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CLEAN ENERGY, GREEN COMMUNITIES

A Guide to Siting Renewable Energy in the Hudson Valley

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VISION FOR THE VALLEY

A Regional Response to Climate Change

To rapidly transition the Hudson Valley to a sustainable, low-carbon region increasingly powered by renewable energy in order to mitigate climate change, while protecting and preserving the region's invaluable scenic, historic, agricultural, environmental and economic resources.

While the potential for smaller, distributed energy wind turbines exists in the Hudson Valley, there are limited areas where sustained wind speeds are high enough to support large-scale wind farms. In comparison, the Hudson Valley has far greater solar insolation resources. Therefore, this guide focuses on the siting and design of solar photovoltaic (PV) energy generating facilities. Whenever possible, low-impact solar development (which uses certain site-preparation and solar-array configuration techniques to minimize disturbance or allows for co-location of the solar facility together with agricultural or other uses) should be utilized.

The Hudson Valley can serve as a regional model for promoting accelerated renewable energy development while simultaneously preserving important natural resources. This guide provides a decision-making framework for all stakeholders—including host communities, developers, landowners and concerned citizens—to find common ground in the interest of achieving this vision.

Significant time, energy and funding have been expended to protect the irreplaceable natural and economic resources that make the Hudson Valley a great place to live and work. These assets now face their greatest threat ever—from climate change. To help mitigate climate change, New York has adopted ambitious policies that will transition the state's energy supply away from major fossil-fuel power plants and long-distance transmission and toward a "smart" grid that integrates both large-scale renewable energy facilities, like large wind and solar farms, as well as smaller-scale distributed energy resources (DER), such as rooftop solar. To help reach its goal to reduce greenhouse gas (GHG) emissions 40 percent from 1990 levels by 2030 and 80 percent by 2050, New York has created market incentives and other methods for utilities and developers to increase the amount of renewable energy supply from 25 percent to 50 percent of the state's total by 2030 (the "50x30" goal).

The benefits of developing clean, renewable energy are clear. In addition to providing climate change benefits, reaching the 50x30 goal will:

- 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, such as land and water, which are used more intensively by fossil-fuel energy generation;
- Increase reliability of the state's energy supply, because it will be more diverse and less dependent on a single source;
- 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 revenue creation.

Reaching the 50x30 goal will require significantly accelerated renewable energy development in New York over the next dozen years, including large-scale solar and wind facilities. However, community opposition to proposed projects can cause significant delays, increase developers' costs and even force project abandonment. Ultimately, this jeopardizes achievement of the state's renewable energy targets and undermines its strategies to mitigate climate change. To minimize the potential for public opposition and delay, developers must be sensitive to local values and community concerns and take them into account during site selection and planning. Involving the public early, providing information and increasing transparency from the start can help to reduce the time, costs and complexities of environmental analysis during permit application reviews.

Proper design, construction and operation of renewable energy facilities can avoid, minimize and mitigate impacts to important natural resources and help build public support for projects. To reduce conflicts, areas with high agricultural, visual, ecological, historic and conservation values should be avoided for renewable energy development. Instead, low-conflict sites and areas—such as brownfields, previously disturbed and developed lands, or closed landfills—should be identified and prioritized for development. In addition, communities should address renewable energy in their comprehensive plans and zoning laws. Finally, planning ahead at the regional or landscape level to identify areas more suitable for development of new renewable energy projects can help to steer them to appropriate, low-conflict locations.

This approach of avoiding conflicts at the outset in order to streamline the review and approval process is known as "Smart from the Start." The principles and strategies presented in this guide are meant to reduce conflicts from the beginning, avoid impacts to the Hudson Valley's invaluable resources and promote successful renewable energy development to help ensure achievement of the state's climate change mitigation goals.

A 166.5 kW roof-mounted solar electric generating system on Ulster Avenue in the City of Kingston, Ulster County, will allow several dozen residential customers to purchase renewable energy. This Community Distributed Generation (CDG) solar facility was the first in Central Hudson's service territory. Output to each customer is based on an agreement with the developer; Central Hudson credits the value of the energy produced to the customers' utility bills. The roof is white and reflective and the solar panels (manufactured locally) are bi-facial—by utilizing both sunlight and light reflected from the roof, they produce more energy from the same space than one-sided panels. *(Sunrise Solar Solutions, LLC, project developer and installer)*

A solar energy facility located on a capped municipal landfill can offset the municipality's annual maintenance and monitoring expenses with lease and energy generation revenue, or the municipality can use the power itself at a savings for taxpayers. The Town of Clarkstown landfill in West Nyack, Rockland County, set on a 161-acre property, was closed in 1997 and a 76-acre cap was put in place. A plan to repurpose the inactive, unusable land with a renewable energy facility was first proposed in 2009. The 2.364 MW solar array, made up of 4,300 panels and built on 13 acres of the decommissioned, capped landfill was the first of its kind in New York State when completed in 2014. The project generates 2.9 GWh of electricity per year and is used for Clarkstown government operations. It is expected to save taxpayers as much as $4 million over the 30-year lifetime of the system, and will offset 2,030 metric tons of CO_2 emissions annually. *(Google maps)*

Prioritize Development on Previously Disturbed Areas & Existing Buildings

Siting renewable energy projects—especially solar facilities—on marginal lands such as degraded sites like "greyfields" (for example, abandoned shopping malls and closed landfills) and contaminated "brownfields" (properties that might be polluted by a hazardous substance or contaminant) is preferred over development on valuable open space or agricultural land. The cleanup and reuse of contaminated or other previously disturbed properties for renewable energy generation can provide many benefits, including the preservation of greenfields, blight reduction, increased property values and job creation. A brownfield site converted to a solar energy facility is often called a "brightfield." Prioritizing renewable energy development on previously disturbed lands can help reduce development pressure on agricultural lands and open space.

Such previously disturbed properties are likely to have lower acquisition or lease costs and may already have reusable, existing on-site infrastructure that can further reduce development costs. In addition, they often are located close to roads and transmission infrastructure, which reduces the need to build expensive new interconnection or access to the facility. The use of such marginal sites also can build greater public support for development and help to streamline and shorten the permitting and environmental review process.

Renewable energy sources can also be sited in conjunction with existing land uses to reduce development impacts—for example, installation of solar canopies in parking lots and rooftop solar facilities on large retail stores, warehouses, office buildings and apartment complexes. In addition to reducing the energy costs of the facility itself, such installations can benefit the community if the energy produced is made available to multiple off-site consumers who cannot construct a renewable energy source at their location.

Parking lots and garages can offer ideal locations for solar installations because they often furnish the large, unshaded and unobstructed spaces optimal for such systems. Solar canopies in parking areas can provide shade and weather protection for cars parked beneath them as well as supply energy to electric vehicle-charging stations.

Renewable energy facilities should be sited to avoid negative impacts to productive farmland and agricultural landscapes:

- Use natural screening to mitigate visual impacts to agricultural landscapes;
- Locate renewable energy facilities on non-productive farm areas to avoid impacting important agricultural soils and farm operations;
- Use pollinator-friendly plantings in and among solar arrays to support bees and other insects that pollinate crops; and
- Use rooftop solar and other small-scale renewable energy sources for on-site farm energy needs.

Protect Agricultural Lands & Promote Co-Location

Farms in the Hudson Valley not only supply fresh, local produce—they maintain the region's scenic working landscapes, rural heritage and quality of life, and also protect wildlife habitat and environmentally sensitive areas such as meadows, woodlands, wetlands and streams. Renewable energy facilities and any necessary transmission, distribution and other facilities should be sited to avoid and minimize any negative impacts to important agricultural lands. New renewable energy projects should not be sited on extremely valuable agricultural resources such as prime soils and actively farmed land. In addition, renewable energy projects on farmland should be sited and designed to minimize disruption to agricultural operations—i.e., they should be located to avoid creation of lengthy access roads through farm fields. Large-scale renewable energy projects may be located on a farm property when they do not impair agricultural soils or farm facilities. And renewable energy scaled for on-site farm use (such as rooftop solar, small ground-mounted solar panel installations or small-scale wind turbines) can reduce energy costs for farms and should be encouraged.

To maximize the benefits of siting renewable energy facilities on agricultural lands, solar installations can be co-located with ongoing agricultural operations. Solar facilities can be designed to be compatible with continued farming practices in order to limit the amount of land taken out of agricultural production. This promotes both agricultural protection and achievement of the state's renewable energy goals.

One possibility is to maintain the vegetation in and around solar panels with sheep or other grazing animals, which benefit from the shade created by the panels and provide natural lawn maintenance. In Vermont, solar projects often are designed to be compatible with rotational grazing of livestock. And in the United Kingdom, it is commonly proposed that the land between and underneath rows of solar panels be made available for grazing small livestock, especially sheep and free-ranging poultry.

With proper design and planning, sheep grazing can be co-located with large scale solar farms. Sheep are generally hardy and low-cost. Design elements include sufficient ground clearance for animals—to walk under panels for grazing and shade, and to keep the sheep from causing any damage to the panels; protecting wiring from sheep with conduits or armouring; and treatment of inverter pads or other exposed facilities for ammonia (urine) resistance. Project developers should consult with agricultural specialists to ensure that site conditions are amenable for such dual use.

Kale growing under solar panels at the University of Massachusetts Amherst Crop and Animal Research and Education Center in South Deerfield. *(Reprinted with permission of the Daily Hampshire Gazette. All rights reserved / Sarah Crosby)*

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 solar double cropping or "solar sharing." In Germany, the Fraunhofer Institute for Solar Energy Systems is conducting research into what it calls "agrophotovoltaics" or "APV." Panels are mounted high enough so the crops receive sufficient sunlight and farm machinery can pass among the arrays. At the University of Massachusetts Amherst Crop and Animal Research and Education Center in South Deerfield, researchers are growing kale, broccoli, beans, peppers and Swiss chard under solar panels. While an area still under study, research so far has shown that sufficient separation of the panels can result in levels of crop production nearly comparable to those achieved under full-sun conditions, and that the dual-use arrangement can significantly increase the land's overall productivity. Alternatively, the damp and dark spaces under solar panels can be used, as farmers do in Japan, for growing mushrooms.

Because solar PV energy generating facilities require land for construction, they will sometimes compete with other existing and potential land uses, such as farming. Dual use of land reduces this competition—helping to limit instances where farmers replace crops with solar PV facilities, 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 techniques of combining solar PV 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, industrial or commercial uses—that would permanently convert the land.

In addition, solar facilities are a temporary (although long-term—at least 30 years) use of land. When a solar PV system is decommissioned and removed, the land can be returned to other productive use, including farming. In this way, a solar lease—provided the facility is properly operated, maintained and removed—can be a way to preserve land for potential future agricultural use. It is also possible that during the term of operation, soils can rest and rebuild if certain plants that help to add organic matter and topsoil are grown in and among the panels.

NYSDAM Impact Mitigation Guidance

The New York State Department of Agriculture & Markets (NYSDAM) has issued guidance documents for mitigating the impacts of solar and wind energy projects as well as transmission lines on agricultural land (www.agriculture.ny.gov/ap/agservices/Solar_Energy_Guidelines.pdf , www.agriculture.ny.gov/ap/agservices/Wind_Farm_Guidelines.pdf and https://www.agriculture.ny.gov/ap/agservices/Electric-Transmission-ROW-Guidelines.pdf, respectively).

For solar PV facilities, NYSDAM recommends that project sponsors avoid installing solar arrays on the most valuable or productive farmland. The following is the order of importance recommended by NYSDAM for solar array avoidance:

1. Active rotational farmland (most important)
2. Permanent hay land
3. Improved pasture
4. Unimproved pasture
5. Other support lands
6. Fallow/inactive farmland (least important)

Within each category, there is a further hierarchy based on soil type:

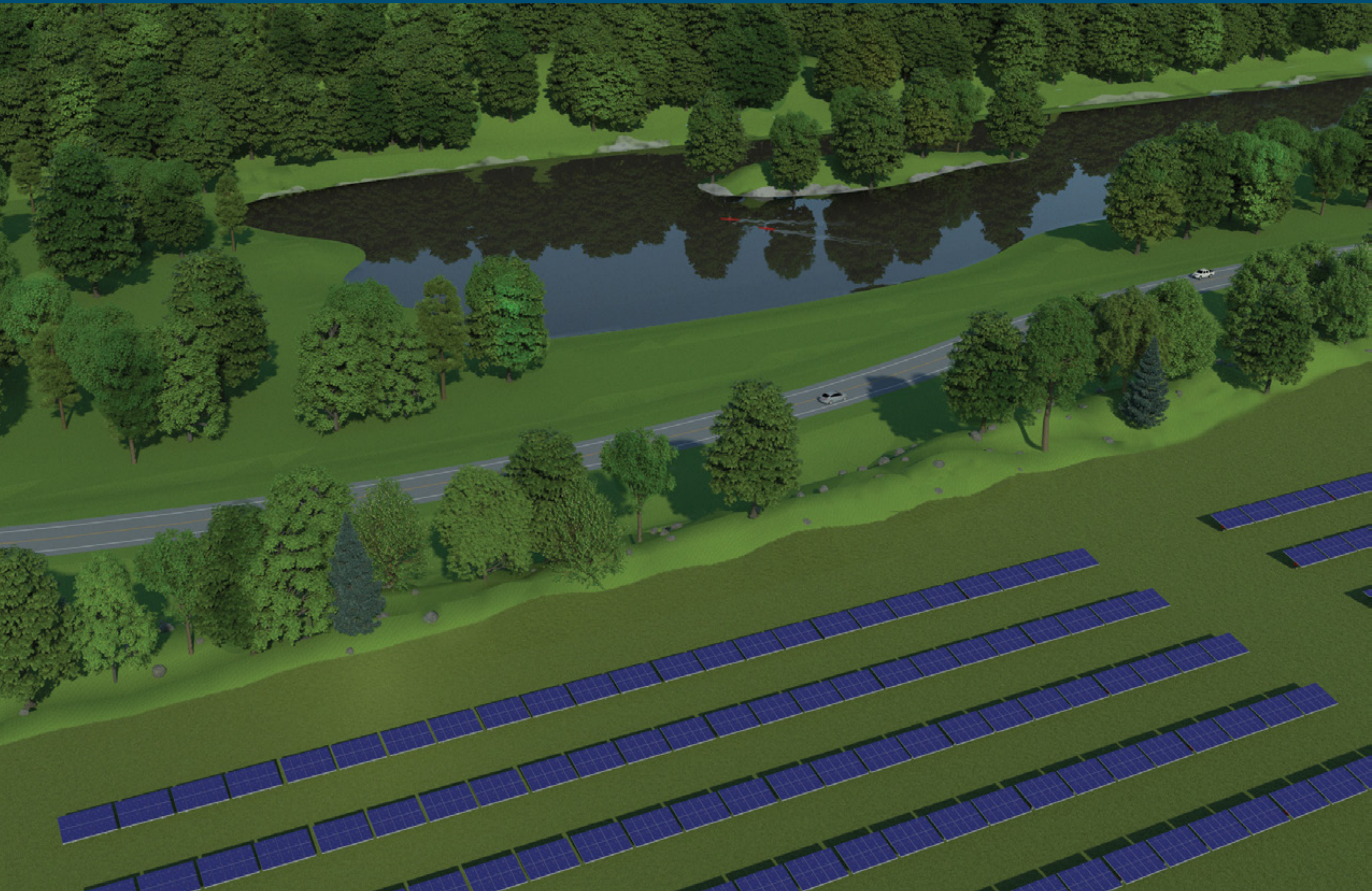
1. Prime Farmland Soils
2. Prime Farmland Soils (if drained)
3. Soils of Statewide Importance

According to federal regulation, Prime Farmland Soils are those that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oil seed crops, and are also available for these uses (the land could be cropland, pastureland, range-land, forestland or other land, but not urban built-up land or water). They have the soil quality, growing season and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming practices. Soils of Statewide Importance might fail to meet one or more of the requirements of Prime Farmland Soils, but are important for the production of food, feed, fiber or forage crops.
They include soils that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods.

NYSDAM also recommends minimizing impacts to normal farming operations from solar facilities by: locating structures for overhead collection lines in non-agricultural areas and along field edges; avoiding the division of larger fields; eliminating the need for cut and fill and reducing the risk of creating drainage problems by locating access roads along ridgelines and along field contours and keeping them to a maximum16-foot width; and avoiding impacts to all farm drainage and erosion-control structures in order to maintain their design and effectiveness.

A cutaway diagram shows how a large-scale solar array can be made invisible from roads or other public vantage points. It demonstrates several techniques for minimizing and mitigating visual impacts from large-scale solar projects: keep facility components at low profile, and site at a lower elevation on the property; design the site to take advantage of natural topographic and vegetative screening and setbacks, such as vegetation and berms along a roadway; locate inverters and other infrastructure on the site where they will have least visual impact; and avoid use of overhead interconnection lines, which can mar an otherwise natural landscape.

An overhead view of the same large-scale solar array shows the extent of the project that can be hidden.



Protect Scenic Views

The Hudson Valley's beautiful landscapes play an important role in its history, identity and economy. Renewable energy facilities and any necessary transmission, distribution and other supporting infrastructure should be sited and designed to avoid impacts to scenic areas that contribute to valued community character. New solar and wind projects should not result in significant negative impacts to scenic views and vistas, including designated Scenic Areas of Statewide Significance (SASS), Scenic Byways and other visual resources identified in adopted plans.

Visual impacts are likely to occur for most large-scale wind projects. The single most effective means for reducing or avoiding these impacts is to site these facilities away from highly valued landscapes and designated visual resource areas to preserve existing visual integrity and scenic vistas.

The direct, onsite impacts of solar installations also are primarily visual. Under certain conditions, they may be reflective, and some viewers may consider their appearance "industrial." To avoid or minimize their impacts on scenic resources—including open spaces, distant views, distinct natural features, and cultural and historic resources:

- Keep facility components at a low profile;
- Use natural screening and setbacks; and
- Locate them on or within areas of low scenic value.

Where feasible, facilities should be sited against treelines rather than in open fields, on high land features or along "skylines" visible from nearby sensitive viewpoints. Strategic use of natural topography and vegetation can keep facilities out of sight from public roads, parks, historic sites and other sensitive viewing areas. Alternatively (or in addition), site design should include appropriate setbacks and vegetative screening to minimize and mitigate visual impacts. Such plantings should:

- Be large enough to screen the facility from the time of its installation;
- Be selected to provide year-round screening;
- Enhance the area's existing beauty;
- Provide a long-lived, resilient and dense bank of vegetation; and
- Be a native species readily available in the area.

In addition, any associated project infrastructure—such as inverters (large, box-like structures that convert solar panels' DC output to AC current suitable for the distribution system) and monitoring equipment—should be located where it will have the least visual impact. Perimeter fencing should be designed to minimize impacts to aesthetics. Finally, developers should use underground interconnection methods rather than overhead lines to further mitigate visual impacts.

A visual impact analysis of a renewable energy proposal may be conducted as part of its environmental review using the methodology in the New York State Department of Environmental Conservation's Assessing and Mitigating Visual Impacts (www.dec.ny.gov/docs/permits_ej_operations_pdf/visual2000.pdf). It offers guidelines for inventorying aesthetic resources, conducting a visual assessment, determining an impact's significance and identifying mitigation measures. A solar glare hazard analysis—a study of when and where glare from a solar project can occur throughout the year from certain observation points—may also be performed using the Solar Glare Hazard Analysis Tool (ip.sandia.gov/technology.do/techID=168), a web application created by Sandia National Laboratories.

Protect Historic & Cultural Resources

The Hudson Valley is rich in historic sites and districts and is home to cultural resources that played a significant role in shaping America's history. Sometimes historic resources can benefit from energy-efficiency retrofitting or a renewable energy installation to improve its energy performance. This is desirable. However, such projects should take into account the effect on the historic site. Renewable energy facilities can have varying impacts on historic resources and their setting and therefore their design and installation must be carefully considered.

Renewable energy installations should be located and designed to minimize visual impacts to or from important historic and cultural resources, using many of the same siting and design tools for protecting visual 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.

Guidance for Renewable Energy at Historic Sites

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.

In addition, the National Renewable Energy Lab's *Implementing Solar PV Projects on Historic Buildings and in Historic Districts* (www.nrel.gov/docs/fy11osti/51297.pdf) 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;
- Avoid installations that would result in the permanent loss of significant, character-defining features;
- Avoid 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, avoiding disjointed or multi-roof installations; and
- Ensure that solar panels, support structures and conduits blend into the resource.

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 and integrity; and
- Be removable in the future without causing damage to the resource.

In addition, use of high-efficiency solar technology, which will reduce the amount and footprint of panels needed, will help to mitigate any impacts to historic sites from renewable energy installations.

Protect Ecological Resources

The Hudson Valley'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. Renewable energy development should not negatively impact these fragile natural assets.

Developers should design project components and layout to optimize efficiency and minimize the amount of land used by a project. Sensitive environmental resources and other critical areas that should be avoided when siting renewable energy projects include:

- Wildlife and other critical habitat, including intact and connected wildlife corridors and migratory bird flyways;
- Preserved open space—including parks, preserves and recreational lands—where the development would be incompatible with the property's conservation purposes, a conservation easement or other existing legal restrictions;
- Streams and stream corridors;
- Wetlands and wetland buffer areas;
- River corridors and floodplains;
- Ridgelines, steep slopes and other sensitive geological and hydrogeological formations; and
- Valuable contiguous forests, such as those that serve as critical wildlife habitat and migration corridors, serve as carbon sinks or provide climate change resiliency.

Forested areas and trees collect carbon and provide water management, cooling and climate benefits. Renewable energy facilities should not be sited or constructed in a manner that would significantly impact the land's carbon-storage benefits or ability to provide climate change adaptation and resiliency. An environmental review of proposed large-scale renewable energy projects that will impact forested areas should include an analysis comparing the facility's GHG emissions-reduction benefits with the lost carbon-storage potential—to ensure that climate change benefits outweigh this loss.

Forested areas, especially contiguous forests, also provide habitat. Renewable energy projects should be designed and sited to avoid clear-cutting large acreages of woodland or removing significant amounts of vegetation, resulting in habitat fragmentation. Perimeter fencing should be designed to minimize impacts to wildlife. In addition, renewable energy facilities should be designed and constructed in a manner that protects the functions of wetlands and other water resources, and that avoids or minimizes any impacts to them from associated activities such as access roads and maintenance operations.

Maintain the Purpose of Conserved Lands

Conserved lands include properties protected by the public or private sector to ensure that their natural, visual and other values remain intact, beneficial and accessible to all, human and otherwise. Such lands can be held in fee ownership or be subject to a conservation easement.

Land trusts are important stakeholders in the renewable energy development process and can help direct development away from conserved and valuable lands and toward more appropriate locations. Because they likely have already conducted an analysis of the lands in their project areas, land trusts can offer critical input in identifying areas unsuitable for renewable energy development, as well as locations that would jeopardize funding and effort already expended to conserve important areas. Through strategic conservation planning, they can identify those lands that are most resilient and play a role in climate change mitigation and adaptation. Land trusts also can promote land conservation strategies to maximize carbon sequestration.

Where appropriate, land trusts may consider construction of renewable energy facilities, such as community distributed generation projects, on conserved lands. They also may include the potential for properly sited and designed renewable energy development in the language of their conservation easements.

Renewable energy facilities may be located on conserved lands when the installation is consistent with the purposes of the acquisition and the restrictions of individual conservation easements or other legally-binding restrictions on use. Such facilities may also serve the energy needs of the conserved land or associated properties. For example, a solar installation or small wind turbine on a conserved farm can power the barns, processing equipment or other on-site facilities. Likewise, a solar array on municipally-conserved land can provide energy for municipal buildings and streetlights.

Any renewable energy project should be designed to avoid or minimize impacts to the conservation value of the property. A renewable energy facility located on conserved lands or lands held in conservation easement:

- Should be designed and scaled appropriately in relation to the overall size of the conserved property—i.e., it does not conflict with the purpose or reduce the value of conserving the land;
- Must comply with all of the easement's provisions;
- If constructed on municipally-owned lands conserved to offer public recreation, education, open space and/or natural area protection, must not conflict with those purposes, and should be supported by the local community and any applicable municipal plan; and
- Should include appropriate decommissioning plans.

(photos this spread: Robert Rodriguez, Jr.)

Pollinator-Friendly Solar

A new technique for solar PV project design is being used increasingly to provide benefits for farms, wildlife and soil health in tandem with increased clean 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 PV installations. Whenever possible, developers should select and plant a mix of native, pollinator-friendly plants throughout the arrays.

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 to fight against species collapse and benefit farmers dependent on insects for crop production. Native plants also provide nutrition and habitat for local gamebirds and songbirds.

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. Additionally, 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 stormwater 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.

To ensure that truly beneficial plants are used, Minnesota, Vermont and Maryland have consulted with entomologists and other experts to establish standards and criteria as well as pollinator-friendly "scorecards" for solar projects. To guide the process of site and seed mix planning, Energy Action Network of Vermont has launched a Pollinator-Friendly Solar Initiative (http://eanvt.org/regulatory-reform/pollinator-friendly-solar-initiative/) and developed a Pollinator Habitat Scorecard, which has been used in New York. In early 2018, Fresh Energy, a clean energy not-for-profit in Minnesota, launched the Center for Pollinators in Clean Energy (https://fresh-energy.org/beeslovesolar/), a national clearinghouse and catalyzer of pollinator-friendly solar information, standards, best practices and state-based initiatives.

(Photo courtesy of Rob Davis, Center for Pollinators in Energy)

Avoid & Minimize New Transmission & Distribution Lines

The Hudson Valley already is impacted by numerous high-voltage transmission corridors that carry energy from upstate generators to the New York City metropolitan area. The communities and landowners affected by these lines are sensitive to proposals for new (or higher and wider) transmission infrastructure. Priority should be given to renewable energy development sites that do not require construction of new substations and major new transmission lines necessitating new rights of way.

If a proposal is made to upgrade or construct new transmission lines to bring renewable energy to market, their need must first be demonstrated. In addition, rather than opening new rights of way, existing power line, transportation, telecommunication or pipeline corridors should be utilized. In existing transmission corridors, there should be no increase in height or width of the right of way resulting from upgraded lines, where possible. In addition, developers should consider undergrounding transmission lines. However, new transmission lines proposed to be buried under watercourses or waterbodies must be designed and sited to minimize impacts on sensitive areas such as Significant Coastal Fish and Wildlife Habitats and other critical habitat. Finally, state decision-making regarding transmission needs should encourage and incentivize non-transmission solutions as an alternative to new or expanded high-voltage transmission projects.

Two large transmission line rights of way merge in the town of Milan, Dutchess County, requiring maintenance of a large open area and resulting in significant visual impacts.

Developers should avoid the use of overhead interconnection lines, which can have a significant visual impact.

Use Construction & Operation Best Practices

Developers should implement construction and operation best practices to further minimize the impacts of renewable energy projects:

Protect Soils and Minimize Construction of New Impervious Surfaces

- The permeable (allowing water to pass through) nature of the land surface under renewable energy facilities, such as ground-mounted solar projects, should be maintained through project design that minimizes disturbance to natural vegetative cover, avoids concentrated run-off and recharges precipitation into the ground.
- Ground-mounted solar panel installation design should consider soil and geological conditions (such as soil contamination, depth to bedrock, water table height, etc.) as well as the site's future intended use. Soil should not be tamped down or compacted.
- Reduce the footprint of foundations for solar arrays and minimize ground disturbance by limiting the use of concrete footings. Permanent (concrete) mountings or paved areas should not be used if the land is to be maintained for future agricultural use. To avoid long-term impacts to soils, installations should use posts inserted into the ground without concrete or set on top of the ground with floating ballasts.
- Minimize land grading and work natural land contours into project design to minimize visual and stormwater impacts. Any stripping of soils should be in accordance with accepted guidance, such as NYSDAM mitigation documents. Leave existing topsoil in place to promote vegetation and soil health after decommissioning.
- Depending on soil and geological conditions, wiring may be placed in underground trenches or in conduits on the surface. Any displacement of soil must be temporary, and all soil must be replaced once trenching is completed.
- Stormwater runoff from solar PV sites is generated when rain falls on access roads and surfaces such as the solar panels themselves and inverter pads. Rainwater runs down the panels to a dripline and can cause erosion when it falls to the ground. Developers should use techniques to minimize impacts of run-off from the panels, such as drip blocks (which prevent erosion by being placed underneath to protect the soil), gutters or other water-collection strategies. Gravel or other unpaved access roads should be used where possible, rather than new impervious road surfaces that will increase stormwater run-off. In addition, there should be no concrete or asphalt in the solar panel mounting area.
- Leave existing vegetation intact; plant native, pollinator-friendly seed mixes; or use co-location techniques. Vegetative cover should be maintained to avoid increases in impervious surfaces (such as concrete or asphalt) that prevent water from passing through the soil in normal drainage patterns and increase run-off that could affect stormwater quantity and quality. Vegetative ground cover can prevent heat radiation from the ground, reduce costs of fertilizer or herbicide applications, reduce the need for dust-suppression measures, control weed growth, and reduce erosion and the need for on-site stormwater treatment. If used, herbicides should only be applied in accordance with approved methodologies.

Minimize Noise Impacts

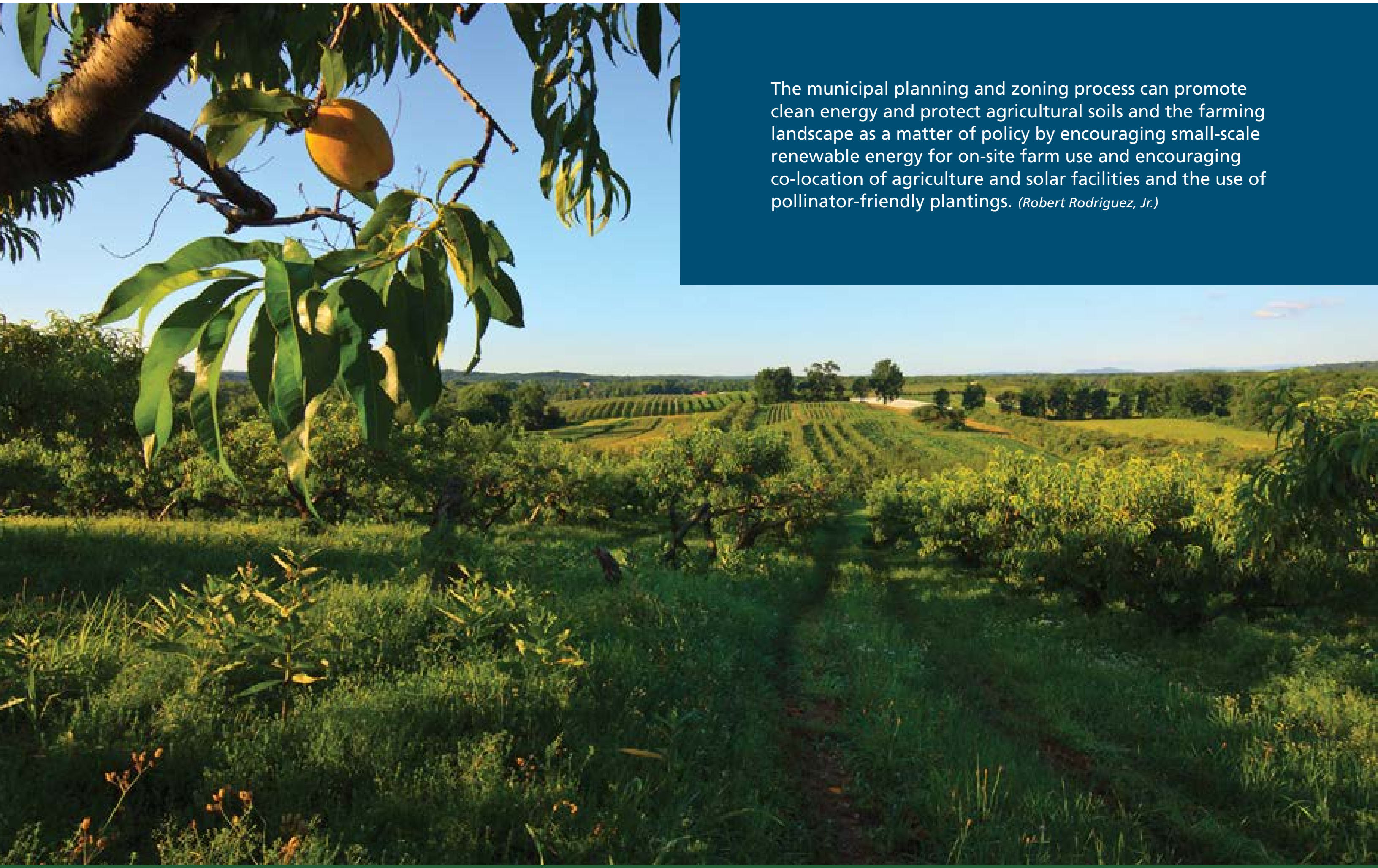
- Renewable energy projects and their supporting infrastructure should be sited and constructed to minimize noise impacts from turbines, fans or other equipment. If necessary, noise barriers can be erected between the renewable energy facility and noise-sensitive areas. These can include berms made of sloping mounds of earth, walls or fences constructed of a variety of materials, and thick plantings of trees and shrubs. In addition, projects can be sited near noise-compatible land uses or set a sufficient distance away from locations where noise would impact quality of life.

Ensure Proper Facility Maintenance and Operation

- Renewable energy projects must include plans for ensuring that the facilities are properly maintained to function as designed throughout their service life, including stormwater and erosion-control measures.

Provide Funding and Strategy for Decommissioning and Restoration

- Projects should include an appropriate strategy and financing for decommissioning and removing facilities once they have reached the end of their useful life. A decommissioning plan should include the method for removal of the system and for disposal and/or recycling of its components. The decommissioning process should include restoration measures that will return the site to its pre-project condition.



The municipal planning and zoning process can promote clean energy and protect agricultural soils and the farming landscape as a matter of policy by encouraging small-scale renewable energy for on-site farm use and encouraging co-location of agriculture and solar facilities and the use of pollinator-friendly plantings. *(Robert Rodriguez, Jr.)*

Planning & Zoning Resources

NYSERDA:
Land Use Planning for Solar Energy: Resource Guide
https://training.ny-sun.ny.gov/images/PDFs/Land_Use_Planning_for_Solar_Energy.pdf
Zoning for Solar Energy: Resource Guide
https://training.ny-sun.ny.gov/images/PDFs/Zoning_for_Solar_Energy_Resource_Guide.pdf
New York State Model Solar Energy Law Toolkit
https://training.ny-sun.ny.gov/images/PDFs/NYS_Model_Solar_Energy_LawToolkit_FINAL_final.pdf
Using Special Use Permits and Site Plan Regulations to Allow Large-Scale Solar Installations while Protecting Farmland
www.nyserda.ny.gov/SolarGuidebook

Dutchess County Planning Federation:
Zoning for Solar Energy
www.co.dutchess.ny.us/CountyGov/Departments/Planning/planonit1015.pdf
Solar is Gaining Ground
www.co.dutchess.ny.us/CountyGov/Departments/Planning/Plan-On-It-July-August-2017.pdf

Orange County Department of Planning:
Solar Farms
https://www.orangecountygov.com/DocumentCenter/View/1618

American Planning Association:
Planning and Zoning for Solar Energy
https://www.planning.org/pas/infopackets/eip30.htm

Promote Renewable Energy Development through Municipal Comprehensive Planning & Zoning

Local comprehensive plans and zoning laws should facilitate the maximum level of renewable energy facility development that is consistent with the community's resource protection goals. In the absence of a statewide renewable energy siting policy or a well-established comprehensive framework for environmental protection and land use planning for renewables development, it is extremely important for Hudson Valley municipalities and the conservation community to consider carefully how renewable energy development should be integrated into comprehensive plans and zoning codes.

Proactively addressing solar and other types of renewable energy in a municipal comprehensive plan—where the community has input and can set its own agenda for development—is vital to setting the stage for success in meeting renewable energy targets. The plan informs developers of local priorities and requires them to take the community's interests into account. This, in turn, helps to reduce the chances of site-specific conflicts. In a comprehensive plan, municipalities can set forth general siting criteria (such as the principles contained in this guide) that help developers identify preferable locations for development, and they can identify specific sites.

Any planning process should focus on assuring that accelerated renewable energy development is considered in context with other land use goals. Planning goals for renewable energy may include:

- Meeting increased demand for renewable energy while decreasing dependence on non-renewable energy sources;
- Promoting effective and efficient use of solar energy resources;
- Promoting safe development of solar energy systems that minimize impacts to adjacent land uses, properties and environments;
- Promoting the use of previously disturbed lands for renewable energy development;
- Minimizing potential aesthetic, community-character and quality-of-life impacts;
- Promoting economic development and building the tax base;
- Eliminating barriers to and incentivizing small-scale, distributed renewable energy systems, such as rooftop solar and small-scale wind and solar for on-farm use.

When amending zoning codes to address solar energy, a municipality must first develop definitions that delineate each type of system it wishes to permit. Then it must determine where such renewable energy projects may be permitted or prohibited. Because solar energy systems vary in size and shape, and thus have different levels of impact, they will require varying levels of review—i.e., through building, site plan or special use permits. In addition, the municipality must select appropriate bulk and area requirements that avoid creating barriers to renewable energy development but provide protections from potential impacts. Issues that should be addressed by zoning for solar energy include:

- Proper height and setback requirements, to help reduce visual and other potential impacts;
- Minimum or maximum lot size, to control density and meet a community's goals for total renewable energy development, based on the availability of eligible and suitable lands;
- Fencing requirements, including height and type, to reduce impacts to wildlife, promote security, and provide visual screening and noise attenuation;
- Buffer/screening requirements for visual and noise impact mitigation;
- Signage requirements and placement, for security and education;
- Undergrounding of on-site electrical interconnection and distribution lines;
- Vegetation removal/replacement and maintenance requirements, to reduce visual and other impacts of necessary infrastructure; and
- Decommissioning plan requirements, to facilitate the land's eventual return to other uses.

Municipalities also can adopt and implement requirements and incentives to accelerate solar development. For example, zoning codes can require solar-ready lot and building orientation, while solar-ready construction standards can be included in building codes. In addition, certain new developments may be required to include solar energy systems. And a municipality can provide a streamlined project review and approval process for projects that include renewable energy facilities, reducing costs and increasing certainty for developers.

Developers' Siting Considerations

Many factors go into a developer's selection of a site for renewable energy development, with economic factors playing a primary role. Developers should seek to comply with the principles in this guide when considering potential sites in order to help streamline the predevelopment and review processes and minimize environmental impacts.

Solar or wind resources: The first siting consideration is the presence of high-quality renewable resources—i.e., what is the insolation (the rate of delivery of direct solar radiation per unit of horizontal surface), or how many hours per year will wind speed be adequate to drive a wind turbine? For solar, a developer will consider a site's aspect and slope—which direction a slope faces, how steeply the land pitches. South-facing slopes with a low gradient are optimal. A wind project's energy production and life-cycle economics depend on wind strength. To be attractive for development for a utility-scale wind project, annual average wind speed should be 14.5 mph (6.5 meters per second) or stronger at a wind turbine's hub height, with wind towers commonly 200-350 feet tall. Some projects may require stronger average winds to realize economic viability. Distributed-scale wind projects, which feature smaller-scale towers and turbines of 80-200 feet, can, in general, make use of winds of only 9-13 mph (5-6 meters per second).

Grid connection potential: The grid infrastructure limits the number of sites that are feasible for renewable energy development. The availability of interconnection points and their capacity means that development will be restricted to certain locations, and at a certain density. Scarcity of places to connect with the electric grid is the most limiting factor for siting. Costs to interconnect are high, with upgrades approaching $1 million per mile. Utilities can provide a circuit map with baseline circuit and substation information to screen available circuits (as opposed to specific interconnection points). The developer must determine whether a parcel along a potentially viable circuit can host a solar array, and pay for both engineering studies and upgrade costs.

Land characteristics: Constraints presented by factors such as the environmental setting, applicable zoning, deed/gift restrictions and the presence of conservation easements must be assessed. For solar in particular, an assessment must include potential for soiling risks of the panels and the availability of water supply for any necessary washing. Developers seek sites that are relatively level and flat (to minimize grading requirements and maximize sun exposure) as well as sites open and free of woody vegetation (to minimize clearing and shading). In addition, a developer must consider whether a site is capable of being screened from public view and is marginal or sub-prime for agricultural or other uses based on location, soils, drainage, etc. The site must be able to support a project of sufficient size to offset interconnection costs. It also must be available for the life of the project—e.g., 30-plus years.

Access: Routes must be sufficient for both transportation and utilities. In addition, the necessity of acquiring a right of way or easement must be assessed.

Costs: Financial considerations include the cost of land and site preparation, as well as fees for geotechnical surveys and the approval process.

Form of land control: Developers may choose whether to purchase or lease a property.

Tax treatment of the constructed project: Under New York Real Property Tax Law § 487, there is a 15-year real property tax exemption for properties with renewable energy systems (including solar systems), which applies to the value a solar electric system adds to the property's overall value. Under the law, jurisdictions may negotiate payments in lieu of taxes (PILOTS), whereby the tax burden and rate uncertainty is reduced but some of the forgone revenue from property taxes is preserved. A jurisdiction may opt out of the exemption and tax large projects at full value. This may make smaller projects economically unviable. More info: *Understanding the Real Property Tax Law § 487* (https://training.ny-sun.ny.gov/29-resources/targeted-resources-for-municipal-officials/planning/129-nyseia-webinar-understanding-the-property-tax-exemption-for-solar-in-new-york)

Consider Landscape-Level Planning for Large-Scale Solar Energy Development in the Hudson Valley

Under New York's goal to get 50 percent of its energy supply from renewable sources by 2030, 431-630 megawatts (MW) of utility-scale solar energy capacity is predicted to be developed in the area known as Load Zone G (Hudson Valley), as delineated by the New York Independent System Operator (NYISO), the entity that controls the New York grid. Load Zone G, made up of Rockland, Orange, Putnam and Dutchess counties as well as portions of Sullivan, Ulster, Westchester, Greene, Columbia and Albany counties, contains an estimated 4,684,023 acres. Assuming that a large-scale solar facility requires from 5-10 acres per MW, this means that a high estimate of 6,300 acres of land is required for large-scale solar energy development in this area. While this is only .13 percent of the total land area, the Hudson Valley would greatly benefit from a landscape-level or regional planning exercise to identify the low-impact and low-conflict areas for solar energy development that align with the principles and recommendations contained in this guide. Such planning can help direct development to appropriate locations and maximize the chance for successfully meeting renewable energy targets.

Landscape-level or regional renewable energy planning—which involves examining an entire region to determine those areas acceptable for development (such as brownfields, closed landfills and previously disturbed areas) and those that are not (active prime farmland soils, wildlife corridors and critical habitat like wetlands)—can help stakeholders simultaneously meet the dual goals of renewable energy development and natural resources conservation. Such a plan utilizes "Smart from the Start" principles by identifying areas that should be protected, guiding development to low-conflict sites and providing mitigation strategies to offset any impacts that do occur.

The regional planning process should include opportunities for public and community input on identifying those areas posing the least conflict for development, as well as the lands, wildlife, and visual, agricultural and other resources in the Hudson Valley that warrant protection. It also should identify those areas that have high energy potential—i.e., have optimal grade and exposure for solar panels. In addition, sites that are located close to necessary interconnection and transportation infrastructure should be identified, and information provided on the availability of interconnection points and their capacity. Additional useful information includes the locations of brownfields, closed landfills and other previously disturbed sites where development should be incentivized.

(Robert Rodriguez, Jr.)

Online Resource Mapping, GIS and Other Information

A significant amount of accessible, online resource inventory mapping and digital Geographic Information System (GIS) data exists for the Hudson Valley. It can be useful in conducting landscape-level or regional renewable energy planning. The following list is merely a starting point and by no means exhaustive. Prior to relying on any data, users should ensure that it is accurate and up to date.

SOLAR RESOURCES

The **NY Solar Map** helps determine solar potential for a particular address and provides several map layers, including statewide solar radiation.
https://nysolarmap.com/

WIND RESOURCES

Wind Power and Biodiversity in New York: A Tool for Siting Assessment and Scenario Planning at the Landscape Scale was developed by scientists from The Nature Conservancy, The New York Natural Heritage Program and The Cornell Laboratory of Ornithology in collaboration with NYSERDA to help decision-makers balance environmental concerns with energy infrastructure siting.
https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/newyork/climate-energy/working-with-wind.xml

AGRICULTURAL RESOURCES

The **Web Soil Survey** provides information produced by the National Cooperative Soil Survey. Operated by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), it provides access to the world's largest and most authoritative natural resource information system. NRCS has soil maps and data available for more than 95 percent of the nation's counties; it anticipates having 100 percent in the near future.
https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

New York State Agricultural Districts
https://www.agriculture.ny.gov/ap/agservices/agricultural-districts.html#Columbia

Scenic Hudson's **Foodshed Conservation Plan** outlines a roadmap for protecting the agricultural land that supplies fresh, local food to the people of the Hudson Valley and New York City.
https://www.scenichudson.org/foodshedplan

VISUAL RESOURCES

Hudson River Scenic Areas of Statewide Significance recognize unique, highly scenic landscapes in the Hudson Valley that are accessible to the public.
https://www.dos.ny.gov/opd/programs/HudsonSASS/Hudson%20River%20Valley%20SASS.pdf

New York State Scenic Byways are transportation corridors that connect travelers with sites of scenic, recreational, cultural, natural, historic or archaeological significance within a region.
https://www.dot.ny.gov/display/programs/scenic-byways/maps

There also are a significant number of **Designated Scenic Roads** in the Hudson Valley.
https://www.dot.ny.gov/display/programs/scenic-byways/ScenicRoads-no-detailed-info

NATURAL RESOURCES

NYSDEC **Environmental Resource Mapper** features an interactive mapping application that can be used to identify some of the state's natural resources as well as environmental features that are state or federally protected, or of conservation concern.
http://www.dec.ny.gov/animals/38801.html

NYSDEC **New York Nature Explorer** offers an online tool for accessing biodiversity information about a specific neighborhood or area of interest. It is intended for landowners, land managers, citizens, municipal officials, planners, consultants, project developers, researchers, students and anyone else interested in the natural world.
https://www.dec.ny.gov/animals/57844.html

Scenic Hudson's **Hudson Valley Conservation Strategy** is a rigorous framework for landscape-scale conservation in the region that meets multiple ecological objectives. It is a tool that transforms land protection efforts by identifying the most efficient and synergistic network of properties for conserving long-term climate resilience, biodiversity and landscape connectivity across the Hudson Valley, including productive and scenic working farmland.
https://www.scenichudson.org/HVCS

New York State's 2016 **Open Space Conservation Plan** describes current open space conservation goals, actions, tools, resources and programs administered by state and federal agencies and conservation nonprofits.
http://www.dec.ny.gov/lands/98720.html

HISTORIC RESOURCES

State Historic Sites Map
https://data.ny.gov/Recreation/State-Historic-Sites-Map/axpc-mqms/data

National Register of Historic Places Interactive Map allows users to identify designated historic sites and districts by community. Note: data last updated in April 2014.
https://www.nps.gov/maps/full.html?mapId=7ad17cc9-b808-4ff8-a2f9-a99909164466

The **Hudson River Valley National Heritage Area**, designated by Congress in 1996, is one of 49 federally-recognized National Heritage Areas throughout the U.S. The website provides information on more than 100 homes, museums and other sites recognized for their historic or cultural significance.
http://www.hudsonrivervalley.com/sites

PREVIOUSLY DISTURBED SITES

The U.S. Environmental Protection Agency's **RE-Powering Mapper** is an online interactive web application that allows users to visualize EPA information about renewable energy potential on contaminated lands, landfills and mine sites.
https://www.epa.gov/re-powering/re-powering-mapper

INTERCONNECTION

Hosting Capacity Maps indicate the amount of Distributed Energy Resources that may be accommodated without adversely impacting power quality or reliability under current configurations and without requiring infrastructure upgrades.

Central Hudson
https://www.cenhud.com/dg/dg_hostingcapacity

Orange & Rockland
https://www.oru.com/en/business-partners/hosting-capacity

Con Edison
https://www.coned.com/en/business-partners/hosting-capacity

EXISTING AND PROPOSED RENEWABLE ENERGY FACILITY MAPS

Solar Electric Programs Reported by NYSERDA: Beginning 2000 provides information about solar electric (PV) projects in New York State by county, region or statewide. Available data include project counts, production, capacity and trends.
Community Solar (CDG) Solar Electric Projects (Completed and Pipeline): Beginning 2000 allows users to locate completed and in-progress Pipeline Community Solar (CDG) projects in the state.
https://data.ny.gov/Energy-Environment/Solar-Electric-Programs-Reported-by-NYSERDA-Beginn/3x8r-34rs

Mapping Clean Energy: New York features a series of interactive maps illustrating clean energy's economic impact in the state.
https://www.e2.org/mappingcleanenergyny/

GLOBAL INFORMATION SYSTEM (GIS) DATA

GIS is a computer system for capturing, storing, checking and displaying data related to positions on Earth's surface. By relating seemingly unrelated data, GIS can help individuals and organizations better understand spatial patterns and relationships.

New York State GIS Clearinghouse, operated by the state ITS GIS Program Office, disseminates information about New York's **Statewide GIS Coordination Program** and provides access to the **New York State GIS Data and Metadata Repository**.
http://gis.ny.gov/

New York OPD Geographic Information Gateway is a one stop, state-of-the-art website providing public access to data, real-time information, interactive tools and expert knowledge relevant to the Office of Planning and Development's activities throughout the state. Interactive maps enable users to easily download, visualize and explore geographic data.
http://opdgig.dos.ny.gov/#/home

Cornell University Geospatial Information Repository provides free and open access to geospatial data for New York State and worldwide. It focuses on data relevant to agriculture, ecology, natural resources and human-environment interactions.
https://cugir.library.cornell.edu/

Glossary of Terms

Capacity—The maximum capability of an energy system or component of that system to produce or move energy at or within a specific time frame. Within the context of electricity, capacity is commonly expressed in megawatts (MW), and means the maximum amount of power that can be generated at any given time. A MW is a unit of electrical power equal to 1,000 kilowatts (kW) or one million watts (W). It is generally estimated that one megawatt provides enough electricity to supply the needs of 800-1,000 homes.

Distributed energy resources (DERs)—"Behind-the-meter" power generation and storage resources typically located on an end-use customer's premises and operated for the purpose of supplying all or a portion of the customer's electric load. **Behind-the-meter** refers to energy resources that are generally not connected on the bulk or wholesale electric power system, but are connected behind a customer's retail access point (the meter). Such resources also may be capable of injecting power into the transmission and/or distribution system, or into a non-utility local network in parallel with the utility grid. DERs may include such technologies as solar photovoltaic (PV), combined heat and power (CHP), or cogeneration systems, microgrids, wind turbines, micro-turbines, back-up generators and energy storage, as well as demand management and energy efficiency. **Distributed generation** (DG), a type of DER, refers to small, behind-the-meter electric-generating facilities located near the end consumer, such as solar panels installed on residential buildings or fuel cells located in office buildings. **Community distributed generation**, also known as **shared renewables**, allows customers who cannot site solar, small wind or other DG on their property to participate directly in off-site projects through net-metering or other valuation.

Distribution—Refers to the delivery of energy through power lines that connect the transmission component to the locations of end-use consumers.

Fossil fuels—Energy sources such as coal, natural gas and petroleum that take millions of years to develop and are considered non-renewable. Burning fossil fuels results in the release of carbon dioxide and other greenhouse gases (GHGs) that trap heat in the atmosphere and contribute to climate change.

Generation—Refers to both the mechanical units and the process of producing electricity by transforming other types of energy, including fossil fuels, hydro, nuclear, wind, solar, etc. Generation is commonly expressed in kilowatt-hours (kWh), megawatt-hours (MWh) or gigawatt-hours (GWh). A MWh is equal to one megawatt (MW) of energy used continuously for one hour. A GWh is a unit of energy representing 1 billion watt-hours and is equivalent to 1 million kilowatt-hours. GWh are often used as a measure of the output of large electricity power stations.

Greenhouse gases (GHGs) — Any of various gaseous compounds (such as carbon dioxide) that absorb infrared radiation, trap heat in the atmosphere and contribute to the greenhouse effect, which warms the Earth's atmosphere. The major greenhouse gases include carbon dioxide, methane, nitrous oxide and ozone.

Land trust—A charitable organization that acquires land or conservation easements, or that stewards land or easements, to achieve one or more conservation purposes.

Large-, grid- or utility-scale renewable energy facilities—Facilities that generate a large amount of electricity that is transmitted from one location (such as a solar energy plant) to many users through the transmission grid.

Renewable energy—Energy that comes from sources that are not depleted when used, but are naturally replenished. They include wind, solar, hydro and geothermal energy.

Transmission—High-voltage, long-distance lines (the "grid") through which electrical power is transported from generation units to end-use customers.

(Photo courtesy of Rob Davis, Center for Pollinators in Energy)

SCENIC HUDSON

land ■ parks ■ advocacy

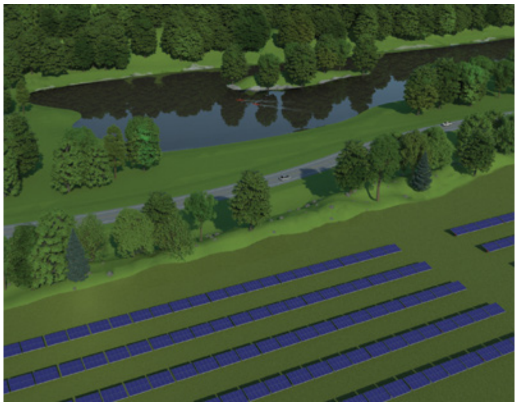
About Scenic Hudson

Scenic Hudson preserves land and farms and creates parks that connect people with the inspirational power of the Hudson River, while fighting threats to the river and natural resources that are the foundation of the Hudson Valley's prosperity. We envision the Hudson Valley as a community of informed and engaged citizens working to make the region a model of vibrant riverfront cities and towns linked by inviting parks and trails, beautiful and resilient landscapes, and productive farms.

Scenic Hudson is working to address the valley-wide challenges of climate change by strategically expanding the scope of our conservation work and helping the region adapt to and plan for inevitable climate change impacts. In addition to furthering adaptation and resilience through our land conservation, park development and community planning work, we continue to create new strategies to develop, model and spread climate mitigation policies that are consistent with our conservation values.

Scenic Hudson has protected more than 40,000 acres in the nine-county Hudson Valley region—lands of the highest scenic, ecological and agricultural significance. We have created or enhanced more than 65 parks, preserves and historic sites throughout the region, including waterfront parks in communities long denied public access to the river. Scenic Hudson also has partnered with more than 100 farm families to protect over 15,000 acres of agricultural land via conservation easements. Our 2013 Foodshed Conservation Plan offers a groundbreaking strategic blueprint for protecting sufficient farmland to meet growing needs for fresh, local food in the valley and New York City.

Most recently, Scenic Hudson has developed the Hudson Valley Conservation Strategy, which identifies a synergistic network of lands whose protection will maximize the ability of the valley's habitats to adapt to changing conditions, ensure connections and pathways so species can move across the landscape, and conserve landscape features on the region's farms. The value of intact ecosystems in combating climate change and helping both natural and human communities cope with its effects is immeasurable.



SCENIC HUDSON

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Climate change impacts already have begun to stress the Hudson Valley's ecological resources and affect the integrity of land conservation efforts:

- Many plant species have "bloom dates" 4-8 days earlier than they did in the early 1970s, and local amphibians have started their "calling" up to two weeks earlier than 100 years ago;
- Average rainfall is increasing and days with snow cover are decreasing;
- The sea level of New York Harbor has risen 15 inches since 1850; and
- The Hudson River has become warmer over the last 60 years, resulting in a decrease of certain fish species.

To reduce emissions of greenhouse gases that result in climate change, New York State has adopted an ambitious goal to increase the amount of clean, renewable energy in the state to 50 percent of the total energy produced by 2030. This guide provides strategies to promote the development of renewable energy resources in the Hudson Valley in the interest of climate change mitigation while conserving the region's irreplaceable farms, forests, wetlands and scenic views. It offers a decision-making framework to facilitate a rapid transition to a low-carbon region and model of sustainability.

Who Should Use This Guide?

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 rapidly deploying renewable energy facilities while protecting the natural and cultural resources critical for sustaining the Hudson Valley's economy and quality of life. It is meant to help reduce conflicts from the start in the interest of 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—and that the Hudson Valley has an important role to play in achieving success.