

Agrivoltaics at the U.S. Department of Energy

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1. Introduction

The U.S. Department of Energy Solar Energy Technologies Office (DOE) supports solar energy research, development, demonstration, and technical assistance in five areas—PV, concentrating solar-thermal power (CSP), systems integration, manufacturing and competitiveness, and soft costs—to improve the affordability, reliability, and domestic benefit of solar technologies on the electric grid in support of the Biden administration’s goals of decarbonizing the electricity sector by 2035 and decarbonizing the U.S. economy by 2050. According to SETO’s *Solar Futures Study*, solar photovoltaics could provide 1 terawatt (TW) of solar capacity to the grid by 2035 and 1.6 TW of capacity by 2050, which represents 40% of U.S. electricity supply by 2035 and 45% by 2050.[1] This level of solar generation will require the U.S. to install 30 gigawatts ac (GW_{ac}) of solar capacity each year between now and 2025 and to ramp up to 60 GW_{ac} per year from 2025-2030. Meeting the 2035 capacity number will require about 5.7 million acres, or 0.3% of the U.S. contiguous land area (see Figure 2), increasing to about 10 million acres (0.5% of U.S. contiguous land area) in 2050. While this is a small fraction of the land, solar energy deployment can conflict with other land uses, especially agriculture because the same attributes that make land appropriate for agriculture (large, sunny, flat areas) are also attractive for solar energy. By studying the combined usage of land for both solar photovoltaics and agriculture, DOE seeks to reduce land use conflicts and provide additional benefits to farmers, rural communities, and the solar industry.

In this talk, we propose to describe DOE’s funding on agrivoltaics and how it fits into the larger U.S. decarbonization strategy. We will present results from our funded research and provide an update on the growth of the agrivoltaics sector in the U.S.

2. Past and Future SETO Work on Agrivoltaics

SETO has invested in research on agrivoltaics for over 6 years. Since 2015, DOE has funded NREL’s “Innovative Solar Practices Integrated with Rural Economies and Ecosystems” (InSPIRE) project to improve the environmental compatibility and mutual benefits of solar development with agriculture and native landscapes. In addition, as part of a Fiscal Year 2020 Funding Opportunity, DOE awarded funding to four agrivoltaics projects:

- The University of Illinois Chicago is studying the economic, ecological, and performance impacts of pollinator plantings co-located at large-scale solar energy facilities (10 MWdc or larger).
- The University of Massachusetts Amherst is measuring the impact of agrivoltaics on farm productivity and economics in the state for a range of crops and solar array designs.
- Silicon Ranch is testing a novel design for a solar panel tracker and control system to accommodate pasture-based cattle grazing under the solar panels.
- The National Center for Appropriate Technology is establishing an online national resource clearinghouse and technical assistance program for farmers, solar companies, and other stakeholders interested in agrivoltaics.

In 2021, SETO funded two projects, led by national laboratories, that are relevant to understanding the opportunities and impacts that solar power generation has on agricultural communities:

- The National Renewable Energy Laboratory is integrating data on infrastructure development, climate change, and urbanization into its energy modeling tools, which will offer a better understanding of how various land uses or restrictions on solar deployment could impact the cost of decarbonizing the power sector.
- Lawrence Berkeley National Laboratory is studying community impacts and stakeholder concerns about large-scale solar projects and developing tools and resources that can help communities meet their specific needs, including using innovative siting strategies such as agrivoltaics.

Finally, SETO has also supported agrivoltaics by investing in agrivoltaics-focused technology commercialization efforts through its Small Business Innovation Research program.

In 2022, SETO announced the Foundational Agrivoltaic Research for Megawatt Scale (FARMS) opportunity, which will invest \$8 million in projects that examine how agrivoltaics can scale up to provide new economic opportunities to farmers, rural communities, and the solar industry [2]. These projects have not yet been selected, but by the time of AgriVoltaics 2023, SETO will be able to present on the new set of projects that will be performing work over the next several years.

3. Agrivoltaics Growth in the U.S.

Although a nascent practice in the U.S., the technical potential for agrivoltaics in the U.S. is quite large. While not all agricultural land and crops are likely to be suitable or desirable for agrivoltaics, U.S. agricultural land has the technical potential to provide 27 TW of solar capacity out of the total U.S. capacity of 115 TW [3]. Agrivoltaics is beginning to receive policy support at the state and local level: eight states have endorsed pollinator-friendly solar scorecards in state law, a 2021 Colorado law provided funding for agrivoltaics research, New Jersey authorized a Dual-Use Solar Energy Pilot Program of up to 200 MW of agrivoltaic projects, and Massachusetts supports agrivoltaic deployments through its Solar Massachusetts Renewable Target (SMART) program, which provides a feed-in tariff adder of \$0.06/kWh for agrivoltaic projects. Agrivoltaic researchers at the National Renewable Energy Laboratory have documented 304 agrivoltaic sites totaling 1.9GW of capacity. [4]

References

- [1] U.S. Department of Energy, “Solar Futures Study.” <https://www.energy.gov/eere/solar/solar-futures-study>
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- [4] National Renewable Energy Laboratory, “InSPIRE Agrivoltaics Map.” https://openei.org/wiki/InSPIRE/Agrivoltaics_Map