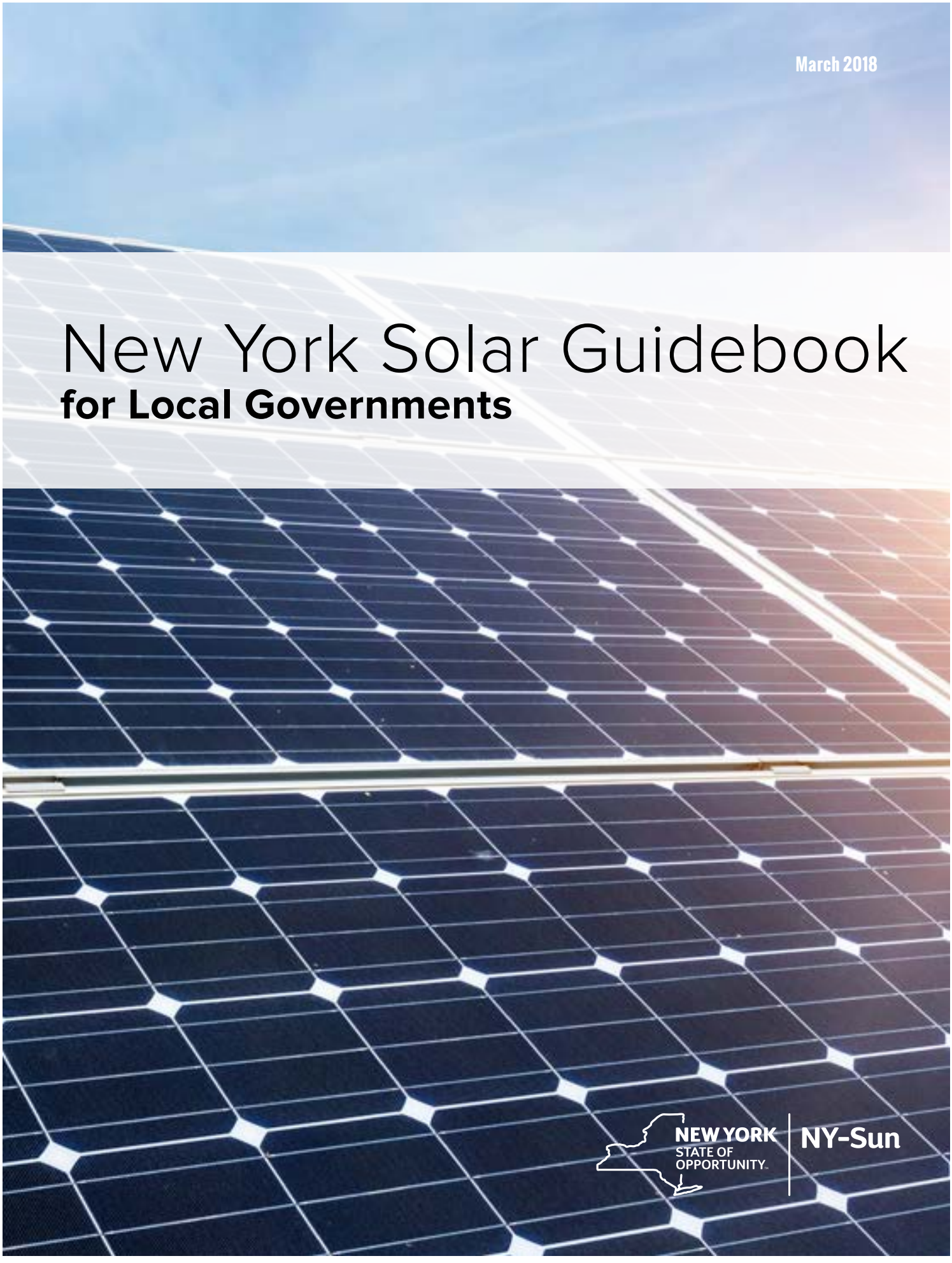
March 2018

New York Solar Guidebook
for Local Governments



NY Solar Guidebook

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NY-Sun is proud to release the 2017 edition of the New York Solar Guidebook for Local Governments. **The Guidebook is a compilation of information, tools and step-by-step instructions to support local governments** developing solar energy resources and creating clean energy jobs.

The Guidebook was first published in September 2016 in response to local government requests for additional resources to help manage a growing number of solar projects. In addition to the revised Unified Solar Permit, the Guidebook addresses rooftop access and ventilation requirements, property tax exemptions, landowner considerations for solar land leases, and decommissioning ground-mounted solar installations.

The 2017 edition of the Guidebook includes updates and new chapters, including:

- The most common solar installation deficiencies in New York State (p. 69)
- A new chapter addressing the SEQR process for large-scale solar energy systems (p. 88)
- The Solar Payment-In-Lieu-of-Taxes (PILOT) Toolkit (p. 117)
- A new chapter on land use tools for siting solar while protecting farmland (p. 131)

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

New York State is undertaking significant changes to how it generates and delivers electricity. Reforming the Energy Vision (REV) is Governor Andrew M. Cuomo's strategy to build a clean, resilient, and affordable energy system for all New Yorkers. The Clean Energy Standard, an important component for the realization of REV goals, requires that 50% of New York State's electricity come from renewable energy sources like solar by 2030.

NY-Sun is Governor Cuomo's $1 billion public-private initiative to expand solar energy throughout New York State. NY-Sun provides financial support for the installation of solar electric systems, as well as a comprehensive approach to reducing solar costs and barriers. The NY-Sun goal is to install three gigawatts (GW) of solar electric capacity by 2023 while building a self-sustaining solar industry. NY-Sun is making solar energy more affordable and driving growth: **solar energy capacity in New York State grew more than 1,000 percent between December 2011 and December 2017.**

The NY-Sun team looks forward to partnering with communities across the state to help them meet their solar energy goals.

Understanding Solar PV Permitting and Inspecting in New York State

Understanding Solar PV Permitting and Inspecting in New York State

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1 Introduction

This tool is intended to help local government officials and authorities having jurisdiction (AHJs) understand and streamline the solar photovoltaic (PV) permitting and inspection process to ensure efficiency, transparency, and safety. Standardizing the process across New York State's more than 1,600 AHJs will help reduce costs for municipalities and solar customers, create local jobs, and advance New York's clean energy goals.

The NY-Sun team at NYSERDA developed this tool in collaboration with the New York Department of State, solar contractors, and other stakeholders. It supports NY-Sun's efforts to implement a unified permitting process for residential solar PV systems. A copy of the New York State Unified Solar Permit application is provided in Appendix A.

Also included are resources to help inspectors and AHJs review solar electric project proposals, including an overview of design issues and a field inspection checklist. Information about solar basics, including equipment, financing, and terminology, is provided in Appendix B. Finally, the tool is also intended to help solar PV installers complete permit applications that meet the standards of AHJs.

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 several building 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 Components and Intended Use

Design and Inspection Issues. An overview of select technical issues and considerations for designing effective and code-compliant solar PV systems.

Design Review of Construction Documents. Provides guidance and a checklist for how AHJs can evaluate the technical documents solar PV contractors submit.

Field Inspection Checklist. AHJs may inspect completed installations, or use approved third party inspectors. This section includes an inspection checklist, complete with NEC references to common installation errors.

Additional Resources include:

- **NY-Sun and PV Trainers Network.** Resources from NYSERDA's solar PV program and solar PV training program, including ones for AHJs, zoning officials, and inspectors.
- **Solar terms.** A glossary of solar PV terminology.
- **Information on Rooftop Access and Ventilation Requirements.**
- **Sample wiring diagrams.** Two examples of detailed electrical wiring diagrams.
- **Sample site map.** An example of a detailed site map for a roof-mounted solar PV system.
- **Sample construction photos of correctly installed equipment.** AHJs are welcome to use this document as a basis for their own photo reviews.

1.4 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.

1.4.1 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 chapter 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 NEC690.7), 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 (NEC 310.15(B) (2-3)), 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 2014 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 2014 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 Section 690 and elsewhere. To assist contractors and inspections, NY-Sun and The Cadmus Group have developed an extensive Labeling Guide, located as Appendix C of this document.

2.6 Zoning Considerations

Solar electric 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 restrictions are placed upon them. Several excellent resources are available to help zoning boards, including the *Zoning for Solar Energy: Resource Guide*, available on the NY-Sun PV Trainers' Network website at training.ny-sun.ny.gov/resources. NY-Sun posted a land use guide to nyserda.ny.gov/All-Programs/Programs/NY-Sun/Learn-About-Solar

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.

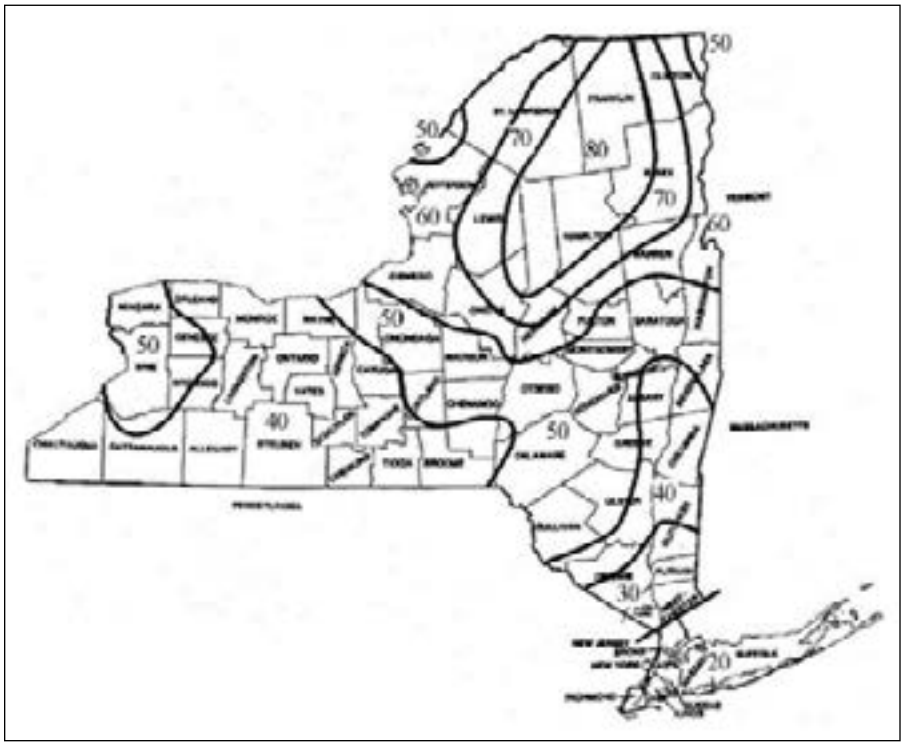
Figure R301.2(4)A from the 2015 International Residential Code: Ultimate Design Wind Speeds[1]

[1] *Measurements given in miles per hour with meters per second in parentheses.*

Figure R301.2(5) from NYS Building Standards and Codes 2017 Uniform Code Supplement Ground Snow Loads[1]

[1] https://www.dos.ny.gov/dcea/pdf/2017-Uniform-Code-Supplement-3-17-2017.pdf

Snow loads given in pounds per square foot.



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 chapter includes checklists 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).[3] 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

Yes/No	Site Plan
	Construction document prepared and stamped by a New York State licensed professional engineer or registered architect, who incorporated the following into system design.
• Street address and tax map parcel number • All required setbacks, including rooftop access and ventilation requirements as applicable[4] • 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 (2014 NEC 690.12)	

[3] Part 1203 - Uniform Code: Minimum Standards for Administration and Enforcement of Rules and Regulations - Department of State Title 19 (NYCRR) Chapter XXXII - Division of Code Enforcement and Administration.

[4] Including the NYS 2017 Uniform Code Supplement https://www.dos.ny.gov/dcea/pdf/2017-Uniform-Code-Supplement-3-17-2017.pdf

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 USE-2 or 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 690.12 in the 2014 NEC. 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 (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, 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, 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. 2014 NEC 705.12
  - Backfed breaker located at opposite end of buss bar from main breaker.
- 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 2015 International Residential Code and International Building 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. NY-Sun 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).

References to construction and equipment photos in Chapter 5 are included in the following checklist, where applicable.

4.1 Array (All photos are located in Appendix C)

1. Circuit conductors are properly supported and are not touching the roof surface [NEC 338.10(B)(4) and NEC 334.30] (Photo 10)	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 (Photo 3)	N	Y	N/A
4. Module manufacturer/model matches plan set (Photo 4)	N	Y	N/A
5. Modules are effectively grounded using lugs, WEEBs, or a racking integrated grounding method [NEC 690.43] (Photo 9)	N	Y	N/A
6. Modules and racking are properly secured (Photos 5, 6, 7)	N	Y	N/A
7. DC optimizers are properly grounded [NEC 690.43 and NEC 110.3(B)]	N	Y	N/A
8. Wire ties are UV-rated (generally black) (Photo 10)	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]) (Photo 8)	N	Y	N/A
11. Conductors are properly identified (ungrounded, grounded, grounding) [NEC 200.7, NEC 200.6, NEC 250.119] (Photo 13)	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 (2015 IRC/2015IBC) (Photo 3)	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

4.2 DC Optimizer (All photos are located in Appendix C)

1. DC Optimizer chassis is properly grounded per manufacturer’s instructions [NEC 690.43, NEC 250 NEC 110.3(B)]	N	Y	N/A
2. EGC is protected if smaller than #6AWG [NEC 690.46 and NEC 250.120] (Photo 9)	N	Y	N/A
3. DC Optimizer GEC is sufficiently sized per manufacturer instructions [NEC 690.47(C), NEC 250.66, NEC 250.122, NEC 250.166]	N	Y	N/A
4. Rapid Shutdown label is present and meets the requirements of NEC 690.56(C).	N	Y	N/A
5. DC Output circuit conductor insulation type is rated for environment (Shall not be type: USE-2, THWN-2, RHW-2) [NEC 310.10]	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) (All photos are located in Appendix C)

1. All roof penetrations are properly flashed and sealed 2015 IRC/ 2015 IBC (Photos 6, 12)	N	Y	N/A
2. Rafter spacing/material matches construction documents	N	Y	N/A
3. Roof appears to be in good condition, with no signs of leaking or damage; Roof is free of debris (Photo 3)	N	Y	N/A
4. 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
5. Modules cannot be moved by pushing or pulling with one hand (Photo 7)	N	Y	N/A

4.4 Junction Box (All photos are located in Appendix C)

1. Wire nuts and splices are suitable for the environment [NEC 110.3(B), NEC 110.14, NEC 110.28] (Photo 13)	N	Y	N/A
2. Junction box is UL listed for the environment [NEC 110.3(B)] (Photo 14)	N	Y	N/A
3. Junction box is properly grounded [NEC 690.43(A), NEC 250.4, NEC 110.3(B)]	N	Y	N/A
4. Grounding equipment is properly installed (NEC 690.43, NEC 250.8, NEC 250.12) (Photo 13)	N	Y	N/A

4.5 Inverter (All photos are located in Appendix C)

1. The number of strings match the plan set (Photo 18)	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)] (Photos 11, 12)	N	Y	N/A
5. Conduit penetrations are properly sealed between conditioned and unconditioned space [NEC 300.7(A)]	N	Y	N/A
6. Conduit is properly supported e.g., [LFMC NEC 350.30, EMT NEC 358.30, PVC NEC 352.30] (Photo 15)	N	Y	N/A
7. Conduit is not being used as conductor support [NEC 300.11(B)] (Photo 15)	N	Y	N/A
8. The enclosure is properly grounded [NEC 690.43, NEC 250.8, NEC 250.12] (Photo 16)	N	Y	N/A
9. Grounding equipment is properly installed [NEC 690.43, NEC 250.8, NEC 250.12] (Photos 16, 19)	N	Y	N/A
10. Enclosure is labeled as a PV disconnect [NEC 690.13(B)]	N	Y	N/A
11. DC characteristics label is present [NEC 690.53]	N	Y	N/A
12. The ungrounded DC conductors are properly identified (shall not be white, gray, or white striped) [NEC 200.7(A)] (Photo 16)	N	Y	N/A
13. Max string voltage below inverter max [NEC 110.3(B) and NEC 690.7]	N	Y	N/A
14. Inverter string fuses are rated for use in application [NEC 690.9]	N	Y	N/A
15. DC and AC disconnecting means are located within sight of or in each inverter [NEC 690.15 (A)] (Photos 15, 18)	N	Y	N/A
16. AFCI protection is present and enabled [NEC 690.11]	N	Y	N/A
17. System is equipped with Rapid Shutdown [NEC 690. 12]	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 (All photos are located in Appendix C)

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 and 250.120(C)] (Photo 5)	N	Y	N/A
3. Microinverter GEC is sufficiently sized per manufacturer instructions [NEC 690.47(C), NEC 250.66, NEC 250.122, NEC 250.166]	N	Y	N/A
4. Rapid Shutdown label is present and meets the requirements of [NEC 690.56(C)]	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 Article 690.12. This does not negate the label requirement in 690.56(C).

4.7 AC Combiner (All photos are located in Appendix C)

1. The number of branch circuits match the plan set. (Photo 20)	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] (Photo 20)	N	Y	N/A
5. Conduit penetrations are properly sealed between conditioned and unconditioned space [NEC 300.7(A)]	N	Y	N/A
6. Conduit is properly supported e.g., [LFMC NEC 350.30, EMT NEC 358.30, PVC NEC 352.30] (Photo 15)	N	Y	N/A
7. Conduit is not being used as conductor support [NEC 300.11(B)] (Photo 15)	N	Y	N/A
8. The enclosure is properly grounded [NEC 690.43, NEC 250.8, NEC 250.12] (Photo 20)	N	Y	N/A
9. Grounding equipment is properly installed [NEC 690.43, NEC 250.8, NEC 250.12] (Photo 20)	N	Y	N/A
10. Enclosure is labeled as a disconnect [NEC 690.13]	N	Y	N/A
11. AC characteristics label is present (voltage and amperage), [NEC 690.54]	N	Y	N/A
12. "Multiple Sources" indication label is present [NEC 705.12(D)(3)]	N	Y	N/A
13. The sum of all overcurrent devices (excluding main) do not exceed the rating of the buss bar [NEC 705.12(D)(2)(3)(c)]	N	Y	N/A
14. The enclosure is labeled "Do Not Add Loads" [NEC 705.12(D)(2)(3)(c)]	N	Y	N/A
15. The main breaker is fastened in place [NEC 408.36(D)]	N	Y	N/A
16. Grounded conductors are isolated from enclosure [NEC 250.24(A)(5)] (Photo 20)	N	Y	N/A

4.8 Load-Side Connection (All photos are located in Appendix C)

1. Circuit conductors have sufficient ampacity [NEC 690.8, 310.15]	N	Y	N/A
2. The OCPD is sufficient to protect the circuit conductors [NEC 240.4]	N	Y	N/A
3. Grounded conductors properly identified [NEC 200.6(A)&(B)]	N	Y	N/A
4. The GEC is present and sufficiently sized [NEC 690.47(C), NEC 250.66, NEC 250.122, NEC 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 250.64(E), NEC 250.4(A)(5)]	N	Y	N/A
7. PV breakers are properly identified [NEC 408.4(A)] (Photo 23)	N	Y	N/A
8. AC characteristics label is present and suitable for the environment (voltage and amperage) [NEC 690.54, NEC 110.21]	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 690.15(A) and NEC 705.10]	N	Y	N/A
11. Backfed breaker 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(D)(2)(3)(b)] (Photo 23)	N	Y	N/A
14. Clearances maintained/live parts secured [NEC 110.27(A) and NEC 110.26] (Photo 18)	N	Y	N/A

4.9 Supply Side Connection (All photos are located in Appendix C)

1. Disconnect is service-rated and has a current rating of at least 60 Amp [NEC 230.79(D)] (Photo 22)	N	Y	N/A
2. Circuit conductors have sufficient ampacity [NEC 690.8, NEC 310.15]	N	Y	N/A
3. New service entrance conductors are less than 10 feet [NEC 705.31] (Photo 18)	N	Y	N/A
4. The OCPD is sufficient to protect the circuit conductors [NEC 240.4] (Photo 21)	N	Y	N/A
5. The disconnect utility conductors are on LINE terminals [NEC 110.3(B), NEC 240.40(if fusible)]	N	Y	N/A
6. There is no OCPD in the grounded conductor [NEC 230.90(B)] (Photo 21)	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, NEC 110.10]	N	Y	N/A
8. The neutral 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(C), NEC 250.66, NEC 250.122, NEC 250.166] (Photo 24)	N	Y	N/A
10. The GEC is continuous (or irreversibly spliced) [NEC 250.64(C), NEC 690.47(C)]	N	Y	N/A
11. Ferrous conduit and the enclosure are appropriately bonded to the GEC [NEC 250.64(E), NEC 250.4(A)(5)] (Photo 24)	N	Y	N/A
12. AC characteristics label is present and suitable for the environment (voltage and amperage) [NEC 690.54, NEC 110.21]	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, NEC 690.56, NEC 705.10]	N	Y	N/A
14. AC disconnect label is present and suitable for the environment (NEC 690.13(B), NEC 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 358.12(6)]	N	Y	N/A

4.10 General

1. Work is done in a neat and workmanlike manner [NEC 110.12] (Photos 5, 10, 13, 28)	N	Y	N/A
2. Working clearances are observed per NEC 110.26 (Photo 18)	N	Y	N/A

5 Resources

5.1 NY-Sun and PV Trainers Network

As part of the NY-Sun initiative, NYSERDA is committed to providing resources to local governments to help them better understand the solar PV contracting and construction process. General information on solar electric, including Community Solar and Solarize, and NY-Sun's initiatives, is available at **nyserda.ny.gov/All-Programs/Programs/NY-Sun**

Of particular relevance is the PV Trainers Network page (**training.ny-sun.ny.gov**), which contains:

- Free videos of trainings on solar electric-related topics, such as zoning, installing shared solar, and fire and safety considerations.
- A Municipal Solar Procurement Toolkit for towns interested in developing their own solar PV project.
- Information on zoning and land use planning for solar PV systems.
- Frequently Asked Questions.
- A section for local governments to request an in-person training session.

5.2 Residential Rooftop Access and Ventilation Requirements

Section 324 in the 2015 International Residential Code concerns roof top access and ventilation requirements for solar PV systems. New York State has adopted the 2017 Uniform Code Supplement with changes to Section 324. The purpose of these requirements is to provide firefighters and first responders access to the rooftop for ventilation purposes during a fire.

NYSERDA has developed an illustrated guide to these new requirements, called Residential Roof Top Access and Ventilation Requirements. Find it at **nyserda.ny.gov/All-Programs/Programs/NY-Sun/Project-Developers/Residential-Small-Commercial-MW-Block/Resources-Residential-Small-Commercial-MW-Block**

5.3 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 ACM: (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 or ACMs

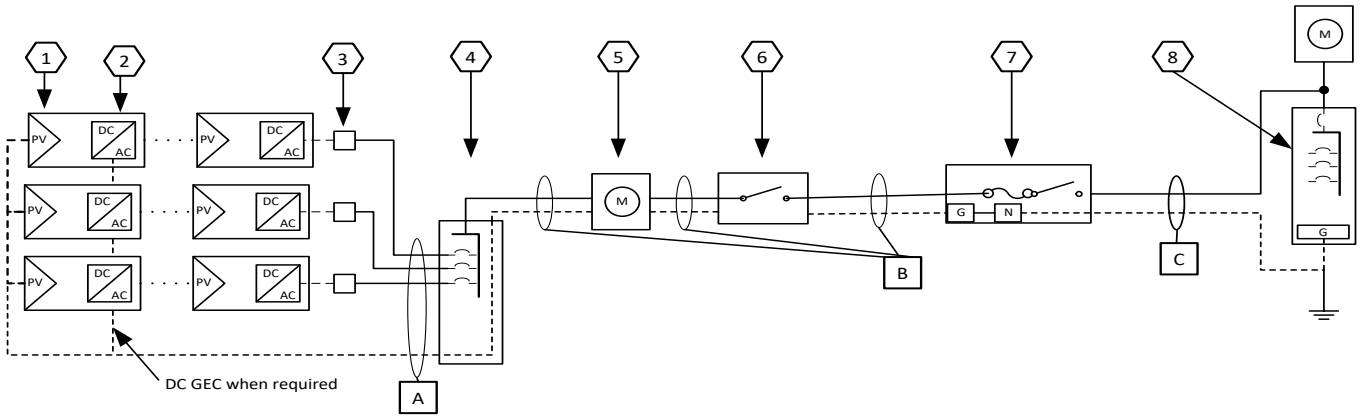
Check a box for DC system grounding: ❑ Isolated, ☒ **Non-Isolated**

For Isolated DC power systems, EGC & GEC are required.

For Non-Isolated DC power systems, EGC is required.

Refer to NEC 250.120 for EGC installation & Table 250.122 for sizing.

DC Rapid Disconnect (NEC690.12) 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	#10	#10	2Hot 1N	2Hot 1N	2Hot 1N	THWN-2	THWN-2	THWN-2	½ inch EMT	½ inch EMT	½ inch EMT
	EGC:	#8AWG Cu											
	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											

5.4 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

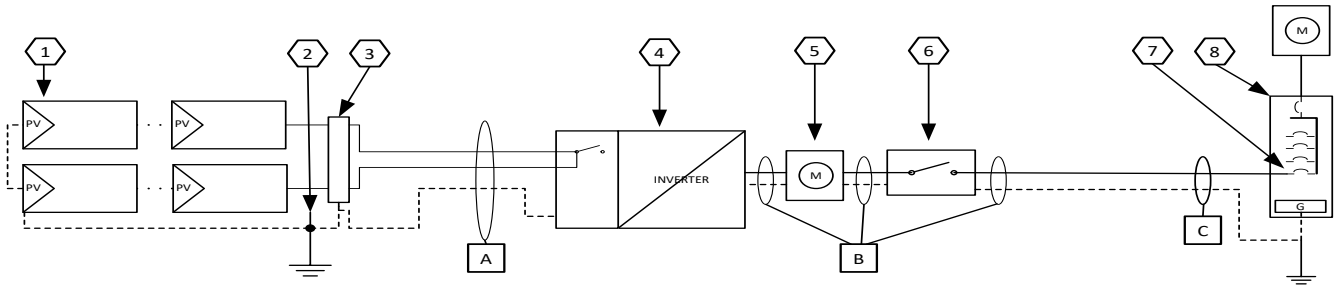
Single Line Diagram for String Inverter

Check a box for DC system grounding: ❑ Isolated, ☒ **Non-Isolated**

For Isolated DC power systems, EGC & GEC are required.

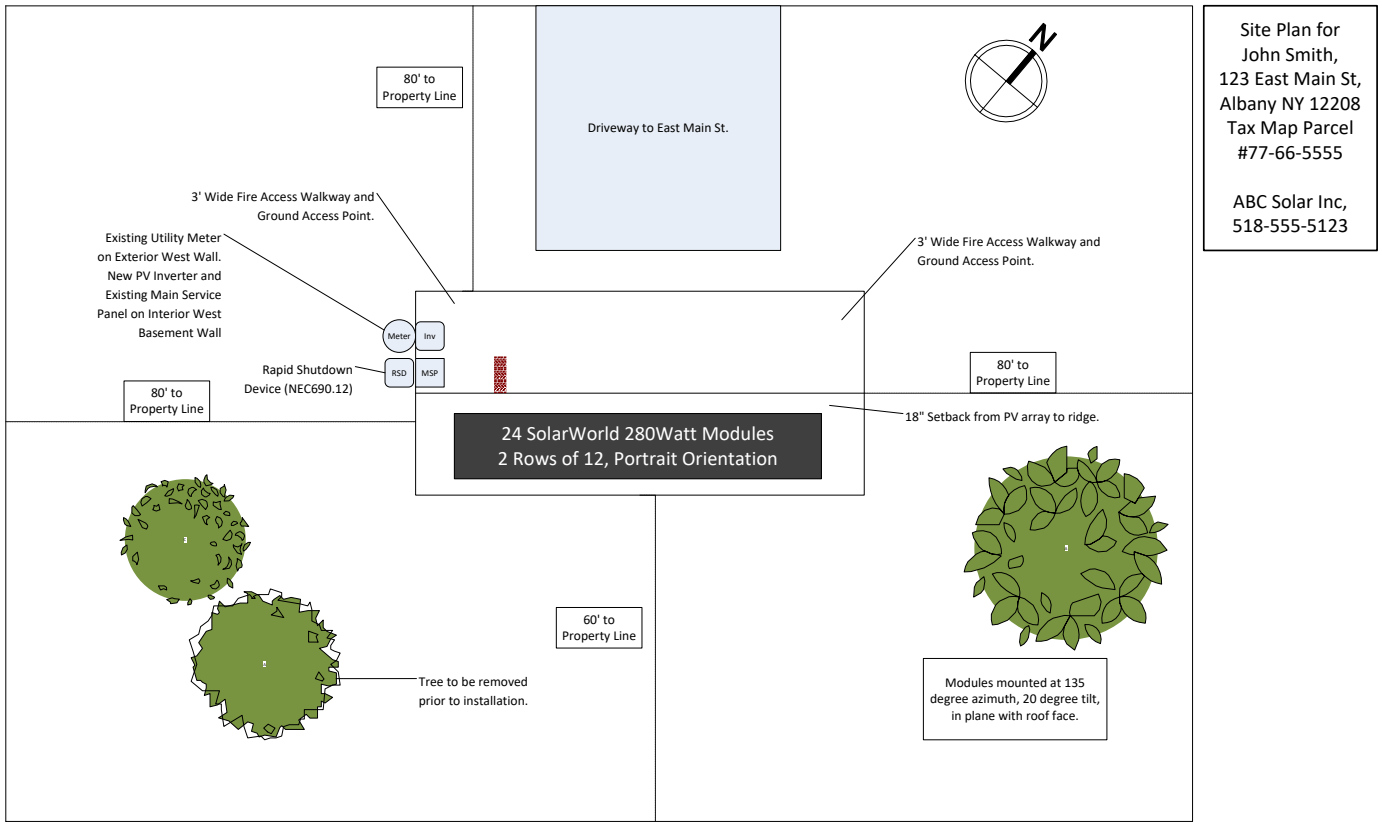
For Non-Isolated DC power systems, EGC is required.

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			

5.5 Sample Site Map



Appendix A. Unified Residential Solar PV Permit Application

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 DC 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 DC

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 DC 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

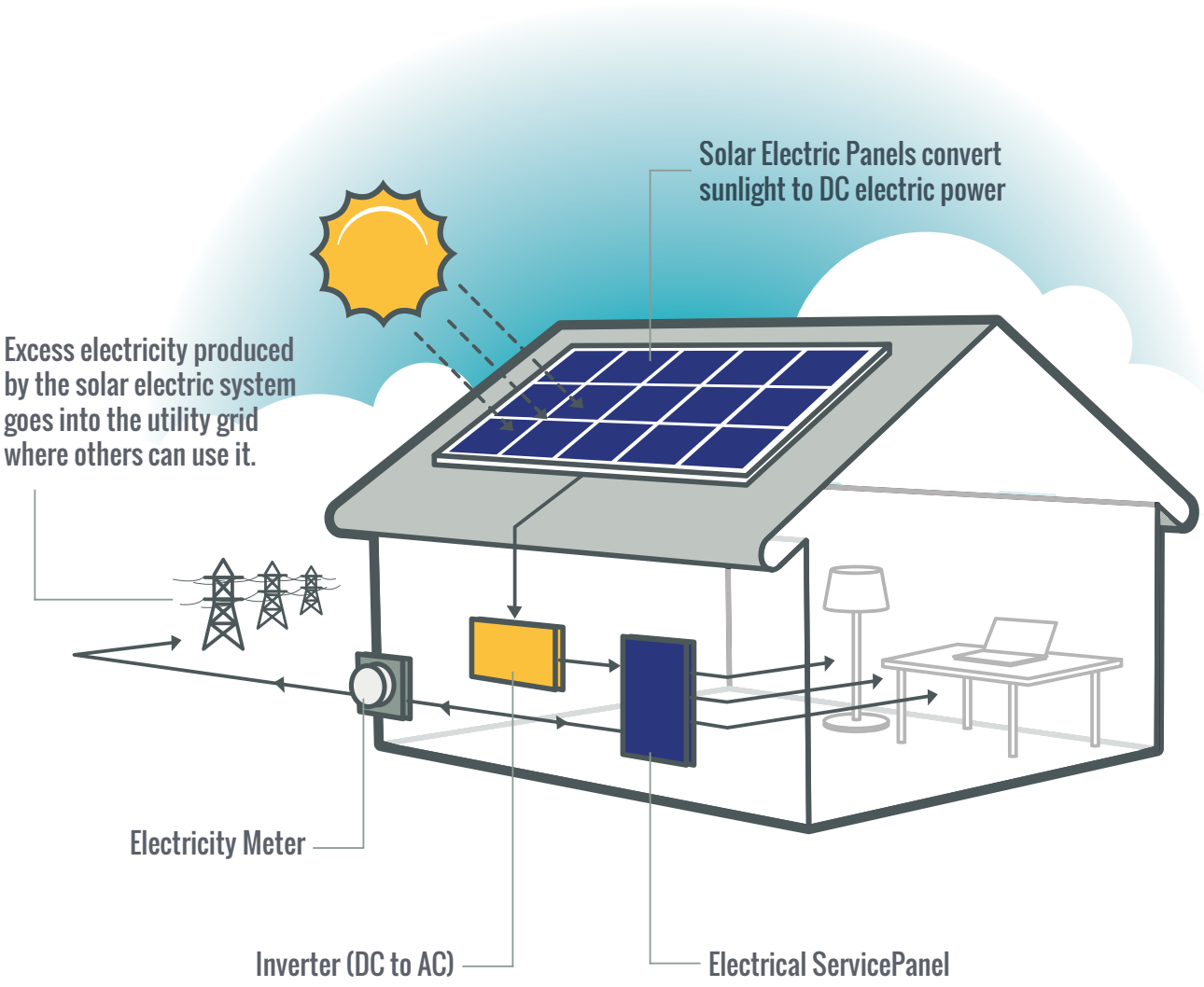
For additional information regarding this permit process, please consult our departmental website at [WEBSITE] or contact [DIVISION NAME] at [PHONE NUMBER].

Appendix B. Solar Basics

B.1 What is a solar PV system?

Solar electric 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 electric systems consist of the same basic components, but vary widely in terms of size and complexity. This tool focuses on utility grid-tied residential solar PV systems under 25 kW in size. Solar electric 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 electric 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 installations.



Most of New York's solar PV installations are residential, utility grid-tied, and do not include battery storage. They are typically roof-mounted and range from 4 to 10 kW. New York State's Standardized Interconnection Requirements (SIR; www3.dps.ny.gov/W/PSCWeb.nsf/All/DCF68EFCA391AD6085257687006F396B) allow residential solar PV systems up to 25 kW.

B.2 System Components

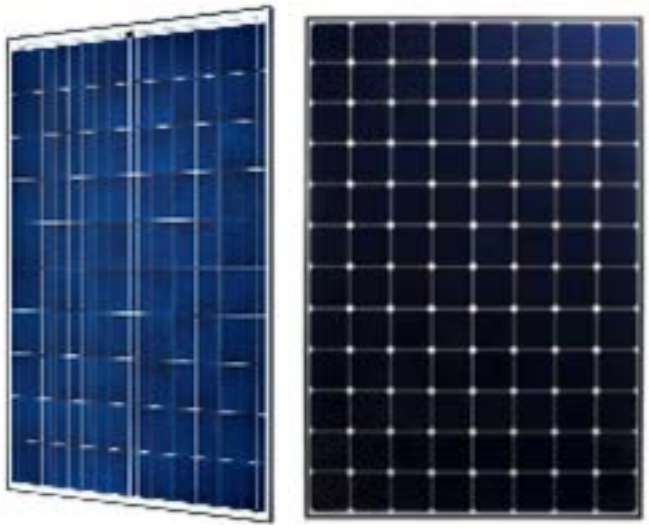
B.2.1 Modules

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



B.2.2 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

B.2.3 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

B.2.4 Racking

Most 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[5], 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 (left) and Detail of an L-Foot with a SnapNrack Flashing (right)

System designers may choose to use a ballast mounting system on flat roofs. 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.

B.2.5 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.

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

B.2.6 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.

B.2.7 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.

B.3 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.

B.4 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.

B.4.1 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.[6] New York State offers a 25% residential income tax credit,[7] and in December 2015 the U.S. Congress extended a 30% federal income tax credit.[8] 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.[9] 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.

[6] http://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun
[7] https://www.tax.ny.gov/pit/credits/solar_energy_system_equipment_credit.htm
[8] https://www.energystar.gov/about/federal_tax_credits
[9] https://www.tax.ny.gov/research/property/assess/manuals/vol4/pt1/sec4_01/sec487.htm

B.4.2 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.

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.

B.5 Solar Terms

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.

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 producing 3 gigawatts of solar energy by 2023.

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 20 – 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.

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.

Appendix C. 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.

REQUIRED CONSTRUCTION PHOTOS

NY-Sun Incentive Program

OVERVIEW PHOTOS:

1. **Home Address Verification** – Must show street number and be taken from a street view.

2. **South Facing Horizon** – View of horizon facing South, taken from the array.

GENERAL ARRAY PHOTOS:

3. **Pull Back Image of Array** – Pull back photo of each array in system so that panel count can be verified. If more than one array comprises the system, please provide pull back photo of each array.

4. **Module Label Documentation** – Close up of module label, including make, model, serial number and Wattage. If multiple module models are used, please include a photo of each model used. If more than one array comprises the system, provide a label image of each array.

ARRAY RACKING PHOTOS:

5. **Module Racking System Documentation** – Photo demonstrating racking system used. If multiple arrays comprise the system, please provide a photo showing racking system of each array.

6. **Racking Roof Mounting System Documentation** – Photo demonstrating how racking system is mounted to the roof plane. If multiple arrays comprise the system, please provide a photo showing racking system mounting and anchors of each array.

7. **Racking End Clip Documentation** – Photo demonstrating that racking system includes end clips.

8. **Racking System Grounding** – Photo demonstrating the rail-grounding mechanism bonding rails north/south as well as across rail split.

MODULE INSTALLATION PHOTOS:

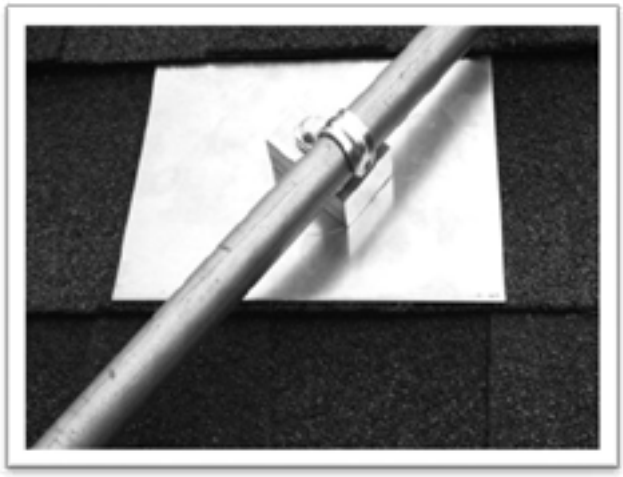
9. **Module Grounding** – Photo demonstrating the module grounding method.

10. **Wire Management of Modules** – Photo demonstrating the wire management of the modules.

CONDUCTOR AND CONDUIT PHOTOS:

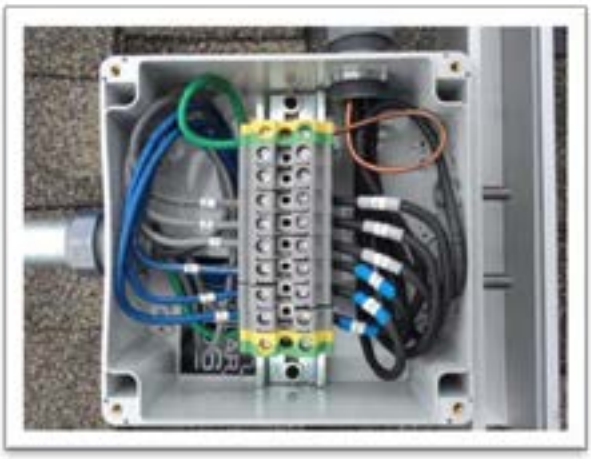
11. **Conductor Support and Management** – Photo demonstrating the wire management of the modules.

12. **Conduit Roof Top Penetrations** – Photo demonstrating the penetrations of any conduit supports.



JUNCTION/ COMBINER BOX PHOTOS:

13. **Junction/ Combiner Box** –Junction/combiner box with the lid opened showing grounding and all conductors entering/exiting the box, and demonstrating strain relief



14. **Junction/ Combiner Box Mounting Method and Label** Overview photo showing exterior of box and method of support/ attachment and required labeling.

INVERTER PHOTOS:

15. **Inverter Outside View with lid on** –Photo demonstrating inverter box and labeling

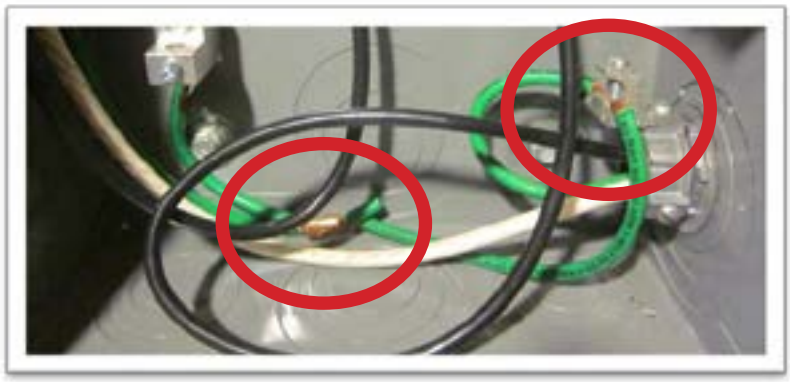
16. **Inverter Internal Photo** – Inverter with cover off showing wiring and grounding

17. **Inverter Label Picture** –Close up photo clearly showing Inverter label with lettering legible.

BALANCE OF SYSTEM PHOTOS:

18. **Balance of System Wall Photos** – A pull-back photo showing the entire balance-of-systems equipment wall (may need multiple photos).

19. **GEC Path Photos** – Sequence of photos showing the path of the GEC from the inverter to the structure's grounding electrode, including any irreversible splices or taps (required for grounded inverters only).



A/C COMBINER PHOTOS:

20. **A/C Combiner Cover Removed** – A photo of the AC combiner with cover removed, showing interior of load center or panel, all breakers, and label and bus rating.

A/C DISCONNECT PHOTOS:

21. **A/C Disconnect Interior Photo** – Clear photo of interior of A/C Disconnect showing all wiring, grounding and overcurrent protection inside the AC disconnect.

22. **Exterior of A/C disconnect** – Exterior of the AC disconnect, showing manufacturer's label and NEMA rating as well as required safety labeling.

23. **Main Breaker Label Photo** – A close up photos showing labels of service panel.

MAIN PANEL TIE-IN PHOTOS:

24. **Buss bar label** – A photo showing buss bar label.

25. **Interior of Main Service Panel** – Photo of main service panel with the front removed, showing any taps.

IF APPLICABLE PHOTOS:

26. **Ground Mounted Systems photo** – Photo of array, taken from behind, showing mounting and conductor protection.

27. **Metal roof Grounding** – Close up photo of grounding method used of metal roof.

28. **Battery Back-Up Photos** - Photo showing battery back-up system and racking.

Appendix D. 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 D1: Main service panel overloaded per NEC 705(D)(2)(3)(b). (100 amp main circuit breaker + 40 amps of PV) ÷ 100 amp bus rating >120%.

Photo D2: Backfed PV breaker not installed at opposite end of buss bar from main breaker: 2014 NEC690.12(D)(2)(3)(b)

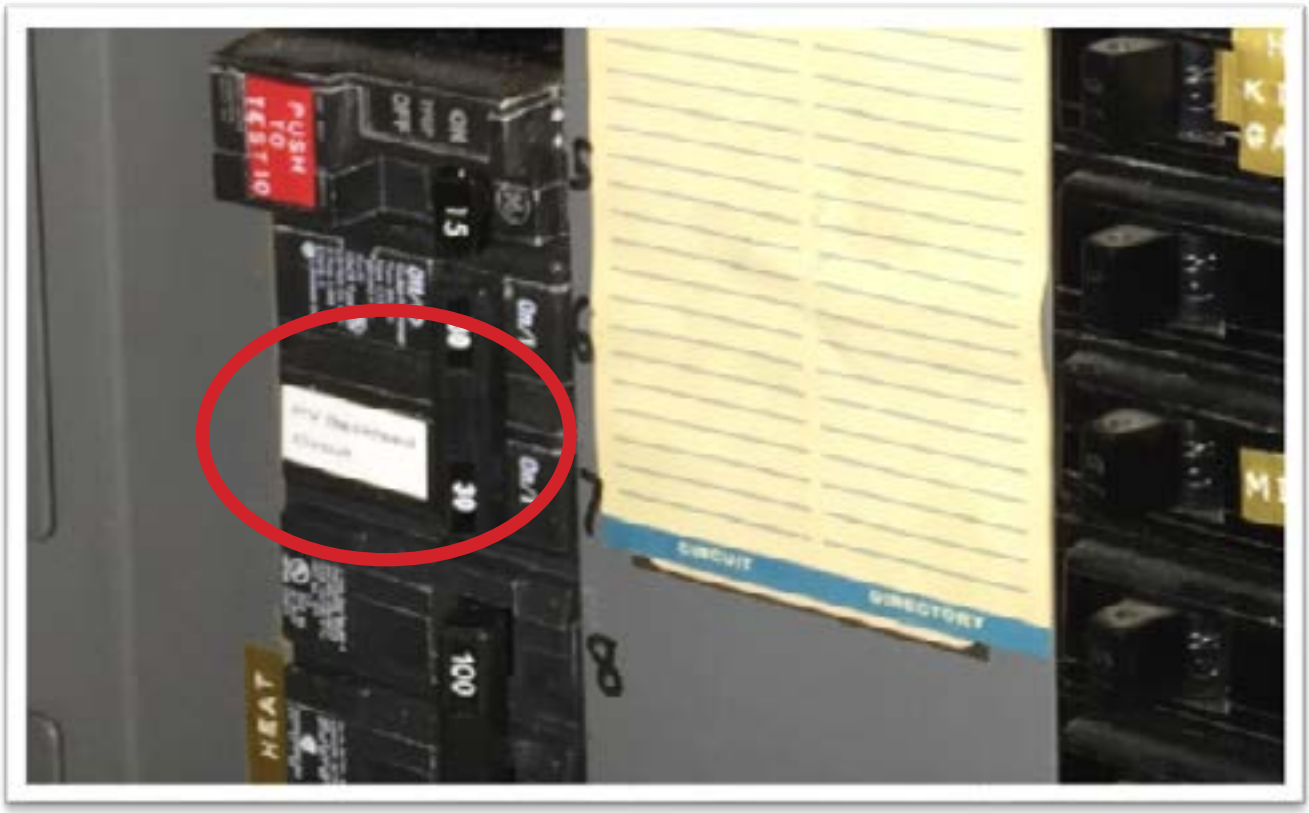


Photo D3: Working clearance not maintained: NEC 110.26

Photo D4: Equipment visibly damaged

Photo D5 - Conductors over 30V not guarded, installed in raceway, or otherwise inaccessible: NEC 690.31(A)

Photo D6: Roof penetrations and anchors not flashed: International Building Code 1503.2, International Residential Code 903.2.

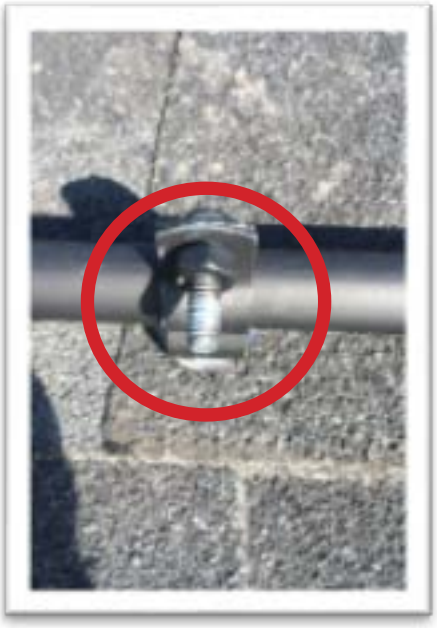


Photo D7: Where not protected from physical damage, equipment grounding conductor must be #6 or larger: NEC 690.46, 250.120(C). Conductors laying on asphalt shingles will become damaged and will not last a PV system's expected 30-year lifespan.

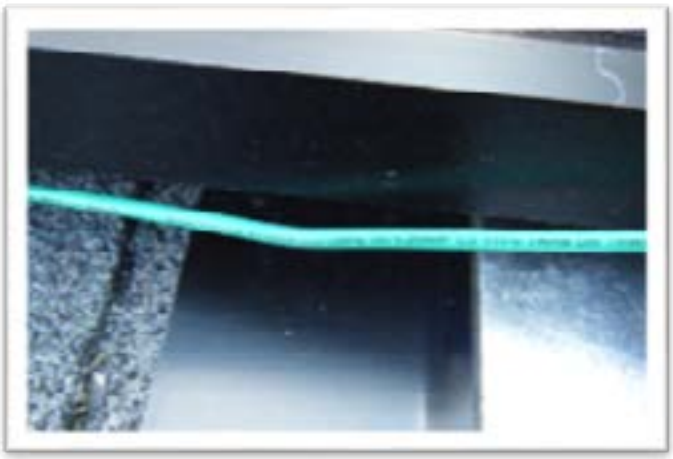


Photo D8: Source circuit conductors in contact with roof: NEC 338.10

Photo D9: 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)

Appendix E. Solar PV System Labeling Guidelines

Technical Bulletin: NYSERDA Solar Photovoltaic System Labeling Guidelines

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, the Cadmus Group has performed approximately 3,000 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 National Electrical Code® (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 picture of what is required labeling 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. While specific installations may have different labeling requirements, the labels included in this bulletin represent those required for solar PV systems under NYSERDA's QA program.

Unless otherwise noted, this bulletin is based on the 2014 edition of the National Electrical Code (NEC). The interpretations in this document are used by inspectors in the NY-Sun QA program.

Document Organization

This bulletin includes the following sections:

I. Label Construction, Placement, Color, and Marking

II. Label Descriptions and NEC References

- Arc-Flash Hazard Warning: NEC 110.16
- Directory/Identification of Power Sources: NEC 705.10, 225.37, 230.2(E), and 705.70
- Conductor Identification & Grouping: NEC 690.31(B), 200.6, 250.119, 310.110, and 690.31(B)
- Ground Fault Indication: NEC 690.5(C)
- Identification of PV Disconnects: NEC 690.13(B)
- Terminals Energized on Line & Load Sides of Disconnect in Open Position: NEC 690.17(E)
- Fuse servicing warning label: NEC 690.16(B)
- DC PV Source & Output Circuits Inside a Building: NEC 690.31(G) (3) & (4)
- Bipolar PV Systems: NEC 690.7(E)(3)
- Ungrounded (non-isolated) PV Systems: NEC 690.35(F)
- DC Photovoltaic Power Source: 690.53
- Identification of PV System Interconnection: NEC 690.54
- Batteries and Energy Storage Systems: NEC 690.5(C) 690.55, 690.71(H)5, 705.80
- Identification of Power Sources: NEC 690.56(B)
- Facilities with Rapid Shutdown: NEC 690.56(C)
- Point of Connection Identification: NEC 705.12(D) (2) (3) (b) & (c)
- Identification and warning of additional power source at the panel board: 690.12(D) (3)
- Identification of backfed breaker(s) NEC 408.4

Overview of Label Locations and Requirements

System Component	Required Labels	Notes
AC Combiner	PV Disconnect (NEC 690.13)	
	AC Characteristics (NEC 690.54)	
	Multiple Sources Present (NEC 705.12(D)(2)(3)(c)	
	Inverter Output Location (NEC 705.12(D)(2)(3)(b))	
	Circuits Identified (NEC 408.4)	
AC Disconnect	PV Disconnect (NEC 690.13)	
	AC Characteristics (NEC 690.54)	
Array	Connector Disconnect Warning (NEC 690.33(E))	
Battery Backup	Battery Characteristics (NEC 690.55 and 705.80) Battery disconnects (NEC 690.71(H)) Ground Fault warning (NEC 690.5(C))	Also note NYSFC 608.7.1 and 608.7.2 for additional fire code related requirements
DC Combiner	PV Disconnect (NEC 690.13)	
	Fuse Servicing Disconnect Directory (NEC 690.16(B))	Labels required for disconnects more than 6ft from fuses and/or not load-break rated
	DC characteristics (NEC 690.53)	
	Energized/ungrounded conductors (NEC 690.35(F))	
DC Disconnect	PV Disconnect (NEC 690.13)	
	Fuse Servicing Disconnect Directory (NEC 690.16(B))	Labels required for disconnects more than 6ft from fuses and/or not load-break rated
	Shock hazard (NEC 690.17(E) and 110.21(B))	
	DC characteristics (NEC 690.53)	
	Energized/ungrounded conductors (NEC 690.35(F))	
Junction & Combiner Boxes in Transformerless Systems	Energized/ungrounded conductors (NEC 690.35(F))	Not necessary on pull boxes where there are no splices
String Inverter	PV Disconnect (NEC 690.13)	For integrated disconnect only-be sure to indicate DC, AC, or dual rating
	GFDI (NEC 690.5(C))	
	DC characteristics (NEC 690.53)	
Transformerless (non-isolated) Inverter	PV Disconnect (NEC 690.13)	For integrated disconnect only-be sure to indicate DC, AC, or dual rating
	Energized/ungrounded conductors (NEC 690.35(F))	
	DC characteristics (NEC 690.53)	

Overview of Label Locations and Requirements (cont.)

System Component	Required Labels	Notes
Load Side Connection	Circuits Identified (NEC 408.4)	
	AC Characteristics (NEC 690.54)	
	Multiple Sources Present (NEC 705.12(D)(2)(3)(c)	
	Inverter Output Location (NEC 705.12(D)(2)(3)(b))	
	Power source directory (NEC 705.10)	
	Inverter directory (NEC 690.15(A) and 705.10)	
Subpanel	PV Disconnect (NEC 690.13)	Label applies to backfed breaker in subpanel
	AC Characteristics (NEC 690.54)	
	Multiple Sources Present (NEC 705.12(D)(2)(3)(c)	
	Inverter Output Location (NEC 705.12(D)(2)(3)(b))	
	Circuits Identified (NEC 408.4)	
Supply Side Connection	Power source directory (NEC 705.10)	Place at both main service disconnect and new PV system disconnect
	AC Characteristics (NEC 690.54)	
	PV Disconnect (NEC 690.13)	

I. Label Construction, Placement, Color, and Marking

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.

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 attach a label or magnet with the company name and contact information at the inverter or interconnection point for easy reference.

Colors

Label colors are chosen per OSHA 29 CFR 1910.145 direction that the requirements of ANSI Z535.4-2011 be used. NFPA 70 (The National Electrical Code) 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.

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.

II. 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 Installation; 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.

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 is 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.

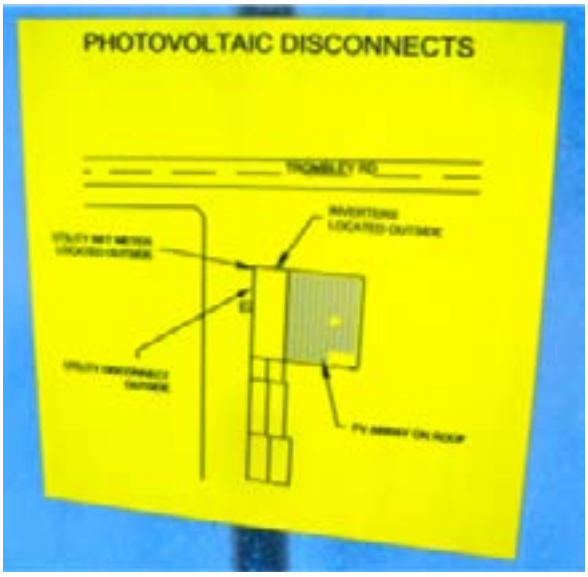
Exception: installations with large numbers of power production sources shall be permitted to be designated by groups.

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.

Conductor Identification & 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 690.4(B)(1) through (4). 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. **PV Output and Inverter Circuits.** The conductors of PV output circuits and inverter input and output circuits shall be identified at all points of termination, connection, and splices.
3. **Conductors of Multiple Systems.** Where the conductors of more than one PV system occupy the same junction box, raceway, or equipment, the conductors of each system shall be identified at all termination, connection, and splice points. Exception: Where the identification of the conductors is evident by spacing or arrangement, further identification is not required.
4. **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 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 (AWG 4 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:

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 (non-isolated) 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.

Ground Fault Indication

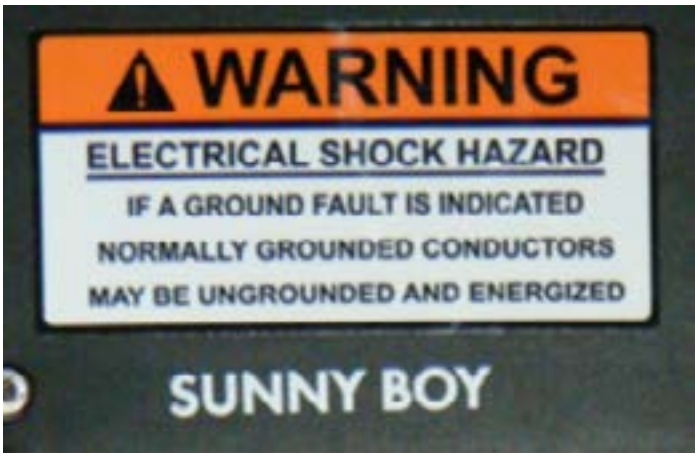
NEC 690.5(C) Labels and Markings

A warning label shall appear on the utility-interactive inverter or be applied by the installer near the ground-fault indicator at a visible location, stating the following:

WARNING
ELECTRIC SHOCK HAZARD
IF A GROUND FAULT IS INDICATED,
NORMALLY GROUNDED CONDUCTORS MAY
BE UNGROUNDED AND ENERGIZED

When the photovoltaic system also has batteries, the same warning is to be applied by the installer in a visible location at the battery bank.

Figure 5



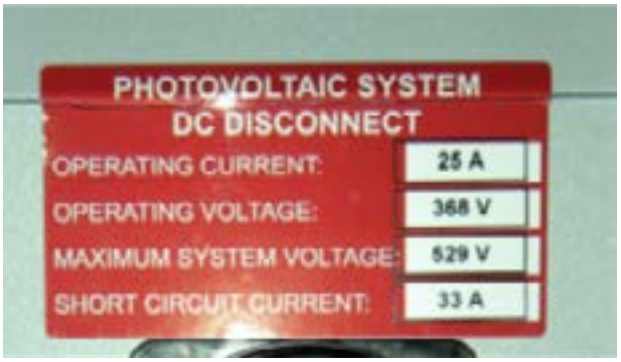
Identification of PV Disconnects

NEC 690.13(B) Marking

Each PV system disconnecting means shall be permanently marked to identify it as a PV system disconnect.

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).

Figure 6



NEC 690.16(B) Fuse Servicing

Where the disconnecting means are located more than 1.8 m (6 ft.) from the overcurrent device, a directory showing the location of each disconnect shall be installed at the overcurrent device location. Non-load-break-rated disconnecting means shall be marked “Do not open under load”.

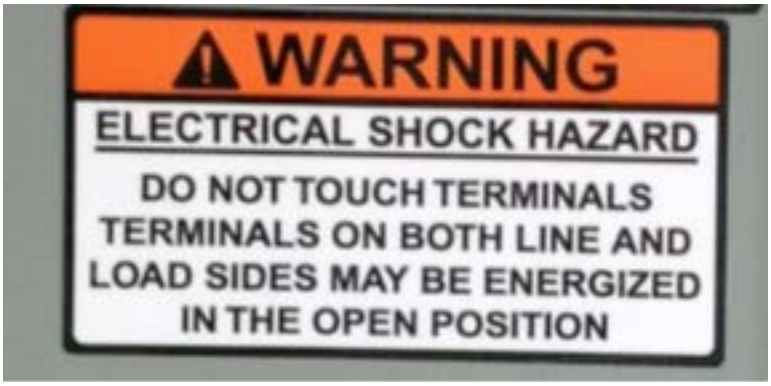
Terminals Energized on Line and Load Sides of Disconnect in Open Position

NEC 690.17 (E) Switch or Circuit Breaker

Where all terminals of the disconnecting means may be energized in the open position, a warning sign shall be mounted on or adjacent to the disconnecting means. The sign shall be clearly legible and have 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 7



Note: This requirement does not apply to AC disconnects for any inverter Listed to UL 1741

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 power source conductors 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 8

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 power 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 9

Bipolar PV Systems

NEC 690.7(E)(3) Bipolar Source and Output Circuits

WARNING

BIPOLAR PHOTOVOLTAIC ARRAY.
DISCONNECTION OF NEUTRAL OR GROUNDED CONDUCTORS
MAY RESULT IN OVERVOLTAGE ON ARRAY OR INVERTER.

The warning sign(s) or label(s) shall comply with 110.21(B).

Ungrounded (non-isolated, transformerless) PV Systems

NEC 690.35(F) Ungrounded PV Power Systems

The PV power source shall be labeled with the following warning at each junction box, combiner box, disconnect, and device where energized, ungrounded circuits may be exposed during service:

WARNING
ELECTRIC SHOCK HAZARD.
THE DC CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM
ARE UNGROUNDED AND MAY BE ENERGIZED.

Figure 10

Figure 11

DC Photovoltaic Power Source

NEC 690.53 Direct-Current Photovoltaic Power Source

A permanent label for the direct-current photovoltaic power source indicating items (1) through (5) provided by the installer at the photovoltaic disconnecting means:

1. Rated maximum power-point current
2. Rated maximum power-point voltage
3. Maximum system voltage

   Refer to § 690.7(A) for maximum PV system voltage.
4. Maximum circuit current. Where the PV power source has multiple outputs, 690.53(1) and (4) shall be specified for each output.

   Refer to § 690.8(A) for calculation of maximum circuit current.
5. Maximum rated output current of the charge controller (if installed).

   Informational Note: Reflecting systems used for irradiance enhancement may result in increased levels of output current and power.

Note: Inverters with multiple MPPT channels must be labeled per channel.

Figure 12

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 13

Batteries and Energy Storage Systems

NEC 690.55 PV Systems Employing Energy Storage

Photovoltaic power systems employing energy storage shall also be marked with the maximum operating voltage, including any equalization voltage and the polarity of the grounded circuit conductor.

Note: also refer to NEC 690.5(C), 480.6(D), 705.80, and 690.71(H)5

NEC 690.71 Storage Batteries

Section H describing disconnects and over current protection where energy storage device input and output terminals are more than 1.5 m (5 feet) from connected equipment, or where the circuits from these terminals pass through a wall or partition, the installation shall comply with the following:

(5) where the energy storage device disconnecting means is not within sight of the PV system AC and DC disconnecting means, records or directories shall be installed at the locations of all disconnecting means indicating the location of all disconnecting means.

NEC 690.56 Identification of Power Sources

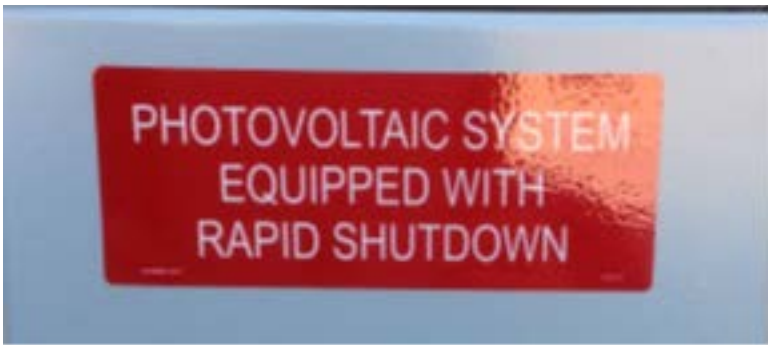
(A) Facilities with Stand-Alone Systems. Any structure or building with a PV power system that is not connected to a utility service source and is a stand-alone system shall have a permanent plaque or directory installed on the exterior of the building or structure at a readily visible location acceptable 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. The marking shall be in accordance with 690.31(G).

Note: (A) will not apply to NY-SUN funded systems

(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 providing the location of the service disconnecting means and the PV system disconnecting means if not located at the same location. The warning sign(s) or label(s) shall comply with 110.21(B). Refer to figure 2.

(C) Facilities with Rapid Shutdown. Buildings or structures with both utility service and a PV system, complying with 690.12, shall have a permanent plaque or directory including the following wording: PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN.

Figure 14



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.

Point of Connection Identification

NEC 705.12 (D) (3)

Equipment containing overcurrent devices in circuits supplying power to a buss bar or conductor supplied from multiple sources shall be marked to indicate the presence of all sources.

Figure 15

Identification and warning of additional power source at the panel board

705.12 (D) (2) (3) (b)

A permanent warning label shall be applied to the distribution equipment with the following or equivalent marking:

WARNING
INVERTER OUTPUT CONNECTION
DO NOT RELOCATE THIS OVERCURRENT DEVICE

Figure 16

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 17

Common Labeling Mistakes to Avoid

Do not cover manufacturer's labeling with other labels.

Figure 18

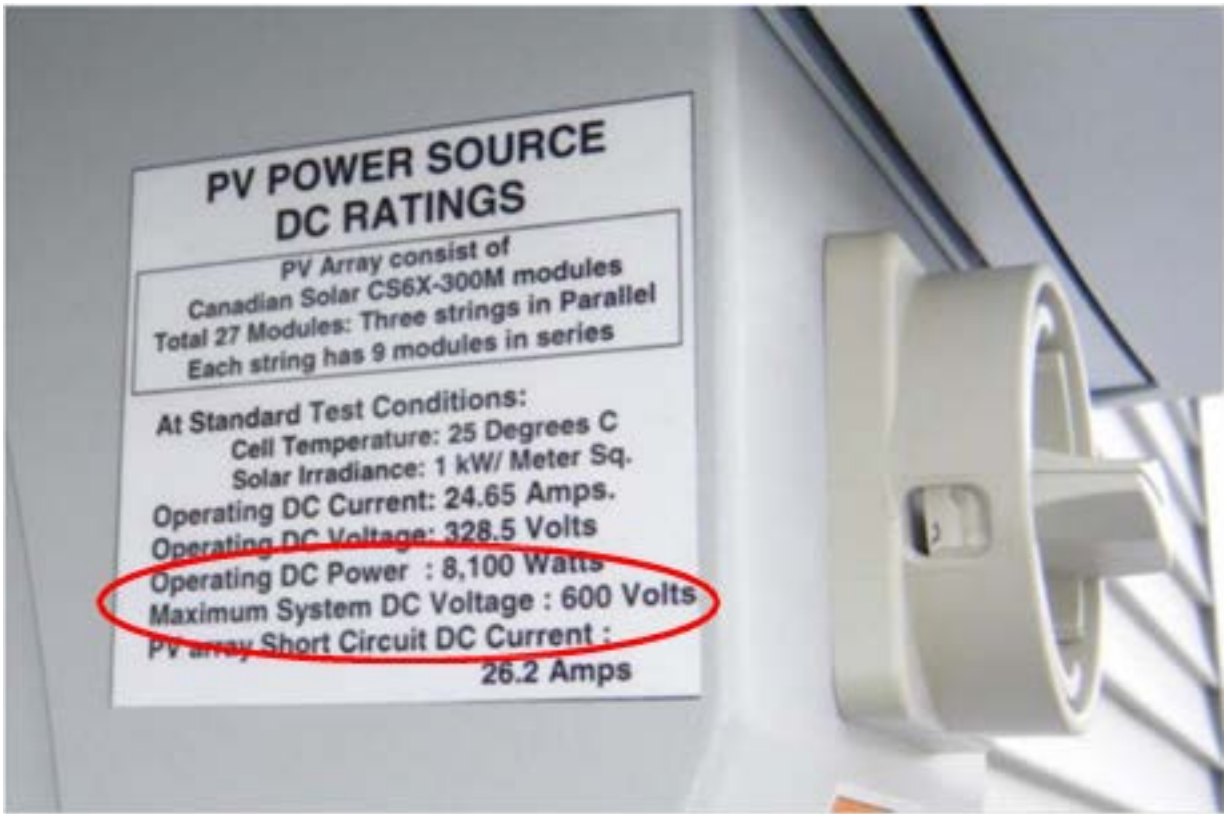
Figure 19

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 110.21.

Figure 20

Maximum System DC voltage is not 600VDC, it must be calculated per 690.7(A)

Figure 21



Label Not of Permanent Construction, nor conforming with 690.31(G)4.

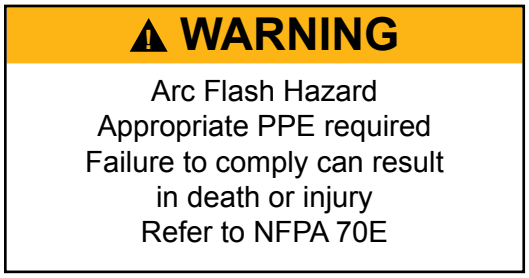
Figure 22

Appendix F. 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.

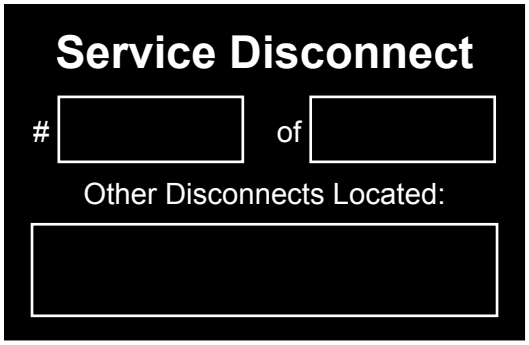
1) All labeling used outdoors must be engraved metal, UV stabilized engraved plastic or of a material sufficiently durable to withstand the environment involved. Values hand written or in written in marker are not acceptable per NEC 2014.
2) Labels used indoors may be made of durable vinyl or paper
3) Do not cover any existing manufacturer applied labels with installation specific labels
4) Label colors chosen per NFPA 70 2014 direction that ANSI Z535-2011 be used
5) Requirements comply with NEC 2014
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
110.16



Label #2
225.37, 230.2(E)

 # 1 of 2 and 2 of 2 where utility is 1 and solar is 2, etc. Description of other disco location.



Label #3
225.37,
230.2(E),
705.12(D)3

This equipment is fed by multiple sources.
Source 1:
Utility Grid – main service panel in basement
Source 2:
Photovoltaic System – Disconnect on SE wall of house

Label #4
690.5(C)

⚠ WARNING

ELECTRIC SHOCK HAZARD
IF A GROUND FAULT IS INDICATED,
NORMALLY GROUNDED CONDUCTORS
MAY BE UNGROUNDED
AND ENERGIZED

Label #5
690.7(E)3

⚠ WARNING

BIPOLAR PHOTOVOLTAIC ARRAY.
DISCONNECTION OF NEUTRAL
OR GROUNDED CONDUCTORS MAY
RESULT IN OVERVOLTAGE ON
ARRAY OR INVERTER

Label #6
690.13(B)

PHOTOVOLTAIC SYSTEM DISCONNECT

Label #7
690.15(A)4,
690.56(B),
705.10

PARALLEL GENERATION SOURCE:
PHOTOVOLTAIC SYSTEM

UTILITY SERVICE DISCONNECT LOCATED:

PHOTOVOLTAIC SYSTEM DISCONNECT LOCATED:

Label #8
690.16(B)

Do not open under load

Label #9
690.17(E)

⚠ WARNING

ELECTRIC SHOCK HAZARD
DO NOT TOUCH TERMINALS.
TERMINALS ON BOTH THE LINE AND
LOAD SIDES MAY BE ENERGIZED
IN THE OPEN POSITION

Label #10
690.31(G)3 & 4,
690.31(G)1

Plaque or directory shall be reflective, with all letters capitalized and having a minimum height of 9.5mm (3/8 in.), in white on red background

WARNING: PHOTOVOLTAIC
POWER SOURCE

Label #11
690.35(F)

⚠ WARNING

ELECTRIC SHOCK HAZARD
THE DC CONDUCTORS OF THIS
PHOTOVOLTAIC SYSTEM ARE
UNGROUNDED AND ENERGIZED

Label #12
690.53

PHOTOVOLTAIC DISCONNECT

Rated maximum power-point current	A
Rated maximum power-point voltage	V
Maximum system voltage	V
Maximum circuit current	A

Label #13
690.53 - multiple MPPT channels

PHOTOVOLTAIC DISCONNECT

Rated maximum power-point current	A
Rated maximum power-point voltage	V
Maximum system voltage	V
Maximum circuit current	A
Maximum rated output current of the charge controller	A

Label #14
690.55

⚠ WARNING

Photovoltaic System Utilizing Energy Storage

Nominal operating voltage	V
Maximum DC voltage	V
Grounded conductor is	NEGATIVE

Label #15
690.54

PHOTOVOLTAIC POWER SOURCE

RATED AC OUTPUT CURRENT	A
NOMINAL OPERATING AC VOLTAGE	V

Label #16
690.56(C)

Plaque or directory shall be reflective, with all letters capitalized and having a minimum height of 9.5mm (3/8 in.), in white on red background

PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN

Label #17
690.71(H)5

This building contains a battery backup storage system located:

Disconnects are located:

Label #18
705.12(D)2(3)b

⚠ WARNING

INVERTER OUTPUT CONNECTION
DO NOT RELOCATE THIS
OVERCURRENT DEVICE

Label #19
705.12(D)2(3)c

⚠ WARNING

THIS EQUIPMENT FED BY MULTIPLE SOURCES.
TOTAL RATING OF ALL OVERCURRENT DEVICES,
EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE,
SHALL NOT EXCEED AMPACITY OF BUSS BAR

Appendix G: 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.

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.

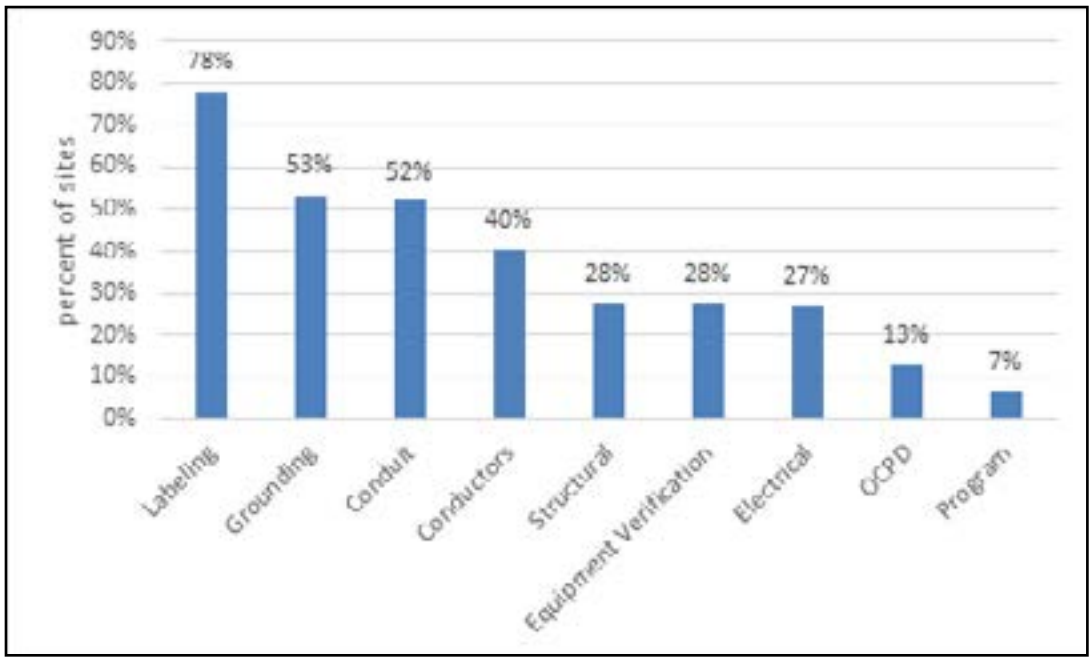
Deficiency Description

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 Description	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



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	

Rank	System Component	Deficiency Description	Example
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	

Grounding Deficiencies: 53% of Systems Inspected

Below, we have summarized the top 5 deficiencies found related to Grounding.

Table 3. Top Grounding Deficiencies

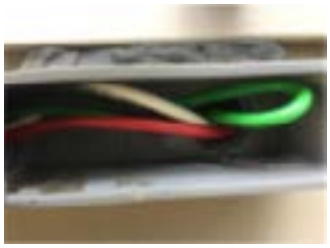
Rank	System Component	Deficiency Description	Example
1	Supply Side Connection	Grounded (neutral) conductor is not properly bonded to PV service disconnect enclosure using a listed grounding bus or terminal, or the grounded conductors are not properly bonded to the Grounding Electrode Conductor (GEC), 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.	

Rank	System Component	Deficiency Description	Example
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.	

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).	

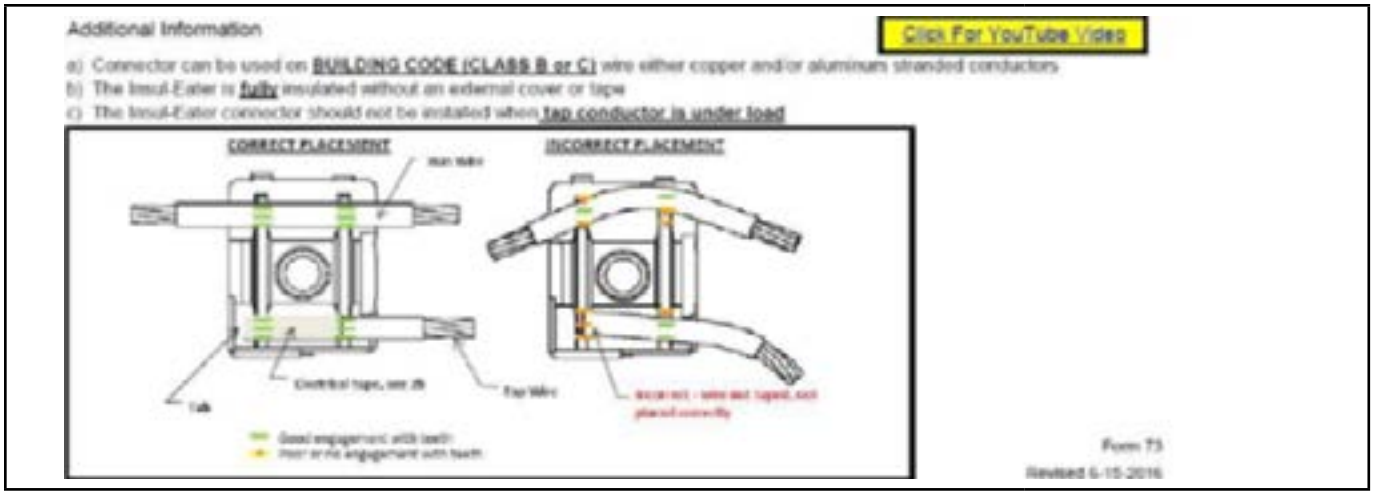
Rank	System Component	Deficiency Description	Example
4	Supply Side Connection	Circuit conduit or raceway lacks adequate support, in violation of NEC (LFMC-350.30, EMT-358.30, Metal Trough-376.30).	
5	Array	Conduit is missing an approved internal sealant at penetrations between conditioned and unconditioned spaces to prevent condensation, in violation of NEC Article 300.7(A).	

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.	



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).	

Rank	System Component	Deficiency Description	Example
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).

Appendix H: Additional Resources

Adopting the NYS Unified Solar Permit Webinar
training.ny-sun.ny.gov/resources-5#pvtn-webinars-and-podcasts

Residential Solar Permitting Best Practices Explained
www.irecusa.org/wp-content/uploads/2013/09/expanded-best-practices.pdf

Expedited Permit Process for PV Systems
www.solarabcs.org/about/publications/reports/expedited-permit/pdfs/Expermitprocess.pdf

Other Resources for Municipal Inspectors and Code Officials
training.ny-sun.ny.gov/resources-5#for-inspectors-and-code-officials

Understanding the roof top access and ventilation requirements as described in Section R324 of the 2015 International Residential Code

This section is meant to help you understand the *2015 International Residential Code* and Errata amendments as adopted by New York State.

We encourage you to have a discussion with your local code official to determine the specific requirements.

In New York State, it is the responsibility of the Local Authority Having Jurisdiction (AHJ) to interpret all codes and standards. ***Always consult with your local code official to determine code compliance.***

SECTION 324 Solar Energy Systems

2015 IRC Code text is black.

2017 NYS Uniform Code Supplements are highlighted in yellow.

Additional commentary is blue.

"**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 the International Fire Code."

(This is a reference to the 2015 International Fire Code [IFC].)

"**R324.3 Photovoltaic systems.** Photovoltaic systems shall be designed and installed in accordance with Sections R324.3.1 through R324.7.7 and NFPA 70. Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction."

(NFPA 70 is also known as the 2014 National Electrical Code.)

"**R324.3.1 Equipment Listings.** Photovoltaic panels and modules shall be listed and labeled in accordance with UL1703.

"**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 Section R907"

(2015 IRC Code section "R907 Rooftop –Mounted Photovoltaic systems," is the section on "Roof Assemblies" and also contains references to R324, NFPA 70, wind loading R301, fire classification R902, and UL 1703, which are all related sections and standards.)

"**R324.4.1 Roof live load.** Roof structures that provide support for photovoltaic panel systems shall be designed for applicable roof live load. The design of the roof structures need not include roof live load in the areas covered by photovoltaic panel systems. Portions of the roof structures not covered by photovoltaic panels shall be designed for roof live load. Roof structures that provide support for photovoltaic panel systems shall be designed for live load, $\mathbf{L}_R$, for the load case where the photovoltaic panel system is not present."

(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 2015 IRC section for "Roof Assemblies".

R905.16 specifically addresses photovoltaic shingles, which references back to R324 and NFPA 70)

"**R324.6 Ground-mounted photovoltaic systems.** Ground-mounted photovoltaic systems shall be designed and installed in accordance with Section R301."

"**R324.6.1 Fire separation distances.** Ground-mounted photovoltaic systems shall be subject to the fire separation distance requirements determined by the local jurisdiction."

(R301 is the "Design Criteria" section of the 2015 IRC in the front under the title "Building Planning" which contains information on items such as winds load, snow loads, and design temperatures.

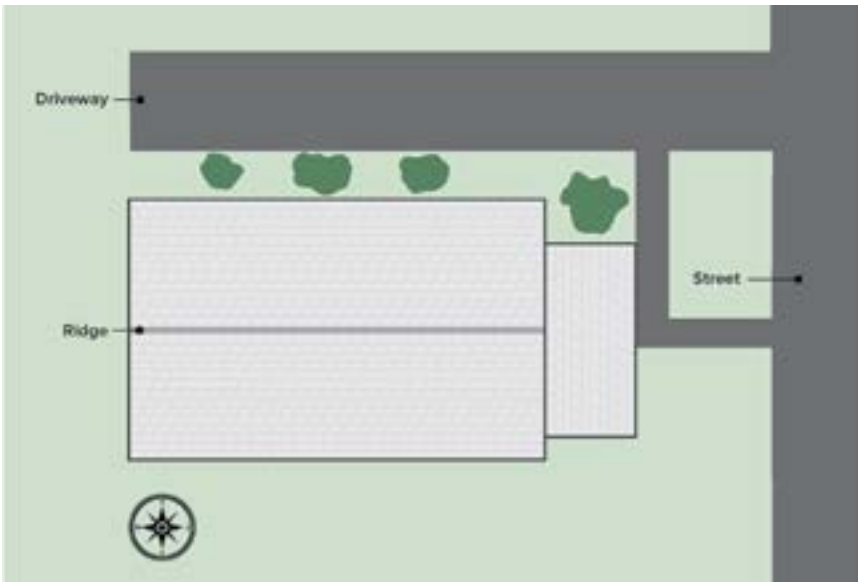
R324.6.1 reinforces the need to coordinate with the local authority having jurisdiction)

"**R324.7 Access and Pathways.** Roof access, pathways and spacing requirements for solar photovoltaic systems shall be provided in accordance with Sections R324.7.1 through R324.7.6

Exceptions:

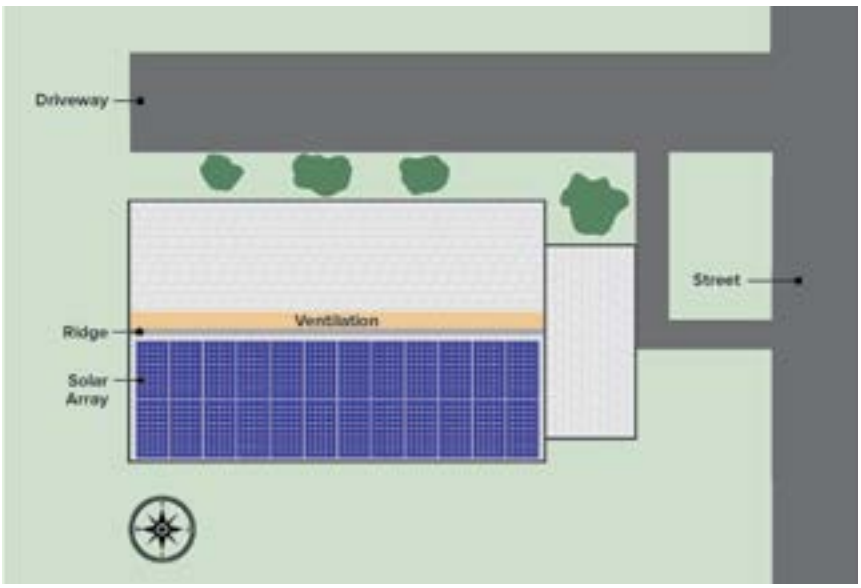
1. Where an alternate ventilation method has been provided.
2. Where vertical ventilation techniques will not be employed.
3. Detached garages and accessory structures."

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 roof with alternative ventilation (Figure 2)



If ventilation is required it may be possible to propose an alternate ventilation location on roof slope opposite the array or the side wall of an attic space. Alternate locations should be coordinated and approved by the AHJ.

When proposing an alternate ventilation location, indicate the direction of the prevailing wind.

"**R324.7.1 Size of solar photovoltaic array.** Each array shall not exceed 150 feet (45 720mm) in any direction."

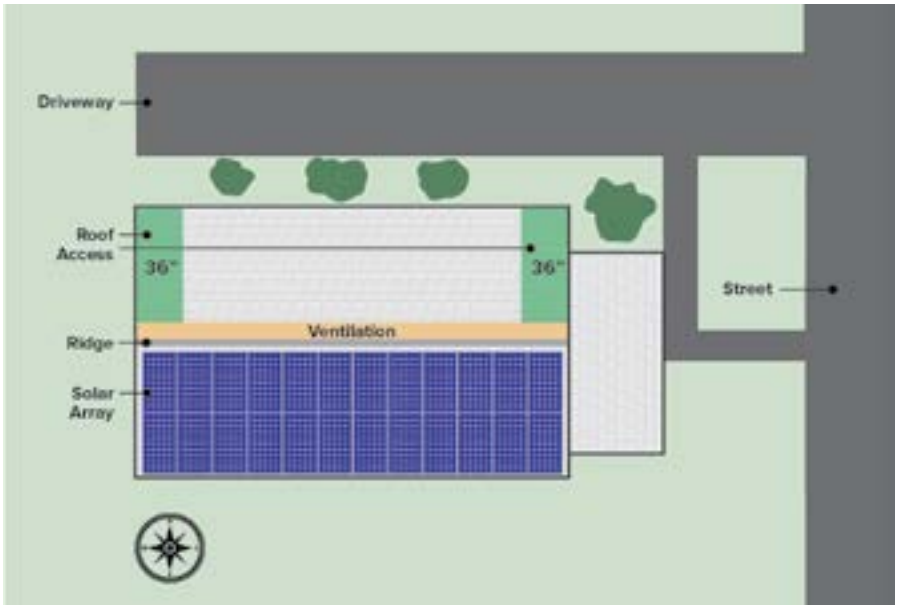
(Size 150 feet in any direction. 150' X 150' = 22,500 Square Feet. This should not be an issue for the vast majority of residences. Consult the "2015 International Building Code" for larger nonresidential structures.)

"**R324.7.2 Roof access points.** Roof access points shall be located:

1. In areas that establish access pathways that are independent of each other and as remote from each other as practicable so as to provide escape routes from all points along the roof;
2. In areas that do not require the placement of ground ladders over openings such as windows or doors or areas that may cause congestion or create other hazards;"
3. At strong points of building construction, such as corners, pilasters, hips, and valleys, and other areas capable of supporting the live load from emergency responders;
4. Where the roof access point does not conflict with overhead obstructions such as tree limbs, wires, signs;
5. Where the accompanying ground access area does not conflict with ground obstructions such as decks, fences, or landscaping; and
6. In areas that minimize roof tripping hazards such as vents, skylights, satellite dishes, antennas, or conduit runs."

(Access and egress should always be available in two locations and cannot block widow and door access or emergency egress.)

Single ridge roof with alternate ventilation shown with two access points (Figure 3)



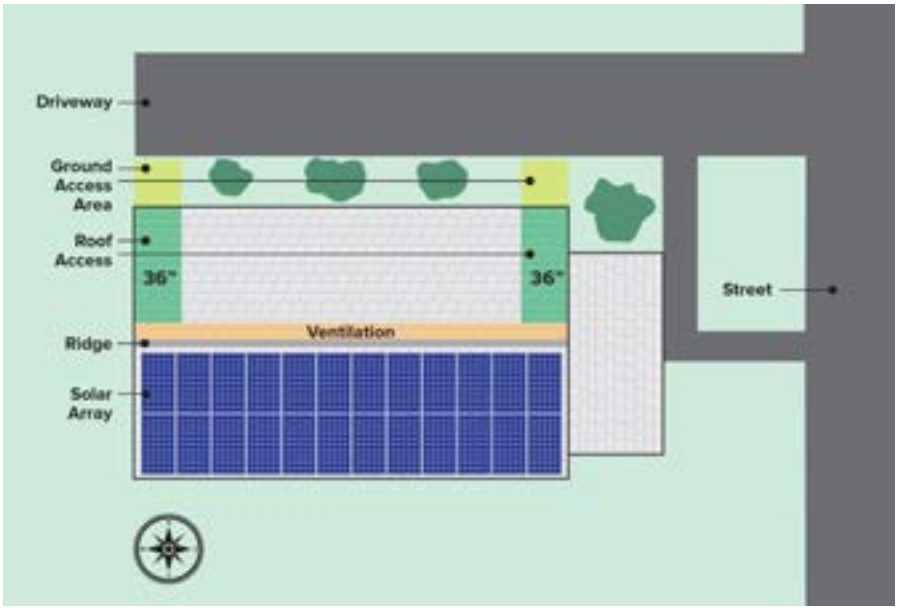
Looking back at the previous typical residential single ridge example, in order to maximize the southern facing roof it may be possible to propose an alternate ventilation on opposite roof slope and two roof access points on the opposite roof slope.

"**R342.7.3 Ground access areas.** Ground access areas shall be located beneath access roofs, and roof access points so as to facilitate roof access. The minimum width of the ground access area shall be the full width of the access roof or roof access point, measured at the eave. The minimum depth shall allow for safe placement of ground ladders for gaining entry to the access roof."

(Ground access must align with roof access.)

"**R324.7.4 Single ridge roofs.** Panels, modules, or arrays installed on roofs with a single ridge shall be located in a manner that provides two 36 inches wide (914mm) access pathway extending from the roof access point to the ridge. Access 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."

Single ridge roof indicating ground access in yellow (Figure 4)



Using the same example, you can see that the ground access aligns with roof access. Note that the two access points and 36" pathways allow two directions of access and egress and do not share a common truss of rafter. There is also adequate unobstructed ground access.

"**Exceptions:**

1. Roofs with slopes of 2 units vertical in 12 units horizontal (16.6 percent) and less.
2. Structures where an access roof fronts a street, driveway, or other area readily accessible to emergency responders.
3. One access pathway shall be required when the ridge or ventable area of a roof slope containing panels, modules or arrays is located not more than 24 inches (610 mm) vertically from an adjoining roof which contains an access roof."

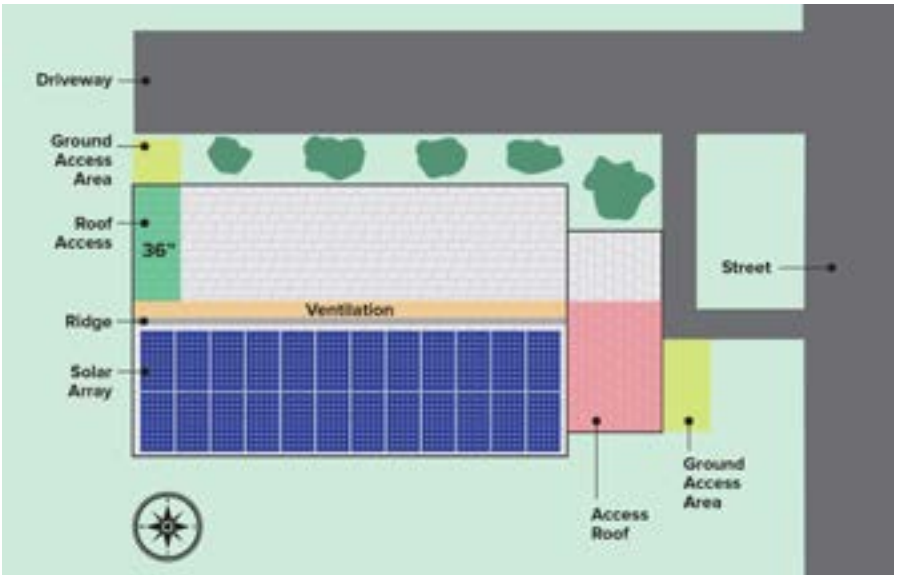
Single roof ridge exceptions:

1. Slope 2/12 or less.

2. Roof fronts a street, driveway, or readily accessible.

3. One pathway is required where roof containing modules is not more than 24" vertically from an adjoining roof that has an access roof.

Single ridge roof – single pathway with exception #3 adjoining roof within 24 Inches (Figure 5)

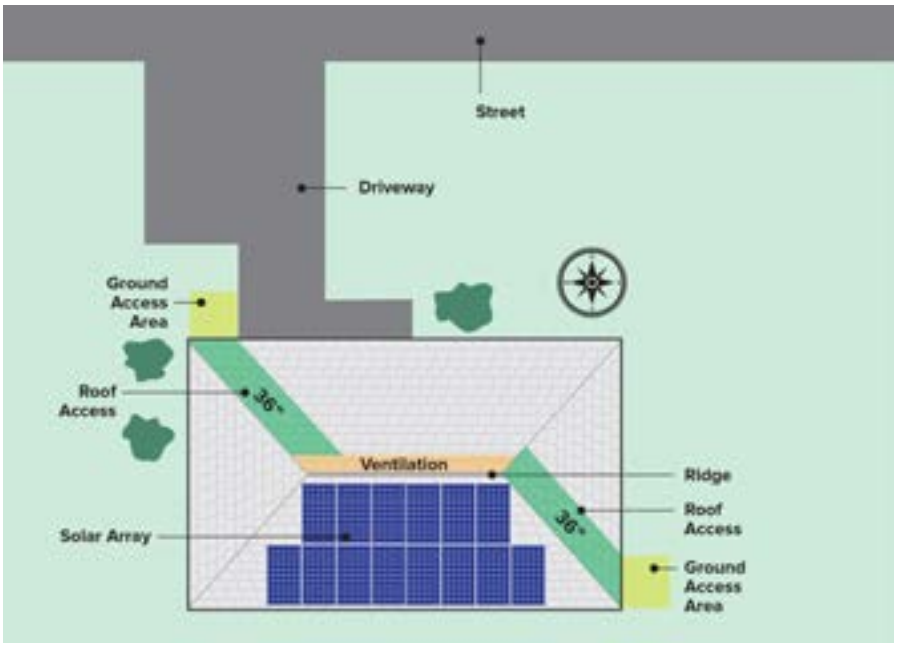


Again, using the same example, with the adjoining roof within 24 inches of the array roof. Applying exception #3 you would only need a single access point and pathway on the main roof, as there is secondary access via an adjoining roof within 24 inches. This still allows two directions of egress, and does not share a common truss of rafter.

An access roof provides access to the ridge or peak of an adjoining roof surface containing solar panels, modules, or arrays.

"**R324.7.5 Hip Roofs.** Panels, modules and arrays installed on dwellings with hip roofs shall be located in a manner that provides a clear access pathway not less than 36 inches wide (914 mm) extending from the roof access point to the ridge or peak, on each roof slope where panels, modules, or arrays are located."

Hip Roof – alternate venting with two roof pathways and ground access (Figure 6)



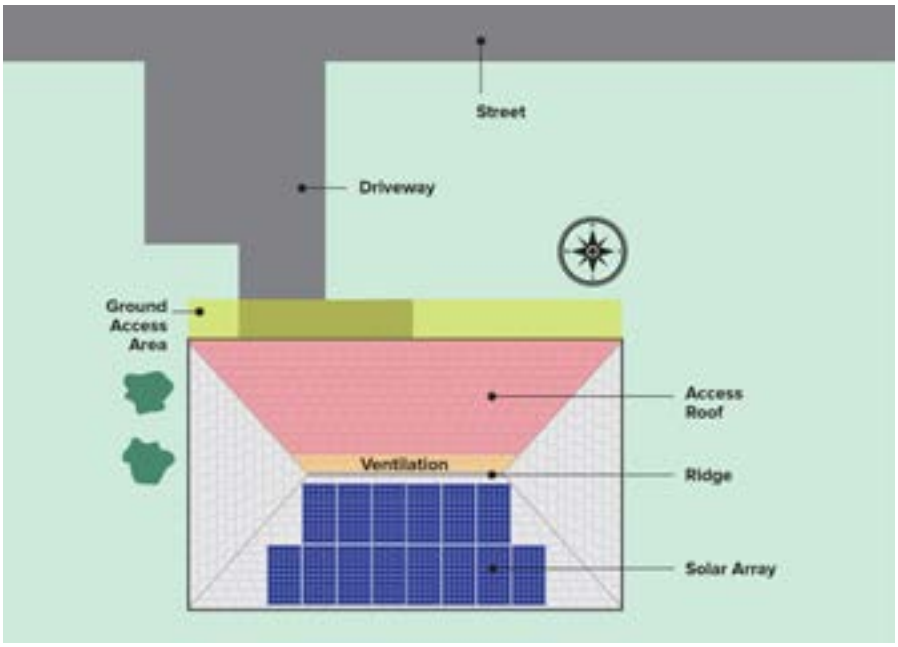
R324.7.5 Typical Hip Roof, showing alternate venting location and clear access pathway not less than 36 inches wide (914 mm) extending from the roof access point to the ridge or peak. Access and egress is from opposite sides and does not rely on the same roof truss or rafter and clear ground access.

"**Exceptions:**

1. Roofs with slopes of 2 units vertical in 12 units horizontal (16.6percent) and less.

2. Structures where an access roof fronts a street, driveway, or other area readily accessible to emergency responders."

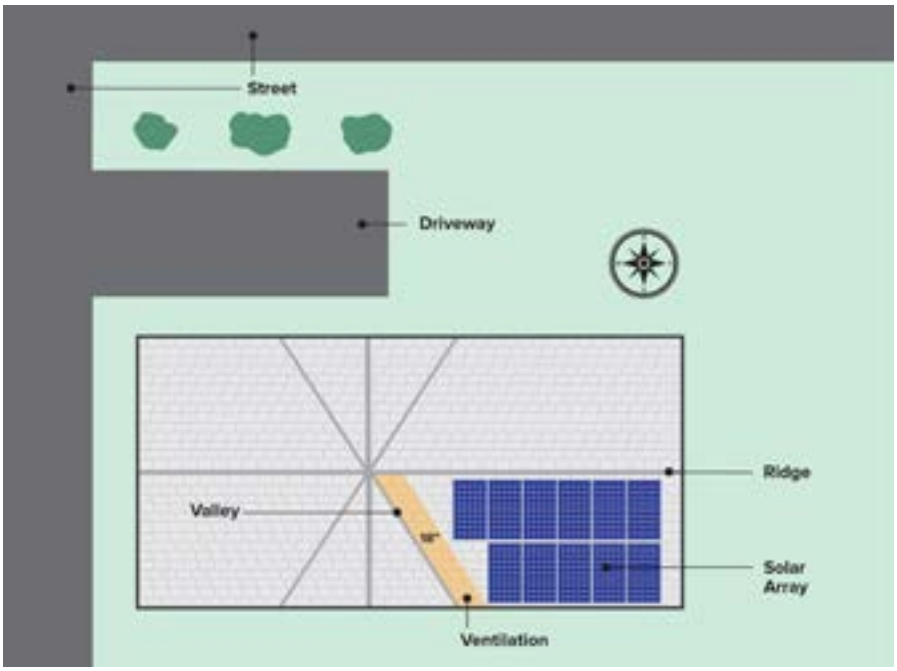
Hip Roof with exception #2 – access roof fronts a street or driveway (Figure 7)



Using the same HIP roof example, exception #2 would apply for all residential structures where an access roof fronts a street, driveway, or other area readily accessible to emergency responders.

"**R324.7.6 Roofs with valleys.** Panels and modules shall not be located less than 18 inches (457 mm) from a valley.
Exception: Roofs with slopes of 2 units vertical in 12 units horizontal (16.6 percent) and less."

Valley Roof showing 18" clearance in yellow to the array (Figure 8)



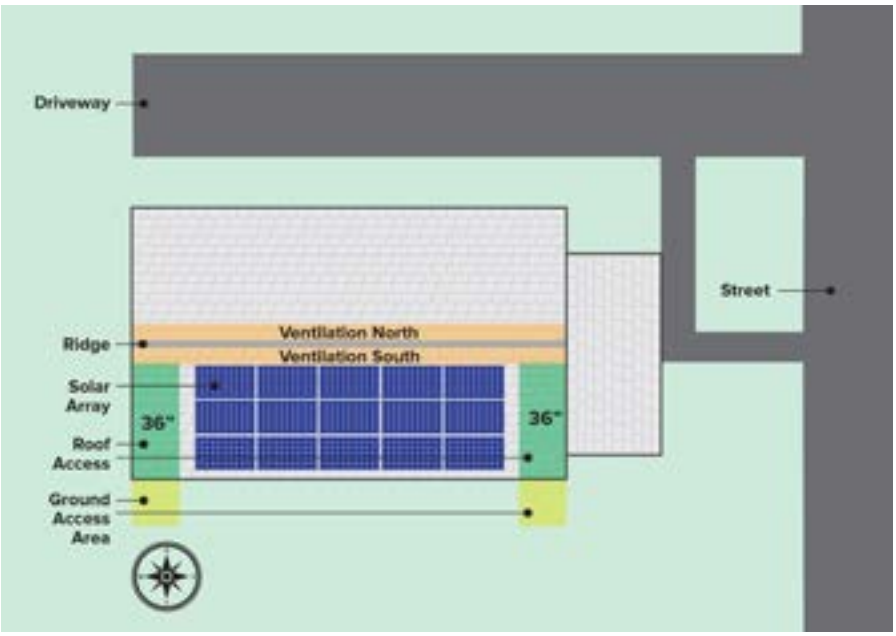
This image shows the 18 inch clear space from the valley to the array. The access and egress paths are not shown for clarity, nor is the venting location. There is street access to the front, and possible alternate venting on the opposite roof slope.

"**R324.7.7 Allowance for smoke ventilation operations**. Panels and modules shall not be less than 18 inches (457 mm) from a ridge or peak.

Exceptions:

1. Where an alternate ventilation method has been provided .
2. Where vertical ventilation methods will not be employed between the upper most portion of the solar photovoltaic system and the ridge or peak.
3. Detached garages and accessory structures."

Single ridge roof showing a smaller array without any exceptions (Figure 9)



Using the original example, but now shown without any exceptions where vertical ventilation techniques will be employed would result in a smaller array. It's important to understand the exceptions and when they apply in order to maximize the available roof space.

NYSERDA's Conclusion

The residential building code as amended for New York State allows the designers of photovoltaic systems several options and alternatives. 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 code.

Contractors, design professionals, and AHJ's must consider many ventilation scenarios and consider that:

1. A fire can break out **anywhere** in a building. Alternate ventilation 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 fires in less than ideal locations.

For more details and definitions, view the 2017 Uniform Code Supplement.
dos.ny.gov/dcea/pdf/2017-Uniform-Code-Supplement-3-17-2017.pdf

Additional Resources

Fire and Safety Considerations for Solar PV Webinar
training.ny-sun.ny.gov/resources-5#pvtn-webinars-and-podcasts

Fire Fighter Safety and Emergency Response for Solar Power Systems
sustainable-firengineering.ie/wp-content/uploads/2015/08/NFPA-FPRF_Firefighter-Tactics-Solar-Power_2013.pdf

Rooftop Solar PV & Firefighter Safety
solaroutreach.org/wp-content/uploads/2014/09/Rooftop-Solar-PV-Firefighter-Safety_Final.pdf

Solar Photovoltaic Installation Guideline
gov.ca.gov/docs/ec/CalFIRE_Solar_PV_guideline.pdf

The following is the access, ventilation, and setback portions of R324 for your reference.

R324.7 Access and Pathways. Roof access, pathways and spacing requirements for solar photovoltaic systems shall be provided in accordance with Sections R324.7.1 through R324.7.6

Exceptions:

1. Where an alternate ventilation method has been provided.
2. Where an alternate ventilation techniques will not be employed.
3. Detached garages and accessory structures.

R324.7.1 Size of solar photovoltaic array. Each array shall not exceed 150 feet (45 720mm) in any direction.

R324.7.2 Roof access points. Roof access points shall be located:

1. In areas that establish access pathways that are independent of each other and as remote from each other as practicable so as to provide escape routes from all points along the roof;
2. In areas that do not require the placement of ground ladders over openings such as windows or doors or areas that may cause congestion or create other hazards;"
3. At strong points of building construction, such as corners, pilasters, hips, and valleys, and other areas capable of supporting the live load from emergency responders;
4. Where the roof access point does not conflict with overhead obstructions such as tree limbs, wires, signs;
5. Where the accompanying ground access area does not conflict with ground obstructions such as decks, fences, or landscaping; and
6. In areas that minimize roof tripping hazards such as vents, skylights, satellite dishes, antennas, or conduit runs.

R342.7.3 Ground access areas. Ground access areas shall be located beneath access roofs, and roof access points so as to facilitate roof access. The minimum width of the ground access. The minimum depth shall allow for safe placement of ground ladders for gaining entry to the access roof.

R324.7.4 Single ridge roofs. Panels, modules, or arrays installed on roofs with a single ridge shall be located in a manner that provides 36 inches wide (914mm) access pathway extending from the roof access point to the ridge. Access 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.

Exceptions:

1. Roofs with slopes of 2 units vertical in 12 units horizontal (16.6 percent) and less.
2. Structures where an access roof fronts a street, driveway, or other area readily accessible to emergency responders.
3. One access pathway shall be required when the ridge or ventable area of a roof slope containing panels, modules or arrays is located not more than 24 inches (610 mm) vertically from an adjoining roof which contains an access roof.

R324.7.5 Hip Roofs. Panels, modules and arrays installed on dwellings with hip roofs shall be located in a manner that provides a clear access pathway not less than 36 inches wide (914 mm) extending from the roof access point to the ridge or peak, on each roof slope where panels, modules, or arrays are located.

Exceptions:

1. Roofs with slopes of 2 units vertical in 12 units horizontal (16.6percent) and less.
2. Structures where an access roof fronts a street, driveway, or other area readily accessible to emergency responders.

R324.7.6 Roofs with valleys. Panels and modules shall not be located less than 18 inches (457 mm) from a valley.

Exception: Roofs with slopes of 2 units vertical in 12 units horizontal (16.6 percent) and less.

R324.7.7 Allowance for smoke ventilation operations. Panels and modules shall not be less than 18 inches (457 mm) from a ridge or peak.

Exceptions:

1. Where an alternate ventilation method has been provided.
2. Where vertical ventilation methods will not be employed between the upper most portion of the solar photovoltaic system and the ridge or peak.
3. Detached garages and accessory structures.

State Environmental Quality Review (SEQR) for Large-Scale Solar Energy Systems

Table of Contents

List of Acronyms

APA . . . . . Adirondack Park Agency

CEQRA . . . . . City Environmental Quality Review Act

CEQR . . . . . City Environmental Quality Review

DEIS . . . . . Draft Environmental Impact Statement

DEP . . . . . Department of Environmental Protection (of New York City)

EAF . . . . . Environmental Assessment Form

EIS . . . . . Environmental Impact Statement

FEAF . . . . . Full Environmental Assessment Form

NYSDEC . . . . New York State Department of Environmental Conservation

NYSERDA . . . New York State Energy Research and Development Authority

PV . . . . . Photovoltaic

SEAF . . . . . Short Environmental Assessment Form

SEQRA . . . . . State Environmental Quality Review Act

SEQR . . . . . State Environmental Quality Review

SHPO . . . . . State Historic Preservation Office

USACE . . . . . U.S. Army Corps of Engineers

1 Introduction

The purpose of this guidance document is to assist local governments completing the State Environmental Quality Review (SEQR) process for rooftop and ground-mount solar photovoltaic (PV) energy systems. 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 2, "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 solarhelp@nyserda.ny.gov

2 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 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.

2.1 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.

Step 1: Is the Project Subject to SEQR?

See Section 4.1 for more information

- 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.

Step 2: Prepare Environmental Assessment Form

See Section 4.3.2 for more information

- The Applicant prepares Part 1 of the Environmental Assessment Form (EAF) and provides it to the Lead Agency for review. Use the online version of the EAF linked to the NYSDEC database. I 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, Part1). 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.

Step 3: Initiate Coordinated Review

See Section 4.3.3 for more information

- 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.

Step 4: Identify and Evaluate Environmental Impacts

See Section 4.4.1 for more information

- 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).

Step 5: Discuss Project Changes to Reduce Impacts

See Section 4.4.1 for more information

- 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.

Step 6: Determine Significance of Environmental Impacts

See Section 4.4.2 for more information

- 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).

Step 7: File Negative Declaration

See Section 4.4.3 for more information

- Negative Declaration for an Unlisted Action - Filed with the Lead Agency

  > Conditioned Negative Declaration (See 6 NYCRR 617.7(d))

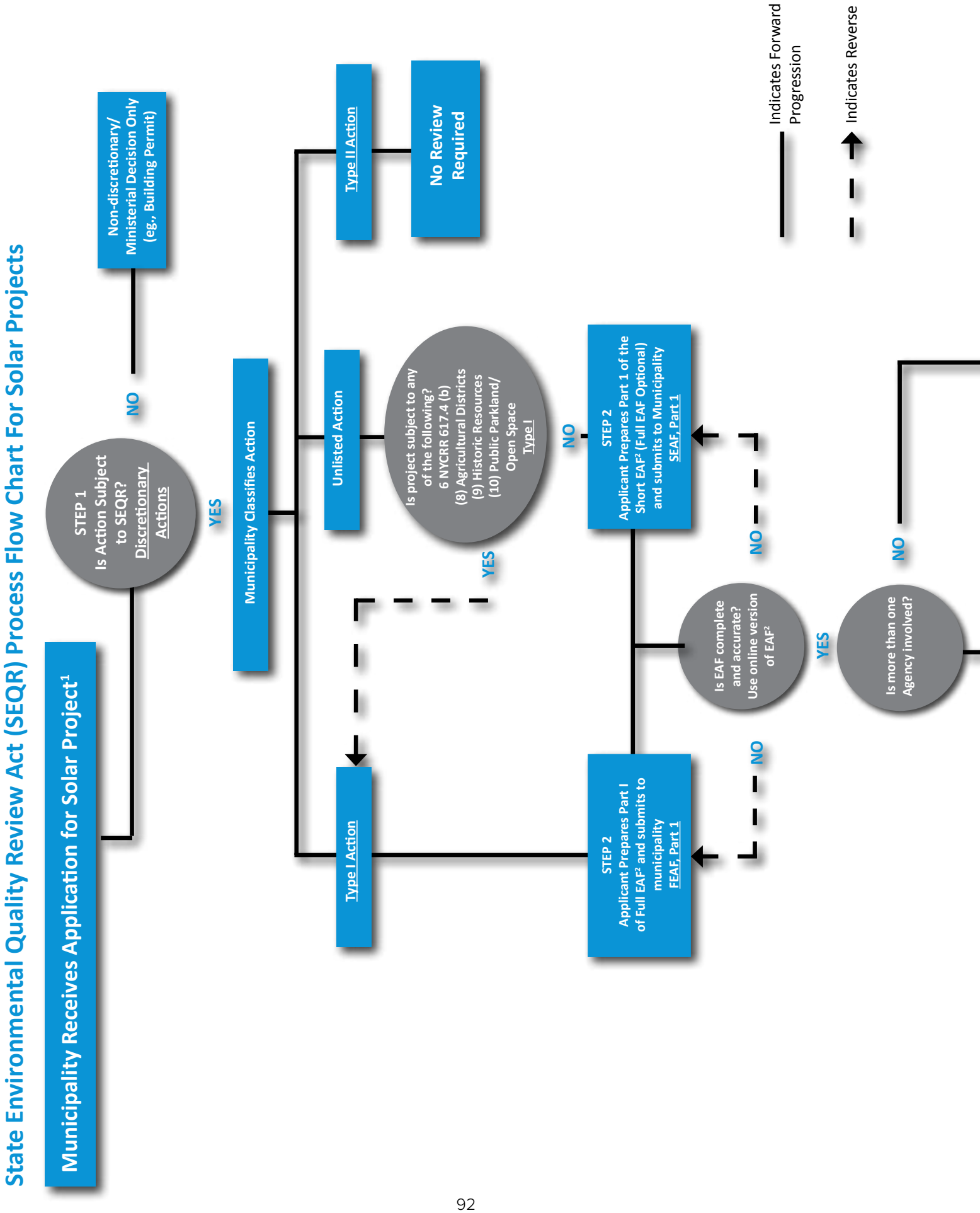
- Negative Declaration for a Type I Action

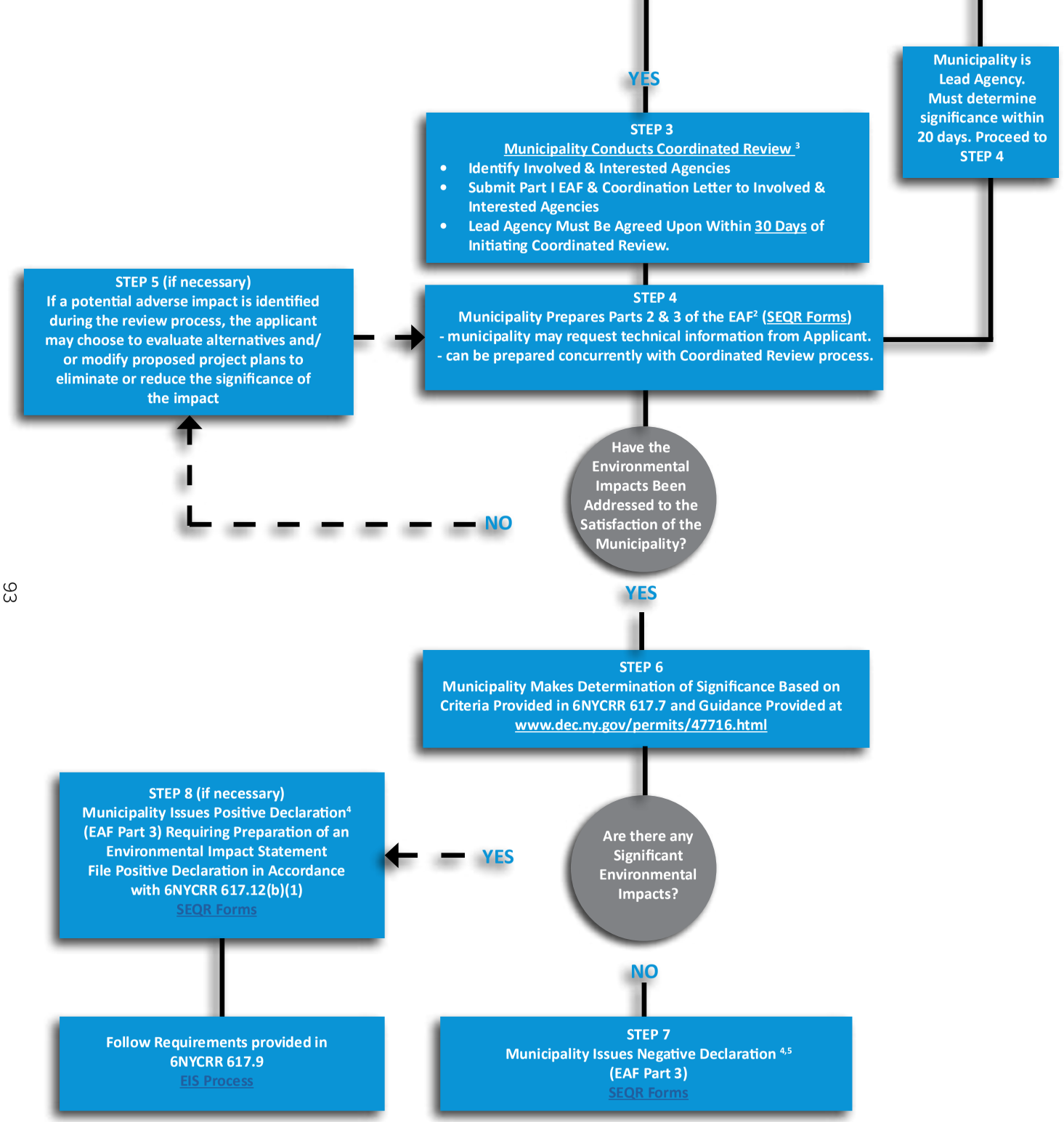
Step 8: Positive Declaration

See Section 4.4.3 for more information

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

2.2 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 http://www.dec.ny.gov/permits/6191.html

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

3 Background on the SEQR Regulations

3.1 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. For large-scale solar installations, 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.

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.

3.2 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.

3.3 Proposed NYSDEC Amendments to the SEQR Regulations

Under existing SEQR regulations, the majority of commercial, ground-mount solar projects are considered Unlisted or Type I Actions. NYSDEC is currently considering amendments to SEQR, including changes to the Type I and Type II lists that could impact the review procedures of solar projects. Two additions to the Type II list are proposed that directly relate to solar installations:

627.5(15)

Installation of five megawatts or less of solar energy arrays on a sanitary landfill, brownfield site that has received a brownfield site clean-up order certificate of completion (under 6 NYCRR 375-.3.9), waste-water treatment facilities, sites zoned for industrial use or installation of five megawatts or less of solar canopies at or above residential and commercial parking facilities (lots or parking garages).

617.5(16)

Installation of five megawatts or less of solar energy arrays on an existing structure that is not listed on the National or State Register of Historic Places or located within a district listed in the National or State Register of Historic Places or on a structure or within a district that has not 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.

If these proposed changes are adopted, projects that meet the criteria will require no further SEQR review.

4 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.

4.1 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.

4.1.1 Is There a 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, which is less likely. 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. 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.

4.1.2 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."
- 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.

4.2 SEQR Roles & Responsibilities

4.2.1 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.

4.2.2 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.

4.2.3 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.

4.2.4 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.

4.2.5 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.

4.3 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.

4.3.1 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, streams 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 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.

4.3.2 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.

4.3.3 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).

4.3.4 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.

4.4 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).

4.4.1 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.

4.4.2 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);
- 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.

4.4.3 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).

5 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.

5.1 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.

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.

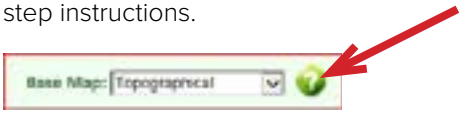
d. Always save the prefilled form to your network before completing the remaining questions in Part 1.[2]

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

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.

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.
- Introduction to SEQR: This is NYSDEC's introductory page on SEQR.
- Stepping Through the SEQR Process: A step-by-step guide to the SEQR process
- SEQR Publications: Publications pertaining to SEQR

[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.

- "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 - Proposed Amendments 2017: The NYSDEC website for proposed amendments to streamline the SEQR process.

5.2 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

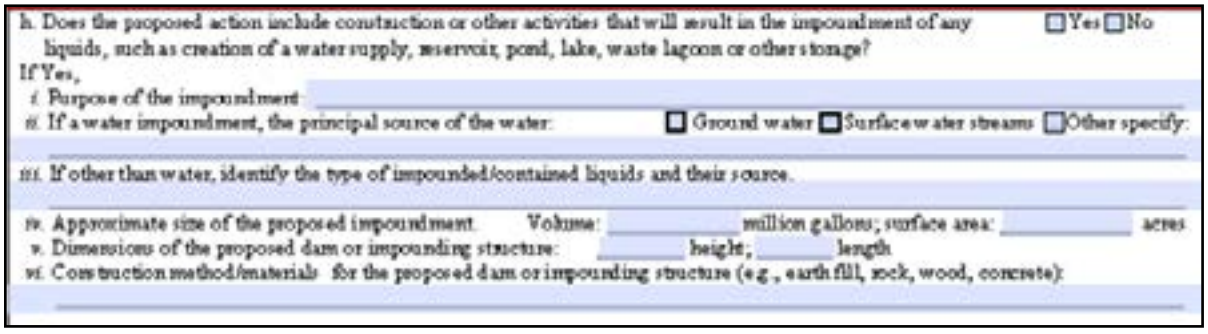
D. Project Details

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: _____

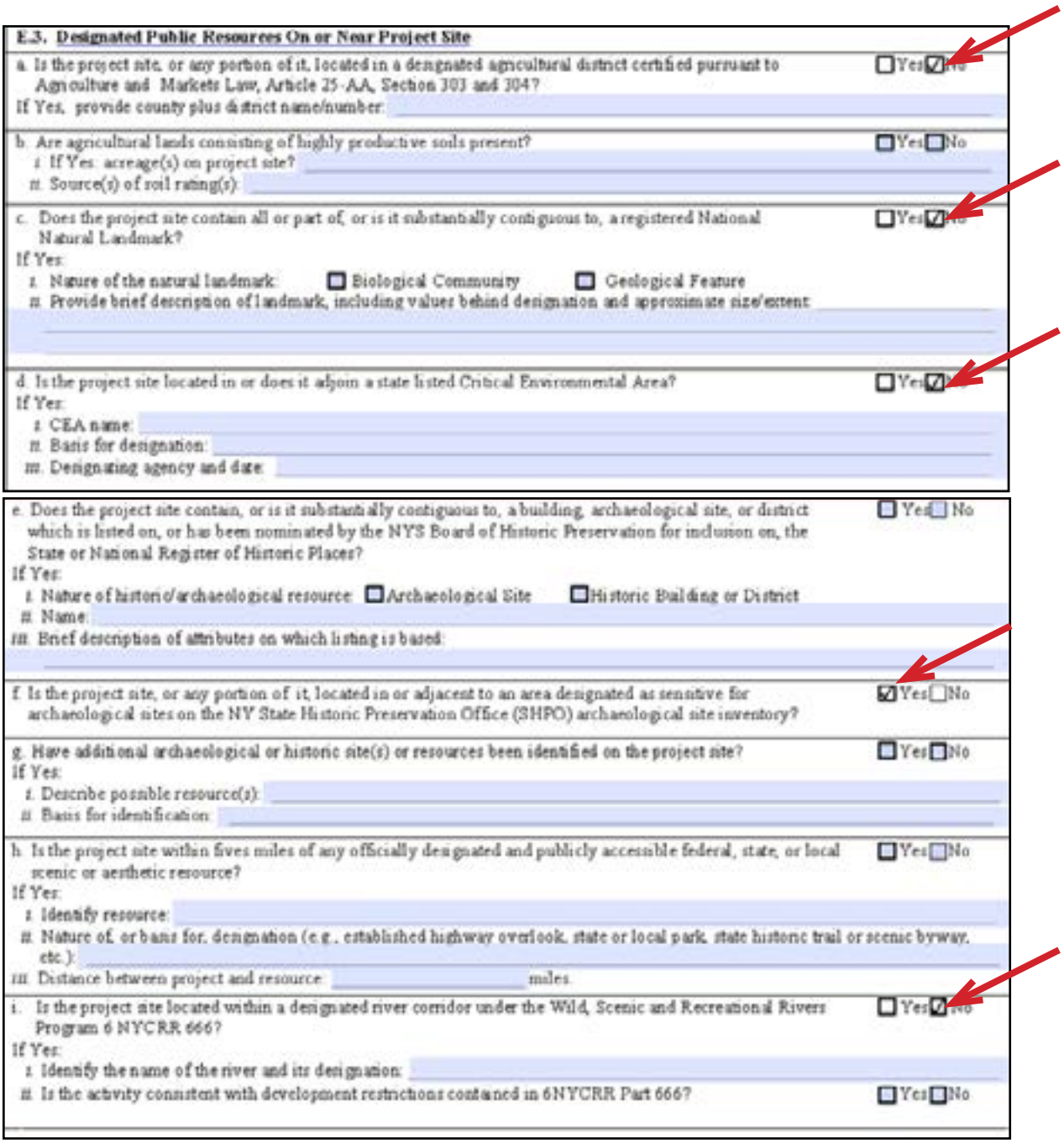
iii. If other than water, identify the type of impounded/contained liquids and their source. _____

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 five 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.

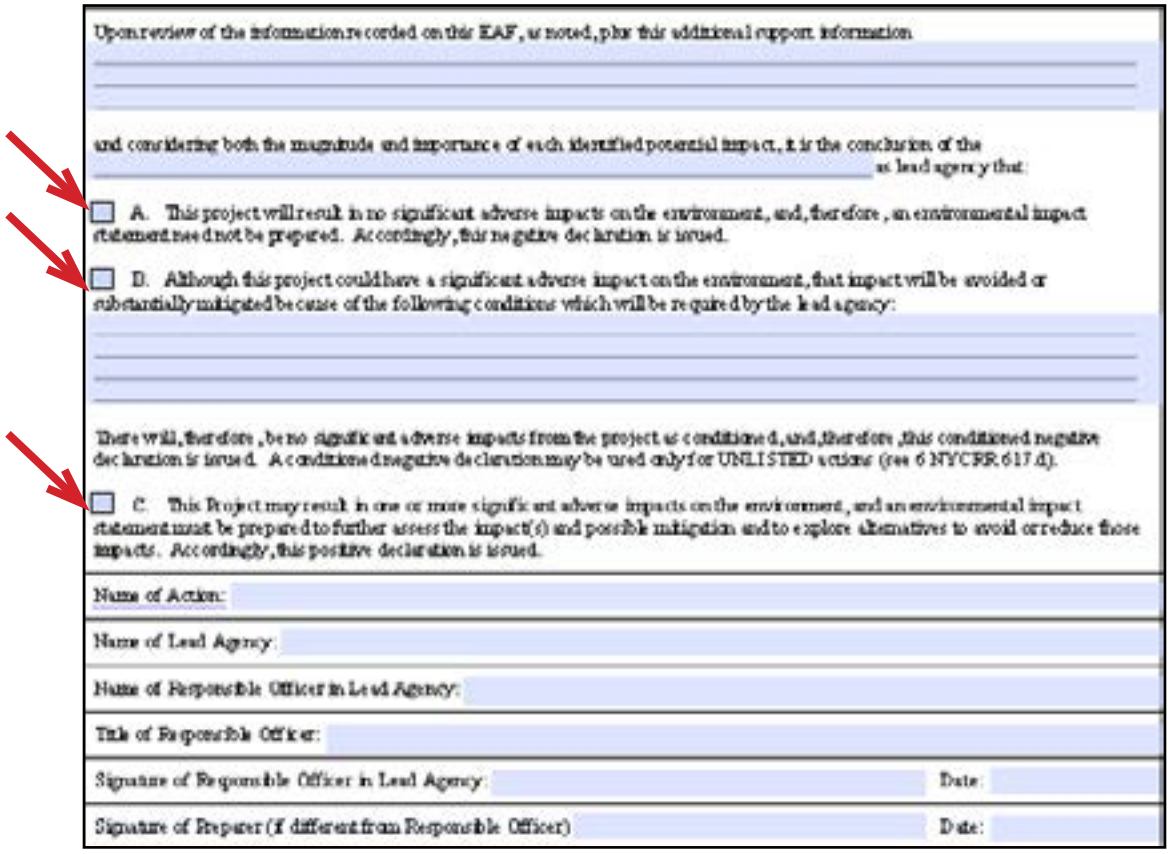
5.3 Parts 2 and 3 of the EAF

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.



Upon review of the information recorded on this EAF, as noted, plus this additional support information

and considering both the magnitude and importance of each identified potential impact, it is the conclusion of the _____ as lead agency that:

☐ A. This project will result in no significant adverse impacts on the environment, and, therefore, an environmental impact statement need not be prepared. Accordingly, this negative declaration is issued.

☐ B. Although this project could have a significant adverse impact on the environment, that impact will be avoided or substantially mitigated because of the following conditions which will be required by the lead agency:

There will, therefore, be no significant adverse impacts from the project as conditioned, and, therefore, this conditioned negative declaration is issued. A conditioned negative declaration may be used only for UNLISTED actions (see 6 NYCRR 617.d).

☐ C. This Project may result in one or more significant adverse impacts on the environment, and an environmental impact statement must be prepared to further assess the impact(s) and possible mitigation and to explore alternatives to avoid or reduce those impacts. Accordingly, this positive declaration is issued.

Name of Action:

Name of Lead Agency:

Name of Responsible Officer in Lead Agency:

Title of Responsible Officer:

Signature of Responsible Officer in Lead Agency: Date:

Signature of Preparer (if different from Responsible Officer) Date:

6 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).

6.1 Wetlands and Streams

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. 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.

For the purposes of complying with SEQR, the potential presence of wetlands and streams 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 stream 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 most 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.

6.2 Threatened and Endangered Species

Certain rare species of plants and animals are protected as threatened and endangered species under both State and 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.

6.3 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.

6.4 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.

6.5 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.

6.6 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.

6.7 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).

7 Solar Developer Guidance

7.1 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:

- Slope (avoidance of steep slopes)
- Aspect (the direction the panels face)
- Land area (sufficient area is required for large arrays)
- Proximity to electrical interconnection points
- 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 (Wind & Solar Power, APA).

7.2 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.

7.3 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.

8 Frequently Asked Questions (FAQ)

Additional guidance and other SEQR topics are found in NYSDEC's SEQR Handbook.

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.

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).

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.

4. Is a large-scale ground-mount solar energy system a Type I, Type II or 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 is currently considering amendments to the SEQR regulations including changes to the Type II list that may affect solar projects. Please see FAQ 15 below.

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.

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. 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.

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.

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.

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.

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.

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

Information on the proposed SEQR amendments are located on the NYSDEC website at 2017 Proposed SEQR Amendments. The NYSDEC prepared a draft generic environmental impact statement to discuss the objectives and the rationale for the proposed amendments. The NYSDEC has not published a timetable for completion of the final generic environmental impact statement and statement of findings. Until such time, the Type I, Type II lists in existing regulation must be used.

Potential changes in the Type II list explicitly related to solar projects include (for information only):

627.5(15)

Installation of five megawatts or less of solar energy arrays on a sanitary landfill, brownfield site that has received a brownfield site clean-up order certificate of completion (under 6 NYCRR 375-.3.9), waste-water treatment facilities, sites zoned for industrial use or installation of five megawatts or less of solar canopies at or above residential and commercial parking facilities (lots or parking garages).

617.5(16)

Installation of five megawatts or less of solar energy arrays on an existing structure that is not listed on the National or State Register of Historic Places or located within a district listed in the National or State Register of Historic Places or on a structure or within a district that has not 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.

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

In addition, NYSERDA offers free technical assistance to municipalities completing the SEQR process for solar energy installations. To request assistance, contact solarhelp@nyserda.ny.gov

Understanding New York State's Real Property Tax Law § 487

The following outlines important points for local governments that are considering opting out of RPTL § 487.

What is the Real Property Tax Law § 487?

This law provides a 15-year real property tax exemption for properties located in New York State with renewable energy systems, including solar electric systems. This law only applies to the value that a solar electric system adds to the overall value of the property; it does not mean that landowners with an installed renewable energy system are exempt from all property tax. A local government that does not opt out can still benefit financially through payment-in-lieu-of-taxes (PILOT) agreements.

In local governments that have taken no action one way or the other, the exemption is in effect. If a local law, ordinance, or resolution opting out of the exemption is adopted, a copy must be filed with the New York State Department of Taxation and Finance, and the New York State Energy Research and Development Authority (NYSERDA).

What is the local economic impact of solar?

New York State's solar market is one of the fastest growing solar markets in the country. Installations grew by 795 percent from 2011 to 2016. During 2012 to 2015, the U.S. as a whole saw a 146 percent increase. New York State ranked seventh nationwide for cumulative solar installed capacity in 2015.[1]

The solar industry is creating jobs across the State with more than 600 solar companies employing more than 8,250 people. In 2015, the solar industry added approximately 1,000 new jobs throughout the State, a 13.3 percent increase over 2014 job growth. The solar job market in the State is projected to grow another 11.6 percent in 2016, which means adding nearly 1,000 more jobs.

With an average wage of $22.02 per hour, the solar industry is responsible for creating thousands of living-wage jobs that allow workers to contribute to their local economies. Most jobs are local or regional and cannot be outsourced.[2]

Why would jurisdictions opt out of the RPTL § 487?

All local governments must offer the RPTL § 487 exemption unless they have opted out not to. Local governments can decide to opt out. As the solar market in New York continues to grow, many large-scale solar projects are being proposed throughout New York. Some local governments are opting out of RPTL § 487 so they can tax these multimillion-dollar projects and generate additional property tax revenue. However, these jurisdictions may find that they will not actually collect substantially more tax revenue from solar or other renewable energy systems because the systems may not be built if they are fully taxable. Property taxes can have a significant impact on the financial viability of solar electric projects, sometimes impacting project economics in a way that unintentionally prohibits solar electric development. Jurisdictions that opt out of RPTL § 487 may unintentionally prevent solar electric development at the local level. Activity in other states suggest there is less solar development in jurisdictions that opt out of the property tax exemption, with little to no additional tax revenue collected.[3]

Can jurisdictions opt out of RPTL§ 487 for large-scale solar only?

No. Under RPTL § 487, jurisdictions are not permitted to conditionally opt out of the property tax exemption. In other words, jurisdictions cannot choose to tax large systems but not small ones. A jurisdiction that opts out of RPTL § 487 to generate tax revenue from larger projects makes solar installations more expensive for homeowners and local businesses.

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[1] NY-Sun, nyserda.ny.gov/All-Programs/Programs/NY-Sun
Solar Energy Industry Association (SEIA). "Top 10 Solar States 2015." www.seia.org/research-resources/top-10-solar-states

[2] The Solar Foundation. "New York Solar Jobs Census 2015." www.TSFcensus.org and SolarStates.org

[3] Barnes et al. 2013. "Property Taxes and Solar PV Systems: Policies, Practices, and Issues." https://nccleantech.ncsu.edu/wp-content/uploads/Property-Taxes-and-Solar-PV-Systems-2013.pdf

Can jurisdictions capture revenue from installations without opting out of RPTL§ 487?

Yes. The law allows jurisdictions that offer the RPTL § 487 exemption to negotiate payments in lieu of taxes (PILOTs). The purpose of a PILOT is to reduce the tax burden and tax rate uncertainty on the property and/or system owner, while preserving some of the forgone revenue that would have been paid in property taxes. PILOTs are often used for large-scale[4] renewable energy projects, including solar electric systems. They are annual payments commonly related to the system's size (often in dollars per megawatt [MW]) and cannot exceed the amount of taxes that would be owed without the exemption.

Each taxing jurisdiction (except the school districts of New York, Buffalo, Rochester, Syracuse, and Yonkers) that has not opted out of RPTL § 487 may require the owner of a solar installation to enter a PILOT. The PILOT may not exceed a 15-year term, but it cannot require payments that exceed the value of taxes that would be paid without the exemption provided by RPTL § 487.[5]

PILOT agreements can be an effective tool for jurisdictions to generate comparable revenue without making solar costs prohibitive for most homeowners and businesses.

Can a municipality that has opted out of RPTL § 487 opt back in?

Yes. The New York State Department of Taxation and Finance has stated that local governments can reinstate the RPTL § 487 exemption simply by repealing the local law, ordinance, or resolution that implemented the opt out. The final step to reinstate the exemption is to provide a copy of the new law, ordinance, or resolution to the New York State Department of Taxation and Finance and NYSERDA.[6]

Do other states have property tax exemptions for solar electric systems?

Yes. Thirty-three states offer some form of tax exemptions for renewable energy. Twenty-two of those states mandate property tax exemptions for 100 percent of the value of solar energy installations over 10 or more years.[7] These states include ones with significant solar development such as California, Massachusetts, and New Jersey, as well as states with minimal solar capacity such as South Dakota, Kansas, and Montana. The majority of states recognize the positive financial impact property tax exemptions can have on solar electric development and the local economic benefits of a robust solar industry.

Email info@training.ny-sun.ny.gov for more information about your municipality's individual situation.

More information about RPTL § 487

NYS Department of Taxation and Finance. "Recent Questions on the Real Property Tax Law and Solar Energy Systems."
www.tax.ny.gov/pdf/publications/orpts/legal/raq2.pdf?_ga=1.225179802.1031257166.1423842465

New York Solar Energy Industry Association (NYSEIA). "Webinar: Understanding the Property Tax Exemption for Solar in New York,"
www.youtube.com/watch?v=A3Urll1-T0k

Barnes et al. "Property Taxes and Solar PV Systems: Policies, Practices, and Issues."
nccleantech.ncsu.edu/wp-content/uploads/Property-Taxes-and-Solar-PV-Systems-2013.pdf

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[4] In this guide, large scale is considered solar electric projects that are in the megawatt range.

5 New York State Department of Taxation and Finance. January 2016. "Recently Asked Questions About the Real Property Tax Law on the Topic of Solar Energy." Available at: https://www.tax.ny.gov/pdf/publications/orpts/legal/raq2.pdf?_ga=1.225179802.1031257166.1423842465

[6] New York State Department of Taxation and Finance, supra note 13.

[7] Solar Power Rocks. https://solarpowerrocks.com/new-york/

Solar Payment-in-Lieu-of-Taxes (PILOT) Toolkit

This section is meant to assist New York State municipalities considering payment-in-lieu-of taxes (PILOT) agreements for community solar projects larger than 1 megawatt (MW).

Overview

NYSERDA developed this resource in collaboration with communities, solar developers, the utilities, and others. The Solar PILOT Toolkit includes (1) a Model Solar PILOT Law, (2) a Model Solar PILOT Agreement and (3) a Solar PILOT Calculator for NYS taxing jurisdictions.[1] The PILOT Calculator is available for download at nyserda.ny.gov/SolarGuidebook under the Payment-in-Lieu-of-Taxes (PILOT) Toolkit section.

As the administrator of the NY-Sun Program, NYSERDA is responsible for helping customers across the State adopt clean, renewable sources of energy. NY-Sun provides financial incentives for the installation of solar (also known as photovoltaic or PV) panel systems that convert sunlight into electricity. The rooftop solar systems you see in your neighborhood probably participated in the NY-Sun program.

In addition to residential, commercial, and municipal projects, a relatively new kind of solar project, "community solar," has emerged as an efficient and affordable way for all New Yorkers to gain access to clean energy. The solar panel systems on your neighbors' roofs are likely in the 4 to 7 kilowatt (kW) size range. Community solar projects are much larger, typically in the 2,000-kW range, and allow individuals (including renters and others who cannot install a system on their own roof for whatever reason) to purchase individual panels or some fraction of the electricity the entire system generates. These customers receive credits for this electricity on their monthly utility bills.

A community solar project brings revenues and benefits to a community and its residents in several ways. The owner of a project site will typically lease land to the solar company in return for lease payments. Community solar customers, which may include municipalities, businesses, and residents, save money on their utility bills. Taxing jurisdictions can benefit from PILOT payments. At the same time, given the passive nature of a solar array, a solar project does not create increased demands on municipal services and infrastructure.

Real Property Tax Law (RPTL) § 487

As a measure to promote the installation of clean energy sources, the New York State legislature adopted a section of the RPTL § 487 that exempts the value of a solar panel system from local property taxes.[2] Under the law, any increase in the property value attributable to the addition of the solar panel system is exempt from property tax. The RPTL § 487 exemption has been a cornerstone of the State's efforts to meet its clean energy goals, providing essential economic incentives for solar. The law does, however, allow any taxing jurisdiction (town, school, etc.) to "opt-out" of the tax exemption by adopting a local law or resolution, making the added value of a solar panel system fully taxable. Alternatively, a taxing jurisdiction that does not opt-out can require a solar developer to pay an annual fee or "payment-in-lieu of taxes" as a replacement for the taxes it would have otherwise collected. Under the law, PILOT amounts cannot exceed what the tax amount would have been without the exemption. Additionally, the law does not allow jurisdictions to partially opt out of the law to generate tax revenue from large solar projects while exempting the small systems of homeowners. Opting out of RPTL § 487 makes community solar projects financially unviable and makes homeowners' rooftop systems more expensive.

NYSERDA understands that many communities have little or no experience with solar PILOT agreements or with assessing the value of large-scale solar projects. Information is difficult to obtain by consulting other communities because few communities have completed large-scale solar projects. Two common questions have arisen from New York State municipal officials and other interested parties:

(1) If we do not opt-out and seek a PILOT, what is a fair PILOT amount based on what projects can afford?

(2) What are the steps to negotiate a successful PILOT agreement?

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[1] *The terms "taxing jurisdictions" and "jurisdictions" include counties, cities, towns, villages and school districts.*

[2] *New York State Real Property Tax Law § 487 provides a 15-year real property tax exemption for properties located in New York State with renewable energy systems, including solar electric systems. The law applies only to the value that a solar electric system adds to the overall value of the property; it does not mean that landowners with an installed renewable energy system are exempt from all property tax. Local governments have the option to opt out of RPTL § 487 and tax solar projects at the full property tax rate, but doing so can impact project economics in a way that unintentionally prohibits developers from building projects. For more information on RPTL § 487, see Understanding New York State's Real Property Tax Law § 487 fact sheet. A local government that does not opt out of RPTL § 487 can still generate revenue through PILOT agreements.*

The answer to the first question is complicated, as PILOTs are often negotiated for individual projects, and the PILOT amount a project can afford depends on many factors, including construction and maintenance costs, and the amount of revenue from electricity sales. From the point of view of solar developers, if the PILOT amount is too high, they will not be able to make the project economically feasible, and will not proceed. So, the amount of revenue available for a PILOT is dependent on the overall project economics. The first question then becomes, "What PILOT amount will allow the jurisdiction and its residents to enjoy the benefits of the project, but will not make the project financially unviable and unattractive to a developer?"

NYSERDA's research indicates that PILOT rates should be negotiable between 1% and 3% of the compensation solar developers receive for the electricity their projects generate.[3] This research includes an independent analysis of current solar market data and an analysis of solar project compensation rates established under the preliminary value stack in the New York Public Service Commission's March 2017 Value of Distributed Energy Resources (VDER) order. The new solar energy compensation methodology will likely reduce project revenue. NYSERDA will review and update its PILOT guidance regularly; taxing jurisdictions are encouraged to adjust their PILOT rates accordingly.

NYSERDA offers the Solar PILOT Toolkit as a resource to help municipalities and solar developers negotiate successful PILOT agreements. The following describes the Toolkit's contents.

Solar PILOT Toolkit

1. The Model Solar PILOT Law

The Model Solar PILOT Law, or resolution, provides a sample template for jurisdictions that wish to establish the legal authority to implement a formulaic, jurisdiction-wide PILOT agreement process with solar developers. The model law cites the appropriate laws to do so and includes blank fields for jurisdictions to fill in. 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.

2. The Model Solar PILOT Agreement

Only jurisdictions that **do not** opt out of RPTL § 487 may enter PILOT agreements. The Model Solar PILOT Agreement provides a draft contract jurisdictions may sign with solar developers. The agreement can be tailored to meet a jurisdiction's specific needs and includes blank fields for the jurisdiction to fill in. Jurisdictions may negotiate PILOT rates with solar developers on a project-by-project basis, or may adopt a jurisdiction-wide rate for certain types of solar panel systems, typically in the form of annual payments based on a dollar-per-MW rate.

3. The Solar PILOT Calculator

This tool provides PILOT rate guidance for solar projects and includes two separate calculators.[4] **Calculator One** should be used to set a uniform PILOT rate across an entire jurisdiction.

The following table displays sample PILOT rates generated by Calculator One for a 2-MW AC community solar project in each utility service territory. The "Low" and "High" rates represent 1% and 3% of the compensation solar developers receive for the electricity their projects generate. NYSERDA's research of solar project economics across the State indicates that such projects should be able to afford rates within this range.

	Low ($/MW AC)	High ($/MW AC)
Central Hudson	$2,600	$7,600
Orange & Rockland	$3,200	$9,500
National Grid	$1,700	$5,100
NYSEG	$1,700	$5,000
Con Edison	$3,700	$11,100
Rochester Gas & Electric	$1,700	$5,000

Calculator Two should be used to set PILOT rates on a project-by-project basis. It is highly customizable, taking into account extensive project-specific data and all factors affecting solar project economics. Users may accept the default values but are encouraged to enter project-specific data. Calculator Two estimates PILOT rates based on the net present value of a project's unlevered cash flow that achieves a specified pre-tax internal rate of return.

[3] NYSERDA continuously assesses market data and Public Service Commission proceedings and may revise this Toolkit when appropriate.

[4] Each calculator's outputs reflect the sum total of all PILOT payments, property taxes from taxing jurisdictions which have opted-out of the exemption, and special district taxes (which are not exempt under RPTL § 487).

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.

Model Solar PILOT Agreement For a 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 THE (TOWN/COUNTY/VILLAGE, _____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

_____

_____
Superintendent/Supervisor/County Official

_____
Date

EXHIBIT A

Description of Land

EXHIBIT B

Year	Payment Amount

Using Special Use Permits and Site Plan Regulations to Allow Large-Scale Solar Installations while Protecting Farmland

This section describes two land-use tools New York State municipalities commonly use to site large-scale solar energy systems in agricultural areas: special-use permits and site plan regulations.

The purpose is to provide guidance and step-by-step instructions for municipalities to support solar energy development that addresses the short- and long-term needs of farmers while also ensuring their most valuable and productive farmland remains in operation.

Municipalities are encouraged to proactively prepare for solar energy development. To assist their efforts, the New York State Energy and Research Authority (NYSERDA) offers free technical assistance to municipalities on land-use tools, including how to update municipal planning and zoning for solar energy systems. To request assistance, visit nyserda.ny.gov/solarguidebook or contact solarhelp@nyserda.ny.gov.

Introduction

New York State has committed to generating 50% of its electricity from renewable energy sources by 2030, increasing the demand for land used for solar energy generation. Some municipalities expressed concern about the pace and extent of solar development in their communities and have requested guidance and assistance. NYSERDA is pleased to provide this document in response.

NYSERDA administers the NY-Sun Program, which helps customers across the State adopt clean, renewable sources of energy. NY-Sun provides financial incentives for the installation of solar (also known as photovoltaic or PV) energy systems that convert sunlight into electricity.

A relatively new kind of solar project, community solar, has emerged as an efficient and affordable way for all New Yorkers to gain access to clean energy. Community solar allows individuals (including renters and others who cannot install a system on their own roof) to purchase individual panels or some fraction of the electricity a large-scale solar energy system generates. These customers receive credits for this electricity on their monthly utility bills. A community solar project benefits a community and its residents in several ways. Community solar customers—which may include municipalities, businesses, and residents—save money on their utility bills. Taxing jurisdictions can benefit from additional revenue through payment-in-lieu-of-tax (PILOT) agreements. Farmers generate revenue by leasing parts of their land. At the same time, given the passive nature of a solar energy system, a solar project does not create increased demands on municipal services and infrastructure.

Community solar projects are much larger than residential rooftop projects and are typically ground-mounted in rural areas, sometimes on agricultural land. A typical 2 MW AC community solar project will require about 10 acres of land. However, solar development is significantly constrained by several factors, including utility infrastructure, the locational cost of electricity, zoning policies and state policies. With some exceptions, the vast majority of municipalities in the State are unlikely to see more than 20 acres of solar development in the near future.

There may be some potential for agricultural uses on the same site as solar energy systems, including grazing livestock. Planting wildflowers for pollinator purposes on marginal or abandoned agricultural land can also provide some added benefit. In addition, the underlying land could be returned to agricultural use if properly restored at the end of the solar energy system lifecycle. A balanced approach that allows solar development and adequately preserves agricultural land is necessary.

Selecting a Land-Use Tool

In municipalities where large-scale solar energy systems are being considered, there are several land-use tools available to accommodate them in agricultural areas, including overlay zones, floating zones, special-use permits, site plan regulations, and environmental review requirements. The two land-use tools addressed here, special-use permits and site plan regulations, are the most commonly used for solar in New York State.

For information on navigating the development of solar projects in State-certified agricultural districts, see the NY-Sun Fact Sheet "Understanding Solar Installations in Agricultural Districts."

Special-Use Permits

Special-use permits may be used to impose conditions that mitigate adverse impacts on the most valuable or productive agricultural land. Zoning traditionally singles out land uses that are allowed in designated zoning districts on the condition that they are compatible with the surrounding neighborhood. These are called conditional uses and are allowed by the issuance of a special-use permit. The zoning code sets forth the specific standards under which the use will be permitted.

Special-Use Permit: Summary of Steps

1. Determine the conditions under which large-scale solar energy systems will be granted special-use permit approval. (Consult the Current Land Use and Soil Types section for minimum conditions and the remaining guidance for additional requirements.)
2. Create a menu of potential mitigation conditions to reduce impact in the event that projects are approved upon conditions.
3. Amend the zoning code to allow large-scale solar energy systems by special-use permit in zoning districts where agricultural uses dominate.

Steps: Municipalities can designate large-scale solar energy systems as a conditionally permitted use in agricultural zones and create a special permit process to carefully examine the impact before granting approval if the project meets certain conditions. These conditions (or standards) can be calibrated to minimize the impact of a solar energy system on agricultural land and operations. Using the standards discussed in the Determining Approval Standards section, municipalities should determine the specific conditions for special permit approval. To create conditions that distinguish between the most valuable or productive farmland and land suitable for solar installations, municipalities may give special consideration to the Current Land Use and Soil Types section. Beyond the land selection standards, municipalities may wish to include conditions for special permit approval that mitigate a solar project's impact.

Once the conditions have been determined, amend the zoning code to incorporate this new special permit option in the selected zoning districts. The municipality might consider designating whichever board approves site plan applications as the same board to approve these new special-use permits. This will allow applicants with fully developed site plan applications to combine approvals and streamline the process. Within the regulation, the community may also include the zone's objectives—such as the preservation of farming on the most valuable or productive agricultural land—which could then be considered when evaluating the potential effect on neighborhood character when variances from the conditional use standards are requested.

It should be noted that in drafting the conditions for a special-use permit, it is often unavoidable that language will leave discretion or need interpretation in a given situation. While conditions should be detailed, detail often defies the diversity of situations that arise. Municipalities should anticipate that special-use permits will either be approved, denied, or approved upon conditions, where further conditions are needed to ensure that the delineated special-use permit conditions are met. Municipalities may consult the Determining Approval Standards section, where the conditions needed for special permit approval on a case-by-case basis are explained. For a sample special permit approach for large-scale systems, see the New York State Model Solar Energy Law (note that the specific land-use and siting conditions discussed here for preserving the most valuable or productive agricultural land will need to be incorporated, as they are not included in the Model Law).

Site Plan Regulations

Municipalities can amend site plan regulations to limit the adverse impact of permitted solar energy systems on farming operations, including conditions that avoid using the most valuable or productive agricultural land. A site plan is a drawing that shows the layout, arrangement, and design of a land-use proposal of a single site. Most municipalities have adopted site plan regulations that contain specifications for submissions and standards that applicants must meet before applying for a building permit. Municipalities can amend these regulations to require applicants for solar energy systems to identify information and meet standards regarding the suitability of the land for such use. This gives municipalities the opportunity to evaluate the solar energy system's impact on the most valuable or productive agricultural lands and deny a site plan application if such requirements are not met.

Steps: Municipalities can amend site plan regulations to require applicants to provide all information the municipality determines necessary for a solar energy system. Municipalities should first determine the specific standards they'll wish to impose for site plan approval. At a minimum, municipalities should develop standards from the Current Land Use and Soil Types section in order to distinguish between the most valuable or productive farmland and land suitable for solar installations. In making selections from the list of approval standards, municipalities should consider what additional information to require on site plan submissions for determining compliance and identifying mitigation opportunities. For example, in order to determine compliance with a requirement to locate structures for overhead collection lines in nonagricultural areas and along field edges where possible, applicants should be required to show field edges on the site plan.

Once the standards have been determined, municipalities may then amend site plan regulations to include new approval standards with submittal specifications. Municipalities with zoning codes may then amend the uses in agricultural zones to allow solar installations as-of-right or by special-use permit, but specifying that any such project triggers site plan review.

Site Plan Regulations: Summary of Steps

1. Determine new site plan approval standards to minimize the impact of large-scale solar on appropriate land. (Consult the Current Land Use and Soil Types section for minimum standards and the remaining guidance for additional requirements.)
2. Based on the selected additional site plan requirements, determine what additional submission information will be required to determine compliance and identify mitigation opportunities.
3. Amend the site plan regulations to include new approval standards with submittal specifications.
4. Amend the zoning code (if applicable) to specify that the development of any large-scale solar project triggers a site plan review.

Determining Approval Standards

When using the land-use tools previously described, municipalities may include conditions that protect their most valuable and productive agricultural land. For an inventory of potential mitigating conditions, municipalities should refer to the Department of Agriculture and Markets' *Guidelines for Agricultural Mitigation for Solar Energy Projects*. These guidelines include details on the following standards.

- **Current Land Use and Soil Types**, such as avoiding installation of solar arrays on the most valuable or productive farmland (provided in the order of importance of current use: active rotational farmland, permanent hayland, improved pasture, unimproved pasture, other support lands, fallow/inactive farmland), especially when containing prime farmland soils or soils of statewide importance.
- **Siting Goals**, such as minimizing adverse impacts to fencing and watering systems; minimizing impacts to normal farming operations by locating structures for overhead collection lines in nonagricultural areas and along field edges; avoiding dividing larger fields into smaller fields, which are more difficult to farm; eliminating the need for cut and fill and reducing the risk of creating drainage problems by locating access roads, which cross agricultural fields, along ridge tops and by following field contours; limiting the permanent width of access roads in agricultural fields to no more than 16 feet to minimize the loss of agricultural land; and avoiding existing drainage and erosion control structures.
- **Construction Requirements**, such as ensuring the surface of access roads is level with the adjacent agricultural field surface; installing culverts and waterbars to maintain natural drainage patterns; stripping all topsoil from agricultural areas used for vehicle and equipment traffic, parking, and equipment laydown and storage areas; stockpiling topsoil stripped from work areas; burying interconnected cables at a specified depth; removing excess subsoil and rock from the site; constructing temporary or permanent fences around work areas to prevent livestock access; and picking up and properly disposing of pieces of wire, bolts, and other unused metal objects.
- **Restoration Requirements**, such as decompacting disturbed agricultural areas; regrading access roads to allow for farm equipment crossing and to restore original surface drainage patterns; seeding restored agricultural areas with the seed mix specified by the landowner; repairing all surface or subsurface drainage structures damaged during construction; and, following restoration, remove all construction debris from the site.
- **Two-Year Monitoring and Remediation Immediately Following Restoration**, including mitigation of topsoil deficiency and trench settling with imported topsoil consistent with the quality of topsoil on the affected site; and determination of the appropriate rehabilitation measures if the subsequent crop productivity within affected areas is less than that of the adjacent unaffected agricultural land.
- **Decommissioning**, including removal of all above-ground structures and restoration of areas previously used for agricultural production, according to recommendations by the landowner, the Soil and Water Conservation District, and the Department of Agriculture and Markets; removal of concrete piers, footers, or other supports to a depth of 48 inches below the soil surface; and removal of access roads, unless otherwise specified by the landowner.

Acknowledgments

NYSERDA created this document in consultation with the Pace University Land Use Law Center and the New York State Department of Agriculture and Markets.

Understanding Solar Installations in Agricultural Districts

Navigate the development of solar projects, also known as photovoltaic or PV, in accordance with local and New York State agricultural policies.

Many local governments are implementing strategies to review solar installations within their community by updating their comprehensive plan and adopting zoning requirements for the siting, installation, and decommissioning of large-scale solar arrays. To protect productive farmland, municipalities should consider siting the non-farm solar energy projects on less productive land. There is a distinction between farm-related solar systems, and solar systems built on agricultural land that primarily serve off-site uses.

What is an agricultural district?

New York State's Agriculture and Markets Law provides a bottoms-up approach for the protection of viable farmland by including land within an Agricultural District. Landowners petition the County Legislature to include their land into an Agricultural District, affected municipalities are notified, a public hearing is held, and the County Legislature creates or modifies an Agricultural District by adding or removing land from the District. Farm operations located within an Agricultural District are provided certain protections, such as limited protection from eminent domain and condemnation; unreasonably restrictive local rules, regulations, laws, and ordinances; agricultural assessment; protection from private nuisance lawsuits; and other benefits.

What is an agricultural assessment?

An agricultural assessment is an assessed value placed on eligible land that is used for agricultural production, based on the land's ability to produce a crop. The taxes paid on the property by the owner are based on the agricultural assessment.

Land inside and outside of an agricultural district is eligible for an agricultural assessment. To qualify, farmers must produce crops, livestock, or livestock products on seven plus acres of land and have an average gross sales of $10,000 in the prior two years. Land that is used in agricultural production that has less than seven acres in production must have an average gross sales of $50,000 in the prior two years.

Additionally, a land owner receiving an agricultural assessment inside an agricultural district annually commits the land to an agricultural use for the next five years, or eight years if located outside of an agricultural district. Farmland outside agricultural districts are generally not eligible for other agricultural district benefits and protections.

What protections do agricultural districts offer farm-related solar?

The Department of Agriculture and Markets considers solar panel systems to be "on-farm" equipment when they are designed, installed, and operated so that the anticipated annual total amounts of electrical energy generated do not exceed the anticipated annual total electrical needs of the farm by more than 110 percent. If a local government classifies solar equipment as structures or buildings, they are deemed on-farm buildings. As on-farm equipment or buildings, the installation of solar panel systems are protected under the Agricultural Districts Law.

To ensure that the electrical output of solar equipment does not exceed the 110-percent threshold, an initial energy assessment may be required to separate farm-related energy consumption from other uses.

Further, if the solar equipment is connected by remote net metering, multiple meters must be combined to determine the electrical needs of on-farm equipment.

What laws are generally considered reasonable for on-farm solar?

Reasonable regulations for solar development include:

- A streamlined site plan review process that involves a shorter review period and fewer submission requirements.
- A building/zoning permit and compliance with the State's Fire Prevention and Building Code requirements.

What laws are generally considered "overly restrictive" for on-farm solar?

"Overly restrictive" regulations for solar development 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 (on-farm solar development is considered a Type II action in the State Environmental Quality Review (SEQR) process, which does not require EAF preparation).
- Visual impact assessments.
- Prohibiting the construction of on-farm, solar generated electricity to offset the energy demands of the farm.

Are there penalties for converting farmland to solar if that development primarily serves off-site uses?

A conversion penalty is imposed if farmland that is subject to an agricultural assessment is located in an agricultural district and is converted to a nonagricultural use within five years of the last agricultural assessment (or eight years if the farmland is located outside an agricultural district). No conversion penalty is imposed if agricultural land is converted for oil, gas, or wind energy development that does not support agricultural production. Because solar energy is not included in this exemption, the conversion penalty could apply if electrical output of solar equipment substantially exceeds (e.g., is more than 110 percent of) a farm's anticipated electrical needs.

The assessor determines whether a conversion has occurred on the basis of the facts of each case:

- Conversion is defined as "an outward or affirmative act changing the use of agricultural land" to a nonagricultural use, in New York State's Agriculture and Markets Law.
- A conversion penalty involves a payment to capture the tax savings a property owner received while the land was under an agricultural assessment. This is limited to a five year roll-back as specified in New York State's Agriculture and Markets Law.
- Conversion payments are equal to five times the taxes saved in the most recent year that the land received an agricultural assessment, plus interest.

When only a portion of a parcel is converted, 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.

Payments for the conversion of agricultural land to nonagricultural use are added to the taxes of the converted land. Properties may be subject to a tax sale if conversion penalty payments are not made. These payments generally become the landowner's responsibility at the time of conversion. Failure to notify may result in a penalty of two times the payments owed, to a maximum of $1,000.

Questions?

Email info@training.ny-sun.ny.gov for more information about your municipality's individual situation.

Resources

NYS Department of Agriculture and Markets Agricultural Districts
www.agriculture.ny.gov/ap/agservices/agdistricts.html

NYS Department of Agriculture and Markets Guidelines for Review of Local Zoning and Planning Laws
www.agriculture.ny.gov/ap/agservices/guidancedocuments/305-aZoningGuidelines.pdf

NYS Department of Agriculture and Markets Guidelines for Review of Local Laws Affecting Small Wind Energy Production Facilities and Solar Devices
www.agriculture.ny.gov/ap/agservices/guidancedocuments/Guidelines_for_Solar_and_Small_Wind_Energy_Facilities.pdf

NYS Department of Taxation and Finance Agricultural Assessment Information
www.tax.ny.gov/research/property/assess/valuation/agindex.htm

NYS Department of Taxation and Finance Agricultural Assessment Overview and Conversion Penalties
www.tax.ny.gov/research/property/assess/valuation/ag_overview.htm

Landowner Considerations for Solar Land Leases

New York's solar market is growing fast – so demand for sites to install large-scale solar electric systems is high. Across New York State, solar developers are contacting farmers and landowners to secure long-term land leases for siting solar arrays. The amount of land desirable for a lease generally ranges from 10 to 30 acres, depending upon the size of the solar array.

Before considering such a lease or contract, you should know installing solar panels on farmland may trigger a "conversion penalty" and may increase the taxable value of the overall property. To fully understand the impact of these factors, landowners are urged to consult with an attorney and their municipal assessor before signing any documents.

What is shared solar?

NY-Sun, Governor Andrew M. Cuomo's initiative to add more than 3GW of installed solar capacity in New York State by 2023, encourages and supports the installation of solar arrays to generate clean and renewable energy statewide. Tens of thousands of New Yorkers have already put solar panels on their homes. Many buildings, however, are not suited for solar panels due to shading, roof condition, or other factors. New Yorkers now have the opportunity to subscribe to larger "shared solar" systems. Shared Solar provides opportunities for renters, homeowners, businesses, and municipalities to subscribe to a portion of shared solar energy projects. The siting of these systems is creating an even greater interest in the leasing of farmland.

Is solar right for your land?

The size of a solar installation is measured by its capacity to produce energy. A 1-megawatt (MW) installation will generate approximately 1,174,000 kilowatt hours (kWh is how electricity usage is measured on your utility bill) each year. A 1-MW system will generally require about six acres of land for 3,000 to 4,000 individual solar panels, and will cost $2 million to $3 million to build. Systems built on open land will connect directly to the electric grid and will have their own utility meter. Solar panels are typically warrantied for 25 years, but a system can last longer than that if panels are replaced over time.

What are the per acre lease rates?

Rates can vary. If you are approached by a developer or have interest in leasing your land, research the going rate for land leases in your area. Contact multiple solar developers to gauge interest in your land. Certain site characteristics are especially attractive for solar development, such as cleared land that is south-facing with road access and in close proximity to the substation. Do research online about solar lease rates in other areas and consider working with a real estate professional.

Prior to signing a lease with a solar developer, landowners should examine possible tax consequences and issues associated with the construction of roads, fencing, and electrical poles. Landowners should consider asking an attorney to carefully examine the land lease terms.

Do you receive an agricultural assessment on your property?

Under the 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)).

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 fine of up to $1,000 can be levied against a landowner who fails to report the conversion.

Who is responsible for paying a conversion penalty?

The landowner on record is responsible for paying the conversion penalty. Your assessor can work with you to determine what the conversion penalty 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.

Are solar panels considered real property and taxable?

Yes. 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).

Will the siting and construction of a solar array on my property affect other taxes?

Possibly. 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.

Isn't there an exemption from the payment of school, county, town, and village taxes for solar arrays?

Possibly. There is an exemption statute in State Law that applies specifically to solar 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. To find out if your county, town, village, and/or school district has opted out, talk to your local tax assessor.

Further information may be found on the following web sites:

tax.ny.gov/research/property/legal/localop/487opt.htm to read Frequently Asked Questions concerning the solar energy system exemption and statute.

New York State Taxation and Finance web page: **tax.ny.gov/pdf/publications/orpts/legal/raq2.pdf?_ga=1.190577835.1031257166.1423842465** (Note: to obtain updated information talk to your assessor.)

If my lease exceeds the 15-year exemption, what happens to my tax bill?

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. This question should be discussed with your local tax assessor.

What are other potential impacts that I should be aware of?

Solar arrays must be connected to the electrical grid, which 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. The same can be said concerning the siting of access roads. 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. Also, 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? See if the access road can be used by you and your farm equipment to access your property. Design the road so that it also serves both your needs and that of the solar company. Be sure to discuss these aspects of the construction of the solar project with the developer before you sign the lease.

Who is responsible for dismantling the solar array once the lease expires or is not renewed?

In the contract, make sure that there are provisions that determine who is responsible for dismantling the facility if the company is no longer in business or if the solar array ages out and is no longer viable, ensuring the property is returned to its pre-leased condiition.

What if I do not like the area of my property that the solar company has selected for their lease?

If you are interested in the possibility of a lease to a solar company, talk to them about the siting of the solar arrays on your property. Does it have to be placed on your best farmland (such as on Soil Groups 1-4)? 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? Can the land beneath the solar arrays be planted with crops or grazed by non-climbing animals? 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.

Does the town where I live have local laws that regulate the siting of solar facilities?

Possibly. Some municipalities have provisions in their zoning code to address the siting of solar arrays within the community. Other municipalities have placed a temporary freeze on the siting and installation of such facilities until they have decided on the best method to review and/or regulate the use within the town or village. Some municipalities are also in the process of drafting amendments to their zoning code to address this issue. Resources for local governments can be found at the NY-Sun PV Trainers Network website: **training.ny-sun.ny.gov**.

What can I do and how can I influence the local process?

Become or stay involved. If you do not participate in the local process, your point of view cannot be heard. Also, speak with your assessor to determine what impact the siting of a solar array may have on your farm or property and the bottom line (taxes versus lease payments).

Decommissioning Solar Panel Systems

The following provides information to local governments and landowners on decommissioning of large-scale solar panel systems.

As local governments develop solar regulations and landowners negotiate land leases, it is important to understand the options for decommissioning solar panel systems and restoring project sites to their original status.

From a land use perspective, solar panel systems are generally considered large-scale when they constitute the primary use of the land, and can range from less than one acre in urban areas to 10 or more acres in rural areas. Depending on where they are sited, large-scale solar projects can have habitat, farmland, and aesthetic impacts. As a result, large-scale systems must often adhere to specific development standards.

Abandonment and decommissioning defined

Abandonment occurs when a solar array is inactive for a certain period of time.

- Abandonment requires that solar panel systems be removed after a specified period of time if they are no longer in use. Local governments establish timeframes for the removal of abandoned systems based on aesthetics, system size and complexity, and location. For example, the Town of Geneva, NY, defines a solar panel system as abandoned if construction has not started within 18 months of site plan approval, or if the completed system has been nonoperational for more than one year.[1]
- Once a local government determines a solar panel system is abandoned, and has provided thirty (30) days prior written notice to the owner it can take enforcement actions, including imposing civil penalties/fines, and removing the system and imposing a lien on the property to recover associated costs.

Decommissioning is the process for removing an abandoned solar panel system and remediating the land.

- When describing requirements for decommissioning sites, it is possible to specifically require the removal of infrastructure, disposal of any components, and the stabilization and re-vegetation of the site.

[1] *Town of Geneva, N.Y. CODE § 130-4(D)(5) (2016):*

What is a decommissioning plan?

Local governments may require to have a plan in place to remove solar panel systems at the end of their lifecycle, which is typically 20-40 years. A decommissioning plan outlines required steps to remove the system, dispose of or recycle its components, and restore the land to its original state. Plans may also include an estimated cost schedule and a form of decommissioning security (see Table 1).

What is the estimated cost of decommissioning?

Given the potential costs of decommissioning and land reclamation, it is reasonable for landowners and local governments to proactively consider system removal guarantees. A licensed professional engineer, preferably with solar development experience, can estimate decommissioning costs, which vary across the United States. Decommissioning costs will vary depending upon project size, location, and complexity. Table 1 provides an estimate of potential decommissioning costs for a ground-mounted 2-MW solar panel system. Figures are based on estimates from the Massachusetts solar market. Decommissioning costs for a New York solar installation may differ. Some materials from solar installations may be recycled, reused, or even sold resulting in no costs or compensation. Consider allowing a periodic reevaluation of decommissioning costs during the project's lifetime by a licensed professional engineer, as costs could decrease and the required payment should be reduced accordingly.

Table 1: Sample list of decommisioning tasks and estimated costs

Tasks	Estimated Cost ($)
Remove Rack Wiring	$2,459
Remove Panels	$2,450
Dismantle Racks	$12,350
Remove Electrical Equipment	$1,850
Breakup and Remove Concrete Pads or Ballasts	$1,500
Remove Racks	$7,800
Remove Cable	$6,500
Remove Ground Screws and Power Poles	$13,850
Remove Fence	$4,950
Grading	$4,000
Seed Disturbed Areas	$250
Truck to Recycling Center	$2,250
Current Total	$60,200
Total After 20 Years (2.5% inflation rate)	$98,900

How can decommissioning be ensured?

Landowners and local governments can ensure appropriate decommissioning and reclamation by using financial and regulatory mechanisms. However, these mechanisms come with tradeoffs. Including decommissioning costs in the upfront price of solar projects increases overall project costs, which could discourage solar development. As a result, solar developers are sometimes hesitant to provide or require financial surety for decommissioning costs.

It is also important to note that many local governments choose to require a financial mechanism for decommissioning. Although similar to telecommunications installations, there is no specific authority to do so as part of a land use approval for solar projects (see Table 2). Therefore, a local government should consult their municipal attorney when evaluating financial mechanisms.

The various financial and regulatory mechanisms to decommission projects are detailed below.

Table 2: Relevant Provisions of General City, Town, and Village Laws Relating to Municipal Authority to Require Conditions, Waivers, and Financial Mechanisms

Site Plan Review	General City Law	Town Law	Village
Conditions	27-a (4)	274-a (4)	7-725-a (4)
Waivers	27-a (5)	274-a (5)	7-725-a (5)
Performance bond or other security	27-a (7)	274-a (7)	7-725-a (7)
Subdivision	**General City Law**	**Town Law**	**Village Law**
Waivers	33 (7)	277 (7)	7-730 (7)
Performance bond or other security	33 (8)	277 (9)	7-730 (9)
Special	**General City Law**	**Town Law**	**Village Law**
Conditions	27-b (4)	274-b (4)	7-725-b (4)
Waivers	27-b (5)	274-b (5)	7-725-b (5

Source: Referenced citations may be viewed using the NYS Laws of New York Online

Excerpts from these statutes are also contained within the "Guide to Planning and Zoning Laws of New York State," New York State Division of Local Governments Services, June 2011: **www.dos.ny.gov/lg/publications/Guide_to_planning_and_zoning_laws.pdf**

Financial mechanisms

Decommissioning Provisions in Land-Lease Agreements. If a decommission plan is required, public or private landowners should make sure a decommissioning clause is included in the land-lease agreement. This clause may depend on the decommissioning preferences of the landowner and the developer. The clause could require the solar project developer to remove all equipment and restore the land to its original condition after the end of the contract, or after generation drops below a certain level, or it could offer an option for the landowner to buy-out and continue to use the equipment to generate electricity. The decommissioning clause should also address abandonment and the possible failure of the developer to comply with the decommissioning plan. This clause could allow for the landowner to pay for removal of the system or pass the costs to the developer.

Decommissioning Trusts or Escrow Accounts. Solar developers can establish a cash account or trust fund for decommissioning purposes. The developer makes a series of payments during the project's lifecycle until the fund reaches the estimated cost of decommissioning. Landowners or third-party financial institutions can manage these accounts. Terms on individual payment amounts and frequency can be included in the land lease.

Removal or Surety Bonds. Solar developers can provide decommissioning security in the form of bonds to guarantee the availability of funds for system removal. The bond amount equals the decommissioning and reclamation costs for the entire system. The bond must remain valid until the decommissioning obligations have been met. Therefore, the bond must be renewed or replaced if necessary to account for any changes in the total decommissioning cost.

Letters of credit. A letter of credit is a document issued by a bank that assures landowners a payment up to a specified amount, given that certain conditions have been met. In the case that the project developer fails to remove the system, the landowner can claim the specified amount to cover decommissioning costs. A letter of credit should clearly state the conditions for payment, supporting documentation landowners must provide, and an expiration date. The document must be continuously renewed or replaced to remain effective until obligations under the decommissioning plan are met.[2]

Nonfinancial mechanisms

Local governments can establish nonfinancial decommissioning requirements as part of the law. Provisions for decommissioning large-scale solar panel systems are similar to those regulating telecommunications installations, such as cellular towers and antennas. The following options may be used separately or together.

- **Abandonment and Removal Clause.** Local governments can include in their zoning code an abandonment and removal clause for solar panel systems. These cases effectively become zoning enforcement matters where project owners can be mandated to remove the equipment via the imposition of civil penalties and fines, and/or by imposing a lien on the property to recover the associated costs. To be most effective, these regulations should be very specific about the length of time that constitutes abandonment. Establishing a timeframe for the removal of a solar panel system can be based on system aesthetics, size, location, and complexity. Local governments should include a high degree of specificity when defining "removal" to avoid ambiguity and potential conflicts.

[2] *See a letter of credit submitted to the Vermont Public Service Board by NextSun Energy, LLC. http://psb.vermont.gov/sites/psb/files/docketsandprojects/Solar/Exhibit%20Petitioner%20JL-7%20(Revised%20326.14).pdf*

- **Special Permit Application.** A local government may also mandate through its zoning code that a decommissioning plan be submitted by the solar developer as part of a site plan or special permit application. Having such a plan in place allows the local government, in cases of noncompliance, to place a lien on the property to pay for the costs of removal and remediation.
- **Temporary Variance/Special Permit Process.** As an alternative to requiring a financial mechanism as part of a land use approval, local governments could employ a temporary variance/special permit process (effectively a re- licensing system). Under this system, the locality would issue a special permit or variance for the facility for a term of 20 or more years; once expired (and if not renewed), the site would no longer be in compliance with local zoning, and the locality could then use their regular zoning enforcement authority to require the removal of the facility.

What are some examples of abandonment and decommissioning provisions?

The New York State Model Solar Energy Law provides model language for abandonment and decommissioning provisions:
www.cuny.edu/about/resources/sustainability/reports/NYS_Model_Solar_Energy_LawToolkit_FINAL_final.pdf

The following provide further examples that are intended to be illustrative and do not confer an endorsement of content:

- Town of Geneva, N.Y., § 130-4(D): **ecode360.com/28823382**
- Town of Olean, N.Y., § 10.25.5: **www.cityofolean.org/council/minutes/ccmin2015-04-14.pdf**

Is there a checklist for decommissioning plans?

The following items are often addressed in decommissioning plans requirements:[3]

- Defined conditions upon which decommissioning will be initiated (i.e., end of land lease, no operation for 12 months, prior written notice to facility owner, etc.).
- Removal of all nonutility owned equipment, conduit, structures, fencing, roads, and foundations.
- Restoration of property to condition prior to solar development.
- The timeframe for completion of decommissioning activities.
- Description of any agreement (e.g., lease) with landowner regarding decommissioning.
- The party responsible for decommissioning.
- Plans for updating the decommissioning plan.
- Before final electrical inspection, provide evidence that the decommissioning plan was recorded with the Register of Deeds.

Additional Resources

Template Solar Energy Development Ordinance for North Carolina (see Appendix G at pg. 21 for Sample Decommissioning Plan): **nccleantech.ncsu.edu/wp-content/uploads/Template-Solar-Ordinance_V1.0_12-18-13.pdf**

Land Use Planning for Solar: **training.ny-sun.ny.gov/images/PDFs/Land_Use_Planning_for_Solar_Energy.pdf**

Zoning Guide for Solar: **training.ny-sun.ny.gov/images/PDFs/Zoning_for_Solar_Energy_Resource_Guide.pdf**

Information on First Solar's recycling program for all of their modules: **www.firstsolar.com/en/Technologies-and-Capabilities/Recycling-Services**

PV Cycle: Europe's PV recycling program: **www.pvcycle.org/**

Solar Energy Industries Association (SEIA) information on solar panel recycling: **www.seia.org/policy/environment/pv-recycling**

Silicon Valley Toxics Coalition: **svtc.org/**

Silicon Valley Toxic Coalition Solar Scorecard: **www.solarscorecard.com/2015/2015-SVTC-Solar-Scorecard.pdf**

End-of-life PV: then what? - Recycling solar panels: **www.renewableenergyfocus.com/view/3005/end-of-life-pv-then-what-recycling-solar-pv-panels/**

[3] *North Carolina Solar Center, NC Sustainable Energy Center. December 2013. Template Solar Energy Development Ordinance for North Carolina.* ***https://nccleantech.ncsu.edu/wp-content/uploads/Template-Solar-Ordinance_V1.0_12-18-13.pdf***

Model Solar Energy Local Law

Model Solar Energy Local Law Instructions

1. The sole siting authority for solar projects under 25 MW resides at the local level rather than the state level. One purpose of this Model Solar Energy Local Law (Model Law) is to inform and facilitate local efforts to expand solar energy generation in a sustainable way. This Model Solar Energy Local Law regulates the installation, operation, maintenance, and decommissioning of solar energy systems. The Model Law is intended to be an "all-inclusive" ordinance to allow for a thorough review of all aspects of solar energy systems under typical zoning and land use regulations, including the State Environmental Quality Review Act. Municipalities are encouraged to review this Model Law, examine their local laws and regulations and the types, size range and number of solar energy projects proposed, and adopt a local law addressing the aspects of solar energy development that make the most sense for each municipality, deleting, modifying, or adding other provisions as appropriate.

2. In some cases, there may be multiple approaches to regulate a certain aspect of solar energy systems. The word "*OR*" has been placed in the text of the model law to indicate these options. Municipalities should choose the option that works best for their communities. The content provided in brackets and highlighted is optional. Depending on local circumstances, a municipality may want to include this content or choose to adopt a different standard.

3. This 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 this language may be modified to suit local conditions, their comprehensive plan, and existing land use and zoning provisions.

4. Prior to drafting a local solar energy law, municipalities can assess the potential of the local electric distribution system to interconnect significant amounts of solar generating capacity. New York utilities have made several tools available, such as Hosting Capacity maps, to help customers and developers conduct initial assessments.

    A. The "Hosting Capacity" is the utility's estimate of the amount of new distributed generation (DG) resources that may be interconnected at a particular part of the distribution system without adversely impacting power quality or reliability under current configurations and without requiring expensive infrastructure upgrades.

    B. Users should understand that the Hosting Capacity maps are not intended as a guarantee that a specific project can interconnect. A number of factors that Hosting Capacity maps cannot fully account for drive up the cost of interconnecting DG to the electric system, and actual

interconnection requirements and costs will be determined following the respective utility's study of individual interconnection applications. However, the maps provide an assessment of the relative feasibility of pursuing projects on different parts of the utility's system and thus help define areas of higher and lower potential for development. Questions regarding Hosting Capacity maps can be directed to solarhelp@nyserda.ny.gov.

C. If the electrical system within a municipality appears to have development potential, municipalities should review and, if necessary, amend their comprehensive plans to address solar energy development within the community and adopt policies to carry this goal forward.

5. Municipalities may consider taking action on the comprehensive plan update at the same time it considers adoption of local laws and/or regulations for solar energy projects. Suggestions on how municipalities can develop and adopt solar friendly policies and plans that provide protection for the municipality are listed below:

   A. Adopt a resolution or policy statement, or the mayor can issue an executive order or proclamation to outline a strategy for municipal-wide solar development.

   B. Appoint a Solar Energy Task Force ("Task Force") that represents all interested stakeholders, including residents, businesses, interested non-profit organizations, the solar industry, utilities, and relevant municipal officials and staff to prepare an action plan, amend the comprehensive plan to include solar energy planning goals and actions, and develop local laws and/or regulations to ensure the orderly development of solar energy projects.

   C. Charge the Task Force with conducting meetings on a communitywide basis to involve all key stakeholders, gather all available ideas, identify divergent groups and views, and secure support from the entire community. The Task Force also should conduct studies and should determine whether existing policies, plans, and land use regulations require amendments to remove barriers to and facilitate solar energy development goals.

   D. Establish a training program for local staff and land use boards. Municipalities are encouraged to utilize State and Federal technical assistance and grants for training programs when available.

   E. Partner with adjacent communities and/or county agencies to adopt compatible policies, plan components, and zoning provisions.

Model Solar Energy Local Law

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 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

A. 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], [such as urban/downtown revitalization, vacant land management, creating a walkable, healthy community, etc.].

Commentary: As the benefits of Solar Energy Systems may vary from community to community, the Purpose Section should be reviewed and adjusted accordingly. Any benefits of solar energy referred to specifically in the local comprehensive plan should be added to this list. An expansive list of the benefits of solar energy may help secure support from local stakeholder groups for the adoption of the Model Law. A municipality should include benefits in this list that resonate with the stakeholders involved in its community. The following list includes additional benefits of solar energy that communities may choose to incorporate into the Purpose Section, as appropriate:

- *To decrease the use of fossil fuels, thereby reducing the carbon footprint of [Village/Town/City];*
- *To invest in a locally generated source of energy and to increase local economic value, rather than importing non-local fossil fuels;*
- *To align the laws and regulations of the community with several policies of the State of New York, particularly those that encourage distributed energy systems;*
- *To become more competitive for state and federal grants and tax benefits;*
- *To make the community more resilient during storm events;*
- *To aid in the energy independence of the community as well as the country;*
- *To diversify energy resources to decrease dependence on the grid;*
- *To improve public health;*
- *To encourage a sense of pride in the community;*
- *To encourage investment in public infrastructure supportive of solar, such as generation facilities, grid-scale transmission infrastructure, and energy storage sites.*

3. Definitions

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.

FARMLAND OF STATEWIDE IMPORTANCE: Land, designated as “Farmland of Statewide Importance” in the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS)’s Soil Survey Geographic (SSURGO) Database on Web Soil Survey, that is of state wide importance for the production of food, feed, fiber, forage, and oilseed crops as determined by the appropriate state agency or agencies. Farmland of Statewide Importance may include tracts of land that have been designated for agriculture by state law.

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 that is anchored to the ground via a pole or other mounting system, detached from any other structure, that generates electricity for onsite or offsite consumption.

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 New York State Department of Environmental Conservation.

POLLINATOR: bees, birds, bats, and other insects or wildlife that pollinate flowering plants, and includes both wild and managed insects.

PRIME FARMLAND: Land, designated as “Prime Farmland” in the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS)’s Soil Survey Geographic (SSURGO) Database on Web Soil Survey, that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these land uses.

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.

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, storage devices, or other electrical and photovoltaic equipment associated with the production 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. The area of a Solar Energy System includes all the land inside the perimeter of the Solar Energy System, which extends to any interconnection equipment. A Solar Energy System is classified as a Tier 1, Tier 2, or Tier 3 Solar Energy System as follows.

A. Tier 1 Solar Energy Systems include the following:

a. Roof-Mounted Solar Energy Systems
b. Building-Integrated Solar Energy Systems

B. Tier 2 Solar Energy Systems include Ground-Mounted Solar Energy Systems with system capacity up to [25] kW AC and that generate no more than [110] % of the electricity consumed on the site over the previous [12] months.

OR

Tier 2 Solar Energy Systems include Ground-Mounted Solar Energy Systems with a total surface area of all solar panels on the lot of up to [4,000] square feet and that

generate up to [110] % of the electricity consumed on the site over the previous [12] months.

C. Tier 3 Solar Energy Systems are systems that are not included in the list for Tier 1 and Tier 2 Solar Energy Systems.

Commentary: These definitions are critical to the workability of the remaining sections of the Model Law. There are three types of Solar Energy Systems defined here.

Tier 1 Solar Energy Systems are defined as all Roof-Mounted and Building-Integrated Solar Energy Systems and are permitted in all zoning districts.

Tier 2 Solar Energy Systems are Ground-Mounted systems that use the electricity generated from solar panels primarily onsite. A municipality may define Tier 2 Solar Energy Systems according to their physical size using measurements similar to those found in the zoning ordinance's bulk and area requirements (measured in acres, square feet etc.), or based on energy capacity due to the fact that the physical size of a Solar Energy System tends to increase as kilowatts produced increases.

Tier 3 Solar Energy Systems are systems that are not included in either Tier 1 or Tier 2 Solar Energy Systems. Note that Solar Energy Systems producing 25 MW or more are permitted by the Board of Electric Generation Siting and the Environment (Siting Board) under Article 10 of the New York State Public Service Law. The Siting Board is responsible for issuing Certificates of Environmental Compatibility and Public Need, authorizing the construction and operation of major electric generating facilities.

This Model Law does not include a specific definition for Solar Energy Systems raised on canopy mounting, such as a solar parking canopy. These configurations are included within the definition of Ground-Mounted Solar Energy Systems or Roof-Mounted Solar Energy Systems, depending on the location of the canopy. If a municipality anticipates requiring special consideration for solar canopy systems, it could consider adding to the Model Law specific provisions addressing these concerns or using a waiver to remove certain standards when they are deemed unnecessary by the community.

SOLAR PANEL: A photovoltaic device capable of collecting and converting solar energy into electricity.

STORAGE BATTERY: A device that stores energy and makes it available in an electrical form.

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 Solar Energy System area by more than [5] % of the original area of the Solar Energy System (exclusive of moving any fencing) shall be subject to this Local Law.

D. 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 ("Building Code"), the NYS Energy Conservation Code ("Energy Code"), and the [Village/Town/City] Code.

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 area less than 5% of the original area of the system (exclusive of moving any fencing).

Note that other zoning code definitions, regulations, and uses should be reviewed for conflict with the provisions of this 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 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.

5. General Requirements

A. A Building permit shall be required for installation of all Solar Energy Systems.

B. 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.

C. 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")].

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:

    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.

Commentary: Roof-Mounted Solar Energy Systems regulated under this Section produce electricity for onsite or offsite consumption, are permitted in all zoning districts, and do not require site plan review. Because Roof-Mounted Solar Energy Systems are installed on existing structures, their placement has no effect on the impermeability of a property's surface area or the parcel's lot coverage, making it unnecessary to include Roof-Mounted Solar Energy Systems in lot coverage and impervious surface calculations.

Most concerns related to these systems are attributed to aesthetics, which in some communities can be a major barrier to the approval of Solar Energy Systems. To help regulate aesthetics, specific requirements regarding height, coloration, and equipment placement can be incorporated into zoning regulations. Municipalities should evaluate their existing height limitations within each zoning district to determine if they are overly restrictive. The height limitations included in Appendix 3 provide a guide if municipalities aim to design specific height limitations for Roof-Mounted Solar Energy Systems. This Model Law also includes other aesthetic standards that address placement and tilt, while limiting the enforcement to "when feasible" to avoid overly burdensome standards.

Solar panels are constructed of dark-colored (usually blue or black) materials and should be covered with anti-reflective coatings. Modern solar panels reflect as little as two percent of incoming sunlight, which is about the same as water and less than soil or wood shingles. For more information, please refer to the US Department of Energy Office of Energy Efficiency and Renewable Energy's Solar PV and Glare Factsheet, available at https://www.energy.gov/eere/solar/downloads/solar-pv-and-glare-factsheet.

B. Building-Integrated Solar Energy Systems shall be shown on the plans submitted for the building permit application for the building containing the system.

Commentary: Building-Integrated Photovoltaic Systems are exempt from any bulk and area requirements and design standards of the law because they are integrated into building envelope systems themselves, including vertical façades (made of glass and/or other façade materials), semitransparent skylight systems, roofing materials, and window shading elements. These systems are regulated in the same manner as the building envelope systems of which they are a part. Therefore, this Model Law only requires that Building-Integrated Solar Energy Systems be shown on the plans submitted for the building permit application.

7. **Permitting Requirements for Tier 2 Solar Energy Systems**

All Tier 2 Solar Energy Systems shall be permitted in all zoning districts as accessory structures and shall be exempt from site plan review under the local zoning code or other land use regulations, subject to the following conditions:

A. Glare: All Solar Panels shall have anti-reflective coating(s).

B. Setbacks: Tier 2 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.

Commentary: To avoid being overly restrictive, municipalities in rural or less dense areas may elect to remove the Model Law's requirement that Tier 2 Solar Energy Systems in residential districts must be installed in the side or rear yards. These systems might not be visible from the street in less dense areas.

C. Height: Tier 2 Solar Energy Systems shall be subject to the height limitations specified for accessory structures within the underlying zoning district.

OR

Tier 2 Solar Energy Systems shall comply with the height limitations in Appendix 3.

D. Screening and Visibility.

1) All Tier 2 Solar Energy Systems shall have views minimized from adjacent properties to the extent reasonably practicable.

2) 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.

E. Lot Size: Tier 2 Solar Energy Systems shall comply with the existing lot size requirement specified for accessory structures within the underlying zoning district.

Commentary: Tier 2 Solar Energy Systems regulated under this Section are Ground-Mounted Systems that produce electricity primarily for onsite consumption and are relatively smaller in physical size compared to Tier 3 Solar Energy Systems. They are permitted as accessory structures in all zoning districts deemed appropriate by the local jurisdiction and do not require site plan review. Tier 2 Solar Energy Systems are standalone structures and generate different concerns than Roof-Mounted installations. Because Tier 2 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 2 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 2 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 2 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.

Commentary: Tier 3 Solar Energy Systems regulated under this Section are permitted through the issuance of a special use permit within districts selected by the local jurisdiction and are subject to site plan approval. Where indicated in the Model Law, municipalities should insert the zoning district(s) in which they choose to permit Tier 3 systems. This is purely a matter of local discretion and will be based, in each case, on the number and types of zoning districts in each municipality and the development in each of those districts.

A. Applications for the installation of Tier 3 Solar Energy System shall be:

1) reviewed by the [Code Enforcement/Zoning Enforcement Officer or Reviewing Board] for completeness. Applicants shall be advised within [10] business days of the completeness of their application or any deficiencies that must be addressed prior to substantive review.

2) subject to a public hearing to hear all comments for and against the application. The [Reviewing Board] of the [Village/Town/City] shall have a notice printed in a newspaper of general circulation in the [Village/Town/City] at least [5] days in advance of such hearing. Applicants shall have delivered the 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 62 days of the public hearing, which can include approval, approval with conditions, or denial. The 62-day period may be extended upon consent by both the [Reviewing Board] and applicant.

B. Underground Requirements. All on-site utility lines 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.

C. Vehicular Paths. Vehicular paths within the site shall be designed to minimize the extent of impervious materials and soil compaction.

D. Signage.

1) 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.

2) 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.

E. Glare. All Solar Panels shall have anti-reflective coating(s).

F. 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.

G. Tree-cutting. Removal of existing trees larger than [6] inches in diameter should be minimized to the extent possible.

H. Decommissioning.

1) Solar Energy Systems that have been abandoned and/or not producing electricity for a period of [1] year shall be removed at the Owner and/or Operators expense,

which at the Owner's option may come from any security made with the [Village/Town/City] as set forth in Section 10(b) herein.

2) A decommissioning plan (see Appendix 4) signed by the owner and/or operator of the Solar Energy System shall be submitted by the applicant, addressing the following:

a. The cost of removing the Solar Energy System.

b. The time required to decommission and remove the Solar Energy System any ancillary structures.

c. The time required to repair any damage caused to the property by the installation and removal of the Solar Energy System.

3) Security.

a. 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 [125] % of the cost of removal of the Tier 3 Solar Energy System and restoration of the property with an escalator of [2] % annually for the life of the Solar Energy System. The decommissioning amount shall be reduced by the amount of the estimated salvage value of the Solar Energy System.

b. 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.

c. In the event of default or abandonment of the Solar Energy System, the system shall be decommissioned as set forth in Section 10(b) and 10(c) herein.

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 NY-Sun's Fact Sheet on Decommissioning Solar Panel Systems, available at https://www.nyserda.ny.gov/SolarGuidebook.

I. Site plan application. For any Solar Energy system requiring a Special Use Permit, site plan approval shall be required. Any site plan application shall include the following information:

1) Property lines and physical features, including roads, for the project site

2) Proposed changes to the landscape of the site, grading, vegetation clearing and planting, exterior lighting, and screening vegetation or structures

3) A one- or three-line electrical diagram detailing the Solar Energy System layout, solar collector installation, associated components, and electrical interconnection methods, with all National Electrical Code compliant disconnects and over current devices.

4) A preliminary equipment specification sheet that documents all proposed solar panels, significant components, mounting systems, and inverters that are to be installed. A final equipment specification sheet shall be submitted prior to the issuance of building permit.

5) 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.

6) Name, address, phone number, 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.

7) Zoning district designation for the parcel(s) of land comprising the project site.

8) Property Operation and Maintenance Plan. Such plan shall describe continuing photovoltaic maintenance and property upkeep, such as mowing and trimming.

9) Erosion and sediment control and storm water management plans prepared to New York State Department of Environmental Conservation standards, if applicable, and to such standards as may be established by the Planning Board.

10) Prior to the issuance of the building permit or final approval by the [Reviewing Board], but not required as part of the application, engineering documents must be signed and sealed by a New York State (NYS) Licensed Professional Engineer or NYS Registered Architect.

Commentary: It is important to consolidate the application review for Solar Energy System approval 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.

J. Special Use Permit Standards.

1) Lot size

a. 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.

Commentary: The Model Law Special Use Permit Standards require that Tier 3 Solar Energy Systems either adhere to the minimum lot size requirements of the underlying zoning district or to specific lot size requirements for solar energy systems designated by the municipality. For guidance, municipalities can use Appendix 1 to determine the minimum lot size needed to qualify for a permit for Tier 3 Solar Energy Systems. Depending on the municipality's needs, lot size requirements should be expressed in acreage or square feet. A municipality should determine this as it determines in which zoning districts to allow Tier 3 systems. One solution is to require a different minimum lot size for each district depending on the type of development present in each.

2) Setbacks

a. The Tier 3 Solar Energy Systems shall comply with the setback requirements of the underlying zoning district for principal structures.

OR

The Tier 3 Solar Energy Systems shall meet the setback requirements in Appendix 2.

3) Height

a. The Tier 3 Solar Energy Systems shall comply with the building height limitations for principal structures of the underlying zoning district.

OR

b. The Tier 3 Solar Energy Systems shall comply with the height limitations in Appendix 3 depending on the underlying zoning district.

4) Lot coverage

a. The following components of a Tier 3 Solar Energy System shall be considered included in the calculations for lot coverage requirements:

I. Foundation systems, typically consisting of driven piles or monopoles or helical screws with or without small concrete collars.

II. All mechanical equipment of the Solar Energy System, including any pad mounted structure for batteries, switchboard, transformers, or storage cells.

III. Paved access roads servicing the Solar Energy System.

b. Lot coverage of the Solar Energy System, as defined above, shall not exceed the maximum lot coverage requirement of the underlying zoning district.

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 the run-off they create, this Model Law measures 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.

It is also important to note that Tier 3 Solar Energy Systems must comply with New York State stormwater regulations, as the panels could alter the volume, velocity, and discharge pattern of stormwater runoff.

5) Fencing Requirements. All mechanical equipment, including any structure for storage batteries, shall be enclosed by a [7-foot-high] fence, as required by NEC, with a self-locking gate to prevent unauthorized access.

6) 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:

        I. 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.

        II. 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 [Village/Town/city] [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].

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.

For Tier 3 Solar Energy Systems that are smaller 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 that are larger than 10 acres, a visual impact assessment is already required for SEQR (considered Type I Actions in SEQR), and solar projects could use the same assessment to analyze visual impacts on public roadways and adjacent properties to comply with Model Law screening and visibility requirements.

For additional resources, please refer to NY-Sun's "State Environmental Quality Review (SEQR) for Solar," available at https://www.nyserda.ny.gov/SolarGuidebook.

7) Agricultural Resources. For projects located on agricultural lands:

1) Any Tier 3 Solar Energy System located on the areas that consist of Prime Farmland or Farmland of Statewide Importance shall not exceed [50] % of the area of Prime Farmland or Farmland of Statewide Importance on the parcel.

OR

Any Tier 3 Solar Energy System located on the areas that consist of Prime Farmland or Farmland of Statewide Importance shall not exceed [50] % of the entire lot.

AND/OR

Tier 3 Solar Energy Systems on Prime Farmland or Farmland of Statewide Importance shall be required to seed [20] % of the total surface area of all solar panels on the lot with native perennial vegetation designed to attract pollinators.

2) To the maximum extent practicable, Tier 3 Solar Energy Systems located on Prime Farmland shall be constructed in accordance with the

Commentary: For more details, please refer to NYS Department of Agriculture and Market's Guidelines for Agricultural Mitigation for Solar Energy Projects, available at https://www.agriculture.ny.gov/ap/agservices/Solar_Energy_Guidelines.pdf.

construction requirements of the New York State Department of Agriculture and Markets.

3) 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.

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.*

K. 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 special use permit, site plan approval, and 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. 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 Storage Batteries are 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.

10. Permit Time Frame and Abandonment

A. The Special Use Permit and site plan approval for a Solar Energy System shall be valid for a period of [18] 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 [18] months after approval, the applicant or the [Village/Town/City] may extend the time to complete construction for [180] days. If the owner and/or operator fails to perform substantial construction after [24] 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 [360] days 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.

11. 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.

12. 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.

Commentary: Local laws typically have a provision that saves the entire law from invalidation by the courts if one or a few provisions are found invalid. The language in this Section can be adjusted to match that of the language already found in the severability clauses in a municipality's other laws.

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: Lot Size Requirements

Zoning District	Tier 3 Solar Energy Systems
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: PARCEL LINE SETBACKS

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: Parcel Line Setback Requirements

	Tier 3 Ground-Mounted		
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

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: Height Requirements

	Tier 1 Roof-Mounted	Tier 2	Tier 3
Zoning District			
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 Farm Name]

As required by [Town/Village/City], [Solar Developer Name] presents this decommissioning plan for [Solar Project Name] (the "Facility").

Decommissioning will occur as a result of any of the following conditions:

1. The land lease, if any, ends
2. The system does not produce power for [12] months
3. The system is damaged and will not be repaired or replaced

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 which may include the following:

1. Removal of all operator-owned equipment, concrete, conduits, structures, fencing, and foundations to a depth of 36 inches below the soil surface.
2. Removal of any solid and hazardous waste caused by the Facility in accordance with local, state and federal waste disposal regulations.
3. Removal of all graveled areas and access roads unless the landowner requests in writing for it to remain.

All said removal and decommissioning shall occur within [12] months of the Facility ceasing to produce power for sale.

The owner of the Facility, currently [Solar Developer Name], is responsible for this decommissioning.

Facility Owner Signature: _____ Date: _____

State of New York
Andrew M. Cuomo, Governor

New York State Energy Research and Development Authority
Richard L. Kauffman, Chair | Alicia Barton, President and CEO