May 2018 **EB 2018-04**

Approaches to Balancing Solar Expansion and Farmland Preservation: A Comparison across Selected States

Travis Grout and Jennifer Ifft

Charles H. Dyson School of Applied Economics and Management

*The work was supported by the Cornell University Atkinson Center for a Sustainable Future Academic Venture Fund, as a part of work under a project on "New York's Renewable Energy Transition and Agricultural Sustainability: Recent Evidence and Potential Roadblocks." We appreciate feedback from David Kay.

New York plans to purchase 50% of its electricity from renewable sources by 2030, among the most aggressive targets in the nation. This "50 by 30" goal, along with regulatory changes and related incentives, led to a recent scramble to secure land and plan facilities for community solar[1] and commercial-scale solar photovoltaic (PV) generation[2]. Compared to the total area of New York, the amount of land expected to be affected is trivial. However, solar development is likely to be concentrated in areas with attractive characteristics for development. The ideal tract of land for solar development is flat, dry, unshaded, close to transmission infrastructure and customers, accessible to installers and maintenance, and in an area with high solar radiation. All of these characteristics are associated with farmland, raising the potential for conflict between farmland preservation and the transition to renewable energy. Indeed, prime farmland may be particularly attractive for solar development. Not only is prime farmland more likely to be flat, dry, and open than more marginal agricultural lands; it is also likely to be convenient to existing infrastructure[3].

The benefits of solar development will certainly be significant for some farmers. Leasing land for solar development can be more profitable, per acre, than producing almost any crop. The reliable revenue stream from successful energy leases may act as a hedge against volatile commodity prices and unpredictable production. Revenue from solar leases may also facilitate farm investments by farmers that previously did not have access to credit.

However, converting agricultural land for solar farms will not necessarily benefit all farm landowners, let alone the state's agricultural economy more broadly. Most obviously, absent colocation[4] which is currently rare, solar development removes land from agricultural production for the duration of the lease, typically decades. Depending on lease terms, landowners assume new financial and environmental risks. Farmers who rely on rented land[5] may see per-acre rental costs rise and land availability fall. Furthermore, the perception that solar expansion endangers farmland may affect how communities and various stakeholders groups respond to renewable energy development.

New York's state government has shown interest in avoiding solar development on farmland. New York has a long tradition of supporting farmland protection and a strong land trust movement. The New York State Energy Research and Development Authority (NYSERDA)

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[1] A PV facility in New York may qualify for incentives as a Community Solar project if it is no larger than 5 MW, serves at least 10 subscribers, and dedicates at least 60% of net generation to small demand-metered (less than 25kW) customers. Community Solar is intended to encourage investment in distributed generation by residents and businesses that do not own property conducive to a PV system.

[2] This brief focuses on solar facilities that produce significantly more energy than required by a residence, business or farm and are likely to require some degree of land use change.

[3] Following historic settlement patterns, the vast majority of New York's population (and associated infrastructure) is still in a relatively narrow arc of fertile soils along the coast of Lakes Erie and Ontario, in the Mohawk and Hudson River valleys, and on Long Island.

[4] Concurrent solar production and farming activities on the same land

[5] 37.5% of land in New York farms was rented in 2012.

maintains a Guidebook for Local Governments that includes a Model Solar Energy Law and guidance for managing solar expansion in agricultural districts and while protecting farmland. Most recently, the New York State Energy Research and Development Authority (NYSERDA) annual solicitation for large-scale renewable energy prioritizes projects that do not affect prime farmland or land under an agricultural assessment[6]. NYSERDA also released GIS data and a public mapping tool identifying prime farmland and prime farmland if drained. The solicitation also reflects Department of Agriculture and Markets guidelines for mitigating impacts of solar development on agricultural land. While this is an evolving area of policy for New York, currently many states have stronger policies or protections for siting of solar on farmland.

In this context, it is useful to consider several types of policies adopted by other states attempting to balance solar expansion and farmland preservation. New York may benefit from consideration of policies and programs deployed successfully elsewhere, both to lower the long-term costs of converting to clean energy and to ensure long-term public support for solar development.

Overview of solar siting policies

We examined the solar siting policies of seven states[7] that have experienced utility-scale solar development on agricultural land. This included several sources on tax treatment of farmland, incentives for farmland preservation, solar site permitting, state-level renewable energy policies, and brownfield redevelopment programs. These states were selected for their high levels of solar production or for comparability with New York. In 2017, these states represented 65% of the United States' net solar electricity generation[8].

Several policies are common across most or all of the states considered. All seven (plus New York) impose a tax penalty for converting land covered by preferential agricultural tax assessments to large-scale solar production. Five of these states also back farmland preservation programs that grant additional tax or regulatory benefits to owners of high-quality farmland in exchange for limiting those owners ability to develop their land. Three states--New Jersey, Massachusetts, and Connecticut--have zoning or approval processes for large solar development on farmland that can halt or substantially delay solar development on farmland. New York imposes a permitting process (Article 10) for solar facilities with a capacity of 25 MW or greater. In New York, a project under 25 MW is permitted at the local instead of state level. Finally, several

[6] 1.5 points on NYSERDA's 10-point project viability evaluation relate to the project's overlap with agricultural land.
[7] While we focus on state-level policies and programs, municipalities or counties may have additional zoning or policies in place. States are listed in order of solar generation capacity in 2017.
[8] Here, these states are listed in order of net electricity generated from solar in 2017: California (33.7 TWh), North Carolina (5.8 TWh), New Jersey (2.8 TWh), Massachusetts (2.6 TWh), Georgia (2.4 TWh) Minnesota (0.8 TWh), and Connecticut (0.5 TWh).

states offer preferential treatment for solar facilities built on brownfields (New Jersey, Massachusetts) or marginal farmland (California).

- **California** is, by a wide margin, the national leader in both solar production and crop sales. In particular, the Central Valley contains some of the country's most valuable farmland and one of its largest concentrations of large-scale PV facilities. A 2015 study estimated that approximately 27,000 acres of California cropland had been converted to solar development, most of it in the Central Valley[9]. As a matter of policy, the state favors solar development on "land that is not valuable habitat, open space, or farmland." The state imposes an expensive conversion penalty for converting farmland to solar, but halves the penalty if the development uses low-quality farmland.
- **North Carolina** is the country's third-biggest producer of solar power. North Carolina's state government has no direct disincentives to solar development on agricultural land, nor does it restrict state incentives for such facilities. Indeed, roughly 9000 acres of agricultural land had been converted to hold a gigawatt of PV panels by the end of 2016. Farmland used for a solar facility may keep its agricultural tax assessment if it is constructed to permit continued agricultural use.
- **New Jersey** was an early adopter of solar power and, as of 2017, still ranked fifth among U.S. states in terms of net generation. New Jersey's 2011 Energy Master Plan specifically identifies farmland preservation as a key consideration in solar siting, asserting that "New Jersey should not subsidize the loss of productive farmland." The state pursues that goal through disincentives for development on agricultural land, statewide mapping of preferred sites for solar, and positive incentives for solar facilities on preferred sites.
- **Massachusetts** imposes additional scrutiny on permit applications for utility-scale solar on productive farmland and encourages additional oversight by local governments. Like New Jersey, the state offers positive incentives for development on preferred sites.
- **Georgia**, like North Carolina, Georgia has no specific disincentives for siting utility-scale solar on farmland.
- **Minnesota** does not identify farmland as a land type to avoid for solar development. As with other states, solar development may interfere with state-backed farmland preservation programs. In addition, Minnesota's legislature established a unique set of best practices to encourage developers to establish prairie and pollinator habitat under and around solar farms.
- **Connecticut** passed a new Solar Siting Statute in 2017 in response to controversy surrounding several utility-scale solar projects on agricultural land. Both the state's Council on Environmental Quality and its agriculture commissioner identified energy development as a major cause of farmland loss in Connecticut. The Siting Statute makes development on farmland more difficult. An unusually high percentage of the state's farmland is also restricted by state-backed conservation easements.

[9] This figure includes inactive and low-quality farmland.

Agricultural assessment (current use taxation) conversion penalties

Every U.S. state allows some form of preferential taxation for agricultural land. Most of these programs (including the eight states considered here) allow qualified, willing farmland owners to pay property taxes based on its value for agricultural production rather than on its market value or its highest and best use. New York's agricultural assessment program is fairly typical. To simplify slightly, a landowner deciding to convert covered land to a nonagricultural use (typically including large-scale solar) must pay a tax penalty based on the difference between use and market value for the previous five tax years, including interest. This up-front cost is a potential barrier to investment. North Carolina, New Jersey, Minnesota, and Massachusetts are quite similar, imposing 3 (or 5 for Massachusetts) years of roll-back taxes for farmland withdrawn from their respective current use programs [10].

Georgia's and Connecticut's programs impose a penalty that declines over time based on the number of years that a parcel spends in the program. There is no penalty for leaving either program after 10 years.

California has rather more stringent requirements. California's Williamson Act provides for use value taxation of farmland in exchange for an annually-renewable 10-year easement. Cancelling a Williamson Act contract is a lengthy and expensive process involving local government review, a public comment process, and a final decision by the state Department of Conservation. If the Department approves the termination petition, the landowner must pay a penalty of 12.5% of the fair market value of the land[11].

State-backed farmland preservation programs

In addition to the programs described above, many states back farmland preservation programs offering further tax and regulatory benefits in exchange a stronger guarantee that land will stay in agricultural use.

Owners of high quality California farmland may petition for a Farmland Security Zone (FSZ) contract. FSZ land is taxed at 65% of the Williamson Act rate, in exchange for a 20-year easement.

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[10] As a practical matter, New Jersey's penalty only affects utility-scale solar facilities. Farms hosting a solar array may retain an agricultural assessment for the affected land if (1) the solar facility generates less than 2MW of power, (2) it uses no more than 10 acres, (3) at least 5 acres of land remain in agricultural use, and (4) the ratio of land used for energy to land used in agriculture does not exceed 1:5. Thus, a 6-acre farm could devote 1 acre to solar; a 60-acre farm could devote 10 acres to solar; and a 500-acre farm could devote 10 acres to solar without roll-back taxes.

[11] Local governments may determine compatible uses, but these typically do not include utility-scale solar. Compatible uses are most constrained for prime land; more compatible uses are allowed on non-prime and marginal farmland.

The penalty for cancelling an FSZ contract is 25% of the land's fair market value (plus expenses associated with petitioning for cancellation, including a public comment process).

88 of North Carolina's 100 counties administer farmland preservation programs that, to varying extents, prevent landowners from converting farmland to other uses. Voluntary Agricultural Districts (VAD) grant regulatory benefits to farmers in exchange for a 10-year conservation agreement that may be cancelled at will by the landowner; Enhanced Voluntary Agricultural Districts (EVAD) offer substantially expanded benefits in 28 counties but require an irrevocable 10-year contract. In 2017, VAD and EVAD agreements covered 9.7% and 0.6% of North Carolina's land in farms, respectively.

Much of the New Jersey's farmland is subject to development easements. The farmland preservation program is administered by the state, but easements are held by various local governments and nonprofits.

The Minnesota Agricultural Land Preservation Program, administered at the county level, grants tax and regulatory benefits to farmers in exchange for a covenant requiring that covered land stay in "exclusive agricultural use." Landowners must give eight years' notice to terminate a Farmland Preserve agreement.

Approximately 10% of Connecticut's land in farms is under perpetual conservation easements backed by the state government's Farmland Preservation Program. The state ultimately hopes to expand the program to protect 130,000 acres, triple the current total. It is unlikely that large-scale solar development would be compatible with such an easement.

Additional permitting requirements for farmland development

New Jersey, Massachusetts, and Connecticut require additional review of permit applications for solar facilities on covered farmland. This review is, in part, intended to make farmland less attractive to development relative to lower-impact sites. All solar development projects on New Jersey farmland subject to a conservation easement must be reviewed by the State Agriculture Development Committee in consultation with the holder of the easement. Similarly, Massachusetts' Agricultural Preservation Restriction (APR) Program requires the Department of Agricultural Resources to approve new solar facilities on land benefiting from current use taxation. While these restrictions fall short of an outright ban of utility-scale solar on covered lands, a 2017 survey of farmers with APR land suggests that permits are denied or too difficult to obtain to make ground-mounted solar practical, even on unproductive land or for colocated facilities.

Connecticut's Solar Siting Statute goes a step further, greatly restricting the circumstances in which large solar projects on farmland can use the expedited "declaratory ruling" process for planning permission. To qualify for a declaratory ruling, the Connecticut Siting Council must find that the project has no substantial adverse environmental effects and the state Department of

Agriculture must certify that the project will not materially affect the status of any prime farmland. If either of those conditions are not met, the project must go through a lengthy proceeding to seek a Certificate of Environmental Compatibility and Public Need from the Connecticut Siting Council, including a detailed environmental and agricultural impact assessment. These requirements make solar development on farmland (particularly prime farmland) substantially more risky, time-consuming, and expensive.

As noted above, developing California farmland covered by the Williamson Act or a FSZ contract requires the landowner to submit a termination petition. That petition must be approved by the state Department of Conservation following input from local government and the public.

Access to state incentives for solar on farmland

New Jersey's Solar Act of 2012 limited circumstances in which solar facilities on former farmland can receive Solar Renewable Energy Credits (SRECs), a vital revenue stream for most solar projects in the state.

Massachusetts' Department of Energy Resources (DOER) is circulating draft changes to state solar incentives that would affect development on farmland. The proposed regulations would withdraw tariff-based incentives for solar facilities on prime, unique, or important farmland but would specifically encourage "Agricultural Solar Tariff Generation Units" with elevated solar panels, provided that those units do not impact agricultural production[12].

Productive agricultural land is also an explicit exception to Massachusetts laws that limit local governments' ability to restrict solar development. DOER's model zoning and planning guidance for solar development encourages local governments to limit development on high-value agricultural land.

Positive incentives for development on preferred sites

State governments would obviously prefer that solar development take place on land that has few alternative productive uses. Aligned with the U.S. Department of Energy's "brightfields" initiative (and taking advantage of related federal tools and incentives), state solar policies almost always identify development on landfills, contaminated land, unused commercial or industrial sites, and so forth as preferable to greenfield development or conversion of productive agricultural, residential, or commercial land. While solar projects may qualify for tax benefits or direct subsidies under many brownfield redevelopment programs, New Jersey and Massachusetts have gone a step further by adopting solar-specific incentives for such sites. Some

[12] Agricultural Solar Tariff Generation Units would be subject to detailed project design and data reporting requirements.

states also recognize marginal farmland as a preferable location for solar development. California, in particular, has lower conversion penalties for non-prime farmland.

In 2011, California established a mechanism for solar development on non-prime agricultural land. When non-prime agricultural land is converted for solar development (subject to Department of Conservation approval), the landowner is responsible for a penalty of 6.25% of the land's fair market value, much lower than the penalty for converting more productive land. The solar lease must be at least 20 years to qualify for this rate, and the land must be restored to its original condition at the end of the lease.

New Jersey prioritizes permit approval and interconnection permission for solar projects on brownfields, landfills, and other "dual benefit" sites where solar development serves multiple policy priorities. Such sites are also exempt from limits on the size of a system that can qualify as "distributed generation."

New Jersey also published a statewide "Solar Siting Analysis" in 2012 and 2017, providing detailed maps of locations "preferred" or "not preferred" for solar development based largely on current land use, proximity to environmentally sensitive areas, and proximity to environmental hazards. Agricultural land was among the 63% of New Jersey deemed "not preferred." The Analysis is intended to make it easier for solar developers to identify promising parcels that meet the state's policy goals. This type of state-level analysis is particularly useful in New Jersey. Compared to other states, local zoning is less important for solar siting than state-level regulations. Solar development designated an "inherently beneficial use" under state law, restricting the ability of local governments to prevent solar development within their jurisdictions.

Like New Jersey, Massachusetts' state government couples these disincentives for solar siting on farmland with positive incentives for development on preferred lands, particularly contaminated lands, landfills, and other brownfields. In addition to streamlining the planning process for such projects, there is direct state support in the form of grants, loans, insurance, and tax incentives.

Minnesota tries to influence solar siting through a positive marketing incentive. In 2016, Minnesota's state legislature passed best practices for land management under and around solar farms, with a focus on prairie and pollinator habitat. While voluntary, the guidelines allow solar projects meeting these standards to advertise wildlife or pollinator benefits in their promotional materials.

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