U.S. Climate Alliance

Solar Deployment Guidebook

A Resource for State and Local Governments

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UNITED STATES CLIMATE ALLIANCE

NASEO

National Association of State Energy Officials

About

To assist states and localities in accelerating solar adoption, the U.S Climate Alliance (USCA) partnered with the National Association of State Energy Officials (NASEO) to elevate crucial strategies and tools for state and local governments to reduce the non-hardware costs of solar development. To achieve this goal the project team has conducted a comprehensive literature review and analysis of existing solar best practices publications to inform the development of the USCA Solar Deployment Guidebook: A Resource for State and Local Governments. This Guidebook was written for state and local governments to identify gaps and opportunities for innovation in local solar market design; provide sample local policy and program frameworks, applications, and language; include local solar policy decision making considerations and planning scenarios; and point states and localities to additional state, federal, and private resources.

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David Althoff, Pennsylvania Energy Programs Office

Ned Noel, City of Eau Claire, Wisconsin

This report was authored by Stephen Goss, NASEO Senior Program Manager, and Sandy Fazeli, NASEO Managing Director for Policy, in December 2018.

How to Use This Guidebook

The purpose of this Guidebook is to equip state and local governments with the tools, strategies, and proven soft cost reduction methods essential to realizing the untapped potential of local solar development. Extensive research has been performed across the country by local, state, and federal agencies to develop and implement meaningful strategies for significantly reducing system costs. This report synthesizes the findings from those efforts and identifies existing barriers, opportunities, and best practices in four key areas: permitting and inspection; zoning and siting; municipal procurement; and property taxes. Each section will provide a comprehensive overview followed by a one-page "Toolkit" that synthesizes key concepts, terms, and considerations; provides model language and frameworks; and identifies best practices, reference guides, and other essential soft cost reduction resources. For states and local governments, this Guidebook will serve as an overview of key soft cost reduction strategies as well as an evolving collection of models, tools, and resources.

Table of Contents

Foreword

States Leading on Solar

Across the U.S. and around the world, climate change is an increasingly urgent threat. Greenhouse gas emissions jumped to an all-time high in 2018 – increasing 2.7% globally. In November, the federal government released the Fourth National Climate Assessment, which contained dire warnings about the impacts of climate change on our communities, our economy, our air, our water and health if we don't act now.

Because of these grave threats, governors from across the country came together in mid-2017 to create the U.S. Climate Alliance, forming a coalition of states committed to upholding the objectives of the Paris Agreement. Through the U.S. Climate Alliance, states are collaborating to scale-up climate solutions – protecting their environments and growing their economies at the same time.

U.S. Climate Alliance states are now working together and with expert partners across nearly a dozen priority areas. One of those areas is the U.S. Climate Alliance Solar Soft Costs Initiative, where states are collaborating with the National Association of State Energy Officials (NASEO) to compile tools and resources that help reduce "soft costs" that often act as barriers to solar adoption. The Solar Deployment Guidebook has been developed in collaboration with states to help achieve soft cost reduction and increase deployment.

The U.S. Climate Alliance Solar Soft Costs Initiative and the Solar Deployment Guidebook build upon the tremendous progress toward scaling up solar that states have made to date. In New York, solar is expected to grow to over 1,216 MW through the end of 2018, up from over 972 MW in 2017,[1] and the state has seen over 1000% growth since 2011. In California, more than 780,000 small solar systems have been installed on homes, businesses, and schools as of August 2018, reaching nearly 7,000 MW of capacity.[2] Progress in community solar is also promising: in Minnesota and Massachusetts, over 300 MW of community solar has been installed in the first half of 2018.[3] Solar is creating hundreds of thousands of new jobs across the U.S., and a total of 350,000 workers are now employed in whole or in part by the solar industry.[4]

Moving forward, the U.S. Climate Alliance will continue to foster interstate collaboration on solar energy adoption through the implementation of the best practices contained in this report. We are grateful to our partners at NASEO for their tremendous work on the Solar Deployment Guidebook and look forward to continued partnership to disseminate these resources. Finally, we will continue to welcome participation from states and local governments across the country as we support the deployment at scale of clean energy solutions in the fight against climate change.

Julie Cerqueira
Executive Director
U.S. Climate Alliance

[1] https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Data-and-Trends
[2] https://www.energy.ca.gov/data-reports/tracking-progress/renewable-energy
[3] https://www.seia.org/research-resources/solar-market-insight-report-2018-q3
[4] https://pv-magazine-usa.com/2018/05/17/more-u-s-jobs-in-solar-than-coal-and-nuclear-combined/

Executive Summary

Introduction

In February 2018, the federal government imposed import tariffs on solar hardware components, including cells and panels, as a result of a 2017 U.S. International Trade Commission (ITC) finding of serious injury to the domestic solar industry from excessive imports of solar hardware. The 30% tariff, which will decline by 5% per year over its four-year term and phase out in 2022, is expected to increase the total cost of U.S. solar projects by about 10% and reduce installations by 11% nationwide. Analyses suggest that it could result in 7.6 fewer gigawatts of installed solar capacity over the next five years, as well as tens of thousands of job losses (an estimated 23,000 in 2018 alone).[5]

To combat the dampening effect that the tariff is expected to have on U.S. solar markets and employment, states and localities can work together to design and implement policies, plans, and practices that enable solar energy to continue to become more affordable. While the hardware costs of solar projects have experienced a steady decline over the past several years, there remains significant opportunity to reduce "soft" costs. Such costs often include those associated with permitting, financing, customer acquisition, installer profit, and other non-hardware costs and may represent as much as 64% of the cost of a project.[6]

Past progress on solar soft cost reduction has been attributed to factors largely under the purview of solar developers and installers, such as increased efficiency in system design and installation, increased installer experience and competition, and compressed margins.[7] This suggests that there remains untapped opportunity for improved public policies and practices to reduce the administrative burden and transaction costs associated with solar installations.

Report Overview

This Guidebook builds upon ongoing efforts under the U.S. Climate Alliance Solar Soft Costs Initiative to equip state and local agencies with tools, strategies, and models on proven soft cost reduction methods in the following areas: permitting and inspection; zoning and siting; municipal procurement; and property taxes.

Across more than 18,000 jurisdictions in the United States, solar photovoltaic (PV) systems are subject to a variety of state and local rules meant to regulate system type, system size, system height, and more. While permitting processes are designed to ensure that public safety requirements, engineering standards, and electrical and building codes are met, inherent complexities and inconsistencies within these processes combined with a lack of standardization across local jurisdictions and states can create significant barriers to solar deployment. Initiating an expedited permitting process can vary significantly depending on the size and resources of a given jurisdiction, but by standardizing permitting processes across jurisdictions, it is estimated that $1 billion in cost savings could be realized for residential systems alone within five years. Section 1 of this Guidebook identifies key opportunities and existing best practices for reforming the solar permitting process for states and local jurisdictions.

In many jurisdictions, zoning and siting requirements can often limit the deployment of small-scale residential or municipal solar systems. Homeowners associations covenants, design review restrictions, and zoning ordinances that restrict or overlook solar PV, legal costs, or other limitations outside the authority of local governments can cause disputes, delay permitting approvals, and restrict the availability of ideal land and

[5] Pyper, J. "New Tariffs to Curb US Solar Installations by 11% Through 2022," *GreenTech Media,* Jan. 23, 2018.

[6] "Soft Costs 101: The Key to Achieving Cheaper Solar Energy." Department of Energy. Accessed September 06, 2018. https://www.energy.gov/eere/articles/soft-costs-101-key-achieving-cheaper-solar-energy.

[7] Woodhouse, Michael, Rebecca Jones-Albertus, David Feldman, Ran Fu, Kelsey Horowitz, Donald Chung, Dirk Jordan, and Sarah Kurtz. "On the Path to SunShot: The Role of Advancements in Solar Photovoltaic Efficiency, Reliability, and Costs." SunShot. May 2016. https://www.nrel.gov/docs/fy16osti/65872.pdf.

access to grid interconnections for new development. Many local jurisdictions have sought to address these challenges by specifically including solar energy systems in zoning and land use regulations to facilitate a regulatory environment that supports the cost-effective expansion of local solar markets. Section 2 of this Guidebook explores key considerations for incorporating solar development into land use regulations and provides best practices and model solar development ordinances.

By procuring solar energy, municipal governments can access a wide range of additional benefits beyond the general economic and environmental advantages that solar deployment offers. In the context of soft cost reduction, innovations in municipal solar procurement may help cities, counties, and other local jurisdictions use solar-generated electricity at lower rates, assist the private and non-profit sectors in accessing public (and potentially lower-cost, and often unused or vacant) land for solar development, and support local job creation and retention for solar installers, legal and financial experts, and other professionals. Section 3 offers key considerations, insights, contractual and partnership models, and steps for municipalities interested in procuring solar energy.

Properties with solar PV energy installations may experience a substantial rise in their property values. While the increase in value may provide a direct benefit to the property owner at the time of sale, in some jurisdictions, it may also trigger an increase in the taxes owed on the property. This dynamic increases the overall soft cost of a solar system. This cost is not necessarily incurred at the time of installation, but later on (for instance, when the property is assessed by the city or county for taxation purposes), potentially harming the financial long-term viability of projects. The purpose of Section 4 of the Guidebook is to highlight how state and local governments can address the soft costs of solar projects associated with a rise in property taxes.

Section 1: Permitting and Inspection

Prior to the installation of a solar PV system, a system owner must acquire all necessary permits required by a specific state and/or local jurisdiction. Across more than 18,000 jurisdictions in the United States, PV systems are subject to a variety of state and local rules regulating system type, system size, system height, and more. While permitting processes are designed to ensure that public safety requirements, engineering standards, and electrical and building codes are met, inherent complexities and inconsistencies within these processes, combined with a lack of standardization across local jurisdictions and states, can create significant barriers to solar deployment.

Not only do these challenges increase non-hardware, balance of system costs for owners and installers; they also place additional burdens on local permitting and inspection agencies and jurisdictions responsible for processing permit applications. According to a report published by the National Renewable Energy Laboratory on market barriers to solar deployment in Michigan, in some cases, the administrative resources (e.g., time, money, training/knowledge, personnel) required to review and process applications can account for up to 50% of the total cost of an installation.[8] As a result, the process for reviewing permit applications is often left unclear or undefined, resulting in increased review times, higher permitting fees, and installation delays.

Expedited permitting refers to a structured process through which small-scale PV systems (10-15 kW) can be permitted quickly and easily by simplifying the requirements for application review and processing and streamlining the field inspection process. In the report *Expedited Permit Process for PV Systems,* the Solar America Board for Codes and Standards (Solar ABCs) offers a one-page expedited permitting process form and an accompanying set of guidelines to help jurisdictions identify the minimum requirements for utilizing expedited permitting. This resource provides a comprehensive guide to streamlining the residential PV permitting process as well as interactive forms that can be customized and used by jurisdictions where standardized processes have been adopted.

Initiating an expedited permitting process can vary significantly depending on the size and resources of a given jurisdiction, but by standardizing permitting processes across jurisdictions, it is estimated that $1 billion in cost savings could be realized for residential systems alone within 5 years.[9] The following section identifies key opportunities and existing best practices for reforming the solar permitting process for states and local jurisdictions.

Standardizing the Permitting Process

To eliminate inconsistencies and develop a standard that spans across all local jurisdictions, several states including California, Vermont, Massachusetts, and Colorado have implemented statewide legislation aimed at streamlining the process for solar permitting. In 2014, California passed the Solar Permitting Efficiency Act, which required all local jurisdictions to adopt an ordinance that expedited the permitting process for residential PV systems under 10kw and reduced the number of required field inspections to one. Similarly, Vermont enacted legislation in 2012 which has since been amended to expedite the approval of residential PV systems under 15kw to 10 days.[10] Through analysis of existing state policy, the National Renewable Energy Laboratory has concluded that enacting statewide legislation designed to standardize permitting requirements across jurisdictions can result in a measurable increase in solar deployment.

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[8] Miller, Emily, Erin Nobler, Christopher Wolf, and Elizabeth Doris. "Market Barriers to Solar in Michigan." August 2012. Accessed August 2018. https://www.nrel.gov/docs/fy12osti/54574.pdf.

[9] "The Impact of Local Permitting on the Cost of Solar Power." January 2011. Accessed August 2018. https://grist.files.wordpress.com/2011/07/solar-report-on-cost-of-solar-local-permitting.original.pdf.

[10] "Expedited Permitting Process for Solar PV Systems." DSIRE. Accessed September 06, 2018. http://programs.dsireusa.org/system/program/detail/5293.

In addition to implementing statewide legislation, many states have also sought to standardize permitting practices among jurisdictions by developing guidebooks specifically designed to aid municipalities and local officials in adapting and adopting model ordinances, codes, technical requirements, and language. New York created the New York State Solar Guidebook, which provides local governments and communities with a wealth of information, tools, and instructions to facilitate local solar development.[11] New Hampshire developed a similar guide for local officials, installers, and residents that contains recommendations and information for permitting, planning, zoning, and utility interconnection.[12]

Increasing Ease of Access to Permitting Resources

Streamlining the process for accessing permitting information and obtaining, completing, submitting, and tracking applications will decrease the administrative burden on a jurisdiction, provide flexibility in the structural review process, and save personnel hours and resources. The Interstate Renewable Energy Council (IREC) recommends that when designing online permitting websites, states and local jurisdictions should, at a minimum, include:[13]

- Application requirements and forms
- Checklists
- Informational bulletins
- Inspection requirements
- Special provisions
- Solar Access Laws
- Frequently Asked Questions

While the most effective practice for states and local jurisdictions is to develop a one-stop, online information portal that houses all permitting resources in a single, easily accessible location, IREC has found that this method for reducing soft costs is vastly underutilized by states and jurisdictions. Several best practices do exist, however, among states, cities, and counties. To facilitate all projects ranging from residential installations to utility-scale facilities, the Hawaii State Energy Office created the Developer and Investor Center: a one-stop suite of online resources for developers, localities, and stakeholders designed to streamline the process for permitting renewable projects by housing all permitting, financing, siting, and utility tools and resources in a single location.[14] This also includes the Renewable Energy Permitting Wizard, a tool designed to walk users through all levels of the permitting process to generate a curated list of the county, state, and federal permit requirements for a given project with estimated time frames for each permit.[15] Likewise, cities and counties in California, Colorado, Pennsylvania, Oregon, Arizona, and others have also designed comprehensive permitting websites to facilitate access to local resources for solar development.

Developing a Transparent and Fair Schedule of Fees

Among non-hardware costs, the cost of obtaining a permit comprises a significant portion of total system costs. To minimize these costs and provide transparency and certainty to applicants, it is crucial that local jurisdictions develop an accessible schedule of permitting fees with a clearly defined basis for fee rates. A

[11] "NYSERDA." New York State Solar Guidebook. Accessed September 06, 2018. https://www.nyserda.ny.gov/All Programs/Programs/Clean Energy Siting/Solar Guidebook.

[12] "Saving Energy and Renewables." New Hampshire Office of Strategic Initiatives. Accessed September 06, 2018. https://www.nh.gov/osi/energy/saving-energy/index.htm.

[13] Stanfield, Sky, Erica Schroeder, and Thad Culley. "Sharing Success: Emerging Approaches to Efficient Rooftop Solar Permitting." Interstate Renewable Energy Council. May 2012. Accessed September 2018. https://irecusa.org/publications/sharing-success/.

[14] "NASEO Best Practices Review: Streamlined Renewable Energy Permitting Initiatives." February 2014. Accessed August/September 2018.

[15] "Project Permitting Assistance and Resources." Hawaii State Energy Office. Accessed September 06, 2018. http://energy.hawaii.gov/developer-investor/project-permitting-assistance-and-resources.

review conducted by the Center for Sustainable Energy of best practices from the Southern California Solar Challenge found that most jurisdictions determine permitting fees based on a cost recovery or flat rate basis.[16] The City of Boise, Idaho amended the city building code ordinance to clarify how residential and commercial PV systems building permit fees were to be calculated by establishing a flat rate based on hours spent during plan review and inspection.[17]

Though less common, several jurisdictions have also reported success in increasing solar permit application and approval numbers by waiving permitting fees entirely for small-scale systems. In 2011, Connecticut passed a law authorizing local jurisdictions to issue building permit fee waivers for Class I renewable energy projects under 5kw, including residential solar PV.[18] Other options for permitting fees include capping permitting costs for residential and nonresidential installations as seen in Colorado under the Fair Permit Act of 2011, or basing the fee rate on the labor costs associated with the installation, as practiced in St. Paul, Minnesota.

Inspections

In jurisdictions where significant efforts are made to expedite the permitting process for solar PV systems, it is essential to emphasize the importance of the field inspection phase. A streamlined permitting process will effectively reduce application processing times and costs and expedite construction, but it is ultimately the final field inspection that will determine the ability of the contractor to install a code-compliant PV system. It is therefore crucial to recognize that while an expedited permitting process should simplify the structural and electrical review of projects, it is not intended to diminish or bypass the integrity of the engineering process. In the face of a simplified project review, it is critical that inspectors and contractors be well-informed in order to better align project standards, timelines, and cost expectations.

[16] "Best Practices for Permitting Processes." February 2013. Accessed August/September 2018. http://energycenter.org/sites/default/files/docs/nav/policy/research-and-reports/Permitting Best Practices web.pdf.

[17] Solar Photovoltaic Systems Building Permit Fees Policy." Letter from Jason Blais. February 6, 2016. In Planning and Development Services. June 2016.

[18] "Local Option - Building Permit Fee Waivers for Renewable Energy Projects." Department of Energy. Accessed September 2018. https://www.energy.gov/savings/local-option-building-permit-fee-waivers-renewable-energy-projects.

Soft Costs Toolkit: *Permitting and Inspection*

Streamlined Permitting and Inspection Tools

- Expedited Permit Process Report and Resources – Solar America Board for Codes and Standards (Solar ABCs)
  This collection of resources includes: a comprehensive report detailing an expedited permit process for small-scale PV system; and example permitting forms and templates designed to be completed online and submitted electronically.

- New York State Unified Solar Permit – New York State Energy Research and Development Authority (NYSERDA)
  The New York State Unified Solar Permit and accompanying implementation guide were designed to help local governments officials understand and streamline the solar PV permitting and inspection process. Resources include: New York State Unified Solar Permit Application; Field Inspection Checklist; and a guide to understanding state solar PV permitting and inspection.

- Model Inspection Checklist for Residential Rooftop PV - Interstate Renewable Energy Council (IREC)
  This document provides basic guidelines for reviewing a permit plan application and inspecting most residential rooftop PV systems.

State Solar Guide Examples:

- California Solar Permitting Guidebook
- New Hampshire Residential Rooftop Solar PV Permitting, Zoning, and Interconnection Guide
- New York State Solar Guidebook

Statewide Permitting Legislation:

- Colorado Fair Permit Act
- California Solar Permitting Efficiency Act

Local Permitting Website and Online Processing Examples:

- Pima County, Arizona
- City of Kansas City, Missouri
- City of San Jose, California
- City of Berkley, California

Section 2: Zoning and Siting

In many jurisdictions, zoning and siting requirements, or a lack thereof, can limit the deployment of small-scale residential or municipal solar systems. One of the most effective methods to overcoming this barrier is through the development of solar-specific supplemental regulations that align the unique siting requirements of PV systems with existing land use regulations. Zoning is a tool used for regulating the development of land within a locality through the creation of zoning districts, land use restrictions, and development standards. A zoning ordinance will regulate land development for a variety of uses, including residential, commercial, industrial, and agricultural, and will include zoning maps to delineate each district within the locality. Use restrictions within a zoning ordinance will specify if and how solar is permitted within a given district (e.g., principle or accessory use, conditional, prohibited), and development standards describe dimensional attributes of permissible solar developments such as size, height limits, and setback requirements.

Key Zoning Considerations for Solar:

- How should solar development be defined?
- Where is solar appropriate and what are the potential land use impacts?
- What should the standards for principal and accessory solar uses be?
- How can solar be balanced with competing interests?

(Planning and Zoning for Solar in North Carolina. 2014. p.13)

STATE SPOTLIGHT
Defining "Solar Energy System (SES)

"The components and subsystems required to convert solar energy into electric or thermal energy suitable for use. The area of the system includes all the land inside the perimeter of the system, which extends to any fencing. The term applies, but is not limited to, solar photovoltaic (PV) systems, solar thermal systems, and solar hot water systems. A system fits into one of three system types: Level 1 SES, Level 2 SES, and Level 3 SES."

Template Solar Energy Development Ordinance for North Carolina

While use restrictions and development standards are essential components of any local solar ordinance, regulations can vary drastically between jurisdictions depending on local priorities, goals, and needs. For example, zoning needs in a densely populated urban area with mixed-use residential and commercial districts can differ significantly from those in a more suburban or rural setting. It is therefore imperative that local jurisdictions formulate standards and review processes for solar development based on the unique needs of the locality. States such as North Carolina and California have facilitated this effort by developing model solar ordinances for local jurisdictions to customize and adopt. These models can provide a foundation for local solar development ordinances by identifying some of the key factors and questions that local governments should consider.

Defining Solar Energy Systems

An important first step for municipalities seeking to incorporate solar into zoning and land use regulations is to establish a comprehensive definition of "solar energy systems". In some jurisdictions, existing land use regulations may be adequate to accommodate solar projects, but the development of a comprehensive definition specific to solar energy systems will prevent misinterpretation, streamline project development, and minimize review times and project delays. When defining solar energy systems to include in the local zoning code, it is important that jurisdictions identify related terms, specify whether systems will be allowed as principle or accessory uses in each zoning district,

and determine respective requirements for roof-mounted and ground-mounted systems. Likewise, many jurisdictions have incorporated language to expand the definition of solar energy systems beyond the more frequent use of photovoltaics to permit the installation of thermal systems as well.

Land-use Impacts

Geographic variability, competing interests, and local priorities and needs will have a significant impact on solar development within a given jurisdiction. Considerations around aesthetics, noise levels, stormwater runoff, glare, public safety concerns, operations, impacts on property value, and other environmental impacts should be taken into account when designing a local solar development ordinance[19]. For instance, in consideration of potential glare impacts along low-altitude military flight paths, the *Template Solar Energy Development Ordinance for North Carolina* includes a requirement for solar energy systems of all levels exceeding half an acre to evaluate the solar glare aviation hazard of the project using the Solar Glare Hazard Analysis Tool (SGHAT), developed by Sandia National Laboratories. Similarly, it is common for states and jurisdictions to discourage development in locations that may result in significant loss of arable land and natural resources.

Solar Development Standards

In general, an effective local solar development ordinance will divide systems into multiple levels or tiers according to system size and location and provide standards and language for each, including: system applicability; permit requirements; parcel line setbacks; height limitations; review requirements; agricultural and biological resource considerations; decommissioning; and others specific to the locality.

Solar Access

Solar access refers to the ability of a given property to receive sunlight, free from impediment by an adjacent property. Trees or building structures from neighboring properties can restrict available sunlight for property owners, making solar development impractical. Likewise, regulations designed by some jurisdictions or homeowners' associations (HOAs) to protect individuals, community aesthetics, or property values can also adversely affect an individual's access to solar. In these instances, it has proven useful for states and local jurisdictions to intervene to ensure adequate solar access for property owners through solar access permits or easements, local solar access ordinances, or state solar access laws. For instance, to protect the rights of system owners, the State of Maryland passed a law in 1980 prohibiting land use covenants that unreasonably impacted the installation of solar photovoltaics, later expanding this law to prohibit use restrictions that could adversely affect system cost or efficiency.[20] Massachusetts also passed legislation to ensure solar access by allowing for the voluntary creation of solar easements and enabling local jurisdictions to design zoning rules to guarantee solar access.[21]

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[19] Lovelady, Adam, *Planning and Zoning for Solar in North Carolina*. The School of Government at the University of North Carolina at Chapel Hill, 2014

[20] Maryland Code, Real Property §2–119, 1980, http://mgaleg.maryland.gov/webmga/frmStatutesText.aspx?article=grp&section=2-119&ext=html&session=2020RS&tab=subject5

[21] M.G.L. ch. 40A § 9B. Solar access, 190th General Court of the Commonwealth of Massachusetts, https://malegislature.gov/Laws/GeneralLaws/PartI/TitleVII/Chapter40A/Section9B

Soft Costs Toolkit: *Zoning and Siting*

Model Zoning Ordinances

- North Carolina - Template Solar Energy Development Ordinance for North Carolina
- California - Model Solar Energy Facility Permit Streamlining Ordinance
- New York – Model Solar Energy Local Law

Zoning and Siting Resources and Tools

- Integrating Solar Energy Into Local Development Regulations Solar Briefing Paper – American Planning Association (APA)
  This resource provides an overview of integrating solar energy into local development regulations through removing barriers, creating incentives, and enacting standards and offers examples of local best practices.

- Planning and Zoning for Solar Energy Info Packet – American Planning Association (APA)
  These resources provide sample ordinances on topics such as solar access, solar siting, and solar energy systems and examples of how communities are adding solar provisions to their comprehensive, subarea, and functional plans.

- Municipal Guidebook for Solar Zoning and Permitting – Environmental Planning and Design, LLC
  This resource provides background information, a model solar zoning ordinance, model permitting application and information related to permitting fees and processes.

- Solar Powering Your Community: A Guide for Local Governments – U.S. Department of Energy
  This resource provides guidance for updating and enforcing local rules and regulations.

- Land Use Tools for Siting Solar While Protecting Farmland – NYSERDA
  This resource 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.

Section 3: Municipal Procurement

By procuring solar energy, municipal governments can access a wide range of additional benefits beyond the general economic and environmental advantages that solar deployment offers. Municipal solar procurement presents opportunities for municipal enterprise cost savings and energy price stability; revenue generation associated with leasing public space for solar development; resilience of city operations and mission-critical facilities and infrastructure; increased use of locally-based energy resources, solar installers, and experts; and progress toward city or state renewable energy and carbon emissions reductions targets and goals, among others.[22]

In the context of soft cost reduction, innovations in municipal solar procurement may help cities, counties, and other local jurisdictions use solar-generated electricity at lower rates, assist the private and non-profit sector in accessing public (and potentially lower-cost, and often unused or vacant) land for solar development, and support local job creation and retention for solar installers, legal and financial experts, and other professionals.

KEY RESOURCE:
NYSERDA's Municipal Solar Procurement Toolkit

Released in August 2018 by the New York State Energy Research and Development Authority's (NYSERDA) NY-Sun Program, the Municipal Solar Procurement Toolkit provides guidance and resources for communities seeking to develop solar projects on underutilized properties such as landfills and brownfields and supports recent revisions to the NY-Sun Megawatt Block Program which provides financial incentives for developing solar projects in those areas. This Toolkit includes step-by-step instructions on how to lease municipal land for solar development, a template Request for Proposals (RFP), a template Lease Agreement, and a Model Law for Counties subject to New York County Law § 215. Municipalities are encouraged to review and consider modifying this toolkit, specifically the template RFP and Lease Agreement, to ensure it addresses all the needs of the municipality by deleting, modifying, or adding any other sections or provisions that would be necessary in the leasing jurisdiction.

To achieve these results, municipal governments may pursue various ownership, partnership, and contractual arrangements. Cities, counties, and other localities have access to unique resources and advantages to implement and advance municipal solar procurement, such as bulk purchase and aggregation options and low-cost financing. Such mechanisms may help municipalities overcome key barriers and challenges to solar procurement, such as high upfront costs, lack of dedicated personnel, and other constraints.

Despite the preponderance of models and options that many cities across the United States have implemented to procure solar, there are still extremely few standardized practices or models that may enable wide-scale replication and adoption. Additionally, various regulatory, financial, and decision-making challenges may pose an obstacle to municipal solar procurement, highlighting the need for thorough stakeholder engagement and policy clarity at the federal, state, and local level.

The following sections offer key considerations, insights, examples, and steps for municipalities interested in procuring solar energy.

Key Opportunities, Challenges, and Considerations

In recognition of the economic, sustainability, and resiliency benefits that can result from solar deployment, municipalities both large and small have made significant commitments to increase installed solar capacity in neighborhoods and communities across the country.[23] In many jurisdictions, municipal solar procurement represents a key component of such solar commitments.

[22] Solar United Neighbors, "Solar for Municipalities," https://www.solarunitedneighbors.org/go-solar/solar-for-municipalities, accessed December 2018.
[23] U.S. Conference of Mayors, "Cities with City-Wide Renewable Energy Goals," 2018.

Solar procurement by municipalities may come about in different ways. Cities, counties, and other localities may opt to install solar directly on publicly-owned buildings and facilities, to power and green their operations. Municipalities may also make available publicly-owned land – particularly brownfields, landfills, or other vacant spaces that do not have plans for alternative use – available for solar development, which may be accessed by the city enterprise itself, and/or nearby businesses and residents in the community.[24] Finally, municipal governments may also engage utilities (including their own municipally-owned utilities, as well as investor-owned and cooperatively-owned utilities) to increase their procurement of solar energy on the grid and thus "green" their power supply, typically substantiated through the issuance of Renewable Energy Certificates (RECs).[25]

Municipalities have several resources and advantages at their disposal to pursue solar procurement efforts: access to unused, unusable or vacant land; purchasing power, either as an individual municipality in or partnership with other localities; low-cost financing options; and convening power among solar stakeholders and the general public. Additionally, as solar-ready building codes expand at the state and local level across the country, some jurisdictions may benefit from newly-constructed and rehabilitated public buildings being better designed for the installment of solar arrays, reducing the potential cost of installation and construction.

Yet, unique barriers faced by municipal governments may hamper solar procurement. Often a multi-stakeholder, multi-agency process, solar procurement requires review and approval by city leadership, legal counsel, procurement officials, engineering teams, and sustainability divisions, among others. In this fashion, the municipal agency review, permissions, and communications processes may result in longer project timeframes and create additional transaction costs for project and program setup to create alignment with existing sustainability plans or renewable energy targets. Municipalities may also be challenged by state and local procurement laws, debt limits, or other financial constraints that limit their ability to invest in solar PV technology.

LOCAL SPOTLIGHT:
Microgrids in Montgomery County, MD

It is important to note that many cities and counties continue to innovate in municipal solar procurement. In 2018, Montgomery County, Maryland achieved the country's first "Microgrid-as-a-service" contract, building on a 25-year term PPA template, in order to construct microgrids with on-site solar capacity in its Public Safety Headquarters and correctional facility. As an ever-evolving field of study and practice, there is no one-size-fits-all approach for local solar procurement nor for the siting, permitting, and application processes that accompany it.

Municipal Solar Procurement Strategies, Partnership Models, and Contractual Models

The specific route a municipality may take to procure solar energy may vary based on state and local procurement and financing laws; the government's sustainability and solar targets as set by executive leadership or local counsel. For a guide to the municipal procurement process, see *Appendix A: Procuring Solar Step-by-Step for Municipalities.*

Ownership represents another foundational question behind municipal solar procurement. Under a municipal ownership model, solar projects are purchased, owned, maintained and operated by the local government entity. This can be achieved with funds from general obligation bonds, special tax-exempt bonds or funded through tax-exempt debt or lease structures, typically at or below market interest rates. With ownership, municipalities own the rights to use or sell all energy production and solar RECs (SRECs). In the case of a

[24] Solar United Neighbors, accessed December 2018.
[25] U.S. Environmental Protection Agency, "Renewable Energy Certificates," https://www.epa.gov/greenpower/renewable-energy-certificates-recs, accessed December 2018.

community solar project, SREC revenue can help pay for the project or supplement benefits that are distributed to residents. [26]

However, localities' tax-exempt status hinders them from directly accessing the 30% federal Solar Investment Tax Credit, which can be claimed to reduce the tax liability of residential, commercial, and utility owners and investors of solar property. To circumvent this issue, some local governments have sought indirect ownership structures, such as third-party-owned solar projects through leases or structures known as Power Purchase Agreements.[27] At the state level, laws governing the sale of electric power may restrict the purchase of electricity from non-utility providers, which could take such options off the table for some municipalities.[28] *Appendix B: Municipal Financing Options Table* offers a breakdown of common financing and contractual structures that municipalities have used, both under municipal ownership and third-party ownership models.

[26] Emily Dodson, Christopher Doyle, Robert Lockhart, and Len Loomans, *Guide to Implementing Solar PV for Local Governments*, International City and County Management Association, 2013.
[27] Dodson et al., 2013.
[28] Interstate Renewable Energy Council, *Solar Power Purchase Agreements: A Toolkit for Local Governments*, March 2015.

Soft Costs Toolkit: *Municipal Procurement*

Municipal Procurement Resources and Tools

- New York Municipal Solar Toolkit - NYSERDA
  This resource is designed to assist local municipalities in leasing existing underutilized lands for solar development.
  - Procurement Guide
  - Template: Solar Lease Request for Proposals
  - Template: Solar Land Lease Agreement
  - Model Law for County Land Leases

- Solar Power Purchase Agreements Toolkit – Interstate Renewable Energy Council
  This resource, which provides a comprehensive toolkit on retail solar power purchase agreements (PPAs) or solar service agreements, assists local governments and other public entities seeking to install and finance rooftop PV systems. It includes a full suite of annotated model documents to highlight the key provisions and considerations in pursuing a PPA.

- Catalyzing Community Solar: A Handbook for Municipalities – The George Washington University
  This resource is designed to help municipalities define project objectives and understand the financial, legal, and policy considerations associated with initiating community solar investments.

- Power Purchase Agreement Checklist for State and Local Governments - National Renewable Energy Laboratory
  This resource provides information and guidance on the solar PV power purchase agreement (PPA), which is a financing mechanism that state and local government entities can use to acquire clean, renewable energy.

  Collaborative Procurement Initiative – U.S. Environmental Protection Agency
  Supported by the U.S. Environmental Protection Agency's Green Power Partnership, this initiative provides a collaborative platform for deploying clean energy technologies across multiple government and educational organizations for maximum impact on installed solar system capacity, local economic activity, and the regional environment.

- Community Shared Solar: Implementation Guidelines for Massachusetts Communities - Commonwealth of Massachusetts
  This resources provides a guide for planners seeking to implement community shared solar projects as well as key criteria, considerations, and implementation strategies for two common financing options for municipalities: public lease model; the participant ownership model.

- Guide to Implementing Solar PV for Local Governments – International City and County Management Association (ICMA)
  This 2013 report, prepared by ICMA, the Institute for Building Technology and Safety, and the Acuity Power Group for the U.S. Department of Energy SunShot Initiative, is a comprehensive guide for local government officials seeking to implement solar PV projects on municipal buildings and land.

  Purchasing Power Best Practices Guide to Collaborative Solar Procurement - World Resources Institute and Joint Venture: Silicon Valley Network
  This guide assists commercial and government entities with organizing and executing a collaborative solar purchase, including detailed case studies of Joint Venture's Silicon Valley Collaborative Renewable Energy Procurement Project (a public-sector initiative) and WRI's Collaborative Solar Project (a private-sector initiative).

  Steps to a Successful Solar Request for Proposals – The Solar Foundation
  This issue brief describes the key elements of a solar Request for Proposals and provides introductory guidance on how to evaluate proposals received. It also provides tools, resources, and sample documents that can help maximize the effectiveness of solar procurement efforts.

- Procurement Guidance - Massachusetts Clean Energy Center
  This webpage offers step-by-step guidance for procuring a solar electric system.

Section 4: Property Taxes

Properties with solar energy installations may experience a substantial rise in their property values: a study of home sales in California, for instance, found a sales price premium of approximately $17,000 for a home with an average size PV system.[29] While the increase in value may provide a direct benefit to the property owner at the time of sale, in some jurisdictions, it may also trigger an increase in the taxes owed on the property.

This property tax dynamic increases the overall soft cost of a solar system. While this cost is not necessarily incurred at the time of sale or installation, the increased value of the home attributable to the solar installation could increase costs for property owners later on (for instance, when the property is assessed by the city or county for taxation purposes), by anywhere from $1 per megawatt-hour (MWh) to $120 per MWh.[30] Such property tax increases may harm the financial viability of projects, particularly residential installations and smaller-scale commercial installations, and thus hamper solar adoption.[31]

The property tax treatment of solar projects varies widely across states and local jurisdictions. In some communities, the tax code has not been updated to address how properties with solar systems should be assessed and taxed, causing potential confusion and uncertainty for prospective solar developers and property owners interested in going solar. In other cases, even in states and localities where the property tax treatment of solar is clear, there may not be enough incentive (for instance, through property tax exemptions) for solar PV projects to be considered financially viable or palatable.

Some states and local jurisdictions have chosen to combat this issue, either by resolving ambiguities in state and local property tax code and/or (in over half of the states) by allowing exemptions for certain properties that have gone solar. Some have also begun exploring additional innovative uses of property taxes to advance and incentivize solar adoption. One particularly successful mechanism, called Property Assessed Clean Energy (PACE), has funded billions of dollars of energy efficiency and renewable energy improvements across the country by enabling property owners to finance solar improvements through voluntary special assessments placed on their property.

This section describes how some states and localities can address the question of the property tax impacts of solar projects. Key options available to these agencies include:

- Clarifying the property tax treatment of properties with solar PV installations;
- Exempting those properties from property tax increases attributable to the solar project; and
- Enabling the use of property tax assessments to finance solar PV on residential and commercial properties through an option called Property Assessed Clean Energy, or PACE.

Resolving Ambiguities in State & Local Property Tax Code and Property Taxation Practices

Inconsistent or unclear taxation practices prevent property owners from making informed decisions about the potential costs of PV installations on their properties, and governments from making sound, transparent, and fair valuation decisions.

To resolve this issue, state and local governments interested in accelerating solar adoption may wish to begin by resolving ambiguities in the tax treatment of properties with solar installations along the following three questions:

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[29] Ben Hoen, Sandra Adomatis, Thomas Jackson, Joshua Graff-Zivin, Mark Thayer, Geoffrey T. Klise, and Ryan Wiser, *Selling into the Sun: Price Premium Analysis of a Multi-State Dataset of Solar Homes*, Lawrence Berkeley National Laboratory, 2015.

[30] Justin Barnes, Chad Laurent, Jayson Uppal, Chelsea Barnes, and Amy Heinemann, *Property Taxes and Solar PV Systems: Policies, Practices, and Issues,* North Carolina Solar Center, 2013.

[31] Barnes et al., 2013; Nick Lawton, *Shrinking Solar Soft Costs: Policy Solutions to Solar Power Economically Competitive,* Green Energy Institute, 2014; and NY-Sun, 2018.

1. Is the solar PV system classified as real or personal property and to what property assessment ratio is it subject?
2. What valuation methodology should be used to determine the value of the PV system?
3. (Particularly on agricultural land) Does the solar PV system conflict with any parameters defining how the property can legally be used?

It is extremely important to note that identifying suitable answers to these questions is often not a straightforward or simple process. In many states, the complexity of these issues has sparked debate among policymakers, state and local tax officials, and solar industry advocates. Ultimately, the specific approach adopted by each state and community will be based on its existing state and local property taxation practices and their solar energy adoption goals, priorities, and market needs.

Property Classification of the PV System

Property classification can be a determining factor in whether and how a piece of property will be valued and taxed. Generally, two broad, mutually exclusive categories exist: real property and personal property. Though states may vary in their specific definitions, real property is generally defined to include land and all permanent improvements and fixtures, whereas personal property encompasses possessions that are not real property. Besides vehicles, personal property not used for the generation of income (e.g., typical household furnishings) is almost always exempt from property taxes, as is business personal property. Some states use different assessment ratios for personal property than they do for real property. Both types of property are assessed and re-assessed on a periodic basis, depending on state and local laws.[32]

The question of how solar PV systems are classified--whether as real or personal property--has been a source of debate. The solar market and many states have historically treated PV as personal property in order to exempt it from property taxes.[33] Those who support classifying PV as personal property note that the modules make up the largest share of the value of an installed PV system. These modules are typically "generic, off-the-shelf" products, which makes them more suitable as personal property.[34] Correspondingly, the Appraisal Institute has found that the contract language in many solar PV system leases considers the system to be personal property.[35]

However, according to the National Renewable Energy Laboratory, PV systems possess "three fundamental properties: permanence, passivity, and being integrated as a system," which make them more suitable for classification as real property.[36] In particular, these properties align with the Internal Revenue Service (IRS) prevailing definition of realty as "inherently permanent structures" and "structural components of inherently permanent structures."[37]

The question of how solar PV systems are classified can have significant implications. Michigan's property tax exemption for commercial and industrial system owners was designed to promote the development of a range of alternative energy technologies (including solar PV systems) by exempting them from personal property tax. Six years after its passage, in 2008, in a decision backed by the Michigan Department of Treasury, the Michigan State Tax Commission ruled that PV systems be classified as real property and assessed as such,

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[32] Barnes et al., 2013.

[33] David Feldman, Michael Mendelsohn, and Jason Coughlin, *The Technical Qualifications for Treating Photovoltaic Assets as Real Property by Real Estate Investment Trusts (REITs),* National Renewable Energy Laboratory, 2012.

[34] Irina Rodina and Shaun Goho, *The Solar Property Tax Exemption in Massachusetts: Interpretation of Existing Law and Recommendations for Amendments*, Harvard Law School, 2013.

[35] Sandra K. Adomatis and Geoffrey T. Klise, Panel: Residential Photovoltaic Leasing Valuation Issues, Appraisal Institute 2014 Annual Meeting, 2014.

[36] Feldman et al., 2012.

[37] Internal Revenue Service, Definition of Real Property, 26 CFR 1.856-10.

nullifying the intent of the original property tax exemption.[38] Such anecdotes illustrate the importance of establishing clear definitions and ensuring they are implemented consistently.

Assessment Valuation Methodology

Appraisers and assessors are tasked with estimating real property values; for appraisers, their estimates inform the mortgage underwriting of the property. For assessors, their estimates are converted into assessments that help a city, county, or village compute the property's tax bills. Three prevailing options exist for appraising and assessing a property: the sales comparison or market approach, the cost approach, and the income approach. The comparable sales analysis uses sales of similar nearby properties. The cost approach is based on how much it would cost to replace the property in question with property of equal usefulness. Finally, the income approach is typically used for properties intended to generate income, such as commercial or industrial properties. Appraisal and assessment professionals are typically required to consider all three, but, depending on the property type, its use, and available data, one method is often used more commonly than the others.[39]

PV installations have raised challenges for property assessors and appraisers, with each individual valuation approach offering challenges and limitations. A limitation of the comparable sales approach, for example, is lack of data: underwriters often choose to give no value to PV systems unless there is a comparable sale with a PV system. In many neighborhoods, insufficient comparable data exist to provide an accurate valuation. Similarly, the use of the cost approach has been put into question because of the "heavily subsidized market [for solar PV] where component and installed prices have been dropping."[40]

The income approach has been acknowledged as the methodology most closely representing buyers' rationale when purchasing a PV system; however, income-based analysis is not typically used for home real estate appraisal, creating limitations for appraisers and lenders particular in the residential solar market.[41] To address this challenge, Sandia National Laboratory has created a tool offering a standard methodology for appraisers largely based on the income approach analysis, which addresses the unique electricity-generating properties of PV systems.[42]

Intent of Property and Potential Conflicts with the PV System

In some cases, and especially for agricultural land and for timber production, installing solar may cause legal discrepancies with the allowable use(s) of a property and its surrounding area. Many agricultural landowners and timber producers receive property tax relief in the form of special assessments in order to shield their property from valuation increases resulting from increased demand for their land for non-agricultural purposes. These assessments bind the land to a specific purpose and intent. Power generation by on-site PV systems (and potential revenue accrued from it) may call this purpose into question, triggering potential penalties if the equipment is found to be out of compliance with the intent of the assessment.[43] In New York, the Department of Agriculture and Markets has provided guidance regarding the way solar systems should be designed, installed, and operated to be considered in compliance with the laws protecting agricultural districts.[44]

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[38] Dave Konkle, *A Guidebook for Community Solar Programs in Michigan Communities*, Great Lakes Energy Association, 2013.
[39] Appraisal Institute, *Understanding the Appraisal*, 2013.
[40] Geoffrey T. Klise, Jamie L. Johnson, and Sandra K. Adomatis, *Valuation of Solar Photovoltaic Systems Using a Discounted Cash Flow Approach*, The Appraisal Journal, Fall 2013.
[41] Klise et al., 2013.
[42] Sandia National Laboratories, *PV Value ®,* https://energy.sandia.gov/energy/renewable-energy/solar-energy/photovoltaics/solar-market-tranformation/pv-value/, accessed August 2018.
[43] Barnes et al., 2013.
[44] NY-Sun, 2018.

Similarly, PV systems installed on property that is already exempt from property taxes may present challenges, generally related to whether the PV installation in some way conflicts with the existing property tax exemption. For instance, under certain net-metering frameworks, property owners may realize revenue from selling excess electricity back to the grid, potentially jeopardizing the tax status of properties that should be operating on a not-for-profit basis (such as places of worship and educational institutions).[45]

Alleviating the Property Tax Burden of Solar Installations

In addition to identifying and resolving ambiguities in their tax code, state and local governments may take the additional step of alleviating or eliminating the property tax burden associated with solar PV installations. Because such a step may result in the reduction or loss of local tax revenue, some local jurisdictions have implemented innovative arrangements enabling the partial or full recovery of foregone revenue.

> "Thirty-three states offer some form of property 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. 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."
>
> -New York Solar Guidebook for Local Governments

The amount, term, and other key features of solar property tax exemptions may vary considerably by state. Typically, the laws establishing these exemptions identify:[46]

- What type of system or property type is eligible (residential, commercial, utility-scale, shared);
- The length of time that the exemption applies (typically tied to the estimated useful life of the equipment);
- The amount of the abatement or exemption (potentially expressed as a percentage of the total system cost or of the increase in assessed value of the property attributable to the renewable energy system);
- Whether the system is classified as real or personal property;
- The primary use of the system (e.g., designed to offset on-site use; shared; for export to the grid; etc.);
- Whether local governments may opt-in to offering the exemption, opt-out of the exemption, or are required to offer the exemption, along with any exceptions; and
- Potential additional guidance for local governments, assessors, or other key stakeholders.

As with solar PV system valuation, state and local governments must anticipate several potential design challenges and ambiguities when designing tax exemptions for properties with solar installations, including:

- The state's relationship with local governments and the degree to which local governments are required to offer property tax exemptions;

[45] Barnes et al., 2013.
[46] DSIRE, *Solar Policy Guide: A Resource for State Policymakers*, 2012.

- Key eligibility questions, including for different system types and ownership arrangements; and
- Mechanisms to enable local governments to recoup property tax revenue foregone as a result of offering the exemption.

STATE SPOTLIGHT:
Oregon's Alternative Energy System Property Tax Exemption

Oregon's property tax exemption for alternative energy systems provides the exemption for net metering facilities and for systems intended to offset on-site electricity use. Properties equipped with qualifying systems are exempt from taxation "in an amount that equals any positive amount obtained by subtracting the real market value of the property as if it were not equipped with an alternative energy system from the real market value of the property as equipped with the alternative energy system," for up to 20 years. It also authorizes local governments to receive payments of fees in lieu of property taxes "at the rate of $7,000 per megawatt of nameplate capacity of the solar project for each property tax year."

(Oregon Revised Statutes 2017)

State and Local Roles and Relationships in Property Tax Exemptions for Solar PV

While property tax exemption laws are typically proposed, enacted, and signed at the state level, their implementation and execution (as well as their revenue impacts) often occur at the local level. For this reason, property tax exemptions for solar PV installations require coordination and engagement between state and local governments, and their design may vary based on many factors, including whether local governments in the state are governed by Dillon Rule, Home Rule, or some hybrid of the two frameworks.

With respect to the state-local relationship, tax exemptions for properties with solar systems can be designed in two ways: as an option for localities, or as a requirement. For instance, the Commonwealth of Virginia (a Dillon Rule state) provides authority for counties, cities and towns to exempt or partially exempt solar energy equipment or recycling equipment from local property taxes. Residential, commercial or industrial property is eligible. Currently, 20 cities and counties have taken advantage of this option.[47]

Similar to Virginia, New York (a Home Rule State) also provides localities with the option to exempt solar equipment from property taxes. An important distinction from the Virginia property tax exemption model, however, is that localities are automatically enrolled in offering the exemption unless they actively opt-out. Local governments that offer the exemption are enabled, under New York law, to negotiate payments-in-lieu-of-taxes, or PILOTs (discussed later in this section), in order to retain some or all of the revenue which would be foregone due to the exemption. They are also authorized to negotiate PILOTs based on the property and system type (i.e., residential solar may receive different treatment that commercial and utility-scale installations). Localities that opt out of the law are unable to offer any solar property tax exemption or to take advantage of the PILOT option and may only do so by repealing the original decision to opt out, whether it be a local law, ordinance, or resolution.[48]

[47] Virginia Department of Mines, Minerals, and Energy, *Energy Incentives*, https://dmme.virginia.gov/DE/Energy_Incentives.shtml, accessed August 2018.
[48] NYSun, 2018.

Notably, the state of Florida (traditionally a Home Rule state[49]) requires that localities exempt 80% of the assessed value of a solar PV system. The only exception to the state's solar property tax exemption law offers is for fiscally constrained counties, which are excused from the exemption.[50]

LOCAL SPOTLIGHT:
New York City's Solar Property Tax Abatement

In some states, local governments offer property tax incentives in addition to state-level property tax exemptions. New York City provides a four-year tax abatement of 5-8.75% of solar project expenditures (up to $62,500 of the building's tax liability). The abatement is calculated as a percentage of total project cost, which does not include the existing statewide property tax exemption that New York's local governments are required to offer unless they opt out. New York City has not opted out of the statewide property tax exemption law.

(NY Department of Taxation and Finance Opt-Out Exemption Listing)

Eligibility Questions and Considerations

Policymakers may navigate several eligibility questions when designing solar property tax exemptions and incentives. For instance, particularly in California, disputes have arisen concerning the eligibility of large utility-scale or grid-supply projects for property tax exemptions (the language of the exemption fails to exclude these systems; however, some California counties maintain that the intent of the exemption does not support the inclusion of utility-scale systems in the exemption and deprives local governments of significant revenue).[51]

Similarly, the growth of shared solar across the country has shed light on the question of whether community solar gardens may benefit from property tax exemptions. In response, Colorado exempts the percentage of a community solar garden's electricity capacity that is attributed to residential, governmental, or non-profit subscribers.[52]

Recovering Foregone Property Tax Revenue: Payments In Lieu of Taxes (PILOTs)

Local governments may experience revenue loss if they provide exemptions to solar projects (particularly for grid-supply systems, some of which can be multi-million dollar installations). However, property taxes may damage the financial viability of projects, and jurisdictions that choose not to alleviate the property tax burden of solar projects may unintentionally hamper solar development.[53]

Payment-in-lieu-of-taxes (PILOT) mechanisms may help circumvent or mitigate this issue. In some states, including New York and Massachusetts, solar PV property tax exemption provisions contain clauses allowing for or requiring the exempt property owner to pay a fee in place of taxes. PILOT provisions enable the city or county to negotiate a specified amount each year that the property or facility owner will pay in lieu of the payment of local personal or real property tax; in return, part or all of the property at the facility is exempt from tax for the term of the agreement. NYSERDA offers local jurisdictions a wealth of PILOT-related tools and resources, including model agreements.[54]

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[49] Florida League of Cities, *2018 Legislative Issue Brief: Local Self-Government*, 2018.
[50] Florida Senate, *An Act Relating to Renewable Energy Source Devices (CS for SB 90),* 2017.
[51] Barnes et al., 2013.
[52] Colorado Revised Statutes, § 39-3-118.7: Community Solar Garden, 2016.
[53] NYSun, 2018.
[54] NYSun, 2018.

Innovative Financing Using Property Taxes

Conventionally, the question of property tax treatment of solar PV projects centers around strategies to lessen the tax impacts that property owners incur. However, property taxes can also help reduce solar soft costs in a different way--namely, by enabling property owners to access lower-cost capital to finance solar improvement projects. Therefore, beyond exempting solar systems from property tax, state and local jurisdictions may wish to use property tax mechanisms to create additional incentives and low-cost financing offers.

One such mechanism is Property Assessed Clean Energy, or PACE. PACE enables property owners to implement energy improvements on their property and repay the costs over an assigned term (typically between 15 and 20 years) through an annual assessment on their property tax bill. PACE financing is secured with a lien on the property and, depending on the program, the energy financier may be paid either before or after other claims on the property (such as the mortgage) are covered, in the event of foreclosure. Renewable energy improvement costs (primarily solar PV) represent about one-quarter of PACE-financed projects, which total over $6 billion across the residential and commercial sectors.[55]

Launching PACE programs typically requires the passage of PACE-enabling legislation at the state level; the enactment of a local ordinance indicating municipal participation in PACE; the creation and administration of a program (by state government, local government, or a private administration); and the recruitment of key program participants such as property owners, capital providers, tax collection entities, mortgage lenders, and contractors. Some state governments, such as Connecticut and Colorado, have sought to achieve economies of scale by establishing statewide PACE programs that offer local governments a consistent program framework to adopt and implement.[56]

[55] PACENation, PACE Market Data, https://pacenation.us/pace-market-data/, accessed December 2018.

[56] Fazeli, Sandy, Accelerating the Commercial PACE Market: Statewide Programs and State Energy Office Participation in Property Assessed Clean Energy (PACE) Finance, NASEO, May 2016.

Soft Costs Toolkit: *Property Taxes*

Property Tax Resources and Tools

- Property Taxes and Solar PV Systems: Policies, Practices, and Issues – U.S. Department of Energy, North Carolina Solar Center, Meister Consultants Group
  This report, authored in 2013 by Justin Barnes, Chad Laurent, Jayson Uppal, Chelsea Barnes, and Amy Heinemann, offers a comprehensive examination and analysis of the major issues, challenges, and best practices affecting the field of solar PV property valuation, appraisal, and taxation.
- Valuation of Solar Generation Assets – Solar Energy Industries Association
  This paper highlights best practices and potential pitfalls in appraising and valuing solar energy projects. It breaks down the cost, income, and market appraisal approaches and highlights the market conditions suitable for each.
- PV Value ® Tool – Sandia National Laboratories and Energy Sense Finance, LLC
  This tool, designed for use by real estate appraisers, mortgage underwriters, credit analysts, real property assessors, insurance claims adjusters, and PV industry sales staff, helps determine the value or existing PV systems installed on residential and commercial properties using the income capitalization approach. It can be used in conjunction with the Appraisal Institute's Residential Green and Energy Efficient Addendum.
- PVWatts Calculator – National Renewable Energy Laboratory
  This web-based calculator estimates the electricity production of a grid-connected roof- or ground-mounted PV system based on the system's location, basic design parameters, and average annual retail electricity rate.
- New York Solar Guidebook – NYSERDA
  The New York Solar Guidebook offers multiple resources that assist local jurisdictions in understanding the state's solar PV property tax laws and opportunities, including:
    - Understanding New York State's Real Property Tax Law §487 (pp. 115-116), which provides for a 15-year real property tax exemption for properties located in New York State with renewable energy systems, including solar electric systems. This section of the guidebook explains key features of the law, as well as how local jurisdictions may participate or opt out of the program.
    - Solar Payment in Lieu of Taxes (PILOT) Toolkit (pp. 117-130), which includes a New York Model Solar Energy System PILOT Law, a Model Solar PILOT Agreement, and two Solar PILOT Calculators which provide PILOT rate guidance for solar projects based on project economics.
- PACENation
  PACENation's mission is to promote awareness and education of Property Assessed Clean Energy. Key features of PACENation's website include guidance for launching a PACE program, enacting PACE-enabling legislation, case studies, and market data.
- Accelerating the Commercial PACE Market: Statewide Programs and State Energy Office Participation in Property Assessed Clean Energy (PACE) Finance – NASEO
  This 2016 report describes how State Energy Offices other state-level partners can create an environment in their state that will increase local PACE participation. It offers insights and strategies for State Energy Offices, green banks, state financing agencies, or other public and private entities to provide coordination and support to PACE programs.

Conclusions and Next Steps

This Guidebook offers an overview of solar soft cost reduction best practices for states and localities in the areas of permitting and inspection; siting and zoning; property taxes; and municipal procurement. The best practices included in this report represent an extensive review of lessons learned and key takeaways drawn from local, state, and federal actions taken across the country. However, it is important to recognize that geographically-specific priorities, land use regulations, building codes, tax laws and other regulations may vary between jurisdictions and ultimately affect the deployment of solar technology in unique and locally-specific ways.

This Guidebook will be regularly revised and updated to reflect emerging state and local efforts, lessons learned, and best practices for reducing solar soft costs. It can be found online by visiting the NASEO website at www.naseo.org/solardeploymentguidebook, or by visiting the U.S. Climate Alliance website at www.usclimatealliance.org/publications-1/.

Appendix A: Procuring Solar Step-by-Step for Municipalities

Across the country, municipalities have utilized a variety of strategies to reduce soft costs for solar procurement. While some strategies may diverge across geographies, some commonalities emerge in the key process milestones to procuring solar. State and local governments, as well as academic institutions and non-government organizations, have aimed to standardize these process milestones in order to reduce soft costs by lessening the time employees spend navigating the procurement process. The following list summarizes some of these key steps in procuring solar as a municipality. Additionally, materials referenced in the Municipal Procurement Toolkit section of the USCA Solar Deployment Guidebook outline in further detail the different approaches to the step-by-step process of procuring solar as a municipality.

(Graphic by Charlotte Hough)

- **Planning and Early Stage Goal Setting:** The first step in the solar procurement process includes planning and early stage goal setting for the procurement. This can include the creation of an advisory committee, the development of communication strategies, early consultations with approving organizations and the establishment of project goals. A well-defined goal and early involvement of stakeholders is paramount to the success of the project, will dictate the nature of the proposals received later in the process, and will help the municipality utilize outside expertise.[57]

- **Municipal Data Collection & Conducting a Feasibility Study:** Municipalities should assess the feasibility and economic viability of a solar project, ideally by conducting a feasibility study. The purpose of conducting a feasibility study for solar PV project is to provide the municipality, project partners and stakeholders with an overall understanding of current conditions, a review of potential risks, limitations and success indicators, and an outline of the requirements needed to complete the project.[58] A feasibility study will typically begin with the Basis of Design and Intent, which should outline the municipality's general goals and priorities. At this stage, municipalities should also assess electricity consumption. This data can provide a benchmark for them to judge what percentage of their energy needs could be satisfied by a solar project.

[57] The Solar Foundation, *Steps to a Successful Solar Request for Proposal (RFP)*, 2012, accessed December 2018 http://www.solaripedia.com/files/1102.pdf

[58] Emily Dodson, Christopher Doyle, Robert Lockhart, and Len Loomans, *Guide to Implementing Solar PV for Local Governments*, International City and County Management Association, 2013.

- **Site Identification:** Municipalities should next evaluate and identify potential sites for solar PV project(s). Important considerations for assessing the feasibility of potential sites for solar generation include what property is available to the municipality, as well as cost considerations. ICMA has detailed the relevant considerations for ground-mounted solar PV compared with Rooftop solar PV. [59]

- **Financial Feasibility:** A financial assessment will provide a rough analysis of project costs and available incentives in order to help determine if the financial conditions for a successful solar project are favorable. Factors that should be considered in assessing project costs may include state and utility interconnection and net metering policies, the retail cost of electricity, future regional projections for the retail cost of electricity, solar resource that drives energy production, state RPS standards and SREC market availability and strength, and an estimate of total project capital expense and operating costs (25 to 30 years).[60] With the baseline costs known, municipalities should next assess the available incentives, renewable energy credits, grants, low-interest loans and other cost-offsetting options available from federal, state, utilities and other sources. Municipalities may use the DSIRE USA database to reference policies specific to their geography that might factor into this analysis. *DSIRE USA: http://www.dsireusa.org/*

- **Determine the Ownership Model:** Next, Municipalities should examine potential ownership models. Options include municipal ownership, third-party ownership through power purchase agreements and the leasing of land or rooftops to developers. State regulations vary in their treatment of the third-party ownership and leasing options, so municipalities are advised to consult these in advance of making a decision. The ownership model will largely determine the available financing options, which we have outlined according to ownership model in the Municipal Procurement section of this report.

- **Purchasing and Contract Models:** Municipalities should next draft and issue a Request for Proposals (RFP). Traditional projects in the public sector have utilized a design, bid, build (DBB) model.[61] This provides a specific engineering design, including all project details, product specifications, quality and other information in the RFP for a vendor to submit a bid. The ownership model will influence what goes into the RFP. Existing RFP templates can inform a municipality's approach to drafting contract models, one example being the Template Solar Lease Request for Proposals that New York State Energy Research and Development Authority (NYSERDA) has compiled for the leasing of municipal land for solar development, which is included in the toolkit.

- **Evaluate Proposals:** Using the criteria laid out in the RFP, municipalities should score and evaluate the proposals. Different project types may call for different weights for the criteria. While there is no standard method for allocating these weights, there are some standard practices that local governments can use to develop weights to allow them to properly score the proposals.[62] For example, the Solar Foundation has provided an analysis of standard RFP elements common to solar RFP's in municipalities across the U.S.[63]

- **Draft Contractual Documents:** Once the developer has been selected, the municipality must negotiate and draft relevant contractual documents. These may include a Power Purchase Agreement, a land agreement, or a Memorandum of Understanding. If the project is to be developed on municipal land, a developer site agreement would grant the developer land rights.

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[59] Ibid.
[60] Ibid.
[61] Ibid.
[62] The Solar Foundation, *Steps to a Successful Solar Request for Proposal (RFP)*, 2012, accessed December 2018 http://www.solaripedia.com/files/1102.pdf
[63] Ibid.

Additional Step-By-Step Guides & Resources:

- ICMA, Guide to Implement Solar PV for Local Governments
- Purchasing Power: Best Practices Guide to Collaborative Solar Procurement
- The Solar Foundation, Steps to a Successful Solar RFP
- Mass Clean Energy Center Procurement Guidance
- Alameda County, CA, Best Practices Guide to Collaborative Solar Procurement Summary and Overview of Best Practices: The 12-Step Process

Appendix B: Municipal Financing Options Table

	Mechanism	Key Features	Case Studies and Other Key Resources
Direct (Municipal) Ownership	Municipal Lease or Tax-Exempt Lease Purchase	• Carries a lower payment rate over that of other lease structures because the lessor is not taxed at the federal level for the interest portion of the lease payment • Lease term is typically structured through a series of one-year terms that are renewed until there is little or no residual value left for the asset, at which point ownership of the solar assets is typically transferred to the lessee • Alternatively, ownership may be transferred to the municipality at the beginning of the lease term, with the lessor maintaining contractual security on the equipment	Case Studies: • California Lease Finance Program (CalLease) • City of Raleigh Water Treatment Solar Array To learn more, see: • ICMA, *Guide to Implement Solar PV for Local Governments*, 2013 • U.S. Department of Energy (DOE) State and Local Solution Center, "Leasing Arrangements"
	Tax-Exempt Bonds	• Allow for low-interest debt • Bond proceeds used to contract services for the design, construction, operation and maintenance of the solar PV system with a private contractor	To learn more, see: • ICMA, *Guide to Implement Solar PV for Local Governments*, 2013 • DOE State and Local Solution Center, "Public Bonding Options" • Brookings, *Clean Energy Finance through the Bond Market*, 2014 (includes case studies)
	Energy Savings Performance Contract	• Commonly used for energy and water efficiency upgrades in federal-, military-, state-, and local government-owned properties • Public-private partnership under which borrowers can procure facility improvements without expending capital upfront • Utility and operational savings delivered by the upgrades pay for the projects • ESPC-enabling statutes typically allow the financing of solar arrays and other renewable energy equipment	Case Studies: • Douglas County, NV School District (combined ESPC with bonds, grants, and tax-exempt installment purchase agreement) • Lowell, MA City Facilities and Solar Upgrades To learn more, see: • North Carolina Energy Center, *Integrating Solar PV into Energy Savings Performance Contracts: Options for Local Governments Nationwide*, 2014
	Revolving Loan Fund	• Often created or operated at the state level, but not limited to state or public entities • Provide below-market or even zero-interest loans for energy efficiency and renewable energy projects • As loans are repaid the funds are replenished, which in turn allows more loans to be distributed	To learn more, see: • ICMA, *Guide to Implement Solar PV for Local Governments*, 2013 • National Association of State Energy Officials, "State Energy Loan Fund Map"

	Mechanism	Key Features	Case Studies and Other Key Resources
Third-party Ownership	Operating Lease	• Solar developer designs, builds and owns the solar equipment, then leases the use of this equipment to the public entity • Public entity receives use of the solar equipment to produce electricity and receives SRECs (if applicable) • Term is typically 7 years or longer, limited to under 75% of the system life and up to 80% of the solar project's value, among other IRS requirements • At the end of the lease term, the public entity does not receive ownership, but may purchase the solar PV equipment at fair market value	To learn more, see: • ICMA, *Guide to Implement Solar PV for Local Governments*, 2013
	Sale/ Leaseback	• Municipality (assuming role of developer) designs and builds solar PV project, then sells the project to a third-party investor, who then leases back the solar PV assets to the municipality under an operating lease structure • Lease payments are treated similarly to rental payments, as an operating expense, allowing investor (considered the owner) to monetize tax incentives and depreciation and receive a cash flow return at an attractive overall interest rate • Benefits of the tax incentives and depreciation are shared with the municipality through lower lease payments	To learn more, see: • ICMA, *Guide to Implement Solar PV for Local Governments*, 2013 • Sale/Leaseback Transactions, presentation of David Weisblat, Foley & Lardner LLP for the Solar Energy Industries Association, 2016 • Wilson Sonsini Goodrich & Rosati, Project Finance Primer for Renewable Energy and Clean Tech Projects, 2010
	Partnership Flip	• Popular mechanism for financing wind and large commercial solar projects • Municipality (host-site), a private developer and an investor who can monetize tax incentives, become members of a special purpose entity (SPE) (i.e., LLC) • Municipality contributes use of land or rooftops, or other contributions, in exchange for a share in the long-term financial returns of the solar project • Municipality may also be the energy purchaser, or *off-taker*, under a separate contract with the SPE	To learn more, see: • ICMA, *Guide to Implement Solar PV for Local Governments*, 2013 • Wilson Sonsini Goodrich & Rosati, Project Finance Primer for Renewable Energy and Clean Tech Projects, 2010
	Solar Energy Management Services Contract	• Long-term (up to 20 years) service agreement that includes: PV system design, financing, and installation; operations, maintenance and PV system removal; long-term lease of public space; electricity generated by a PV system; and a system performance guarantee; all services procured together via the Ch. 25A procurement process • Municipality is responsible for hosting the PV system on a municipally-owned site, and purchasing all the electricity generated by the PV system per a price schedule agreed upon in the solar EMS contract • Developer owns the PV system and generates revenue by selling electricity to the community and monetizing the tax incentives and RECs associated with solar electricity generation.	Case Study: • Town of Holbrook, MA Request for Qualifications for Solar Energy Management Services To learn more, see: • ICMA, *Guide to Implement Solar PV for Local Governments*, 2013

	Power Purchase Agreement	• Private developer and financial investor with tax equity create a SPE that designs, builds, owns and operates the solar project • Municipality provides the site(s) for the solar project under a long-term easement or lease to this entity, and then agrees to purchase the solar energy at an agreed upon rate that is typically less than the utility rate • Term may be from 10 to 20 years or custom to the project • States that have authorized the use of 3rd-party PPAs may not have done so in every jurisdiction; for instance, municipal utilities may not allow 3rd-party PPAs in their territories even though they are allowed or in use in the state's investor-owned utility (IOU) territories	Case Studies: • Sacramento, CA Solar PPA • Montgomery County, MD Microgrid-as-a-Service PPA To learn more, see: • ICMA, *Guide to Implement Solar PV for Local Governments*, 2013 • IREC, *Solar Power Purchase Agreements: A Toolkit for Local Governments*, 2015 • U.S. Environmental Protection Agency, "Solar Power Purchase Agreements"
	Combined or Hybrid Municipal Bond Power Purchase Agreement	• Municipality (or a conduit) issues taxable bonds to finance the solar development • RFP process is used to select a developer, and a sale/lease-back model is employed whereby the municipality transfers project ownership to the developer in exchange for lease payments, using the capital lease structure (also known as a finance lease) • Lease payments cover the cost of the municipality's taxable bond obligations and are secured through agreements, including a performance payment bond and a posted security. • Municipality enters into a long-term PPA agreement with the developer, receiving a low price for energy	Case Study: • Explanation by the Council of Development Finance Agencies of the "Morris Model" originating in Morris County, NJ To learn more, see: • ICMA, *Guide to Implement Solar PV for Local Governments*, 2013 • National Renewable Energy Laboratory, *Financing Solar PV at Government Sites with PPAs and Public Debt*, 2011