Solar Energy Development and Land Conservation

PENNSYLVANIA LAND TRUST ASSOCIATION

An enormous boost in solar energy production is one of the actions needed to stop the dramatic rise of carbon in the atmosphere and better ensure civilization's long-term prospects. This guide explores issues that conservationists may want to consider in order to both advance their land conservation work and support solar energy development.

Introduction

With the industrial revolution and its adoption of fossil fuels in the production of goods and services, humans unwittingly began changing the earth's atmospheric chemistry in a major way, every decade pumping more and more carbon into the atmosphere. Now that atmospheric carbon concentrations are at levels last seen 800,000 years ago and the consequences are becoming evident, people are recognizing that steep reductions in carbon emissions are necessary if there is to be any hope of avoiding the most calamitous changes to our climate and threats to civilization.

These steep reductions require many actions, including widespread development of renewable energy sources. Deployment of solar power installations is a key element of this expansion of renewable energy.

Conservationists may rightfully feel morally compelled to do what they reasonably can to support the development of solar energy. However, this support should not be unqualified. While solar development in general is beneficial and necessary, not every solar development concept or project proposal is good from a holistic environmental perspective, and many efforts to deploy solar could benefit from fine-tuning.

Conservationists should recognize that their work of conserving land—from preventing development to promoting sustainable use of the land—already contributes to reducing greenhouse gasses in the atmosphere and that they can achieve still greater reductions by further refining their conservation practices.

Viewed from a broad environmental perspective, conserved lands are generally the worst possible place to site solar energy facilities. However, in some circumstances, solar energy installations could be appropriate.

Using Conserved Land to Address Climate Change

Conserved lands deliver many environmental benefits to the public, and they can and do help with addressing the dire threat of global climate change. Seldom, however, will these lands be sensible locations for large solar facilities. Factors arguing against using conserved lands for solar energy development include but are not limited to the following:

- Solar facilities can be sited nearly anywhere; from a comprehensive environmental perspective, conserved land is generally the worst place to site large facilities.

- Conserved land already delivers carbon-reduction benefits (benefits that may be reversed if the land is no longer used for conservation purposes).
- Conserved land mitigates climate change problems.

Solar Facilities Can Be Sited Nearly Anywhere; Conserved Land Is Generally a Poor Choice

Solar facilities can be sited anywhere with sun and relatively stable land (and perhaps on the water in the future). They can be placed over parking lots, on rooftops, on brownfield sites, and on abandoned mine lands. Siting on these types of locations provides clear environmental benefits and next to no environmental costs. In contrast, siting large solar facilities on conserved land likely reduces or eliminates any number of the conservation benefits provided by those lands.

Granted, it can be costlier to place facilities on disturbed and degraded land than on farm and natural lands uncomplicated with other development and environmental issues. But this doesn't negate the reality that—from a reasonably broad environmental perspective—it makes better sense to house solar facilities where, in producing one environmental benefit, they do not do grave harm to a variety of other environmental benefits delivered by the land (whether or not the land is conserved). Of course, non-conserved lands are developed all the time. What makes conserved land special is that, unlike non-conserved land, we can be reasonably assured that it will continue to deliver environmental benefits year after year, decade after decade.

Complicating this analysis is the possibility that there may be, in some geographies and climates, situations where agricultural production and solar panels might be compatible and even synergistic (see "Combining Solar with Other Uses" below); far from certain is whether such situations can both maximize positive conservation outcomes and deliver cost-effective solar energy production.

Conserved Land Delivers Carbon Reductions

Conserved land contributes to reducing carbon in the atmosphere—both by preventing carbon-producing development and by sequestering more and more carbon each year in soils and plant life. With further refinements in conservation practices, conserved land can provide even greater carbon sequestration benefits.

The guide *Land Conservation's Role in Reducing Atmospheric Carbon* outlines how conserved agricultural lands, forests, and meadows sequester carbon.

Conserved Land Mitigates Climate Change Problems

Conserved land mitigates various impacts of climate change:

- **Flooding.** Climate change is causing more frequent and severe storms. Conserved forests and wetlands absorb massive amounts of stormwater, reducing destructive and life-threatening flooding.
- **Rising temperatures.** As the planet warms, conserved open spaces provide people with relief from soaring temperatures. Green spaces are cooler than developed areas, especially in cities where parks can be 5–10 degrees lower than the surrounding built environment.
- **Habitat loss.** Climate change brings habitat change, forcing many species to move to new territories or alter migratory pattern if they are to survive. Conserved land provides potential new habitat and migration routes.

Combining Solar with Other Uses

In some cases, solar energy development can coexist with other uses of the land. Though this is still an emerging topic and information is sparse, there are recent examples of:

- Creating positive synergistic outcomes with co-location of crops and elevated solar panels. (These combined food and solar energy production systems are sometimes referenced as *agrivoltaics*.) In some situations, the partial shading provided by solar panels can be beneficial for some food crops. For more information see the paper "Co-locating food and energy" in *Nature Sustainability* (2019)

and "Farms Can Harvest Energy Along with Food" in Scientific American (2019).

- Allowing animals (most commonly sheep) to graze below and around ground-mounted solar panels. The panels provide welcome shade, while the animals keep the vegetation trimmed. For more information, see "Solar Grazing: How Sheep Mow the Lawn at Community Solar Farms in Upstate NY" and *Guide to Farming Friendly Solar*.
- Planting pollinator-friendly wildflowers in the vicinity of ground-mounted solar arrays. In addition to providing habitat for bees, butterflies, and birds, wildflower meadows cost less to maintain over time than grass. In some cases, these pollinator-friendly solar farms operate as apiaries, with beekeepers placing their hives nearby. For more information, see "Solar Farms Shine a Ray of Hope on Bees and Butterflies" and a case study of the largest solar apiary in the U.S.

Is Solar Development Compatible with a Particular Place?

Land Trust–Owned Land

Renewable energy development may be compatible with some land trust–owned land, for example:

- Land with poor soils and poor wildlife habitat that wouldn't be further harmed and might well benefit by a carefully designed energy facility
- Rooftops of existing and future structures
- Parking lots

Keep in mind that simply having land appropriate for renewable development from an environmental-impact standpoint is only one factor in ultimately determining whether the land is suitable for development. Other factors include but aren't limited to the following items:

- The slope of the land and the direction the slope faces (flat and southern facing being optimal)
- The proximity of the electric grid and potential connection points (close being better)
- The minimum project size needed
- Local land development rules
- Restrictive covenants on the land or contractual obligations that may restrict the land trust's flexibility in using the land
- Other promises or commitments that the land trust may have made regarding the land

A land trust may want to review its portfolio of land holdings to determine whether portions of any properties would be potentially appropriate for renewable energy development.

Public Parks and Open Space Held by Local Government

Land that Pennsylvania local governments hold in trust for the public—in other words, land dedicated *formally or informally* by municipal or county government to park or other open space purposes—may only be used for these public purposes. Having energy developers install commercial solar facilities is most likely not an option. (A facility that strictly provides energy to the park is another matter.)

Local government properties that have not been dedicated to these public purposes, on the other hand, could present solar development opportunities.

Is Solar Development Compatible with Easements?

New Conservation Easement Projects

Is it appropriate to place under conservation easement land that presently hosts a solar facility? What if the landowners want to retain a right to install such a facility in the future? The answer to these questions should follow from the project selection criteria and prioritization process that an organization runs for any potential project. If the carbon-reducing benefits of solar power production are not accounted for in the organization's evaluation system, then an adjustment to the system could be in order.

One way to think about the question of solar facilities is by considering it in the context of other land development: Would the presence of a house, garage, swimming pool, and other residential improvements spread out across five acres cause you to reject an easement project—would the development be so damaging as to make the conservation effort not worthwhile? If no, then why would solar panels deployed across a similar acreage present a problem? If yes, then you might ask an additional question: Can a solar installation be required to be designed such that substantial conservation benefits will accrue with it that wouldn't occur with other forms of development that you would normally reject (e.g., providing wildlife habitat under the panels).

With any potential conservation easement project—involving solar development or not—it makes sense to ask, what course of action would most efficiently and effectively advance conservation in the public interest consistent with the land trust's mission?

Accommodating Solar Development with Existing Conservation Easements

Is it appropriate to allow a solar facility on land presently protected by a conservation easement if the easement's restrictive covenants prohibit such development? In a word, no. However, in some narrow circumstances, it may be appropriate to amend the easement document to permit such development. Those circumstances would involve the easement holder determining, among all its other determinations, that the change would not be contrary to the conservation objectives (e.g., protecting water quality, wildlife habitat, soils, or scenic views) of the easement or detrimental to the natural and other resources (e.g., birds and other wildlife or scenic landscape) protected by the easement. Many—perhaps most—situations won't meet such conditions, but scenarios are conceivable. For example, the solar facility would be located on severely degraded land and the development would ensure a permanent restoration or enhancement of a portion of the land to actually increase the land's productivity as wildlife habitat as compared to the land without the development.

With this said, keep in mind that there are many other factors to consider with any easement amendment proposal. As a starting point, it makes sense to review the *Guide and Model Policy for Conservation Easement Amendment* published by the Pennsylvania Land Trust Association.

Relevant Provisions in the Model Grant of Conservation Easement and Declaration of Covenants

Carbon-Related Conservation Objectives

The *Model Grant of Conservation Easement and Declaration of Covenants, 7th edition* sets forth conservation objectives—the purposes of the easement. The fifth of these objectives addresses ecosystem services and reads in part:

> to sequester carbon in plants and soil to mitigate rising atmospheric carbon levels; and to support other healthy ecosystem processes.

Renewable Energy Generation

The model provides for the possibility of renewable energy generation, the scale of the facilities and power production being largely dependent on the impervious coverage limitations set forth in the easement document for the particular conservation project.

Facilities and generation are prohibited in the Highest Protection Area, which is the designation for areas (if any) of the property to be used primarily for protecting biodiversity and natural habitat. In contrast, facilities and generation are permitted in the Standard Protection Area and Minimal Protection Area if the easement holder, without any obligation to do so, approves them. The broad discretion provided to the easement holder reflects the impossibility of fully identifying in the text the great variety of ways the evolving technologies for generating renewable energy can impact conservation values.

Beyond holder approval, the model ultimately constrains the scale of solar energy production in the Standard Protection Area through the impervious coverage limitations placed on improvements. Assume, for example, that no more than 3,000 square feet of impervious coverage is allowed in the Standard

Protection Area. A landowner could use this allowance by having:

- A barn with a 3,000 square-foot footprint with solar panels placed all over the barn's roof;
- A barn with a 1,500 square-foot footprint (with or without solar panels) and ground-mounted solar panels with another 1,500 square-foot footprint; or
- A ground-mounted solar panel array with a 3,000 square-foot footprint.

Again, subject to easement holder's approval, solar energy facilities and power generation are permitted in the Minimal Protection Area. Unlike for the Standard Protection Area, the easement document does not set impervious coverage limits in the Minimal Protection Area. The easement holder however could potentially find it necessary to make approval of facilities in the area conditional on the landowner limiting the impervious coverage.

Siting Considerations

To ensure that an easement is drafted to optimally accomplish all of the easement's conservation objectives, which (as presented in the model) might include protecting water quality, wildlife, soil, and scenic resources, it is likely best to accommodate any contemplated ground-mounted solar arrays within one or more carefully located Minimal Protection Areas rather than increasing impervious coverage limitations in the Standard Protection Area.

Customization

The provisions in the *Model Grant of Conservation Easement and Declaration of Covenants* are written to accommodate a wide variety of situations. However, users of the model are encouraged to tailor the model to the project by addressing the goals of the easement holder, needs of the landowner, and character of the land.

The latest version of this guide and related resources are posted at https://conservationtools.org/guides/182

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