Fact Sheet: Making the Case for Solar Beekeeping

CENTER *for* RURAL AFFAIRS

Written for the AgriSolar Clearinghouse by Center for Rural Affairs

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As demand for solar energy continues to grow, agrivoltaics offers an opportunity to maximize usage of land allocated for solar projects. The co-location of solar and agriculture offers opportunities for conservation, food production, increasing pollinator habitat, and adding additional farm revenue streams while producing affordable renewable energy.

Solar beekeeping is the practice of placing beehives on or near solar sites. While photovoltaic panels are generating energy from the sun, bees are busy making honey and pollinating the native and non-invasive plant species below the panels.

Beekeeping at solar sites can enhance the value of the land by keeping it in agricultural production, providing new streams of income for local farmers, and adding such environmental benefits as water filtration, reduced erosion, and enhanced soil health due to the presence of native and non-invasive vegetation.

Economics

Solar beekeeping offers financial opportunities for local beekeepers and landowners. This business model stacks benefits by using the land for multiple purposes simultaneously. Project developers benefit from the solar energy produced by the photovoltaic panels, beekeepers gain resiliency from a diverse source of pollen for honey production, nearby farmers profit from pollination services, and the landowner sees a positive impact from improved soil health.

Additionally, project developers can save money on maintenance costs by seeding the ground with native and non-invasive vegetation. Industry experts say developers can expect to spend as much as three times less on operation and maintenance costs over 20 years when compared to managing turfgrass sites.[1]

[1] Argonne National Laboratory, produced for the U.S. Department of Energy's InSPIRE Study. Obtained via personal communication with Fresh Energy, April 2020.

Bees are especially helpful to crops that are pollinator-dependent, including berries, apples, squash, and pumpkins. Pollinators produce an estimated $18 billion worth of edible crops in the U.S. annually.[2] An Argonne National Laboratory case study found that 1.1 million hectares of land are designated as proposed or potential solar sites in the country. The estimated value of pollinator habitats on land suitable for pollinator habitat is between $1.5 billion and $3.2 billion.[3]

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Furthermore, solar beekeepers see an increasing market opportunity for solar-grown honey products, from cosmetics to honey-infused drinks. Studies show that consumers want more than just a good-tasting product—they are also conscious of the environmental impact of their purchases.[4]

Environmental Benefits

Solar beekeeping can also add environmental benefits to a site. When solar panel fields are planted with native and non-invasive vegetation, the land not only generates carbon-free energy and provides pollinating services to plants and crops, but it also serves as critical habitat for bees, monarch butterflies, and other insects, birds, and animals.

Native and non-invasive vegetative ground cover can enhance soil health and reduce runoff. The deep root systems of native plant species increase soil porosity and water filtration, organic matter content, healthy soil microbes, fungi, and insects, and add nutrients back to the soil. Perennial vegetation has been shown to reduce peak stream flows by as much as 57% during flood events, building resilience in times of stress.[5]

Planning

Including solar beekeeping as a goal in the beginning stages of a project will allow developers to tailor a site plan for optimal beekeeping and honey production. They should consider various factors, such as vegetation management, panel height, and hive accessibility.

Many pollinator plants can grow several feet tall; 3 to 4 feet is widely viewed as the maximum clearance between the lowest edge of the solar panel and the ground without substantially increasing material costs and creating the need for elevation of workers for operations and maintenance.[6] A seed mix should include plants that

[2] Keel, Casey C. "The Buzz About Pollinators." U.S. Department of Agriculture, June 2022. https://www.usda.gov/media/blog/2022/06/22/buzz-about-pollinators. Accessed September 2022.

[3] "Case Study: Economics of Pollinator Habitats at Solar Facilities." Argonne National Laboratory, anl.gov/partnerships/case-study-economics-of-pollinator-habitats-at-solar-facilities. Accessed August 2022.

[4] "The global consumer: Changed for good." PwC, June 2021, pwc.com/gx/en/consumer-markets/consumer-insights-survey/2021/gcis-june-2021.pdf. Accessed August 2022

[5] Arenas, Antonio, et al. "Des Moines River Upstream Mitigation Study." Iowa Flood Center, University of Iowa, April 2020, iowafloodcenter.org/wp-content/uploads/2018/04/DesMoinesRiverStudy_v7.pdf. Accessed September 2022.

[6] Personal communications, City of Cedar Falls, Oct. 26, 2019; Kertech, LLC, Oct. 30, 2019.

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do not reach a peak height that could shade the low, tilted edge of ground-mounted solar energy systems unless developers plan to use strategic mowing or livestock grazing to avoid interfering with project efficiency. It may be possible to plant taller species in the buffer area around the perimeter of the solar field, which would provide a greater diversity of vegetation for the bees. Hive accessibility is another important factor to consider. Typically, beehives are placed just outside the fence of the solar field. Proper planning can ensure there is enough right-of-way space for the hives and for beekeepers to maneuver any necessary equipment.

Project developers should create a timeline for site vegetation establishment so beekeepers will know when they can expect the site to be ready for honey production. Introduction of beehives should be withheld until native vegetation is fully established—two to three years.[7] Project directors often hire someone to manage the vegetation; that service should be outlined in a contract between the project developer and the landowner. To meet pollinator goals, a vegetation management calendar should accommodate bloom seasons to ensure the bees have access to the diversity of species at the site.

Considerations

Developers and landowners should work together to draft a contract that outlines expectations and responsibilities before moving forward with a project. Requirements such as placing beehives outside the solar field fence perimeter may avoid insurance complications.

Beekeepers may want to consider registering their bees on Field Watch, a communication tool between beekeepers and pesticide applicators. The goal is to prevent pesticide drift near specialty crops and pollinator habitats.[8]

Solar beekeeping and seed mixes

Consulting with local experts is key when selecting a seed mix that is regionally appropriate, site-specific, and suitable for honey bees. The plant species used in both the array area and the buffer area seed mixtures should have a documented high-pollinator value, extend their pol-

[7] Personal communication, Joel Fassbinder, Highlandville Honey Farm, March 2022.

[8] "About FieldWatch." FieldWatch, fieldwatch.com. Accessed September 2022.

linator benefits over an entire growing season, and be designed to benefit intended pollinating species.[9]

An abundance and diversity of vegetation leads to a more balanced and diverse diet for bees, making the hives healthier and stronger.[10] Therefore, choosing a diverse variety of seeds will promote beekeeping goals.

Policies

Policymakers can develop zoning regulations that require, incentivize, or otherwise encourage utility- and community-scale solar projects to be seeded with native and non-invasive vegetative ground cover. These regulations can set up a project site for beekeeping, even if it is not included as a goal during original project planning. It is important that regulations not be so strict they reduce opportunities for other beneficial practices, such as grazing.

For example, Minnesota requires all ground-mounted installations to complete a solar pollinator scorecard both during the planning stage and after the establishment period of three years.[11] The scorecard is part of Minnesota's Habitat Friendly Solar Program, a result of state policy that requires verification of adherence to standards set by the Board of Water and Soil Resources. It ensures the quality of pollinator habitat at the site is reported to the Minnesota Board of Water and Soil Resources.

In 2018, Illinois lawmakers passed a bill that established the Pollinator Friendly Solar Site Act, which requires a solar project developer to meet standards outlined in a scorecard so a site can be designated as pollinator-friendly.[12]

Also that year, New York passed a bill that established a vegetation standard for ground-mounted solar arrays. Such policies are promoting numerous environmental benefits and new opportunities for beekeepers.[13]

[9] Personal communication, Pete Berthelsen, Conservation Blueprint, September 2022.
[10] Personal communication, Joel Fassbinder, Highlandville Honey Farm, March 2022.

[11] "Minnesota Habitat Friendly Solar Program." Minnesota Board of Water and Soil Resources, 2019, bwsr.state.mn.us/minnesota-habitat-friendly-solar-program. Accessed September 2022.
[12] "Solar Site Pollinator Scorecard." Illinois Department of Natural Resources, illinois.gov/dnr/conservation/pollinatorscorecard/pages/default.aspx. Accessed September 2022.
[13] "New York State Issues Guidelines to Promote Creation of Pollinator Habitats on Commercial Properties." New York State Department of Agriculture and Markets, June 22, 2020, agriculture.ny.gov/news/new-york-state-issues-guidelines-promote-creation-pollinator-habitats-commercial-properties. Accessed September 2022.

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