association (SEIA) that could aid plant owners in material management decision making.

What federal and state environmental regulations need to be followed when disposing of material?

Disposal involves landfilling renewable energy equipment during the decommissioning process. Disposal is the least expensive option, though it has significant environmental drawbacks such as unwanted release of harmful toxins and/or unsustainable waste accumulation.

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[54] U.S. ESA 2020. "*End-of-Life Management of Lithium-ion Energy Storage Systems.*" https://energystorageassociationarchive.org/wp-content/uploads/2020/04/ESA-End-of-Life-White-Paper-CRI.pdf

[55] NREL 2021. "*Best Practices at the End of the Photovoltaic System Performance Period.*" U.S. Solar System Decommissioning Policies (nrel.gov)

Solar PV Panels

When discarded, solar panels are regulated either under Subtitle C or D of the Resource Conservation and Recovery Act (RCRA), depending on whether the panel is classified as solid waste or hazardous waste. Hazardous waste solar panels that are recycled may be able to use regulatory exclusions available under RCRA.[56]

Solar panels are designed to withstand extreme weather events and be safe for human health and the environment while in use. However, if disposed of irresponsibly, they can release toxins. Hazardous waste testing on solar panels in the marketplace has revealed that solar panels have a variety of different metals present in the semiconductor and solder, some of which, are harmful to human health and the environment, like lead and cadmium. However, c-Si solar panels, which constitute over 90% of the US market, typically do not contain any cadmium and may only contain trace amounts of the other hazardous materials.[57] The hazardous waste classification can vary between panels even within the same model and manufacturer, and requires a toxicity characteristic leaching procedure test to determine if the waste is hazardous. If it is known that specific models of solar panels have previously been deemed hazardous, the solar panel waste can be classified as hazardous without the need for testing.[58]

Project owners should review up-to-date federal and state level environmental regulations when disposing solar panels during decommissioning.

Wind Turbines

Wind turbine blades accounted for 50,000 tons, or 0.017% of total solid waste in the United States in 2018.[59] As of February 2025, there are no federal or state laws that regulate disposal of wind turbine blades. Unlike solar panels, they are not considered hazardous waste, so there are fewer disposal restrictions and considered less hazardous to the environment when they are landfilled at the EOL. Since much of a wind turbine's structure can be recycled, disposal is of lesser concern relative to disposal of solar PV panels.

Battery Energy Storage Systems

Once a battery is removed from service and diverted toward EOL management, it is designated as "Universal Waste," a special category of hazardous waste under EPA regulations.[60] Similar to solar PV panels, battery energy storage systems are regulated under Subtitle C and D of the RCRA. These rules generally require recordkeeping, labeling, and storage methods that keep material out of the environment, and they outline approved recycling or disposal pathways. Damaged cells, e.g., where the cell casing has been breached, may face additional requirements than those imposed under Universal Waste rules.[61] A battery intended for refurbishment and reuse is not considered "waste" under RCRA because it is not discarded.

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[56] US EPA. "*End-of-Life Solar Panels: Regulations and Management.*" https://www.epa.gov/hw/end-life-solar-panels-regulations-and-management

[57] Solar panels are classified as hazardous waste if they exhibit any of the four characteristics of hazardous waste, which are toxicity, ignitability, reactivity, and corrosivity. Heavy metals in solar panels are subject to the Toxicity Characteristic Leaching Procedure (TCLP) test as defined by the EPA. Further details can be found in the EPA's guidance. https://www.epa.gov/hw-sw846/sw-846-test-method-1311-toxicity-characteristic-leaching-procedure

[58] End-of-Life Solar Panels: Regulations and Management | US EPA

[59] WINDExchange: End of Service Wind Turbine Guide (energy.gov)

[60] 40 CFR § 273

[61] U.S. EPA. "*May a handler of universal waste manage broken or damaged batteries as universal wastes?*" EPA: FAQ About Universal Waste

5. Repowering Projects

Repowering refers to retrofitting or upgrading a renewable energy system with new equipment or redesigning with new infrastructure. The repowering process can occur during or at the end of a renewable energy project's initial service life and may result in a higher project capacity and/or greater generation output. It is the more expensive option relative to removing the facility. According to the Center for Rural Affairs (CFRA), it can cost about 80% of the total project value, depending on how much of the initial project is retrofitted or upgraded.[62] Despite the high cost, repowering offers several advantages. The advantages and disadvantages of repowering are discussed below.

Recent Repowering | Cohocton and Steel Winds Wind Farm Repowering Project

In December 2021, Brookfield Renewable U.S. completed the repowering of the 35 MW Steel Winds (I and II) wind farms, and the 125 MW Cohocton Wind Farm.* The repowering was completed by replacing the original turbine blades with new models. The more efficient models allowed Brookfield to increase annual generation by almost 30 percent with the same number of units. The turbines combined generate enough power for 60 thousand homes. The repowering will extend the useful life of the project for another 20 years, based on the terms of the PILOT secured by the project owner with the local community.**

**Source: Cohocton Steel Wind Press Release*
***Source: TerraForm Power 4th Quarter Report*

Repowering is an umbrella term for several types of rebuilding, upgrading, or retrofitting options. Table 4 shows the various types of repowering that renewable energy installations may implement at or before the end of the energy installation's service life.[63] Generally, these are split between a full repower and a partial repower.

Full repowers replace a significant portion of existing equipment and will repower an installation at or greater than its prior output. This is most commonly performed to ensure renewable energy output is able to meet the terms agreed upon within a power purchase agreement (PPA).[64] If an installation is repowered at greater than its previous output (in megawatt-hours or project area), the owner may have to renegotiate PPAs and revisit interconnection agreements and permitting requirements for the "new" installation.

A full repowering at the previous -level of output (typically within a +/- 10% margin) may not require these kinds of negotiations or permitting and interconnection changes. Review local laws to ensure compliance with environmental permitting for the renewable energy project's location.

As of February 2025, NYISO Interconnection Agreement rules state that for repowering where capacity increases by greater than 10%, NYISO has to review the changes to determine if additional studies are needed to classify the project as a Permissible Technological Advancement. ORES Regulations (16 NYCRR Part 1100) do not explicitly refer to repowering projects. However, based on the declaratory ruling to AES in October 2023 regarding the proposed repowering of six wind farms, a repowering that results in any increase in nameplate capacity falls under ORES's jurisdiction, and thus requires a hearing under the "major modification" process described in 16 NYCRR Part 1100-11.1.[65]

A partial repower will be less extensive than the full repower option. Partial repowers may comprise either a partial rebuild or a retrofit/upgrade improvement. Partial rebuilds entail component upgrades, but this may be limited to inverters, certain ground or electrical infrastructure for solar, and turbine blade replacements for wind installations. A software/retrofit upgrade typically includes material upgrades or technological improvements that do not increase the total capacity of the generation facility. Certain smaller components could also be upgraded to constitute a retrofit. New software could be included to better manage energy output. It should be noted that if total output of the system increases, it does not qualify as a software system upgrade. **Table 4** contains a summary of considerations and classifications for repowering options.

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[62] Decommissioning solar energy systems WEB.pdf (cfra.org)
[63] Repowering and Decommissioning: What Happens in Communities When Solar and Wind Projects End? - Great Plains Institute (betterenergy.org)
[64] To Repower or Not to Repower? That's the Question; Here's How Asset Owners Can Answer It (powermag.com)
[65] 16 NYCRR Part 1100 – 11.1 Accessed December 17, 2024

Table 4 | Repowering Options Comparison

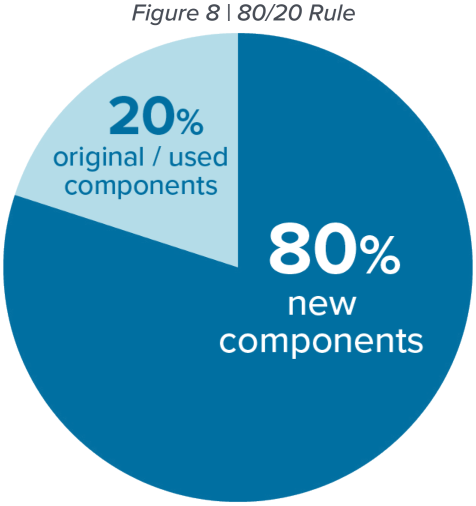
Repowering			
Full Repower		**Partial Repower**	
Exceeds Original Output	**Equivalent to Original Output**	**Partial Rebuild**	**Software/Retrofit Upgrade**
Most involved type of upgrade. Electricity generation is greater than former system's output, requiring a new negotiation with the state's regulatory utility commission, ISO/RTO, local, environmental, state, or county permitting.	Electricity generation is roughly equal to prior system's output and should not require negotiation with the public utility commission or the utility. The utility must be notified of repowering regardless of output changes.	Component upgrades but not extensive to constitute a full repower. Some examples could be installing longer turbine blades or replacing PV panels with more efficient ones.	Material upgrades or technological improvements, such as new software, upgrading electrical components. If total output of the system increases, then it does not qualify as a partial repower.

What are the opportunities associated with repowering?

Use our NYSERDA ITC/PTC Calculator Tool.

Repowering offers several advantages to developers and local governments. Repowering extends the life of the generation asset and generally allows the project owner to leverage existing land-use agreements, permits, and utility interconnections.[66] These can be costly to initiate for a new project, both in financial and administrative terms. For example, initial project stages may take several years of coordination between the developer, landowner, manufacturer, and local government. Repowering an existing project can considerably reduce the burdens in this uncertain phase of project development. For developers, repowering can be supported by accessing tax incentives such as the Clean Electricity Investment Tax Credit (CEITC) or Clean Electricity Production Tax Credit (CEPTC). These can significantly offset the costs of building and operating a renewable energy project. Developers and municipalities can assess the impacts of the tax credits against project costs using NYSERDA's ITC/PTC Calculator Tool.

Figure 8 | 80/20 Rule



Projects that are repowering may be able to claim CEITC/CEPTC credits under the Internal Revenue Service's 80/20 Rule. The 80/20 Rule allows projects to claim these tax benefits if the retrofitted property's original or used components are no more than 20 percent of the fair market value of the total value of the property.[67] In other words, a developer repowering a renewable energy project must spend at least 80% of the total project fair market value to satisfy the rule and unlock additional CEITC/CEPTC benefits.

Repowering keeps a power generation project in the same jurisdiction, which can provide local residents with access to more affordable renewable energy sources. Other benefits include reduced greenhouse gas emissions in the area, induced economic activity near the project, sustained employment, renewed land leases, and improved health impacts. It will also ensure the local government continues to receive a stream of tax payments into the future.

By the time a project is ready for repowering, the 15-year limit set in the Real Property Tax Law (RPTL) § 487 has likely been reached. As noted in RPTL 487(5), the tax exemption is offered for renewable energy projects constructed prior to January 2, 2030.[68] As a result, repowering projects are likely not eligible for further exemptions depending on the nature of the upgrades and repowering taking place, and when it occurs. See additional information on Real Property Tax Law 487 (RPTL 487) and Payment in Lieu of Taxes (PILOT) Chapter of the Solar Guidebook.

[66] The specific requirements for repowering will vary by project, and project developers must ensure they are compliant with local regulations. Laws are subject to change and may impact permits required to repower or operate renewable energy projects.
[67] Federal Register: Definition of Energy Property and Rules Applicable to the Energy Credit
[68] NYS Open Legislation | NYSenate.gov

What are the challenges associated with repowering?

While repowering a site may be simpler than developing a new site, there are challenges to repowering a renewable energy project. It is a more complex option than decommissioning an existing system. New design, components, permits, potential new interconnection agreements and PPAs may be required depending on the nature of the repowered installation.

Renewable energy projects typically have high upfront costs and much lower operating costs than fossil fuel energy generation projects. Repowering is committing to a longer payback period, as there is significant cash outlay up front. Finally, repowering can entail a significant redesign and upgrade to the existing project, which will introduce new complexities to the project. Challenges with repowering can include fitting new panels or wind turbines onto existing racking or tower support structures, and in some cases the existing balance of plant electrical systems may not be sufficient for new output. The organized complexity of upgrading a project needs to be carefully managed to meet its electricity output goals. Repowering requires planning, resources, coordination, and financing to be completed successfully.

6. Conclusion

Decommissioning is an important aspect of lifecycle planning for renewable energy projects. Successful decommissioning is contingent on careful planning, which starts prior to the project's construction, and thorough execution to ensure safety, environmental responsibility, and regulatory compliance with a goal to return the land to its original state. Local governments have a significant role to play in ensuring decommissioning is handled properly at the local level. Key considerations include:

- Depending on the project size, developments may require a decommissioning plan:
    - Utility scale projects exceeding 25 MW are permitted at the State level through the Office of Renewable Energy Siting and Electric Transmission and require decommissioning plans;
    - Smaller projects are permitted at the local level and often require decommissioning plans;
- Decommissioning plans are initially written during the project development stage, and updated periodically over the renewable energy project's useful life;
- Decommissioning plans include important information such as the roles and responsibilities for project owners and stakeholders, conditions that trigger the decommissioning process, and timing to complete decommissioning activities;
- Financial and non-financial enforcement mechanisms provide municipalities with the means to ensure the project owner is responsible for covering decommissioning costs;
- Estimation of decommissioning costs should be based on reasonable assumptions of long-term forecasting to avoid excessively burdening project owners with large surety bonds or decommissioning trusts;
- Licensed engineers and cost estimating professionals should be retained by project owners to generate accurate decommissioning cost estimates; and
- There are a growing number of options to recycle, salvage, or repower renewable energy projects to extend their useful lives, avoid disposing of components in landfills, burdening local services and potentially damaging the environment.

Appendix A: Inflation Primer

Understanding inflation can help local governments manage setting accurate contingencies for decommissioning cost estimates. A renewable energy developer's upfront project financing will need to obtain a bond, letter of credit, or other financial instrument to ensure an appropriate amount of funds are available to cover full project decommissioning costs. The calculation of the full decommissioning costs 30 years into the future can be challenging and requires using reasonable assumptions to prevent significantly over- or under- estimating these costs. In practice, developers estimate costs in present day terms, and apply a contingency factor to capture some risk of inflation. The assumptions for the rate of inflation can significantly impact the required decommissioning cost estimate provided for renewable energy projects as the compounding effects of inflation can significantly magnify costs and create undue burden on renewable energy developers.

Decommissioning plans for renewable energy projects are initially developed up to 30 years before actual activities commence. Thus, it is important to use realistic, data-driven measures of inflation because of the effect of compounding over longer horizons. Recent periods of high inflation - driven in part by the COVID-19 pandemic and supply chain shock - have highlighted inflation's impact on project costs and brought it to the forefront of industry discussions.

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This primer will provide guidance for estimating inflation assumptions by answering the following questions:

- What is inflation?
- What are the best practices for inflation forecasting?
- What are the best sources for inflation data?
- What are the best sources for inflation forecasts?
- Can I revise the inflation assumptions over the 30-year period?

What is inflation?

Inflation refers to the general increase in prices in the economy over time.[1] Prices can change for several different reasons. For example, due to supply and demand of certain goods and services, or changes in the money supply. Inflation is estimated by several government agencies by comparing prices for the same goods at different points in time. These agencies track the prices of thousands of goods, that are compiled into indices.

What are the best practices for estimating inflation?

It is important to use realistic, data-driven measures of inflation. Using accurate estimates of inflation that reflect long-term trends will allow developers to have access to sufficient funds to cover future decommissioning costs without overburdening project costs. This can be a challenging balance to strike during periods of unusually high or low inflation. Given these yearly fluctuations and the expected lifetime of renewable energy projects, it is crucial for developers and local governments to use long-term inflation expectations for planning decommissioning.

For long-term inflation estimates, the Federal Reserve will implement policy in an effort to maintain inflation at or near its target of 2% annually.[2] Based on current forecasts as shown in Figure 1, inflation is anticipated to stabilize at a rate of around 2% annually by 2026.

[1] What is Inflation? clevelandfed.org
[2] The Fed - Why does the Federal Reserve aim for inflation of 2 percent over the longer run?

Federal reserve target rate

Since over the long-term inflation is managed by the Federal Reserve, it is likely reasonable to assume general inflation will be near 2% for longer term inflation projects. *Source: The Fed*

Understanding the upper and lower bounds of prevailing rates may be helpful for selecting a reasonable short-term inflation estimate as the project nears its anticipated decommissioning. Projects in New York can consider using the region-specific implicit gross domestic product (GDP) Deflators or regional construction indexes, as opposed to national-level inflation measures to gather current measures of region-specific inflation.

Selecting an appropriate inflation estimate for decommissioning cost estimates should be driven by the estimated time horizon of when actual activities are expected to be taking place. For activities occurring at least five or more years in the future, using the Federal Reserve's long-term inflation target may be most representative of anticipated changes in prices. For near-term activities, reviewing current inflation rates and available short term inflation outlooks can be more representative of anticipated market conditions.

What are the best sources for inflation forecasts?

There are several organizations that publish inflation forecasts, including the Federal Reserve, commercial banks and other financial institutions, and economic research think tanks.[3] Two major data agencies in the U.S., the Bureau of Labor Statistics (BLS) and Bureau of Economic Analysis (BEA) do not produce inflation forecasts. The inflation forecasts are frequently a part of a broader economic outlook analysis and are reported together with forecasts of other economic variables such as GDP growth, employment growth, or unemployment rate. These forecasts are typically national short-term outlooks for the next 2-3 years and focus on the aggregate PCE inflation or CPI inflation.

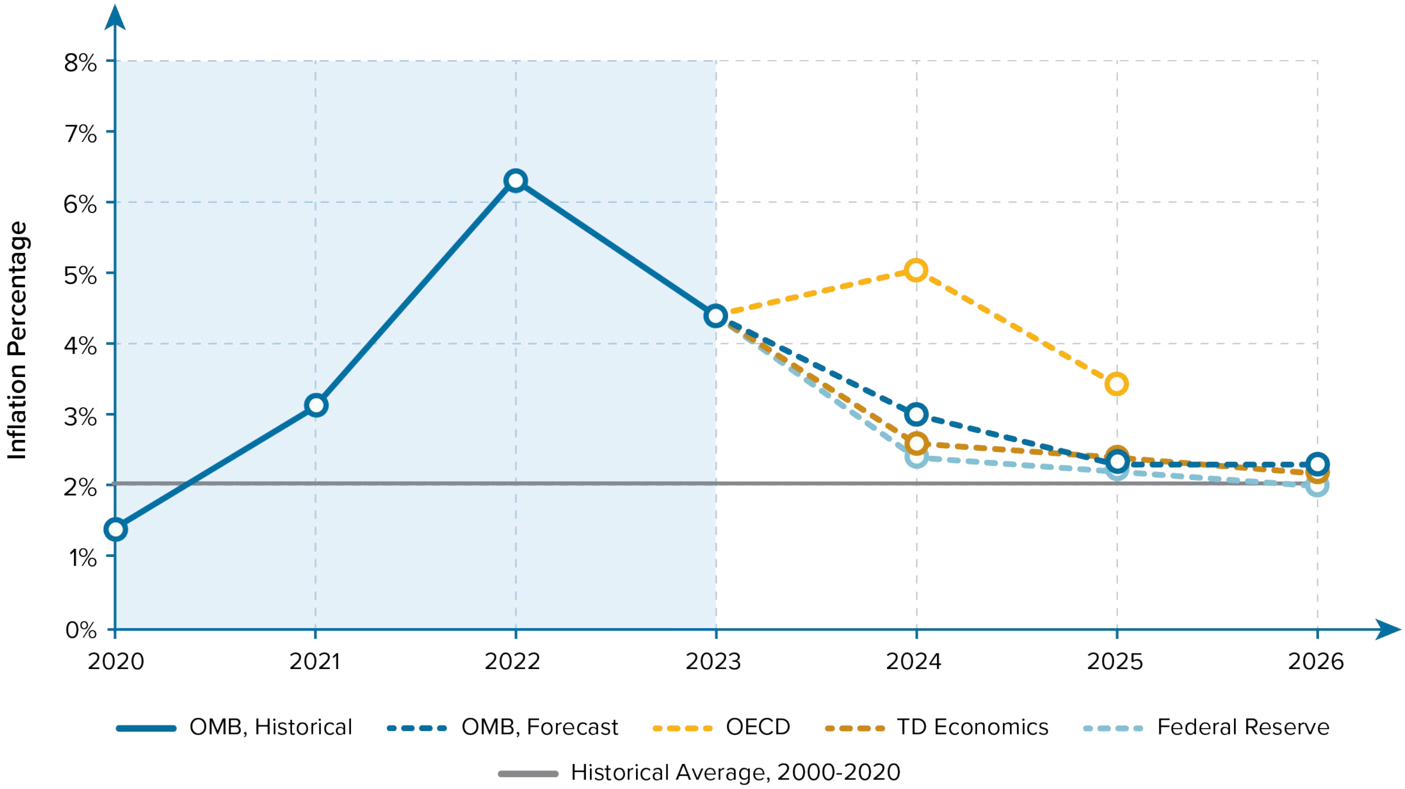
Alternatively, the forecasted inflation rate can be calculated from the total GDP deflator forecasts prepared by the White House Office of Management and Budget, which currently has forecast data available through 2029.[4] Inflation is anticipated to stabilize around 2% annually by 2025, which is in line with the Federal Reserve's inflation target.[5] Since the Federal Reserve will implement policy to attempt to maintain inflation at or near 2% annually, it is likely reasonable to assume general inflation will be near 2% for longer term inflation projections. **Figure 1** contains a comparison of inflation forecasts from 2023 to 2026.

[3] The latest PCE inflation forecasts from the Federal Reserve (news release from the December 12-13, 2023 meeting of Federal Open Market Committee) are available at Federal Reserve Board - Federal Reserve Board and Federal Open Market Committee release economic projections from the December 12-13 FOMC meeting. Examples of forecasts from international organizations include OECD at Prices - Inflation forecast - OECD Data. Canadian banks also produce US economic forecasts with TD Bank as one of such examples (see Latest Forecast Tables (td.com))

[4] See Historical Tables, Table 10.1 – Gross Domestic Product and Deflators Used in the Historical Tables: 1940-2028, Historical Tables | OMB | The White House.

[5] The Fed - Why does the Federal Reserve aim for inflation of 2 percent over the longer run?

Figure 1 | Inflation Forecast, 2020-2026



What are the best sources for current inflation data?

There are two primary sources of inflation data that produce various indices that can be used to measure inflation. Measuring the changes of these indices is a way to estimate current and historical annual inflation. Given that these measures can only be used to estimate current and historical inflation rates, these sources are not ideal for projecting longer term inflation on costs that have yet to be incurred due to larger variability in year-over-year estimates due to changing market forces. **Table 1** compares the BLS and BEA sources for inflation forecasts.

Table 1 | Comparison of Sources for Inflation Data

Bureau of Labor Statistics (BLS)	Bureau of Economic Analysis (BEA)
3 main categories of price indices: Consumer Price Index (CPI), Producer Price Index (PPI), Employment Cost Index (ECI)	**3 main categories of price indices:** Implicit GDP Deflator, Personal Consumption Expenditure (PCE) Price Index, Implicit Regional Price Deflators (IRPD)

Bureau of Labor Statistics (BLS)

The three main categories of price indices for measuring current and historical inflation produced by the BLS are the CPI, the PPI and the ECI. These indices are frequently used to escalate various contractual payments and obligations. BLS provides guidance on potential applicability of these indices in contract escalation (although it does not encourage or discourage the use of specific adjustments, or contractual language).[6]

[6] See Contract Escalation: U.S. Bureau of Labor Statistics (bls.gov).

Table 2 | Comparison of Various Price Indices Produced by BLS

	CPI	PPI	ECI
Measures average change in:	Consumer prices for a basket of consumer goods & services	Prices paid to domestic producers for their output	Wages and benefits paid by employers
Available at:	Major metropolitan area, regional, and national level	Industry sector level	Industry sector level
Typically used for escalation:	In private sector collective bargaining agreements, rental contracts, etc.	By business firms for long-term sales and purchase contracts	By business owners and HR for staff pay adjustments

Bureau of Economic Analysis (BEA)

The BEA collects data to produce a range of price indices and implicit price deflators which can be used to assess inflation in the economy from various points of view and geographic levels (i.e., nationwide, statewide, and county/regional economy). BEA produces three primary indices that can be used to measure inflation: the implicit GDP deflator, personal consumption expenditure (PCE) price index, and implicit regional price deflators (IRPD), which are summarized in **Table 3**.

Table 3 | Comparison of Various Price Indices Produced by BEA

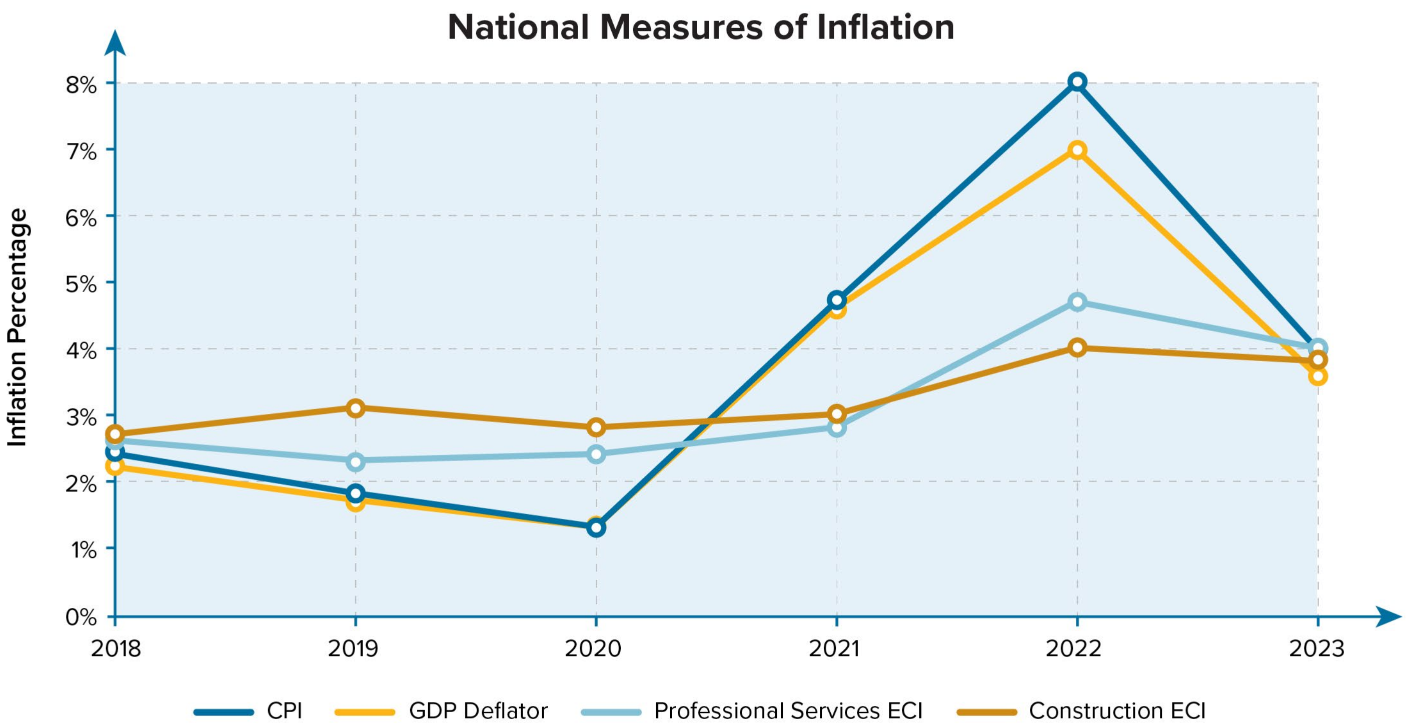
	Implicit GDP Deflator	PCE Index	IRPD
Measures average change in:	Consumption and investment patterns across the entire economy	Average household spending	Regional prices
Available at:	National level, though can be calculated at regional levels	National level, though can be calculated at regional levels	State level
Additional Characteristics:	Recommended for use in federal benefit-cost analysis guidance	Includes expenditures made on behalf of consumers, like government assistance programs to estimate accurate measure on cost of living	Allows for estimating state-specific inflation rates

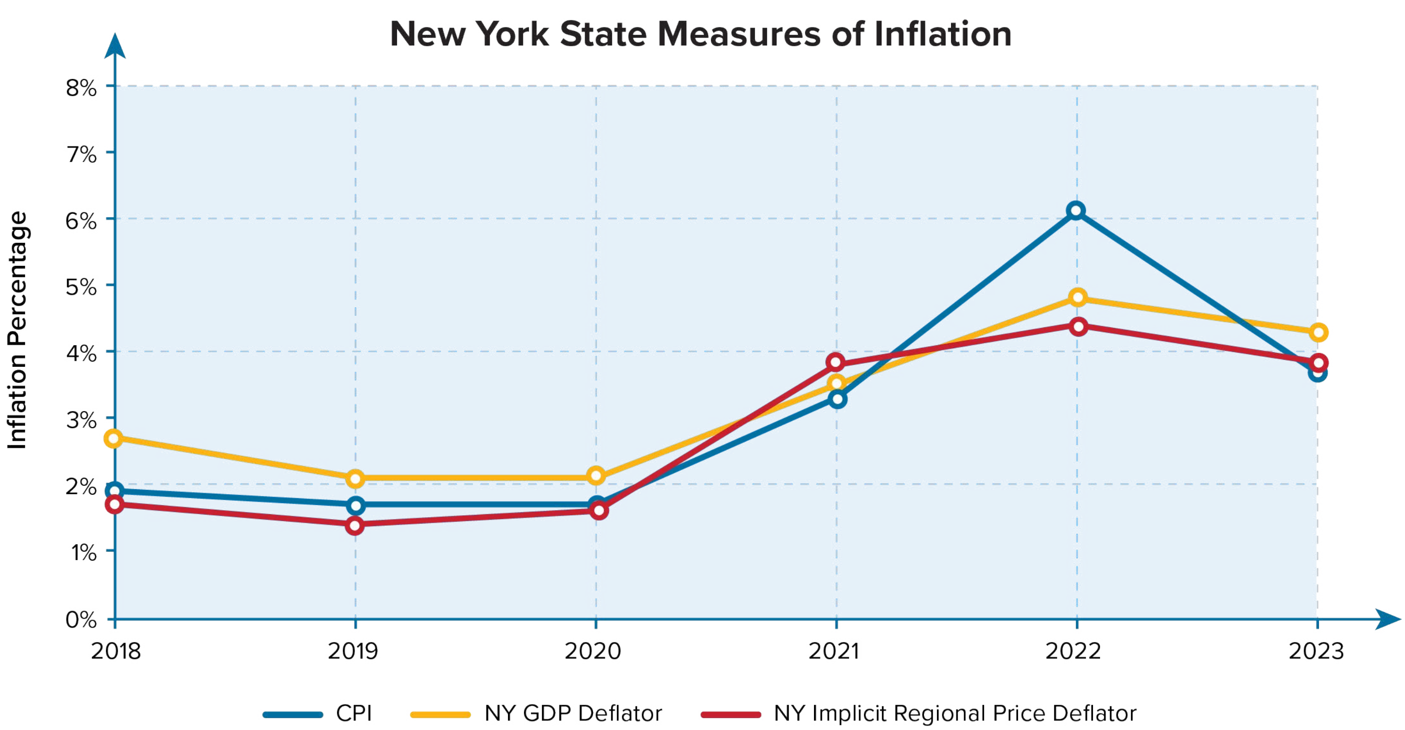
Despite all these different ways to measure inflation, the overall economy-wide inflation estimates produced by the various indices typically trend together in a similar range, as shown in the charts below. Industry-specific measures of inflation will produce greater variability and offer insight on whether an industry is trending above or below average inflation levels. At the national level, the Construction ECI index has shown less variation than overall CPI in recent years. New York State measures of current and historical inflation are typically below national level indicators.

The inflation measures shown in **Figure 2** represent a point-in-time estimate measuring the change in prices relative to the previous year. While there may be larger variability in year-over-year estimates due to changing market forces, the Federal Reserve strives to maintain price stability by targeting a long-run inflation target of 2%.[7]

[7] The Fed - Why does the Federal Reserve aim for inflation of 2 percent over the longer run?

Figure 2 | Comparison of Levels of Inflation, National and State-Level, %





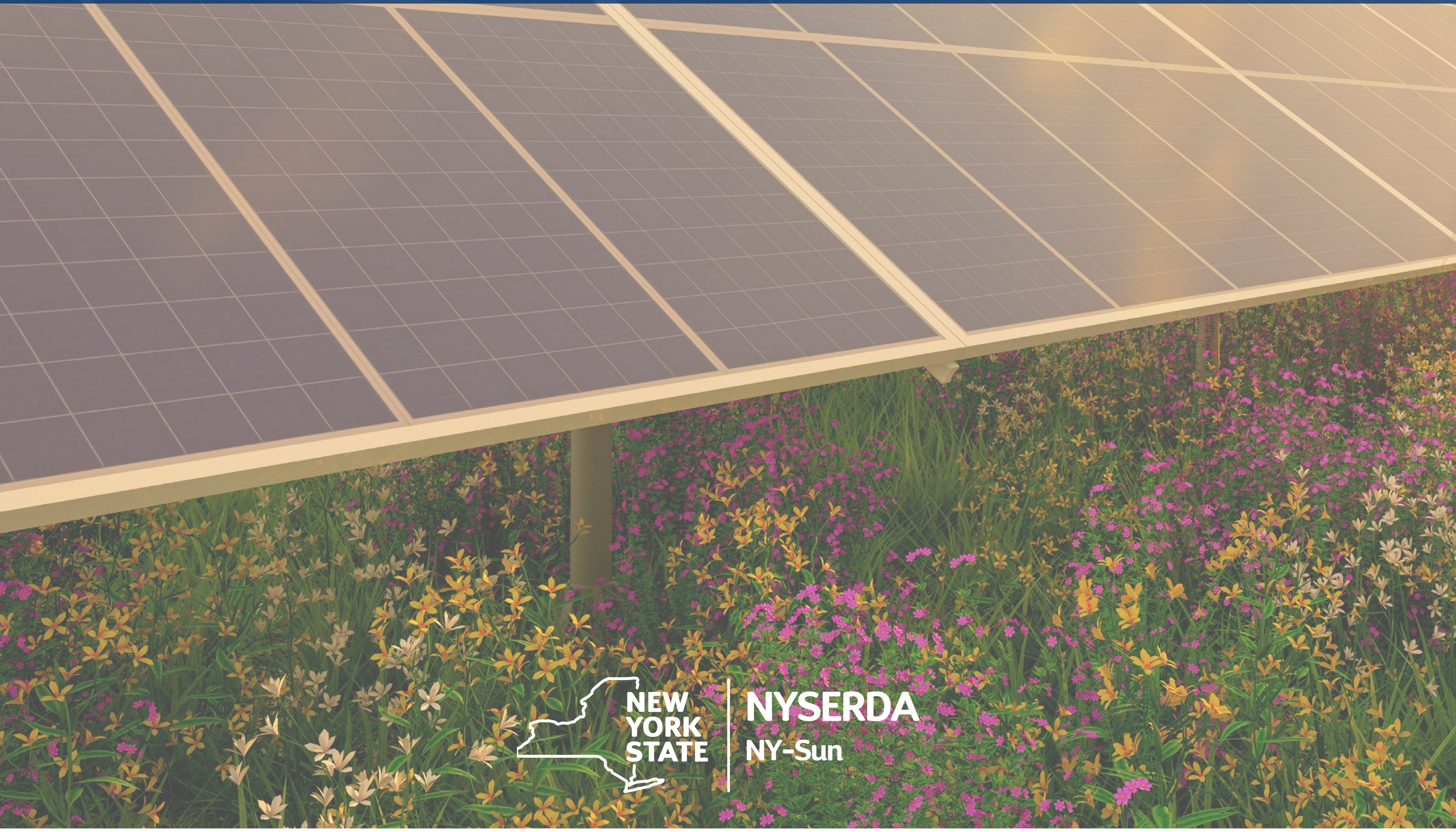
Can I revise the inflation assumptions over the 30-year period?

Given that decommissioning plans are anticipated to be updated roughly every five years, this can be used as an opportunity to update the decommissioning cost estimates and capture changes in underlying costs and revisit the inflation assumptions to more accurately capture current conditions throughout a project's lifecycle. Updating decommissioning cost estimates will implicitly incorporate changes in market prices since the previous update, and contingency values also be updated to reflect changes in risk since the last estimate. As project costs are locked-in prior to when these costs are actually incurred, changes after projects reach commercial operation can be difficult for the project to adjust. Therefore, it is important to provide a quality inflation forecast to estimate impacts for future decommissioning costs that will occur 30 years after project commissioning.

Section 8

Model Solar Energy Local Law

For local governments to utilize when drafting local laws and regulations for solar development.



Section Contents

Overview

The Solar Energy Local Law serves as a resource to help educate local officials about the processes of installing, operating, maintaining, and decommissioning solar energy systems in their respective jurisdictions. Local officials can use the Model Law to evaluate their existing local laws, regulations, and policies and adopt new rules and regulations that facilitate solar development while meeting local needs. Before adopting the Model Law provisions, local officials should consider the role local governments play in solar energy development, how they can plan for solar energy, zoning techniques that facilitate solar development, and other helpful resources.

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1. The Role of Local Governments in Solar Energy Development

Local governments have broad authority to adopt land use regulations that encourage the most appropriate use of the land. New York State has empowered its local governments to adopt land use regulations and to review and approve development proposals through various local boards, including local legislatures, planning boards, zoning boards of appeal, and architectural review boards. Local governments adopt zoning and other land use regulations to implement their planning goals and objectives and guide land development.

Zoning is the most commonly and extensively used technique for regulating land uses. Zoning provisions, established in accordance with a comprehensive plan, separate a community into zoning districts and specify the land uses and building dimensions that are permitted in each zone. Other local land use regulations govern the subdivision of land and the planning and design of individual sites. For example, local regulations can determine which uses require site plan review and approval. During site plan review, the designated local board evaluates how a particular parcel is developed. For communities without zoning, site plan regulations and permit requirements are the primary technique for regulating development. In addition, land use regulations may include provisions that protect natural and cultural resources or help facilitate solar energy development. Many of the factors considered under land use regulations go hand in hand with a community's review under the State Environmental Quality Review Act (SEQRA).

In some circumstances, local land use laws regulating solar energy systems may interact with other State laws. In April 2020, the New York State legislature enacted the Accelerated Renewable Energy Growth and Community Benefit Act (the Act), which created the Office of Renewable Energy Siting and Electric Transmission (ORES). ORES implements the State's consolidated and timely review and approval process for major renewable energy facilities. Under the Act, new large-scale renewable energy projects producing 25 MW or more must obtain a permit from ORES. Prior to issuing a final siting permit for a major renewable energy facility, ORES must find that the proposed project complies with any applicable local laws and regulations, except those determined by ORES to be unreasonably burdensome.

Applications for major renewable energy facilities must contain a statement clearly identifying any applicable local comprehensive plan, an indication of whether the proposed facility is consistent with that plan, as well as a list of all substantive local requirements (e.g. laws, resolutions, regulations, standards, and other requirements) applicable to the proposed facility. Permittees must construct and operate permitted facilities in accordance with all applicable and substantive local requirements which are not determined to be unreasonably burdensome. In accordance with the office's regulations, ORES "may elect to not apply, in whole or in part, any local law or ordinance which would otherwise be applicable if it makes a finding that, as applied to the proposed facility, it is unreasonably burdensome in view of the CLCPA targets and the environmental benefits of the proposed facility". Applicants may request that ORES not apply a local law or ordinance by including in their application a statement of justification showing the degree of burden caused by a specific requirement.

Whether permitted locally (under local land use regulations and SEQRA) or by ORES, applicants for a solar energy system shall be required to obtain building, electrical, and/or plumbing permit approvals and successful inspections as necessary to ensure full compliance with the New York State Uniform Fire Prevention and Building Code.

1.1 Comprehensive Planning for Solar Energy

Municipalities should consider amending their local plans before adopting solar energy regulations because local land use regulations must conform to the locality's comprehensive plan. New York State Village Law § 7-704, General City Law §20(25), and Town Law § 263 require land use regulations to be "in accordance with a comprehensive plan" or "in accordance with a well-considered plan." When a local regulation is challenged, courts will examine a municipality's land use policies, actions, and existing regulations for evidence of the locality's comprehensive plan. Thus, proactive planning for solar energy development provides significant legal protections for regulations that implement the plan.

Local comprehensive plans also influence ORES permits for large-scale renewable energy projects. Under ORES regulations, applications for major renewable energy facilities must identify applicable local comprehensive plans and indicate whether the proposed facility is consistent with those plans.

Comprehensive plans inventory a community's needs and assets, develop a shared vision for the future, and build consensus and support for actions that will implement the plan. These plans can create the policy foundation for solar energy regulations through planning goals, objectives, strategies, and implementation measures that facilitate solar energy development. To learn more about comprehensive planning for solar energy, and to access additional comprehensive planning resources, consult NYSERDA's Clean Energy and Your Comprehensive Plan guide at: www.nyserda.ny.gov/ComprehensivePlan.

Commentary: Evidence of Comprehensive Planning

If a municipality's land use regulations become subject to legal challenge or review, the courts will look for evidence of a comprehensive plan by considering all relevant municipal policies and actions, including but not limited to the following:

- Municipal zoning laws and their legislative findings.
- Previously adopted plans and policies, including topic-specific plans, such as agricultural protection or conservation plans.
- Previous land use decisions.
- The local legislature's minutes.
- Existing conditions (or other) studies.
- Environmental reviews and findings.

1.2 Solar Energy Land Use Regulations

Municipalities can implement local solar plans and policies by adopting solar energy regulations that meet local needs. To develop a solar energy regulation, municipalities should consider completing the following steps.

1.2.1 Ensure the Regulation Conforms to Existing Plans and Policies

As discussed above, solar energy regulations should conform to existing policies and plans by implementing their goals, objectives, and strategies. For example, communities that have farmland protection plans, sustainability plans or climate action plans should ensure that their solar energy regulations align with those plans.

Commentary: Land Use Moratoria – What They Are, and How to Use Them Effectively

A moratorium on development is a local law or ordinance that suspends (for a reasonable time) property owners' rights to obtain development approvals, intended to grant a community time to consider, draft, and adopt land use plans or rules to respond to new or changing circumstances not adequately dealt with under its current laws.

Communities should be cautious when considering the adoption of a moratorium. Moratoria involve the suspension of landowners' right to use their property, are often litigated, and are likely to be invalidated by the courts if the community is unable to show the necessity for the moratorium and its reasonableness under the circumstances. Moratoria can also have negative impacts on communities, reducing municipal tax receipts, restricting jobs and economic development, and potentially preventing the replacement of pollution-causing infrastructure with clean energy technology.

Key Considerations for Municipalities:

- A moratorium must be reasonable, time-limited, and narrowly crafted to address a demonstrable community need, while less restrictive land use regulations are being developed. A moratorium must be adopted in conformance with all procedures required of any zoning or land use action, including notice, hearing, the formalities of adoption, and filing.
- A moratorium should include specific procedures for requesting a variance from its terms, just as land use regulations have to provide for variances.
- A moratorium does not apply to approved projects where the developer has completed construction or has completed substantial construction in reliance on a development approval or permit.

Resources:

- NYS Department of State: Land Use Moratoria https://dos.ny.gov/land-use-moratoria-0

1.2.2 Collect Relevant Information About Solar Energy Development

When conducting studies and gathering data for solar energy development, local governments should assess existing conditions for relevant infrastructure, including gathering information about local electric distribution from hosting capacity maps.

Commentary: Hosting Capacity Maps

The “hosting capacity” of the local electric distribution system may affect solar energy development in a community. Hosting capacity refers to an estimate of the location and quantity of new distributed energy resources (DER), including solar energy systems, which can be interconnected without adversely impacting power quality or requiring costly infrastructure upgrades.

Analyzing local hosting capacity can help communities identify and account for areas with higher or lower potential for solar energy development. The Joint Utilities of New York publish and regularly update hosting capacity maps for public use.

Knowing that development is more likely to occur in areas with available hosting capacity, NYSERDA recommends municipalities consider the following:

- Hosting capacity maps should be analyzed alongside local zoning maps and other resources to help promote solar energy in areas with higher development potential.
- Utility hosting capacity maps do not include high-voltage transmission lines and therefore may not be predictive of all future solar energy development.
- Hosting capacity is subject to change based on factors like grid upgrades and should not be the sole factor shaping a municipality’s planning around clean energy.

For assistance viewing or analyzing a hosting capacity map, please contact NYSERDA’s Clean Energy Siting Team at cleanenergyhelp@nyserda.ny.gov.

Resources:

- NYS Department of Public Service: Hosting Capacity Maps and Useful Links https://www3.dps.ny.gov/W/PSCWeb.nsf/All/6143542BD0775DEC85257FF10056479C

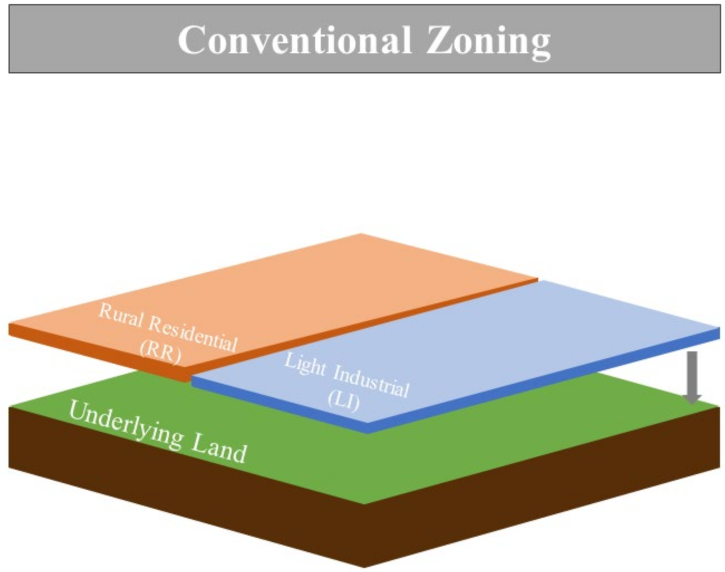
1.2.3 Involve Stakeholders in Process

Involving stakeholders in the development and implementation of solar energy regulations is crucial to build community support for these mandatory regulations that will effect real change. Municipalities should identify key stakeholders and ensure they are involved in regulation development. To learn more about facilitating meaningful community participation, review the Public Engagement and Education section of NYSERDA’s Clean Energy and Your Comprehensive Plan (www.nyserda.ny.gov/ComprehensivePlan).

1.2.4 Choose the Right Regulatory Tool

Local governments have broad authority to adopt solar energy regulations using a variety of zoning techniques that meet a community's unique land-use needs and goals. The regulatory tools described below offer different mechanisms and incentives to help municipalities create appropriate solar energy regulations given local circumstances. These include:

(a) Conventional Zoning



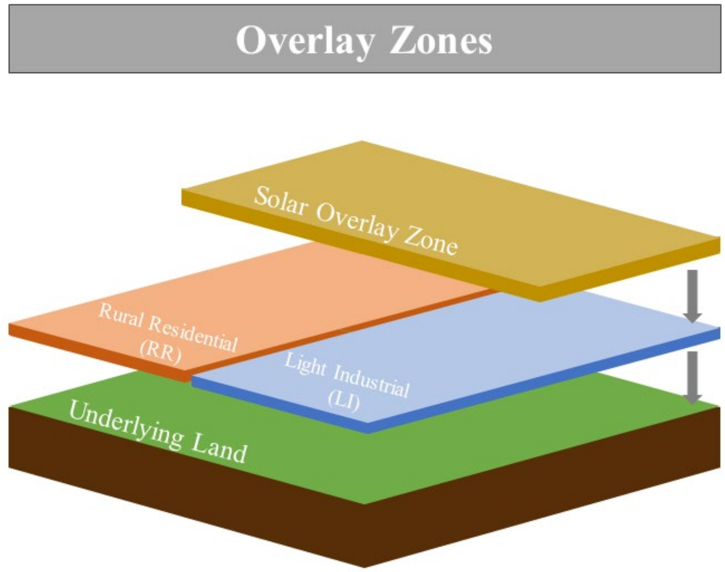
The Municipal Home Rule Law, NYS Village Law §7-702, General City Law § 20(25), and Town Law § 262 empower local governments to adopt zoning regulations that divide a municipality's land into districts with authorized land uses and building restrictions that limit structure height, lot area coverage, and other building dimensions within each district. Users can consult a municipality's zoning map to identify the district within which any parcel of land is located. Conventional zoning defines each type of permitted solar energy system based on selected criteria, which may include system type, location, physical size, and nameplate capacity. The zoning law then allows each defined solar energy system as a principal, accessory, secondary or special use within certain zoning districts.

- Principal uses are permitted as-of-right in certain districts.
- Accessory uses are subordinate, incidental to, and customarily found in connection with a principal use, and are usually permitted as-of-right but may require additional review in certain districts.
- Conditional or special uses are principal in nature; permit approvals are conditioned upon compliance with specific requirements to mitigate a system's adverse impacts.

As discussed below, to further limit adverse impacts, site plan regulations may include provisions that require applicants to submit a site plan showing the proposed system's layout, arrangement, and design to help the municipality evaluate a proposed system's impacts. The Model Solar Energy Local Law uses a conventional zoning approach to regulate solar energy systems.

A conventional zoning approach may be more familiar and more easily implemented by municipal board members and staff in charge of adopting and enforcing local solar energy regulations. This approach allows municipalities to regulate solar in a manner comparable to other types of development, rather than requiring them to proactively map out and limit solar development to specific areas.

(b) Overlay Zones



Under their delegated power to enact zoning regulations, municipalities may adopt overlay zoning. Overlay zoning contains provisions that apply to an overlay district, which is superimposed over the existing zoning map to designate precise areas where development may be permissible. Overlay provisions apply in addition to or in lieu of underlying zoning requirements, and often provide incentives and waivers to encourage certain types and styles of development. By creating a solar overlay zone, local governments are tasked with defining specific areas where solar energy systems would be appropriate within the community. Because the underlying zoning district standards still apply to projects in an overlay zone, this approach may help minimize resistance from property owners who have concerns about continuity with existing zoning regulations.

An overlay zoning approach may be preferred if the municipality wishes to define specific areas in which to allow solar development that are not directly aligned with current zoning boundaries. Implementing a solar overlay approach may require additional time and resources, as it requires the municipality to evaluate the entire community based on factors of concern (such as proximity to electric infrastructure, topography, and soil qualities, etc.), identify where to locate systems, and draw the boundaries of the overlay zone on the existing zoning map.

Solar Overlay Zone Example: Town of Evans, NY

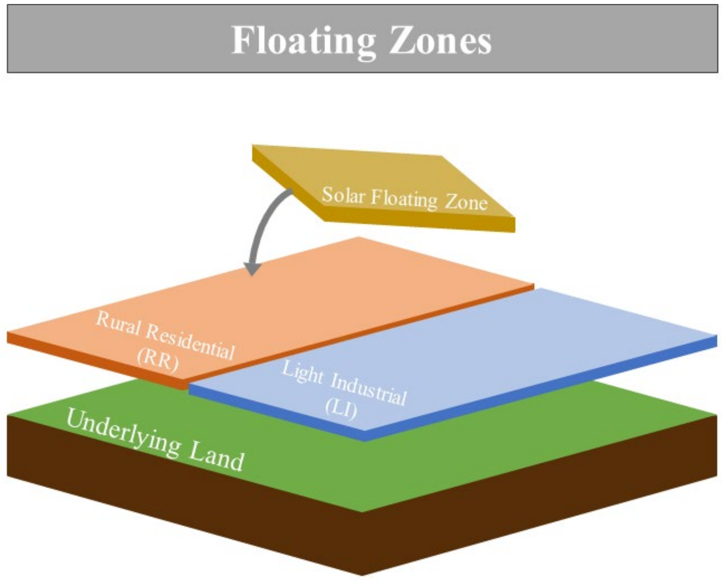
The Town of Evans utilizes an overlay zone approach as outlined in its 2019 “Solar Energy Systems Law of the Town of Evans” (Solar Law). Under this approach, Type 2 solar energy systems (defined as a small-scale system not exceeding 110% of on-site electricity consumption) are permitted in all zoning districts, while Type 1 systems (large-scale systems which are not sized in accordance with on-site residential or commercial consumption) are permitted only within the Town’s Utility Scale Solar Overlay District.

Projects proposed within the Overlay District – which spans portions of the Town’s agricultural lands, open space, and existing industrial zones – are required to comply with applicable regulations for Type 1 systems as established in the Solar Law. These requirements include minimum lot size, maximum yard, minimum setbacks, orientation, maximum height, maximum energy generation, and other requirements.

Reference materials:

- Town of Evans’ Solar Energy Systems Law: https://dos.ny.gov/local-laws
- Town of Evans’ Utility Scale Solar Overlay District and Zoning Map: https://townofevans.org/docs/maps-and-drawings.html

(c) Floating Zones



Under its zoning authority, a local government may amend its zoning code to include a "floating zone" which allows for solar energy systems, but does not require an amendment to the zoning map until a project or area is identified for the application of this zone.

Though sometimes referred to as an overlay zone (the terms have been used interchangeably), a floating zone is distinct in that it "floats" in the zoning code until the municipality amends its zoning map to affix the new district to an area that is appropriate for solar development. The municipality can apply the zone upon a developer's petition, the local legislature's initiative, or a municipal board's recommendation. When a developer or landowner applies for the floating zoning to be affixed to their property, they must demonstrate compliance with the floating zone's conditions and performance objectives, which may include criteria to mitigate project impacts. If approved, the floating zone is applied to the developer's property on the zoning map, and the applicant may proceed to any subsequent permitting or approval processes.

Like the overlay zone approach, floating zones offer some flexibility in terms of identifying appropriate or preferred areas for solar development.. Developers can apply for a floating zone to be applied to any parcel they can show is appropriate for solar development, which may open more areas in the community to solar development. Because of this, floating zones eliminate the municipality's preliminary burden of determining the most environmentally appropriate areas for solar development. The municipality must only identify appropriate solar project site criteria and standards for inclusion in the floating zone. However, this approach does introduce some uncertainty for developers who must invest in and submit the preliminary application prior to knowing that the floating zone will be applied to a proposed site, and it creates a more elaborate, two-step review process for applicants and local governments.

Solar Overlay/Floating Zone Example: Town of Glenville, NY

In early 2021, the Town of Glenville amended its zoning law to include a "Solar Farm Overlay District." In practice, the law incorporates aspects of both an overlay and floating zone approach, whereby:

- Designated solar districts do not exist on the Town's zoning map unless approved on a project-by-project basis;
- Applicants proposing a solar farm must seek a zoning change for the project parcel(s); if approved by the Town Board, a new solar district is created and added to the zoning map;
- The applicant may then submit a site plan application for review by the Town's Planning and Zoning Commission.

To be approved for a zoning change, an applicant's preliminary-stage site plan must demonstrate compatibility with surrounding uses, alignment with the Town's Comprehensive Plan, avoidance of adverse visual impacts, and other criteria. Once approved for a zoning change, the applicant's submission to the Planning and Zoning Commission will be reviewed for compliance with solar zone and underlying-district-specific standards (setbacks, lot size, etc.) and other requirements established in the zoning law.

Reference materials:

- Town of Glenville's law establishing a "Solar Farm Overlay District": https://locallaws.dos.ny.gov/sites/default/files/drop_laws_here/ECMMDIS_appid_DOS20210223060238/Content/09021343802e0f10.pdf.

(d) Site Plans

NYS Village Law § 7-725-a, General City Law § 27-a, and Town Law § 274-a authorize municipalities to adopt site plan regulations that govern the development of individual parcels of land through site-specific design and infrastructure standards. Site plan regulations supplement the zoning code's use and dimensional standards and authorize local boards to review a proposed project's site design and features to determine potential impacts to the site and neighboring parcels.

Solar energy system regulations can require applicants to submit a site plan showing the proposed system's layout, arrangement, and design so the municipality can evaluate system impacts. The Model Solar Energy Local Law requires site plans only for projects of certain types and sizes, while ensuring that projects which are unlikely to have significant land use impacts (e.g. rooftop or building-integrated solar) are not subject to onerous permitting requirements.

Commentary: Site Planning for Solar Development Versus Conventional Development

Ground-mounted solar arrays differ from conventional development projects in the following ways:

1. Large-scale solar arrays are a passive principal use with minimal regular activity and disturbance.
2. The amount of land occupied by a solar array may significantly vary project-to-project, from less than an acre to hundreds of acres.
3. The accelerated construction timeframe for solar developments can disturb soils and vegetation and contribute to stormwater runoff.
4. Solar arrays are installed above ground on metal racking systems, often utilizing simple steel piles or ground screws. The bulk of the system is not fixed to the ground and has a minimal footprint, unlike traditional development which has a large, fixed footprint.
5. Solar arrays require vehicular paths, and must account for the movement of vehicles across the natural ground surface.
6. Solar arrays have on-site utility lines and electrical interconnection equipment.
7. Solar arrays require fencing at a large scale.
8. The lifespan of solar panels requires the consideration of system decommissioning and site restoration after a 25- to 35-year term.

(e) Incentive Zoning

Incentive zoning allows developers to build at greater development densities than permitted under existing zoning in exchange for providing one or more community benefits, such as off-site infrastructure, open space or parks, agrivoltaics, or some other physical, social, or cultural amenity. Incentive zoning is authorized by and must comply with the requirements of Village Law § 7-703, General City Law § 81-d, and Town Law § 261-b, whereby incentives may allow adjustments to zoning requirements for lot coverage, setbacks, or other considerations. The resulting increase in development density may help provide community benefits (e.g. electric bill savings through a community solar subscription), and can mitigate land use impacts by reducing a project's physical footprint.

If it is not feasible for the development to provide a direct community benefit, the incentive zoning system may allow developers to make cash payments to a municipal trust fund to provide specified benefits elsewhere. It is important to note that local zoning regulations are not to include a mandate for payment as a prerequisite for a zoning approval; frequently, however, solar project developers may be willing to provide payments to the municipality as part of a local benefit package, sometimes referred to as a Host Community Benefit Agreement.

(f) Regulatory Tools for Communities without Conventional Zoning

Some municipalities have not adopted conventional zoning, as described in section 124(a) above, because they have limited administrative capacity or will to develop and enforce zoning regulations or they want to protect landowner independence. Localities without conventional zoning often regulate solar energy systems through other types of land use regulations, such as moratoriums, site plan review, local permits, overlay districts, and stand-alone solar energy laws. Some municipalities without conventional zoning amend their site plan regulations to require site plan review for large-scale solar energy systems (see section 124(d) above), and some adopt a solar permit law, requiring solar energy systems to obtain a formal approval after complying with several conditions, such as preparing plot, decommissioning, and emergency response plans. Other municipalities without conventional zoning may adopt an overlay district, described in section 124(b) above, to indicate where solar energy systems are permitted and other requirements with which they must comply. Finally, some local governments without conventional zoning create stand-alone solar energy laws, often by adopting a model solar law after modifying the law to accommodate local circumstances, including removing references to conventional zoning.

Adapting the Model Solar Law for a Municipality without Conventional Zoning Example: Town of Friendship, NY

In 2022, the Town of Friendship adopted a modified version of the NYSERDA model solar law. When Friendship adopted the law, the Town did not have zoning or site plan regulations. To adapt the model law to local circumstances, the Town changed language such as "All Tier 1 Solar Energy Systems shall be permitted in all zoning districts and shall be exempt from site plan review under the local zoning code or other land use regulation" to "All Tier 1 Solar Energy Systems/Facilities shall be permitted in all areas of the Town, and shall be exempt from site plan review if such Site Plan Review procedures are adopted in the future[.]" Ideally, the Town also would have modified the introductory paragraph to exclude the word "zoning."

Reference materials:

- Town of Friendship Solar Energy Systems and Facilities Local Law: https://www.townoffriendship-ny.com/uploads/notices/61eeb9568450f_doc20220124092750.pdf.

1.2.5 Streamline the Project Review Process

Local land use review and approval systems typically involve several local agencies that undertake complicated, uncoordinated, single-issue reviews of a proposed project. It is not uncommon for applicants to have difficulty navigating this complex process, which can result in costly delays. Municipalities with or without zoning can streamline the land use approval system through techniques that simplify, consolidate, clarify, and automate the process. Localities can simplify application requirements, coordinate board reviews, engage the public early in the review process through pre-application meetings, and allow administrative approvals when appropriate. Local staff can improve efficiencies by coordinating with the local utility and state agency staff who will issue any permits required for local approvals. Municipalities can also clarify the process for applicants by creating clear guidelines, developing a road map for them, revising application materials, ensuring transparency throughout the process, and proactively educating the public about the process. Online permitting helps automate the process, and preapplication meetings help get all parties on the same page early in the process, avoiding conflict and confusion later.

1.2.6 Complete a Generic Environmental Impact Statement on the Land Use Regulation

Solar energy system regulations must undergo SEQRA review, as do any subsequent solar energy projects approved under those regulations (projects approved under a state-level siting process are subject to a comprehensive alternative review process). To reduce the need for in-depth SEQRA reviews for future projects, the municipality can prepare a Generic Environmental Impact Statement (GEIS) for the solar energy regulation. Authorized by 6 N.Y.C.R.R. § 617.10, a GEIS identifies environmental conditions and develops standards and review thresholds to ensure that future development is compatible with or protective of those conditions. When a final GEIS has been filed, no further SEQRA compliance is required if a subsequent proposed project will conform with the GEIS's established conditions and thresholds. However, a supplement to the final GEIS must be prepared if the final GEIS did not adequately address the subsequent proposed project and that project may have one or more significant adverse environmental impacts. Additionally, the Part 617 regulations authorize a municipality to charge a portion of its GEIS preparation costs to developers of later projects as they submit permit applications, a highly cost-effective approach.

1.3 Additional Resources

Planning & Land Use Regulation Resources
NYS Department of State Division of Local Government Services
https://dos.ny.gov/publications?f%5B0%5D=filter_term%3A1716

Local Laws Search
NYS Department of State Division of Local Government Services
https://locallaws.dos.ny.gov

Training and Assistance
NYS Department of State Division of Local Government Services
https://dos.ny.gov/training-assistance

Planning and Zoning Training Series
New York Planning Federation
https://nypf.org/services

Property Topics and Concepts
American Planning Association Planning and Law Division
https://www.planning.org/divisions/planningandlaw/propertytopics.htm#Floating

Are You Solar Ready?
American Planning Association
https://www.planning.org/planning/2020/mar/are-you-solar-ready

Planning Implementation Tools: Overlay Zoning
University of Wisconsin-Stevens Point, Center for Land Use Education
https://www.uwsp.edu/cnr-ap/clue/documents/planimplementation/overlay_zoning.pdf

U.S. Solar Siting Regulation and Zoning Ordinances
National Renewable Energy Laboratory
https://data.openei.org/submissions/5734

Planning Implementation Tools: Overlay Zoning
Land Use Law Center
https://appsrv.pace.edu/GainingGround/?do=TopicSearch&Topic=84#bottom

2. Model Solar Energy Local Law

The Model Solar Energy Local Law can be found on the following page and at www.nyserda.ny.gov/SolarGuidebook, under the Model Solar Energy Local Law tab. A workable version of this document can also be found online at the above website. It is not recommended for municipalities to use the Model Solar Energy Local Law 'as is'; rather, it was created as a resource for advising local governments when adopting solar energy local laws.

a. This Model Solar Energy Local Law (Model Law) is not intended for adoption exactly as it is written. It is intended to be advisory only, and users should not rely upon it as legal advice. A municipality is not required to adopt this Model Law. Municipal officials are urged to seek legal advice from their attorneys before enacting a solar energy law. Municipalities must carefully consider how the Model Law language may be modified to suit local conditions, their comprehensive plan, and existing zoning and land use regulations and zoning provisions.

b. The sole siting authority for solar projects under 25 megawatts (MW) resides at the local level rather than the state level. One purpose of this Model Law is to inform and facilitate local efforts to expand solar energy generation in a sustainable way. This Model Law regulates the installation, operation, maintenance, and decommissioning of solar energy systems. The Model Law is intended to be an "all-inclusive" ordinance that facilitates a thorough review of all aspects of solar energy systems under typical zoning and land use regulations, including the State Environmental Quality Review Act. As they review this Model Law, municipalities are encouraged to examine their local laws and regulations and the types, size and number of solar energy projects proposed. Local governments should adopt a local law that regulates solar energy development in a way that makes the most sense for each municipality, removing, modifying, or adding provisions as appropriate.

c. In some cases, there may be multiple approaches to regulating solar energy systems based on certain criteria or local preferences. Throughout the Model Law text, "[OR]" has been selectively placed to indicate considerations for which a municipality should evaluate multiple approaches, before selecting a preferred strategy. Municipalities should choose the options which work best for their communities, in consultation with appropriate municipal officials and staff. The content provided in brackets and highlighted may be customizable or optional; depending on local circumstances, a municipality may want to include this content or choose to adopt a different standard.

d. Other zoning code definitions, uses, and regulations should be reviewed to identify any conflict with the provisions of this Model Law. For example, municipalities should amend any zoning provision that prevents an accessory use from existing on an accessory structure, which the Model Law allows. If a municipality's zoning code defines or limits the use of the term "subordinate," in a way that conflicts with the Model Law's definitions, the municipality should amend the Model Law to state that it preempts the more restrictive definition. Some local zoning laws prohibit accessory structures on other accessory uses, which this Model Law allows. One solution to this and the other conflicts noted here is to amend the zoning definition for solar accessory uses to clarify that they are allowed despite restrictive definitions of "subordinate" or the prohibition of accessory uses to accessory buildings.

e. If a municipality has not adopted zoning, terms such as "zoning," "zoning districts," and "zoning provisions" should be removed from the provisions of this Model Law. Some of these sections should be clarified after the removal of zoning-related phrases, particularly phrases that incorporate by reference elements of an underlaying zoning district.

Compare the following examples:

- **1. Authority**: "to adopt land use regulations and zoning provisions" could be changed by simply deleting "and zoning provisions"
- **6. Permitting Requirements for Tier 1 Solar Energy Systems**: "All Tier 1 Solar Energy Systems shall be permitted in all zoning districts and shall be exempt from site plan review under the local zoning code or other land use regulation." could be modified to "All Tier 1 Solar Energy Systems shall be permitted throughout the [Village/Town/City] and shall be exempt from site plan review under any local land use regulation."
- **6. Permitting Requirements for Tier 1 Solar Energy Systems (C)(4)**: "Lot Size. Tier 1 Solar Energy Systems shall comply with the existing lot size requirement specified for accessory structures within the underlying zoning district." could be modified to "Lot Size. Tier 1 Solar Energy Systems shall comply with the lot size limitations in Appendix 1." However, Appendix 1 would also have to be modified to include the desired lot size limitations, as it references zoning districts.

1. Authority

This Solar Energy Local Law is adopted pursuant to [Select one: sections 261-263 of the Town Law / sections 7-700 through 7-704 of the Village Law / sections 19 and 20 of the City Law and section 20 of the Municipal Home Rule Law] of the State of New York, which authorize the [Village/Town/City] to adopt land use regulations and zoning provisions that advance and protect the health, safety and welfare of the community, and, in accordance with the [Village/Town/City] law of New York State, "to make provision for, so far as conditions may permit, the accommodation of Solar Energy Systems and equipment and access to sunlight necessary therefor."

Commentary: Municipalities are specifically authorized to adopt legislation to accommodate Solar Energy Systems and equipment. The Model Law Authority Section references this delegated authority. The municipal attorney should be consulted regarding this Section as well as the Model Solar Energy Law in its totality.

2. Statement of Purpose

This Solar Energy Local Law is adopted to advance and protect the public health, safety, and welfare of [Village/Town/City] by creating regulations for the installation and use of solar energy generating systems and equipment, with the following objectives:

1. To take advantage of a safe, abundant, renewable and non-polluting energy resource;
2. To decrease the cost of electricity to the owners of residential and commercial properties, including single-family houses;
3. To increase employment and business development in the [Village/Town/City], to the extent reasonably practical, by furthering the installation of Solar Energy Systems;
4. To mitigate the impacts of Solar Energy Systems on environmental resources such as important agricultural lands, forests, wildlife and other protected resources; and
5. To create synergy between solar and [other stated goals of the community pursuant to its Comprehensive Plan; may include urban/downtown revitalization, vacant land management, creating a walkable, healthy community, etc.].

3. Definitions

ACTIVE AGRICULTURAL LAND: Land used for a Farm Operation in accordance with Agriculture and Markets Law § 301 – uses of which include production of crops, livestock, and livestock products – within the past five years.

BATTERY ENERGY STORAGE SYSTEM: One or more devices, assembled together, capable of storing energy in order to supply electrical energy at a future time (not to include a stand-alone 12-volt car battery or an electric motor vehicle).

BUILDING-INTEGRATED SOLAR ENERGY SYSTEM: A combination of Solar Panels and Solar Energy Equipment integrated into any building envelope system such as vertical facades, semitransparent skylight systems, roofing materials, or shading over windows, which produce electricity for onsite consumption.

FACILITY AREA: The cumulative land area occupied during the commercial operation of the solar energy generating facility. This shall include all areas and equipment within the facility's perimeter boundary – including the solar energy system, onsite interconnection equipment, onsite electrical energy storage equipment, and any other associated equipment – as well as any site improvements beyond the facility's perimeter boundary such as access roads, permanent parking areas, or other permanent improvements. The facility area shall not include site improvements established for impact mitigation purposes, including but not limited to vegetative buffers and landscaping features.

FARM OPERATION: Land and on-farm buildings, equipment, facilities, and practices which contribute to the production, preparation, and marketing of crops, livestock, and livestock products as a commercial enterprise (in accordance with Agriculture & Markets Law § 301[11]).

GLARE: The effect by reflections of light with intensity sufficient as determined in a commercially reasonable manner to cause annoyance, discomfort, or loss in visual performance and visibility in any material respects.

GROUND-MOUNTED SOLAR ENERGY SYSTEM: A Solar Energy System which is secured to the ground via a pole, ballast system, or other mounting system; is detached from any other structure; and which generates electricity for onsite or offsite consumption.

KILOWATT (kW): A unit of power equal to 1,000 watts. The nameplate capacity of residential and commercial solar energy systems may be described in terms of kW.

MEGAWATT (MW): A unit of power equal to 1,000 kW. The nameplate capacity of larger solar energy systems may be described in terms of MW.

MINERAL SOIL GROUPS 1-4 (MSG 1-4): Soils recognized by the New York State (NYS) Department of Agriculture and Markets as having the highest value based on soil productivity and capability, in accordance with the uniform statewide land classification system developed for the NYS Agricultural Assessment Program.

NAMEPLATE CAPACITY: A solar energy system's maximum electric power output under optimal operating conditions. Nameplate Capacity may be expressed in terms of Alternating Current (AC) or Direct Current (DC).

NATIVE PERENNIAL VEGETATION: Native wildflowers, forbs, and grasses that serve as habitat, forage, and migratory way stations for Pollinators and shall not include any prohibited or regulated invasive species as determined by the NYS Department of Environmental Conservation.

ON-FARM SOLAR ENERGY SYSTEM: A Solar Energy System located on a farm which is a "farm operation" (as defined by Article 25-AA of the Agriculture and Markets Law, which may include one or multiple contiguous or non-contiguous parcels) in an agricultural district, which is designed, installed, and operated so that the anticipated annual total amounts of electrical energy generated do not exceed more than 110 percent of the anticipated annual total electrical energy consumed by the farm operation.

POLLINATOR: Bees, birds, bats, and other insects or wildlife that pollinate flowering plants, and includes both wild and managed insects.

ROOF-MOUNTED SOLAR ENERGY SYSTEM: A Solar Energy System located on the roof of any legally permitted building or structure that produces electricity for onsite or offsite consumption.

Commentary: This Model Law does not include a specific definition for Solar Energy Systems raised on canopy mounting, such as a solar parking canopy. Canopy-mounted configurations are included within the definition of Roof-Mounted Solar Energy Systems or Ground-Mounted Solar Energy Systems, depending on canopy location. Canopy-mounted systems installed on the roof of a structure are treated as Roof-Mounted Solar Energy Systems. Elevated systems not mounted on a roof are treated as Ground-Mounted Solar Energy Systems. If a municipality anticipates requiring special consideration for solar canopy systems, it could add to the Model Law specific provisions addressing these concerns or use a waiver for certain standards that may conflict with canopy-mounted systems, like height limitations.

SOLAR ACCESS: Space open to the sun and clear of overhangs or shade so as to permit the use of active and/or passive Solar Energy Systems on individual properties.

SOLAR ENERGY EQUIPMENT: Electrical material, hardware, inverters, conduit, energy storage devices, or other electrical and photovoltaic equipment associated with the production and storage of electricity.

SOLAR ENERGY SYSTEM: The components and subsystems required to convert solar energy into electric energy suitable for use. The term includes, but is not limited to, Solar Panels and Solar Energy Equipment. A Solar Energy System is classified as a Tier 1, Tier 2, Tier 3, or Tier 4 Solar Energy System as follows.

A. Tier 1 Solar Energy Systems include the following:

1. Roof-Mounted Solar Energy Systems.
2. Building-Integrated Solar Energy Systems.
3. Ground-Mounted Solar Energy Systems with a Nameplate Capacity of up to [25] kW AC.

   [OR]

   Ground-Mounted Solar Energy Systems with a total solar panel surface area of up to [4,000] square feet.
4. On-Farm Solar Energy Systems

B. Tier 2 Solar Energy Systems include the following:

1. Ground-Mounted Solar Energy Systems not included under Tier 1 Solar Energy Systems with a Nameplate Capacity of up to [1] MW AC and which generate no more than [110]% of the electricity consumed on the site over the previous [12] months.

   [OR]

   Ground-Mounted Solar Energy Systems not included under Tier 1 Solar Energy Systems with a Facility Area of up to [8] acres in size and which generate up to [110] % of the electricity consumed on the site over the previous [12] months.

C. Tier 3 Solar Energy Systems include the following:

1. Ground-Mounted Solar Energy Systems not included under Tier 1 or Tier 2 Solar Energy Systems with a Nameplate Capacity of up to [5] MW AC.

   [OR]

   Ground-Mounted Solar Energy Systems not included under Tier 1 or Tier 2 Solar Energy Systems with a Facility Area of up to [40] acres in size.

D. Tier 4 Solar Energy Systems are Solar Energy Systems which are not included under Tier 1, Tier 2, or Tier 3 Solar Energy Systems.

SOLAR PANEL: A photovoltaic device capable of collecting and converting solar energy into electricity.

Commentary: It is imperative that municipalities consider the practical land use impacts of different solar project types when establishing definitions and thresholds for Solar Energy System tiers. Where indicated in the Solar Energy Systems definition, municipalities shall elect to establish thresholds based on a systems' Nameplate Capacity (using kW and MW) OR its physical footprint (using square feet or acres), and should be consistent in this choice throughout. These definitions will be critical to the workability of the remaining sections of any solar regulation.

As defined above, NYSERDA's Model Solar Energy Local Law utilizes four tiers:

Tier 1 Solar Energy Systems include all Roof-Mounted and Building-Integrated Solar Energy Systems; Ground-Mounted Solar Energy Systems with a Namplate Capacity up to 25 kW AC, or with a total Solar Panel surface area of up to 4,000 square feet; and On-Farm Solar Energy Systems designed to support an existing agricultural operation in the community. Permitted in all zoning districts, Tier 1 Solar Energy Systems comprise those which are likely to cause the least concern from a zoning and land use perspective. These systems will primarily support residences and small commercial operations, or may directly support agricultural operations.

Roof-Mounted and Building-Integrated Solar Energy Systems do not pose any land use or stormwater runoff impacts; as such, their inclusion under Tier 1 offers a streamlined permitting process while still ensuring adequate review and code compliance through a building permit requirement.

For Ground-Mounted Systems, the 25 kW AC Nameplate Capacity limit aligns with the Unified Solar Permit criteria; derived from the 25 kW cutoff for residential solar net metering as established by the NYS Public Service Commission (PSC). The 4,000 square foot size limit corresponds to the SEQRA Type 2 action threshold for certain accessory structures which do not require zoning changes or use variances.

Finally, On-Farm Solar Energy Systems are included under Tier 1 because, in accordance with NYS Agriculture and Markets Law Chapter 69, Article 25-AA Section 305-a and related guidance, these systems cannot be subject to unreasonably restrictive requirements such as site plan review, special use permits, or non-conforming use requirements.

See Guidelines for Review of Local Laws Affecting Small Wind Energy Production Facilities and Solar Devices, available at https://agriculture.ny.gov/system/files/documents/2019/11/guidelines_for_solar_and_small_wind_energy_facilities.pdf.

Tier 2 Solar Energy Systems include Ground-Mounted Solar Energy Systems larger than 25 kW that primarily use the electricity generated from the system on-site. Tier 2 Ground-Mounted Solar Energy Systems have a Nameplate Capacity of up to 1 MW AC or a Facility Area of up to 8 acres, and generate no more than 110% of the electricity consumed on-site over the previous 12 months.

A municipality may elect to define Tier 2 Solar Energy Systems according to their physical size using measurements akin to those found in the zoning ordinance's bulk and area requirements (measured in acres, square feet etc.), or based on system Nameplate Capacity. Because Tier 2 Solar Energy Systems are tied to existing development as accessory structures subordinate to the principal use on-site, these systems have smaller impacts and require less oversight.

Tier 3 Solar Energy Systems are larger principal uses with greater impacts that require more oversight. Tier 3 systems are those not included in Tier 1 or Tier 2 Solar Energy Systems that have a Nameplate Capacity of up to 5 MW AC or a Facility Area of up to 40 acres in size, depending on the threshold type selected by the municipality.

The 5 MW cutoff derives from the NYS Standardized Interconnection Requirements (SIR) as established by the NYS PSC. Because solar energy systems typically occupy 5-8 acres per megawatt, a 40-acre cutoff utilizes a conservative estimate of the land needed for a 5 MW project, while allowing for some flexibility in terms of planning and project design.

Tier 4 Solar Energy Systems are large-scale systems that are not included under Tier 1, Tier 2, or Tier 3 Solar Energy Systems.

Tier 4 Solar Energy Systems include all projects subject to the state-level siting process administered by the Office of Renewable Energy Siting and Electric Transmission (ORES); this extends to all new solar projects with a Nameplate Capacity of 25 MW or greater.

4. Applicability

A. The requirements of this Local Law shall apply to all Solar Energy Systems permitted, installed, or modified in [Village/Town/City] after the effective date of this Local Law, excluding general maintenance and repair.

B. Solar Energy Systems constructed or installed prior to the effective date of this Local Law shall not be required to meet the requirements of this Local Law.

C. Modifications to an existing Solar Energy System that increase the Facility Area by more than [5] % of the original Facility Area (exclusive of moving any fencing) shall be subject to this Local Law.

Commentary: The Applicability Section establishes the effective date for implementation of the law. In addition, it carves out an exemption for maintenance, repair of systems, and modifications to existing Solar Energy Systems with an increase in Facility Area less than 5% of the original Facility Area (exclusive of moving any fencing).

5. General Requirements

A. A Building permit shall be required for installation of all Solar Energy Systems.

B. Prior to the issuance of the building permit or final approval by the [Reviewing Board], construction and/or site plan documents must be signed and stamped by a NYS Licensed Professional Engineer or NYS Registered Architect.

C. Local land use boards are encouraged to condition their approval of proposed developments on sites adjacent to Solar Energy Systems so as to protect their access to sufficient sunlight to remain economically feasible over time.

D. Issuance of permits and approvals by the [Reviewing Board] shall include review pursuant to the State Environmental Quality Review Act [ECL Article 8 and its implementing regulations at 6 NYCRR Part 617 (“SEQRA”)].

Commentary: The Solar Guidebook provides an overview of the SEQRA process and instructions for solar energy projects. Access the Solar Guidebook at www.nyserda.ny.gov/SolarGuidebook.

E. All Solar Energy Systems shall be designed, erected, and installed in accordance with all applicable codes, regulations, and industry standards as referenced in the NYS Uniform Fire Prevention and Building Code (“Uniform Code”), the NYS Energy Conservation Code (“Energy Code”), and the [Village/Town/City] Code.

F. For Solar Energy Systems subject to site plan review, the [Village/Town/City] shall impose, and may update as appropriate, a schedule of fees to recover expenses associated with engineering, environmental, or legal services determined to be reasonably necessary in the processing of an application under this law.

6. Permitting Requirements for Tier 1 Solar Energy Systems

All Tier 1 Solar Energy Systems shall be permitted in all zoning districts and shall be exempt from site plan review under the local zoning code or other land use regulation, subject to the following conditions for each type of Solar Energy Systems:

A. Roof-Mounted Solar Energy Systems.

1. Roof-Mounted Solar Energy Systems shall incorporate, when feasible, the following design requirements (exceptions may be approved by the [Code Enforcement Official]):

    a. Solar Panels on pitched roofs shall be mounted with a maximum distance of [8] inches between the roof surface the highest edge of the system.

    b. Solar Panels on pitched roofs shall be installed parallel to the roof surface on which they are mounted or attached.

    c. Solar Panels on pitched roofs shall not extend higher than the highest point of the roof surface on which they are mounted or attached.

    d. Solar Panels on flat roofs shall not extend above the top of the surrounding parapet, or more than [24] inches above the flat surface of the roof, whichever is higher.

2. Glare. All Solar Panels shall have anti-reflective coating(s).

3. Height. All Roof-Mounted Solar Energy Systems shall comply with the height limitations in Appendix 3.

   [OR]

   All Roof-Mounted Solar Energy Systems shall be subject to the maximum height regulations specified for principal and accessory buildings within the underlying zoning district.

B. Building-Integrated Solar Energy Systems

1. Building-Integrated Solar Energy Systems shall be shown on the plans submitted for the building permit application for the building containing the system.

C. Ground-Mounted Solar Energy Systems

1. Glare. All Solar Panels shall have anti-reflective coating(s).

2. Setbacks. Tier 1 Solar Energy Systems shall be subject to the setback regulations specified for the accessory structures within the underlying zoning district. All Ground-Mounted Solar Energy Systems shall only be installed in the side or rear yards in residential districts.

3. Height. Tier 1 Solar Energy Systems shall be subject to the height limitations specified for accessory structures within the underlying zoning district.

   [OR]

   Tier 1 Solar Energy Systems shall comply with the height limitations in Appendix 3.

4. Lot Size. Tier 1 Solar Energy Systems shall comply with the existing lot size requirement specified for accessory structures within the underlying zoning district.

5. Lot coverage. Tier 1 Solar Energy Systems are exempt from the lot coverage requirements in the underlying zoning district.

6. Screening and Visibility.

   a. All Tier 1 Solar Energy Systems shall have views minimized from adjacent properties to the extent reasonably practicable.

   b. Solar Energy Equipment shall be located in a manner to reasonably avoid and/or minimize blockage of views from surrounding properties and shading of property to the north, while still providing adequate Solar Access.

7. Permitting Requirements for Tier 2 Solar Energy Systems

All Tier 2 Ground-Mounted Solar Energy Systems shall be permitted in all zoning districts as accessory structures and shall be subject to site plan approval. Tier 2 Solar Energy Systems shall adhere to the standards and requirements established for Tier 1 Ground-Mounted Systems in Section [6(C)], in addition to (or in some cases amended by) the following requirements:

A. Application & Site Plan Review Requirements. Applications for Tier 2 Solar Energy Systems, including materials for site plan review, shall include the following:

1. Name, address, and contact information of proposed or potential system installer and the owner and/or operator of the Solar Energy System. Such information of the final system installer shall be submitted prior to the issuance of building permit.

2. Name, address, contact information, and signature of the project applicant, as well as all the property owners, demonstrating their consent to the application and the use of the property for the Solar Energy System.

3. Nameplate Capacity of the Solar Energy System (as expressed in kW or MW).

4. Zoning district designation for the parcel(s) of land comprising the Facility Area.

5. Property lines and physical features, including roads, for the project site.

6. Adjacent land uses on contiguous parcels within a certain radius of the site boundary.

7. Proposed changes to the landscape of the site, including site grading, vegetation clearing and planting, the removal of any large trees, access roads, exterior lighting, signage, fencing, landscaping, and screening vegetation or structures.

8. A one- or three-line electrical diagram detailing the entire Solar Energy System layout, including the number of Solar Panels in each ground-mount array, solar collector installation, associated components, inverters, electrical interconnection methods, and utility meter, with all National Electrical Code compliant disconnects and over current devices. The diagram should describe the location and layout of all Battery Energy Storage System components if applicable and should include applicable setback and other bulk and area standards.

9. A preliminary equipment specification sheet that documents all proposed Solar Panels, system components, mounting systems, racking system details, and inverters that are to be installed. A final equipment specification sheet shall be submitted prior to the issuance of building permit.

B. Standards. Tier 2 Systems shall adhere to the following standards.

1. Lot coverage. Tier 2 Solar Energy Systems are exempt from the lot coverage requirements in the underlying zoning district.

2. Screening/Visibility. Tier 2 Solar Energy Systems shall have views minimized from adjacent properties to the extent reasonably practicable using architectural features, earth berms, landscaping, or other screening methods that will harmonize with the character of the property and surrounding area.

3. Environmental Resources

a. Tree-cutting. Removal of existing trees larger than [6] inches in diameter should be minimized to the extent possible.

b. To the extent practicable, Tier 2 Solar Energy System Owners shall utilize and maintain native perennial vegetation to provide foraging habitat for pollinators in all appropriate areas within the Facility Area.

c. Use integrated pest management practices to refrain from/limit pesticide use (including herbicides) for long-term operation and site maintenance.

Commentary: The previous Sections regulate Tier 1 and Tier 2 Ground-Mounted Solar Energy Systems. Tier 1 Ground-Mounted Solar Energy Systems are relatively smaller in physical size compared to Tier 2 Ground-Mounted Solar Energy Systems. Tier 2 Ground-Mounted Solar Energy Systems produce electricity primarily for onsite consumption. Tier 1 and Tier 2 Ground-Mounted Solar Energy Systems are permitted as accessory structures in all zoning districts deemed appropriate by the local jurisdiction and do not require site plan review. Tier 1 and Tier 2 Ground-Mounted Solar Energy Systems are standalone structures and generate different concerns than roof-mounted installations. Because these system sizes are not limited to a structure's available roof space, it is important to think about the size of the lot in relation to the allowable system size, after accounting for setbacks. The Model Law requires all Tier 1 and Tier 2 Ground-Mounted Solar Energy Systems to be subject to the setback requirements of the underlying zoning district.

The Model Law provides two options to regulate the height of Tier 1 and Tier 2 Ground-Mounted Solar Energy Systems. One way is to limit the height of Ground-Mounted Solar Energy Systems to the requirements in the underlying zoning district. Each municipality must adopt appropriate height restrictions based on local need. Alternatively, municipalities can specify a set of new height standards, as shown in Appendix 3. All height measurements should be calculated when the Solar Energy System is oriented at maximum tilt.

This Model Law includes specific screening and visibility standards for Tier 1 and Tier 2 Ground-Mounted Solar Energy Systems while limiting the enforcement to "the extent reasonably practicable" to avoid overly burdensome standards.

8. Permitting Requirements for Tier 3 Solar Energy Systems

All Tier 3 Solar Energy Systems are permitted through the issuance of a [special use permit] within the [XXXXXXXXXXXXX, XXXXXXXXXX, XXXXXXXXXX] zoning districts, and subject to site plan application requirements set forth in this Section.

A. Applications for the installation of Tier 3 Solar Energy System shall be:

1. Reviewed by the [Code Enforcement/Zoning Enforcement Officer/Reviewing Board] for completeness. Applicants shall be advised within [30] days of the completeness of their application or any deficiencies that must be addressed prior to substantive review.

Commentary: Municipalities are encouraged to consider and establish a reasonable period for determining the completeness of a Solar Energy System permit application, which may be shaped by factors including:

- Availability and capacity of the Reviewing Board and/or municipal officials tasked with reviewing applications.
- Cadence of Reviewing Board meetings; if meetings are held monthly, a 30-day review period may be necessary to allow the Board to issue a completeness determination.
- Supplemental review and support services provided by a consultant or third-party.

2. Subject to a public hearing to hear all comments for and against the application. This hearing shall be in compliance with all existing public hearing requirements established under law by the [Village/Town/City].

Commentary: State law requires a public hearing and decision on special use permits but does not require notice to neighbors unless mandated under local law. If not already required by local law, localities may elect to require the following notice for proposed Tier 3 Solar Energy Systems to ensure adequate notice to adjoining landowners by adding the following provision:

"In addition to existing public notice requirements under local law, Applicants shall deliver notice by first class mail to adjoining landowners or landowners within [200] feet of the property at least [10] days prior to such a hearing. Proof of mailing shall be provided to the [Reviewing Board] at the public hearing."

3. Referred to the [County Planning Department] pursuant to General Municipal Law § 239-m if required.
4. Upon closing of the public hearing, the [Reviewing Board] shall take action on the application within 60-days of the public hearing, which can include approval, approval with conditions, or denial. The 60-day period may be extended upon consent by both the [Reviewing Board] and applicant.

B. Application & Site Plan Review Requirements. Applications for Tier 3 Solar Energy Systems, including materials for site plan review, shall include the following:

1. Name, address, and contact information of proposed or potential system installer and the owner and/or operator of the Solar Energy System. Such information of the final system installer shall be submitted prior to the issuance of building permit.
2. Name, address, contact information, and signature of the project applicant, as well as all the property owners, demonstrating their consent to the application and the use of the property for the Solar Energy System.
3. Nameplate Capacity of the Solar Energy System (as expressed in MW).
4. Zoning district designation for the parcel(s) of land comprising the Facility Area.
5. Property lines and physical features, including roads, for the project site.
6. Map(s) of MSG 1-4 soils and Active Agriculture Lands on the parcel(s) comprising the Facility Area and adjacent parcels.
7. Adjacent land uses on contiguous parcels within a certain radius of the site boundary.
8. Proposed changes to the landscape of the site, including site grading, vegetation clearing and planting, the removal of any large trees, access roads, exterior lighting, signage, fencing, landscaping, and screening vegetation or structures.
9. Erosion and sediment control and storm water management plans prepared to NYS Department of Environmental Conservation standards, if applicable, and to such standards as may be established by the Planning Board.
10. A one- or three-line electrical diagram detailing the entire Solar Energy System layout, including the number of Solar Panels in each ground-mount array, solar collector installation, associated components, inverters, electrical interconnection methods, and utility meter, with all National Electrical Code compliant disconnects and over current devices. The diagram should describe the location and layout of all Battery Energy Storage System components if applicable and should include applicable setback and other bulk and area standards.

11. A preliminary equipment specification sheet that documents all proposed Solar Panels, system components, mounting systems, racking system details, and inverters that are to be installed. A final equipment specification sheet shall be submitted prior to the issuance of building permit.

12. A Property Operation and Maintenance Plan that describes continuing site maintenance, anticipated dual-use, and property upkeep, such as mowing and trimming.

Commentary: In addition to long-term maintenance, the Operation and Maintenance Plan should present plans for dual-use on the site, including the crops that will be produced and a project-specific strategic grazing management plan of 3-to-7-year duration for the class(es) of livestock intended for the solar project. The grazing management plan should address herd size, forage availability, time of year, acreage to be grazed, weather conditions, and producer requirements. The Operation and Maintenance Plan should also place restrictions on the use of fertilizer or herbicide for long-term operation and site maintenance and should provide for scheduled upkeep of screening vegetation planted as part of the screening and visual impact mitigation plan.

13. A Decommissioning Plan [see Appendix 4] signed by the owner and/or operator of the Solar Energy System shall be submitted by the applicant. The decommissioning plan shall address the following:

    a. The time required to decommission and remove the Solar Energy System and any ancillary structures.

    b. The time required to repair any damage caused to the property by the installation and removal of the Solar Energy System.

    c. The cost of decommissioning and removing the Solar Energy System, as well as all necessary site remediation or restoration.

    d. The provision of a decommissioning security which shall adhere to the following requirements:

        1. The deposit, executions, or filing with the [Village/Town/City] Clerk of cash, bond, or other form of security reasonably acceptable to the [Village/Town/City] attorney and/or engineer, shall be in an amount sufficient to ensure the good faith performance of the terms and conditions of the permit issued pursuant hereto and to provide for the removal and restorations of the site subsequent to removal.

           The amount of the bond or security shall be [115]% of the cost of removal and site restoration for the Tier 3 Solar Energy System, and shall be revisited every [5] years and updated as needed to reflect any changes (due to inflation or other cost changes). The decommissioning amount shall be reduced by the amount of the estimated salvage value of the Solar Energy System.

        2. In the event of default upon performance of such conditions, after proper notice and expiration of any cure periods, the cash deposit, bond, or security shall be forfeited to the [Village/Town/City], which shall be entitled to maintain an action thereon. The cash deposit, bond, or security shall remain in full force and effect until restoration of the property as set forth in the decommissioning plan is completed.

Commentary: Decommissioning is the process of removing an abandoned Solar Energy System and remediating the land. When describing requirements for decommissioning Solar Energy Systems, it is possible to specifically require the removal of infrastructure, disposal of any components, and the stabilization and re-vegetation of the site. A decommissioning plan is required for Tier 3 Solar Energy Systems.

It is important to note that despite many municipalities' choice to require a financial mechanism for decommissioning, there is no specific authority to do so as part of a land use approval for solar PV projects. Therefore, a municipality should consult the municipal attorney when evaluating financial mechanisms.

For additional resources, please refer to NYSERDA's Chapter on Decommissioning Solar Panel Systems.

Commentary: It is important for municipalities to consider consolidating application reviews and approvals for Solar Energy Systems in one board. In some communities, the local zoning law may allocate responsibilities for special use permits and site plan approvals to different boards. Moving the application back and forth between two boards can add months and unnecessary costs to the Solar Energy System.

To avoid this, the community should determine which board should be primarily responsible for Solar Energy System approvals and consolidate special use permit and site plan approval thereby adding the following language to the Model Law: "All site plan and special use permit approvals for Solar Energy Systems shall be the responsibility of the [Reviewing Board] in order to avoid delays in the review of Solar Energy System applications."

Including specific requirements for site plan approval ensures that potential problems are addressed in the initial stages of the project. Municipalities can modify the list of required information to meet local needs as appropriate.

C. Special Use Permit Standards. [Reviewing Board] may issue a special use permit for a Tier 3 Solar Energy System only after it has found that all the following standards and conditions have been satisfied:

Commentary: Municipalities may elect to include waiver provisions that provide flexibility for the Reviewing Board, in its discretion, to waive certain requirements for Solar Energy Systems which: (1) are harmonious with existing land uses where proposed, and/or (2) based on system size or other considerations, need not adhere to the law's special use permit and site plan regulations. In some cases, the waiver may be partial, allowing the Reviewing Board to require a proposed Solar Energy System to comply with individual requirements in the law or to remove certain special use permit standards, such as required fencing, for smaller projects or other situations where the community deems these standards unnecessary. This is especially useful to encourage agrivolatic projects.

1. Underground Requirements. All utility lines located outside of the Facility Area shall be placed underground to the extent feasible and as permitted by the serving utility, with the exception of the main service connection at the utility company right-of-way and any new interconnection equipment, including without limitation any poles, with new easements and right-of-way.
2. Vehicular Paths. Vehicular paths within the Facility Area shall be designed in compliance with Uniform Code requirements to ensure emergency access, while minimizing the extent of impervious materials and soil compaction.
3. Signage.
   a. No signage or graphic content shall be displayed on the Solar Energy Systems except the manufacturer's name, equipment specification information, safety information, and 24-hour emergency contact information. Said information shall be depicted within an area no more than [8] square feet.
   b. As required by National Electric Code (NEC), disconnect and other emergency shutoff information shall be clearly displayed on a light reflective surface. A clearly visible warning sign concerning voltage shall be placed at the base of all pad-mounted transformers and substations.
4. Glare. All Solar Panels shall have anti-reflective coating(s).
5. Lighting. Lighting of the Solar Energy Systems shall be limited to that minimally required for safety and operational purposes and shall be reasonably shielded and downcast from abutting properties.
6. Multiple lots. At the discretion of the [Reviewing Board], where a Tier 3 Solar Energy System's Facility Area comprises multiple lots (regardless of ownership by an individual or multiple participating landowners), the combined lots may be treated a single lot for the purposes of applying specific standards and requirements, including but not limited to [lot size, setback] requirements.

Commentary: Tier 3 and Tier 4 Solar Energy Systems may include multiple lots within the Facility Area. To avoid project fragmentation, and to encourage responsible project density, the Reviewing Board should elect to treat adjacent participating lots as a single lot when applying select bulk and area standards, such as setbacks or lot size requirements.

This approach may help minimize visual and cumulative land-use impacts by consolidating a project's footprint, minimizing project fragmentation throughout the community, and preventing accidental marginalization of lands in the Facility Area.

7. Lot size. The property on which the Tier 3 Solar Energy System is placed shall meet the lot size requirements of the underlying zoning district.

   [OR]

   The property on which the Tier 3 Solar Energy System is placed shall meet the lot size requirements in Appendix 1.

8. Setbacks. The Tier 3 Solar Energy Systems shall comply with the setback requirements of the underlying zoning district for principal structures. Fencing, collection lines, access roads and landscaping may occur within the setback.

   [OR]

   The Tier 3 Solar Energy Systems shall meet the parcel line setback requirements in Appendix 2, Table 2.1. Fencing, collection lines, access roads and landscaping may occur within the setback.

9. Height. The Tier 3 Solar Energy Systems shall comply with the building height limitations for principal structures of the underlying zoning district.

   [OR]

   The Tier 3 Solar Energy Systems shall comply with the height limitations in Appendix 3 depending on the underlying zoning district.

   a. This height requirement can be waived by the [Reviewing Board] if the panels are being raised to accommodate continued or new agricultural purposes.

Commentary: Since Ground-Mounted Solar Energy Systems generally do not include much impervious surface and since lot coverage requirements are designed, in large part, to reduce impervious surfaces and associated stormwater runoff, this Model Law exempts Ground-Mounted Solar Energy Systems from lot coverage requirements. Ground-Mounted Solar Energy Systems are distinct from other uses, such as buildings or sheds, because stormwater generally will continue to infiltrate the uncompacted and vegetated ground beneath them. The setback, environmental, and agricultural requirements contained in the Model Law address issues related to stormwater runoff from Ground-Mounted Solar Energy Systems, and both the construction and operation of large Ground-Mounted Solar Energy Systems will be subject to applicable State requirements around erosion, sediment control and stormwater management requirements.

Municipalities which prefer not to waive lot coverage requirements for Ground-Mounted Solar Energy Systems can adopt more flexible lot coverage requirements that allow the Reviewing Board to limit issues related to fragmentation and the need to utilize large parcels of land for projects. The model language below requires that the Solar Energy System not exceed the maximum lot coverage requirement of the underlying zoning district but calculates lot coverage for a Ground-Mounted Solar Energy System by its actual impervious footprint, which results in a smaller measurement than the square footage of the Solar Panels.

10. Lot coverage. Lot coverage of the Solar Energy System, as defined below, shall not exceed the maximum lot coverage requirement of the underlying zoning district. The following components of a Tier 3 Solar Energy System shall be considered included in the calculations for lot coverage requirements:

   a. Foundation systems, typically consisting of driven piles or monopoles or helical screws with or without small concrete collars.

   b. All mechanical equipment of the Solar Energy System, including any pad mounted structure for Battery Energy Storage System components, switchboards, or transformers.

   c. Paved access roads servicing the Solar Energy System.

Alternatively, the requirement below measures a system's lot coverage by Solar Panel square footage and requires that the system not exceed a maximum lot coverage requirement established specifically for Ground-Mounted Solar Energy Systems.

10. Lot coverage. The Tier 3 Solar Energy System shall not exceed [80%] of the lot where it is installed. The surface area covered by Solar Panels shall not be included in total lot coverage.

10. Lot coverage. Tier 3 Solar Energy Systems are exempt from the lot coverage requirements in the underlying zoning district.

11. Fencing Requirements. All mechanical equipment, including any structure for Battery Energy Storage System components, shall be enclosed by a [7-foot-high] fence, as required by NEC, with a self-locking gate to prevent unauthorized access.

12. Screening and Visibility.

   a. Solar Energy Systems smaller than [10] acres shall have views minimized from adjacent properties to the extent reasonably practicable using architectural features, earth berms, landscaping, or other screening methods that will harmonize with the character of the property and surrounding area.

   b. Solar Energy Systems larger than [10] acres shall be required to:

      1. Conduct a visual assessment of the visual impacts of the Solar Energy System on public roadways and adjacent properties. At a minimum, a line-of-sight profile analysis shall be provided. Depending upon the scope and potential significance of the visual impacts, additional impact analyses, including for example a digital viewshed report, [shall/may] be required to submitted by the applicant.

      2. Submit a screening & landscaping plan to show adequate measures to screen through landscaping, grading, or other means so that views of Solar Panels and Solar Energy Equipment shall be minimized as reasonably practical from public roadways and adjacent properties to the extent feasible.

i. The screening & landscaping plan shall specify the locations, elevations, height, plant species, and/or materials that will comprise the structures, landscaping, and/or grading used to screen and/or mitigate any adverse aesthetic effects of the system. The landscaped screening shall be comprised of a minimum of [1] evergreen tree, at least [6] feet high at time of planning, plus [2] supplemental shrubs at the reasonable discretion of the [Reviewing Board], all planted within each [10] linear feet of the Solar Energy System. Existing vegetation may be used to satisfy all or a portion of the required landscaped screening. A list of suitable evergreen tree and shrub species should be provided by the [Village/Town/city].

[OR]

The screening & landscaping plan shall specify the locations, elevations, height, plant species, and/or materials that will comprise the structures, landscaping, and/or grading used to screen and/or mitigate any adverse aesthetic effects of the system, following the applicable rules and standards established by the [Village/Town/County].

ii. The [Reviewing Board] may elect to waive certain screening and landscaping requirements in select locations based on an applicant's demonstration of non-impact or impact mitigation on adjacent parcels.

Commentary: In general, municipalities should think through how helpful SEQRA can be in mitigating adverse impacts of any proposed system approved through a special use permit under this Section. When determining the appropriate SEQRA classification for a solar energy facility, municipalities shall consider a variety of tangible impacts which may be associated with the project, including the cumulative acreage of land disturbed by grading, road construction, racking system installation, and other activities.

For Tier 3 Solar Energy Systems which occupy fewer than 10 acres (considered Unlisted Actions in SEQR, except for systems in agricultural districts with a solar-panel surface area larger than 2.5 acres), this Model Law limits the enforcement of screening and visibility standards to "the extent reasonably practicable" to avoid overly burdensome standards.

For Tier 3 Solar Energy Systems which occupy greater than 10 acres (considered Type I Actions in SEQR), a visual impact assessment may be required by the Reviewing Board. If so, the visual impact assessment prepared for compliance with SEQRA could also be used to analyze visual impacts on public roadways and adjacent properties in compliance with requirements under the Model Law.

For additional resources, please refer to NY-Sun's "State Environmental Quality Review (SEQR) for Solar," available at nyserda.ny.gov/SolarGuidebook.

13. Environmental Resources

a. Tree-cutting. Removal of existing trees larger than [6] inches in diameter should be minimized to the extent possible.

b. Tier 3 Solar Energy System owners shall develop, implement, and maintain native vegetation to the extent practicable pursuant to a vegetation management plan by providing Native Perennial Vegetation and foraging habitat beneficial to game birds, songbirds, and Pollinators. To the extent practicable, when establishing perennial vegetation and beneficial foraging habitat, the owners shall use native plant species and seed mixes and seed all appropriate areas within the Facility Area. Any project which is designed to incorporate agricultural or farm-related activities or uses within the Facility Area may be excluded from this requirement based on the amount of space actually occupied by the agricultural use(s). This exclusion will only be allowed based on the [Reviewing Board] determination that these lands are being used for actual agricultural uses.

c. Use integrated pest management practices to refrain from/limit pesticide use (including herbicides) for long-term operation and site maintenance.

Commentary: Pollinators (birds, bats, bees, butterflies, moths, beetles, and multiple other species of insects) are critical to agricultural yield in the U.S. Some solar facilities are starting to use seed mixes of native grasses and Pollinator friendly flowering plants as ground cover in solar farms. By establishing native Pollinator habitats on solar farms, it is possible to reconcile the conflict between solar farms and agricultural land use. Below are multiple recommended approaches that can be used for creating Pollinator habitat on solar farms:

- Plant short-growing, low-maintenance, native seed mix underneath and around the panels;
- Plant a diverse Pollinator seed mix in between the rows of panels;
- Plant buffers with vegetation that benefit Pollinators and early successional species; Plant native shrubs along the property boundary;
- Specify a minimum number of species of native flowers (encouraged to include species for each bloom period) and native grass species.

14. Agricultural Resources. Tier 3 Solar Energy Systems for which the Facility Area includes lands consisting of MSG 1-4 shall adhere to the following requirements:

    a. Tier 3 Solar Energy System components, equipment, and associated impervious surfaces shall occupy no more than [50%] of the area of MSG 1-4 within the Facility Area.

        1. A Tier 3 Solar Energy System may exceed the [50%] MSG 1-4 coverage threshold if it incorporates an onsite activity or program which provides for the use of the land as a Farm Operation. Exceedance beyond the [50%] threshold will only be allowed based on the [Reviewing Board]'s determination that the land is being used for a Farm Operation.

        2. Subject to discretion of the [Reviewing Board], if the landowner demonstrates that – notwithstanding the classification as MSG 1-4 – the land cannot be profitably employed due to excessive wetness, rocky conditions or slopes, the land may be excluded from the calculation required by this section.

    b. To the maximum extent practicable, Tier 3 Solar Energy Systems located on MSG 1-4 shall be constructed, monitored, and decommissioned in accordance with the the NYS Department of Agriculture and Markets' "Guidelines for Solar Energy Projects - Construction Mitigation for Agricultural Lands."

Commentary: For more information about solar and agriculture, including dual-use approaches and relevant NYS programs, please refer to the 'Solar Installations on Agricultural Lands' section of the Solar Guidebook, available at: www.nyserda.ny.gov/SolarGuidebook.

MSG 1-4 include the highest quality soils in New York based on soil productivity and capability, as identified by the NYS Department of Agriculture and Markets. The agricultural protection standards and requirements included in this Model Law are designed to align with this soil categorization methodology, which is already utilized by NYS agencies including the NYS Department of Agriculture and Markets, NYSERDA, ORES, and the NYS Department of Taxation and Finance.

Other optional approaches for addressing agriculture include:

- Adding a provision that requires any Tier 3 Solar Energy System located on Active Agricultural Land to not exceed [75%] of the area of Active Agricultural Land within the Facility Area.
- Utilizing "Prime Farmland" and "Farmland of Statewide Importance" as the basis for agricultural protection standards included under local regulations, rather than MSG 1-4.
- Rather than cross referencing to the construction requirements of the NYS Department of Agriculture and Markets, consider directly adding select priority construction requirements to the law. For more details, please refer to NYS Department of Agriculture and Market's Guidelines for Agricultural Mitigation for Solar Energy Projects, available at https://agriculture.ny.gov/system/files/documents/2019/10/solar_energy_guidelines.pdf.
- Adding a provision that permits the Reviewing Board to waive or modify certain bulk and area standards that result in unintended consequences. Waiving those standards better protects agriculture and promotes continued agricultural use and alternative designs that protect more land.
- In drafting and evaluating solar regulations, coordinate with local/county/regional agricultural preservation board(s) as appropriate to provide an opportunity for ideation and feedback regarding agricultural land impacts. As with other external referral processes, consider establishing clear expectations and timelines to avoid delays.

D. Ownership Changes. If the owner or operator of the Solar Energy System changes or the owner of the property changes, the special use permit shall remain in effect, provided that the successor owner or operator assumes in writing all of the obligations of the decommissioning plan. A new owner or operator of the Solar Energy System shall notify the zoning enforcement officer of such change in ownership or operator within [30] days of the ownership change.

9. Permitting Requirements for Tier 4 Solar Energy Systems

All Tier 4 Solar Energy Systems are permitted through the issuance of a [special use permit] within the [XXXXXXXXXXXXX, XXXXXXXXXX, XXXXXXXXXX] zoning districts, and are subject to the site plan and special use permit application requirements established for Tier 3 Solar Energy Systems in Section [8], in addition to (or in some cases amended by) the following requirements:

A. Applications for Tier 4 Solar Energy Systems shall:

1. Be reviewed by the [Code Enforcement/Zoning Enforcement Officer/Reviewing Board] for completeness. Applicants shall be advised within [60] days of the completeness of their application or any deficiencies that must be addressed prior to substantive review.

B. Pre-Application Meeting.

At least [60] days prior to the submission of an application, the Applicant shall conduct a pre-application meeting with the [Reviewing Board OR Village/Town/City staff] to ensure all parties have clear expectations regarding any [Village/Town/City] requirements applicable to the proposed Solar Energy System. A written request for this purpose shall be sent to the [Reviewing Board OR highest-ranking official of the Village/Town/City]. Submission and review of the application shall not be delayed based on the failure of the [Reviewing Board OR highest-ranking official of the Village/Town/City] to respond in a timely manner to a properly-filed meeting request.

At the pre-application meeting, the Applicant must provide (1) a brief description of the proposed facility and its environmental setting, (2) a map of the proposed facility showing project components, (3) the proposed facility's anticipated impacts, (4) a designated contact person with telephone number, email address, and mailing address from whom information will be available going-forward basis, and (5) an anticipated application submission date.

Commentary: The pre-application meeting requirement is intended to align with procedural requirements applicable to major renewable energy facilities, as permitted by ORES and available at https://dps.ny.gov/ores-regulatory-documents.

C. Community Engagement Plan.

Applications for a Tier 4 Solar Energy System shall include a Community Engagement Plan detailing the applicant's proposed plans and strategies for ensuring adequate public awareness and encouraging community participation. Applicants are highly encouraged to discuss the contents and details proposed in this plan with the [Reviewing Board OR local officials] prior to the submission of a formal application.

Commentary: Community Engagement Plans are also required for facilities that produce TIER 1 Eligible Renewable Energy Certificates in the New York Generation Attribute Tracking System (NYGATS). These facilities must meet the Community Engagement Plan criteria outlined in the Step Two Bid Proposal requirements for NYSERDA's Request for Proposals for Tier 1 Eligible Renewable Energy Certificates, available at https://www.nyserda.ny.gov/All-Programs/clean-energy-standard/renewable-generators-and-developers/res-tier-one-eligibility/solicitations-for-long-term-contracts.

Consistent with those criteria, municipalities can require the Plans be publicly posted and incorporate the following criteria into Community Engagement Plan requirements for Tier 4 Solar Energy Systems:

- Details of outreach strategies and activities that will be used to engage stakeholders and interested parties.
- Planned frequency of public events and strategies to ensure that events are widely attended by a representative cross section of community residents.
- Details of the direct benefits to the community.
- Details on past/planned engagement regarding payments in lieu of taxes agreements or host community agreements.
- Describe local interests and concerns, including identifying plans to thoughtfully build support for and respectfully responding to any opposition.
- Identify strategies the Applicant will use to mitigate concerns raised by the public.
- Method for soliciting feedback and input from the public and the process for sharing feedback and responses publicly.

D. Special Use Permit Standards

1. Setbacks: Tier 4 Solar Energy Systems shall meet all applicable parcel line and other setback requirements as outlined in Appendix 2, Table 2.2. Fencing, collection lines, access roads and landscaping may occur within the setback.
2. Agricultural Resources: Tier 4 Solar Energy Systems for which the Facility Area includes Active Agricultural Lands shall adhere to the following requirements:
    a. Tier 4 Solar Energy System components, equipment, and associated impervious surfaces shall occupy no more than [50%] of the Active Agricultural Lands within the Facility Area.
        i. A Tier 4 Solar Energy System may exceed the [50%] Active Agricultural Land threshold if it incorporates an onsite activity or program which provides for the use of the land as a Farm Operation. Exceedance beyond the [50%] threshold will only be allowed based on the [Reviewing Board]'s determination that the land is being used for a Farm Operation.

b. To the maximum extent practicable, Tier 4 Solar Energy Systems located on Active Agricultural Lands shall be constructed, monitored, and decommissioned in accordance with the the NYS Department of Agriculture and Markets' "Guidelines for Solar Energy Projects - Construction Mitigation for Agricultural Lands."

10. Safety

A. Solar Energy Systems and Solar Energy Equipment shall be certified under the applicable electrical and/or building codes as required.

B. Solar Energy Systems shall be maintained in good working order and in accordance with industry standards. Site access shall be maintained, including snow removal at a level acceptable to the local fire department and, if the Tier 3 Solar Energy System is located in an ambulance district, the local ambulance corps.

C. If a Battery Energy Storage System is included as part of the Solar Energy System, they shall meet the requirements of any applicable fire prevention and building code when in use and, when no longer used, shall be disposed of in accordance with the laws and regulations of the [Village/Town/City] and any applicable federal, state, or county laws or regulations.

D. Where deemed necessary by the [Reviewing Board], the Applicant shall ensure emergency access to the Facility Area for local first responders by installing an emergency lock box or similar device, in a location subject to approval by the [Fire Chief of Village/Town/City].

11. Permit Timeframe and Abandonment

A. The Special Use Permit and site plan approval for a Solar Energy System shall be valid for a period of [36] months, provided that [a building permit is issued for construction OR construction is commenced]. In the event construction is not completed in accordance with the final site plan – as may have been amended and approved – as required by the [Reviewing Board], within [36] months, the applicant may request to extend the time to complete construction for [12] months. Approval of a request to extend the time to complete construction shall not be unreasonably withheld by the the [Village/Town/City]. If the owner and/or operator fails to perform substantial construction within [48] months, the approvals shall expire.

B. Upon cessation of electricity generation of a Solar Energy System on a continuous basis for [12] months, the [Village/Town/City] may notify and instruct the owner and/or operator of the Solar Energy System to implement the decommissioning plan. The decommissioning plan must be completed within [12] months of notification.

C. If the owner and/or operator fails to comply with decommissioning upon any abandonment, the [Village/Town/City] may, at its discretion, utilize the bond and/or security for the removal of the Solar Energy System and restoration of the site in accordance with the decommissioning plan.

Commentary: Abandonment, as it applies to Solar Energy Systems, requires that the Solar Energy System be removed after a specified amount of time of inactivity. A municipality can establish a timeframe for the removal of a Solar Energy System based on aesthetics, system size, location, and system complexity. Municipalities, in their codes, can designate the amount of time after which a Solar Energy System is considered abandoned.

If provisions of financial surety to cover the cost of removal are not required, municipalities could use other remedies, such as placing a tax lien on the property if the owner and/or operator fail(s) to comply with decommissioning requirements.

12. Enforcement

Any violation of this Solar Energy Law shall be subject to the same enforcement requirements, including the civil and criminal penalties, provided for in the zoning or land use regulations of [Village/Town/City].

Commentary: This Section provides that any violation of the Solar Energy Law will result in the same assessment of civil and criminal penalties already laid out in the existing enforcement provision(s) of the municipality's zoning code.

If a municipality is particularly concerned about enforcement and adherence to permit requirements, the municipality should provide solar specific training for enforcement officers.

13. Severability

The invalidity or unenforceability of any section, subsection, paragraph, sentence, clause, provision, or phrase of the aforementioned sections, as declared by the valid judgment of any court of competent jurisdiction to be unconstitutional, shall not affect the validity or enforceability of any other section, subsection, paragraph, sentence, clause, provision, or phrase, which shall remain in full force and effect.

Appendix 1: Lot Size Requirements

The following table displays the size requirements of the lot for Ground-Mounted Solar Energy Systems to be permitted.

Table 1.1: Lot Size Requirements

Zoning District	Tier 3 & 4
Residential Low Density	≥ 2 acres
Residential High Density	—
Commercial / Business	≥ 5 acres
Light Industrial	N/A
Heavy Industrial	N/A
Agricultural / Residential	≥ 5 acres

Key:

—: Not Allowed
N/A: Not Applicable

Appendix 2: Setback Requirements

The following table provides parcel line setback requirements for Ground-Mounted Solar Energy Systems. Fencing, access roads and landscaping may occur within the setback.

Table 2.1: Parcel Line Setback Requirements for Tier 3 Solar Energy Systems

	Tier 3		
Zoning District	**Front**	**Side**	**Rear**
Residential Low Density	100’	100’	100’
Residential High Density	—	—	—
Commercial / Business	30’	15’	25’
Light Industrial	30’	15’	25’
Heavy Industrial	30’	15’	25’
Agricultural / Residential	30’	15’	25’

Key:

—: Not Allowed

Table 2.2: Parcel Line and Other Setback Requirements for Tier 4 Solar Energy Systems

	Tier 4			
Zoning District	**Front**	**Side**	**Rear**	**Non-Participating Occupied Residence**
Residential Low Density	100’	100’	100’	250’
Residential High Density	—	—	—	—
Commercial / Business	50’	50’	50’	250’
Light Industrial	50’	50’	50’	250’
Heavy Industrial	50’	50’	50’	250’
Agricultural / Residential	50’	50’	50’	250’

Key:

—: Not Allowed

Appendix 3: Height Requirements

The following table displays height requirements for each type of Solar Energy Systems. The height of systems will be measured from the highest natural grade below each Solar Panel.

Table 3.1: Height Requirements

Zoning District	Tier 1 Roof-Mounted	Tier 1 & 2 Ground-Mounted	Tier 3 & 4 Ground-Mounted
Residential Low Density	2’ above roof	10’	15’
Residential High Density	2’ above roof	10’	—
Commercial / Business	4’ above roof	15’	20’
Light Industrial	4’ above roof	15’	20’
Heavy Industrial	4’ above roof	15’	20’
Agricultural / Residential	2’ above roof	15’	20’

Key:

—: Not Allowed

Appendix 4: Example Decommissioning Plan

Date: [Date]

Decommissioning Plan for [Solar Project Name], located at: [Solar Project Address]

Prepared and submitted by [Solar Developer Name], the owner of [Solar Facility Name]

As required by [Town/Village/City], [Solar Developer Name] presents this decommissioning plan for [Solar Project Name] (the "Facility").

The [Solar Project Name] [5]-megawatt (MW) alternating current (AC) solar photovoltaic (PV) power generating facility on approximately [XXX] acres of land located in [XXX] County, New York. The Project [does/ does not] include energy storage up to [XXX] MW. The Project would interconnect from the Project substation via a [230 kilovolt (kV)] transmission line (gen-tie) into the existing [Name of Substation] pursuant to an Interconnection Agreement where the renewable generation would be delivered into the electrical transmission system. The energy storage component of the Project would optimize the delivery of power to the grid. The Facility is anticipated to operate for a minimum of [30] years. At the discretion of the Project operator and the landowner, the Project may extend its operation for an additional [5-10] years.

System decommissioning shall be required as a result of any of the following conditions:

1. The land lease – if any – ends, unless the project owner has acquired the land.
2. The Solar Energy System ceases to generate electricity on a continuous basis for [12] months.
3. The Solar Energy System is damaged and will not be repaired or replaced by [Solar Developer Name].

If any of the above conditions are met, and upon notification or instruction by the [Village/Town/City], [Solar Developer Name] shall implement this decommissioning plan. System decommissioning and removal, as well as all necessary site restoration or remediation activities, shall be completed within [12] months.

The owner of the Facility, as provided for in its lease with the landowner, and in accordance with the requirements of the [Village/Town/City] zoning law, shall restore the property to its condition as it existed before the Facility was installed, pursuant to which shall include the following:

1. Removal of all operator-owned equipment, concrete, conduits, structures, fencing, and foundations located less than 36-inches below the soil surface, and/or less than 36-inches below the soil surface in areas consisting of [Mineral Soil Groups (MSG) 1-4 and/or Active Agricultural Lands].
2. For projects located on areas consisting of [MSG 1-4 and/or Active Agricultural Lands], removal of all operator-owned equipment, concrete, conduits, structures, fencing, and foundations in accordance with the decommissioning requirements contained in the NYS Department of Agriculture and Markets' "Guidelines for Solar Energy Projects - Construction Mitigation for Agricultural Lands."
3. Removal of any solid and hazardous waste caused by the Facility in accordance with local, state and federal waste disposal regulations.
4. Removal of all graveled areas and access roads unless the landowner requests in writing for it to remain.

An appendix is included in this plan to provide a project schedule detailing a breakdown of tasks required for the decommissioning removal of the system, including:

1. Time required to decommission and remove the system and any ancillary structures.
2. Time required to repair any damage caused to the property by the installation and removal of the system.

The cost of system decommissioning and removal, as well as all necessary site remediation and restoration activities, is estimated to be $[XXX] in current year terms as of the date and time this application is filed. A decommissioning security [has been OR will be] executed in the amount of [115]% of the cost of system decommissioning, removal, and site restoration.

This cost estimate and decommissioning surety will be revisited every [5] years and updated as needed to account for inflation or other cost changes.

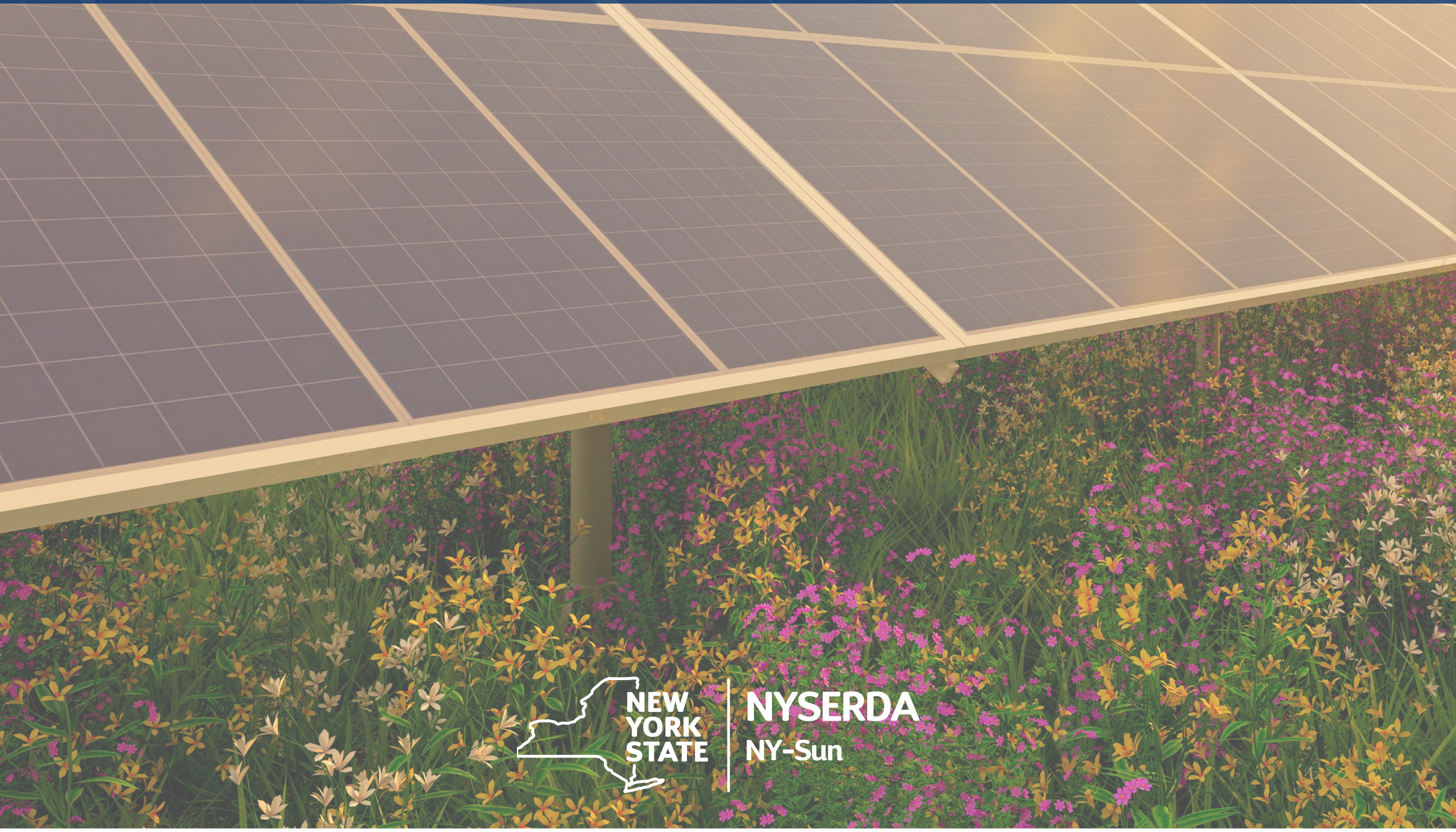
The owner of the Facility, currently [Solar Developer Name], is responsible for this decommissioning.

Facility Owner Signature:____ **Date:**________________________

Section 9

Municipal Solar Procurement Toolkit

Information for local governments looking to lease existing underutilized land for solar development.



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Overview

Included in this toolkit are step-by-step instructions on how municipalities can lease underutilized land, such as landfills and brownfields, for solar development. In addition, we provide a Request for Proposals (RFP) template, Lease Agreement template, and a Model Law for Charter Counties subject to New York County Law § 215. These resources previously mentioned are materials often used by local governments when in the solar development process and are included for an advisory purpose.

Intended Use

Municipalities are encouraged to review and consider modifying this toolkit, specifically the template RFP and Lease Agreement, to ensure it addresses all the needs of the municipality by deleting, modifying, or adding any other sections or provisions that would be necessary in the leasing jurisdiction.

Depending on the type of land the municipality plans on leasing, there are specific requirements within the template RFP and Lease Agreement that will need to be updated. The template RFP and Lease Agreement provide specific requirements for landfills and brownfields that will need to be adjusted for the project. All language that may need to be modified by the municipality is highlighted grey.

The Templates in this Toolkit are not intended for use exactly as written. This Toolkit is intended to be advisory only, and users should not rely upon it as legal advice. A municipality is not required to utilize these templates exactly as written. Municipal officials are urged to seek legal advice from their attorneys before issuing an RFP or signing a Lease Agreement.

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1. Planning and Early Stage Goal-Setting

Leasing land for solar development requires the active participation of multiple government departments. All relevant local government stakeholders should be included at the beginning of the process, to ensure that all potential project barriers are identified early and that critical municipal departments are fully informed about the project in advance. Relevant local government stakeholders may include elected leaders, legal counsel, planning and zoning staff, sustainability coordinator, or local State Environmental Quality Review (SEQR) authority. Frequently, the municipal authority or executive authorizes the creation of an advisory committee to investigate the feasibility of a solar project. This committee should be responsible for coordinating the process details and serving as a review committee for selecting the solar developer. In addition to managing the solar land lease process, committee members may wish to arrange project updates with local government leaders and the public. Local government project proponents should also consider developing strategies for communicating information about proposed solar projects to external stakeholders, particularly if the project involves developing large tracts of open space, as large projects have raised concerns among adjacent landowners and other stakeholders in some jurisdictions. External stakeholders may include the community members, utility representatives, or NYS Department of Environmental Conservation (if a landfill or brownfield, or near a wetland).

It is a necessary step to get support from your community members. Pursuant to state law, for example New York Town Law § 64, municipal land leases or solar procurements may be subject to permissive referendums. A permissive referendum is a legal mechanism available for a community to vote on a decision directly, rather than having the issued decided solely by governing board. In addition, certain actions of the governing board that raise or expend money can be subject to a permissive referendum. If an action is determined to be subject to permissive referendum, such act shall be subject to a referendum on petition, unless the proposition has been adopted at an election.

As an example, Town Law Article § 7 lays out the process for town referendums:

– Within ten days after the adoption by the town board, the town clerk shall post and publish a notice which shall set forth the date of the adoption of the act and contain an abstract of such act concisely stating the purpose and effect thereof.

  • The notice shall specify that the resolution that was adopted is subject to a permissive referendum.

– The resolution cannot take effect until thirty (30) days after its adoption.

  • If within 30 days of the adoption, there is a petition filed and signed by the electors of the town protesting against such act and requesting that it be submitted to the electors of the town for approval or disapproval, then this resolution needs to go to a public vote.

– If the petition is filed between 60-75 days prior to a biennial town election, a proposition for the approval of the resolution can be submitted at the election.

– If the petition is filed at any other time, the proposition for the approval of the resolution shall be submitted at a special town election to be held between 60-75 days after filling the petition.

County Consideration: If a project is located on county-owned land, New York County Law § 215 may limit the term of the land lease to five (5) years. As part of this Toolkit, there is a model law that can allow for Charter Counties to lease land longer than 5 years for specific projects. The model law cites the appropriate laws to extend the land lease and includes fields for jurisdictions to fill in. Jurisdictions should work closely with their local legal counsel to determine local land lease requirements.

1.1 Establish Project Goals

The advisory committee, once assembled, should consider the goals and the desired outcomes of a solar project, and develop a preliminary list of project goals and key outcomes, which could include:

- Providing **revenue to the town by leasing public land, such as landfills or brownfields**, to a private developer to construct a community solar project, which the town may or may not participate in, but will provide greater access to clean power to community members.[27]
- Providing a **positive use of a capped landfill, brownfield, or other sites** where environmental or other attributes make alternate land uses difficult.
- Providing **greater access to solar power** for residents, businesses, institutions, and organizations through a community solar project.

2. Site Identification & Considerations

For many municipalities, closed landfills or brownfields are attractive areas to site solar projects because of the limited number of alternative uses for these sites. Developing solar on these sites requires special consideration.[26] If a solar project is being considered for county owned land, County Law § 215 may limit the term of county-owned land leases to a five-years. If municipalities are considering county land, they should contact their legal counsel and County government.

[27] If a solar project is being considered for county owned land, County Law § 215 may limit the term of county-owned land leases to a five-years. If municipalities are considering county land, they should contact their legal counsel and County government.

2.1 Considerations for solar on landfills

- Under 6 N.Y.C.R.R. Part 360, landfill owners must submit landfill closure plans and adhere to a Post-Closure Monitoring and Maintenance Operations Manual when ceasing landfill operations.
- To develop solar on a landfill, a contractor must submit a modification to the post-closure plan to the New York State Department of Environmental Conservation (NYSDEC). These plans will have to take into consideration existing infrastructure, such as gas collection systems and leachate control systems.
- NYSDEC's regional offices offer pre-application consultations to municipalities, who are encouraged to contact NYSDEC early in the project planning process to understand the special requirements of developing solar on landfill sites.

2.2 Considerations for solar on brownfields

- For a proposed brownfield solar site with an Institutional Control (IC) on the property, the Developer will be required to notify the NYSDEC's Division of Environmental Remediation of the site's change of use and to submit details to assess whether the remedy will remain effective or what new Engineering Control and Institutional Control (EC/IC), monitoring activities, and periodic reviews may be necessary. A site-specific inquiry needs to be undertaken in this regard, and the DEC regional office should be engaged early on to discuss next steps.
- Any submissions relative to new and/or revised EC/ICs will likely require modification of the Site Management Plan (SMP) that directs the process for certain site activities and may require additional work to be undertaken pursuant to DEC approval, depending on the scope of proposed site activities.
- SMPs are filed against the deed of the brownfield property via an Environmental Easement, and a copy of the SMP would either be accessible via the DEC or by retrieving the copy included in the County real property records. Of note, the DEC utilizes a form SMP as the starting point for plan development, which is revised based on site-specific information. A copy of the form is available on DEC's website.
- Note that brownfield sites without existing IC equipment should notify the change of use but may not have to submit any additional plan documentation.

3. RFP Process & Contractual Documents

Competitive processes create a fair and open procedure under which solar developers can offer their services. They also ensure that local governments receive the best available pricing, thereby maximizing financial benefits to the municipality. The Toolkit provides a template Request for Proposals (RFP) for municipalities to utilize. The template provides suggested language that can be adjusted to reflect the goals and context of a municipality's procurement. Example evaluation criteria are provided in the template RFP. Municipalities may use these evaluation criteria as a guide but are encouraged to tailor their evaluation processes to meet their own needs and goals. To facilitate comparison of proposals, it is recommended that municipalities ask all respondents to provide price proposals in the same format (the attached sample RFP includes such a request).

One step that municipalities can take to protect their interests is to use a model lease agreement, as provided in the Toolkit. By using a document that the municipality is comfortable with, the municipality may ensure that all its contractual "must haves" are brought up early in the contract negotiations and included in the final contract. It contains many of the terms and conditions that typically arise during contract negotiation. It is the responsibility of the contracting jurisdiction to negotiate its own final contract and local governments should hire legal counsel with solar lease negotiation experience to protect their interests in contract negotiations.

4. Request for Proposal (RFP)

The workable version of this document can be found at nyserda.ny.gov/SolarGuidebook, under the Municipal Solar Procurement Toolkit tab.

REQUEST FOR PROPOSALS

Leasing Municipal Land for Solar Development

Municipality Name

Municipality Address

Issue Date

Proposals Due By:

Request for Proposals Contents

1. Executive Summary

The Municipality seeks proposals from solar energy developers (“Respondents”) to lease land at site address (“the Site”), pursuant to a Lease Agreement, a form of which is included in this RFP, and install, own, operate, and maintain thereon a solar photovoltaic energy system (“Solar Energy System” or “System”).

It is the desire of the Municipality to site a solar energy system for the benefit of the Municipality and the environment. This Request for Proposals is being issued to allow the Municipality to evaluate options and determine the project and financial arrangements that best meet the Municipality’s interest. The Municipality notes that it is not seeking proposals to be an off-taker of a solar energy system. The goal of this RFP is to lease the Site for purposes of siting a Solar Energy System in order to provide a revenue stream to the Municipality in the form of lease payments.

The Municipality will evaluate all proposals and reserves the right to select the proposal that provides the best economic solution. The Municipality has the right to accept any bid even if it does not provide the highest revenue to the Municipality. Proposals will be evaluated against other proposals received. In addition to other rights reserved herein, the Municipality reserves the right to cancel this RFP in its discretion and to the fullest extent permitted by law.

All Proposals prepared in response to this RFP are at the sole expense of the Respondent, and with the express understanding that there will be no claim, whatsoever, for reimbursement from Municipality for the expenses of preparation. Municipality shall not be liable for any expenses incurred by the Respondent in development of this proposal.

2. Background

Provide a background on your Municipality and include any demographic information that would be helpful for a developer to understand the character of your community. Provide a brief description of the background of the project site, for example if it is located on a landfill or brownfield. Also provide description of the goals of your Municipality. Below are examples of potential goals and should be updated to match the specific goals of your Municipality.

The Municipality is located in County and is home to # residents and has # households.

Provide any additional background about your Municipality that will be helpful for Respondents to know.

The Municipality wishes to bring this project to our community with the goal of expanding Municipality’s and its residents’ participation in the energy of the future, and benefit from the lower electric prices and local job creation associated with it.

Municipality is interested in leasing municipal land for solar development. Municipality has the following prioritized goals for the project:

1. Increase revenue for the Municipality through a land lease.
2. Reduce energy bill costs for residents through a community solar project.
3. Purposefully utilize otherwise unusable municipal property such as landfills or brownfields.
4. Advance the community’s environmental sustainability and leadership goals.

3. Project Scope

Project Description

Describe the desired project and the amount of land the Municipality is looking to lease to a Developer. Include the responsibilities of the successful Respondent.

The Municipality is interested in leasing all or a portion of the site(s) described in Appendix 1. The lease will be structured initially for a 2-year option to assess the feasibility of the site, following with a 25-year lease when it is determined the site is viable, with up to four additional 5-year optional renewal periods, exercisable at Municipality's sole discretion. The Municipality is willing to consider alternative lease durations and conditions as part of the proposal evaluation process set forth herein. The Municipality will not be an off-taker of the electricity generated at the Site.

The selected Respondent will own the System and will be responsible for the design, engineering, permitting, installation, testing, operation, maintenance, repair, vegetation management, and decommissioning of the System, including, without limitation, procurement of the solar photovoltaic equipment and related services. The successful Respondent will be solely responsible for owning, insuring, commissioning, interconnection, metering, and for providing security for the system at all times. The successful Respondent shall be responsible for all project costs including, but not limited to: the furnishing of all materials, services, labor, performance and payment bonds, insurance, and other costs incurred in the preparation of this response and the performance of the contract, signed by an individual authorized to bind the Respondents contractually.

On termination of the lease, the successful Respondent will be responsible for performing, and paying for the removal of all panels, racks, concrete blocks, and conduits, and returning the portion of the property on which the System was installed to its original conditions as mutually agreed upon.

Site Description

In this section provide any additional unique information about the site.

The potential host site(s) are described in Appendix 1 attached to this RFP.

Before submitting a proposal, each Respondent shall familiarize themselves with the potential host sites as necessary to develop a proposal to undertake the Project in accordance with the terms and conditions of this RFP. The selected Respondent will be responsible for conducting any additional studies it may require, at its own cost and risk, prior to entering the lease agreement and/or in conjunction with the development of the Project. The Municipality intends to lease the municipal land on an "as is" basis.

Site Work and Maintenance Requirements

The successful Respondent shall be responsible for the design, permitting, construction, and maintenance of all site work, drainage, erosion controls, and landscaping associated with the system and lease area.

The successful Respondent shall be responsible for performing vegetation management within the lease area. Respondents shall develop, implement, and maintain native vegetation to the extent practicable pursuant to a vegetation management plan by providing native perennial vegetation and foraging habitat beneficial to game birds, songbirds, and pollinators. To the extent practicable, when establishing perennial vegetation and beneficial foraging habitat, the owners shall use native plant species and seed mixes.

If the project is on a ***landfill***, include the below paragraph in your RFP to provide additional information to Respondents of requirements for solar energy projects on landfills.

Landfills are overseen by DEC's Division of Materials Management. As the proposed solar project will alter and impact the landfill cap, the Respondent is required to submit modifications to the Post-Closure Care Manual that is part of the Closure Plan. The requirements are intended to address concerns regarding the protection and maintenance of the Final Cover ("cap") and the protection of the landfill gas systems. The modification submission shall cover aspects including soil, slope, sediment, erosion, vegetation, drainage, etc. The submitted work plan shall contain descriptions of the planned uses and project plans to demonstrate the disturbance will not increase the potential threat to human health or the environment via construction method, equipment placement, and monitoring systems and plans[28].

If the project is on a ***brownfield***, include the below paragraph in your RFP to provide additional information to Respondents of requirements for solar energy projects on brownfields.

Additional DEC requirements apply to solar on brownfield sites and DEC's Division of Environmental Remediation provides the oversight. For a proposed brownfield solar site with an Institutional Control (IC) on the property, the Respondent will be required to notify the Division of the site's change of use and submit a work plan to ensure whether the remedy will remain effective or what new Engineering Control and Institutional Control (EC/IC), monitoring activities, and period reviews may be necessary. The workplan submission modifies the Site Management Plan (SMP) containing pertinent Environmental Easement information. SMPs are filed in the Deed of the brownfield property and accessible via DEC's Brownfield Cleanup Program site or filed as part of the Deed restriction. Note that brownfield sites without existing IC equipment should notify the change of use, but do not have to submit an additional work plan.

The successful Respondent shall be responsible for the installation and maintenance of site specific safety and security requirements or other measures as are required to comply with all necessary permits and approvals.

Community Engagement

The successful Respondents will play an integral role in public outreach and educational events coordinated for community members. An outreach plan will raise community awareness and provide a platform for education. Creative approaches are encouraged.

If the project is intended to serve as a community solar project, through which local electric customers can purchase electricity from the developer, the Municipality will respect the strategic business decisions of Respondents on how to recruit subscribers of a community solar project. The Municipality requires that a priority process of enrollment be used whereby Municipality residents would have first call on participating as customers in a community solar program. The Municipality also requires that residents of County have a second stage enrollment priority.

Potential support offered by the Municipality as examples of ways the Municipality and other associated organizations would be interested in participating may include:

- Notification of the opportunity on the Municipality and various organizations' websites;
- Use of Municipality and other organizations' staff in conducting community oriented "Solar PV 101" Q&A sessions;
- Support in engaging local media;
- Banners or signage promoting the initiative at town-owned facilities

These are meant as examples of the sorts of informational and recruitment activities in which the Municipality, and perhaps associated organizations, would be interested in participating.

Local Business Utilization

It is in the best interest of the Respondent to give a preference to subcontracting with local businesses, recruiting from the local labor force, and providing education or other benefits to local students particularly inside Municipality limits. The Municipality also encourages all Respondents to include minority and small business participation, including those owned by women, veterans, and disadvantaged individuals. Respondents should include goals for local employment, including for both the construction and operation periods of the project, providing a brief description of the number and types of jobs expected to be created in the Municipality.

[28] https://www.dec.ny.gov/regulations/81768.html

Award

Based upon the results of the evaluation of the proposals and interview process (if applicable), a recommendation will be developed and submitted for approval by the respective stakeholders within the Municipality.

All Respondents shall review the Lease Agreement in Appendix 4. Should a Respondent question any of the terms and conditions contained in this Lease Agreement, it must submit a written attachment to their proposal specifically identifying its objection, setting forth its reasoning for the objection, and proposing an alternative solution addressing the objection. Respondents must include a brief discussion of the purpose and impact, if any, of each proposed revision. Acceptance of any proposed revision is within the Municipality's sole discretion. In no event will general references to the Respondent's terms and conditions or attempts at complete substitutions be considered. All objections will be reviewed as part of the evaluation process.

If the Municipality and the most qualified Respondent are unable, within 60 days following the Municipality's notice of commencement of negotiations with a Respondent (or such longer period of time as the Municipality may deem appropriate), to negotiate satisfactory Agreements with that Respondent at a price the Municipality determines to be fair, competitive, and reasonable, the Municipality shall negotiate with the next highest-rated Respondent. The Municipality reserves the right to waive any and all informalities and to award the proposal on the basis of the above procedures to the Respondent it deems most qualified or terminate the process at any time without making an award.

4. Timeline

EVENT	TARGET DATE
Issuance of Request for Proposal	Day 0
Informational Respondent Meeting and Site Visit	Day 14
Deadline for Submission of Questions	Day 28
Municipality Issues Responses to Respondent Questions	Day 35
RFP Submission Deadline & Opening of Bids	Day 49

5. Submission of Questions

The Designated Contact Person during the RFP period is contact name. All communication of any kind regarding this RFP during this period must be made via contact name. All questions and inquiries regarding this RFP must be submitted via email to contact email no later than question deadline. Questions submitted in writing must include the firm name and the name, title, address, telephone number, and email address of the individual submitting the question. Any questions regarding proposal requirements or specifications received after this date and time will not be considered for response.

Questions will not be answered directly. The Awarding Authority will issue an addendum to address the written questions submitted by the deadline. Any addenda will be posted by email/online at website.

6. Pre-Bid Meeting

The Municipality will hold a pre-bid meeting for all interested Respondents on date & time at site address. It is recommended that all interested Respondents attend in order to familiarize themselves with existing conditions and project requirements. Respondents interested in attending must confirm attendance by contacting point of contact and contact information.

7. Submittal

Responses must be submitted in a sealed package to Municipality's address by date & time and labeled as noted below. Within the package, the Respondent shall enclose a cover letter with the signature, name, and title of the person authorized to submit the proposal on behalf of the Respondent. The Respondent shall enclose three (3) hard copies and one (1) electronic version in a searchable text format (in Adobe Acrobat (pdf) format and on a flash drive or CD-ROM) of the proposal. The sealed outer package shall be marked with the Respondent's company name, and clearly marked in the lower left- hand corner:

"Response to Leasing Municipal Land for Solar Development"

It is the Respondent's responsibility to see that its proposal is delivered within the time and at the place prescribed. The right is reserved, as the interest of the Municipality may require, to reject any or all proposals, to waive any technical defect or informality in proposals received, and to accept or reject any proposal or portion thereof. If there are any differences between the original hard copy and the electronic copy of the proposal, the material in the electronic copy will prevail.

8. Proposal Requirements

These instructions outline the format and content of the proposal and the approach to be used in its development and presentation. Only that information which is essential to an understanding and evaluation of the proposal should be submitted.

Table of Contents

Proposals shall include a Table of Contents listing the individual sections of the proposal and their corresponding page numbers.

Section 1 – General Respondent Information

- **Transmittal Letter** - Each Respondent's response should include a transmittal letter signed by a party authorized to make a formal bid on behalf of the Respondent. The letter shall clearly indicate that the Respondent has carefully read all the provisions in the RFP. Transmittal letters should also acknowledge receipt and understanding of any Addenda associated with the project. Include the name, title, address, telephone number, e-mail address and fax number of the individual the Municipality should contact concerning the Respondent's proposal.
- **Executive Summary** - Provide an overview of the proposal (not more than two pages) describing the highlights of the response and summarizing how your firm will meet the needs and goals of the Municipality.
- Executed **Certificate of Non-Collusion** in Appendix 3.

Section 2 – Experience & Qualification

This section shall discuss the highlights, key features, and distinguishing points of the proposal.

- **Company Overview**
    - o Provide a document with the following company information.
        - Year founded and number of continuous years in business
        - Ownership status (public or private company, LLC, LLP, S-Corp, Sole Proprietor)
        - Federal Tax Identification Number
        - Corporate & Local Office location
        - Number of employees in corporate & local office at time of submittal

- ▫ Your firm's Experience Modification Rate (EMR) for each of the past three years and your firm's OSHA ratings (Recordable Incidence Rates and Lost Workday Incident Rates) for the past three years
- ▫ A description of any ongoing or previous litigation your firm has been involved in and a statement that the Respondent is not debarred, suspended or otherwise prohibited from practice by any federal, state, or local agency

- **Project Team**
  - o Provide information about the key personnel to be assigned to this project.
    - ▫ Project Team organizational chart including all key personnel and their proposed roles
    - ▫ Provide resumes, in an appendix, for all key personnel that will be assigned to this project
    - ▫ Provide evidence of all relevant licenses held by your firm to do work in New York State, attach list and copies of documents as an appendix

- **References**
  - o Provide references for at least three completed and currently operating non-residential grid-connected PV systems, with preference towards New York municipalities and landfill or brownfield projects. Include the following information:
    - ▫ Location and Utility Company name
    - ▫ System size (kW DC)
    - ▫ Metering Type (Remote Net Metering, Community Distributed Solar, Onsite)
    - ▫ Date completed
    - ▫ Host Customer and/or Owner contract information (name, email, address, phone)

- **Project Development Experience**
  - o Provide the total number of megawatts of solar PV your firm has constructed over the last five (5) years.
  - o Provide the total number of megawatts of solar PV your firm has constructed over the last five (5) years in New York.
  - o Provide total number of megawatts and projects of solar PV your firm has constructed on landfills and brownfields.
  - o Detail the types of customers your firm has worked with in the past (for example, residential, commercial nonprofit, or government).
  - o Describe your firm's implementation of PV construction standards and other safety measures.
  - o Provide the number of operational PV systems under your firm's management.

- **Project Financing Capability**
  - o Provide number of PV systems that have been financed by you and/or your financing partner.
  - o Provide most recent audited financial statements, annual reports, consolidated financials, and Form 10-K (if any). If available, provide similar materials for parent entities, significant affiliates and collaborators.

Section 3 – Proposal Narrative

Provide a detailed plan of the proposed project. Project plans must include the following:

- **Project Management Plan**
  - o Provide a detailed narrative description of the approach for installing the proposed project, including how the Respondent will work with subcontractors, municipal agencies, and other relevant stakeholders. Detail how the Respondent will approach special site considerations such as capped landfills.
  - o Provide a detailed description of each task and delivery. Include a project schedule indicating key milestones and durations of various activities.
  - o Respondents must demonstrate a firm understanding of permits required to successfully execute the project. The selected Respondent will be responsible for all necessary environmental testing, permitting, and compliance. To the extent possible, Respondents should identify the regulatory and permit conditions relevant to their proposals, potential conflicts between the project and existing permit conditions, and variances that might be required.
- **Financing Plan**
  - o Provide a description of how the proposed project will be financed. Identify any potential financial partners that will be involved in the project. Describe in this plan possible sources of funds and revenue streams other than the sale of energy including all available tax credits, incentives, and subsidies that will be used to finance the project.
- **Operations and Maintenance Plan**
  - o The Respondent will be responsible for Operation & Maintenance (O&M) services for the full term of the Agreement. Describe the proposed O&M procedures for the system, detailing duties performed and if the contract will be maintained with the Respondent or a third-party provider.
- **Decommissioning Plan**
  - o Provide information regarding the proposed approach to system decommissioning and restoration of the property. This decommissioning plan should include a description of Respondent's approach to providing financial assurance that funding will be available to decommission the system at the end of the contract term.
  - o The owner of the Facility, as provided for in its lease with the landowner, shall restore the property to its condition as it existed before the Facility was installed, pursuant to measures which may include the following:
    - Removal of all operator-owned equipment, concrete, conduits, structures, fencing, and foundations to a depth of 36 inches below the soil surface.
    - Removal of any solid and hazardous waste caused by the Facility in accordance with local, state and federal waste disposal regulations.
    - Removal of all graveled areas and access roads unless the landowner requests in writing for it to remain.
- **Local Business Utilization Plan**
  - o Respondent shall submit a proposed local business utilization plan and must make a good faith effort to hire local business enterprises on the project. The utilization plan must demonstrate how this requirement will be met to the extent possible at this stage in the program.
- **Outreach Plan**
  - o Respondent will provide a clear plan to best meet the goals and strategies specified in the **Project Scope** section for **Community Engagement.**
  - o Provide clear marketing and recruitment strategies from the developer to attract members. Strategies for particular customer segments (e.g. LMI, anchor, commercial, etc.) should be specified, if desired by the Municipality.

Section 4 –Technical Proposal

All solar energy systems proposed under this RFP must conform to industry best practices. System Design and Components are not binding at the proposal stage, but this information will be used to evaluate Respondent proposals.

- Components: Include an overview of the proposed photovoltaic system, including brief descriptions of the main components (at minimum modules, inverters, racking system, and monitoring system) including manufacturer and warranty information. Respondents are encouraged to provide specification sheets for any proposed technologies as an appendix.
- Design: Include Preliminary Drawings for the proposed PV system that include (at a minimum):
    - o System size (in kW DC and kW AC)
    - o Location of modules (including tilt)
    - o Location of inverters
    - o Any other site-specific information that will aid in overall evaluation
- Expected System Generation
    - o Provide estimated annual production of the proposed solar project for years 1-25 inclusive of the degradation rate.

Section 5 – Price Proposal

Price proposals should be provided using the form in Appendix 3 of this RFP. Price proposals shall be valid for a minimum of 180 days.

All price proposals will include a lease payment from the Respondent to the Municipality in the format of a price per acre. The lease will be structured initially for a two-year option to assess the feasibility of the site, followed by a 25-year lease when it is determined the site is viable, with up to four additional 5-year optional renewal periods, exercisable at Municipality's sole discretion, or on the basis of any other alternative lease duration proposal submitted by the respondent.

9. Evaluation Criteria

Overview of Evaluation Process

The Municipality will utilize an evaluation system to rank the qualified Respondents. It is the responsibility of each Respondent to provide information, evidence or exhibits that clearly demonstrate the Respondent's ability to satisfactorily respond to project requirements and the factors listed in this RFP. The evaluation process may include verification of references, confirmation of financial information, and examination of other information as the Municipality deems appropriate. The Municipality will/may as it deems necessary conduct interviews to evaluate the Respondents. The Municipality may require public presentations by Respondents. The Municipality reserves the right to request or obtain additional information about any and all responses. Each response from a qualified Respondent will be evaluated and ranked solely according to the criteria set forth in this RFP.

The Municipality may cancel this RFP at any stage of the process if it determines that cancellation serves the best interests of the public. The Municipality may reject, in whole or in part, any and all planned or proposed project measures, when it determines that rejection serves the best interests of the public.

At a minimum, Respondents shall meet the following requirements:

1. Timely submission of response and attendance at optional/mandatory pre-bid meeting
2. Submission of all required elements found in Section 8 of this RFP
3. Certification of Non-Collusion (Appendix 3)
4. Evidence of appropriate insurance

The qualified Respondents providing completed responses will be evaluated based on the following factors:

Price Proposal – The Respondent should clearly identify the financial benefit to the Municipality of the proposed arrangement in the form of either annual lease payments, savings in current electric costs of Municipality operations, or some other monetary benefit to the Municipality.

Proposal Narrative – The response shall include an explanation of how the Respondent will approach the various tasks, including scheduling methods, project schedule, construction, financing, measurement and verification, operations and maintenance, and decommissioning plans. The demonstrated ability to obtain financing for the construction of the solar energy system is critical to the Respondent's ability to complete the project. Respondents should provide in their responses a clear discussion of how they intend to finance the system and what financing partners will be involved in the project.

Developer Experience & Project Team – The extent of the Respondent's experience in designing, financing, constructing and operating solar energy facilities. Additional consideration will be given to firms with experience constructing and operating such facilities on municipal and commercial properties most similar to the proposed sites, particularly capped landfills. The relevant experience and quality of project personnel and their commitment to the proposed project in Municipality. The clarity and organization of the proposed scope of work and approach will be included in the assessment of the project team.

Technical Proposal – The response will be evaluated on the preliminary system design that is provided and the selected equipment and corresponding warranties. The demonstrated ability of designing a system that will generate the highest production will provide greater benefit to the Municipality and the community members

Appendix 1: Site Description

Provide the below information for the selected site(s) if known.

1. Facility name and address
2. Planned future use of the property and zoning requirements
3. Any shading, trees, or other potential obstructions
4. Electric utility
5. Distance to utility interconnection
6. Phases available at utility pole (single or three-phase)
7. Description of roof and/or available land
8. Aerial photos, site map, and/or roof plan
9. Any feasibility assessment done to date, including information on roof, shading, environmental analysis, etc.

If the site is a landfill, provide additional information, such as NYSDEC Requirements for Closure and Post-Closure Care, site's Final Closure Plan, and the Post-Closure Monitoring and Maintenance Operations Manual.

If the site is a brownfield, provide additional information such as the Site Management Plan.

Appendix 2: Land Lease Price Proposal Template

PV System Size	________________kW dc	Annual System Degradation Factor	________________%/year
Year 1 Estimated kWh Generation	________________kWh		

The Respondent hereby agrees to pay the Municipality the following amounts to lease up to acreage for the construction and operation of a solar energy system for 25 years.

The following is a summary of assumptions for developing the costs for a base solar system. Respondents are to assume no sales tax on equipment purchased, and no property tax. Interconnection costs can vary widely depending on system size, interconnection voltage, and other interconnection requirements. For the purposes of establishing a base bid, Respondents should assume interconnection cost of $0.10 per Watt.

Year 1 Lease Payment	$____________/acre	Annual Lease Escalator	%/year
Year 1 Total Lease Payment	$____________	Total Payments to Municipality over Contract Length (25 Years)	$____________

Respondents shall understand that the submitted price proposals must include the scope of work and all deliverables as defined in the Lease Agreement and as specified in this RFP. Respondents shall complete the below table to account for change orders due to unforeseen additional costs such as interconnection upgrades, taxes, etc. Municipality will use a regression model to predict incremental values if needed.

Change Order ($/acre)	0-$4,999	$5,000-$9,999	$10,000-$14,999	$15,000-$19,999	$20,000-$24,999	>$25,000
Adjustment to ProposedLease Payment ($/acre)						

A Respondent may attach, in substantially the form above, any alternative lease arrangement(s) that the Respondent wishes to include with its proposal.

Appendix 3: Certificate of Non-Collusion

The undersigned certifies, under penalties of perjury, that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word “person” shall mean any natural person, business, partnership, corporation, union, committee, club or other organization, entity, or group of individuals.

____

(Signature)

____

(Name of person signing proposal)

____

(Name of business)

Appendix 4: Sample Land Lease Agreement

The workable version of this document can be found at nyserda.ny.gov/SolarGuidebook, under the Municipal Solar Procurement Toolkit tab.

SOLAR LEASE AGREEMENT COVER SHEET

This Solar Lease Agreement (consisting of this Cover Sheet, the Terms and Conditions, all Exhibits referenced herein and attached hereto, this "Agreement") is made and entered into as of the Effective Date and between the parties listed below.

Party A, as Lessee: **Developer Name,** ("Entity Name")	Party B, as Lessor: **Name,** a New York municipality (the "Village/Town/City/County")
Contact: Name Title Number	Contact: Name Title Number
Premises Location: Address City, NY Zip	Duration: Date of Agreement: Date ("***Effective Date***")
Pricing:	Commercial Operation Date: TBD
Development Period Payment: XX per year Term Rent: XX per year Term Rent Adjustment: X % increase per year	Term: Initial Term: 25 years from the System's Commercial Operation Date, with option to extend the Lease Term for up to four (4) additional and successive period of five (5) years

Town and Developer shall each be referred to in this Agreement individually as a "***Party***" and, together, as "***Parties***".

RECITALS:

WHEREAS, Town owns and occupies the land located at Address in Village/Town/City/County, New York described in Exhibit A attached hereto (the "***Premises***") and desires to lease a portion of the Premises (the "***Lease Area***", defined below) to Entity Name;

WHEREAS, the Premises is the site of a landfill which is the subject of a closure plan approved by the New York State Department of Environmental Conservation.

WHEREAS, the Town desires that Entity Name install the System, to be located at the Premises, and Entity Name is willing to perform the installation of the System; and

WHEREAS, Entity Name further desires to lease the Lease Area and the Easements from the Town, and to operate and maintain the System, and provide other services in accordance with the terms and conditions set forth herein.

AGREEMENT

NOW, THEREFORE, in consideration of the mutual promises set forth herein, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties hereby agree as follows:

1. Each of the following documents shall be deemed part of this Agreement and are incorporated herein by this reference as though set forth herein in their entirety:

    - Terms and Conditions
    - Exhibit A, Premises Legal Description
    - Exhibit B, Lease Area Description & Design Layout
    - Exhibit C, Guaranty

2. This Agreement constitutes the entire agreement and understanding between Entity Name and the Town with respect to the subject matter hereof and supersedes all prior agreements, written or verbal, if any, between them relating to the subject matter hereof, which are hereafter of no further force or effect. The Terms and Conditions and the Exhibits, referred to herein, are integral parts hereof and are made a part of this Agreement by reference. In the event of a conflict between the provisions of this Agreement and those of any Exhibit, the provisions of this Agreement shall prevail over the terms of the Exhibit and any Exhibit shall be corrected accordingly if inconsistent with this Agreement.

3. This Agreement may only be amended, modified, or supplemented by an instrument in writing executed by duly authorized representatives of the Town and Entity Name.

4. This Agreement shall be governed by, and construed and enforced in accordance with, the laws of the State of New York without reference to its principles or conflicts of laws.

5. The relationship between Entity Name and the Town shall not be that of partners, agents, or joint ventures, and nothing contained in this Agreement shall be deemed to constitute a partnership or agency agreement between them for any purposes, including federal income tax purposes. Entity Name and the Town, in performing any of their obligations hereunder, shall be independent contractors and shall discharge their contractual obligations at their own risk. Neither Party has the right to create an obligation for the other Party.

6. This Agreement may be executed by facsimile or scanned signatures transmitted by electronic mail and/or in one or more counterparts, each of which when so executed and delivered shall be deemed an original, but all of which taken together shall constitute but one and the same original.

(Signatures appear on the following page.)

IN WITNESS WHEREOF, the duly authorized officers of the Parties have executed this Solar Lease Agreement as an instrument under seal as of the Effective Date.

By: ____________________________________

Name:

Title:

By: ____________________________________

Name:

Title:

ACKNOWLEDGMENT

(Entity Name)

Notary Public Statement, Seal, and Signature

TERMS AND CONDITIONS

THIS SOLAR LEASE AGREEMENT ("***Agreement***") is made and entered into as of this Day of Month, Year (the "***Effective Date***"), by and between the **Village/ Town/ City/ County Name**, a municipality of the State of New York ("***Village/ Town/ City/ County***") and **Entity Name**, a New York limited liability company ("***Entity Short Name***"). Town and Entity Short Name are sometimes hereinafter referred to individually as a "***Party***" and collectively as the "***Parties***."

ARTICLE 1 - DEFINED TERMS; RULES OF INTERPRETATION

1.1 Defined Terms.

Capitalized terms used in this Agreement shall have the meanings ascribed to them in this Agreement, or as otherwise set forth below.

"***Agreement***" means this Solar Lease Agreement, including the Solar Lease Agreement Cover Sheet, all Exhibits and attachments hereto.

"***Applicable Legal Requirements***" means any present and future law, act, rule, requirement, order, by-law, ordinance, regulation, judgment, decree, or injunction of or by any Governmental Authority, ordinary or extraordinary, foreseen or unforeseen.

"***Bankrupt***" means that a Party or other entity (as applicable): (i) is dissolved (other than pursuant to a consolidation, amalgamation or merger); (ii) becomes insolvent or is unable to pay its debts or fails (or admits in writing its inability) generally to pay its debts as they become due; (iii) makes a general assignment, arrangement or composition with or for the benefit of its creditors; (iv) has instituted against it a proceeding seeking a judgment of insolvency or bankruptcy or any other relief under any bankruptcy or insolvency law or other similar law affecting creditor's rights, or a petition is presented for its winding-up, reorganization or liquidation, which proceeding or petition is not dismissed, stayed or vacated within twenty (20) Business Days thereafter; (v) commences a voluntary proceeding seeking a judgment of insolvency or bankruptcy or any other relief under any bankruptcy or insolvency law or other similar law affecting creditors' rights; (vi) seeks or consents to the appointment of an administrator, provisional liquidator, conservator, receiver, trustee, custodian or other similar official for it or for all or substantially all of its assets; (vii) causes or is subject to any event with respect to it which, under the Applicable Legal Requirements of any jurisdiction, has an analogous effect to any of the events specified in clauses (i) to (vi) inclusive; or (viii) takes any action in furtherance of, or indicating its consent to, approval of, or acquiescence in, any of the foregoing acts.

"***Business Day***" means any day except a Saturday, Sunday, or a Federal Reserve Bank holiday.

"***Casualty Date***" shall have the meaning set forth in § 11.2.

"***Commercial Operation Date***" means the tenth (10th) day after the Town's receipt of a Completion Notice for the System.

"***Completion Notice***" means a notice from the Entity Name to the Town when the System is generating electric power and has been accepted for continuous commercial service by the LDC.

"***Development Period Payment***" means an annual rent amount of $XX, paid on a prorated basis for use of the Premises for the number of days from the Effective Date to the Commercial Operation Date.

"***Dispute***" shall have the meaning set forth in §14.1.

"***Easements***" mean the easements granted pursuant to § 2.1, and which area(s) may be later defined by the Parties.

"***Effective Date***" is the date first set forth in the introductory paragraph of this Agreement.

"***Environmental Attributes***" means any offset, credit, benefit, reduction, rebate, financial incentive, tax credit and other beneficial allowance that is in effect as of the Effective Date or may come into effect in the future, including, to the extent applicable and without limitation, RECs, Solar RECs, carbon credits, Green-e products, investment tax credits, production tax credits, forward capacity market credits or other credits earned by or in connection with, or otherwise attributable to, the System, or the electricity produced by the System, under or with respect to the Federal Clean Air Act (including, but not limited to, Title IV of the Clean Air Act Amendments of 1990), any state or federal renewable portfolio standard or renewable energy standard or other portfolio purchase mandate or requirement, including the renewable portfolio standard of the State of New York, the Regional Greenhouse Gas Initiative or any statute or regulation implementing the foregoing, any federal or other applicable act or regulation relating to carbon emissions or a cap or other limitation thereupon or any other state, federal or other Governmental Authority act, law or regulation that provides offsets, credits, benefits, reductions, allowances or incentives of any kind or nature related to electricity generation, generation capacity or emissions (or the lack or avoidance thereof).

"***Equipment Leasing Party***" means, if applicable, any Person to whom Entity Name transferred the ownership interest in the System, subject to a leaseback of the System from such Person.

"***Events of Default***" means a Town Event of Default or a Entity Name Event of Default.

"***Financing Party***" or "***Financing Parties***" means any and all Persons or successors in interest thereof, directly or indirectly, (i) lending money, (ii) extending credit, (iii) investing equity capital or (iv) providing or financing any System or other arrangement including tax equity investments for or in connection with any of the following: (a) the construction, term or permanent financing of the System; (b) working capital or other ordinary business requirements of the System (including the maintenance, repair, replacement or improvement of the System); (c) any development financing, bridge financing, credit support, credit enhancement or interest rate protection in connection with the System; or (d) the purchase of the System and the related rights. For avoidance of doubt, "Financing Party" shall include an Equipment Leasing Party, if any, and any Person providing any of the foregoing categories of financing to Equipment Leasing Party with respect to the System.

"***Force Majeure Event***" means an event, occurrence or circumstance, or combination thereof, beyond the reasonable control of a Party which wholly or partly prevents or delays the performance of any obligation arising under this Agreement, and is not the result of the negligence of the Claiming Party, and which by the exercise of reasonable due diligence, the Claiming Party is nonetheless unable to overcome or avoid or cause to be avoided, including, but not limited to: (a) acts of God, terrorism, war, blockade, riot, civil disturbance or sabotage; (b) any effect of unusual natural elements, including fire, subsidence, earthquakes, floods, lightning, tornadoes, unusually severe storms, or similar cataclysmic occurrence or other unusual natural calamities; (c) environmental and other contamination at or affecting the Premises, the Lease Area, the System or a Party's obligations hereunder, except as may be caused by the negligence or affirmative act of a Party; (d) explosion, accident or epidemic; (e) failure of a Governmental Authority to issue any permits properly applied for or to take any other action required to be taken by such Governmental Authority; (f) failure of an LDC to issue any permissions properly applied for and diligently pursued in good faith, or to take any other action required to be taken by such LDC; and (g) general strikes, lockouts or other collective or industrial action by workers or employees, or other labor difficulties; provided, that neither the lack of money nor changes in market conditions shall constitute a Force Majeure Event.

"***Governmental Authority***" means the United States of America, the State of New York, and any political or municipal subdivision thereof (including but not limited to the Town), and any agency, department, commission, board, bureau, or instrumentality of any of them, and any independent electric system operator.

"***Hazardous Materials***" means those substances defined, classified, or otherwise denominated as a "hazardous substance," "toxic substance," "hazardous material," "hazardous waste," "hazardous pollutant," "toxic pollutant" or oil in the Applicable Legal Requirements or in any regulations promulgated pursuant to the Applicable Legal Requirements.

"***Interest Rate***" means a fluctuating interest rate per annum equal to the sum of the lesser of (i) the Prime Rate as stated in the "Bonds, Rates & Yields" section of The Wall Street Journal on the Effective Date and thereafter on the first day of every calendar month, plus two (2) percentage points, or (ii) the maximum rate permitted by Applicable Legal Requirements. In the event that such rate is no longer published in The Wall Street Journal or such publication is no longer published, the Interest Rate shall be set using a comparable index or interest rate selected by Town and reasonably acceptable to Entity Name. The Interest Rate hereunder shall change on the first day of every calendar month. Interest shall be calculated daily on the basis of a year of 365 days and the actual number of days for which such interest is due. In no case shall the Interest Rate for this Agreement be less than XX% per year.

"***Landfill***" means the landfill on the Premises, including, without limitation, any waste and other materials within such landfill, the landfill cap, the area below such membrane, any fill placed over the membrane and all structures, equipment, fixtures and improvements installed on the Premises by the Town and/or its agents and/or contractors, including without limitation the landfill cap, drainage, and gas venting structures and apparatus referenced in the closure plan with respect to such landfill. To avoid doubt, "Landfill" does not include the System.

“***Landfill Closure Plan***” means the closure plan required by the December 14, 1988 NYS DEC order of consent and approved by the NYS DEC, as same may be amended from time to time with the approval of the NYS DEC.

“***LDC***” means the regulated electric local distribution company that provides electric distribution service to the municipality in which Town is located, which as of the Effective Date is Local Distribution Company/ Local Utility Company.

“***LDC System***” means the electric distribution system operated and maintained by the LDC.

“***Lease Area***” means the portion of the Premises in which the Town grants Entity Name a lease to allow the installation, operation, repair and removal of the System, which area shall include the Easements, and means the real property depicted in the plan attached as Exhibit B until the Lease Area is further defined as follows: Within sixty (60) days of the Commercial Operation Date, Entity Name shall, solely at its’ expense, obtain a survey of the portion of the Premises determined to be the final Lease Area, and that survey or plot plan shall be an amendment to this Agreement as a new Exhibit B, and the Lease Area shall then mean the portion of the Premises defined by the survey. Further, the Lease Area does not consist of any portion of the Landfill but does include any areas impacted by incidental subsurface penetration in installing the System in accordance with the Projects Plans and Applicable Legal Requirements.

“***NYS DEC***” means the New York State Department of Conservation.

“***Entity Name Indemnified Parties***” shall have the meaning set forth in § 13.2.

“***Entity Name’s Maintenance Obligations***” shall have the meaning set forth in § 5.1.1.

“***Entity Name Property***” shall have the meaning set forth in § 2.6.1. “Permitted Repair Period” shall have the meaning set forth in § 11.2.

“***Person***” means any individual, partnership, corporation, limited liability company, business trust, joint stock company, trust, unincorporated association, joint venture, firm, or other entity, or a Governmental Authority.

“***Premises***” has the meaning set forth in Exhibit A and shall include the Lease Area.

“***System***” means the solar electric generating facility to be installed in the Lease Area, including but not limited to the System Assets, which produces electricity.

“***System Assets***” means each and all of the assets of which the System is comprised, including Entity Name’s solar energy panels, mounting systems, carports, tracking devices, inverters, integrators and other related equipment and components installed on the Premises, electric lines and conduits required to connect such equipment to the LDC delivery point, protective and associated equipment, improvements, metering devices, fencing and other tangible and intangible assets, including System electricity production and Environmental Attributes, and permits, property rights and contract rights reasonably necessary for the construction, operation, and maintenance of the System.

“***Term***” shall have the meaning set forth in § 3.1 herein.

“***Term Rent***” means, after the Commercial Operation Date, an annual amount equal to $XX escalating at X% annually. The Town acknowledges that this rent constitutes fair market value rent payable in an arms-length transaction.

“***Termination Date***” means the earlier to occur of (i) the last day of the Term, and (ii) the date of termination of this Agreement as the result of an Event of Default.

1.2 Rules of Interpretation.

Section headings are for convenience only and shall not affect the interpretation of this Agreement. References to sections are, unless the context otherwise requires, references to sections of this Agreement. The words “hereto”, “hereof” and “hereunder” shall refer to this Agreement as a whole and not to any particular provision of this Agreement. The word “including” shall be deemed to be followed by the words “without limitation”. In the event of any conflict between the text of this Agreement and the contents of an Exhibit hereto, the text of this Agreement shall govern.

ARTICLE 2 - THE PREMISES

2.1 Lease Area.

The Town, for and in consideration of the covenants and agreements on the part of Entity Name contained in this Agreement, does hereby lease to Entity Name, and Entity Name does hereby take from the Town, upon and subject to the conditions hereinafter expressed, the Lease Area for the sole and exclusive use of constructing, operating, maintaining, repairing and removing the System. Entity Name's use of the Lease Area is subject to all Applicable Legal Requirements

2.2 Easements.

The Town further grants the following easements ("***Easements***") to Entity Name, during the period commencing on the Effective Date of this Agreement and ending upon the expiration or earlier termination of the Term:

2.2.1 a non-exclusive easement for access to the Lease Area across or through the external portion of the Premises and any surrounding or adjacent area owned or leased by the Town which is necessary in such location and of such dimensions as determined by the LDC and approved by the Town, which approval shall not be unreasonably withheld, conditioned or delayed by the Town in its reasonable discretion, to gain access to the System;

2.2.2 a non-exclusive use right of an area on the Premises to be used solely for System construction, repair and removal; and

2.2.3 an easement for the installation, operation and maintenance of electric lines necessary to interconnect the System to the LDC's electric distribution System in such location and of such dimensions as determined by the Town in its reasonable discretion which shall not be unreasonably withheld, conditioned or delayed.

2.2.4 The preliminary location of such Easements are set forth on Exhibit B attached hereto and such Exhibit will be supplemented prior to the start of construction of the System subject to the approval of the Town which shall not be unreasonably withheld.

2.3 File Notice of Lease.

Parties agree that this Agreement shall not be recorded, but the Parties shall execute and record a Notice of Lease that shall describe the Lease Area and Easements and shall otherwise be reasonably acceptable to both Parties. Any subsequent amendments of this Agreement, including all easements subsequently entered into in accordance with ARTICLE 3 hereof, shall be reflected by filing with the County an appropriate Notice of Amendment to Lease. All recordation shall be at Entity Name's expense.

2.4 Town Representations and Warranties.

The Town represents and warrants that:

2.4.1 It has no knowledge of any violation of the Landfill Closure Plan with respect to Premises and no event or condition has occurred which with the passage of time or giving of notice would constitute such a violation;

2.4.2 It has no knowledge of any violations of Applicable Legal Requirements with respect to the Premises or any event or condition having occurred which with the passage of time or giving of notice would constitute such a violation.

2.5 As-Is Lease of the Lease Area and Easements.

2.5.1 Entity Name accepts the Lease Area after a full and complete examination thereof, as well as the title thereto, and knowledge of its present uses and non-uses. Except as expressly provided herein, Entity Name accepts the Lease Area in the condition or state in which it now is without any representation or warranty, express or implied in fact or by law, by the Town or any person purporting to represent the Town and without recourse against the Town, as to the title thereto, the nature, condition or usability thereof or the suitability of the Lease Area for the use or uses to which the Lease Area or the Premises or any part thereof may be put as authorized hereby.

2.5.2 Except as expressly provided herein, the Town shall not be required to furnish any services or facilities or to make any repairs or alterations in or to the Lease Area or the Premises.

2.5.3 Notwithstanding anything contained in this ARTICLE 2, neither Entity Name nor any entity which enters into a sublease with Entity Name with respect to all or any portion of the Premises, shall be liable for: (i) the Landfill; (ii) any conditions on the Premises arising from or related to acts or omissions occurring prior to the Effective Date or (iii) any "release" of any Hazardous Materials from the Premises from the Landfill, unless, and to the extent, caused wholly or partly by Entity Name or any of its related entities, contractors, invitees or licensees.

2.5.4 The parties acknowledge that since this Lease Area is a landfill, that Town is required by law to monitor and/or maintain the Lease Area. Thus, so far as between the Parties, Entity Name shall, at its sole cost and expense, maintain and operate the System which shall not penetrate the cap of the landfill. Town shall continue to maintain and operate the landfill. Entity shall maintain the ground cover, including regular mowing of vegetation consistent with the operation requirements of a photovoltaic system. Jurisdiction shall have the right to enter on the premise to maintain and monitor the cap as needed, provided that they provide reasonable notice of their entrance.

2.6 Ownership of the System.

2.6.1 **Title to System.** Subject to the rights provided to the Town pursuant to other terms hereof, the System and all alterations, additions, improvements or installations made thereto by Entity Name and all Entity Name property used in connection with the installation, operation and maintenance of the System is, and shall remain, the personal property of Entity Name ("Entity Name Property"). In no event shall any Entity Name Property be deemed a fixture, nor shall the Town, nor anyone claiming by, through or under the Town (including but not limited to any present or future mortgagee of the Premises) have any rights in or to the Entity Name Property at any time except as otherwise provided herein. Except as provided otherwise herein, the Town shall have no ownership or other interest in the System or any System Assets or other equipment or personal property of Entity Name installed on the Premises, and Entity Name may remove all or any portion of the System or any System Assets at any time and from time to time as further provided in and subject to, this Agreement. Without limiting the generality of the foregoing, Town hereby waives any statutory or common law lien that it might otherwise have in or to the System and other System Assets or any portion thereof, but such waiver shall not extend to claims by the Town in the System Assets based upon a default by Entity Name hereunder.

2.6.2 **Security Interests in System.** The Town acknowledges and agrees that Entity Name may grant or cause to be granted to a lender a security interest in the System and in Entity Name's rights to payment under the Agreement, and Town expressly disclaims and waives any rights in the System at law or in equity pursuant to this Agreement. Any security interest shall be subordinate to the interest of the Town in the Premises and subject to the terms and conditions of this Agreement; provided however the Town shall execute, or use best efforts to cause any holder of an interest in the Premises senior to that of Entity Name to execute, a form of a non-disturbance agreement reasonably acceptable to the Financing Party and the Town or such other holder.

2.7 No Expenditures.

Entity Name and the Town acknowledge and agree that the Town shall not be required, except as expressly provided herein, to make any expenditure, incur any obligation, or incur any liability of any kind whatsoever in connection with this Agreement or the ownership, construction, operation, maintenance, repair, or removal of the System

2.8 No Additional Use.

Except with the prior express written consent of the Town, Entity Name shall not use the Lease Area for any use other than the installation, operation, maintenance, repair and removal of the System.

ARTICLE 3 – TERM

3.1 Term.

The term of this Agreement (the "***Term***") shall commence on the Effective Date and shall remain in effect until the twenty fifth (25th) anniversary of the Commercial Operation Date.

3.2 Termination.

If Lessee delivers the Exercise Notice prior to the Commercial Operation Date, then Lessee shall have the option, in its sole discretion, to terminate the Agreement at any time before the Commercial Operation Date.

3.3 Late Payment.

If any payment is not paid when due under this Agreement, it shall earn interest at the rate of the lesser of (i) XX (XX%) per month (and pro-rated for a partial month) and (ii) the maximum amount allowed by law from the time when the payment was due until the time it is paid.

ARTICLE 4 – RENT

4.1 The Development Period Payment.

Entity Name shall pay the Development Period Payment. The Development Period Payment, prorated for the number of days from the Effective Date to the Commercial Operation Date, shall be due on the Commercial Operation Date. Following the Commercial Operation Date, the Development Period Payment shall cease.

4.2 The Term Rent.

Entity Name shall pay the Term Rent. The payment of the Term Rent shall be payable in advance and due annually no later than XX (XX) days following the annual anniversary of the Commercial Operation Date.

4.3 Term Rent Adjustment.

The Term Rent shall increase by an amount of XX% per year starting on the first (1st) anniversary of the Commercial Operation Date.

ARTICLE 5 – DUTIES OF PARTIES

5.1 Maintenance; Repairs; Non Interference.

5.1.1 Entity Name shall, at its sole cost and expense, (i) take good care of the System, conduct all required maintenance of the System and make all repairs thereto, interior and exterior, structural and non-structural, ordinary and extraordinary, foreseen and unforeseen, and shall maintain and keep the System in safe, first class order, repair and condition, free and clear of any hazards or dangerous conditions and (ii) mow the grass and otherwise maintain all vegetation and otherwise comply with all standards and conditions required under the Legal Obligations, applicable to the operation and maintenance of the System including without limitation standards recommended by the NYS DEC (the "***Entity Name Maintenance Obligations***")

5.1.2 Except as expressly provided in § 5.1.1 or elsewhere in this Lease, the Town will continue to have responsibility for all obligations with respect to the Landfill, including maintaining the Landfill and making all repairs and replacements to the Landfill, interior and exterior, structural and non-structural, ordinary and extraordinary, foreseen and unforeseen, except to the extent of any required as a result of any act, or failure to act, by Entity Name or any of its related entities, contractors, invitees or licensees, and except any required in connection with Entity Name's activities pursuant to and in accordance with this Agreement.

5.1.3 Nothing in this Agreement shall limit the Town's ability and obligation to maintain the Premises in a reasonable manner consistent with the Town's current and past practices and the terms of this Agreement.

5.1.4 To the extent required to comply with Applicable Legal Requirements, the Town may construct, reconstruct, modify or make alterations to the Premises; provided, however, that in no event shall such activities shade the System or otherwise materially interfere with the operation of the System or Entity Name's rights hereunder. Any such material interference with the operation of the System or Entity Name's rights hereunder which is caused by a Town Event of Default shall be governed by ARTICLE 10.

5.1.5 Entity Name shall make all arrangements for and pay directly to the entity providing the service, before delinquent, all charges for all utilities and services furnished to or used by it, including without limitation, gas, electricity, water, steam, telephone service, trash collection and connection charges. The Town shall have no duty or liability to Entity Name with respect to the maintenance, repair, upgrade, or replacement of any utilities, including, without limitation, any electrical transmission or distribution lines, whether such lines are owned by the Town or any third party. In the event that Entity Name desires to undertake maintenance, repair, upgrade, replacement or security activities with respect to electrical transmission or distribution lines owned by the Town, Entity Name may do so at Entity Name's expense subject to the prior written approval of the Town, which shall not be unreasonably withheld.

5.1.6 Extension Option. Entity Name shall have the option to extend the Lease Term for up to four (4) additional and successive period of five (5) years beginning on the day following the Expiration Date of the then-current Lease Term, by giving notice (the "Extension Exercise Notice") to Town no less than ninety (90) days prior to the then-current Expiration Date, and without the requirement of any further action on the part of either Town or Entity Name.

5.2 Compliance with Laws; Professional Standards.

5.2.1 Entity Name, at Entity Name's expense, shall diligently and fully comply with all Applicable Legal Requirements governing its use and occupancy of the Lease Area and the construction, maintenance, repair, and removal of the System. In addition, Entity Name shall ensure that the System is operated and maintained in a professional manner by appropriately trained and qualified individuals.

5.2.2 The Town, at the Town's expense, shall diligently and fully comply with all Applicable Legal Requirements governing the Landfill, including the closure of the Landfill and the maintenance, repair and upkeep of the Landfill, except to the extent of conditions caused wholly or partly by any act, or failure to act, by Entity Name of any of its related entities, contractors, invitees, or licensees. In addition, the Town shall ensure that such obligations are performed in a professional manner by appropriately trained and qualified individuals.

ARTICLE 6 – CONSTRUCTION AND OPERATION OF PERMITTED USE

6.1 General Description.

Except as otherwise specified herein, the System shall conform to Exhibit B of this Agreement. Any material modification or deviation from the design as depicted in Exhibit B shall require the subsequent consent of the Town, which consent will not be unreasonably withheld, conditioned or delayed.

6.2 Governmental Approval.

Except as otherwise specified herein, or otherwise obtained prior to the Effective Date, Entity Name will obtain at its sole cost all approvals and permits required under the Applicable Legal Requirements for Entity Name's use of the Lease Area for the System from any Governmental Authority having jurisdiction. Entity Name will promptly inform the Town of all significant developments relating to the issuance of such approvals or permits. The Town will reasonably cooperate with Entity Name in procuring such approvals, except as expressly set forth herein this Agreement does not impose an affirmative obligation on the Town to issue or procure any approval or to engage in any action or inaction inconsistent with the proper exercise of the Town's regulatory authority). If any changes in such plans and/or specifications are required by any Governmental Authority, then Entity Name shall submit such changes, if any, to the Town for its approval, and such approval shall not be unreasonably conditioned, withheld or delayed. Entity Name will be required to keep any such approvals current and in full effect during the Term.

6.3 Completion Requirements.

Entity Name may perform construction at the Premises between the hours of 7:00 a.m. and 7:00 p.m., Monday through Saturday, unless otherwise limited by local ordinance and shall do so in reasonable coordination with the Town and in a manner which limits inconvenience to and interference with the Town and the Town's invitees' and employees' use of the Premises to the extent commercially practical. Entity Name shall grant the Town and its authorized representative's access to and the right, but not the obligation, to observe installation and any significant repairs to or replacement of the System at all times provided that neither the Town nor its authorized representatives shall interfere with the installation or repair work or use or move any Entity Name equipment or the System without written authorization from Entity Name.

6.4 Access to and Use of the Premises.

Entity Name and its sub-contractors, agents, consultants, and representatives shall have reasonable access at all reasonable times (including under emergency conditions) to the Lease Area for the purpose of construction, operation, inspection, maintenance, repair and removal of the System, and to any documents, materials and records of the Town relating to the Premises that Entity Name reasonably requests in conjunction with these activities. During any such activities, Entity Name, and its sub-contractors, agents, consultants and representatives shall comply with the Town's reasonable safety and security procedures (as may be promulgated from time to time), and Entity Name and its sub-contractors, agents, consultants and representatives shall conduct such activities in such a manner and such a time and day as to cause minimum interference with the Town's other activities.

Through the Option Term and Lease Term and through the Removal Date, Entity Name shall have the rights to perform (or cause to be performed) all tasks necessary or appropriate, as reasonably determined by Lessee, to carry out the activities set forth in the Agreement, including, without limiting the generality of the foregoing, the right (i) to design, construct, install, and operate the System, (ii) to maintain, clean, repair, replace, add to, remove or modify the System or any part thereof as determined to be necessary by Entity Name in its sole discretion and in accordance with the Permits and Applicable Laws, (iii) to use any and all appropriate means of restricting access to the System and Premises, including without limitation, the construction of a fence or other encumbrances existing on the Premises determined to be necessary by lessee in its sole discretion and in accordance to the Permits and Applicable Laws. Except as may otherwise be specifically agreed upon by the Parties or as expressly set forth herein, Entity Name shall be responsible for all costs of designing, permitting, construction, installation, operation, and maintenance of the System, and System Removal.

6.5 As-built Plans.

Within ninety (90) days following the issuance of the Completion Notice, Entity Name shall prepare and deliver to the Town detailed as-built plans accurately depicting the System including, without limitation, all wiring, lines, conduits, piping and other structures or equipment, certified to the Town. Entity Name shall also deliver to the Town a certification from its engineer, who shall be duly licensed in the State of New York, that the System has been constructed in accordance with all approved plans and specifications.

6.6 Operations.

Entity Name shall submit to the Town annually a written summary of operations which shall include any material modifications and a summary of the amount of production for the preceding twelve (12) months.

6.7 Removal of the System.

6.7.1 Within ten (10) days following the anniversary of the Commercial Operation Date, if the Parties have determined that this Agreement will definitely terminate at the 25th anniversary of the Commercial Operation Date without extension or replacement and that the Town has determined that it wishes that the System be removed from the Premises at the Termination Date of this Agreement, then (i) Entity Name shall provide to the Town the estimated cost of System removal, and (ii) the Parties shall meet and discuss the options for removal of the System, and (iii) if the Town requests, Entity Name shall post a bond or provide another financial assurance to the Town, in form and amount reasonably satisfactory to the Town, to demonstrate its ability to satisfy the financial costs of the removal of the System from the Premises. Upon the Termination Date, Entity Name shall at its sole cost and expense remove from the Premises all of the tangible property comprising the System, including but not limited all structures built by the Entity Name, any fencing and/or barriers to secure the System and any System mounting and other support structures, not later than 360 days after such Termination Date and shall return the Lease Area to the same condition as it was in on the Effective Date (including uniform grass coverage for areas impacted) except for any reasonable use and wear or damage by casualty or eminent domain. Lessee shall return the Premises “as is” with all vegetation, trails or roadways, utilities and site conditions existing as of the expiration of the Lease Term and shall have no obligation to restore the Premises to their condition prior to the Effective Date.

6.7.2 Entity Name shall repair any damage it causes in connection with such removal not related to ordinary use and wear at its sole cost and expense.

6.7.3 If Entity Name fails to remove or commence substantial efforts to remove the System within 180 days of the expiration of the date that the Agreement terminates, the Town shall have the right, at its option, to possession, use of and ownership of the System including the right, without limit, to remove and to sell same, and restore the Lease Area to its original condition (other than ordinary wear and tear) and Entity Name shall reimburse the Town for reasonable out-of-pocket costs and expenses incurred by the Town in removing, storing and selling the System and in restoring the Lease Area.

6.7.4 The provisions of this Section 6.7 shall survive the Termination Date of this Agreement.

ARTICLE 7 – LIENS

7.1 No Liens.

Entity Name shall not create, or suffer to be created or cause to remain, and shall promptly discharge, any mechanic’s, laborer’s or materialman’s lien, or any other lien upon the Premises and Entity Name will not suffer any other matter or thing arising out of Entity Name’s use and occupancy of the Premises whereby the estate, rights and interests of the Town in the Premises or any part thereof might be impaired, except in accordance with and subject to the provisions of this Agreement.

7.2 Discharge.

If any mechanic’s, laborer’s or materialman’s or other lien shall at any time be filed against the Premises, Entity Name, within sixty (60) days after notice to Entity Name of the filing thereof, shall cause such lien to be discharged of record by payment, deposit, bond, insurance, order of court of competent jurisdiction or otherwise. If Entity Name shall fail to cause such lien to be discharged within the period aforesaid, then, in addition to any other right or remedy, the Town may, but shall not be obligated to, discharge the same either by paying the amount claimed to be due or by procuring the discharge of such lien by deposit or by bonding. Any amount so paid by the Town and costs reasonably incurred by the Town in connection therewith, together with interest thereon at the Interest Rate from the respective dates of the Town’s making of the payment of the cost and expenses, shall be paid by Entity Name to the Town within ten (10) Business Days of the Town’s invoice therefor.

7.3 Town’s Obligations.

The Town shall not directly or indirectly cause, create, incur, assume or suffer to exist any liens on or with respect to the System or any interest therein.

ARTICLE 8 – RIGHT TO INSPECT AND ENTER

8.1 Inspection and Entry.

During the course of construction and completion of the System and any substantial alteration thereto, Entity Name shall maintain all plans, shop drawings, and specifications relating to such construction which the Town, whose agents or contractors may examine at reasonable times upon reasonable prior notice for the purpose of determining whether the work conforms to the agreements contained or referenced in this Agreement. The Town may, upon reasonable prior notice to Entity Name by telephone or otherwise, enter upon the Lease Area and inspect the System for the purpose of ascertaining its condition or whether Entity Name is observing and performing the obligations assumed by it under this Agreement, all without hindrance or molestation from Entity Name. Entity Name shall obtain the Town’s prior written approval of any proposed substantial alteration, other than alterations required by any Applicable Legal Requirement, and such approval shall not be unreasonably withheld, conditioned or delayed.

8.2 Notice of Damage.

The Town shall promptly notify Entity Name of any matter it is aware of pertaining to any damage to or loss of the use of the System or that could reasonably be expected to adversely affect the System.

ARTICLE 9 – ASSIGNMENT AND SUBCONTRACTING

9.1 Successors and Assigns; Subcontracting.

This Agreement shall inure to the benefit of and shall be binding upon the Parties and their respective permitted successors and assigns; provided, that Entity Name in its discretion may elect to use such certified and licensed subcontractors as it may choose in performing any of its obligations hereunder and performance of any obligation of Entity Name by any such subcontractor shall satisfy such obligation to the extent of such subcontractor's performance.

9.1.1 **Assignment by Town**. The Town shall not sell, transfer, assign, pledge or cause to be assumed (together, "***Assign***"; and any such action, an "***Assignment***") this Agreement, in whole or in part, without the prior written consent of Entity Name and its applicable Financing Parties.

9.1.2 **Assignment by Entity Name**. Entity Name may with the prior written notice to and the prior written consent of, the Town in each instance, except as provided for in §9.2 this ARTICLE 9, assign this Agreement, in whole or in part. Any assignment shall be conditioned upon the assignee explicitly assuming in writing all of Entity Name's obligations under this Agreement. Entity Name shall deliver to the Town thirty days' (30) advance written notice of its intent to assign this Agreement. Entity Name shall also have the right to enter into one or more subleases with respect to this Agreement and/or to assign any rights under this agreement to any purchaser(s) of metering credits.

9.2 Consent to Assignment for Financing or Leasing.

Entity Name may seek financing for the ownership of all or a portion of the System under this Agreement, whether by a sale-leaseback of all or a portion of the System from an Equipment Leasing Party or entering into other arrangements with a Financing Party in the form of an equipment lease, finance lease, debt, equity, tax equity or other financing arrangement. Entity Name may collaterally assign or assign fully in connection with any financing of the System (which may, in connection with such Assignment, permit the Financing Party to further assign collaterally), its rights, and/or obligations hereunder for purposes of securing such financing or leasing arrangement. The Town hereby consents to any such Assignment, provided that:

9.2.1 Such Assignment shall not create any lien or other encumbrance on the Premises other than Entity Name's rights and obligations contemplated in this Agreement nor on any other real or personal property located on the Premises other than the System; and all provisions regarding the entry onto and use of the applicable Lease Area shall remain in effect;

9.2.2 If Entity Name assigns this Agreement, or any portion hereof, to a Financing Party as provided herein, the Town acknowledges and agrees that such Financing Party shall not be personally liable for the performance of such assigned obligations hereunder except to the extent of the interest of the Financing Parties in the System. Notwithstanding any such Assignment to one or more Financing Parties or a designee thereof, Entity Name shall not be released and discharged from and shall remain liable for any and all obligations to the Town arising or accruing hereunder (and, in the case of a partial Assignment, for the obligations accruing after the date of such Assignment with respect to obligations accruing under the unassigned portion of the Agreement).

9.2.3 The Town agrees to sign, execute and deliver or cause to be delivered each such consent to assignment, legal opinion, instrument or other document as Entity Name or its Financing Parties, if any, may reasonably request to satisfy the requirements of any Financing Party with respect to or in connection with any financing or leasing of the System. The Town also agrees, to the extent required by a Financing Party, if any, to provide Entity Name and/or a Financing Party with such information about the Town or the Premises as Entity Name, a Financing Party may reasonably request, provided that Entity Name shall be responsible for any expense incurred by Town in connection therewith, and provided further that the Town shall not be required to disclose any information deemed confidential under any Applicable Law.

9.2.4 Entity Name shall be responsible to reimburse the Town for all costs and expenses incurred in connection with the Town's obligations hereunder in connection with any System Financing including, without limitation by reason of specification, reasonable attorney, engineer and other consultant fees and disbursements.

9.3 Rights of Financing Parties.

9.3.1 **Rights Upon Event of Default.** Notwithstanding any contrary term of this Agreement:

(a) The Financing Party, as owner of the System, or as collateral assignee of this Agreement, shall be entitled to exercise, in the place and stead of Entity Name, any and all rights and remedies of Entity Name under this Agreement in accordance with the terms of this Agreement. The Financing Party shall also be entitled to exercise all rights and remedies of owners or secured parties, respectively, generally with respect to this Agreement and the System;

(b) The Financing Party shall have the right, but not the obligation, to pay all sums due under this Agreement and to perform any other act, duty or obligation required of Entity Name thereunder or cause to be cured any default of Entity Name hereunder in the time and manner provided by the terms of this Agreement. Nothing herein requires the Financing Party to cure any default of Entity Name under this Agreement or (unless the Financing Party has succeeded to Entity Name's interests under this Agreement) to perform any act, duty or obligation of Entity Name under this Agreement, but the Town hereby gives it the option to do so;

(c) Upon the exercise of remedies, including any sale of the System by the Financing Party, whether by judicial proceeding or under any power of sale contained therein, or any conveyance from Entity Name to the Financing Party (or any assignee of the Financing Party) in lieu thereof, the Financing Party shall give notice to the Town of the transferee or assignee of this Agreement. Any such exercise of remedies shall not constitute a default under this Agreement;

(d) Upon any rejection or other termination of this Agreement pursuant to any process undertaken with respect to Entity Name under the United States Bankruptcy Code, at the request of Financing Party made within ninety (90) days of such termination or rejection, the Town shall enter into a new agreement with Financing Party or its assignee having substantially the same terms and conditions as this Agreement.

9.3.2 **Right to Cure.**

(a) Town will not exercise any right to terminate or suspend this Agreement unless it shall have given the Financing Party prior written notice of its intent to terminate or suspend this Agreement, as required by this Agreement, specifying the condition giving rise to such right, and the Financing Party shall not have caused to be cured the condition giving rise to the right of termination or suspension within thirty (30) days after such notice or (if longer) the periods provided for in this Agreement; provided that if such Entity Name default reasonably cannot be cured by the Financing Party within such period and the Financing Party commences and continuously and diligently pursues curing of such default within such period, such period for cure will be extended for a reasonable period of time under the circumstances, such period not to exceed additional ninety (90) days. The Parties' respective obligations will otherwise remain in effect during any cure period.

(b) If the Financing Party or its assignee (including any purchaser or transferee), pursuant to an exercise of remedies by the Financing Party, shall acquire title to or control of Entity Name's assets and shall, within the time periods described in this Agreement, cure all defaults under this Agreement existing as of the date of such change in title or control in the manner required by this Agreement and which are capable of cure by a third person or entity, then such Person shall no longer be in default under this Agreement, and this Agreement shall continue in full force and effect.

ARTICLE 10 – DEFAULT AND REMEDIES

10.1 Entity Name Events of Default and Town Remedies.

10.1.1 **Entity Name Events of Default.** Entity Name shall be in default of this Agreement (a "Entity Name Event of Default") if any of the following shall occur:

(a) Entity Name fails to pay when due any sum of money becoming due to be paid to the Town under this Agreement, whether such sum be any installment of the rent reserved by this Agreement, any other amount treated as additional rent under this Agreement, or any other payment or reimbursement to the Town required by this Agreement, whether or not treated as additional rent under this Agreement, and such failure shall continue for a period of twenty (20) business days after written notice that such payment was not made when due;

(b) Entity Name fails to perform or observe any material term or condition of this Agreement, including any violation by Entity Name of Applicable Legal Requirements and/or any negligent or wrongful actions by Entity Name which cause damage to the membrane or other landfill feature which violates the NYS DEC closure plan with respect to the Landfill and such failure is not cured within thirty (30) days after written notice of such failure to Entity Name, which period shall be extended for an additional period not to exceed thirty (30) days if such failure cannot be cured within such initial 30-day period provided Entity Name has commenced such cure within such period and is diligently prosecuting the same to completion;

(c) Entity Name is Bankrupt;

(d) Entity Name vacates or abandons the Premises;

(e) Entity Name's interest in this Agreement devolves upon or passes to any Person, whether by operation or law or otherwise, except as expressly permitted hereunder.

10.1.2 **Town Remedies.** Upon a Entity Name Event of Default, the Town shall have the option to pursue any one or more of the following remedies without any notice or demand whatsoever, concurrently or consecutively and not alternatively:

(a) the Town may terminate this Agreement;

(b) Upon any termination of this Agreement, whether by lapse of time or otherwise, Entity Name shall surrender possession and vacate the Lease Area immediately and deliver possession thereof to the Town, and the Town may enter into and upon the Lease Area in such event and to repossess the Lease Area and to expel or remove Entity Name and any others who may be occupying or be within the Premises, and to remove Entity Name's signs and other evidence of tenancy and all other property of Entity Name therefrom, subject only to the provisions in § 6.6 on Removal of the System, without the Town being deemed in any manner guilty of trespass, eviction or forcible entry or detainer and without incurring any liability for any damage resulting therefrom, Entity Name waiving any right to claim damages for such re-entry and expulsion, and without relinquishing the Town's right to rent or any other right given to the Town under this Agreement or by operation of law. The Town may, but need not, enter into a new lease of the Lease Area or any part thereof for such rent and upon such terms as the Town, in its sole discretion, shall determine (including the right to re-lease the premises upon such terms as the Town desires, including without limitation a greater or lesser rent, or for a greater or lesser term than that remaining under this Agreement and the right to change the character or use made of the Premises). In connection with or in preparation for any re-leasing, the Town may, but shall not be required to, make repairs or alterations to the Premises to the extent the Town deems necessary or desirable, and Entity Name shall, upon demand, pay the cost thereof, together with Town's expenses of re-leasing;

(c) Until such time as the Town shall elect to terminate the Agreement and shall thereupon be entitled to recover the amounts specified herein, Entity Name shall pay to the Town upon demand the full amount of all rent, including any amounts treated as additional rent under this Agreement and other sums reserved in this Agreement for the remaining Term, together with the costs of repairs or alterations and the Town's expenses of re-letting and the collection of the rent accruing therefrom (including attorney's fees and disbursements), as the same shall then be due or become due from time to time, less only such consideration as the Town may have received from any re-leasing of the Premises; and Entity Name agrees that the Town may file suits from time to time to recover any sums falling due under this section as they become due. Any proceeds of re-leasing by the Town in excess of the amount then owed by Entity Name to the Town from time to time shall be credited against Entity Name's future obligations under this Agreement (unless previously terminated) but shall not otherwise be refunded to Entity Name or inure to Entity Name's benefit;

(d) the Town, without being under any obligation to do so and without waiving any Entity Name default, may remedy any state of facts constituting a default for the account of Entity Name, immediately upon notice in the case of emergency or if necessary to protect public health or safety, or to avoid forfeiture of a material right, or in any other case, but only provided Entity Name shall have failed to remedy such default within thirty (30) days, or such longer period as may be required due to the nature of such other default (provided Entity Name has commenced and is diligently prosecuting a cure), after the Town notifies Entity Name in writing of the Town's intention to remedy such other default. All costs reasonably incurred by the Town to remedy such default (including, without limitation, all reasonable and documented attorney's fees and disbursements), shall be at the expense of Entity Name;

(e) Regardless of whether the Town exercises its rights pursuant to § of this Agreement, it shall have the right, but not the obligation, and to the extent permitted by Applicable Legal Requirements, to take possession of the System until Entity Name demonstrates to the reasonable satisfaction of the Town that the events giving rise to the Event of Default have been cured, and that Entity Name has taken all reasonably necessary steps to ensure that such events shall not re-occur. The Town shall not be liable to Entity Name for any damages, losses or claims sustained by or made against Entity Name as a result of the Town's exercise of possession and operational control of the System except to the extent such damages, losses or claims result from the negligence or willful misconduct of the Town. The Town shall, if taking operational control of the System, recognize the right of any subtenant of which the Town has actual knowledge if such subtenant is then in full compliance with all of its obligations under the applicable sublease of the Premises. The Town shall, however, be entitled to demand that any payments due to Entity Name from any such subtenant be made to Town until the Event of Default has been cured. No subtenant shall incur any liability to Entity Name by reason of compliance or non-compliance with any such demand;

(f) If, on account of any breach or default by Entity Name in Entity Name's obligations under the terms and conditions of this Agreement, it shall become necessary or appropriate for the Town to employ or consult with an attorney concerning, or to enforce or defend, any of Town's rights or remedies arising under this Agreement or to respond to or interpret an inquiry of Entity Name under the Agreement, Entity Name agrees to pay all of the Town's attorney's reasonable and documented fees and court costs so incurred. Entity Name expressly waives any right to trial by jury.

10.1.2 Pursuit of any of the foregoing remedies shall not preclude pursuit of any of the other remedies provided in this Agreement or any other remedies provided by law (all such remedies being cumulative), nor shall pursuit of any remedy provided in this Agreement constitute a forfeiture or waiver of any rent due to the Town under this Agreement or of any damages accruing to the Town by reason of the violation of any of the terms, provisions and covenants contained in this Agreement.

10.1.3 No act or thing done by the Town or any of its agents, officers or employees during the Term shall be deemed a termination of this Agreement or an acceptance of the surrender of the Premises, and no agreement to terminate this Agreement or accept a surrender of said Premises shall be valid, unless in writing signed by the Town.

10.2 Town Events of Default and Entity Name Remedies.

10.2.1 **Town Events of Default.** The Town shall be in default of this Agreement (a **"Town Event of Default"**) if any of the following shall occur:

(a) Any representation or warranty by the Town herein is incorrect or incomplete in any material way, or omits to include any information necessary to make such representation or warranty not materially misleading, and such defect is not cured within fifteen (15) days after receipt of notice from Entity Name identifying the defect;

(b) the Town obstructs installation of the System or fails to take any actions necessary for the interconnection of the System required hereunder;

(c) The Town fails to perform or observe any material term or condition of this Agreement including, without limitation, violation of any Applicable Legal Requirements which materially interferes with the operation of the System with respect to the Landfill or the Landfill Closure Plan and such failure is not cured within: (A) thirty (30) days if the failure involves a failure to make payment when due or maintain required insurance; or (B) sixty (60) days if the failure involves an obligation other than payment, after receipt of notice from Entity Name identifying the failure, unless the Town, prior to the expiration of either of said periods, contests any claimed failure on its part and thereafter continues to diligently do so;

(d) the Town is Bankrupt;

(e) the Town's interest in this Agreement devolves upon or passes to any Person, whether by operation or law or otherwise, except as expressly permitted hereunder.

10.2.2 **Entity Name Remedies.** Upon a Town Event of Default, Entity Name may exercise any one or more of the following remedies:

(a) terminate this Agreement; and/or

(b) pursue any other remedies available at law or in equity.

ARTICLE 11 – CASUALTY; FORCE MAJEURE

11.1 If the Premises is damaged by fire or other casualty whatsoever so that such damage may reasonably be expected to materially and adversely disrupt the Entity Name's operations at the Premises for more than three hundred and sixty five (365) consecutive days, then the Entity Name may at any time following such fire or other casualty so long as such material and adverse disruption is continuing, terminate this Agreement upon sixty (60) days written notice to the Town.

11.2 In the event of the damage to or destruction of the Landfill and/or the System by fire, explosion, the elements or otherwise during the Term, or such partial damage or destruction thereof as to render the Lease Area and/or the System wholly untenantable or unfit for occupancy, or should the Landfill be so badly damaged that the same cannot (notwithstanding the Town's exercise of due diligence) be repaired within the "Permitted Repair Period" or should the System be so badly injured that the same cannot (notwithstanding Entity Name's exercise of due diligence) be repaired within the "Permitted Repair Period" then and in any case the Term shall, at the option of either the Town or Entity Name, cease and become null and void effective as of the date of such damage or destruction (the "Casualty Date").

11.3 The "Permitted Repair Period" means one hundred eighty days (180) from the Casualty Date, provided, however, that Entity Name shall have the right at its option, at any time within sixty (60) days after the Casualty Date, to elect to extend the Permitted Repair Period for an additional one hundred eighty (180) days (in which case the Permitted Repair Period will be three hundred sixty (360) days).

11.4 Upon cessation of the Term as provided in § 11.3, this Agreement shall expire with the same force and effect as though the date set forth in such notice were the date originally set as the expiration date of this Agreement, and the Parties shall make an appropriate adjustment, as of such Termination Date, with respect to payments due to the other under this Agreement. Nothing herein shall relieve Entity Name from its obligations under § 6.7 to restore the Lease Area.

11.5 Should the System be rendered, wholly or partially untenantable and unfit for occupancy, or if the Landfill shall be damaged, but yet be repairable within the Permitted Repair Period:

11.5.1 The Town shall enter and repair the Landfill with reasonable speed, except as to damage caused and to the extent of any damage caused wholly or partly by Entity Name or any of its related entities, contractors, invitees or licensees.; and Entity Name shall enter and repair the System with reasonable speed;

11.6 Force Majeure Event.

11.6.1 Except as otherwise specifically provided in this Agreement, neither Party shall be considered in breach of this Agreement if and to the extent that any failure or delay in such Parties' performance of one or more of its obligations hereunder is attributable to the occurrence of a Force Majeure Event; provided that, the Party claiming a Force Majeure Event shall (a) notify the other Party in writing of the existence of the Force Majeure Event, (b) promptly exercise all r easonable efforts necessary to minimize delay caused by such Force Majeure Event, (c) notify the other Party in writing of the cessation or termination of said Force Majeure Event, and (d) resume performance of its obligations hereunder as soon as practicable thereafter.

11.6.2 Notwithstanding anything in this Agreement to the contrary, if the Town claims relief pursuant to a Force Majeure Event, the obligation of Entity Name to make any rent payment hereunder shall be suspended as of the date that the Force Majeure Event commenced until the Town notifies Entity Name that it has resumed performance of its obligations under the Agreement. If a Force Majeure Event shall have continued for a period of at least 180 consecutive days, then Entity Name may terminate this Agreement upon thirty (30) days' written notice to the Town. If at the end of such thirty (30) day period such Force Majeure Event shall still be continuing, this Agreement shall automatically terminate. Upon such termination, neither Party shall have any liability to the other, subject to any obligations which arose prior to such termination (including the payment of rent, additional rent or other payments adjusted to the date of termination on a pro rata basis) and subject to provisions which expressly survive termination.

ARTICLE 12 – INSURANCE

12.1 Coverages.

Entity Name shall maintain the following insurance coverages in full force and effect throughout the Term:

12.1.1 **Entity Name's Public Liability and Property Damage Insurance.** Entity Name shall obtain and maintain in full force and effect for the entire Term and until all obligations of Entity Name hereunder have terminated, a comprehensive general liability insurance policy providing coverage for all claims for damages because of bodily injury, including death, and for claims for damages, other than to the work itself, to property which may arise out of or result from the Entity Name's operation under this Agreement, whether such operation be by itself or by anyone directly or indirectly employed by Entity Name, or any independent contractor, consultant, or any other person, firm or entity performing work or supplying materials on or to the System, or any other person, firm or entity under Entity Name's direction or control. The insurance shall name the Town as an additional insured and shall be written for not less than $1,000,000 each person, $2,000,000 each occurrence and $3,000,000 aggregate for bodily injury, and $500,000 each occurrence, $1,000,000 aggregate for property damage, or such other amount or amounts as required by law, whichever is greater, and shall include contractual liability applicable to the Entity Name's obligations. Coverage must include the following: premises/operations, elevators and hoists, independent contractors, contractual liability assumed under this Agreement, products/completed operations, broad form property coverage, and personal injury;

12.1.2 **Workmen's Compensation Insurance.** Workmen's compensation insurance must be provided at the Entity Name's expense as required by law;

12.1.3 **Vehicle Liability Insurance.** Entity Name shall take out and maintain at its own expense vehicle liability insurance during the Term of this Agreement. The insurance shall name the Town as an additional insured and shall be written for not less than $1,000,000 each person, $2,000,000 each occurrence and $3,000,000 aggregate for bodily injury and $500,000 each occurrence $1,000,000 aggregate for property damage, or such amount as required by law, whichever is greater, and shall include contractual liability applicable to the Entity Name's obligations. Coverage must include the following: Owned Vehicles, Leased Vehicles, Hired Vehicles, Non-Owned Vehicles;

12.1.4 **All Risk Property Coverage and Boiler and Machinery Coverage, or All Risk Builder's Risk Insurance.** The Entity Name shall take out and maintain, at its own expense, during construction, against damage to the System during the Term in an amount no less than the full replacement cost of the System, with commercial reasonable sub-limits and deductibles. Such insurance shall provide for a waiver of the underwriters' right to subrogation against the Town; and

12.1.5 **Excess Umbrella Liability Insurance.** The Entity Name shall take out and maintain, at its own expense, an Excess Umbrella Liability Insurance policy in an amount not less than five million dollars ($5,000,000).

12.2 Certificates of Insurance.

The Entity Name shall, prior to entry upon the Premises for any purpose authorized hereby, deliver to the Town copies of all insurance policies and certificates of insurance naming the Town as an additional named insured and evidencing all of the foregoing coverages required by this ARTICLE 12, in form and substance satisfactory to the Town, and shall deliver to the Town new policies and certificates thereof so naming the Town for any insurance about to expire at least ten (10) days before such expirations. All such insurance policies shall contain an endorsement requiring thirty (30) days written notice to the Town prior to cancellation or change in coverage, scope or amount of any such policy or policies. Compliance by the Entity Name with the insurance requirement, however, shall not relieve any contractor or subcontractor from liability pursuant to ARTICLE 13.

ARTICLE 13 – INDEMNIFICATION

13.1 Indemnification of Town.

The Entity Name shall indemnify, save harmless and defend the Town and its officers, employees, and agents (collectively, the "***Town Indemnified Parties***") from and against all liabilities, losses, damages, penalties, costs, and expenses, including reasonable attorneys' fees and disbursements, that may be imposed upon or incurred by or asserted against any the Town Indemnified Party by reason of any of the following occurrences during the Term:

13.1.1 Any accident, injury, or damage to any person or property occurring in, on or about the Lease Area or elsewhere arising from or related to the installation, operation, repair, maintenance or replacement of the System caused by (i) the negligence or intentional misconduct of Entity Name or any of its agents, contractors, subcontractors, servants, employees, or invitees; or (ii) any failure on the part of Entity Name or any of its agents, contractors, subcontractors, subtenants, servants, employees, licensees or invitees in, on or about the Premises to fully comply with the Applicable Legal Requirements of any of the Entity Name's other obligations hereunder.

13.1.2 In case any action or proceeding is brought against any Town Indemnified Party by reason of any such claim, the Town may, but shall not be obligated to, elect that Entity Name defend such action or proceeding with counsel approved by the Town. Upon written notice from Town of such election, Entity Name shall defend such action or proceeding at Entity Name's expense to the reasonable satisfaction of the Town.

13.2 Indemnification of Entity Name.

To the extent permitted by Applicable Legal Requirements, the Town shall indemnify, save harmless and defend Entity Name and its officers, employees, agents, and any subtenants of the Leased Area and/or System (collectively, the "***Entity Name Indemnified Parties***") from and against all liabilities, losses, damages, penalties, costs, and expenses, including reasonable attorneys' fees and disbursements, that may be imposed upon or incurred by or asserted against any Entity Name Indemnified Party by reason of any of the following occurrences during the Term:

13.2.1 Any accident, injury, or damage to any person or property occurring in, on or about the Lease Area, the Premises or the System of any part thereof which is caused by (i) the negligence or intentional misconduct of the Town or any of its agents, contractors, subcontractors, servants, employees, or invitees; or (iii) any failure on the part of the Town or any of its agents, contractors, subcontractors, servants, employees, licensees or invitees in, on or about the Premises to fully comply with any of the Town's obligations hereunder.

13.2.2 In case any action or proceeding is brought against any Entity Name Indemnified Party by reason of any such claim, such Entity Name Indemnified Party may, but shall not be obligated to, elect that the Town defend such action or proceeding with counsel approved by such Entity Name.

13.2.3 Indemnified Party. Upon written notice from Entity Name of such election, the Town shall defend such action or proceeding at Town's expense to the reasonable satisfaction of Entity Name.

13.3 Survival.

The provisions of this ARTICLE 13 shall survive the expiration or earlier termination of the Agreement.

ARTICLE 14 – DISPUTE RESOLUTION.

14.1 Binding Arbitration.

The Parties shall meet, confer and negotiate in good faith and attempt to resolve any dispute, controversy or claim arising out of or relating to the Agreement or the breach, interpretation, termination or validity thereof (a "***Dispute***"). Any Dispute that is not settled to their mutual satisfaction within the applicable notice or cure periods provided in this Agreement shall be settled by arbitration between the Parties conducted in White Plains, New York, and in accordance with the Commercial Arbitration Rules of the American Arbitration Association in effect on the date that a Party gives notice of its demand for arbitration under this ARTICLE 14. The submitting Party shall submit such Dispute to arbitration by providing a written demand for arbitration to the other Party and the Parties shall select a single neutral arbitrator. If the Parties cannot agree on a single neutral arbitrator within fifteen (15) days thereafter, then either Party may request that the American Arbitration Association select and appoint a neutral arbitrator who shall act as the sole arbitrator. The Parties may engage in discovery in connection with the arbitration as provided by the New York statutes and shall be entitled to submit expert testimony or written documentation in such arbitration proceeding. The decision of the arbitrator shall be final and binding upon the Parties and shall be set forth in a reasoned opinion, and award may be enforced thereon by either Party in a court of competent jurisdiction; provided, however, that the arbitrator shall not have the authority to award punitive, exemplary or analogous damages. Any award of the arbitrator shall include interest from the date of any damages incurred for breach or other violation of this Agreement at the Interest Rate. Each Party shall each bear the cost of preparing and presenting its own case, provided, however, that the Parties hereby agree that the prevailing party in such arbitration shall be awarded its reasonable attorney's fees, expert fees, expenses and costs incurred in connection with the dispute. The cost of the arbitration, including the fees and expenses of the arbitrator, shall initially be shared equally by Parties, subject to reimbursement of such arbitration costs and attorney's fees and costs to the prevailing party. The arbitrator shall be instructed to establish procedures such that a decision can be rendered within one-hundred eighty (180) calendar days of the appointment of the arbitrator.

14.2 Exceptions to Arbitration Obligation.

The obligation to arbitrate shall not be binding upon any Party with respect to (a) requests for preliminary injunctions, temporary restraining orders, specific performance, or other procedures in a court of competent jurisdiction to obtain interim relief when deemed necessary by such court to preserve the status quo or prevent irreparable injury pending resolution by arbitration of the actual Dispute or (b) actions to collect payments not subject to a bona fide Dispute or (c) claims permitted hereunder against third parties.

ARTICLE 15 – NOTICES

15.1 Notice.

Unless otherwise provided herein, any notice provided for in this Agreement shall be hand delivered, sent by registered or certified U.S. Mail, postage prepaid, or by commercial overnight delivery service, or transmitted by facsimile, and shall be deemed served or delivered to the addressee or its office when delivered.

15.2 Financing Party Notice.

Any notice or other communication which the Town shall desire or is required to give to or serve upon a Financing Party in accordance with the terms of this Agreement shall be in writing and shall be served in accordance with the provisions of § 15.1, addressed to such Financing Party at such party's addresses provided in writing by a Financing Party or by Entity Name, and any notice or other communication which the Financing Party shall desire or be required to give to or serve upon Town shall be deemed to have been duly given or served if sent in accordance with the provisions of § 15.1 or at such other address as shall be designated by Town by notice in writing given to such Financing Party in accordance with the provisions of this ARTICLE 15.

15.3 Notice Addresses.

Town Address:

Entity Name Address:

15.4 Address for Rent Payment.

All rent payments under this Agreement shall be sent to the Town's address as provide in § 15.3 and shall be sent by regular first-class mail postage prepaid or as otherwise agreed by the Parties.

ARTICLE 16 – MISCELLANEOUS

16.1 No Limitation of Regulatory Authority.

The Parties acknowledge that nothing in this Agreement shall be deemed to be an agreement by the Town to issue or cause the issuance of any approval or permit, or to limit or otherwise affect the ability of the Town or any regulatory authority of the Town, to fulfill its regulatory mandate or execute its regulatory powers consistent with Applicable Legal Requirements.

16.2 Subordination to Existing Leases, Easements and Rights of Way.

Entity Name acknowledges and understands that this Agreement is subject and subordinate to all existing leases, easements, rights of way, declarations, restrictions or other matters of record, and all existing agreements of the Town with respect to the Premises, and the Town represents that there is no restriction by agreement or otherwise which restricts the Town's right to enter into this Agreement or which would impair, interfere with, or be superior to or have priority over the leasehold estate granted hereunder. The Town reserves the right to grant additional licenses, easements, leases or rights of way, whether recorded or unrecorded, as may be necessary, which do not cause shading of the System or otherwise unreasonably interfere with Entity Name's use of the Premises and the operation of the System; provided however the Town shall execute and shall cause any holder of an interest in the Premises senior to that of the Entity Name to execute, a form of a non-disturbance agreement reasonably acceptable to Entity Name, any Financing Party and any subtenant with which the Town has executed a recognition agreement.

16.3 Compliance.

16.3.1 Entity Name shall comply with all Applicable Legal Requirements relating to the System.

16.3.2 The Town shall comply with all Applicable Legal Requirements relating to the Landfill including without limitation, the Landfill Closure Plan, except as to matters resulting wholly or partly by, and to the extent caused by, Entity Name or any of its related entities, contractors, invitees or licensees.

16.3.3 Upon knowingly encountering any Hazardous Materials at the Premises, Entity Name will stop work in the affected area and duly notify the Town and, if required by Applicable Legal Requirements, any Governmental Authority with jurisdiction over the Premises

16.3.4 The Town is not responsible for any Hazardous Materials introduced to the Premises by Entity Name, nor is the Town required to remediate an affected area. Entity Name shall not, and shall not direct, suffer or permit any of its agents, contractors, subcontractors, employees, leases, or invitees at any time to manufacture or dispose of in or about the Premises any Hazardous Materials, including but not limited to flammables, explosives, and radioactive materials. Entity Name agrees to comply with all Applicable Legal Requirements pertaining to the use, storage and disposal of Hazardous Materials (***"Environmental Laws"***) at the Premises. Entity Name shall indemnify, defend and hold harmless the Town and its agents, representatives and employees from any and all liabilities and costs (including any and all sums paid for settlement of claims, litigation, expenses, attorneys' fees, consultant and expert fees) of whatever kind or nature, known, or unknown, resulting from any violation of Environmental Laws caused by Entity Name or Entity Name's agents, contractors, subcontractors, employees, lessees or invitees at the Premises. In addition, Entity Name shall reimburse the Town for any and all costs related to investigation, clean up and/or fines incurred by Town for non-compliance with Environmental Laws, which are caused by Entity Name or Entity Name's agents, contractors, subcontractors, employees, lessees or invitees at the Premises. Town reserves the right to inspect the Lease Area for purposes of verifying compliance with these Hazardous Materials requirements.

16.4 Limited Effect of Waiver.

The failure of either Party to enforce any of the provisions of this Agreement, or the waiver thereof in any instance, shall not be construed as a general waiver or relinquishment on its part of any such provision, in any other instance or of any other provision in any instance.

16.5 <u>Survival.</u>

In addition to the other provisions of this Agreement that shall survive any expiration or termination hereof in accordance with the explicit terms thereof, the provisions of ARTICLE 1 (Defined Terms), ARTICLE 14 (Dispute Resolution), ARTICLE 9 (Assignment and Subcontracting), ARTICLE 15 (Notices), ARTICLE 13 (Indemnification) and ARTICLE 16 (Miscellaneous) shall survive the expiration or termination of this Agreement for any reason; <u>provided</u>, that the survival of any particular provision or set of provisions shall be limited in duration if and to the extent such survival is explicitly limited herein or otherwise limited by Applicable Legal Requirements.

16.6 <u>Severability.</u>

If any term, covenant or condition in this Agreement shall, to any extent, be invalid or unenforceable in any respect under the laws governing this Agreement, the remainder of this Agreement shall not be affected thereby, and each term, covenant or condition of this Agreement shall be valid and enforceable to the fullest extent permitted by Applicable Legal Requirements and, if appropriate, such invalid or unenforceable provision shall be modified or replaced to give effect to the underlying intent of the Parties and to the intended economic benefits of the Parties.

16.7 <u>Non-recourse.</u>

The obligations of the Town and Entity Name under this Agreement are not intended to and shall not be personally binding on, nor shall any resort be had to the private properties of, any of the Town's officers, employees, agents nor of Entity Name's trustees or board of directors and officers, as the case may be, or any beneficiaries, employees, agents or the like thereof. In no event shall the Town ever be liable to the Entity Name for any indirect or consequential damages under the provisions of this Agreement.

16.8 <u>Representations and Warranties.</u>

Each Party hereby represents and warrants to the other, as of date hereof, that:

16.8.1 **<u>Organization.</u>** It is duly organized, validly existing and in good standing under the laws of the state in which the Premises are located, respectively, and has the power and authority to enter into this Agreement and to perform its obligations hereunder.

16.8.2 **<u>No Conflict.</u>** The execution and delivery of this Agreement and the performance of and compliance with the provisions of this Agreement will not conflict with or constitute a breach of or a default under (1) its organizational documents; (2) any agreement or other obligation by which it is bound; (3) any law or regulation.

16.8.3 **<u>Enforceability.</u>** (1) All actions required to be taken by or on the part of such Party necessary to make this Agreement effective have been duly and validly taken; (2) this Agreement has been duly and validly authorized, executed and delivered on behalf of such Party; and (3) this Agreement constitutes a legal, valid and binding obligation of such Party, enforceable in accordance with its terms, subject to laws of bankruptcy, insolvency, reorganization, moratorium or other similar laws.

16.8.4 **<u>No Material Litigation.</u>** There are no court orders, actions, suits or proceedings at law or in equity by or before any governmental authority, arbitral tribunal or other body, or threatened against or affecting it or brought or asserted by it in any court or before any arbitrator of any kind or before or by any governmental authority which could reasonably be expected to have a material adverse effect on it or its ability to perform its obligations under this Agreement, or the validity or enforceability of this Agreement.

(End Terms and Conditions.)

SOLAR LEASE AGREEMENT

EXHIBIT A

PREMISES AND LEGAL DESCRIPTION

That real property at Site Address, as described in the indenture recorded with Organization & Address and The Town, dated Date.

SOLAR LEASE AGREEMENT

EXHIBIT B

LEASE AREA DESCRIPTION & DESIGN LAYOUT

GUARANTY

The Town, a New York municipality (hereinafter referred to as the "Town") and **ENTITY NAME, NY LLC**, (hereinafter referred to as the "Lessee") have entered into a Solar Lease Agreement dated Date (the "Agreement"). In order to induce the Town to enter into, execute and deliver the Agreement, and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, **Entity Name**, a New York limited liability company with an address of Address, as guarantor (the "Guarantor") hereby warrants, represents, guarantees and agrees with The Town as follows:

1. Guarantor has examined and approved and is fully familiar with all of the terms, covenants and conditions of the Agreement. Guarantor represents that Guarantor shall benefit from the making of the Agreement. Guarantor acknowledges that Guarantor executes and delivers this Guaranty on the understanding that Guarantor's doing so is a condition precedent to the Town's entering into the Agreement, as the Town is relying upon Guarantor's covenants herein in entering into the Agreement with Lessee.
2. Guarantor hereby guarantees and warrants to the Town the full, prompt and complete performance of all of the terms, covenants and conditions of the Agreement on the part of Lessee (collectively, the "Obligations"). Guarantor acknowledges that the intent of this Guaranty is that in the event Lessee does not in any way fully perform any of Lessee's Obligations in a timely manner under the Agreement, Guarantor shall perform any and all of such Obligations.
3. This guaranty is primary, irrevocable, absolute and unconditional and shall not be released, discharged, mitigated, impaired or affected by any amendments, modifications, extensions and/or renewals of the Agreement, or by any waiver or by failure of the Town to enforce any of the terms, covenants and conditions thereof or by any extension of time or indulgence extended by the Town to Lessee; and Guarantor hereby consents that the Town and Lessee may do any of the foregoing without notice to Guarantor during the term of this Guaranty.
4. Guarantor's liability under this Guaranty shall not be deemed to be waived, released, discharged, mitigated, impaired or affected by reason of the release or discharge of Lessee under the Agreement in any bankruptcy, reorganization or insolvency proceedings.
5. Guarantor's liability under this Guaranty shall not be waived, released, discharged, mitigated, impaired or affected in any respect by reason of any action or proceeding taken against Lessee under the Agreement, and in any such action or proceeding, the Town need not include Guarantor as a party thereto. The Town may pursue its remedies under this Guaranty concurrently with or independently of any such action or proceeding against Lessee under the Agreement.
6. The word "Lessee" as used in this Guaranty shall be deemed to and shall include any assignee to whom the Agreement shall have been assigned by Lessee in accordance and in compliance with the provisions thereof.
7. Anything to the contrary contained in the Agreement notwithstanding, Guarantor's liability under this Guaranty shall not be waived, released, discharged, mitigated, impaired or affected in any respect by reason of any assignment of the Agreement by the Town or Lessee, or by any subsequent assignee of the Agreement.
8. The Town may proceed directly against Guarantor under this Guaranty without being required to proceed against Lessee under the Agreement or to the exhaust any other rights or remedies it may have against the Lessee.
9. The Guaranty shall not be changed or terminated orally.
10. This Guaranty shall inure to the benefit of the Town, its successors and assigns, and shall be binding upon Guarantor, its successors and assigns.
11. The Guarantor shall pay the Town's reasonable attorneys' fees, costs, and other expenses incurred in the successful enforcement of this Guaranty against the Guarantor.
12. The Town may, upon written notice, assign this Guaranty to the successor to all of the Town's interest in the Agreement and no assignment or transfer of this Guaranty or the Agreement shall operate to extinguish or diminish the liability of the Guarantor hereunder.
13. It is in furtherance of the company purposes of the Guarantor that the Agreement with Lessee be entered into; and this Guaranty has been duly authorized by its members and by all parties whose consent is required for the execution hereof.

This Guaranty is made as of date

Entity Name, Guarantor

By: ______________________________

Name: ______________________________

Title: ______________________________

5. Model Law for Charter County Land Leases

The workable version of this document can be found at nyserda.ny.gov/SolarGuidebook, under the Municipal Solar Procurement Toolkit tab.

Local Law No. [#] of the year 20[##]

A local law authorizing the County of [ ], notwithstanding Section 215 of County Law of the State of New York, to enter into a lease of County-owned real property for a specific project for a term of up to 45 years.

SECTION 1. Purpose

The County of [ ] seeks to enter into an agreement with [Developer], which agreement shall lease real property owned by the County of [ ] for an initial term of twenty-five years and four additional optional terms of five years each.

SECTION 2. Legal Authority

New York State County Law Section 215(5) provides that, after determining that a property is no longer needed for public use, a County may sell the property or lease the property for a term not to exceed five years.

New York State Comptroller Opinion 91-27 opines that, pursuant to County Law Section 2(b), a County that has adopted an alternative form of county government pursuant to Article IX, Section 2 of the New York State Constitution (i.e., a Charter County), may enter into leases for a term in excess of five years if the county authorizes such leases by local law.

New York State Municipal Home Rule Law Section 24 provides that any local law that changes a provision of law relating to leasing of real property is subject to referendum on petition (permissive referendum).

SECTION 3. Applicability

The County of [ ], which is a Charter County, is authorized, notwithstanding Section 215 of the County Law of the State of New York, which is hereby superseded, to enter into a lease of County-owned real property for a specific project for a term of up to [45] years.

This Local Law is applicable to the specific project with [Developer].

SECTION 4. Effective Date

Notice of the adoption of this local law subject to permissive referendum shall be published in the official newspaper of the County.

This Local Law shall take effect at the end of the permissive referendum period upon filing in the Office of the Secretary of State, and if a permissive referendum is held, upon approval at the permissive referendum upon filing in the Office of the Secretary of State.

Questions?

If you have any questions about the municipal solar procurement toolkit, please email questions to cleanenergyhelp@nyserda.ny.gov or request free technical assistance at nyserda.ny.gov/SolarGuidebook. The NYSERDA team looks forward to partnering with communities across the state to help them meet their solar energy goals.

Section 10

Solar PV – Permitting and Inspecting

Understanding the solar permitting and inspecting process for local governments and authorities having jurisdiction (AHJ).

Section Contents

Overview

To allow officials to better understand the permitting and inspecting process, and ensure them an efficient, transparent, and safe beginning to their solar development project, this section reviews the solar photovoltaic (PV) permitting and inspection process for local government officials and authorities having jurisdiction (AHJs).

Tools and materials are provided to assist local officials and AHJs on evaluations of solar systems less than 25kW. Solar PV design issues, design reviews of construction documents, and field inspection checklists are among the topics discussed.

Within this chapter, we provide the following supplemental material for government officials and AHJs:

- NY State Unified Solar Permit Application
- Sample construction photos of correctly installed equipment
- Sample installation errors
- Labeling guidelines
- Sample wiring diagrams
- Sample site map for roof mounted solar PV systems

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1. Intended Use

NYSERDA developed this tool in collaboration with the New York Department of State, solar contractors, and other stakeholders. It supports NYSERDA's efforts to implement a unified permitting process for residential solar PV systems. Standardizing the permitting and inspecting process across New York State will reduce costs for municipalities and solar customers, create local jobs, and advance New York's clean energy goals.

1.1 What the Tool Is

This tool is a free resource to help code enforcement officials review and evaluate solar electric systems for grid-tied residential solar PV installations of 25 kW or less. Off-grid and commercial-scale solar PV systems are more complex and warrant greater detail than this tool provides.

1.2 What the Tool is Not

This tool is not all-encompassing. Electric construction is a complicated process governed by the NYS Uniform Fire Prevention and Building Code (Uniform Code), which references other codes. This tool highlights many common and important design issues referenced in the National Electrical Code (NEC), but it should not be considered comprehensive.

1.3 Distribution

AHJs and other entities are welcome to use and distribute this tool. AHJs may wish to update the Unified Solar Permit Application itself and Submittal Instructions to reflect any unique requirements that apply to their municipality (such as a schedule of fees). The inspection and design review checklists can also be changed to reflect additional requirements.

AHJs should keep in mind that changing the Unified Solar Permit's contents may diminish consistency and increase the cost of solar energy for their constituents. Changes may not be obvious to contractors working across many local governments, so AHJs should highlight any changes made to the standard documents.

1.3.1 Disclaimer

This document and the New York Unified Solar Permit are provided to support and standardize the solar permitting process. These documents should not be used as a substitute for proper solar PV system design calculations. Users of these documents assume all responsibility for solar PV system design, installation, and permitting, as required by New York State law. NYSERDA and its contractors cannot be held liable for any errors or omissions in these documents.

2. Solar PV System Design Issues

This section provides an overview of issues involved in solar PV system design. It is critical that designers optimize safety and performance because systems have expected lifespans of 20-30 years.

2.1 Array Siting

Designing a solar PV system involves many factors, but the most important is siting the array to maximize sunlight. South-facing roofs are ideal, but PV modules ("panels") can be located on southwest- or southeast-facing roofs with minimal losses. North-facing roofs and heavily shaded roofs should be avoided. Prior to installation, solar PV contractors measure the amount of sunlight a location receives annually, either with a hand-held tool or aerial imagery software.

Residents planning to remove trees to increase solar access should clearly mark the trees on construction documents submitted with their permit application. The projected growth of vegetation should also be considered when designing a system, especially for ground-mounted arrays.

When a house does not have a clear south-facing roof, contractors can install on garages, outbuildings, or in the ground. Experienced designers will maximize solar access and minimize wire runs, building penetrations, and labor costs. Depending on the layout of a house, conductors can be run on exterior roofs and walls, through attic or basement spaces, or in wall cavities.

2.2 Irradiance and Temperature

Solar electric modules convert solar radiation into electric current. Their power output is variable, based on the intensity of sunlight (irradiance) and the temperature of the cells. All modules have a nameplate capacity, which states the power (Wattage) produced by the module under Standard Test Conditions (STC), defined as 1,000 Watts per square meter at 25 °C. The module's actual output at a specific point in time is typically lower than the nameplate capacity but can be higher under certain conditions.

Solar electric modules have the greatest power output when exposed to high levels of irradiance (intensity of sunlight) at low temperatures. There is a positive relationship between irradiance and the current (Amperes) solar PV modules produce: as irradiance increases, current increases (with little change in voltage). There is an inverse relationship between temperature and a PV module's voltage: at temperatures below 25 °C, modules produce voltage higher than during STC. At higher temperatures, voltage decreases (see NEC 690.7), with no significant change to amperage.

In addition to reducing voltage (and therefore Wattage), high temperatures have other detrimental effects on solar PV systems. Prolonged exposure to high temperatures accelerates the rate at which solar PV cells degrade. Therefore, most roof-mounted arrays are located on racking, which places the PV cells 3 to 6 inches above the roof surface and allows airflow under the array. Inverters may be installed outdoors but perform slightly better when not in direct sunlight. High temperatures must be considered when sizing conductors located on hot roofs, as the current carrying capacity of conductors decreases when exposed to heat. Conduit runs must also have expansion fittings (as required by code) to account for thermal expansion and contraction.

Because the output voltage of solar PV modules increases significantly in colder weather, installers must account for the lowest expected ambient temperature when determining the maximum number of solar PV modules per string (NEC 690.7).

2.3 System Sizing and Equipment Selection

Solar electric installations are highly customized. Installers must carefully design systems to meet site-specific conditions and choose equipment that satisfies detailed technical requirements. Solar electric modules have different STC electrical outputs (voltage and current), which vary with temperature and irradiance. At residential sites the NEC limits the maximum DC string voltage to 600 volts, so installers must determine the maximum number of modules per string, based on design low temperatures (i.e. when module voltage is highest). DC strings of modules must also have a minimum voltage (based on design high temperatures) greater than the minimum voltage required to activate the system's inverter. Certain technologies allow for increased flexibility in system design, such as multiple power point trackers (MPPTs), DC optimizers, and microinverters.

DC array sizes should not exceed an inverter's maximum input rating. If an inverter is significantly undersized for an array, solar PV production during peak hours will be limited. Generally, a solar PV system's DC Wattage should not exceed 1.3 times the AC rating of its inverter. Many inverter manufacturers have developed computer programs that assist in string sizing and optimizing system design, such as www.fronius.com/froniusdownload/tool.html

2.4 Grounding

One of the more challenging aspects of solar PV system design and installation is thoroughly grounding and bonding the system in accordance with the NEC.

The grounding electrode conductor (GEC) is the reference ground that establishes the voltage relationships between the ungrounded conductors and earth ground. The GEC must be run with irreversible splices from any separately derived power supply (i.e., inverters that contain transformers) to the grounding electrode. All solar PV systems with a transformer-based inverter will require a GEC from the inverter to the grounding electrode. Table 250.66 in the NEC governs the sizing of the GEC. The GEC must be a minimum of number six American Wire Gauge Building Wire (#6 AWG) when exposed and must be bare or covered with green insulation. When exposed and insulated, the wire must be UV-protected.

The grounded conductor (or "neutral" conductor) is intentionally grounded and carries current under normal conditions. It is always insulated and may be white or gray in color. Current flows out on the ungrounded conductors and returns on the grounded conductor, completing the circuit.

The equipment grounding conductor (EGC) does not carry current under normal conditions. It provides a path back to the grounded conductor (neutral) when a fault occurs. The EGC may include all bonded metal components, such as the racking, boxes, enclosures, building steel, and metal roofing materials. (Bonding is the physical connecting of metal components so that they are at equal potential. They may or may not be grounded. Bonding jumpers may be extensions of the GEC, EGC, or grounded conductor.) Table 250.122 in the NEC governs EGC sizing. The EGC is required on both grounded and ungrounded (transformer-less) systems. The EGC must be a minimum of #6 AWG when exposed and must be bare or insulated green. When exposed and insulated, the wire must be UV-protected.

The GEC, EGC, and grounded conductor must be bonded together at the main service disconnect(s) and at the overcurrent protection/disconnects when performing a supply-side connection.

2.5 Labeling

The NEC provides many unique labeling requirements for solar PV systems, located in Sections 690, 705, 706 and elsewhere. To assist contractors and inspections, NYSERDA has developed an extensive Labeling Guide, located as Section 8 of this document.

2.6 Zoning Considerations

Solar photovoltaic is a relatively new technology. Many municipalities are unsure how solar PV installations fit into their existing zoning and land-use regulations. Large-scale systems in particular raise land use, aesthetic, decommissioning, and disposal concerns.

Municipalities should review their existing zoning requirements to ensure they clearly describe how solar PV systems are classified, and what rules are applicable to them. For more information, please reference Chapter 10 - Model Solar Energy Law.

2.7 Wind and Snow Loads

Solar electric contractors are responsible for ensuring that their installations do not jeopardize the structural integrity of the buildings upon which they are mounted. Due to their large surface areas, solar PV arrays can catch updrafts and create significant amounts of uplift during windy conditions. Forces are especially strong when modules are located at the ridge of a roof, when they are mounted a significant distance above the roof surface, or when they are not mounted parallel to the roof surface. Ground-mounted arrays are also subject to large wind forces. Detailed calculations are required to determine the exact amount of pressure for which systems should be designed.

Solar electric arrays, including racking and mounting hardware, typically add 4-6 pounds per square foot of dead load to a structure. Although this amount is modest, it may become significant when combined with a roof's existing dead load and snow load. The International Residential Code provides snow load data, which range from 20-80 pounds per square foot in New York State.

A Professional Engineer or Registered Architect should perform detailed calculations to ensure solar PV designs meet all structural requirements, taking wind load and snow load into account.

Figure R301.2(5)A from the 2020 Residential Code of New York State: Ultimate Design Wind Speeds

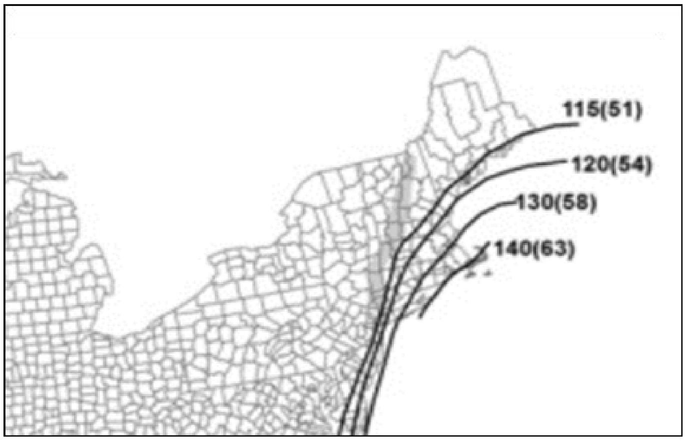
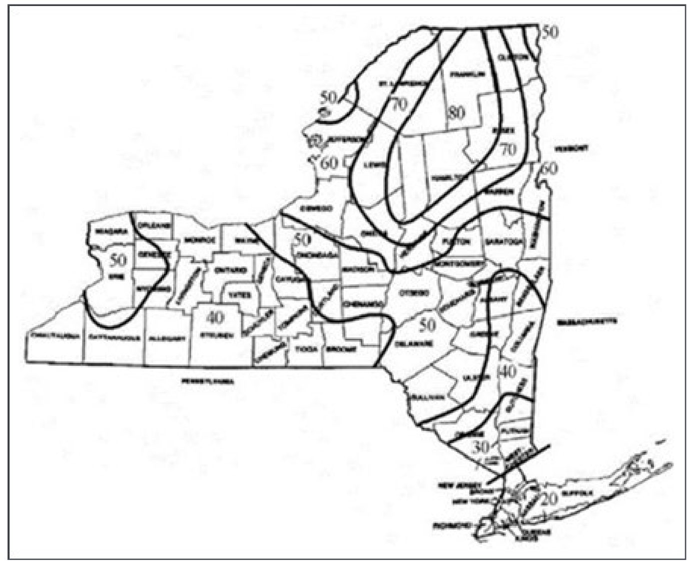


Figure R301.2(6) from the 2020 Residential Code of New York State: Ground Snow Loads



3. Design Review of Construction Documents

As part of their permit application, applicants must submit a site plan, an electrical wiring diagram, a structural analysis, and specification sheets for the modules, inverter, and racking system. This section includes a checklist of items for code officials to check as part of their design review.

The construction documents must be stamped by a New York State licensed professional engineer (PE) or registered architect (RA). The local code official will determine the depth of review necessary. The following three-part checklist may be expanded should the code official require examination at greater depth, such as checking wire sizing and other calculations.

3.1 Site Plan

<table>
<tr><th>Yes/No</th><th>Site Plan</th></tr>
<tr><td></td><td>Construction document prepared and stamped by a New York State licensed professional engineer or registered architect, who incorporated the following into system design.</td></tr>
<tr><td colspan="2">• Street address and tax map parcel number
• All required setbacks, including rooftop access and ventilation requirements as applicable
• Location of array, inverter, disconnects, and point of interconnection
• Array azimuth and tilt
• For ground mounted systems, length and location of trenches
• Location and type of rapid shutdown device, if applicable (NEC 690.12)</td></tr>
</table>

3.2 Electrical Diagram

Yes/No	Electrical Wiring Diagram
	Electrical wiring diagram prepared and stamped by a New York State-licensed Professional Engineer or Registered Architect, who incorporated the following into system design.

- Solar electric module array information – number of modules in series, number of strings.
- Quantity, make, and model of UL-listed solar PV modules.
- All conductor types, ratings, and conduit type (if applicable). Solar electric source circuit conductors are solar PV wire (NEC 690.31(B)).
- Max voltage of 600 VDC (NEC 690.7(C)) (1,000 VDC wire may be used on 600 VDC systems).
- Rating (voltage and current) for all disconnects.
- Voltage drop is minimized (NEC 210.19(A)Informational Note No. 4).
- Provision for Rapid Shutdown per NEC 690.12. Using microinverters or string inverters with DC Power optimizers is one way of meeting this requirement.
- DC disconnect is present (may be integral to inverter) (NEC 690.13).
- Quantity, make, and model of UL-listed inverter provided.
- AC disconnect appropriately sized for inverter output (NEC 690.8(A)(3), 690.8(B)(1)).
- Conductor type, rating, and conduit type (if applicable) provided for all conductors.
- If supply-side connection, meets all requirements of NEC 705.12(A), including:
    - Service-rated AC disconnect specified, at least 60 amps, with appropriate overcurrent protection device. If breaker used, must meet or exceed utility fault current kAIC rating.
    - Conductors between disconnect and point of interconnection are sized at least 60 amps (#6 or larger).
    - Supply side connection made between main service panel's main disconnect and utility meter.
- If load side connection, meets all requirements of NEC 705.12(B), including:
    - Inverter output connection is made at a dedicated circuit breaker or fusible disconnect.
    - The sum of 125% of the inverter(s) output current plus the main circuit breaker rating must be less than or equal to 120% of the bus or cable rating (NEC 705.12(B)(3)(b)).
    - Backfed breaker located at opposite end of busbar from main breaker (NEC 705.12(B)(2)(1)).
- Equipment grounding conductor (EGC) present at all components likely to become energized, and sized according to NEC 250.122.
- If not using an isolated/ungrounded/transformer-less inverter, grounding electrode conductor (GEC) present and continuous from inverter to service disconnect, sized according to NEC 250.66.

3.3 Structural Analysis

Yes/No	Structural Analysis
	Structural analysis prepared and stamped by a New York State licensed professional engineer or registered architect, who incorporated the following into their review.

- Weight of the existing roofing (composition shingle, metal, masonry, etc.).
- Number of layers of roof covering.
- Method of waterproofing penetrations (flashing is required by the 2020 NYS Uniform Code).
- Type of racking system (engineered product) and height of solar PV modules from surface of roof.
- Location-specific wind load and snow load.
- Type, dimensions, and spacing of roof structural framing.
- Calculations must be provided if any of the following apply:
  - Roofing is not lightweight, or roof has multiple layers of covering.
  - Racking system is not engineered for mounting of solar PV modules.
  - Modules will be mounted more than 18 inches above roof surface.
  - Modifications must be made to framing to strengthen roof structure.
  - Solar electric system and racking will add more than 5 pounds per square foot to dead load, or more than 45 pounds per attachment point, calculated as follows:
    - Total weight of solar PV modules, racking, and mounting hardware ____________pounds.
    - Total number of attachment points to roof ____________.
    - Weight per attachment point (A ÷ B) ____________pounds.
    - Total area of solar PV array ____________square feet.
    - Distributed weight of solar PV array on roof (A ÷ D) ____________pounds/square foot.

4. Field Inspection Checklist

The Field Inspection Checklist in this chapter can be used directly by the AHJ or provided to a third-party inspection agency, where applicable. The checklist is intended to highlight key system characteristics and common installation errors. Completing the checklist should take approximately 20 minutes per field inspection. Not all sections may apply to a given installation.

A "rough inspection" (which occurs when all boxes and wires are installed to the point when walls or trenches are ready to be closed) is not necessary on most small residential installations with existing construction.

When a field inspection is necessary, inspectors should consider bringing the following items:

- Ladder with non-conductive sides.
- Binoculars for surveying inaccessible roof-mounted equipment.
- Screwdriver for opening enclosures.
- A copy of the contractor's submitted design.

Code enforcement officers should consider asking solar PV contractors for a set of construction photos. Contractors typically document their installation progress with photos, which are sometimes required by their internal quality assurance team or financing partners. NYSERDA also requires construction photos from participating contractors. Code enforcement officers can use such photos to review hard-to-access parts of the installation (such as roof-mounted racking).

4.1 Array

1. Circuit conductors are properly supported and are not touching the roof surface [NEC 338.30, 350.30, 376.30]	N	Y	N/A
2. Circuit conductors are same conductor type/size as on plan set	N	Y	N/A
3. Module count matches plan set. If no, investigate stringing configuration	N	Y	N/A
4. Module manufacturer/model matches plan set	N	Y	N/A
5. Modules are effectively grounded using lugs, WEEBs, or a racking integrated grounding method [NEC 690.43]	N	Y	N/A
6. Modules and racking are properly secured [NEC 110.3(B), 250.5, 250.8, 250.12, 690.43]	N	Y	N/A
7. DC optimizers or microinverters are properly grounded [NEC 110.3(B), 250.4(A)(5), 250.64(E), 250.97]	N	Y	N/A
8. Wire ties are UV-rated (generally black)	N	Y	N/A
9. All electrical connections are secured to ensure no arcing	N	Y	N/A
10. Racking system is properly grounded (EGC bonding the rails [NEC 690.43])	N	Y	N/A
11. Conductors are properly identified (ungrounded, grounded, grounding) [NEC 200.7, 200.6, 250.119]	N	Y	N/A
12. Outdoor components are UL-listed for the environment [NEC 110.3(B)]	N	Y	N/A
13. Roof vents are not covered by the modules [2020 NYS Uniform Code]	N	Y	N/A
14. DC conduit is labeled "WARNING: PHOTOVOLTAIC POWER SOURCE" every 10 feet, and is reflective, and meets color and size requirements [NEC 690.31(G)(3) and (4)]	N	Y	N/A
15. Conductors over 30V are guarded, installed in raceways, or otherwise inaccessible [NEC 690.31(G)(3)(4)]	N	Y	N/A
16. Equipment Grounding Conductor (EGC) is protected if smaller than #6 AWG [NEC 690.46, 250.120(C)]	N	Y	N/A
17. Source circuit conductors are not in contact with the roof [NEC 338.10, 334.30]	N	Y	N/A

4.2 DC Optimizer

1. DC Optimizer chassis is properly grounded per manufacturer's instructions [NEC 110.3(B), 250.4(A)(5), 250.64(E), 250.97]	N	Y	N/A
2. Rapid Shutdown label is present and meets the requirements of NEC 690.56(C)(1)(a)	N	Y	N/A

Note 1: Many violations from the "Array" section also apply to the "DC Optimizer" section.

Note 2: DC optimizer can have an integrated ground, or not. Bring the specifications sheet to the inspection for quick reference.

4.3 Structural (Roof-Mounted Only)

1. All roof penetrations are properly flashed and sealed per 2020 NYS Uniform Code and NEC 110.3(b)	N	Y	N/A
2. Lag bolts are properly installed, not over torqued deforming the flashing	N	Y	N/A
3. Rafter spacing/material matches construction documents	N	Y	N/A
4. Roof appears to be in good condition, with no signs of leaking or damage; Roof is free of debris	N	Y	N/A
5. All racking splices are properly supported per manufacturer requirements (generally splices must be supported on both sides of the joint by a structural attachment)	N	Y	N/A
6. Modules cannot be moved by pushing or pulling with one hand	N	Y	N/A

4.4 Junction Box

1. Wire nuts and splices are suitable for the environment [NEC 110.3(B)]	N	Y	N/A
2. Junction box is UL listed for the environment [NEC 110.3(B)]	N	Y	N/A
3. Junction box is properly grounded [NEC 110.3(B), 250.4, 250.8, 250.12, 690.43]	N	Y	N/A
4. Grounding equipment is properly installed [NEC 110.3(B), 250.4, 250.8, 250.12, 690.43]	N	Y	N/A

4.5 Inverter

1. The number of strings match the plan set	N	Y	N/A
2. The conductors have sufficient ampacity for each string	N	Y	N/A
3. DC conductors in metal when on or inside a building [NEC 690.31(G)]	N	Y	N/A
4. Conduit penetrations are properly sealed between conditioned and unconditioned space [NEC 300.7(A)]	N	Y	N/A
5. Conduit is properly supported e.g., [LFMC NEC 350.30, EMT NEC 358.30, PVC NEC 352.30]	N	Y	N/A
6. Conduit is not being used as conductor support [NEC 725.143]	N	Y	N/A
7. The enclosure is properly grounded [NEC 690.43, 250.8, 250.12]	N	Y	N/A
8. Grounding equipment is properly installed [NEC 690.43, 250.8, 250.12]	N	Y	N/A
9. Point of interconnection enclosure is labeled as a PV disconnect [NEC 110.21(B) and/or 690.13(B)]	N	Y	N/A
10. DC characteristics label is present [NEC 690.53]	N	Y	N/A
11. The ungrounded DC conductors are properly identified (shall not be white, gray, or white striped) [NEC 200.6(A)(B)]	N	Y	N/A
12. Max string voltage below inverter max [NEC 110.3(B), 690.7]	N	Y	N/A
13. Inverter string fuses are rated for use in application [NEC 110.3(B), 690.9]	N	Y	N/A
14. DC and AC disconnecting means are located within sight of or in each inverter [NEC 690.15]	N	Y	N/A
15. AFCI protection is present and enabled [NEC 690.11]	N	Y	N/A
16. System is equipped with Rapid Shutdown [NEC 690.12]	N	Y	N/A
17. Rapid Shutdown label is present and meets the requirements of NEC 690.56(C)(1)(a)	N	Y	N/A
18. System is marked with a permanent label with the following wording: "PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN" [NEC 690.56(C)]	N	Y	N/A

4.6 Microinverter

1. Microinverter chassis is properly grounded per manufacturer's instructions [NEC 690.43(A), 250.4, 110.3(B)]	N	Y	N/A
2. EGC is protected if smaller than #6 AWG [NEC 690.46, 250.120(C)]	N	Y	N/A
3. Rapid Shutdown label is present and meets the requirements of NEC 690.56(C)(1)(a)	N	Y	N/A

Note 1: Many items from the "Array" section also apply to the "Microinverter" section.

Note 2: Microinverters can have an integrated ground, or not. This information is found on the specification sheet.

Note 3: As long as the microinverters are listed, they are inherently equipped with rapid shutdown, which is required by NEC 690.12. This does not negate the label requirement in NEC 690.56(C)(1)(a).

4.7 AC Combiner

1. The number of branch circuits match the plan set.	N	Y	N/A
2. The conductors have sufficient ampacity for each branch circuit.	N	Y	N/A
3. The Overcurrent Protective Device (OCPD) for the conductors have a rating sufficient to protect them [NEC 240.4]	N	Y	N/A
4. Conduit penetrations are properly sealed between conditioned and unconditioned space [NEC 300.7(A)]	N	Y	N/A
5. Conduit is properly supported e.g., [LFMC NEC 350.30, EMT NEC 358.30, PVC NEC 352.30]	N	Y	N/A
6. Conduit is not being used as conductor support [NEC 300.11(B), 725.143]	N	Y	N/A
7. The enclosure is properly grounded [NEC 690.43, 250.8, 250.12]	N	Y	N/A
8. Grounding equipment is properly installed [NEC 690.43, 250.8, 250.12]	N	Y	N/A
9. Enclosure is labeled as a disconnect [NEC 690.13]	N	Y	N/A
10. AC characteristics label is present (voltage and amperage), [NEC 690.54]	N	Y	N/A
11. The main breaker is fastened in place [NEC 408.36(D)]	N	Y	N/A
12. Grounded conductors are isolated from enclosure [NEC 250.24(A)(5)]	N	Y	N/A

4.8 Load-Side Connection

1. Circuit conductors have sufficient ampacity [NEC 690.8, 310.15]	N	Y	N/A
2. The AC OCPD is properly sized for the expected output current of the PV system. [NEC 690.9]	N	Y	N/A
3. Grounded conductors properly identified [NEC 200.6(A), (B)]	N	Y	N/A
4. The Grounding Electrode Conductor (GEC) is present and sufficiently sized [NEC 690.47(C), 250.66, 250.122, 250.166]	N	Y	N/A
5. The GEC is continuous (or irreversibly spliced) [NEC 250.64(C), 690.47(C)]	N	Y	N/A
6. Ferrous conduit and the enclosure are appropriately bonded to the GEC [NEC 250.4, 250.8, 250.12, 690.43]	N	Y	N/A
7. PV breakers are properly identified [NEC 110.21(B), 705.10]	N	Y	N/A
8. AC characteristics label is present and suitable for the environment (voltage and amperage) [NEC 690.54, 110.21(B)]	N	Y	N/A
9. Dissimilar metals are separated and will not cause a galvanic reaction [(NEC 110.14, RMC NEC 344.14, EMT NEC 358.12(6)]	N	Y	N/A
10. Inverter directory present [NEC 705.10]	N	Y	N/A
11. Backfed breaker or fuse is sized to protect circuits [NEC 690.8(B)(1) and/or NEC 310.15]	N	Y	N/A
12. Source breakers follow 120% rule [NEC 705.12(D)(2)(3)(b)]	N	Y	N/A
13. Backfed breaker properly located in panel [NEC 705.12(B)(3)(b)]	N	Y	N/A
14. Clearances maintained/live parts secured [NEC 110.27(A), 110.26]	N	Y	N/A

4.9 Supply Side Connection

1. Disconnect is service-rated and has a current rating of at least 60 Amp [NEC 230.79(D)]	N	Y	N/A
2. Circuit conductors have sufficient ampacity [NEC 690.8, 310.15]	N	Y	N/A
3. New service entrance tap conductors are less than 10 feet [NEC 705.31]	N	Y	N/A
4. The AC OCPD is properly sized for the expected output current of the PV system [NEC 690.9]	N	Y	N/A
5. The disconnect utility conductors are on LINE terminals [NEC 110.3(B), 240.40(if fusible)]	N	Y	N/A
6. There is no OCPD in the grounded conductor [NEC 230.90(B)]	N	Y	N/A
7. The AIC rating on the OCPD meets, or exceeds the rating of other main OCPD on the premises [NEC 110.9, 110.10]	N	Y	N/A
8. The neutral (white or grey grounded conductor) is bonded to the PV disconnect enclosure/GEC [NEC 250.24(C)]	N	Y	N/A
9. The GEC is present and sufficiently sized [NEC 690.47, 250.66]	N	Y	N/A
10. The GEC is continuous (or irreversibly spliced) [NEC 250.64(C), 690.47(C)]	N	Y	N/A
11. Ferrous conduit and the enclosure are appropriately bonded to the GEC [NEC 250.64(E), 250.4(A)(5)]	N	Y	N/A
12. AC characteristics label is present and suitable for the environment (voltage and amperage) [NEC 690.54, 110.21(B)]	N	Y	N/A
13. Power source directory is present, denoting all locations of power sources and disconnects on premises, at each service equipment location [NEC 110.21, 705.10]	N	Y	N/A
14. AC disconnect label is present and suitable for the environment [NEC 690.13(B), 110.21]	N	Y	N/A
15. Dissimilar metals are separated and will not cause a galvanic reaction [NEC 110.14, RMC NEC 344.14, EMT NEC 358.14]	N	Y	N/A

4.10 General

1. Work is done in a neat and workmanlike manner [NEC 110.12]	N	Y	N/A
2. Working clearances are observed per NEC 110.26	N	Y	N/A
3. Equipment is visibility damaged	N	Y	N/A

5. Resources

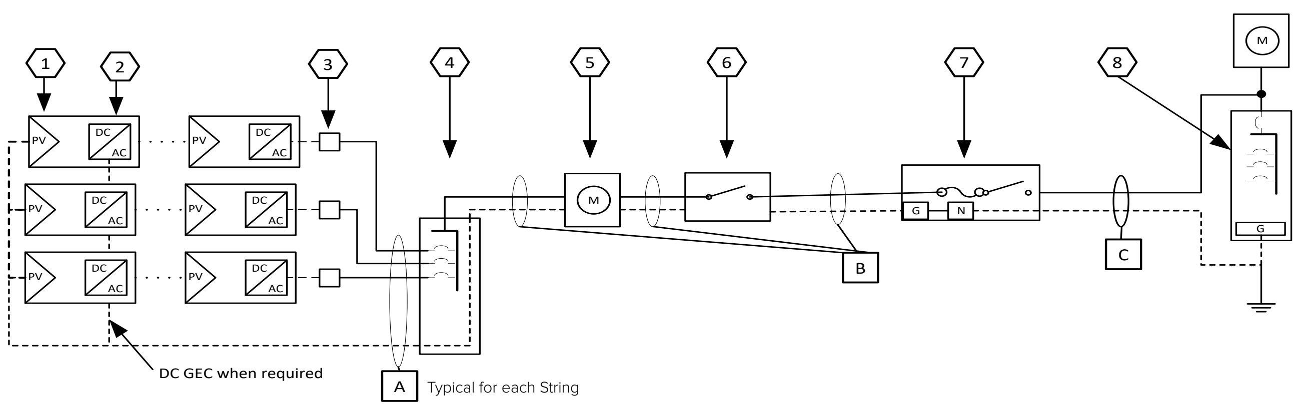
5.1 Sample Wiring Diagram 1: Microinverters with Supply Side Connection

Equipment Schedule	
TAG	DESCRIPTION: (Provide manufacturer and model number if applicable)
1	Solar PV Module or AC Module: (45) Trina TSM250PA05: (3) strings of (15)
2	Microinverter (if not ACM): (45) Enphase M250
3	Junction Box(es): (3) Soladeck NEMA 3R, on roof
4	Solar Load Center, Yes / No: YES, 60 amps with (3) 20 amp breakers.
5	Performance Meter Yes / No: YES, online monitoring through Enphase Envoy unit
6	*Utility External Disconnect Switch Yes / No: Yes
7	Supply Side Disconnect with OCPD: Disconnect rating 60 amps. OCPD Rating 60 amps
8	Main Electrical Service Panel: Cutler-Hammer 200-amp bus, 200-amp main breaker

Single Line Diagram for Microinverters, Optimizers or AC Modules

Refer to NEC 250.120 for EGC installation & Table 250.122 for sizing.

DC Rapid Disconnect (NEC 690.12) not required for microinverter systems, as DC conductors are under 5 feet.



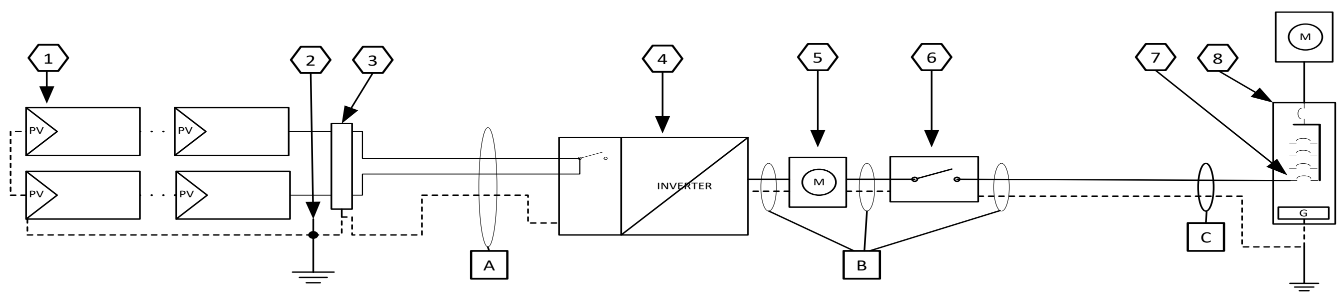
Conductor, Cable, and Conduit Schedule					
Tag	**Description and Conductor Type: (Table 3)**	**Conductor Size**	**Number of Conductors**	**Conductor/Cable Type**	**Conduit Size and Type**
A	Current carrying conductors (for each branch circuit):	#10	2	THWN-2	½ inch EMT
	EGC:	#8AWG Cu	(1)		
	GEC (when required):	n/a			
B	Current carrying conductors:	#6AWG Cu	(2) plus (1) Neutral	THWN-2	¾ inch PVC
	EGC:	#8AWG Cu			
	GEC (when required):	n/a			
C	Current carrying conductors:	#6AWG Cu	(2) plus (1) Neutral	THWN-2	¾ inch EMT
	EGC:	#8AWG Cu	(1)		
	GEC (when required):	n/a			

5.2 Sample Wiring Diagram 2: String Inverter with Supply Side Connection

Equipment Schedule	
TAG	DESCRIPTION: (Provide manufacturer and model # if applicable)
1	Solar PV Module: (24) SolarWorld SW280 Mono, (2) strings of (12)
2	Grounding Electrode for Array
3	Junction Box(es): Soladeck NEMA 3R, on roof
4	Inverter Model: (1) Fronius Primo 6.0-1, Transformerless
5	Performance Meter Yes / No
6	*Utility External Disconnect, or AC disconnect grouped with inverter if not grouped with main service panel
7	Backfed AC breaker in Main Service Panel rating: 35 amps
8	Main Service Panel Main Breaker rating:200 amps; Bus Bar rating: 200 amps

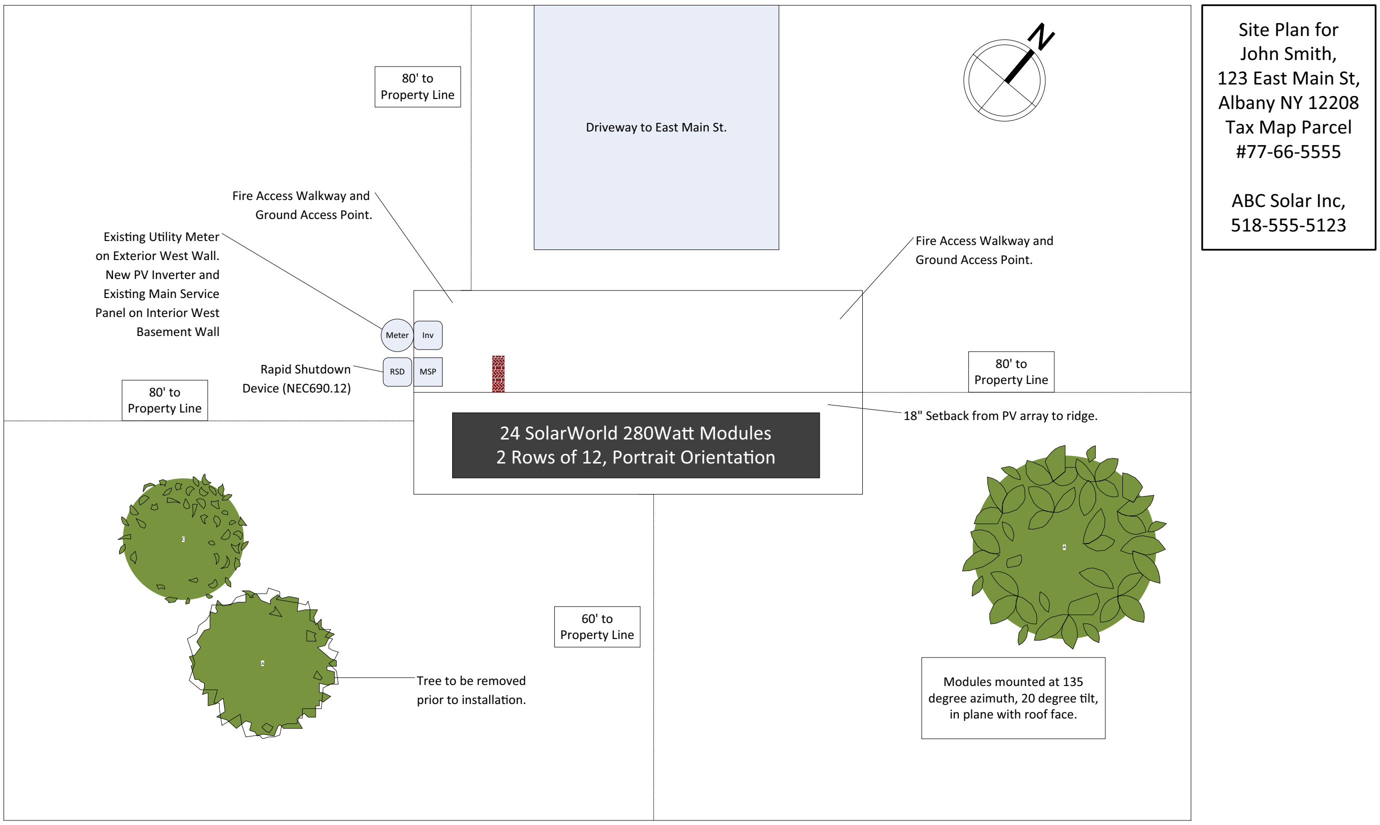
Single Line Diagram for String Inverter

Refer to NEC 250.120 for EGC installation & Table 250.122 for sizing.



Conductor, Cable, and Conduit Schedule					
Tag	**Description and Conductor Type:**	**Conductor Size**	**Number of Conductors**	**Conductor/Cable Type**	**Conduit Size and Type**
A	Current carrying conductors:	#10AWG Cu	2	THWN-2	½ inch EMT
	EGC:	#10AWG Cu	1		
	GEC (when required):	n/a			
B	Current carrying conductors:	#8AWG Cu	(2) plus (1) Neutral	THWN-2	¾ inch PVC
	EGC:	#10AWG Cu			
	GEC (when required):	n/a			
C	Current carrying conductors:	#8AWG Cu	(2) plus (1) Neutral	THWN-2	¾ inch EMT
	EGC:	#10AWG Cu	(1)		
	GEC (when required):	n/a			

5.3 Sample Site Map



6. Sample Photos

NYSERDA requires contractors participating in the NY-Sun program to provide construction photos. The photos in this chapter are illustrative examples only. Not all photos will apply to a given installation. Code enforcement officers may require construction photos from solar PV contractors to supplement or replace an in-person inspection. These example photos also help give a sense of solar PV system components and installation methods, and how they look when installed correctly.

6.1 Required Construction Photos for NY-Sun Incentive Program

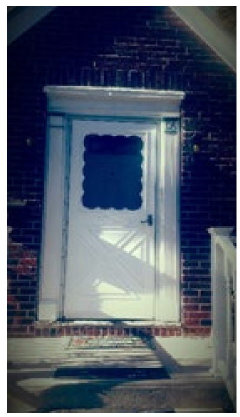
6.1.1 Overview Photos

Home Address Verification

Guidance: Must show street number and be taken from a street view.

Inspection Items: Site address must match site address reported

Example Photos:

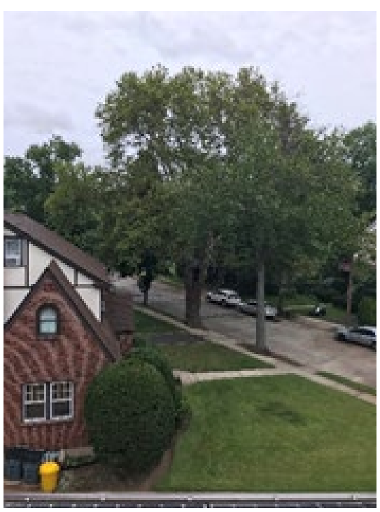


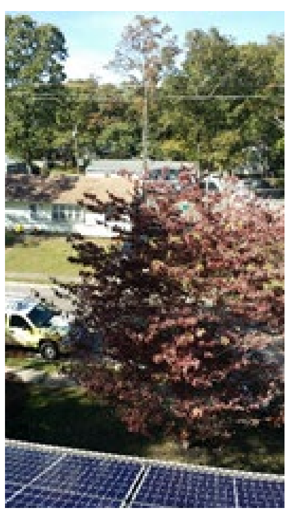
South Facing Horizon

Guidance: View of Horizon facing South (or whatever direction an array is facing) taken from behind the array illustrating presence or lack of potential shading issues.

Inspection Items: Site shading must match what was reported

Example Photos:





6.1.2 General Array Photographs

Pull Back Image of Array

Guidance: Wide angle shot or multiple images with clear reference point of each array so module count can be verified.

Inspection Items: Module and array count and must match what was reported

Example Photos:

Module Label Documentation

Guidance: Close up module label with model label legible.

Inspection Items: Module model must match what was reported

Example Photos:

6.1.3 Array Racking Photographs

Module Racking System Documentation

Guidance: Multiple angles of racking being used. Must provide pictures of complete array and sub-arrays. Pictures should be taken just before panels are installed to show all grounding and wire management.

Inspection Items: Racking system mechanical connections must be installed to manufacturer specifications

Example Photos:



Racking Roof Mounting System Documentation

Guidance: Photos must illustrate adequate flashing and sealing of racking attachments, that no vents or pipes are obstructed, and that roof is free of damage. For flat roofs, photos must include example of how vertical posts are secured to roof.

Inspection Items:

- Roof penetrations must be sealed and flashed to prevent moisture problems
- PV module and/or racking system must not obstruct open vent pipe(s) on roof
- No visible roof damage must be present

Example Photos:





Racking End Clip Documentation

Guidance: Photos should demonstrate the end clips are properly installed.

Inspection Items: Modules must be properly secured to the end of the racking system with end clips and sufficient clearance

Example Photos:



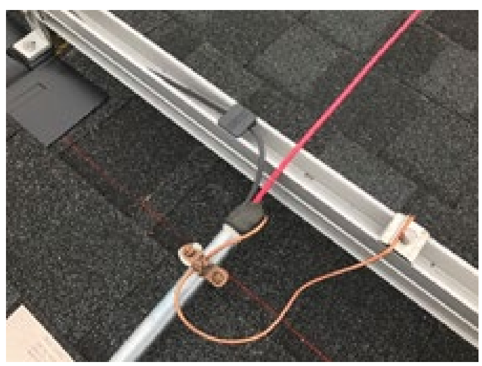
Racking System Grounding

Guidance: Photos should show there is a continuous ground path from all rails, sub-arrays, conduits, etc. Provide documentation for any self bonding rail systems. Provide a close up shot of EGC for size verification.

Inspection Items:

- Racking system and support structure must be grounded per manufacturer instructions
- Equipment grounding conductor must be larger than #6AWG or be protected from physical damage
- Electrical bonding means (e.g., bonding jumpers) must be present between rail sections

Example Photos:


6.1.4 Module Installation Photos

Module Grounding

Guidance: Demonstrate the bond between the module and rails by means of approved rail components or appropriate grounding hardware at each array. Provide documentation if necessary.

Inspection Items:

- Module grounding hardware must be present
- Module grounding hardware must be properly installed to effectively ground module frames; including solid contact between grounding device and metal of the module frames, at designated grounding points

Example Photos:

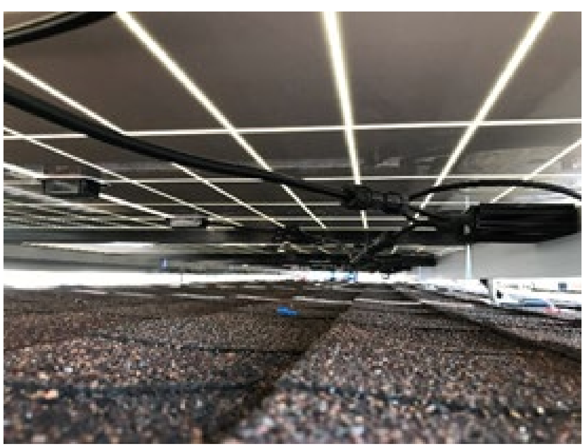
Wire Management of Modules (Under Array)

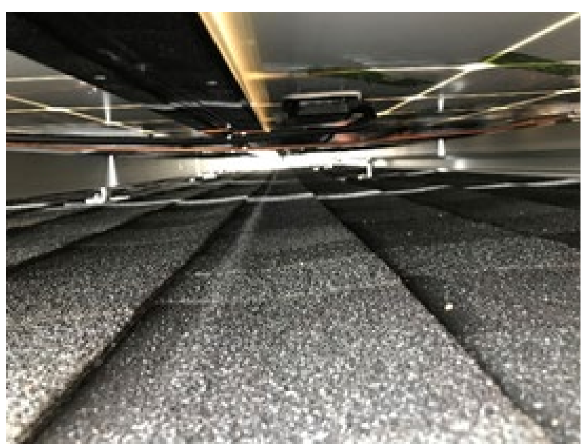
Guidance: Supply multiple pictures from all arrays showing proper wire management under arrays and entering conduit or junction boxes. Provide image of wire management device (clips, UV rated zip ties, etc.).

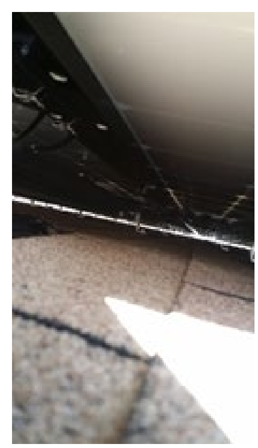
Inspection Items:

- Circuit conductors cannot be in contact with the roof and supported and secured at least every 4.5’ and within 12” of every termination
- Wire ties/clips must be UV and/or outdoor rated
- Conductors cannot be installed with a bend radius less than 5 times the conductor diameter

Example Photos:







6.1.5 Conductor Conduit Photos

Conductor Support and Management

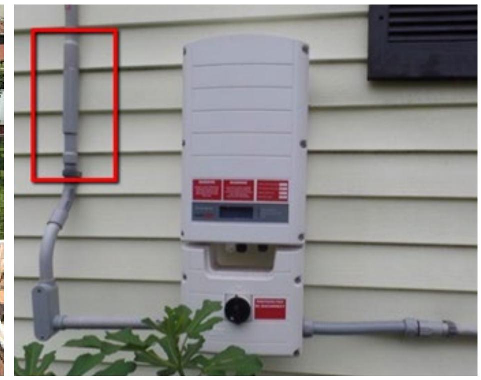
Guidance: Take pictures showing all conduit is properly supported. Include photos to illustrate thermal expansion fittings and frost sleeves are used when required. Include close-ups of fittings and connectors.

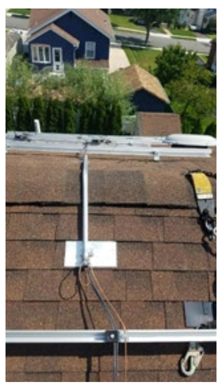
Inspection Items: Thermal expansion fitting must be present on raceways to compensate for expansion and contraction

- PV circuit conduit or raceway must be properly supported and secured
- Conduit below grade must be installed with provisions for movement (e.g., frost sleeve)
- Conduit fittings and connectors must be designed and listed for use

Example Photos:








Conduit Roof Top Penetrations

Guidance: Include photos that illustrate any roof penetrations for conduit pass through or securing are adequately sealed.

Inspection Items:

- Roof penetrations must be sealed and flashed to prevent moisture problems
- PVSC indoors in metal conduit

Example Photos:



Conduit Penetrations into Conditioned Space

Guidance: Include photos of conduit pass through into building to illustrate it is sealed.

Inspection Items: Conduit must have an approved internal sealant between conditioned and unconditioned spaces

Example Photos:


6.1.6 Junction/Combiner Box Photos

Internal Photo (cover off)

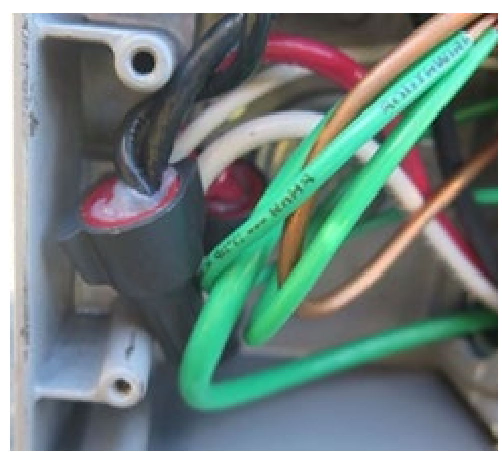
Guidance: Pictures should show proper grounding and components used for splices and transitions (i.e. terminal blocks, wire nuts etc.). Also show proper use of strain relief and submit pics of all Junction boxes on site

Inspection Items:

- Electrochemically dissimilar metals cannot be in direct physical contact
- Ferrous conduit and enclosures containing the grounding electrode conductor (GEC) must be electrically continuous or appropriately bonded to GEC
- Junction Box circuit conductors must be properly sized for expected current load
- Conduit fittings and connectors must be designed and listed for their use
- Thermal expansion fittings must be installed on raceways and conduit
- Grounded conductor must be identified properly as white or gray
- Junction Box splices and connections must be secure and of high integrity
- Junction Box splice components must be rated for environment
- Grounded conductor(s) must be insulated from metal enclosure surfaces and the ground terminal
- Equipment grounding conductor must be properly identified
- Junction Box must be properly grounded

Example Photos:





External Photo (cover on)

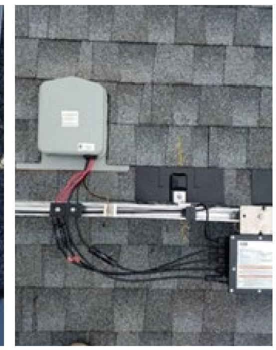
Guidance: Pictures should show proper labels close enough to verify language, wires are secured no more than 12” from junction box and should show proper use of strain relief. Include images for all junction/combiner boxes onsite.

Inspection Items:

- Junction Box must be properly guarded against accidental contact and/or physical damage and have proper working clearances
- Junction Box must be properly identified and listed
- Junction Box must be suitable for wet locations
- Junction Box must be properly secured in place

Example Photos:





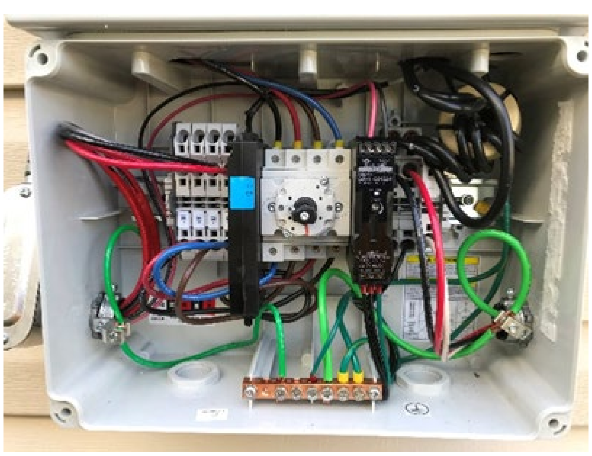
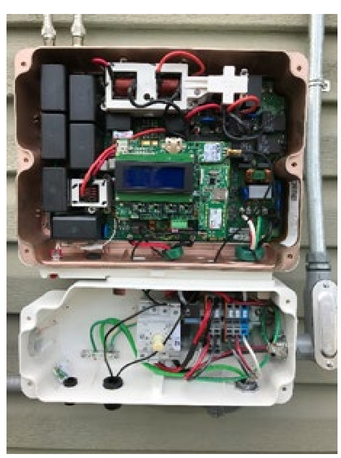
6.1.16 Inverter Photos: Internal Photo (inside view)

Guidance: Inverter showing correct wiring (AC and DC side) and grounding of inverter as well as conduits.

Inspection Items:

- Electrochemically dissimilar metals cannot be in direct physical contact
- Ferrous conduit and enclosures containing the grounding electrode conductor (GEC) must be electrically continuous or appropriately bonded
- Inverter DC grounded conductors and AC grounded conductors (neutral wires) must be correctly identified
- Conduit fittings and connectors must be designed and listed for use
- Inverter PV source conductors’ ampacity must meet or exceed expected current load
- Inverter PV system AC output conductors ampacity must meet or exceed expected current load
- Inverter string fuses must be 600 or 1000 VDC (if applicable)
- Inverter metal enclosure must be properly grounded
- Inverter grounding electrode conductor must be present and sufficiently sized
- Equipment grounding conductor must be properly identified

Example Photos:

6.1.7 Inverter Photos

External Photo (with lid on)

Guidance: Photos showing proper labels installed, and proper working and manufacturer clearances are provided.

Inspection Items:

• Inverter detailed system information label must be present

• The completed installation appears to be neat and of good workmanship

• Inverter must be mounted in accordance with manufacturer instructions and its listing

• Inverter mounting location provides clearance required by the manufacturer

• Inverter Ground Fault warning label must be present

Example Photos:

Inverter Label Picture

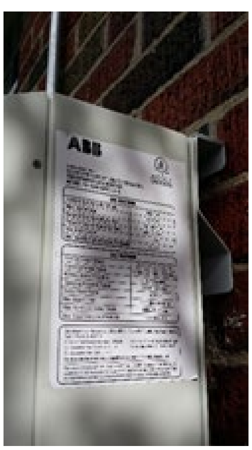
Guidance: Close up photo clearly showing all data clearly legible

Inspection Items:

• Inverter model number must match what must be submitted to Salesforce

• PV array maximum DC string voltage complies with inverter maximum input voltage rating

Example Photos:



6.1.8 Balance of System

Balance of System Wall Photos

Guidance: A pulled back shot showing all BOS equipment. Take multiple shots if necessary.

Inspection Items:

- AC disconnect switch must be labeled with AC output information
- AC disconnect switch must be properly labeled as a photovoltaic system disconnect
- The completed installation appears to be neat and of good workmanship
- PV Service Disconnect must be installed in accordance with its listing and manufacturer instructions
- Installed with appropriate working clearances and guarding from accidental contact
- AC Disconnect must be in a readily accessible location
- Service Disconnects must be properly grouped
- Permanent plaque or directory must be properly installed

Example Photos:

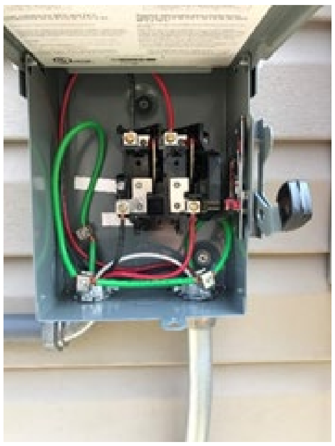
GEC Path Photos

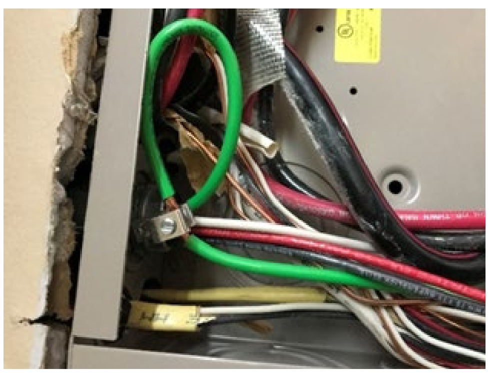
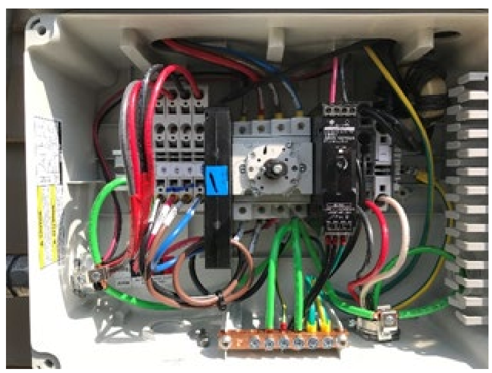
Guidance: Sequence of photos showing the path of the GEC from the inverter(s) to the structure's GEC. Must show use of bond bushings and irreversible splices when used.

Inspection Items:

- Grounding electrode conductor must be present and sufficiently sized
- Grounding electrode conductor must be properly bonded to the main premise grounding electrode system
- Grounded conductor(s) must be bonded to the enclosure of the PV service disconnect through a listed grounding terminal or bus

Example Photos:



6.1.9 A/C Combiner

Internal Photos (cover off)

Guidance: Include photos to show correct wiring and grounding at all terminals. Include close ups of any breakers with rating visible.

Inspection Items:

- Ferrous conduit and enclosures must be either electrically continuous or bonded to the grounding electrode conductor
- Enclosure must be properly grounded using a listed grounding method
- AC Combiner overcurrent protection must be sufficient
- Grounded conductor(s) must be insulated from metal enclosure surfaces and the ground terminal inside combiner box
- Grounded conductor must be properly identified
- Ungrounded conductor must be properly identified
- Equipment grounding conductor must be properly identified
- Conduit or raceway must have adequate support
- AC Combiner circuit conductors must be properly sized for expected current load
- PV backfeed breaker must be sufficiently sized to prevent nuisance tripping
- Electrochemically dissimilar metals must not be in direct physical contact, which may lead to a galvanic reaction

Example Photos:

External Photo

Guidance: Include photos to show all labeling and enclosure ratings, with photos provided to allow wording and value verification.

Inspection Items:

- Integrated AC combiner/disconnect switch must be labeled with AC output information
- AC Combiner must be labeled to indicate presence of multiple sources
- The completed installation appears to be neat and of good workmanship
- AC Combiner must be suitable for wet locations
- AC Combiner must be properly secured in place
- AC Combiner must be installed with the appropriate clearances

Example Photos:

6.1.10 A/C Disconnect Photos

Interior Photo

Guidance: Show correct wiring and grounding. Make sure OCPD rating is clear and readable.

Inspection Items:

- AC Disconnect must be properly rated for expected current load
- Electrochemically dissimilar metals must not be in direct physical contact
- Disconnect terminals must be properly wired
- Ferrous conduit and enclosures must be either electrically continuous or appropriately bonded to GEC
- AC Disconnect Switch must be breaking the ungrounded conductor and keep the grounded conductor properly grounded and unenergized
- Ungrounded conductor must be properly identified
- Outdoor conductor insulation type must be rated for 90C and wet conditions
- Grounded conductor(s) must be insulated from metal enclosure surface and ground terminal inside Disconnect enclosure
- Equipment grounding conductor must be properly identified
- Enclosure must be properly grounded by a listed means
- AC Disconnect must be grounded
- Equipment grounding conductor must be properly sized
- Equipment grounding conductor must be larger than #6AWG or else it must be protected from physical damage
- Grounding electrode conductor must be sufficiently sized
- Grounding electrode conductor must be continuous
- AC Disconnect must be present when required to isolate equipment for service

Example Photos:

Exterior Photo

Guidance: Photos should allow for factory installed listings, and field installed label wording and values to be assessed.

Inspection Items:

- AC Disconnect switch must be properly labeled as a photovoltaic system Disconnect
- AC Disconnect switch must be labeled with AC output information
- The completed installation appears to be neat and of good workmanship
- AC Disconnect must be installed with the appropriate clearances
- AC Disconnect enclosure must be suitable for wet locations

Example Photos:

6.1.11 Main Panel Tie-In Pictures

Interior of Main Service Panel

Guidance: Take both close up and pulled back shots to correct wiring, grounding, and overcurrent protection (solar and main). Include clear shots of all splices for load and line side taps. Include a back-up photo showing circuit run to illustrate interconnection point/method.

Inspection Items:

- Main panel overcurrent protection must be sufficient
- PV system AC output conductors must be appropriately sized for expected current load
- Grounded conductor must be identified properly
- PV back feed breaker rating size must be properly sized to protect circuit conductors
- PV backfeed breaker must be sufficiently sized to prevent nuisance tripping
- Sum of back feed breaker(s) and main breaker must be less than or equal to 120% of busbar rating
- Inverter output connection must be properly located in main panel
- PV system AC output conductors must be appropriately sized for expected current load
- Enclosure must be properly grounded using a listed grounding method
- Equipment grounding conductor must be properly identified
- Grounding electrode conductor must be sufficiently sized
- Grounding electrode conductor must be properly bonded to the main premise's grounding electrode system
- GEC must be continuous/irreversibly spliced
- The completed installation appears to be neat and of good workmanship
- Grounded conductor(s) terminal lug must be properly installed in accordance with its listing

Example Photos:

Busbar label

Guidance: Include a clear photo(s) of the busbar rating of the main service panel or other enclosure where PV is connected.

Inspection Items: Sum of backfeed breaker(s) and main breaker must be less than or equal to 120% of busbar rating

Example Photos:

Exterior of Main Service Panel

Guidance: Include photos to show all labeling (manufacturer enclosure rating and field installed labels). Include photos with cover on, cover off, door open, and door closed.

Inspection Items:

- PV system backfeed breaker must be properly labeled as a photovoltaic system Disconnect
- AC Disconnect switch must be labeled with AC output information
- Main panel busbar must be labeled to indicate presence of multiple sources
- PV backfeed breaker(s) must be correctly labeled
- Permanent plaque or directory must be properly installed
- The completed installation appears to be neat and of good workmanship
- Main Panel must be properly secured in place
- Main Panel must be installed with the appropriate clearances

Example Photos:

6.1.12 If Applicable Photos

Pole Mounted Systems Photo

Inspection Items:

- All array conductors must be properly connected
- Thermal expansion fittings must be installed on raceways
- Conduit below grade must be installed with provisions for movement
- PV source and output circuits operating in readily accessible locations must be installed in a raceway
- Racking system and support structure must be properly grounded per manufacturer instructions
- The completed installation appears to be neat and of good workmanship
- Ground/pole mount support structure, anchor system, and or footings must be installed and used according to manufacturer instructions
- Outdoor wire ties/clips must be UV and outdoor rated

Metal Roof Grounding

Inspection Items: Metal roof beneath PV Array must be properly grounded

Battery Back-Up Photos

Inspection Items:

- Quantity of batteries present must match report quality to Salesforce
- Model of batteries must match model reported to Salesforce
- Working clearance maintained above and around battery bank
- Batteries must be properly ventilated
- Battery backup system voltage must be limited to 50VDC nominal
- Battery DC conductors must be protected from accidental contact
- Battery DC conductors must be properly sized for expected current load
- Battery DC conductor type complies code requirements
- Electrical equipment in all adjacent circuits must be protected from battery bank short circuit current
- Conduit fittings and connectors must be designed and listed for this use
- DC Disconnect must be present for ungrounded conductors of battery banks over 30V
- Batteries must be installed on non-conductive supports
- Grounded conductor must be properly identified

6.1.13 Overall Observation

Program

Inspection Items: Existing Panelboard does not meet Program Compliance

7. Sample Installation Errors

The following photos are examples of common yet serious installation errors. Each item presents a safety concern, a system performance issue, or both. For each of these installations, a certificate of completion had been issued by the AHJ.

Photo 1: Main service panel overloaded per NEC 705.12(B)(3)(b).
(100 amp main circuit breaker + 40 amps of PV) ÷ 100 amp bus rating >120%.

Photo 2: Backfed PV breaker not installed at opposite end of buss bar from main breaker: NEC 705.12(B)(3)(b)

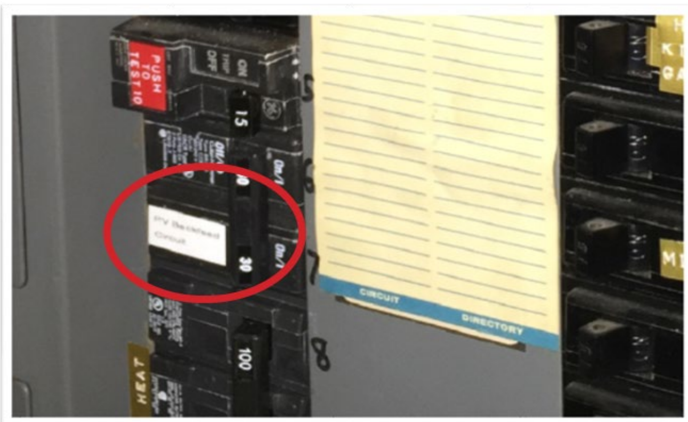


Photo 3: Working clearance not maintained: NEC 110.26

Photo 4: Equipment visibly damaged

Photo 5 - Conductors over 30V not guarded, installed in raceway, or otherwise inaccessible: NEC 690.31(A)

Photo 6: Roof penetrations and anchors not flashed, or improper flashing and sealing: 2020 NYS Uniform Code including applicable 2020 Building Code of NYS and NEC 110.3(B)

Photo 7: Where not protected from physical damage, equipment grounding conductor must be #6 or larger: NEC 690.46, 250.120(C). Conductors laying on asphalt shingles will become damaged and will not last a PV system's expected 30-year lifespan.

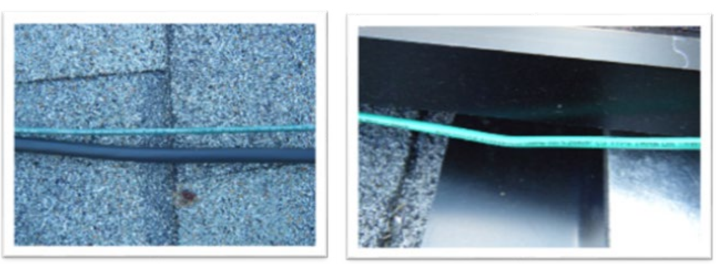


Photo 8: Source circuit conductors in contact with roof: NEC 338.10, 334.30

Photo 9: Equipment is not rated for location. In this case, a non-GFCI outlet for PV monitoring equipment is located in a wet location: NEC 110.3(B), 210.8(A)(3)

Photo 10: DC Conductor in contact with sharp edge: NEC 334.15(B)

Photo 11: AC disconnect/load center manufacturer's label obscured: NEC 110.21

Photo 12: Conductors entering conditioned space must be sealed: NEC 300.7

Photo 13: Two Hole conduit strap, with only one point of attachment, and no strain relief on conductors: NEC 110.3(B)

Photo 14: Failure to torque the lugs to the manufacturers specification: NEC 110.14(D)

8. Solar PV System Labeling Guidelines

Technical Bulletin: NYSERDA Solar Photovoltaic System Labeling Guidelines

8.1 Scope and Purpose

This document was prepared as part of NYSERDA's ongoing quality assurance (QA) for the NY-Sun Solar Photovoltaic (PV) program.

As part of this QA program, NYSERDA and their contractors have performed thousands of inspections on solar PV systems installed in New York State since January 1, 2012. Many of these inspections have found issues related to incorrect, incomplete, or missing labels on installed equipment. The NEC, OSHA and ANSI provide guidelines for required labels. However, these guidelines are not necessarily organized in an easy to use manner and make it difficult for system installers to get a clear understanding of labeling requirements for solar PV systems.

The purpose of this document is to provide participating installers and other stakeholders with a summary of the required labels for the most common PV system configurations.

Unless otherwise noted, this bulletin is based on the 2017 edition of the NEC.

8.2 Overview of Label Locations and Requirements

System Component	Required Labels
Combiner Box / Circuits / Conduit Combiner Box / Enclosures / EMT Enclosures	PV Disconnect [NEC 690.13(B)]
	Guarding of Live Parts [NEC 110.27(C)]
Building / Structure	Power Source Directory [NEC 705.10, 690.56(B)]
EMT / Conduit Raceways	Wiring Methods [NEC 690.13(G)(3)(4)]
	Embedded in Building Surfaces [NEC 690.31(G)(1)]
Inverter	Bipolar PV Systems [NEC 690.31(I)]
	Interactive System Point of Interconnection [NEC 690.54]
Production / Net Meter (Bi-directional)	Point of Connection [NEC 690.59]
AC Disconnect / Breaker / Points of Connection	PV Disconnect [NEC 690.13(B)]
	Identification of terminals [NEC 690.52]
	AC Characteristics [NEC 690.54]
Break Panel / Pull Boxes	PV Disconnect [NEC 690.13(B)]
	Guarding of Live Parts [NEC 110.27(C)]
	Interactive System Point of Interconnection [NEC 690.54]
Main Service Disconnect	Single 120-Volt Supply / Overcurrent Protection [NEC 710.15(C), 692.9(C)]
	Connector Disconnect Warning [NEC 690.15(C), 690.33(E)(2)]
	Type of Disconnect [NEC 690.13(F), 705.12(B)(3-4), 690.59]
	Dual Power Source [NEC 705.12(B)(3-4), 690.59]
	PV Disconnect [NEC 690.13(B)]
	Guarding of Live Parts [NEC 110.27(C)]

8.3 Label Construction, Placement, Color, and Marking

8.3.1 Materials and Construction

Labeling used outdoors must be of durable construction and intended to withstand conditions including high temperatures, UV exposure, and moisture as required by NEC 110.21(B)(3). Heavy duty UV resistant vinyl, metal, or plastic may all be suitable materials, depending on the specific product ratings. Installers should also consider the label attachment method (e.g., adhesive) when considering longevity and are encouraged to review ANSI Z535.4-2011 for guidance on selecting the appropriate labeling and adhesive materials.

8.3.2 Placement

It is a violation of an enclosure's UL listing (and NEC 110.3(B)) to cover any existing manufacturer applied labels with installation specific labels, so this should be avoided. Additionally, it is highly recommended that the installer attaches a label or magnet with the company name and contact information at the inverter or interconnection point for easy reference.

8.3.3 Colors

Label colors are chosen per OSHA 29 CFR 1910.145 direction that the requirements of ANSI Z535.4-2011 be used.

NFPA 70 (NEC) is driven by NFPA 1 (Fire Code) which provides specific colors and characteristics for certain labels as required by the NEC, so these requirements over rule the referenced ANSI standards in these cases, as noted in this Technical Bulletin and the text of the NEC.

8.3.4 Marking

Marking on labels for system specific values, such as short circuit current, shall not be hand-written and must be legible, as required by NEC 110.21(B)(2). Marking may be achieved by means of engraving or use of a long-lasting ink or paint as part of the printing process.

8.4 Label Descriptions and NEC References

There are various articles in the NEC that require labeling for PV systems. Many of the specific requirements are found in Article 690, Solar Photovoltaic Systems. Additional requirements are found in Article 110: Requirements for Electrical Installations; Article 200: Use and Identification of Grounded Conductors; Article 225: Outside Branch Circuits and Feeders; Article 230: Services; and Article 705: Interconnected Electric Power Production Sources.

8.4.1 Arc-Flash Hazard Warning

NEC 110.16 Flash Protection

Electrical equipment such as switchboards, panel boards, industrial control panels, meter socket enclosures, and motor control centers that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized shall be field marked or factory marked to warn qualified persons of potential electric arc flash hazards. The marking shall meet the requirements in 110.21(B) and be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

Figure 1
Note: does not apply to residential PV systems

Directory / Identification of Power Sources

A directory identifying the solar system and other power sources on site should be placed at service equipment and state the location of system disconnecting means. The NEC stipulates this requirement in the following articles:

NEC 705.10 Directory

A permanent plaque or directory, denoting all electric power sources on or in the premises, shall be installed at each service equipment location and at locations of all electric power production sources capable of being interconnected.

Exception: installations with large numbers of power production sources shall be permitted to be designated by groups.

Figure 2

NEC 230.2(E) Identification

Where a building or structure is supplied by more than one service, or any combination of branch circuits, feeders, and services, a permanent plaque or directory shall be installed at each service disconnect location denoting all other services, feeders, and branch circuits supplying that building or structure and the area served by each. Note that NEC 225.37 has similar requirements.

Figure 3

NEC 705.70 Utility-Interactive Inverters Mounted in Not-Readily-Accessible Locations

Utility-interactive inverters shall be permitted to be mounted on roofs or other exterior areas that are not readily accessible. In these cases, inverter location must be noted in the directory required by NEC 705.10, described above.

8.4.2 Conductor Identification and Grouping

NEC 310.110 Conductor Identification

This Article specifies the acceptable conductor marking methods for:

- Grounded conductors: NEC 200.6 (see below)
- Equipment grounding conductors: NEC 250.119 (see below)
- Ungrounded conductors: Shall be distinguishable from grounded and grounding conductors, with reference to NEC 310.120 for manufacturer-applied markings

NEC 690.31(B) Identification and Grouping

PV system conductors shall be identified and grouped as required by 690.31(B). The means of identification shall be permitted by separate color coding, marking tape, tagging, or other approved means.

1. **PV Source Circuits**. PV source circuits shall be identified at all points of termination, connection, and splices.
2. **Grouping**. Where the conductors of more than one PV system occupy the same junction box or raceway with a removable cover(s), the AC and DC conductors of each system shall be grouped separately by wire ties or similar means at least once, and then shall be grouped at intervals not to exceed 1.8 m (6 feet).

Exception: The requirement for grouping shall not apply if the circuit enters from a cable or raceway unique to the circuit that makes the grouping obvious.

NEC 690.31 (G) (1) Embedded in Building Surfaces

Where circuits are embedded in built-up, laminate, or membrane roofing materials in roof areas not covered by PV modules and associated equipment, the location of circuits shall be clearly marked using a marking protocol that is approved as being suitable for continuous exposure to sunlight and weather.

NEC 200.6 Means of Identifying Grounded Conductors

(A) **Sizes 6 AWG or Smaller**. An insulated grounded conductor 6 AWG or smaller shall be identified by one of the following means:

1. A continuous white outer finish.
2. A continuous gray outer finish.
3. Three continuous white stripes along the conductor's entire length on other than green insulation.
4. Wires that have their outer covering finished to show a white or gray color but have colored tracer threads in the braid identifying the source of manufacture shall be considered as meeting the provisions of this section.

(B) **Sizes 4 AWG or Larger**. An insulated grounded conductor 4 AWG or larger shall be identified by one of the following means:

1. A continuous white outer finish.
2. A continuous gray outer finish.
3. Three continuous white stripes along the conductor's entire length on other than green insulation.
4. At the time of installation, by a distinctive white or gray marking at its terminations. This marking shall encircle the conductor or insulation.

Note: Tape or similar marking means are only code-compliant on large (4 AWG or larger) conductors. Smaller diameter conductors cannot be field-identified in this way.

NEC 200.7 Use of Insulation of a White or Gray Color or with Three Continuous White or Gray Stripes

The following shall be used only for the grounded circuit conductor, unless otherwise permitted in 200.7(B) and (C):

1. A conductor with continuous white or gray covering
2. A conductor with three continuous white or gray stripes on other than green insulation
3. A marking of white or gray color at the termination

Note: PV systems utilizing transformerless (ungrounded) inverters do not ground either polarity of the PV array conductors. Therefore, conductors in these circuits cannot have insulation colored white or gray.

Figure 4

NEC 250.119 Identification of Equipment Grounding Conductors

Unless otherwise required, equipment grounding conductors shall be permitted to be bare, covered, or insulated. Individually covered or insulated equipment grounding conductors shall have a continuous outer finish that is either green or green with one or more yellow stripes. Conductors with these color schemes shall not be used for grounded or ungrounded circuit conductors.

8.4.3 Identification of PV Disconnects

NEC 690.13(B) Marking

Each PV system disconnecting means shall plainly indicate whether in the open (off) or closed (on) position and be permanently marked “PV SYSTEM DISCONNECT” or equivalent.

Note: This requirement applies to both AC and DC disconnects. The International Fire Code (IFC) recommends labels that identify the main service disconnect or critical disconnects with reflective, red and white labels (IFC 605.11).

Figures 5

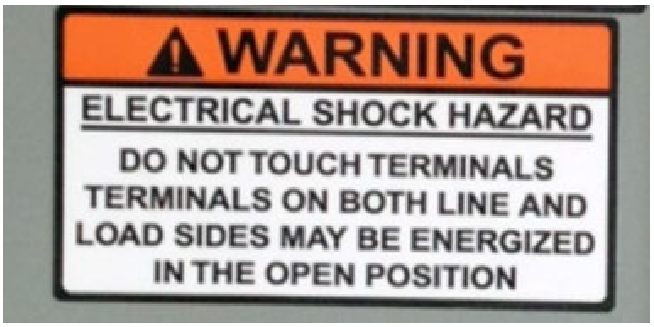
8.4.4 Terminals Energized on Line and Load Sides of Disconnect in Open Position

NEC 690.13(B) Switch or Circuit Breaker

Each PV system disconnecting means shall plainly indicate whether in the open (off) or closed (on) position and be permanently marked “PV SYSTEM DISCONNECT” or equivalent. Additional markings shall be permitted based upon the specific system configuration. For PV system disconnecting means where the line and load terminals may be the open position, the device shall be marked with the following words or equivalent:

WARNING
ELECTRIC SHOCK HAZARD.
DO NOT TOUCH TERMINALS.
TERMINALS ON BOTH THE LINE AND LOAD SIDES
MAY BE ENERGIZED IN THE OPEN POSITION.

Figure 6



Note: This requirement does not apply to AC disconnects for any inverter Listed to UL 1741

8.4.5 DC PV Source and Output Circuits Inside a Building

NEC 690.31(G) (3) Marking and Labeling Required

The following wiring methods and enclosures that contain PV system dc circuit shall be marked with the wording “WARNING: PHOTOVOLTAIC SOURCE” by means of permanently affixed labels or other approved permanent marking:

1. Exposed raceways, cable trays, and other wiring methods
2. Covers or enclosures of pull boxes and junction boxes
3. Conduit bodies in which any of the available conduit opening are unused

Figure 7

NEC 690.31 (G) (4) Marking and Labeling Methods and Locations

The labels or markings shall be visible after installation. The labels shall be reflective, and all letters shall be capitalized and shall be minimum height of 9.5mm (3/8in) in white on a red background. PV system dc circuit labels shall appear on every section of the wiring system that is separated by enclosures, walls, partitions, ceilings, or floors. Spacing between labels or makings, or between a label and a marking, shall not be more than 3 m (10 feet). Labels required by this section shall be suitable for the environment where they are installed.

Note: Although the ANSI standard directs that these types of labels have different coloring, the NEC has been driven by fire codes and thus specifies characteristics explicitly for these applications.

Figure 8

8.4.6 DC Photovoltaic Power Source

NEC 690.53 Direct-Current Photovoltaic Power Source

A permanent label for the dc PV power source indicating the information in (1) through (3) shall be provided by the installer at dc PV system disconnecting means and at each dc equipment disconnect means required by NEC 690.15. Where disconnecting means has more than one dc PV power source, the values in NEC 690.53(1) through (3) shall be specified for each source.

(1) Maximum voltage

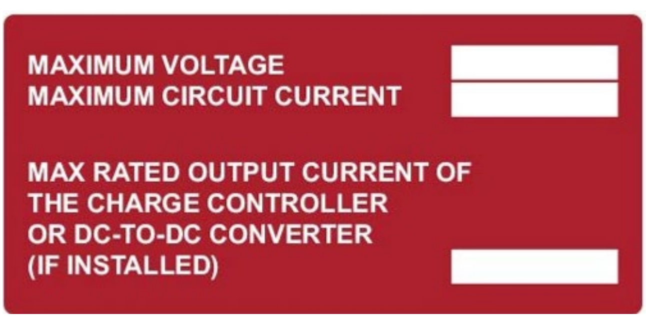
(2) Maximum circuit current

(3) Maximum rated output current of the charge controller or dc-to-dc converter (if installed)

Informational Note to (1): See 690.7 for voltage

Informational Note to (2): See 690.8(A) for calculation of maximum circuit current

Figure 9



8.4.7 Identification of PV System Interconnection

NEC 690.54 Interactive System Point of Interconnection

All interactive system(s) points of interconnection with other sources shall be marked at an accessible location at the disconnecting means as a power source and with the rated AC output current and the nominal operating AC voltage.

Note: Examples of points of interconnection are AC combining panels, AC disconnects, backfed breakers at point of utility interconnection, etc. This requirement does not apply only to the point of common coupling for the PV system and the utility grid.

Figure 10

8.4.8 Identification of Power Sources

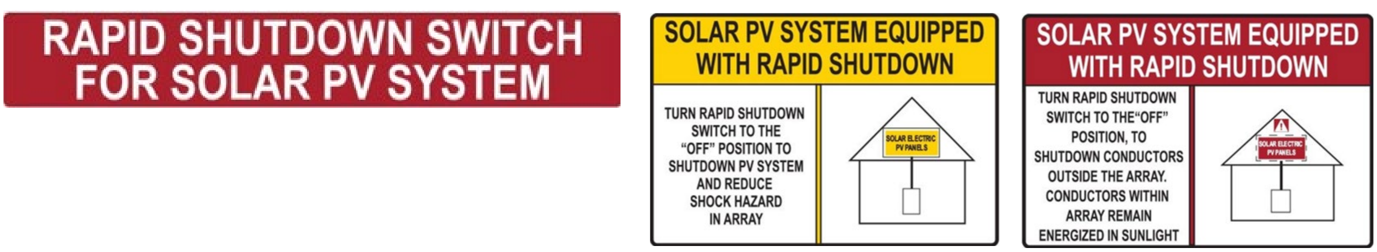
NEC 690.56 Identification of Power Sources

(A) Facilities with Stand-Alone Systems. Any structure or building with a PV power system that is not connected to a utility service source and is a stand-alone system shall have a permanent plaque or directory installed on the exterior of the building or structure at a readily visible location acceptable to the authority having jurisdiction. The plaque or directory shall indicate the location of system disconnecting means and that the structure contains a stand-alone electrical power system.

(B) Facilities with Utility Services and PV Systems. Buildings or structures with both utility service and a PV system shall have a permanent plaque or directory in accordance with NEC 705.

(C) Buildings with Rapid Shutdown. Buildings with PV systems shall have permanent labels as described in 690.56 (C)(1) through (C)(3).

Figure 11



The plaque or directory shall be reflective, with all letters capitalized and having a minimum height of 9.5 mm (3/8 inch), in white on red background.

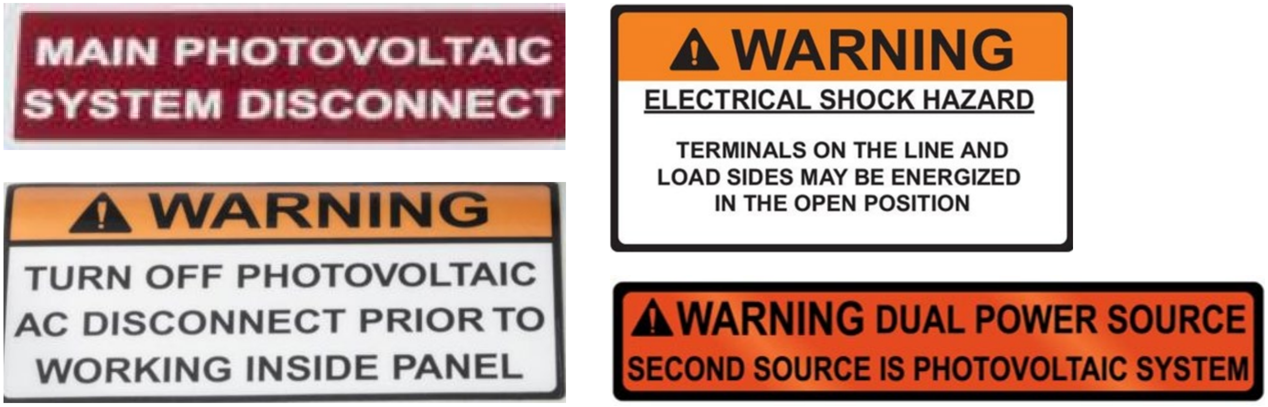
Note: Although the NEC does not explicitly define a location for this labeling, it is suggested that one be located at the main service disconnect for the utility, and one at the inverter location, or the location of the 'rapid shutdown' initiator if different.

8.4.9 Point of Connection Identification

NEC 705.12(A) or (B)

The output of an interconnected electric power source shall be connected as specified in NEC 705.12(A) or (B).

Figure 12



8.4.10 NEC 408 Switchboards, Switchgear, and Panelboards

408.4 Field Identification Required

(A) Circuit Directory or Circuit Identification.

It is important to properly complete the circuit directory, as required by NEC 408.4(A). These directories are generally found on the inside of panelboard cover doors and if there is not one present prior to the PV installation, it is the installer's responsibility to add one and properly document the relevant PV system-associated breakers.

Figure 13

8.5 Common Labeling Mistakes to Avoid

Do not cover manufacturer's labeling with other labels (NEC 690.13(B), 110.21(B)).

Figure 14

Figure 15

Make sure labels are permanent and suitable for use in the environment to which it will be exposed. In this example, these light duty adhesive labels will not withstand 20+ years of wind, sun and rain, and are in violation of NEC 110.21.

Figure 16

Label Not of Permanent Construction, nor conforming with NEC 690.31(G)(4).

Figure 17

9. Example Labels

The following pages provide example NEC-compliant labels based on NEC required/recommended text as well as their related code articles.

While the use of these labels on NY-Sun-funded solar PV projects is encouraged; final selection, preparation, and placement of labels in compliance with the NEC and other relevant codes is the responsibility of the installer.

1) All labeling used outdoors must be engraved metal, UV stabilized engraved plastic or of a material sufficiently durable to withstand the environment involved. Values hand written or in written in marker are not acceptable per NEC.

2) Labels used indoors may be made of durable vinyl or paper

3) Do not cover any existing manufacturer applied labels with installation specific labels

4) Label colors chosen per NEC directs that ANSI Z535-2011 be used

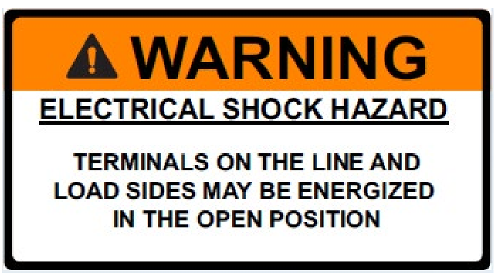
5) Requirements comply with the NEC

6) Additionally, it is highly recommended that the installer attach a label with the company name and contact information at the inverter

7) All warning signs or labels shall comply with NEC 110.21(B)

Label #1

NEC 690.13(B)

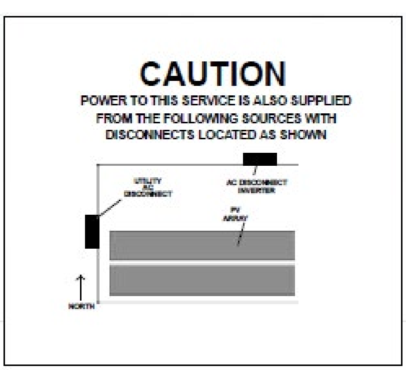


Label #2

NEC 110.27(C)

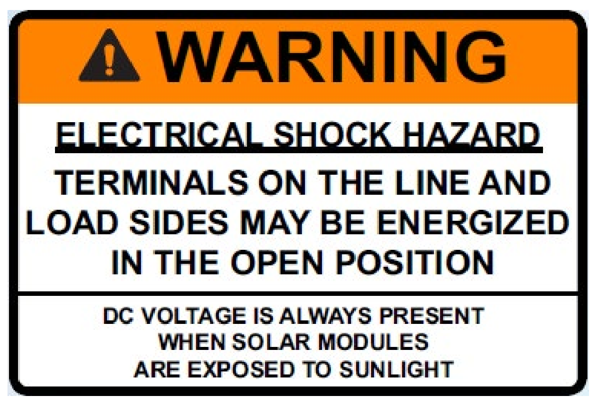
Label #3

NEC 705.10 & 690.56(B)



Label #4

NEC 690.13(B)

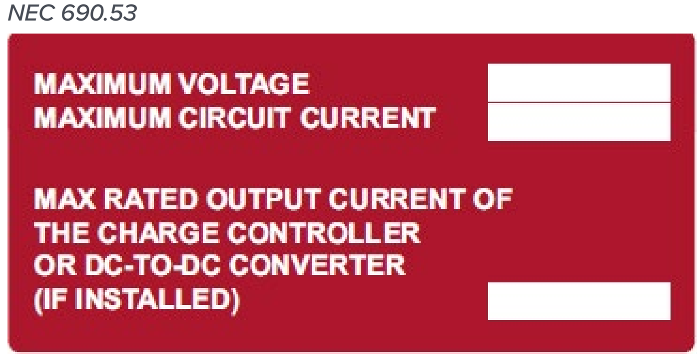


Label #5

NEC 690.13(B)

Label #6

NEC 690.53



Label #7

NEC 690.31(G)(3)(4)

Label #8

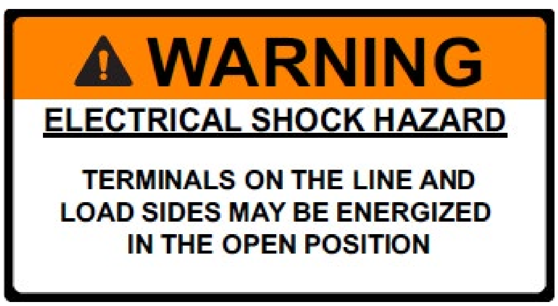
NEC 705.12(D)(3) & 690.59

Label #9

NEC 690.13(B)

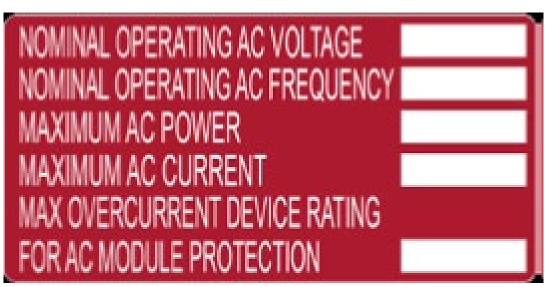
Label #10

NEC 690.13(B)



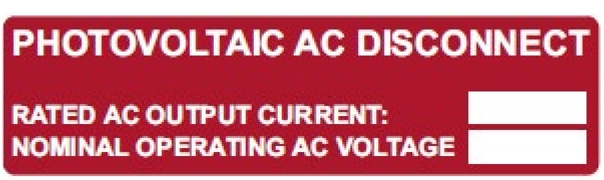
Label #11

NEC 690.52



Label #12

NEC 690.54



Label #13

NEC 690.3(I)

Label #14

NEC 710.15(C) & 692.9(C)

Label #15

NEC 690.15(C) & 690.33(E)(2)

Label #16

NEC 690.13(F), 705.12(B)(3-4), & 690.59

Label #17

NEC 705.12(B)(3-4) & 690.59

Label #18

NEC 705.12(B)(2)(c)

Label #19

NEC 690.13(B)

10. Top Deficiencies in Solar Electric Systems

In order to provide a summary of common PV system installation issues and help the New York solar industry prioritize education and process improvement, the NY-Sun program has compiled the results of 287 recent PV system inspections. The summaries below are generated from PV installations within a three-month time period based on the 2014 National Electrical Code (NEC). The chart shows that the most frequent violation is Labeling. The table provides an overview of the 9 most common deficiencies found with the top five categories being, Labeling, Grounding, Conductors, Conduit, and Structural. For each category, the list shows the most prevalent violations.

10.1 Likelihood of Finding Installation Issues

In order to prioritize inspection issues, we have calculated what percent of sites have one or more issues in each of the categories below. For example, 78% of inspected sites had at least one Labeling issue.

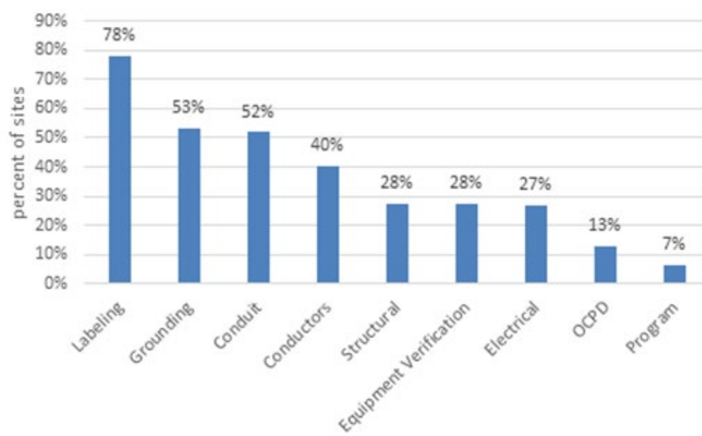
10.2 Deficiency Description

In order to prioritize efforts to improve quality, we have categorized the types of installation deficiencies found into several descriptive categories. As shown in Figure 1, labeling violations are by far the most common deficiency. This is most likely due to the complexity of the NEC, changing code articles, and new requirements (cannot be hand-written, exact size/coloring of certain labels, reflectivity, etc.). Grounding issues were the next most common violation. After the labeling and grounding issues, conduit and conductor violations are the most prevalent.

Table 1. Deficiency Description Categories

Deficiency	Includes
Labeling	Methods and materials for marking PV system components to provide nearby personnel with pertinent system information and warnings
Grounding	Portions of the installation used to reference system components to earth potential, including metallic components such as racking
Conduit	Methods and materials related to installation of conduit
Conductors	Methods and materials related to conductor installation
Structural	Non-electrical installation issues related to mechanical execution of work on equipment mounting, building penetrations
Equipment Verification	Confirmation that equipment installed matches equipment included in project application materials to NYSERDA
Electrical	Uncategorized electrical installation issues
OCPD	Installation issues related to overcurrent devices, such as fuses and circuit breakers
Program	Installation methods and materials that are not compliant with NY-SUN program requirements but not necessarily non-compliant with pertinent codes or standards

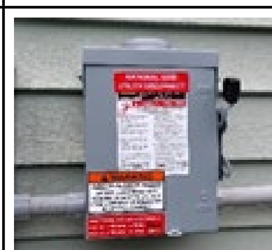
Figure 1. Likelihood of PV System Installation Issues by Category



10.2.1 Labeling Deficiencies: 78% of Systems Inspected

Below, we have summarized the top 5 deficiencies found related to labeling.

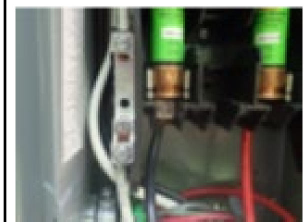
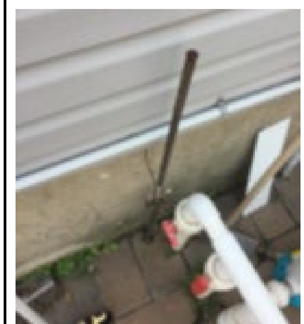
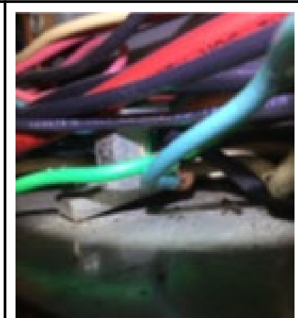
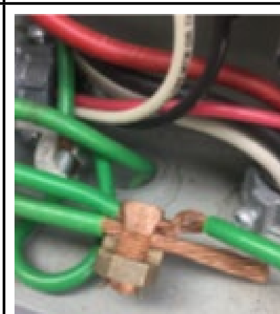
Table 2. Top Labeling Deficiencies

Rank	System Component	Deficiency Description	Example
1	Supply Side Connection	Service Disconnect label with AC output information is missing, incomplete, or not suitable for the environment, in violation of NEC Article 690.54 and/or 110.21. Label: Rated AC output current: _____AAC Nominal operating AC voltage: _____VAC	
2	Inverter	Inverter information label is missing, incomplete, or unsuitable for the environment, in violation of NEC Article 690.53. Label: Rated maximum power-point current (Imp): _____ADC Rated maximum power-point voltage (Vmp): _____VDC Maximum system voltage (Voc): _____VDC Short-circuit current (Isc): _____ADC Maximum rated output current of charge controller (if installed): _____ADC	
3	AC Combiner	Integrated AC combiner/disconnect switch label with AC output information is missing, incomplete, or not suitable for the environment in violation of NEC Article NEC 690.54. Label: Rated AC output current: ______AAC Nominal operating voltage: ______VAC	
4	Supply Side Connection	Permanent plaque or directory denoting location of all power sources and location of disconnects on premise at each service equipment location is missing, incomplete, or unsuitable for the environment, in violation of NEC Articles 705.10, 690.56 and/or 110.21.	
5	AC Disconnect	AC Disconnect label with AC output information is missing, incomplete, or not suitable for the environment, in violation of NEC Article 690.54. Label: Rated AC output current: ______AAC Nominal operating voltage: ______VAC	

10.2.2 Grounding Deficiencies: 53% of Systems Inspected

Below, we have summarized the top 5 deficiencies found related to Grounding.

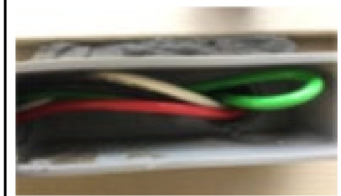
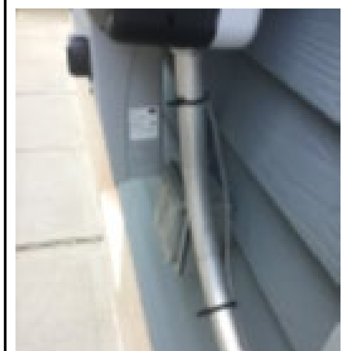
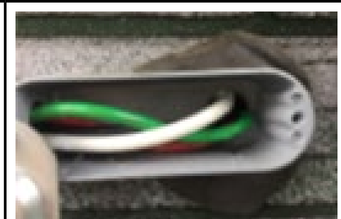
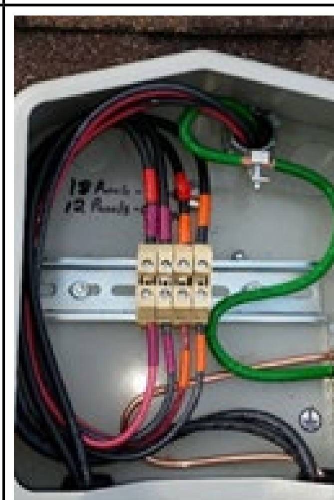
Table 3. Top Grounding Deficiencies

Rank	System Component	Deficiency Description	Example
1	Supply Side Connection	Grounded (neutral) conductor is not properly bonded to PV service disconnect enclosure using a listed grounding bus or terminal, or the grounded conductors are not properly bonded to the Grounding Electrode Conductor (GEC), in violation of NEC Article 250.24(C).	
2	Supply Side Connection	The top of the grounding electrode is not flush with, or below, ground level in violation of NEC Article 250.53(G).	
3	AC Disconnect	Enclosure is not properly grounded using a listed grounding method, in violation of NEC Articles 690.43, 250.8, and 250.12. Enclosure must be grounded with equipment listed for the purpose and that is solidly connected to the enclosure body.	
4	Supply Side Connection	The GEC is not continuous or irreversibly spliced, in violation of NEC Articles 250.64(C) and 690.47(C). Allowable means of splicing the GEC include compression crimp and exothermic welding processes.	
5	AC Combiner	Enclosure is not properly grounded using a listed grounding method, in violation of NEC Articles 690.43, 250.8, and 250.12. Enclosure must be grounded with equipment listed for the purpose and that is solidly connected to the enclosure body.	

10.2.3 Conduit Deficiencies: 52% of Systems Inspected

Below, we have summarized the top 5 deficiencies found related to Conduits.

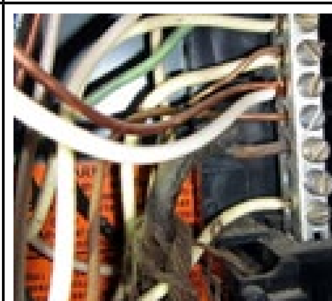
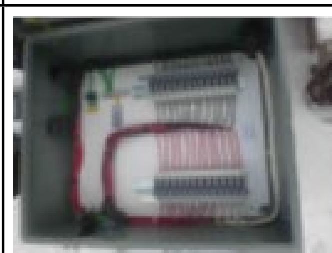
Table 4. Top Conduit Deficiencies

Rank	System Component	Deficiency Description	Example
1	Supply Side Connection	Conduit is missing an approved internal sealant at penetrations between conditioned and unconditioned spaces to prevent condensation, in violation of NEC Article 300.7(A).	
2	Inverter	Conduit is improperly used to support conductors, in violation of NEC Article 300.11(B).	
3	AC Disconnect	Conduit is missing an approved internal sealant at penetrations between conditioned and unconditioned spaces to prevent condensation in violation of NEC Article 300.7(A).	
4	Supply Side Connection	Circuit conduit or raceway lacks adequate support, in violation of NEC (LFMC-350.30, EMT-358.30, Metal Trough-376.30).	
5	Array	Conduit is missing an approved internal sealant at penetrations between conditioned and unconditioned spaces to prevent condensation, in violation of NEC Article 300.7(A).	

10.2.4 Conductor Deficiencies: 40% of Systems Inspected

Below, we have summarized the top 5 deficiencies found related to Conductors.

Table 5. Top Conductor Deficiencies

Rank	System Component	Deficiency Description	Example
1	Supply Side Connection	Service Entrance conductor splice is not installed in accordance with its listing, in violation of NEC Article 110.3(B) and 110.14.	
2	Junction Box	The receptacle is not GFCI-WR rated or listed for use in wet locations in violation of NEC Article 210.8(A)(2) & (A)(3).	
3	Supply Side Connection	The neutral conductor is terminated at an individual terminal that already contains another conductor in violation of NEC Article 408.41.	
4	Array	Ungrounded conductors are not properly identified, in violation of NEC Article 200.7.	
5	Feeder Tap Connection	Feeder tap conductor splice is not installed in accordance with its listing, in violation of NEC Article 110.3(B) and 110.14.	

10.2.5 Structural Deficiencies: 28% of Systems Inspected

Below, we have summarized the top 5 deficiencies found related to Structural issues.

Table 6. Top Structural Deficiencies

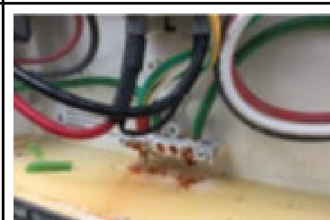
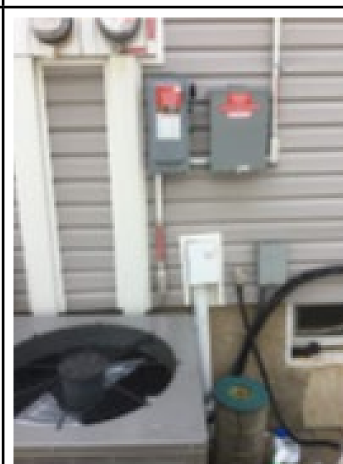
Rank	System Component	Deficiency Description	Example
1	Array	Racking system mechanical connections not made correctly and/or racking not installed per manufacturer instructions, in violation of NEC Article 110.3(B).	
2	Inverter	Inverter is not mounted in accordance with manufacturer instructions, in violation of NEC Article 110.3(B).	
3	Inverter	Moisture or evidence of moisture was found inside the inverter, an approved method of moisture accumulation prevention appears to be missing in violation of NEC Article 314.15.	
4	Array	Roof penetrations are not properly sealed and flashed to prevent moisture ingress.	
5	AC Combiner	AC Combiner does not have sufficient working clearances as required by NEC Article 110.26.	

Table 7. Deficiency as a Percent of All Deficiencies Found

Frequency	System Component	Defect Category	Deficiency Description
44%	All	Labeling	This deficiency includes all labeling violations found within all the Regions.
2.3%	Supply Side Connection	Grounding	Grounded (neutral) conductor is not properly bonded to PV service disconnect enclosure using a listed grounding bus or terminal, or the grounded conductors are not properly bonded to the Grounding Electrode Conductor (GEC), in violation of NEC Article 250.24(C).
2.2%	Supply Side Connection	Grounding	The top of the grounding electrode is not flush with, or below, ground level in violation of NEC Article 250.53(G).
1.8%	AC Disconnect	Grounding	Enclosure is not properly grounded using a listed grounding method, in violation of NEC Articles 690.43, 250.8, and 250.12. Enclosure must be grounded with equipment listed for the purpose and that is solidly connected to the enclosure body.
1.6%	Supply Side Connection	Conduit	Conduit is missing an approved internal sealant at penetrations between conditioned and unconditioned spaces to prevent condensation, in violation of NEC Article 300.7(A).
1.5%	Supply Side Connection	Conductors	Service Entrance conductor splice is not installed in accordance with its listing, in violation of NEC Article 110.3(B) and 110.14.
1.4%	Supply Side Connection	Grounding	The GEC is not continuous or irreversibly spliced, in violation of NEC Articles 250.64(C) and 690.47(C). Allowable means of splicing the GEC include compression crimp and exothermic welding processes.
1.1%	Array	Structural	Racking system mechanical connections not made correctly and/or racking not installed per manufacturer instructions, in violation of NEC Article 110.3(B).
1.1%	AC Combiner	Grounding	Enclosure is not properly grounded using a listed grounding method, in violation of NEC Articles 690.43, 250.8, and 250.12. Enclosure must be grounded with equipment listed for the purpose and that is solidly connected to the enclosure body.
1.0%	Array	Electrical	Electrochemically dissimilar metals are in direct physical contact, which may lead to a galvanic reaction, in violation of NEC Article 110.14 (for conductors/splice components) and/or RMC-NEC 344.14, EMT-NEC 358.12(6) (for conduit and surrounding materials).
1.0%	Inverter	Conduit	Conduit is improperly used to support conductors, in violation of NEC Article 300.11(B).
0.9%	AC Disconnect	Conduit	Conduit is missing an approved internal sealant at penetrations between conditioned and unconditioned spaces to prevent condensation in violation of NEC Article 300.7(A).
0.9%	Supply Side Connection	Conduit	Circuit conduit or raceway lacks adequate support, in violation of NEC (LFMC-350.30, EMT-358.30, Metal Trough-376.30).
0.9%	Supply Side Connection	Grounding	Enclosure is not properly grounded using a listed grounding method, in violation of NEC Articles 690.43, 250.8, and 250.12. Enclosure must be grounded with equipment listed for the purpose and that is solidly connected to the enclosure body.
0.9%	Array	Conduit	Conduit is missing an approved internal sealant at penetrations between conditioned and unconditioned spaces to prevent condensation, in violation of NEC Article 300.7(A).

11. Unified Residential Solar PV Permit Application

The workable version of this document can be found at nyserda.ny.gov/SolarGuidebook, under the Solar Permitting and Inspecting tab.

PERMIT APPLICATION

NY State Unified Solar Permit

Unified solar permitting is available statewide for eligible solar photovoltaic (PV) installations. Municipal authorities that adopt the unified permit streamline their process while providing consistent and thorough review of solar PV permitting applications and installations. Upon approval of this application and supporting documentation, the authority having jurisdiction (AHJ) will issue a building and/or electrical permit for the solar PV installation described herein.

PROJECT ELIGIBILITY FOR UNIFIED PERMITTING PROCESS

By submitting this application, the applicant attests that the proposed project meets the established eligibility criteria for the unified permitting process (subject to verification by the AHJ). The proposed solar PV system installation:

☐ Yes ☐ No 1. Has a rated AC capacity of 25 kW or less.

☐ Yes ☐ No 2. Is not subject to review by an Architectural or Historical Review Board. (If review has already been issued answer YES and attach a copy)

☐ Yes ☐ No 3. Does not need a zoning variance or special use permit. (If variance or permit has already been issued answer YES and attach a copy)

☐ Yes ☐ No 4. Is mounted on a permitted roof structure, on a legal accessory structure, or ground mounted on the applicant's property. If on a legal accessory structure, a diagram showing existing electrical connection to structure is attached.

☐ Yes ☐ No 5. The Solar Installation Contractor complies with all licensing and other requirements of the jurisdiction and the State.

☐ Yes ☐ No 6. If the structure is a sloped roof, solar panels are mounted parallel to the roof surface.

For solar PV systems not meeting these eligibility criteria, the applicant is not eligible for the Unified Solar Permit and must submit conventional permit applications. Permit applications may be downloaded here: [BUILDING DEPARTMENT WEBSITE] or obtained in person at [BUILDING DEPARTMENT ADDRESS] during business hours [INDICATE BUSINESS HOURS].

SUBMITTAL INSTRUCTIONS

For projects meeting the eligibility criteria, this application and the following attachments will constitute the Unified Solar Permitting package.

- This application form, with all fields completed and bearing relevant signatures.
- Permitting fee of $[ENTER FEE HERE], payable by [ENTER VALID PAYMENT METHODS, If checks are allowed INCLUDING WHO CHECKS SHOULD BE MADE PAYABLE TO]
- Required Construction Documents for the solar PV system type being installed, including required attachments.

Completed permit applications can be submitted electronically to [EMAIL ADDRESS] or in person at [BUILDING DEPARTMENT ADDRESS] during business hours [INDICATE BUSINESS HOURS].

APPLICATION REVIEW TIMELINE

Permit determinations will be issued within [TIMELINE] calendar days upon receipt of complete and accurate applications. The municipality will provide feedback within [TIMELINE] calendar days of receiving incomplete or inaccurate applications.

FOR FURTHER INFORMATION

Questions about this permitting process may be directed to [MUNICIPAL CONTACT INFORMATION].

PROPERTY OWNER

Property Owner's First Name | Last Name | Title

Property Address

City | State | Zip

Section | Block | Lot Number

EXISTING USE

☐ Single Family ☐ 2-4 Family ☐ Commercial ☐ Other

PROVIDE THE TOTAL SYSTEM CAPACITY RATING (SUM OF ALL PANELS)

Solar PV System: ________ kW AC

SELECT SYSTEM CONFIGURATION

Make sure your selection matches the Construction Documents included with this application.

☐ Supply side connection with microinverters
☐ Supply side connection with DC optimizers
☐ Supply side connection with string inverter
☐ Load side connection with DC optimizers
☐ Load side connection with microinverters
☐ Load side connection with string inverter

SOLAR INSTALLATION CONTRACTOR

Contractor Business Name

Contractor Business Address | City | State | Zip

Contractor Contact Name | Phone Number

Contractor License Number(s) | Contractor Email

Electrician Business Name

Electrician Business Address | City | State | Zip

Electrician Contact Name | Phone Number

Electrician License Number(s) | Electrician Email

Please sign below to affirm that all answers are correct and that you have met all the conditions and requirements to submit a unified solar permit.

Property Owner's Signature | Date

Solar Installation Company Representative Signature | Date

SUBMITTAL REQUIREMENTS SOLAR PV 25KW OR LESS (ATTACHMENTS)

NY State Unified Solar Permit

This information bulletin is published to guide applicants through the unified solar PV permitting process for solar photovoltaic (PV) projects 25 kW in size or smaller. This bulletin provides information about submittal requirements for plan review, required fees, and inspections.

Note: Language in [ALL CAPS] below indicates where local jurisdictions need to provide information specific to the jurisdiction. Language in italics indicates explanatory notes from the authors of this document that may be deleted from the distributed version.

PERMITS AND APPROVALS REQUIRED

The following permits are required to install a solar PV system with a nameplate AC power output of 25 kW or less:

a) Unified Solar Permit

b) [LIST TYPE OF PERMIT(S) REQUIRED BY THE LOCAL JURISDICTION, i.e., ELECTRICAL OR BUILDING

PERMIT]. Planning review [IS/IS NOT] required for solar PV installations of this size.

Fire Department approval [IS/IS NOT] required for solar PV installations of this size.

SUBMITTAL REQUIREMENTS

In order to submit a complete permit application for a new solar PV system, the applicant must include:

a) Completed Standard Permit Application form which includes confirmed eligibility for the Unified Solar Permitting process. This permit application form can be downloaded at [WEBSITE ADDRESS].

b) Construction Documents, with listed attachments [SAMPLES ARE AVAILABLE IN Understanding Solar PV Permitting and Inspecting in New York State AT WEBSITE ADDRESS]. Construction Documents must be by stamped and signed by a New York State Registered Architect or New York State Licensed Professional Engineer.

[MUNICIPALITY NAME], through adopting the Unified Solar Permitting process, requires contractors to provide construction documents, such as the examples included in the Understanding Solar PV Permitting and Inspecting in New York State document. Should the applicant wish to submit Construction Documents in another format, ensure that the submittal includes the following information:

- Manufacturer/model number/quantity of solar PV modules and inverter(s).
- String configuration for solar PV array, clearly indicating the number of modules in series and strings in parallel (if applicable).
- Combiner boxes: Manufacturer, model number, NEMA rating.
- From array to the point of interconnection with existing (or new) electrical distribution equipment: identification of all raceways (conduit, boxes, fittings, etc.), conductors and cable assemblies, including size and type of raceways, conductors, and cable assemblies.
- Sizing and location of the EGC (equipment grounding conductor).
- Sizing and location of GEC (grounding electrode conductor, if applicable).
- Disconnecting means of both AC and DC including indication of voltage, ampere, and NEMA rating.
- Interconnection type/location (supply side or load side connection)
- For supply side connections only, indication that breaker or disconnect meets or exceeds available utility fault current rating kAIC (amps interrupting capacity in thousands).
- Ratings of service entrance conductors (size insulation type AL or CU), proposed service disconnect, and overcurrent protection device for new supply side connected solar PV system (reference NEC 230.82, 230.70).
- Rapid shutdown device location/method and relevant labeling.

c) (For Roof Mounted Systems) A roof plan showing roof layout, solar PV panels and the following fire safety items: approximate location of roof access point, location of code-compliant access pathways, code exemptions,
solar PV system fire classification, and the locations of all required labels and markings.

d) Provide construction drawings with the following information:

- The type of roof covering and the number of roof coverings installed.
- Type of roof framing, size of members, and spacing.
- Weight of panels, support locations, and method of attachment.
- Framing plan and details for any work necessary to strengthen the existing roof structure.
- Site-specific structural calculations.

e) Where an approved racking system is used, provide documentation showing manufacturer of the racking system, maximum allowable weight the system can support, attachment method to roof or ground, and product evaluation information or structural design for the rack.

PLAN REVIEW

Permit applications can be submitted to [DEPARTMENT NAME] in person at [ADDRESS] and [IF APPLICABLE] electronically through: [WEBSITE/EMAIL/FAX].

FEES

[PROVIDE CLEAR FEE SCHEDULE]

INSPECTIONS

Once all permits to construct the solar PV installation have been issued and the system has been installed, it must be inspected before final approval is granted for the solar PV system. On-site inspections can be scheduled by contacting [DEPARTMENT] by telephone at [PHONE NUMBER] or electronically at [WEBSITE OR EMAIL ADDRESS]. Inspection requests received within business hours are typically scheduled for the next business day. If next business day is not available, inspection should happen within a five-day window. [IF MUNICIPALITY ACCEPTS THIRD PARTY INSPECTIONS, INDICATE THIS AND PROVIDE A LIST OF APPROVED INSPECTORS].

In order to receive final approval, the following inspections are required:

Delete Rough/Final inspection descriptions if not applicable in your jurisdiction

[ROUGH INSPECTION, IF REQUIRED] During a rough inspection, the applicant must demonstrate that the work in progress complies with relevant codes and standards. The purpose of the rough inspection is to allow the inspector to view aspects of the system that may be concealed once the system is complete, such as:

- Wiring concealed by new construction.
- Portions of the system that are contained in trenches or foundations that will be buried upon completion of the system.

It is the responsibility of the applicant to notify [ENTER CONTACT INFORMATION] before the components are buried or concealed and to provide safe access (including necessary climbing and fall arrest equipment) to the inspector. The inspector will attempt, if possible, to accommodate requests for rough inspections in a timely manner.

[FINAL INSPECTION] The applicant must contact [INSERT CONTACT INFORMATION] when ready for a final inspection. During this inspection, the inspector will review the complete installation to ensure compliance with codes and standards, as well as confirming that the installation matches the records included with the permit application. The applicant must have ready, at the time of inspection, the following materials and make them available to the inspector:

- Copies of as-built drawings and equipment specifications, if different than the materials provided with the application.
- Photographs of key hard to access equipment, including;
  - Example of array attachment point and flashing/sealing methods used.
  - Opened rooftop enclosures, combiners, and junction boxes.
  - Bonding point with premises grounding electrode system.
  - Supply side connection tap method/device.
  - Module and microinverter/DC optimizer nameplates.
  - Microinverter/DC optimizer attachment.

[MUNICIPALITY NAME] has adopted a standardized inspection checklist, which can be found in the Understanding Solar PV Permitting and Inspecting in New York State document, found here: [WEBSITE ADDRESS].

The inspection checklist provides an overview of common points of inspection that the applicant should be prepared to show compliance. If not available, common checks include the following:

- Number of solar PV modules and model number match plans and specification sheets number match plans and specification sheets.
- Array conductors and components are installed in a neat and workman-like manner.
- Solar PV array is properly grounded.
- Electrical boxes and connections are suitable for environment.
- Array is fastened and sealed according to attachment detail.
- Conductor's ratings and sizes match plans.
- Appropriate signs are property constructed, installed and displayed, including the following:
  - Sign identifying PV power source system attributes at DC disconnect.
  - Sign identifying AC point of connection.
  - Rapid shutdown device meets applicable requirements of NEC 690.12.
- Equipment ratings are consistent with application and installed signs on the installation, including the following:
  - Inverter has a rating as high as max voltage on PV power source sign.
  - DC-side overcurrent circuit protection devices (OCPDs) are DC rated at least as high as max voltage on sign.
  - Inverter is rated for the site AC voltage supplied and shown on the AC point of connection sign.
  - OCPD connected to the AC output of the inverter is rated at least 125% of maximum current on sign and is no larger than the maximum OCPD on the inverter listing label.
  - Sum of the main OCPD and the inverter OCPD is rated for not more than 120% of the buss bar rating.

UNIFIED SOLAR PERMITTING RESOURCES

The jurisdiction has adopted the following documents from the New York Unified Solar Permit process:

Delete any documents not adopted by the jurisdiction.

- Standard Application [WEB ADDRESS]
- Understanding Solar PV Permitting and Inspecting in New York State document, which includes sample construction documents, inspection checklist, design review checklist, and labelling guide [WEB ADDRESS]

DEPARTMENTAL CONTACT INFORMATION

For additional information regarding this permit process, please consult our departmental website at [WEBSITE] or contact [DIVISION NAME] at [PHONE NUMBER].

Questions?

If you have any questions regarding the solar permitting and inspecting process, please email questions to cleanenergyhelp@nyserda.ny.gov or request free technical assistance at nyserda.ny.gov/siting.
The NYSERDA team looks forward to partnering with communities across the state to help them meet their solar energy goals.

Section 11

Roof Top Access And Ventilation

Understanding the 2020 NYS Uniform Code as it relates to roof top access and ventilation for residential and nonresidential solar energy systems.

Section Contents

Overview

Through the 2020 New York State Uniform Fire Prevention and Building Code (Uniform Code), specific codes are set in place regarding rooftop access and ventilation when installing a solar photovoltaic (PV) system. This section provides information on the parts of the 2020 Residential Code of New York State (2020 RCNYS) and the 2020 Fire Code of New York State (2020 FCNYS) that are applicable to solar PV installers and Authorities Having Jurisdiction (AHJ), when installing and inspecting PV systems. Additionally, figures are shown in this chapter to visualize and explain scenarios where rooftop access and ventilation will be needed to adhere with the 2020 Uniform Code.

We encourage you to have a discussion with your local code official to determine the specific requirements for your solar installation. In New York State, it is the responsibility of the local AHJ to administer and enforce the Uniform Code as well as any applicable local zoning and land use laws.

Always consult with your local code official to determine code compliance.

2020 RCNYS Code text is black.

Additional commentary is blue.

1. Residential Roof Top Access – 2020 Residential Code of NYS

1.1 Section 324 - Solar Energy Systems

R324.1 General. Solar energy systems shall comply with the provisions of this section.

R324.2 Solar thermal systems. Solar thermal systems shall be designed and installed in accordance with Chapter 23 and Fire Code of New York State.

(This is a reference to the 2020 Fire Code of New York.)

R324.3 Photovoltaic systems. Photovoltaic systems shall be designed and installed in accordance with Sections R324.3.1 through R324.7.1 and NFPA 70 and the manufacturer's installation instructions.

(NFPA 70 is also known as the National Electrical Code.)

R324.3.1 Equipment Listings. Photovoltaic panels and modules shall be listed and labeled in accordance with UL1703. Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction.

R324.4 Rooftop-mounted photovoltaic systems. Rooftop-mounted photovoltaic systems installed on or above the roof covering shall be designed and installed in accordance with this section.

R324.4.1 Structural requirements. Rooftop-mounted photovoltaic panel systems shall be designed to structurally support the system and withstand applicable gravity loads in accordance with Chapter 3. The roof on which these systems are installed shall be designed and constructed to support the loads imposed by such systems in accordance with Chapter 8.

R324.4.1.1 Roof load. Portions of roof structures not covered with photovoltaic panel systems shall be designed for dead loads and roof loads in accordance with Sections R301.4 and R301.6. Portions of roof structures covered with photovoltaic panel systems shall be designed for the following load cases:

1. Dead load (including photovoltaic panel weight) plus snow load in accordance with Table R301.2(1).

2. Dead load (excluding photovoltaic panel weight) plus roof live load or snow load, whichever is greater, in accordance with Section R301.6

R324.4.1.2 Wind load. Rooftop-mounted photovoltaic panel or module systems and their supports shall be designed and installed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3).

R324.4.2 Fire classification. Rooftop-mounted photovoltaic panel systems shall have the same fire classification as the roof assembly required in Section R902.

R324.4.3 Roof penetrations. Roof penetrations shall be flashed and sealed in accordance with Chapter 9.

(The adequacy of the roof structure should always be determined by a New York State Licensed Professional Engineer or Registered Architect)

R324.5 Building–integrated photovoltaic systems. Building–integrated photovoltaic systems that serve as roof covering shall be designed and installed in accordance with Section R905

R324.5.1 Photovoltaic shingles. Photovoltaic shingles shall comply with Section R905.16

(R905 is the 2020 Residential Code's section for "Roof Assemblies." R905.16 specifically addresses photovoltaic shingles, which references back to R324 and NFPA 70)

R324.5.2 Fire classification. Building-integrated photovoltaic systems shall have a fire classification in accordance with Section R902.3

R324.6 Roof access and pathways. Roof access, pathways and setback requirements shall be provided in accordance with Sections R324.6.1 through R324.6.2.1. Access and minimum spacing shall be required to provide emergency access in the roof, to provide pathways to specific areas of the roof, provide for smoke ventilation opportunity areas, and to provide emergency egress from the roof.

Exceptions:

1. Detached, nonhabitable structures, including but not limited to detached garages, parking shade structures, carports, solar trellises and similar structures, shall not be required to provide roof access.
2. Roof access, pathways and setbacks need not be provided where the building official has determined that rooftop operations will not be employed.
3. These requirements shall not apply to roofs with slopes of two units vertical in 12 units horizontal (17-percent slope) or less.

[NY] R324.6.1 Pathways. Not fewer than two pathways, on separate roof planes from the lowest roof edge to ridge and not less than 36 inches (914mm) wide, shall be provided on all buildings. Not fewer than one pathway shall be provided on the street or driveway side of the roof. For each roof plane with a photovoltaic array, a pathway not less than 36 inches wide (914 mm) shall be provided from the lowest roof edge to ridge on the same roof plane as the photovoltaic array, on an adjacent roof plane, or straddling the same and adjacent roof planes. Pathways shall be over areas capable of supporting fire fighters accessing the roof. Pathways shall be located in areas with minimal obstructions such as vent pipes, conduit, or mechanical equipment. Pathways on opposing roof slopes shall not be located along the same plane as the truss, rafter, or other such framing system that supports the pathway.

Exception: Access pathways shall not be required on roof slopes containing photovoltaic modules, panels, or an array where the opposing or adjacent roof slope is an access roof.

[NY] R324.6.2 Setback at ridge. Photovoltaic arrays shall not be located less than 18 inches (457 mm) from a horizontal ridge.

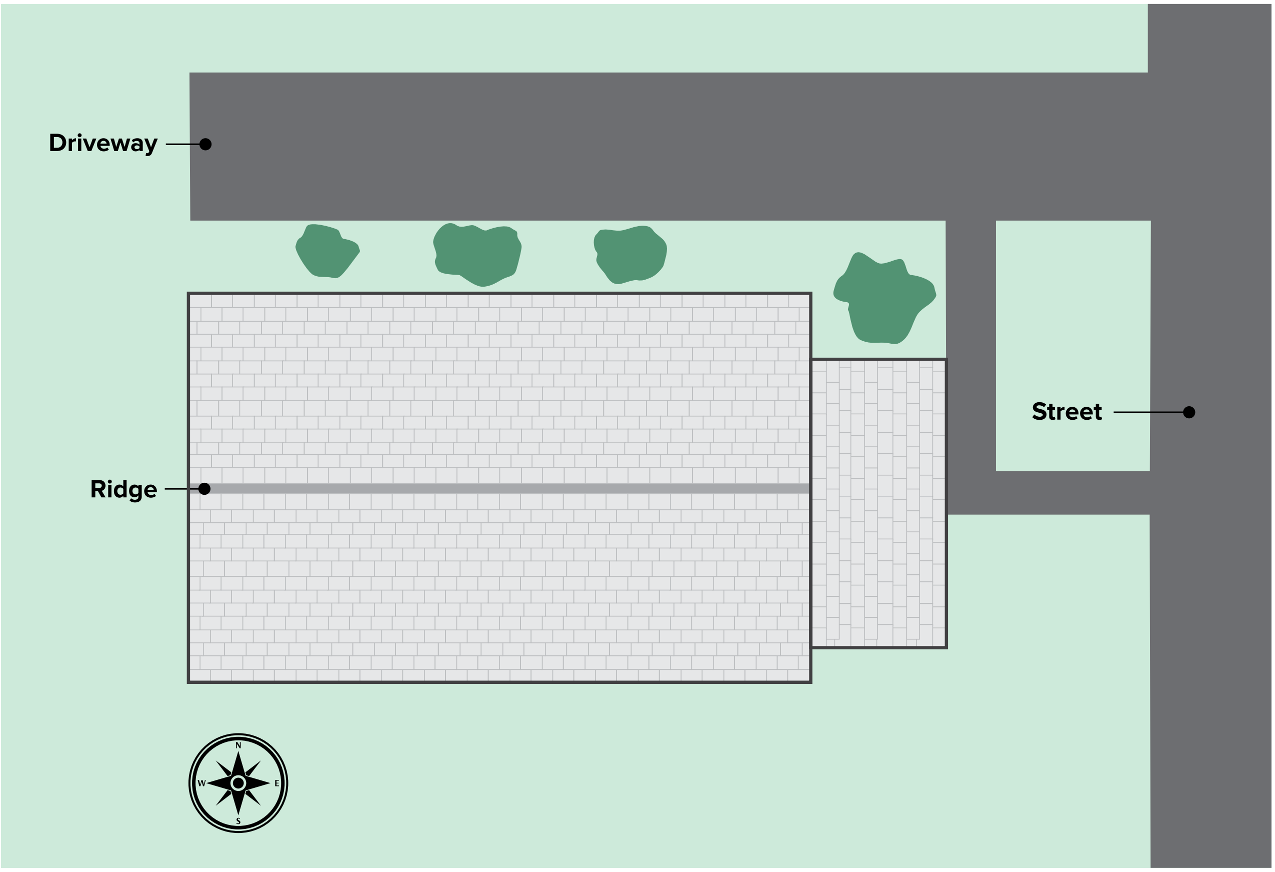
[NY] R324.6.2.1 Reserved.

R324.6.2.2 Emergency escape and rescue opening. Panels and modules installed on dwellings shall not be placed on the portion of a roof that is below an emergency escape and rescue opening. A pathway not less than 36 inches (914mm) wide shall be provided to the emergency escape and rescue opening.

R324.7 Ground-mounted photovoltaic systems. Ground-mounted photovoltaic systems shall be designed and installed in accordance with Section R301.

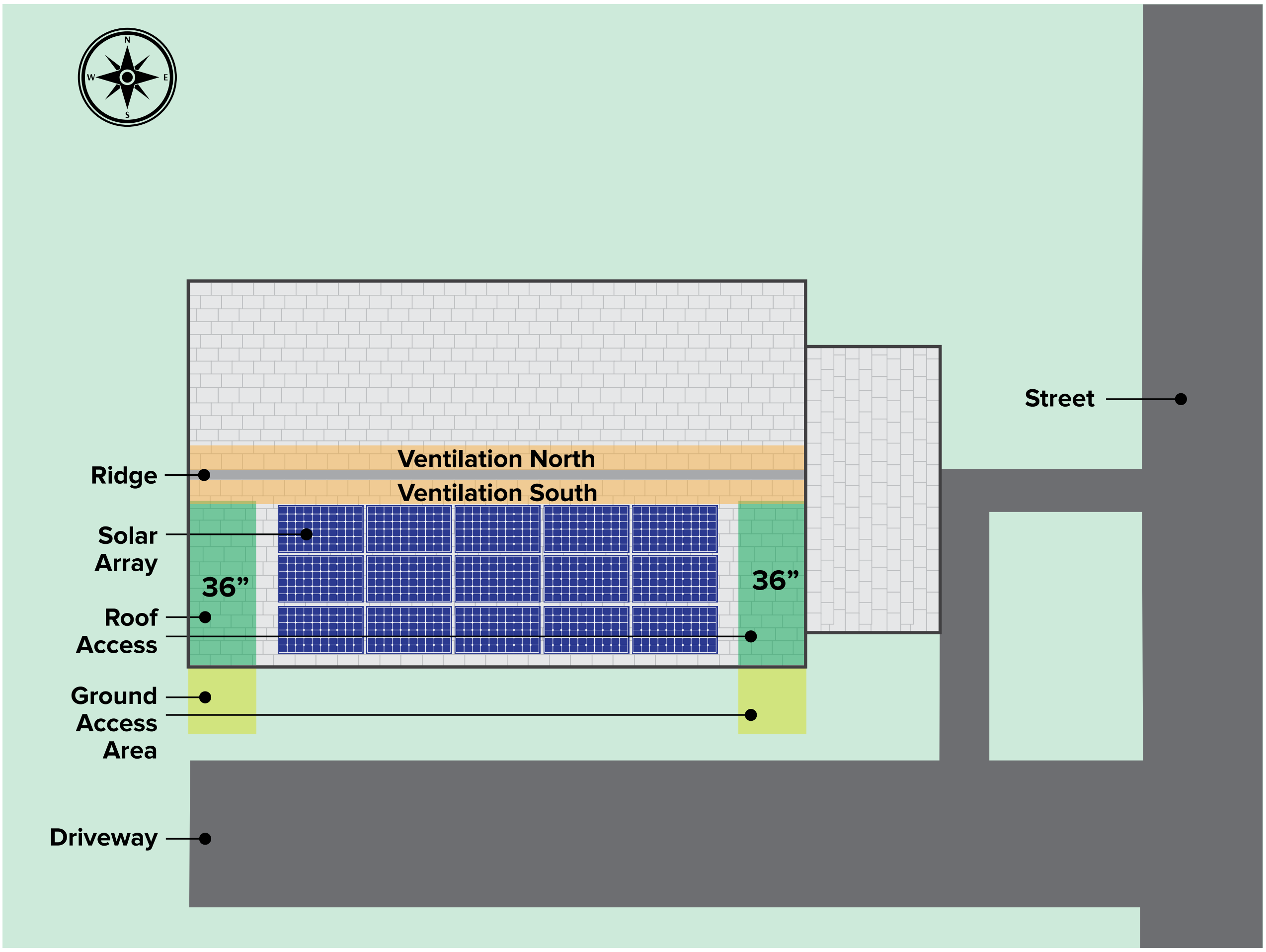
1.2. Possible Scenarios for Rooftop Access & Residential PV Installations

Typical single ridge residence (Figure 1)



This is a typical residential single ridge residential structure. We will use this as an example to further evaluate and explain the various options.

Typical single ridge residential (Figure 2)

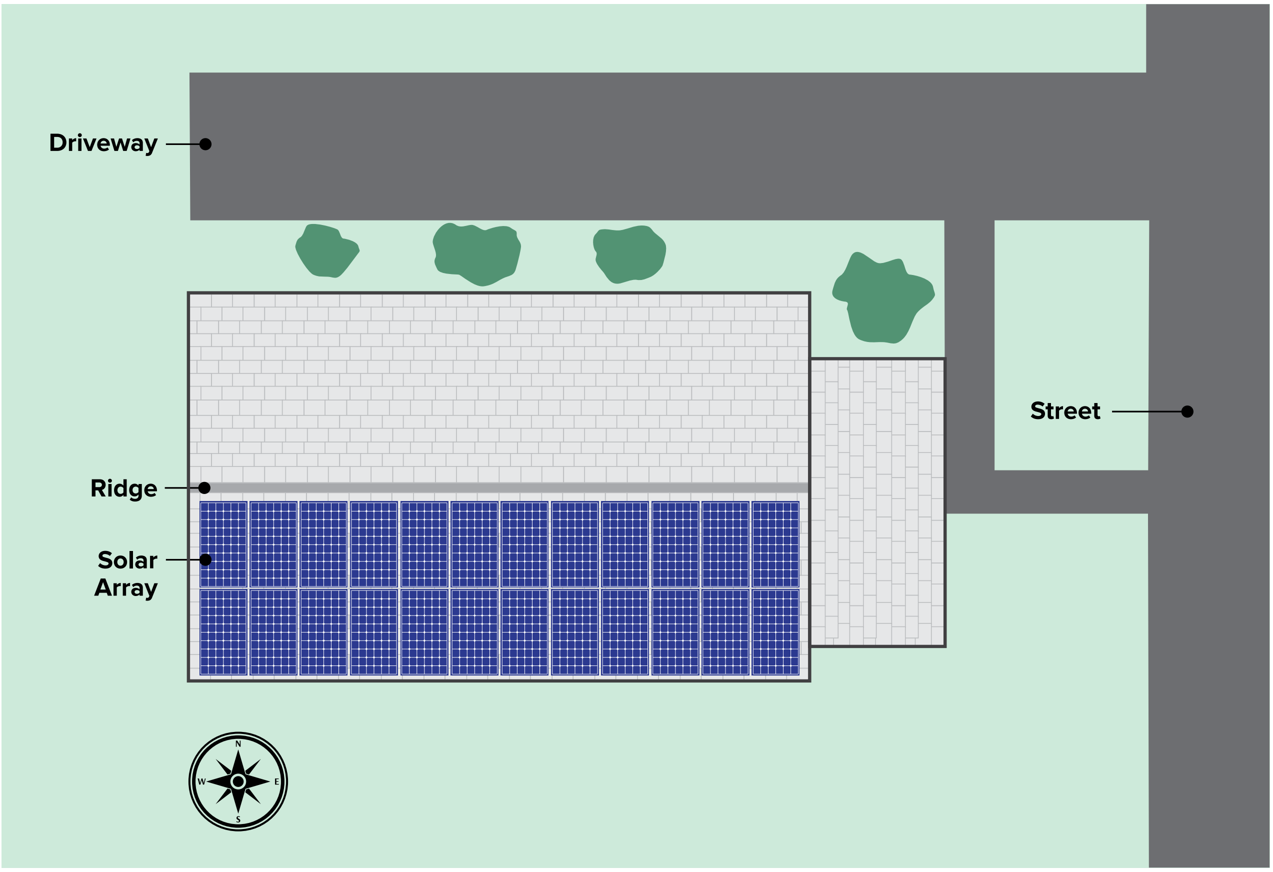


This is a typical single ridge residential structure that complies with the required setbacks, pathways and ventilation with no exceptions. The Emergency Escape and Rescue Opening (EERO) is on gable end.

Basic Requirements being met:

1. ***Not fewer than two pathways***
2. ***Not fewer than one pathway shall be provided on the street or driveway side of the roof***
3. ***For each roof plane with a photovoltaic array, a pathway not less than 36 inches wide (914 mm) shall be provided from the lowest roof edge to ridge***

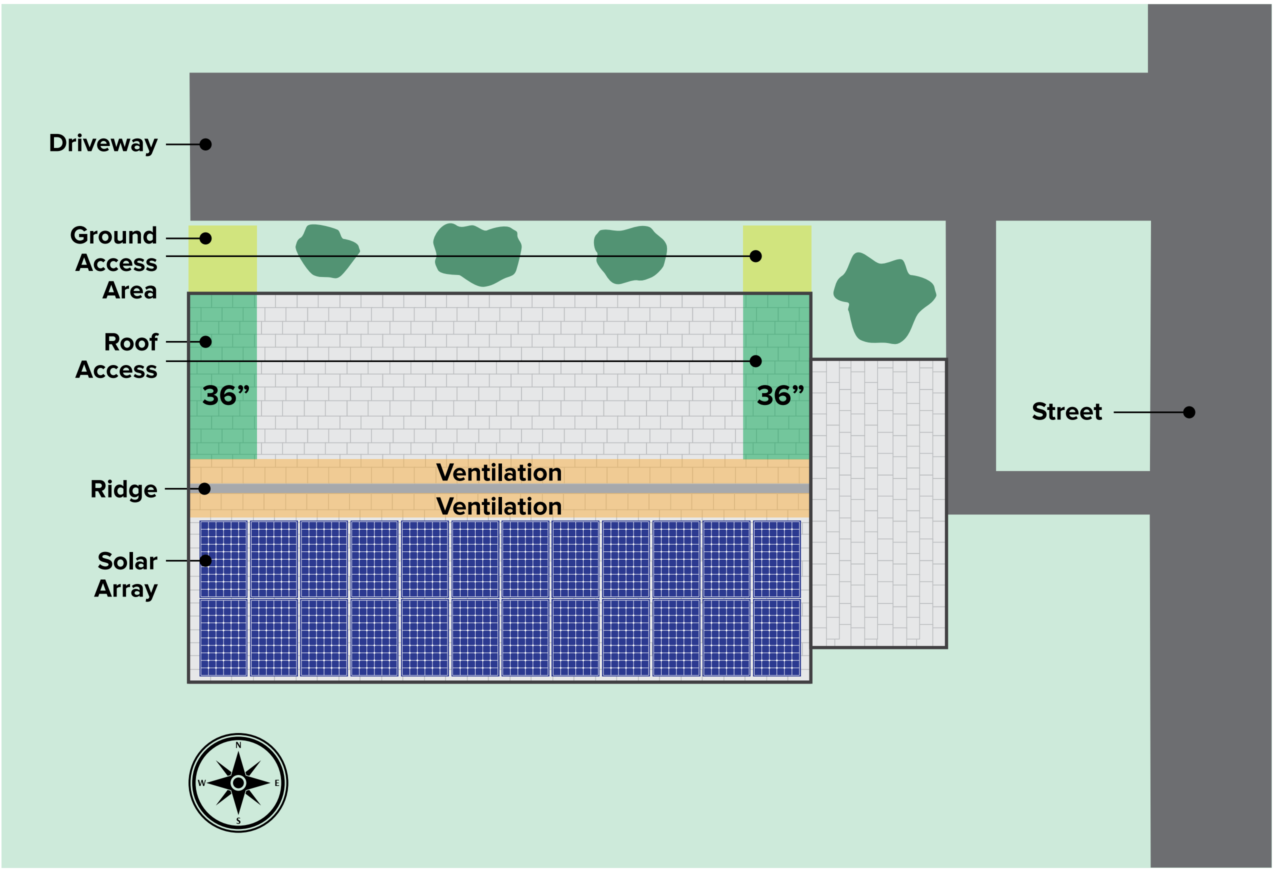
Typical single ridge structure where one or more exceptions apply (Figure 3)



The following exceptions apply to all residential structures:

1. ***Detached, nonhabitable structures, including but not limited to detached garages, parking shade structures, carports, solar trellises, and similar structures shall not be required to provide roof access***
2. ***Roof access, pathways and setbacks need not be provided where the building official has determined that rooftop operations will not be employed***
3. ***These requirements shall not apply to roofs with slopes of two units vertical in 12 units horizontal (17-percent slope) or less***

Single ridge residential access from opposing roof slopes (Figure 4)

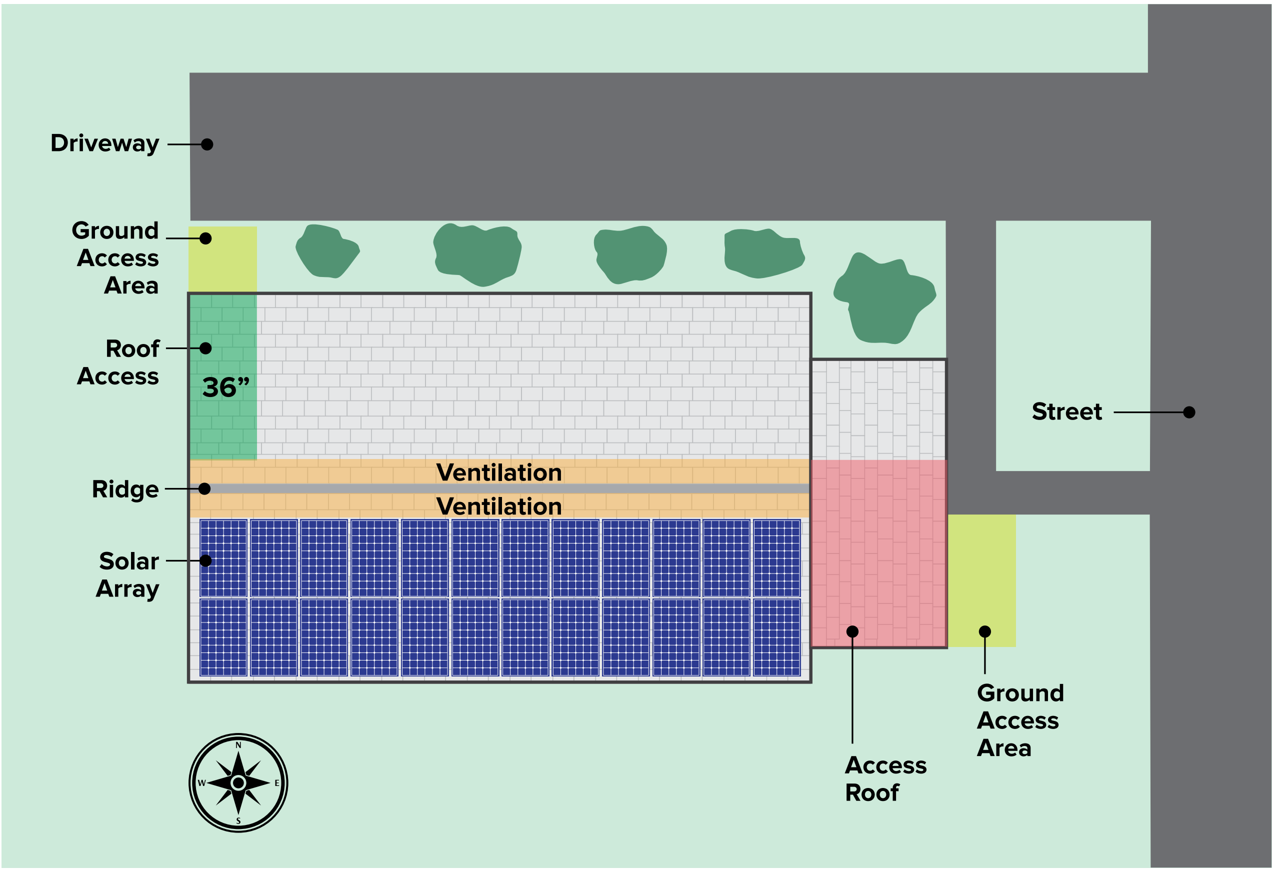


This is showing a single ridge with access from an opposing roof slope. The two access points and pathways allow two directions of access and egress which do not share a common truss or rafter.

Basic Requirements being met:

1. ***Not fewer than two pathways; one opposing roof slope***
2. ***Not fewer than one pathway shall be provided on the street or driveway side of the roof***
3. ***For each roof plane with a photovoltaic array, a pathway not less than 36 inches wide (914 mm) shall be provided from the lowest roof edge to ridge***

Single ridge residential roof access from adjacent roof (Figure 5)

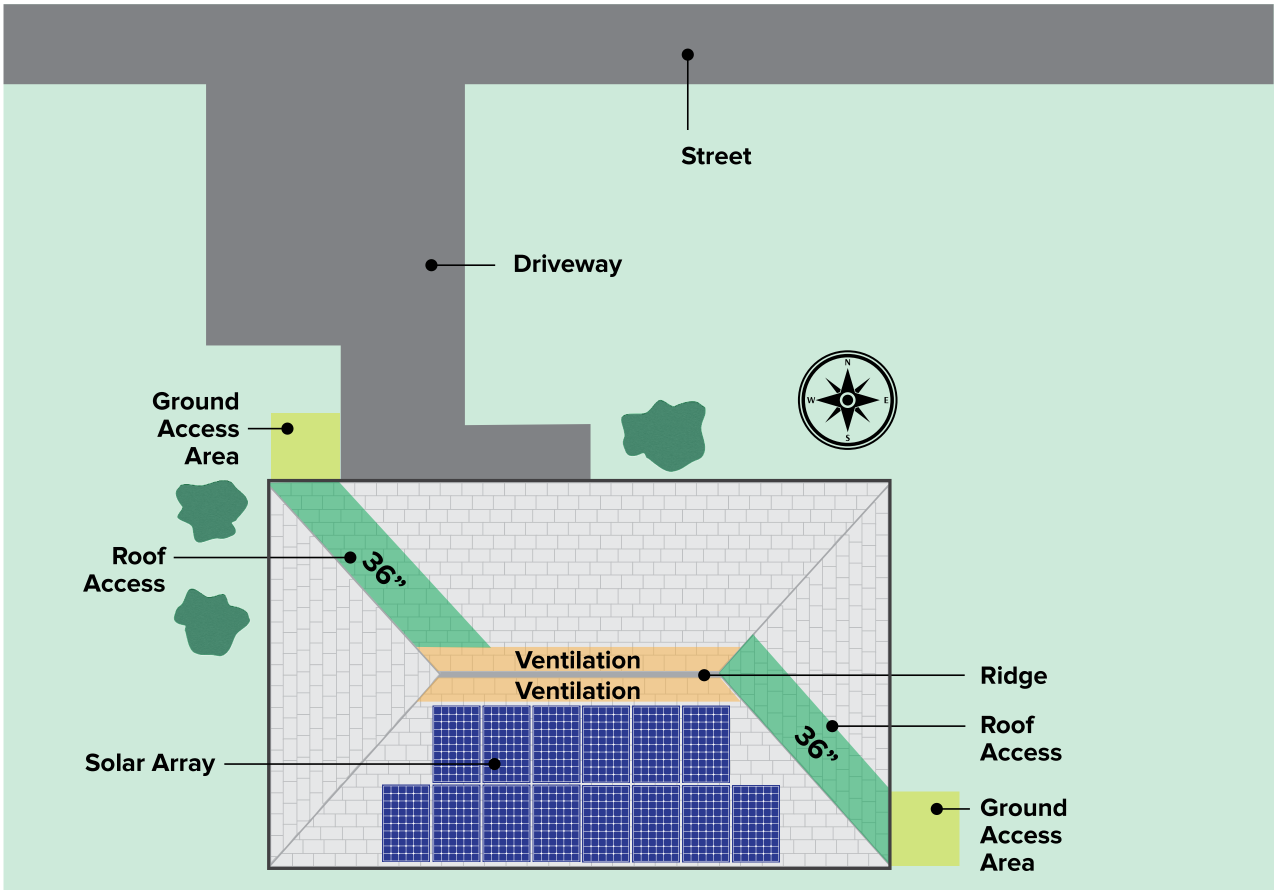


Similar to the previous figure, but with adjacent roof providing 36" wide minimum access to the ridge or peak of an adjoining roof surface containing solar panels, modules, or array. This figure shows that access is provided by the opposing and adjacent roof planes, but not the same roof plane as the array. This demonstrates how to use opposing and adjacent roofs to meet the requirements

Basic Requirements being met:

1. ***Not fewer than two pathways; one opposing roof slope, one adjacent roof***
2. ***Not fewer than one pathway shall be provided on the street or driveway side of the roof***
3. ***For each roof plane with a photovoltaic array, a pathway not less than 36 inches wide (914 mm) shall be provided from the lowest roof edge to ridge***

Hip Roof — venting with two roof pathways and ground access (Figure 6)



Typical hip roof showing venting location on both sides of the ridge and clear access pathway extending from the roof access point to the ridge or peak. Access and egress are from opposite sides and does not rely on the same roof truss or rafter and clear ground access.

Basic Requirements being met:

1. ***Not fewer than two pathways; one opposing roof slope, one adjacent roof***
2. ***Not fewer than one pathway shall be provided on the street or driveway side of the roof***
3. ***For each roof plane with a photovoltaic array, a pathway not less than 36 inches wide (914 mm) shall be provided from the lowest roof edge to ridge***

2. Nonresidential Roof Top Access – 2020 Fire Code of New York State

The following explains the 2020 Fire Code of New York requirements for access, pathways and ventilation for other than Group R-3. Many of the requirements are similar to those for residential structures (Group R-3) yet there are some differences as explained below.

2.1 Section 1204 Solar Photovoltaic Power Systems

1204.1 General. Solar Photovoltaic systems shall be installed in accordance with Sections 1204.2 through 1204.5, and the Building Code of New York State or Residential Code of New York State. The electrical portion of solar PV shall be installed in accordance with NFPA 70.

1204.2 Access and pathways. Roof access, pathways, and spacing requirements shall be provided in accordance with Sections 1204.2.1 through 1204.3.3. Pathways shall be over areas capable of supporting fire fighters accessing the roof. Pathways shall be located in areas with minimal obstructions, such as vent pipes, conduit or mechanical equipment.

Exceptions:

1. Detached, non-habitable Group U structures including, but not limited to, detached garages serving Group R-3 buildings, parking shade structures, carports, solar trellises, and similar structures.
2. Roof access, pathways and spacing requirements need not be provided where the fire code official has determined that rooftop operations will not be employed.

1204.2.1 Solar photovoltaic systems for Group R-3 buildings. Solar photovoltaic systems for Group R-3 buildings shall comply with Sections 1204.2.1.1 through 1204.2.1.3.

Exceptions:

1. These requirements shall not apply to structures designed and constructed in accordance with the Residential Code of New York State.
2. These requirements shall not apply to roof with slopes of 2 units vertical in 12 units horizontal or less.

1204.2.1.1 Pathway to Ridge. Not fewer than two 36-inch -wide (914mm) pathways on separate roof planes, from lowest roof edge to ridge, shall be provided on all buildings. Not fewer than one pathway shall be provided on the street or driveway side of the roof. For each roof plane with a photovoltaic array, not fewer that 36-inch-wide (914mm) pathway from lowest roof edge to ridge shall be provided on the same roof plan as the photovoltaic array, on an adjacent roof plane or straddling the same adjacent roof planes.

1204.2.1.2 Setback at ridge. For photovoltaic arrays occupying 33 percent or less of the plan view total roof area, a setback of not less than 18 inches (457mm) wide is required on both sides of a horizontal ridge. For photovoltaic arrays occupying more than 33 percent of the plan view total area, a setback of not less than 36 inches (457 mm) wide is required on both sides of a horizontal ridge.

1204.2.1.3 Alternate setback at ridge. Where an automatic sprinkler system is installed within the dwelling in accordance with Section 903.3.1.3, setbacks at the ridge shall conform to one of the following:

1. For photovoltaic arrays occupying 66 percent or less of the plan view total roof area, a setback of not less than 18 inches (457 mm) wide is required on both sides of a horizontal ridge.
2. For photovoltaics arrays occupying more than 66 percent of the plan view total roof area a setback of not less than 36 inches (914mm) wide is required on both sides of a horizontal ridge.

1204.2.2 Emergency escape and rescue openings. Panels and modules installed on Group R-3 buildings shall not be placed on the portion of a roof that is below an emergency escape and rescue opening. A pathway of not less than 36 inches (914mm) wide shall be provided to the emergency escape rescue opening.

1204.3 Other than Group R-3 Buildings. Access to systems for buildings, other than those containing Group R-3 occupancies, shall be provided in accordance with Sections 1204.3.1 through 1204.3.3

Exception: Where it is determined by the fire code official that the roof configuration is similar to that of a Group R-3 occupancy the residential access and ventilation requirements in section 1204.2.1.1 through 1204.2.1.3 are a suitable alternative.

1204.3.1 Perimeter Pathways. There shall be a minimum 6-foot-wide (1829 mm) clear perimeter around the edges of the roof.

Exception: Where either axis of the building is 250 feet (76 200 mm) or less, the clear perimeter around the edges of the roof shall be permitted to be reduced to a minimum width of 4 feet (1219 mm).

1204.3.2 Interior pathways. Interior pathways shall be provided between array sections to meet the following requirements:

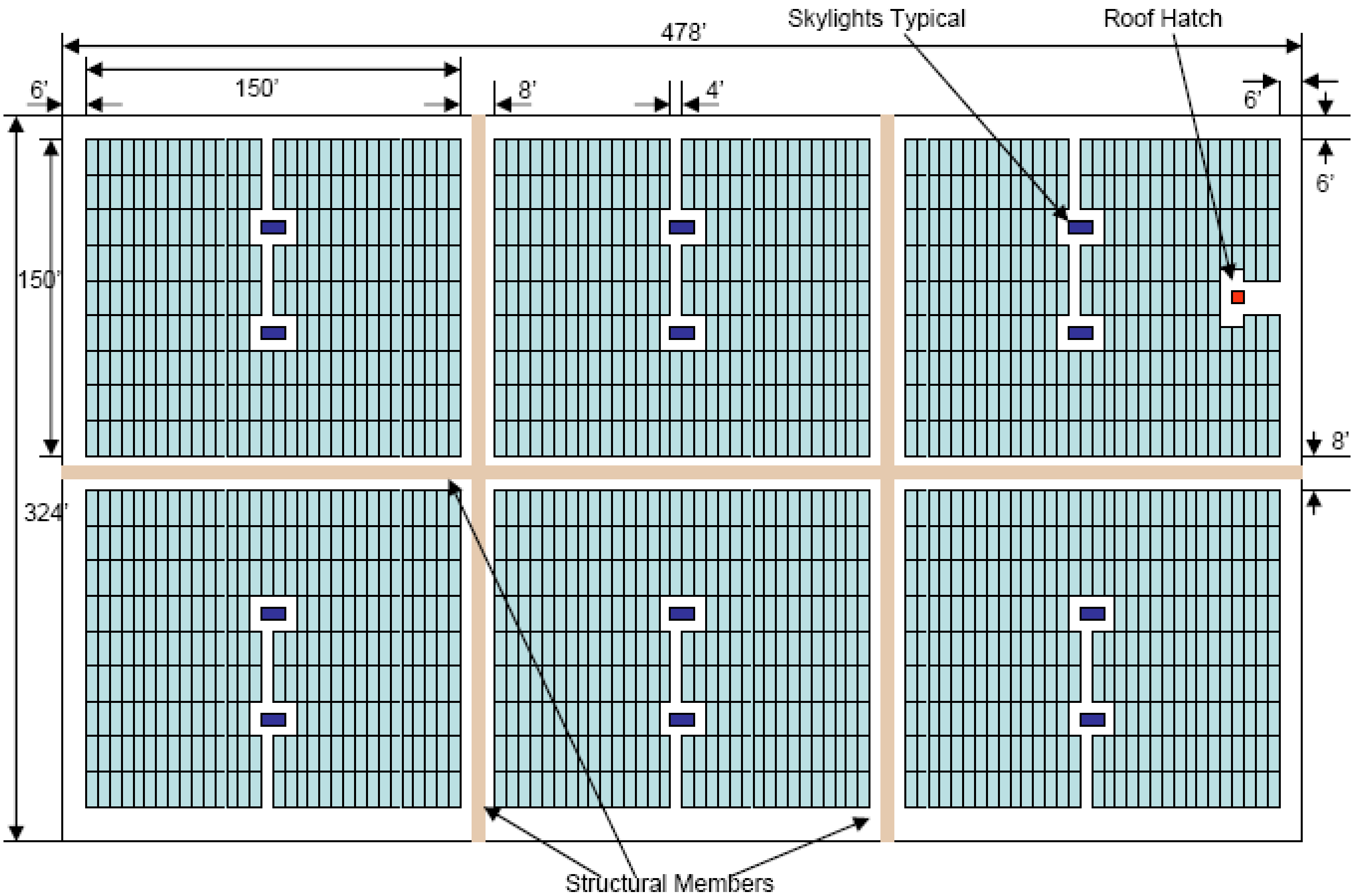
1. Pathways shall be provided at intervals not greater than 150 feet (45 720 mm) throughout the width and length of the roof.
2. A pathway not less than 4 feet (1219 mm) wide in a straight line to roof standpipes or ventilation hatches.
3. A pathway not less than 4 feet (1219 mm) wide around roof access hatches, with not fewer than one such pathway to a parapet or roof edge.

1204.3.3 Smoke ventilation. The solar installation shall be designed to meet the following requirements:

1. Where nongravity-operated smoke and heat vents occur, a pathway not less than 4 feet (1219 mm) wide shall be provided bordering all sides.
2. Smoke ventilation options between array sections shall be one of the following:
   - 2.1. A pathway not less than 8 feet (2438 mm) wide.
   - 2.2. Where gravity-operated dropout smoke and heat vents occur, a pathway not less than 4 feet (1219 mm) wide on not fewer than one side.
   - 2.3. A pathway not less than 4 feet (1219 mm) wide bordering 4-foot by 8-foot (1219 mm by 2438 mm) venting cutouts every 20 feet (6096 mm) on alternating sides of the pathway.

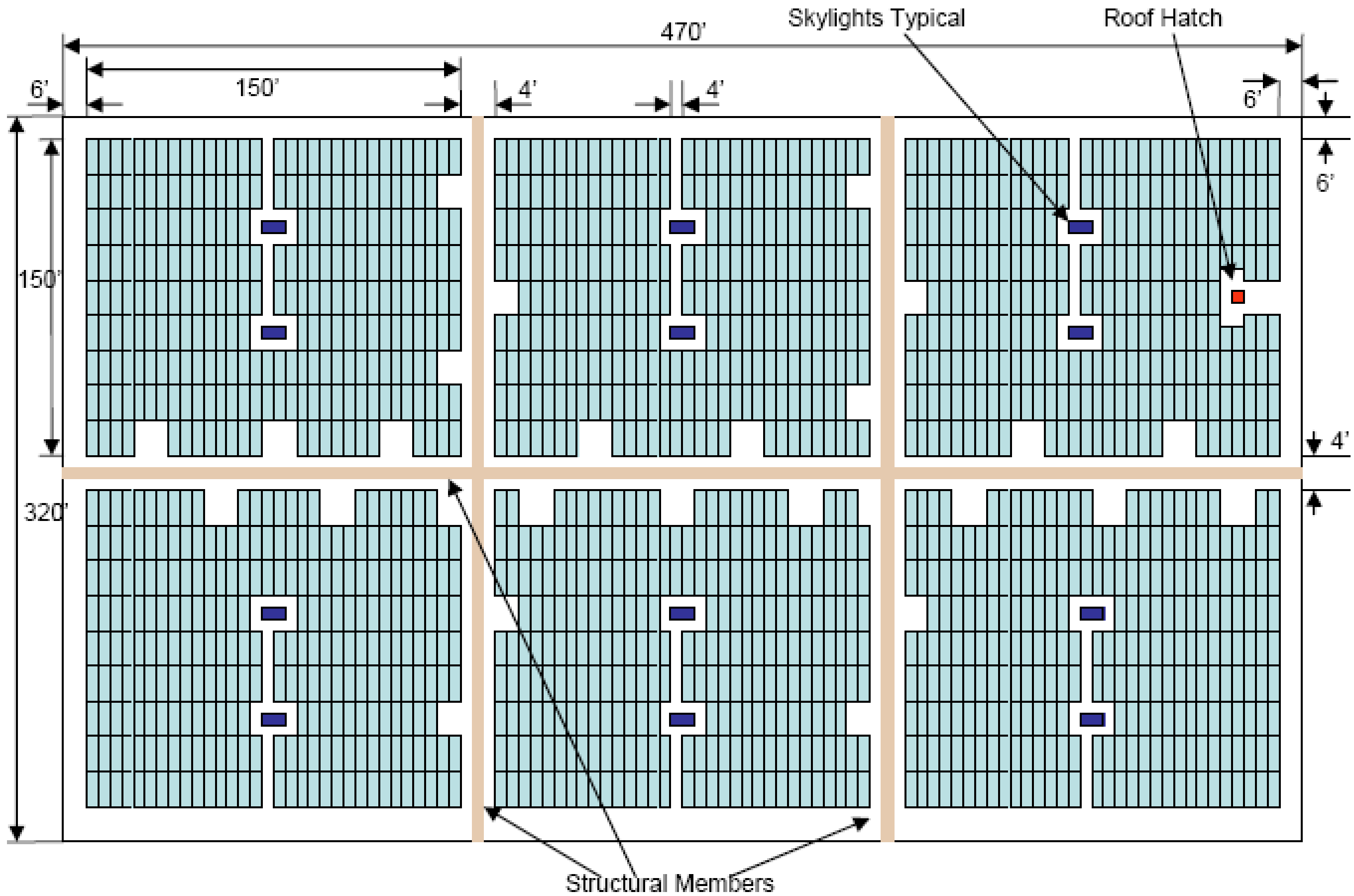
2.2 Possible Scenarios for Rooftop Access & Nonresidential PV Installations

Typical Nonresidential roof access greater than 250 feet (Figure 1)



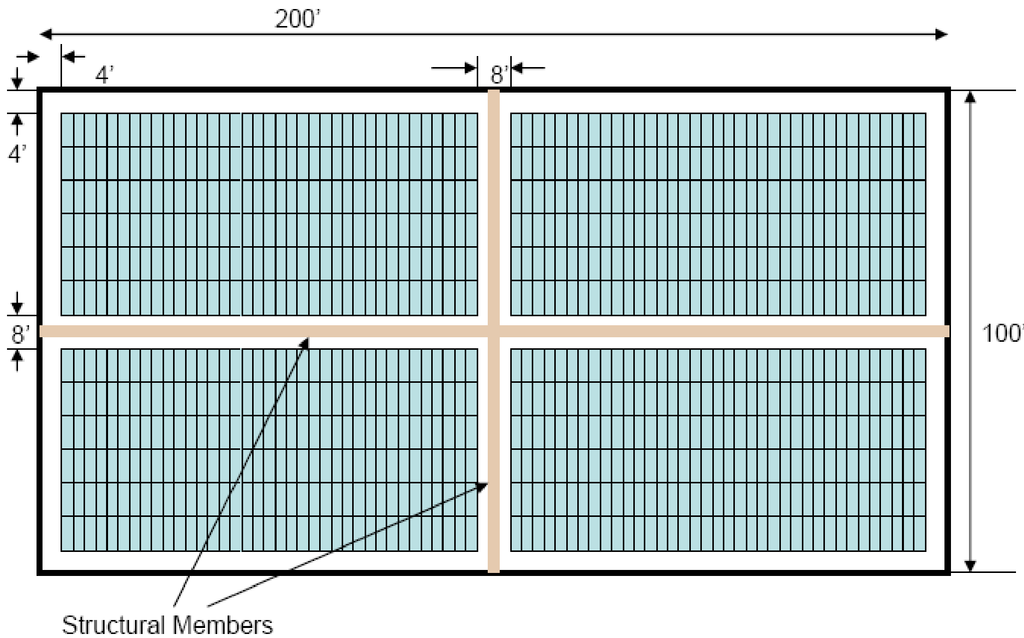
Nonresidential building with either axis greater than 250 feet, minimum perimeter pathway of 6 feet. Interior pathway not less than 8 feet, arrays of 150 feet maximum spacing with a 4-foot walkway to ventilation skylights. (not drawn to scale)

Typical Nonresidential roof access greater than 250 feet with 4 foot by 8-foot ventilation skylight space (Figure 2)



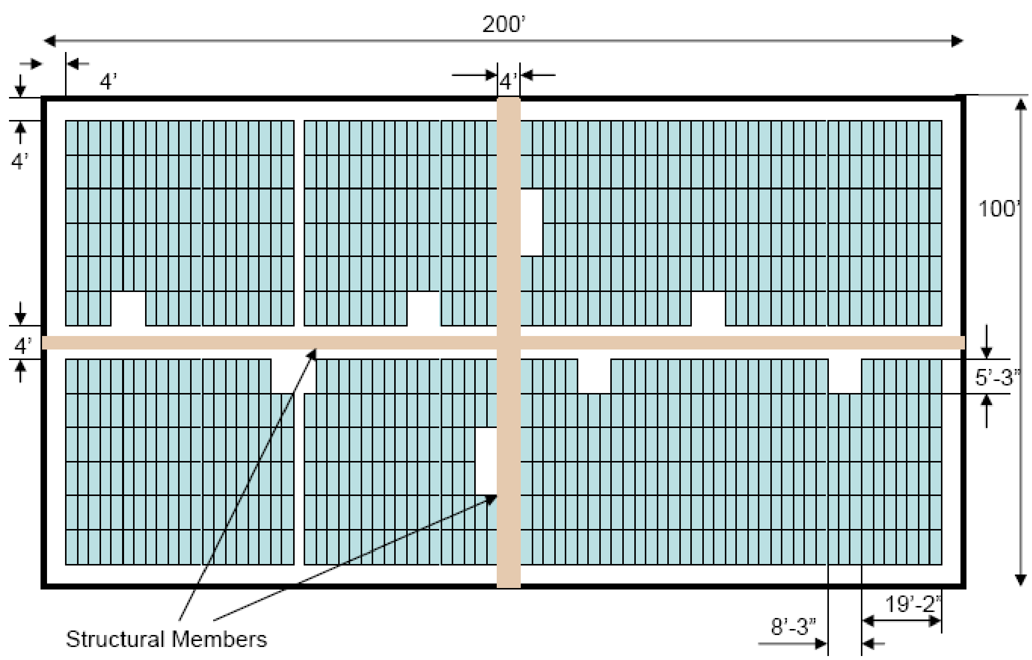
Nonresidential building with either axis greater than 250 feet, minimum perimeter pathway of 6 feet. Interior pathway not less than 8 feet, array of 150 feet maximum spacing between pathways, with a 4-foot by 8-foot walkway to ventilation space. (not drawn to scale)

Typical Nonresidential roof access less than 250 feet (Figure 3)



Nonresidential building with either axis less than 250 feet, minimum perimeter pathway of 4 feet. Interior pathway not less than 8 feet, array of 150 feet maximum spacing between pathways. (not drawn to scale)

Typical Nonresidential roof access less than 250 feet, with 4 foot by 8-foot ventilation space (Figure 4)



Nonresidential building with either axis less than 250 feet, minimum perimeter pathway of 4 feet. Interior pathway not less than 4 feet, array of 150 feet maximum spacing between walkways with 4 foot by 8-foot ventilation space. (not drawn to scale)

3. NYSERDA's Conclusion

The 2020 NYS Uniform Code allows the designers of photovoltaic systems several options and alternatives with regard to access, pathways and ventilation. These illustrations are offered as possible examples. It is not possible to show every possible scenario. It is however up to the judgment of the local code official to determine final compliance with the codes. Contractors, design professionals, and AHJ's must consider many ventilation scenarios and consider that:

1. A fire can break out **anywhere** in a building. Methods should consider fires occurring in less than ideal locations and during less than ideal conditions.
2. Emergency responders do not have x-ray vision. When approving an alternate ventilation method, AHJ's should consider the presence of attic storage atop a plywood base, finished attic space, or other such conditions that could deter ventilation operations.
3. Contractors and AHJ must remember that the direction and magnitude of a prevailing wind can affect the location of the ventilation opening.

   For example, a wind from the north places positive pressure on the northern roof slope and negative pressure on the southern slope. Under ideal conditions, a fire occurring in the northern portion of the building could necessitate a ventilation opening on the northern roof slope. A moderate wind from the north, however, could reduce the effectiveness of this opening due to positive wind pressures. In this case, it may be more effective to take advantage of the negative roof pressures and place the ventilation opening on the southern roof slope.
4. Design professionals, contractors, and AHJ must consider how the building is framed.

   For example, a building with a cathedral ceiling and a dividing wall along its peak would appear to necessitate ventilation openings on both slopes to accommodate fresh air in less than ideal locations.

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