State of Rhode Island

COMPREHENSIVE PLANS & SOLAR ENERGY SYSTEMS




February 2019

Prepared by
The Rhode Island Office of Energy Resources &
The Division of Statewide Planning

RI Division of Statewide Planning

Comprehensive Plans & Solar Energy Systems

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- Advise and prepare long term policy for the State within the State Guide Plan
- coordinate activities of the public /private sectors within the framework of the State Guide Plan
- assist municipal governments with planning, and
- advise the Governor and others on physical, social, and economic planning related topics.

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- Division of Statewide Planning
- Office of Energy Resources
- Department of Environmental Management
- RI League of Cities and Towns
- RI Builders Association
- Northeast Clean Energy Council
- RI American Planning Association
- RI Land Trust Council
- Acadia Center
- The Nature Conservancy
- Green Energy Development
- Clean Energy Collective
- Green Energy Consumers Alliance
- Audubon Society of Rhode Island
- Grow Smart RI
- Turning Point Energy
- Conservation Law Foundation
- Energy Development Partners
- Civic Alliance for a Cooler Rhode Island
- Nexeamp Solar
- RI Tree Council
- Newport Solar
- RI Farm Bureau
- Burrillville Land Trust
- Handy Law
- RI Distributed Generation Board
- West Bay Land Trust
- RI Forest Conservators Organization
- Kearsarge Energy
- Heartwood Group
- Municipal Planning Offices: Coventry, Cranston, Narragansett, Exeter, Charlestown, Richmond

Public Outreach

In addition to working with the advisory group, a series of public presentations and workshops was conducted between June and October in 2018. The workshops and presentations were held throughout the State to present general information on solar energy systems and gather public feedback. The OER and DOSP thank the more than 150 persons who took time out of their busy lives to attend and participate in the workshops providing valuable comments and local viewpoints on the preliminary recommendations. The workshops were held as follows:

- Providence – June 6th
- Cranston – July 18th
- Charlestown – July 23rd
- Coventry – August 2nd
- Hopkinton – August 27th
- Westerly - September 13th
- Jamestown – September 19th
- Bristol – September 24th
- Providence – September 26th
- Burrillville – October 4th
- Narragansett – October 11th
- Warwick – October 16th

Abstract

The Statewide Planning Program is charged by RI General Law §42-11-10-(f)7 to produce renewable energy facility siting guidelines. The Statute directs the Program to consider guidelines for the location of renewable energy resources within commercial, industrial, and agricultural areas, areas occupied by public and private institutions, and property of the State, as appropriate. The Division of Statewide Planning (DOSP) provides staff to the Program and has produced this second volume of renewable energy siting guidelines jointly with the Office of Energy Resources (OER).

Standards for wind energy systems were previously issued by the Statewide Planning Program and the Office of Energy Resources. The principles reflected herein are **voluntary** guidance and represent the participation of state and local officials, renewable energy developers, residents, property owners, business and utilities, and non-governmental organizations. **Nothing in this guidance is construed to supersede or diminish any regulatory or planning authority delegated to a municipality by state or federal statute.** The recommendations within are responsive to the reality that our State is a small place with high population density, a decreasing amount of undeveloped land, and a diversity of environments, landscapes, built and natural resources, and community types.

This paper is one of three resources concerning the siting of solar energy systems (SES) in Rhode Island. The documents should be reviewed together in their entirety; starting with the general information presented in the PowerPoint, then, this report on comprehensive plans, and last, the report which contains the templates for zoning and taxation ordinances. Taking one document in insolation, without reading the others, will not provide the reader with the benefit of the comprehensive and interlinked advice within all the documents. A glossary and the references used throughout the project are included in the *Comprehensive Plans & Solar Energy Systems Report.* The three documents are:

1. *Solar Siting Information- February 2019 (PowerPoint)*
2. *Comprehensive Plans & Solar Energy Systems Report – February 2019*
3. *Renewable Energy Guidelines: Solar Energy Systems – Model Ordinance Templates Zoning & Taxation– February 2019*

Introduction

The intended audience includes citizens, community groups, environmental organizations, land trusts, local conservation advisory commissions and other municipal boards, regional planning bodies, renewable energy developers and all other stakeholders interested in deploying renewable energy facilities while protecting the natural and cultural resources critical for sustaining Rhode Island's economy, sense of place, and quality of life. It is meant to help reduce conflicts from the start in the interest of reducing greenhouse gas emissions with both natural and renewable energy infrastructure solutions. This includes accelerating new renewable energy development in the region.

As new renewable energy generation projects are proposed, all stakeholders must be prepared for the substantive and procedural issues that will arise during their siting and approval, and endeavor to work collaboratively to achieve the mutual goal of mitigating climate change. Stakeholders also must recognize that new renewable energy development, which will provide both environmental and economic benefits, is a vital part of our State's initiative to mitigate climate change.

This report focuses on the siting and design of solar photovoltaic (PV) energy generating facilities. It contains principles for renewable energy siting and recommendations to promote well-planned renewable energy development through municipal comprehensive planning and zoning. At the end of the Guide, there are resources for online mapping, geographic information (GIS), and other information, as well as a glossary of terms. The guidance provided in this document is intended to facilitate a fair balancing of interests in considering solar energy systems.

RI Department of Administration – Rooftop Solar Installation (2018)

Rhode Island's State Guide Plan Element: *Energy 2035*

The Rhode Island State Energy Guide Plan, *Energy 2035*[1] describes the existing state of Rhode Island's energy system and sets a vision, and goals and policies to improve energy security, cost-effectiveness, and sustainability in all sectors of energy production and consumption. It is intended to advance the effectiveness of public and private stewardship of the State's use of energy resources and identifies activities needed to keep the energy systems on which the state depends functioning optimally. The vision is to provide energy across all sectors- electricity, thermal, and transportation, using a secure, cost-effective and sustainable energy system. Municipal planning officials should familiarize themselves with the full guide plan. Important points to consider from the Plan are:

> "*Rhode Island cannot achieve the Energy 2035 Vision without bold steps to increase the generation and use of clean, renewable sources of energy—wind, solar, hydropower, anaerobic digestion, and others. Renewable energy will diversify the state's energy supply portfolio, help mitigate long-term energy price volatility, stimulate the state's economy through industry growth and job creation, and set Rhode Island on pace to meet ambitious greenhouse gas emission reduction targets*."

[1] *Energy 2035: Rhode Island State Energy Plan*, http://www.planning.ri.gov/documents/LU/energy/energy15.pdf

Rhode Island Principles for Renewable Energy Siting

Rhode Island is facing an immediate challenge to accelerate the development of clean, renewable energy sources to respond to climate change while protecting our natural resources and unique community character. In March of 2018, an advisory stakeholder committee to the Office of Energy Resources/Division of Statewide Planning adopted thirteen principles as a holistic framework to integrate competing interests in drafting policies and practices to facilitate the development of renewable energy in the State. The principles reflected the participation of state and local officials, renewable energy developers, residents, property owners, businesses and utilities, and non-governmental organizations. The primary purpose of the principles is to guide the Office of Energy Resources and The Division of Statewide Planning in developing recommendations on solar siting which are responsive to Rhode Island's reality as a place with a small geographic area, high population density, a shrinking amount of undeveloped land, and a diversity of environments, landscapes and community types. The recommendations respect the commitments that Rhode Island has made as a jurisdiction to mitigate greenhouse gas emissions and enable people throughout the State to participate in and benefit from renewable energy programs. The Principles are:

1. Accelerate the pace toward achieving Rhode Island's renewable energy and greenhouse gas reduction goals through thoughtful and strategic development of renewable energy projects of all sizes.
2. Build support for achieving Rhode Island's renewable energy and greenhouse gas reduction goals by increasing public understanding of the multiple benefits of renewable energy including to the economy, the environment, to promote equity and to cultivate climate resiliency.
3. Provide predictability, consistency and fairness in state and local rules, regulations, zoning and ordinances to support development of renewable energy projects.
4. Promote proactive, comprehensive utility distribution system planning.
5. Ensure that regulations governing renewables are applied in a fair and balanced manner with those governing other land uses, while recognizing that local zoning is the authority of communities to establish public health and safety standards.
6. Honor commitments to keep permanently protected land free from development.
7. Encourage renewable energy development on commercial and industrial zoned land, on already developed land, and in other locations with environmental alterations such as closed landfills, brownfields, parking lots, commercial and residential rooftops, sand and gravel pits.
8. Support the economic viability of farms through appropriate renewable energy development as a complementary use in a manner which keeps farms in agricultural production while preserving agricultural soils.
9. Promote policies that recognize ecological services and sensitivity as well as habitat connectivity in the siting of renewable energy projects.
10. Respect landowner rights to realize value from their property within the context of established planning and zoning principles.
11. Ensure equitable access to renewable energy installations for all consumers and recognize that delaying the transition to renewable energy disproportionately burdens environmental justice communities.
12. Provide local governments with guidance on smart renewable energy siting and to ensure consistency between the state guide plan and local ordinances and policies. Establish a timeline for all municipalities to adopt renewable energy siting ordinances and associated processes.
13. Provide opportunities for state and municipal governments to lead by example and use renewables to exercise more control over their energy use and production in meeting their energy needs.

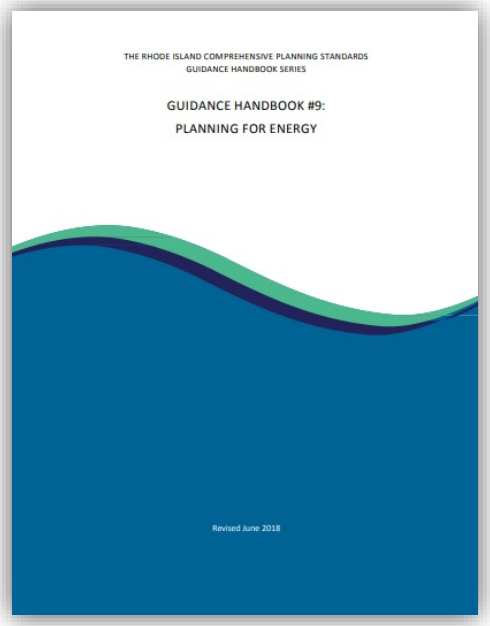
Promote Energy Conservation and Strategically Sited Renewable Energy Development through Municipal Comprehensive Planning & Zoning

The Rhode Island Comprehensive Planning and Land Use Regulation Act, R.I. General Law § 45-22.2-6(b)(8) requires that comprehensive community plans must consider energy production and consumption. The *Rhode Island Comprehensive Planning Standards Manual,* as adopted by the State Planning Council, sets forth that comprehensive community plans should embody the State's goals and policies. The manual recommends including actions within the Implementation Program that address:

a. Conducting a baseline assessment of the amount of energy currently being used by municipal buildings, vehicles, and equipment or, if a baseline assessment has already been completed, conserving and efficiently using energy in public buildings, transportation, and equipment, and

b. Adopting zoning policies and siting standards for renewable energy production facilities.

Guidance Handbooks #1 through #16 are an accompaniment to the Manual. *Handbook #9: Planning for Energy* provides additional information on the energy-related standards contained within the Manual, as well as general guidance on planning for energy. Other goals for renewable energy may also be included such as:



- Decrease dependence on non-renewable energy sources.
- Promote effective and efficient use of solar energy resources.
- Promote safe development of solar energy systems that minimize impacts to adjacent land uses, properties and environments.
- Promote the use of previously disturbed lands for renewable energy development.
- Minimize potential natural resource, aesthetic, community-character, and quality-of-life impacts.
- Promote economic development and building the tax base.
- Eliminate barriers to and incentivize small-scale, distributed renewable energy systems, such as rooftop solar, small-scale wind and or solar for on-farm use.

Additional goals to consider in comprehensive plans have been suggested by the advisory stakeholders. These are:

- To promote the enhancement for a pollinator friendly environment and vegetative restoration upon decommissioning of solar energy systems.
- To promote the collaborative use of solar energy with current agricultural and farming uses, providing economical sustainability for the landowner.

The comprehensive planning process provides communities the opportunity to consider the future of energy in their city or town, to transition their community to sustainable, low-carbon energy sources in to order to mitigate climate change, and to craft goals that exemplify the desired future condition.

Comprehensive Plans & Solar Energy Systems

Municipalities are encouraged to consider policies and standards that encourage the use and production of renewable energy suitable to their land use and simultaneously preserving important natural resources. To determine the goals that may be appropriate for your municipality, consider the following guiding questions:

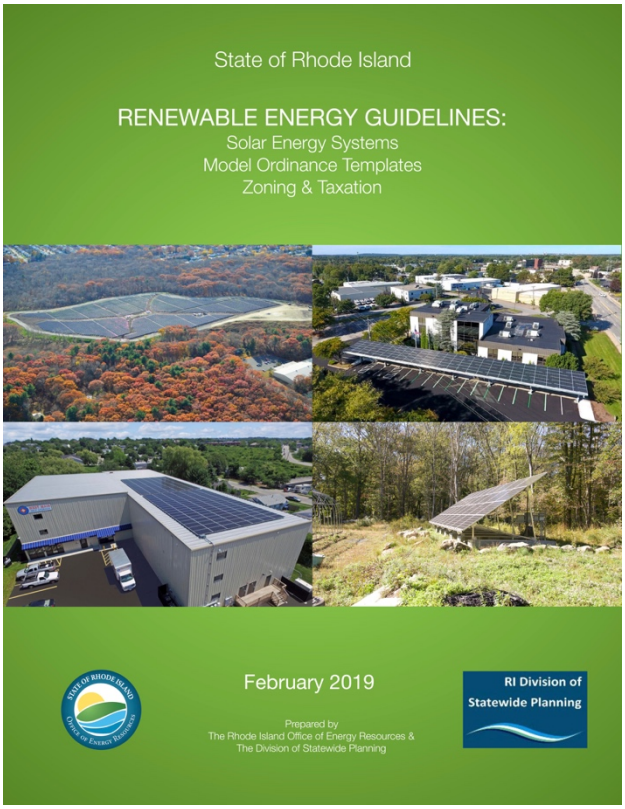
- How can the community's land use decisions support energy conservation and efficiency?
- What benefits could the community realize by implementing greater energy efficiency and conservation measures?
- Is it important to the community that locally generated energy options be available for use by citizens, neighborhoods and businesses?
- What should be the future role of renewable energy in powering and heating the community, both in the public and private sectors?

Future land uses should consider the availability of energy infrastructure. This Report focuses on the siting and design of solar photovoltaic (PV) energy generating facilities. The mix of uses on the Future Land Use Map also has implications for energy usage. The future siting of renewable energy facilities should be considered when determining appropriate future land uses. If considered as part of the land use discussion, the municipality can ensure the compatibility of such facilities with surrounding land uses. The benefits of developing clean, renewable energy are clear. In addition to providing climate change benefits, accepting and permitting local solar energy systems will help to:

- reduce emissions of air pollutants, as renewable energy sources replace fossil-fuel power plants,
- benefit public health by improving air quality,
- reduce impacts to finite natural resources which are used more intensively by fossil-fuel energy generation,
- increase reliability of the State's energy supply,
- increase resiliency of the regional electricity supply, enhancing its ability to handle severe weather events, and
- create regional economic benefits—including manufacturing of renewable energy equipment, new jobs and municipal revenue creation.

Handbook #2: Planning for Natural Resources can help municipalities identify their natural resource assets so they can guide renewable energy siting away from areas with high conservation value, such as large intact forests. Additionally, communities can consider identifying and mapping in conjunction with the Future Land Use Map, areas where utility scale renewable energy developments should be encouraged and discouraged. The renewable energy siting principles, previously discussed, suggest that specific areas in communities should be encouraged for solar energy systems, such as but not limited to; brownfields, closed landfills, defunct gravel banks, commercial and industrial districts, and parking lots. Conversely, communities should use their local land use authority to determine areas where development of renewable energy systems should be discouraged, such as prime agricultural soils, large unfragmented forests, and or other critical wildlife habitat. In doing so, communities can exercise their local land use authority to protect lands they've determined to be important to them, while providing predictable and easily permittable locations for renewable developers and homeowners, businesses, and farmers looking to pursue renewables for their respective properties.

Regulating Solar Installations as a Land Use Through Zoning Ordinances



RI General Law §45-24, Zoning Enabling Act, authorizes communities to adopt zoning ordinances that control the use of land and how it is developed to implement the vision of their comprehensive plans and to protect the public health, safety and welfare of the community. It is imperative that local zoning ordinances address renewable energy production facilities. To provide clarity to the development process, zoning ordinances must include identification of which types of renewable energy production facilities will be allowed within the municipality, and within which specific zoning districts. Additionally, when appropriate, zoning ordinances may include siting standards for allowed renewable energy production facilities, to dictate the placement and the allowable footprint of the facilities within a property. To develop appropriate zoning policies and siting standards, municipalities should undertake community discussion on the topic and assess what types of renewable energy are appropriate for which contexts. The goal of such discussions should be to determine an appropriate framework for the development of renewable energy production facilities that maximizes the benefits to the community, reduces potential impact to neighbors and natural resources, and in accordance with the goals laid out in the community comprehensive plan and the State Guide Plan.

The Office of Energy Resources and the Division of Statewide Planning have released a technical assistance document, ***Renewable Energy Guidelines: Solar Energy Systems – Model Ordinance Templates Zoning & Taxation***. There are two explanatory templates within the document (zoning and taxation) that are intended to guide municipalities interested in regulating solar power development. The zoning template addresses typical siting issues and impacts which should be reviewed when considering approving solar energy systems. There is no one size fits all ordinance for siting solar energy systems. An inventory of existing solar related municipal ordinances is included in the document's Appendix A and case studies of Rhode Island solar installations are included in the ***Solar Siting Information February 2019*** *(PowerPoint).*

Integrating Solar Energy Systems into Local Development Regulations

Proper siting design, construction and operation of solar energy systems can minimize impacts to important natural resources, maximize the net greenhouse gas reduction benefits of projects, and help build public support for projects. To reduce potential conflicts, while promoting renewable energy through comprehensive planning and zoning, communities should consider low-conflict locations within their community as areas more suitable for development of solar energy systems. The principles and strategies that follow are meant to help communities reduce conflicts from the start, mitigate potential impacts to Rhode Island's invaluable resources, and promote successful solar energy systems development.

Ground Mount Commercial Solar Energy Systems Development – Degrees of Scale and Footprint

How much land does a solar energy system use?

1 MW (megawatt) = roughly 3- 5 acres

When evaluating and examining solar energy systems within your community plan, one aspect to understand is that sizes vary, and the amount of land that commercial scale and other ground mounted systems require will vary too. The acreage needed includes the spatial distance between each row of panels on the ground. This is in addition to, any buffers or setbacks depending on the location's zoning and the fencing required around the system. For further information on solar footprints, a series of case studies showing different acreages and types of large, commercial ground mounted systems can be found within the *Solar Siting Information - February 2019 (PowerPoint)*

Development Priority on Previously Developed and Disturbed Areas, Landfills, Gravel Pits, Rooftops & Existing Buildings

Solar Energy Systems can also be sited in conjunction with existing land uses to reduce development impacts—for example, installation of solar carports in parking lots and rooftop solar facilities on large retail stores, warehouses, office buildings and multifamily complexes. Other principles to consider are:

- Encourage the location of renewable energy facilities to minimize impacts to abutting properties and landscapes and forestland.
- Encourage renewable energy development on commercial/industrially zoned lands
- Encourage renewable energy development on already developed lands, such as parking lots and roof tops
- Encourage renewable energy development on location with difficult remediation standards for other uses, such as closed landfills, brownfields and sand & gravel pits.
- Use natural screening to mitigate visual impacts to abutting landscapes.

2.6 MW Solar Energy System, Closed Landfill, North Providence, RI

- Review farms as a whole and encourage renewable energy facilities on the non-productive land areas within the site to bypass impacting important agricultural soils, farm operations, wildlife habitat, and ecosystems while allowing farmers to secure supplemental income to maintain the farm long-term.
- Use rooftop solar and other small-scale renewable energy sources for on-site farm energy needs.
- Protect agricultural lands and promote the dual use of the land for farming and renewable energy.

Protect Historic Buildings and Properties

Rhode Island is rich in historic sites and districts and is home to cultural resources. Projects should consider the effect on any officially listed historic site. Roof or ground mounted solar energy systems could have varying impacts on historic resources and their setting and therefore their design and installation should be carefully considered by each municipality. Solar energy systems should be located and designed to minimize visual impacts to or from important designated historic and cultural resources. They should not significantly impact the historical appearance of a building or cause the loss of character-defining features. In addition, such installations may be subject to local historic preservation ordinances, which generally seek to preserve the external historic character of buildings and areas, and so may place restrictions on alterations and new construction.[2]

The National Park Service has developed guidance (www.nps.gov/tps/sustainability/new-technology.htm) for the installation of new technologies such as solar and wind power at historic sites. Its general rule is that they must be both compatible with the historic property and reversible. The National Renewable Energy Lab's *Implementing Solar PV Projects on Historic Buildings and in Historic Districts*[3] includes the following principles:

- If possible, use ground-mounted panels sited to respect the historic setting and be inconspicuous.
- Locate solar panels or any new construction on a site, rather than on a historic structure.
- Locate solar panels on non-historic buildings and additions.
- Place solar panels to minimize public visibility.
- Hide installations that would result in the permanent loss of significant, character-defining features.
- Stay away from the removal or permanent alteration of historic materials and fabric.
- Use low profiles.
- On flat roofs, set solar panels back from the edge.
- Locate panels on a single roof in a pattern that matches its configuration, evading disjointed or multi-roof installations.
- Ensure that solar panels, support structures and conduits blend into the resource.
- Include native vegetative screening and appropriate setbacks.
- Locate them on or within areas of low scenic value.
- Small-scale, on-site installations (such as rooftop solar) proposed for historic sites should:
    - Be located on a non-primary façade.
    - Recognize and reflect the historic resource's architectural lines and features.
    - Be installed in a manner that does not damage historic material integrity and be removable in the future.

[2] Friedrichsen, A. *Clean Energy, Green Communities: A Guide to Siting Renewable Energy in the Hudson Valley*, Scenic Hudson, Inc., Poughkeepsie, NY, 2018

[3] https://www.nrel.gov/docs/fy11osti/51297.pdf

Protect Ecological Resources

Rhode Island's wetlands, wetland buffers, streams, forests and preserved open space provide critical public benefits, including wildlife habitat, water filtration and carbon sinks (vegetation and other natural resources that absorb carbon), which in turn support climate change adaptation and resiliency. Ground mounted solar energy system development should minimize impacts to these fragile natural assets. Projects should be designed to optimize efficiency and minimize the amount of land used by a commercial ground mount solar energy system. Sensitive environmental resources and other critical areas that should be considered when siting solar energy projects include[4]:

- Habitat areas for identified wildlife.
- Preserved open space—including parks, preserves and recreational lands—where the development would be incompatible with the property's conservation purposes, such as an existing conservation easement or other existing legal restrictions.
- Streams and stream corridors.
- Wetlands and wetland buffer areas.
- Large, intact core forests as mapped in the DEM RI Wildlife Action Plan[5]
- River corridors and floodplains.
- Ridgelines, steep slopes, and
- Hydrogeological formations where there are water quality concerns.

Maintain the Purpose of Conserved Lands

Conserved lands include properties protected by the public or private sector to ensure that their natural, resources and other values remain intact, beneficial and accessible. If constructed on municipally-owned lands conserved to offer public recreation, education, open space and/or natural area protection, installations must not conflict with those purposes, and should be supported by the local community[6].

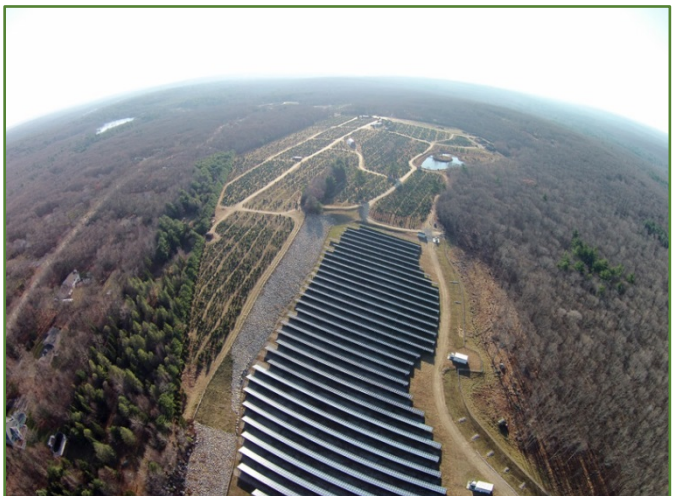
[4] Friedrichsen, A. *Clean Energy, Green Communities: A Guide to Siting Renewable Energy in the Hudson Valley,* Scenic Hudson, Inc., Poughkeepsie, NY, 2018

[5]The Division of Planning's Handbooks 2 and 15 recommend using the RI Wildlife Action Plan's Conservation Opportunity Areas, which include these forest cores, for identifying habitats with high conservation value.

[6] Friedrichsen, A. *Clean Energy, Green Communities: A Guide to Siting Renewable Energy in the Hudson Valley,* Scenic Hudson, Inc., Poughkeepsie, NY, 2018

Farmland Sustainability

Ground mounted solar energy systems and any transmission, distribution and other related facilities should be designed to minimize any impacts to important agricultural lands. Farms supply fresh, local food, maintain the State's rural character, and protect wildlife habitat and environmentally sensitive areas such as meadows, woodlands, wetlands and streams. Further, local agriculture reduces the amount of food that must be transported long distances and the energy consumption associated with that transport. Regenerative agricultural practices build healthy soils that store carbon in its rich organic content. Solar energy systems on farmland should designed to minimize disruption to agricultural operations[7].



2 MW Solar System at Leyden Christmas Tree Farm, West Greenwich – Farm used 12 acres of 92 acres or 13% of the total property.

An adopted principle of the advisory working group was that communities should support the economic viability of farms through appropriate renewable energy development as a complementary use in a manner which keeps farms in agricultural production while preserving agricultural soils. Farmers are also impacted by commodity prices of agricultural products and property taxes. Appropriately sited commercial scale solar energy systems could provide opportunities for valuable farm lands to be kept for farming and agricultural uses long-term for future generations. Other solar energy systems such as accessory rooftop installations or ground-mounted solar panel installations can reduce energy costs for farms and provide supplemental income to farmers. To maximize the benefits of siting solar energy systems on agricultural lands, solar installations may be designed to be co-located with ongoing agricultural operations. Solar energy systems can be designed to be compatible with continued farming practices to limit the amount of land taken out of agricultural production. Solar projects also can be designed so harvestable crops can thrive between panels. Using the same land to grow food and generate electricity is known as "dual use". Dual use of land reduces this competition—helping to limit instances where farmers replace crops with solar energy systems, and instead keep farmland in production. Putting solar on existing grazing or agricultural land also provides an additional income stream for farmers through lease payments from solar developers. The dual-use technique of combining solar with grazing, crops or pollinator-friendly habitat also helps to reduce pressure on farmland to convert it to other forms of development—such as residential uses.

According to R.I. general Law **§ 44-27-10.1,** farmlands classified in the farm, forest, or open-space program are not subject to a land use change tax if the landowner converts no more than 20% of the total acreage of land that is actively devoted to agricultural use to install a renewable-energy system. Tax assessors can only withdraw from farmland classification the actual acreage of the farmland used for a renewable-energy system that is not concurrently used as farmland. The rest of the farmland will remain eligible if it still meets the program qualification criteria. There are several case studies of commercial solar installations on farmlands in the *Solar Siting Information- February 2019 (PowerPoint).*

[7] Ibid

Pollinator-Friendly Solar Developments

This technique is being used increasingly to provide benefits to pollinators and maintaining soil health in tandem with solar energy development. As loss of habitat for both native and managed bees, monarch butterflies and other pollinating insects becomes a concern, there is an opportunity to establish new habitat at solar energy systems. Whenever possible, developers should select and plant a mix of native, pollinator-friendly plants throughout the arrays. Additionally, where possible, whether for crops and/or pollinator habitat, plants and seeds pre-treated with insecticides and other pesticides should be minimized, as should pesticide applications in or near pollinator habitat. Researchers at the US Department of Energy's Argonne National Laboratory have started to look at the potential benefits of creating pollinator habitats among large-scale solar developments.

Image: US DOE's Argonne National Lab

Using native, pollinator-friendly plantings instead of gravel, impervious surfaces or turfgrass underneath solar facilities can increase populations of bees and other insects needed to pollinate crops and decrease operation and maintenance costs for solar projects. Choosing pollinator-friendly plants can help pollinators and benefit farmers dependent on insects for crop production. Native plants like grasses and forbs also provide nutrition and habitat for local gamebirds and songbirds.[8] While there may be additional up-front costs, beyond the initial establishment period operation and maintenance costs should be lower—from not having to mow turfgrass throughout the facility's 30-year lifespan or apply pesticides and herbicides regularly to maintain it. Maintenance mowing should only be necessary once or twice a year to prevent woody colonizing species. Additionally, many native plants are better at soaking up rainwater than turfgrass because they have deeper roots. As a result, they lessen the potential for erosion and improve soil quality and storm water retention. Finally, including such plantings in the design of a solar PV proposal can help to maximize public support and community buy-in for a project from the beginning and boost solar efficiency by creating a cooler micro-climate around the panels. More information can be found within the references.

[8] Friedrichsen, A. *Clean Energy, Green Communities: A Guide to Siting Renewable Energy in the Hudson Valley*, Scenic Hudson, Inc., Poughkeepsie, NY, 2018

References

- RI Solar Energy Profile – https://www.eia.gov/state/?sid=RI
- US State Solar Resource Map - https://www.nrel.gov/gis/solar.html
- RI Low-Impact Development Guide - http://www.dem.ri.gov/programs/bpoladm/suswshed/pdfs/lidplan.pdf
- NJ Association of Environmental Commissions - Solar Siting and Sustainable Land Use
- RIDEM Resource Maps - http://www.dem.ri.gov/maps/
- RI Wildlife Action Plan Conservation Opportunity Areas https://www.arcgis.com/home/item.html?id=63f3ef956b3e4711ab3f8dd8349f346e
- Guidance Handbook #2: Planning for Natural Resources http://www.planning.ri.gov/documents/comp_handbook/2_NaturalResources.pdf
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    - Grow Solar Local Government Solar Toolkit - https://www.growsolar.org/toolkit/
    - MN Local Government Solar Toolkit - http://www.betterenergy.org/blog/minnesota-solar-toolkit/
- Friedrichsen, A. *Clean Energy, Green Communities: A Guide to Siting Renewable Energy in the Hudson Valley*. Scenic Hudson, Inc., Poughkeepsie, NY, 2018
- Mass - Model Zoning for the Regulation of Solar Energy Systems (2014)
- The American Planning Association, 205 N. Michigan Ave., Suite 1200, Chicago, IL 60601–5927.
    - "Planning and Zoning for Solar Energy," guide,
        - https://www.planning.org/pas/infopackets/eip30.htm
    - *Planning for Solar Energy*, Planning Advisory Service, Report 575, 2014
- https://digitalcommons.pace.edu/cgi/viewcontent.cgi?article=1003&context=environmental
- https://www.nyserda.ny.gov/-/media/NYSun/files/Model-Solar-Energy-Law-Guidance-Document.pdf
- https://www.cleanenergyresourceteams.org/sites/default/files/MinnesotaPZPToolkit1.pdf
- *Rooftop Solar Photovoltaic Technical Potential in the United States: A Detailed Assessment,* National Renewable Energy Laboratory, 2016 https://www.nrel.gov/docs/fy16osti/65298.pdf
- *Rhode Island Greenhouse Emission Reduction Plan*, RI EC4, 2016 http://climatechange.ri.gov/documents/ec4-ghg-emissions-reduction-plan-final-draft-2016-12-29-clean.pdf
- Rhode Island Executive Order, 17-06, *Reaffirming Rhode Island's Commitment to the Principles of the Paris Climate Agreement* http://www.governor.ri.gov/documents/orders/ExecOrder_17-06_06112017.pdf
- https://environment.transportation.org/environmental_issues/construct_maint_prac/compendium/manual/4_11.aspx
- Multiple states model ordinances or guidance including the counties or states of:
    - California (State of and numerous counties), Colorado, Connecticut, Cumberland County, PA, Delaware Valley, PA, Georgia, Maine, Massachusetts, Michigan, Minnesota, North Caroline, New Hampshire, New York, Oregon, Texas, Utah, Virginia, and Vermont
- **Pollinator-friendly** "scorecards" for solar projects:
    - Energy Action Network of Vermont - http://eanvt.org/regulatory-reform/pollinator-friendly-solar-initiative/
    - Center for Pollinators in Clean Energy (Minnesota)- https://fresh-energy.org/beeslovesolar/
        - The State of Minnesota's Department of Natural Resources technical guidance for establishing native, pollinator friendly habitat in solar projects.

- Xerces Society - http://xerces.org/pollinators-northeast-region/
- GoBotany for information on native status of plants in RI and the rest of New England.
- Construction Practices for Environmental Stewardship, Chapter 4, AASHTO Center for Environmental Excellence
- https://environment.transportation.org/environmental_issues/construct_maint_prac/compendium/manual/4_11.aspx

Solar Siting Glossary

- **Abandoned SES**- When the solar energy system either reaches the end of its useful life or is disconnected.
- **Alternating Current "AC"-** Electric current which periodically reverses direction, in contrast to direct current (DC) which flows only in one direction. The Inverter in the Solar System converts the DC produced from the panels to AC that can then be used by the Grid.
- **Array**– Consist of the entire group or section of PV Panels.
- **Array Area**– Total area occupied by the solar panel array; includes panel area + inter-panel spaces)
- Accessory Solar – Use of solar on a parcel where energy production is a secondary use, as opposed to a primary use.
- **Cleared Area**– Area that include the fenced in area but also outside the fenced area in which trees have been removed as not to shade the array.
- **Decommissioning Plan**- The plan and financial guarantee for the dismantling of the solar system after the system is no longer operational.
- **Direct Current "DC"-** Electric Current that flows in only one direction, PV Panels produce DC electricity
- **Dual use** – when there is more than one principal use on the same piece of property.
- **Emergency/Utility Access Road**- A gravel or dirt paved road for fire and police to have access to the solar system site.
- **Feeder Line**- In power engineering, a feeder line is part of an electric distribution network.
- **Fenced Area**– The safety fence perimeter that include the array inverters, transformers, etc. (note the interconnection usually is located at the street and consist of 2-3 poles and a small device mounted atop the pole.).
- **Interconnection Application**– Formal application process with the utility carrier to connect to grid
- **Inverter-** An equipment device that converts Direct Current into Alternating Current from the production of the solar system.
- **Kilowatts "kW"-** 1000 watts (Used mainly in reference to small and commercial scale solar systems.)
- **Megawatts "MW"-** One million watts (Used mainly in reference to large commercial solar systems.)
- **Micro - inverter**– Inverter that is attached to the back of each solar panel (typically used in residential and commercial projects).
- **Nameplate Capacity-** The maximum rated output of electric power production of the photovoltaic system in watts of Direct Current (DC).
- N**et Metering**- Using electrical energy generated by an eligible, net-metering system for self-supplying electrical energy and power at the eligible net-metering-system site, or with respect to a community remote-net-metering system, for generating net-metering credits to be applied to the electric bills of the eligible credit recipients associated with the community net-metering system.
- **Panel Coverage**- Panel Size X # of Panels (this is in addition to the inter-row spacing which can be 8 – 17 feet from the back of one row to the front of next row).
- **Photovoltaic ("PV") Panels aka Solar Panel / aka Solar Modules**-Absorb sunlight as a source of energy to generate electricity. Panels are comprised of solar cells, normally 60 cells or 72 cells per panel.
- **Photovoltaic (PV) System**- Solar photovoltaics (PV) is a method of converting renewable solar energy into direct current electricity using semiconducting materials.

- **Prime Farmland**– Land, classified and mapped by the USDA NRCS, 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 uses. Prime farmland is classified and mapped by the USDA NRCS.
- **Racking**- (also known as mounting equipment) – The system components used to support and secure solar panels to roofs, building façades, or the ground.
- **Roof Mounted Solar Energy System**– A system where the panels and other equipment are affixed to a building roof.
- **Security Area**-Total area within security fencing.
- **Site Restoration**– Bringing back a site to a former position or specific condition.
- **Solar Access-** The access of a solar energy system to direct sunlight.
- **Solar Clearing Area**– The total area where the location and height of vegetation and/or structures must be managed to allow for unobstructed access to direct sunlight and minimize shading.
- **Solar Energy**–Radiant energy received from the sun that can be collected in the form of heat or light by a solar collector.
- **Solar Energy System (SES)-** A series of devices to provide for the collection, conversion, storage and distribution of energy derived from solar radiation for space heating or cooling, electricity generation, or water heating.
- **Solar Panel Coverage Area**– The area directly covered by panels.
- **Substation**- A subsidiary station in which electric current is transformed.
- **Three-Phase Power**- A common method of alternating current electric power generation, transmission, and distribution and is the most common method used by electrical grids worldwide to transfer power.
- **Topsoil**- Surface soil, which has the highest concentration of organic matter and in which plants have most of their roots.
- **Transformer**- A device that changes the voltage of alternating current electricity.
- **Virtual Net Metering**- Virtual net metering (VNM) is a bill crediting system for renewables. It refers to when renewables are not used on-site but is instead remotely installed and net metering credits are allocated to subscribers.