Agricultural Solar Stakeholder Group Meeting
Thursday, July 22, 2021; 9:00 am - 12:00 pm

Meeting Registration Link:
https://mainestate.zoom.us/webinar/register/WN_v28U_L77S6ajgXxlIoVpXA

Desired Outcomes

By the end of this meeting we will have:

- Considered other states' solar siting approaches and their relevance for Maine
- Learned about the tax impacts of solar development on agricultural lands enrolled in Maine's farmland and open space current use taxation program
- Had an opportunity to discuss the range of technical materials provided in advance
- Brainstormed priority deliverables
- Provided an opportunity for public input

Agenda

What	When
Welcome and Agenda Review – Jo D.	9:00 - 9:05
Vermont Ag Solar Policy - Genevieve Byrne, Vermont Law School Farm and Energy Initiative	9:05 - 9:30
NJ Ag Solar Policy - Ethan Winter, American Farmland Trust	9:30 - 9:55
Tax Implications of Solar Development on Ag. Land in Current Use - Peter Lacy, Director, Property Tax Division, Maine Revenue Services	9:55 - 10:25
Break	10:25 - 10:35
Discussion of Technical Materials, and Identification of Possible Group Deliverables	10:35 - 11:45

Public Comment	11:45 - 11:50
Follow-up and Next Meeting: **Tuesday**, August 24, 9:00 am – 12:00 pm	11:50 - 12:00

Note: Agenda item times are subject to change based on the progress of the group.

Agricultural Solar Stakeholder Group Ground Rules

1. Meetings start and end on time.
2. Come prepared, having read all meeting materials in advance.
3. Be present and engaged.
4. Strive for equal air time, enabling everyone to participate fully.
5. Listen with curiosity and an openness to learning and understanding.
6. Adopt a creative problem solving orientation.
7. Commit to working toward consensus.
8. Meetings and materials are public, and comments are on the record.
9. Humor is welcome; it's OK to laugh while addressing a serious topic.

Decision-making: Decisions by the Stakeholder Group are advisory and represent recommendations to the Department of Agriculture, Conservation & Forestry and the Governor's Energy Office. The Stakeholder Group will strive to make decisions by consensus. Where not possible, recommendations supported by the majority will be advanced and other perspectives will be noted.

Meeting Schedule:

Th. 7/22	https://mainestate.zoom.us/webinar/register/WN_v28U_L77S6ajgXxlIo-VpXA
Tue. 8/24	https://mainestate.zoom.us/webinar/register/WN_2KiIelblQB6G6r-Sn8_RgJw
Th. 9/23	https://mainestate.zoom.us/webinar/register/WN_qsFHsHkgQ3yDXie-L1M5Tng
Th. 10/21	https://mainestate.zoom.us/webinar/register/WN_Sj7iq73NSx2NRrGNc-YPFqQ
Th. 11/18	https://mainestate.zoom.us/webinar/register/WN_MCVJo2bzRO2tj-Hvr0pqrhg
Th. 12/16	https://mainestate.zoom.us/webinar/register/WN_5I5XIFfPTZuzYx-PZGGraYA

APPROVED
JUNE 8, 2021
BY GOVERNOR

CHAPTER
26
RESOLVES

STATE OF MAINE

IN THE YEAR OF OUR LORD

TWO THOUSAND TWENTY-ONE

S.P. 206 - L.D. 820

Resolve, To Convene a Working Group To Develop Plans To Protect Maine's Agricultural Lands When Siting Solar Arrays

Sec. 1. Department of Agriculture, Conservation and Forestry to convene working group. Resolved: That the Department of Agriculture, Conservation and Forestry shall convene a working group of stakeholders to develop plans and consider ways to discourage the use of land of higher agricultural value and encourage the use of more marginal agricultural lands when siting a solar array. The department shall submit its report and recommendations, including any suggested legislation, to the Joint Standing Committee on Agriculture, Conservation and Forestry; the Joint Standing Committee on Energy, Utilities and Technology; and the Joint Standing Committee on Environment and Natural Resources no later than January 14, 2022.

obtain, a stormwater permit. These types of requirements become expected embedded costs for developers.

During a project's review, a developer and agricultural landowner can be caught between competing state policies. Many farmers view wet fields as marginal at best, but they continue to keep those wet fields in agricultural use – because under state wetland rules, if those wet fields are not in active farming, it seems that they will become regulated wetlands. The Wetland Rules do contain certain agricultural use exceptions, and developers have worked with ANR and landowners to ensure that land stays in agricultural use to preserve that exemption.

Sometimes, however, projects on agricultural properties run up against Vermont policies without any statutory exemptions. As explained in the University of Vermont's 2017 "Guide to Farming Friendly Solar", to be eligible for the Vermont current use land valuation program, a solar array must be owned or leased by the farmer, with half or more of the electricity used on the farm. Otherwise, the landowner must unenroll the land from the current use program and pay the change in use tax.[13] The economic margins for farming operations are traditionally razor-thin. Most farmers, particularly small family farmers, do not have access to the capital required to build solar arrays as a farm "improvement" that would allow them to retain the current use status of the land.

There is a growing number of solar projects that do provide specific agricultural benefits, however. More and more solar projects, including a number of Green Lantern's projects, are planting pollinator species between the rows of panels, or allowing sheep to be grazed among solar panels. Appropriate state policy could encourage and recognize both uses or allow "dual-use" sites to be given "preferred site" status under the net metering rules.

Development of solar projects on marginal land can help preserve larger agricultural parcels, and revenue from a solar lease may mean the difference between an older generation farmer keeping their property or splitting it off and selling it for residential or other uses. As the number of small Vermont farms dwindles, the State has an opportunity to find better ways to merge the policies of encouraging renewable energy and protecting farming and farmland for future Vermonters by leveraging the creativity and capital that solar project developers can bring to the state.

Policies for multi-functional solar in Vermont

Genevieve Byrne, Staff Attorney and Assistant Professor, Farm and Energy Initiative, Vermont Law School

Vermont's multi-functional solar policies are not found in any individual law or regulation. Rather, the state has eased regulatory requirements or established incentives for certain kinds of multi-functional solar within existing state programs. Within its solar development laws, Vermont defines and promotes specific multi-functional designs, including roof-mounted arrays, those sited on a list of "preferred" locations, and arrays designed to support agricultural land uses.

Vermont has streamlined the regulatory oversight of all solar arrays in the state by delegating nearly all siting, permitting and array approval decisions to

[13] The Department of Taxes technical bulletin " Solar Generating Facilities Constructed on Land Enrolled in the Current Use Program" of 2015 explains how to interpret the law. https://tax.vermont.gov/sites/tax/files/documents/TB69.pdf

the state Public Utility Commission (PUC).[14] The permitting and approval process itself can be expensive and time-consuming, and often requires legal assistance and expertise. Easing project permitting requirements for preferred or low-impact solar arrays can help incentivize projects of a preferred type, including multi-functional solar. In Vermont, all solar projects are required to obtain a Certificate of Public Good (CPG) from the Vermont PUC.[15] However, the review requirements and criteria for approval differ based on proposed project capacity, with increased oversight of larger-scale projects, and eased requirements for small-scale and roof-mounted projects.[16]

While Vermont does not currently ease permitting costs or requirements for multi-functional solar beyond roof-mounted arrays, the centralized permitting authority of the PUC and its familiarity with applying different review criteria to different types of solar arrays may offer opportunities to create a specialized approval process for arrays of this type in the future.

Vermont incentivizes multi-functional solar beyond roof-mounted arrays within its net-metering[17] program by offering additional compensation (or relief from reduced compensation) to projects located on "preferred sites."[18] In 2017, the PUC added two compensation rate modifiers that increase or decrease the compensation rate offered to new net-metered customers for excess solar energy contributed to the grid: the "REC adjustor" [19] and the "siting adjustor."[20] The siting adjustor opened the door for more diverse multi-functional solar arrays by creating an incentive for net-metering systems to be installed on "preferred sites," including previously disturbed terrain, rooftops, landfills, and parking lot canopies, among others.[21] The "overall purpose of the adjustors is to

[14] 24 V.S.A. § 4413(b) (2016); 30 V.S.A. §§ 224 (2017) and 248 (2019).

[15] 30 V.S.A. § 248 (2019). In most other states, solar siting and interconnection approvals are issued by a variety of different state agencies and local planning and zoning boards. Vermont is unique in requiring all solar arrays be permitted solely by the PUC.

[16] *30 V.S.A. § 248 (2019); Projects 15-50 kW in capacity participate in an "application" process, in which they need to submit evidence of compliance with a limited set of criteria to obtain a CPG. Projects above 50 kW must submit a full "petition" to the PUC and submit evidence of compliance with all of the criteria found in 30 V.S.A. § 248. These projects are also subject to decommissioning requirements not applied to smaller projects. VT PUC Rule 5.901 (2017).*

[17] Net-metering "means measuring the difference between the electricity supplied to a customer and the electricity fed back by the customer's net-metering system during the customer's billing period." 30 V.S.A. § 8002(15) (2019). Vermont has steadily increased the overall capacity of the net metering program and expanded customer eligibility since enactment of its first net-metering law in 1998. Vermont Public Utility Commission, *Order in Re: Biennial Update of the Net-Metering Program*, November 12, 2020, 4-5 (hereinafter, "2020 Biennial Report").

[18] VT PUC Rule 5.103 and 5.127 (2017).

[19] "RECs" refer to "renewable energy credits," which represent the environmental attributes of solar energy and are used by Vermont utilities to show compliance with state Renewable Portfolio Standard goals. The REC adjustor encourages customers to transfer their RECs to the interconnecting utility to be used for utility compliance with these goals. The original 2017 REC adjustor provided an additional $0.03/kWh to customers transferring their RECs to the utility and reduced compensation by -$0.03/kWh for customers electing to keep their RECs. VT PUC Rule 5.127(B)(1)-(3) (2017). When customers transfer RECs, they lose the ability to make claims about "going solar" or "using solar energy" at their home.

[20] VT PUC Rule 5.127(C)(1)-(2) (2017).

[21] VT PUC Rule 5.103. Preferred sites include: (1) new or existing structures; (2) a parking lot canopy over a paved parking lot, provided that the location remains in use as a parking lot; (3) certain previously developed land; (4) brownfields (5) suitable landfills; (6) the disturbed portion of a lawful gravel pit, quarry, or similar site; (7) locations designated in a duly adopted municipal plan; (8) suitable CERCLA sites; and (9) the same parcel as, or an adjacent parcel to, a customer using at least 50% of the system output.

encourage the beneficial siting of net-metering systems and to provide a mechanism for the Commission to better tailor net-metering compensation to reflect the cost of technology."[22] However, the PUC significantly reduced these incentives in its most recent order setting compensation rates for the net-metering program, reducing overall compensation for multi-functional and other preferred projects.

The PUC's net-metering rules define four categories for proposed solar arrays, each of which receives a different per-kilowatt-hour rate modification through the siting adjustor, which is "intended to reflect whether the project is on a preferred site and the lower cost of development enjoyed by larger projects due to economies of scale."[23] Category I net-metering systems are residential systems with capacities of 15 kW or less, regardless of where they are sited.[24] Category II systems include medium-scale arrays (>15 kW to 150 kW) located on the list of preferred sites. Category III includes larger arrays (>150 kW to 500 kW) located on preferred sites, and Category IV includes medium-scale arrays (>15 kW to 150 kW) that are *not* located on preferred sites.

Under the original siting adjustor values set in 2017, Categories I and II were each eligible to receive an additional $0.01/kWh,[25] Category III systems received a rate decrease of -$0.01/kWh and Category IV systems received a rate decrease of -$0.03/kWh.[26] While projects are eligible for positive rate adjustments for ten years, negative rate adjustments last for the lifetime of the solar array. In 2018, the PUC "decided to gradually scale back net-metering compensation," and reduced the siting adjustor for Category III systems by one cent.[27] In November 2020, the PUC again reduced the siting adjustors for all categories of net-metering systems by one cent beginning in February 2021 and by an additional one cent beginning in September 2021.[28] The PUC found that the "siting adjustors are accomplishing the goal of steering development to better locations," and that the reduced compensation would "help better align the cost of net-metering and the value that new net-metering systems provide, while narrowing the gap between the cost of net-metering and the cost of other sources of in-state distributed renewable energy." [29] It also noted that the overall cost of installing solar energy has significantly decreased.

While Vermont has reduced its financial incentives for multifunctional solar in the net-metering program, with increased advocacy and political will, new or increased incentives could be established either by legislative action or through the PUC's next biennial review of the net-metering program, scheduled to occur in 2022. Additionally, the state could encourage multi-functional solar in larger-scale projects by creating incentives for such projects within its "Standard Offer" program, which provides long-term contracts to eligible projects up to 2.2 MW in capacity.[30]

Vermont's solar policies include relatively strong support for multi-functional solar arrays designed to support agricultural land uses. First, Vermont's Land Use Value Appraisal Program[31] (also referred to as the "current use" program) offers opportunities for developing solar arrays on enrolled farmland without triggering tax penalties otherwise applied to non-agricultural "development" on enrolled

[22] 2020 Biennial Report, 14.
[23] *Id.*
[24] VT PUC Rule 5.103
[25] The siting adjustor and REC adjustor rate modifications are applied to the "blended base rate" established by the PUC.
[26] VT PUC Rule 5.127(C)(1)-(2) (2017).
[27] The REC adjustor was also reduced by one cent in 2018 and another one cent in 2019. 2020 Biennial Report, 11.
[28] 2020 Biennial Report, 40.
[29] *Id.*
[30] 30 V.S.A. §8005a (2019).
[31] 32 V.S.A. §§ 3752, 3755, 3757, 3802, and 8701 (2019).

land.[32] In Vermont, any solar array that is less than 50 kW in capacity and either net-metered or not connected to the electrical grid may be located on enrolled land without triggering tax penalties. Larger solar arrays are also permissible, so long as they qualify as a "farm improvement."[33] Solar arrays are generally considered to be a permissible "farm improvement" when fifty percent or more of the electricity generated from the solar array is consumed on-site by enrolled farm buildings. These rules promote the siting of solar next to active agricultural uses and help support farm viability by reducing electric bills.

Vermont further supports multi-functional solar and agriculture through its voluntary certification program for "pollinator friendly" solar arrays. Developers may submit a Solar Site Pollinator Habitat Scorecard identifying project details including vegetative cover, blooming and perennial species, pollinator nesting habitat, buffers, and pesticide use. Projects achieving certain criteria are certified as "pollinator friendly" or "excellent habitat," with certification lasting three years.[34]

Priorities for future research

Jason Mazurowski, Gund Institute for Environment

Over the past decade, rapid proliferation of solar development on agricultural land has led to unprecedented overlap in food and energy production nationwide. In response, solar developers, landowners, farmers, graziers, and scientists have been working to integrate novel technologies and practices into traditionally agricultural landscapes. As policymakers and developers work toward the mainstream adoption of these practices, researchers and site managers continue to address questions surrounding cost, feasibility, and best practices to ground truth the myriad benefits of multifunctional solar.

The Department of Energy's National Renewable Energy Lab (NREL) has emerged as a clear leader in the field of agrivoltaics through its Innovative Site Preparation and Impact Reductions on the Environment (InSPIRE) project. Their team — working at 25 sites across the country — has explored everything from soil health and crop yield, to optimum panel height and spacing across a wide range of emerging practices. Yale's school of Forestry and Environmental Studies has also focused on the economic and social ramifications of pollinator-friendly solar in the Midwest with an analysis published in 2019 highlighting private economic benefits of the practice. Meanwhile, a joint effort between UVM's Gund Institute and Audubon Vermont seeks to explore the role of pollinator-friendly solar in reversing habitat loss and biodiversity decline throughout the region.

While the growing body of research has thus far supported the ecological and economic benefits of multifunctional solar, there is still much to learn. How will the landscape respond over the lifetime of the panels? What are the long-term effects on soil health, water quality, and microclimate at each site? Would benefits from multiple practices

[32] The Land Use Value Appraisal Program is a beneficial taxation programs in which farmland is assessed and taxed at its agricultural value instead of its market value while meeting program criteria. Solar development may jeopardize enrollment in the program and subject landowners to tax penalties if not designed in compliance with current use program rules.

[33] A solar array qualifies as a farm improvement when it is actively used by a "farmer," as part of a "farming operation," is owned by a farmer or leased to a farmer for at least 3 years, and is located on enrolled land or an adjoining house site. Vermont Department of Taxes, Technical Bulletin 69, *Solar Generating Facilities Constructed on Land Enrolled in the Current Use Program*, July 13, 2015.

[34] 6 V.S.A. §§ 5101-5102 (2017).

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Senate Approves Legislation to Expand Solar Energy Throughout NJ

Courtesy Sen. Kip Bateman

By ROBERT KENNEY

Published June 30, 2021 at 2:37 PM
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TRENTON, NJ - In an effort to expand the use of renewable energy across New Jersey, the Senate has approved two bills sponsored by Senator Kip Bateman and Senator Bob Smith which would increase the capacity for solar energy development throughout the state.

“Solar energy will play an increasingly crucial role in the state’s transition to renewable power and away from fossil fuels and the resultant problems and pollutants,” said Bateman (R-Somerset/Hunterdon/Middlesex/Mercer. “These programs will contribute a dramatic increase in renewable energy production as New Jersey establishes the standard for solar and sustainable power in the nation. Today’s action delivers an emphatic message that the Garden State is fully committed to clean, renewable and reliable power from the sun.”

The first bill, S-2605, would establish the successor program to the Solar Renewable Energy Certificate (SREC) program, which would be known as the 'SREC-II' program, within the Board of Public Utilities (BPU). The program would distribute solar renewable certificates to solar power facilities that qualify and include a competitive solicitation process for certain large-scale solar power facilities.

"By 2050, we as a state have big goals to achieve in order to become a carbon-neutral state," said Smith (D-Middlesex/Somerset). "It is imperative that we take steps to greatly expand our use of clean energy power sources. The use of both utility-scale solar energy and dual-use solar energy projects will keep us on track for our long-term goals, ensuring the successful transition to renewable energy sources."

The second bill, S-3484, would direct the BPU and the Department of Agriculture to establish a "Dual-Use Solar Energy Pilot Program" to permit the construction, installation, and operation of dual-use solar energy projects on unpreserved farmland, while maintaining the affected land in active agricultural or horticultural use. Under the program, owners would be able to construct a dual-use solar energy project that produces a maximum of 10 megawatts of electricity on their land while continuing to receive farmland assessment.

Under the bill, a dual-use solar energy project would be defined as energy generation facilities, structures, and equipment for the production of electric power from solar photovoltaic panels located on unpreserved farmland in agricultural or horticultural production that ensures the continued simultaneous use of the land below and adjacent to the panels for agricultural or horticultural production. Energy generated from dual-use projects would not be considered an agricultural or horticultural product, and any income from the power sold from the project would not be considered income for the purposes of eligibility for farmland assessment.

In order to be eligible for the pilot program, landowners proposing a dual-use solar energy project must apply to the BPU. The pilot program would last for a duration of three years and authorize up to 200 megawatts of power from dual-use solar facilities. After the three years, the BPU would be authorized to extend the program for a maximum of two additional 12-month periods and increase the overall power limit of the program by 50 megawatts for each extension. Upon expiration of the pilot program, the BPU would be required to adopt rules converting the pilot program into a permanent program as part of the BPU's successor solar incentive program.

According to the 2019 Energy Master Plan, New Jersey's goal is to secure 50 percent of the state's electricity supply from renewable energy by 2030 and 100 percent by 2050, while also being the most cost-effective for consumers. Both bills would help put the state on track to achieve this goal.
The bills were released from the Senate by votes of 25-11 and 36-0, respectively, and sent to the Governor for final approval.

MAINE REVENUE SERVICES
PROPERTY TAX DIVISION
PROPERTY TAX BULLETIN NO. 20

FARMLAND TAX LAW

REFERENCE: 36 M.R.S. §§ 1101 - 1121
April 9, 2020; replaces June 1, 2017 revision

1. General

The Farm and Open Space Tax Law was adopted in 1971 to encourage the preservation of farmland and open space land and to protect farmland and open space land from competing, higher-valued uses. This bulletin addresses only those portions of the law that are applicable to farmland, referred to throughout this bulletin as the "farmland program." For information on the open space program, see Bulletin No. 21 – Open Space Tax Law.

The farmland program provides for the valuation of farmland based on its current use as farmland, rather than based on its fair market value for other potential uses. This reduced land value results in lower property tax bills for owners of farmland. Lower taxes are designed to act as an incentive to preserve Maine's farming community.

2. Definitions

A. Agricultural products. "Agricultural products," as defined in 7 M.R.S. § 152(2), means those plants and animals and their products that are useful to humans and includes, but is not limited to, forages and sod crops, grains and feed crops, dairy and dairy products, poultry and poultry products, bees and bees' products, livestock and livestock products, manure and compost and fruits, berries, vegetables, flowers, seeds, grasses and other similar products, or any other plant, animal or plant or animal products that supply humans with food, feed, fiber or fur. "Agricultural products" does not include trees grown and harvested for forest products.

B. Assessor. "Assessor" means a sworn municipal assessing authority, whether an individual assessor, a board of assessors, or a chief assessor of a primary assessing area. However, "Assessor" means the State Tax Assessor with respect to the unorganized territory.

C. Certified ratio. "Certified ratio" means the level of municipal assessed value, expressed as a percentage, relative to full market value as certified by the assessor pursuant to 36 M.R.S. § 383.

D. Farming. For purposes of this bulletin, "farming" means agricultural or horticultural activities. Horticultural activity means the production of vegetables, tree fruits, small fruits, flowers, and woody or herbaceous plants.

E. Municipality. "Municipality" means any city, town, plantation, or any location in the unorganized territory.

3. Valuation

The assessor for each municipality with land in the farmland program must establish the 100% value per acre for each category of farmland in that municipality, based on the current use of that land for farming purposes. See Appendix A—Guidelines for Agricultural Valuation at the end of this bulletin for descriptions of the different categories of farmland. The established values should be based on considerations such as farmland rentals, farmer-to-farmer sales, soil types and quality, commodity values, topography, and state-developed guidelines for agricultural valuation. These values should not reflect potential uses of the land, other than farming uses. In addition, the values should not reflect either road or shore frontage. The 100% values are then adjusted by the municipality's certified ratio. See Appendix A—Guidelines for Agricultural Valuation at the end of this bulletin for additional information on valuation.

The assessor must record both the value of farmland established under the farmland program and the value at which the farmland would have been assessed had it not been classified as farmland. Values must be recorded in the office of the municipality in which the farmland is located. 36 M.R.S. § 1109(1).

4. Classification

A. Minimum size. A tract of farmland must contain at least five contiguous acres. If a tract is divided by water at the normal high-water mark or high tide, that tract is not contiguous. While a landowner must have a tract containing five contiguous acres, not all five acres must be farmed. For example, if a person owns a five-acre lot and crops are grown on one acre, with the remaining four acres used for purposes other than farming, the five-acre lot meets the minimum size requirement. If all other qualifications are met, the landowner may enroll the land in the farmland program, but only the one acre devoted to farming is subject to the lower farmland valuation. The remaining lot must be assessed according to fair market value.

B. Use. A tract of farmland must be used for farming activities; however, the tract may also include woodland and wasteland. See Appendix A—Guidelines for Agricultural Valuation at the end of this bulletin for additional information on qualifying uses.

C. Income requirement. A tract of farmland must generate gross income of at least $2,000 per year from the sale of agricultural products in one of the two, or three of the five, calendar years preceding the date of application for classification. To determine whether a landowner meets the income threshold, look at the two previous calendar years. If the landowner earned at least $2,000 from farming in one of those years, the land will qualify as farmland. If a landowner didn't earn at least $2,000 in either of the two previous years, the landowner must have earned at least $2,000 in each of the third, fourth, and fifth previous years. Gross income is generally reported on Schedule F of the federal income tax return, Form 1040. Gross income from the sale of agricultural products includes the value of commodities produced for consumption by the farm household.

D. Income report. Once qualified, an owner of farmland must file with the assessor by April 1 of each fifth year after qualification a statement of the gross income derived by either the owner or lessee in each of the previous five years from acreage classified as farmland. If a farmland owner fails to

file this report, the owner will be liable for the taxes that should have been paid, the recapture penalty in 36 M.R.S. § 1112 (see section 7(C) below), plus an additional 25% penalty.

E. Provisional Classification. The owner of farmland that meets all the requirements under this section, except the income requirement, may apply for a two-year provisional classification as farmland. The land must be provisionally classified and subject to the provisions of Farm and Open Space Tax Law. If the land does not qualify at the end of the two-year period, the penalty described in section 7(C) will be assessed for the two preceding tax years.

5. General Provisions

A. Filing. Owners must file an application with the assessor of the municipality where the property is located by April 1 of the year in which classification is first requested. Annual filing is not necessary; however, an assessor may request the filing of a new application at any time. The application must be accompanied by a map or sketch showing the different land classifications, including any non-farmland, within the tract.

B. Determination. The assessor must determine whether the land is subject to classification as farmland, identify the land based on the categories listed in the Guidelines for Agricultural Valuation at the end of this bulletin, and notify the owner of the decision by June 1 of the year of application. If the application is denied, the assessor must state the reasons for the denial in the decision notification to the applicant and provide the landowner an opportunity to meet the requirements for approval.

C. Reclassification. Landowners are required to give the assessor notice of any change of use or change of classification of farmland by the end of the tax year in which the change occurs. If a landowner does not give notice of a change of use or classification, the assessor must reclassify the tract and impose a recapture penalty if the facts justify a change in classification or use.

D. Tax rate. Classified farmland shall be subject to the same property tax rate applicable to other property in the municipality.

E. Valuation of areas other than farmland:

(1) Woodland. The valuation for farm woodland within a classified tract must be based on the valuation under the Tree Growth Tax Law.

(2) Other Areas. Areas in a classified tract other than farmland must be assessed on the basis of fair market value.

F. Farm structures. Building components of a farm, such as animal shelters, are normally considered part of the farm and the structures should be valued in the same way as other similar structures in the municipality. While not specifically addressed in the law, when accessory structures such as animal shelters are built on classified farmland, that land may remain in the farmland program.

6. Abatement and Appeal

A. Abatement request. Farmland assessments are subject to the abatement procedures provided by 36

M.R.S. § 841. If the owner of land classified as farmland believes the land is overvalued, the landowner may request an abatement. The landowner must submit an abatement request in writing to the municipal assessor within 185 days from the date of commitment. The assessor has 60 days to respond to an abatement request.

B. State Board of Property Tax Review. If an assessor denies a landowner's abatement request, the landowner may appeal that decision to the State Board of Property Tax Review within 60 days of the assessor's denial. The State Board of Property Tax Review must issue a decision within 60 days of the appeal.

C. Superior Court. Either party (the landowner or the municipality) that is dissatisfied with a decision of the State Board of Property Tax Review may appeal that decision to Superior Court in the county where the property is located. The appeal must be made within 30 days of the State Board of Property Tax Review decision.

For a more thorough explanation of the abatement and appeal process, see Bulletin No. 10 – Property Tax Abatement and Appeals Procedures.

7. Withdrawal, Transfer, and Penalty

A. Withdrawal. A landowner may withdraw land from the farmland program at any time. A recapture penalty, however, will be assessed on the withdrawal. If the assessor determines property no longer qualifies for the program the assessor must withdraw the property from the program.

B. Transfer. An alternative to withdrawal from the farmland program is available. If the land qualifies for another current use program (tree growth, open space), the landowner may transfer the land into that program without incurring a penalty. For information on other current use programs, see Bulletin No. 19 – Maine Tree Growth Tax Law and Bulletin No. 21 – Open Space Tax Law.

C. Recapture Penalty. The penalty for withdrawal from the farmland program is equal to the taxes that would have been due for the previous five years if the property was not in the program, less the taxes that were paid on the property during that period. Interest is also added to the penalty, based on the applicable interest rate for each year. If the land has been in the program less than five years, the penalty is based on the number of years the property has been in the program. If the property has been in the program for at least five years, the landowner may pay the penalty in five equal annual installments.

8. Valuation Guidelines and Program Promotion

The Department of Agriculture, Conservation and Forestry, working with Maine Revenue Services, representatives of municipal assessors and farmers, must prepare valuation guidelines to assist local assessors in the valuation of farmland. The suggested guidelines include values for cropland, orchard land, pastureland, and horticultural land. The values recommended are designed to enlighten Maine citizens to the existence of the Farm and Open Space Tax Law as well as providing regional information to local farm organizations and municipal tax assessors.

For more information, see the Department of Agriculture, Conservation and Forestry website at: www.maine.gov/dacf/ard/farmland_protection/farmland_tax_law.shtml.

NOTE: This bulletin is intended solely as advice to assist persons in determining, exercising or complying with their legal rights, duties or privileges. If further information is needed, contact the Property Tax Division of Maine Revenue Services.

MAINE REVENUE SERVICES
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APPENDIX A:
GUIDELINES FOR AGRICULTURAL VALUATION

The following guidelines were derived by the Department of Agriculture, Conservation and Forestry and Maine Revenue Services after review of commentary from the assessing and agricultural communities.

The categories listed vary somewhat relative to language found in the law; our attempt to reconcile that language with typical Maine farming practices follows.

Upon consideration of the various adjustment factors relative to regional or statewide averages, an assessor may elect to develop local values. However, the assessor must document and substantiate any variation in assessment of farmland from the recommended values.

Cropland. Land used for field grown crops such as a typical Maine potato farm. This would include usual crops grown in rotation with potatoes - corn for grain, small grains, legumes, broccoli, etc.

Orchard Land. Land devoted to the growth and cultivation of trees bearing edible fruit. There should be a minimum stocking density equivalent to 60 trees per acre.

Pastureland. Land devoted to the production of forage plants consumed by animals. This includes grazing land, hay, ensilage, corn for ensilage and any other crops grown for forage.

Horticultural Land (edible). Land used for intensive vegetable and small fruit production, market gardening, strawberries, raspberries, high-bush blueberries, etc.

Horticultural Land (ornamental). Land used for production of planted and cultivated Christmas trees, flowers, sod, shrubs, trees and general nursery stock. Excluded from this category are trees harvested for forest products.

Blueberry Land. Land devoted to production of wild low-bush blueberries.

ADJUSTMENT FACTORS

Adjustments to the recommended values may be based on soil type, conservation measures, convenience and proximity to the farmstead, field size and shape, slopes, drainage, aeration, accessibility to and choice of markets, rocks, climate, commodity yield and price.

Proposed “dual-use” and “co-location” definitions

The proposed definitions for “dual-use” and “co-location” are being provided for the purpose of developing a shared understanding of this terminology amongst the Maine Agricultural Solar Siting Stakeholder Group in order to clarify discussion about solar-agricultural land use in the state and to help facilitate discussions about the creation of incentives or regulatory efficiencies to support the development of these types of projects. The proposed definitions are not contemplated as necessarily being the final definitions for these terms that are embodied in statutory or rulemaking language.

Proposed Definition of Dual-Use

“Dual-use” projects involve the installation of solar photovoltaic panels on farmland in such a manner that primary agricultural activities (such as animal grazing and crop/vegetable production) are maintained simultaneously on the farmland. To qualify as dual-use, the solar installation must (1) retain or enhance the potential for the land’s agricultural productivity, both during operation of the array and after its decommissioning, (2) be built, maintained, and have provisions for decommissioning to protect the land’s agricultural resources and utility, and (3) support the viability of the farming operation.

Proposed Definition of Co-Location

“Co-location” involves traditional ground-mounted solar installations (designs that have not been modified to increase flexibility and compatibility for agricultural use) that host non-agricultural plantings with additional environmental benefits. For example, co-location could include the grazing of animals as part of planned vegetation management, planting pollinator habitat, or planting ground cover or other plant species to benefit the surrounding ecosystems. Co-location could also involve siting a more traditional solar installation on a portion of farmland, while retaining other portions of the farm property for agricultural use. This may prove to be one way to help support the continued viability of farm operations; but it is not dual-use solar.

Draft areas of consensus for Agricultural Solar Stakeholder Group, based on group discussions through June 2021.

Draft Consensus Areas

From initial stakeholder group materials:

- Prime farmland and soils of statewide importance are critical natural resources and are key to Maine's current and future agricultural productivity, biodiversity, and food security.
- Solar energy development is key to reducing greenhouse gas emissions and creates economic benefits in communities throughout the state.
- Maine is in a unique position to grow its food economy locally, regionally, and nationally; however, that will require preserving working lands for future generations.
- Dual-use farmland can be an important tool for diversifying income to farms. Opportunities for aligning solar and agricultural uses may exist with increased education and engagement.

From stakeholder group's discussions to date:

- There is a lack of data to support a clear picture of the problem the group has been tasked with addressing. Further research and ongoing monitoring may be needed.
- There is substantial interest in exploring opportunities for positive interactions between agriculture and solar, including dual-use and co-location. The group has committed to defining these terms, with a sub-group forming to propose a draft to the full group. Specific consensus areas related to this topic include:
    - Dual-use may play a role in minimizing impacts of solar development to agriculture.
    - Grazing as a vegetation management strategy can often provide additional agricultural value without substantial added development costs. Regulatory requirements should at minimum seek to enable these practices as an alternative to traditional vegetation management.
    - Permit-by-rule or other regulatory adjustments could encourage solar development that supports or enhances ongoing agricultural uses.
    - The impact of dual-use and/or co-located solar development on the tax status of farmland enrolled in Maine's farmland current use taxation program should be clarified
    - Certain dual-use applications may incur additional solar development costs, potentially raising ratepayer or energy cost concerns.
    - Applying the Massachusetts model of requiring all solar development impacting agricultural land to be dual-use is too restrictive for Maine's needs.
- The group supports sound decommissioning requirements that protect the potential for future reversion from solar production to agricultural use, such as those established by PL 2021 Ch. 151 (LD 802).

AGRICULTURAL SOLAR STAKEHOLDER GROUP – Knowledge Assessment
Maine Department of Agriculture, Conservation and Forestry
July 15, 2021

This document was created to collect information relevant to the Agricultural Solar Siting Stakeholder Group's policy discussions to date and to identify existing information gaps.

Knowns

Utilization of Maine soils for pasture and crop land

- Maine has a total landmass of 20,829,400 acres (ac).
- Soils data from the Natural Resource Conservation Service indicates 2,929,881 ac (14%) of Maine's landmass can be designated as crop land or pasture.
- Maine has 14% of its total landmass classified as prime farmland (794,320 ac) or soils of statewide importance (2,106,549 ac).
- USGS Land Cover Database data indicate 2.5% (730,005 ac) of crop and pasture land is in active production.
- 73% of crops and pasture (529,241 ac) are grown on prime soils or soils of statewide importance.

Trends in Maine agricultural land ownership

- Maine agricultural producers own 577,561 ac of woodlot.
- When woodlots are included with crop and pastureland Maine agricultural producers own 1,307,566 ac or 6% of the state according to the 2017 National Agricultural Statistics Service.
- Between 2012 and 2017, 146,491 acres of land (10%) was converted from agricultural production.
- According to American Farmland Trust, Maine was in the top five states with declines in farmland between 2012 and 2017.

Location and Land use within 5 miles of existing electrical infrastructure (Maine Audubon)

- Approximately 43% of the state (9,003,304 ac) exists within 5 miles of transmission lines or substations serving 69kV or greater.
- 604,935 ac (83%) of all active crop and pasture land is found within this 5-mile buffer area.
- 23% of the 5-mile buffer area consists of prime farmland or soils of statewide importance, compared to 14% across the state.
- An estimated 33,451 acres of Superfund sites, capped landfills and gravel pits fall within the 5-mile buffer.

Solar capacity

- Previous materials provided to the stakeholder group have estimated one megawatt of ground-mounted solar in Maine requires approximately five acres of land.
- Existing and proposed solar facilities, which includes operational projects (220 MW) of which approximately 25% have no significant footprint, projects in RPS tranche 1 and 2 (773 MW) and all potential net energy billing projects (1,400 MW) of which substantial attrition is expected, total roughly 2,400 MW, suggesting up to 12,000 acres impacted if all proposed projects are built. This development is occurring on a variety of land classes, as well as rooftops.

Unknowns

- More information would be needed to determine what portion of Maine's renewable energy generation goals will be met with solar development, and how much agricultural soil would be impacted by that development.
- Acreage available for solar development on brownfields, landfills, and PFAS sites could not be calculated due to limited information available on the sizes of these sites. For instance, most brownfield sites are relatively small lots.
- The extent of agricultural land already in solar development is unknown.

PUC awards new round of Maine clean-energy projects

pressherald.com/2021/06/29/puc-awards-new-round-of-maine-clean-energy-projects/

By Tux Turkel June 29, 2021

Portland Press Herald

Six new solar projects and one existing wind farm were selected Tuesday by the Maine Public Utilities Commission as the best clean-energy choices to supply power for Central Maine Power and Versant Power customers.

Among solar developers, Glenvale LLC and Walden Renewables were awarded two projects each, and Swift Current and C2 Energy Capital LLC were awarded one project each. These new solar projects will sign contracts for 100 percent of their energy output.

Maine clean energy project awards

Glenvale LLC (Warren); 75 MW

Glenvale LLC (Turner); 10 MW

Swift Current (Greene); 120 MW

C2 Energy Capital LLC (Parkman); 14 MW

Walden Renewables (Trenton); 40 MW

Walden Renewables (Warren); 31 MW

Helix Maine Wind Development LLC (Kibby Mountain); 66 MW

Source: Maine Public Utilities Commission

The one existing project winner, for 50 percent of its 132-megawatt output, was Helix Maine Wind Development LLC. The wind farm is in the Boundary Mountains of Franklin County.

“Today’s announcement by the PUC is further evidence of extraordinary momentum in Maine’s clean energy sector, which is creating good-paying jobs across our state, reducing our dependence on fossil fuels, and continuing our fight against climate change,” said Dan Burgess, director of the Governor’s Energy Office. “The projects selected by the PUC will provide renewable energy at competitive prices, which will benefit Maine ratepayers and move Maine toward its nation-leading climate and energy goals.”

More details about the projects will be available when the PUC releases its formal order.

In total, the projects have a generation capacity of 289 megawatts. They will provide power for first-year contract prices that are very competitive in New England's wholesale power market.

"I am again pleased with the results of this procurement, as participation was robust and the bids were very competitive," PUC Commission Chairman Philip Bartlett said. "Initial prices range from 2.8 cents to 3.9 cents per kilowatt-hour. These prices, combined with the economic and environmental benefits that the projects will provide, are a positive outcome for Maine."

Based on estimates provided by the bidders to the PUC, the projects also will:

• Reduce greenhouse gas emissions by roughly 260,000 tons per year.

• Create roughly 175 full-time-equivalent jobs during construction and 14 full-time-equivalent jobs in each year of operations.

• Lead to initial capital spending with Maine-based entities of more than $86 million, and purchases of goods and services averaging more than $2.6 million annually during the 20-year contract term.

• Pay taxes to Maine entities and host communities averaging $4.1 million annually during the 20-year contract term.

Tuesday's selection was the second part of a bidding process set up to satisfy a 2019 law to expand the amount of clean energy that Maine utilities must have in their supply mix.

Known as a renewable portfolio standard, the law upped the target level of green power to 80 percent of electricity sales by 2030 and 100 percent by 2050. These levels are considered an essential element of Maine's strategy to combat climate change and lower greenhouse gas emissions.

Interest groups that support clean energy reacted favorably following the decision.

A spokesman for the Maine Renewable Energy Association, a trade group representing clean energy generators in the state, said the outcome will be a good deal for electric customers.

"Today's unanimous approval by the Maine PUC demonstrates (that) a highly competitive bidding process will help to bring low-cost, high-value Maine-made solar and wind for the benefit of all Maine ratepayers," said Jeremy Payne, the association's executive director. "As expected, the solicitation attracted a high number of bids. The approved contract pricing was between 2.85 and 3.95 cents/kwh, which offers tremendous short, medium and long-term value to homeowners and businesses alike."

The Natural Resources Council of Maine said the project awards create a future in which Maine residents and businesses are powered by clean energy from local resources.

“The PUC’s approval of seven very competitive solar and wind energy projects is further proof that Maine’s vital transition to 100 percent clean energy is accelerating and beginning to deliver vast economic, environmental and public health benefits,” said David Costello, the group’s climate and clean-energy director.

Last September, the PUC approved contracts for 17 renewable power projects – largely solar, but also wind, biomass and hydroelectric. Taken together, those projects will have a generating capacity of 492 megawatts. They represent the largest procurement of clean-energy initiated by the state since at least the 1980s and 1990s, when laws designed to reduce dependence on imported oil spawned a fleet of wood-fired, hydroelectric and waste-to-energy projects.

More than 70 renewable energy developers presented proposals to the PUC, which analyzed them and drew up a short list.

Those first-pick projects were expected to create 450 jobs during construction and 30 jobs during each year of operation. They also were projected to spur an estimated $145 million in spending, including roughly $11 million in wood harvesting payments.

In both cases, the PUC scored each bidder through an evaluation process that put the greatest weight on customer benefits, notably competitive rates. They will be achieved mostly through 20-year contracts with CMP and Versant. Advantages for the state’s economy, such as job creation, capital investment and benefits to host communities, also were part of the scoring.

Both rounds of contracts also highlighted how large-scale solar power has emerged as a cost-competitive alternative to natural gas, the dominant form of power generation in New England.

The number of homes powered by a megawatt of solar power can vary significantly from state to state, according to the Solar Energy Industries Association. In Maine, roughly 130 homes would be powered by 1 megawatt, the trade group estimates.

Based on legislation, when all the projects are online, they will generate energy equal to 14 percent of Maine’s retail electricity sales during 2018, or a total of 1.7 million megawatt-hours.

On Rockport farm, blueberry grower, solar power developer seek common ground

pressherald.com/2021/07/04/on-rockport-farm-blueberry-grower-solar-power-developer-seek-common-ground/

By Tux Turkel July 4, 2021

A new solar project in Rockport combines solar panels with blueberry farming. The project is being shown as an example of how dual-use design can accommodate renewable energy on agricultural land. *Brianna Soukup/Staff Photographer*

ROCKPORT — They are coming a bit early this season, but lavender specks are beginning to color the low-bush blueberry fields here on a hillside off Route 17. But that's not the biggest news.

What has area farmers talking are the 10,608 solar-electric panels or modules that construction crews are installing on metal racks that traverse roughly 12 acres of south-sloping fields. This acreage is about to undergo a unique crop trial, to see how well sunshine can produce both energy and blueberries in the same space.

This is Maine's first commercial-scale dual-use or agrivoltaics project, terms of phrase that signify the combination of solar energy production and agriculture. Roughly a dozen growers last month toured the site, which is being developed by Boston-based BlueWave Solar and Navisun LLC, the Massachusetts solar power producer that will own and operate it.

Agrivoltaics is a new idea for growers of Maine's iconic wild blueberry crop, which has been buffeted in recent years by low prices, drought and labor challenges.

Lily Calderwood, a wild blueberry specialist at the University of Maine, touches a patch where wild blueberries have been temporarily impacted at a new solar project in Rockport that combines solar panels with blueberry farming. Calderwood said the impacted blueberries will grow back since most of the plant is under the ground, but it will take a few years. *Brianna Soukup/Staff Photographer*

The project will shed light on how valuable agricultural land can accommodate both solar installations and crops, perhaps easing the tension between land uses that may be in competition.

As they trekked uphill, these growers wondered if hosting a solar farm on some of their land could help ease their challenges.

"They're curious about how it's going to work and they're curious if they could make some money," said Lily Calderwood, wild blueberry specialist at the University of Maine Cooperative Extension Service. "What changes would they need to make for it to work on their land?"

And what changes would Maine policymakers need to consider to encourage the growth of agrivoltaics?

The solar panels and the blueberries growing beneath them here are at the intersection of two climate change priorities for Maine – promote renewable energy development to reduce greenhouse gas emissions and protect agricultural land to increase local food supply.

These goals, seemingly at odds, also are the focus of a newly formed stakeholder group made up of state and local officials, conservation interests and farmland advocates. They're trying to develop policies to balance those two ambitions. The group is meeting monthly and will present recommendations to the Legislature in January.

"Dual-use farmland," the solar/ag stakeholder group says in an opening statement, "can be an important tool for diversifying income to farms," noting opportunities to integrate solar panels with pollinator habitat, meadows and grassland and mixed agricultural uses.

But how important? And at what cost? The early experiences in Rockport could help inform eventual policy decisions.

Roughly 12 acres of wild blueberry fields in Rockport are being covered with more than 10,000 solar panels, a first-in-Maine experiment in dual-use design to pair solar energy with agriculture. Special construction and design techniques are being used to maximize power production while minimizing impact on the crop. Developers and agriculture officials hope the lessons learned can be applied to other blueberry farms. *Photo courtesy of BlueWave Solar*

States including Massachusetts offer a financial incentive for developers that build dual-use projects which satisfy certain criteria, such as panel height and percent of shading. But elevating panels 8 or 10 feet off the ground so harvesters can move under them, or spacing panels to admit more sunlight to the ground, adds to development costs.

It's too early to say if Maine will follow that route. But solar developers are watching. BlueWave Solar has been considering a second project, on blueberry land near Machias, but is waiting to see if Maine creates a Massachusetts-style incentive.

Laws and policies enacted by the Maine Legislature in 2019 to encourage solar development have led to an explosion of proposals and projects across the state.

But despite all the activity, a Portland Press Herald story last year detailed how Maine has had no specific rules for where community solar and other midsize arrays should be sited, as some states do. The decisions have been largely left to developers and landowners, as well as existing state and local permit review processes.

Roughly 14 percent of Maine, or 2.9 million acres, is considered farmland that's prime or of statewide importance, according to the state's agriculture department. This acreage is generally defined as having the best combination of characteristics such as soil quality and moisture supply for producing food, forage and other crops.

The Public Utilities Commission does have a requirement in its large-scale solar procurement program that no more than 10 percent of a project is located on prime and important farmland. Protecting those soils is a focus of the solar/ag stakeholder group. How that could look on blueberry fields is now being studied in Rockport.

'CAREFUL' CONSTRUCTION

Growers toured a field last week that also was a busy construction zone.

Trucks, loaders and ATVs scurried across the site as lead contractor CS Energy and its partners unloaded and moved big boxes of solar-electric modules. They're being installed on thousands of metal racks supported by steel legs set into drill holes in the bedrock.

Crews had erected poles and were stringing wire along a rocky access road. The 4-megawatt project will send power to Central Maine Power's electric system, enough to run 800 homes. Being near a heavy-duty, three-phase utility connection is one reason this site was chosen. Solar isn't cost-effective in remote farm fields far off the grid.

Alan Robertson, back right, who works for BlueWave Solar, talks to people about the solar panels they have installed at a new solar project in Rockport that combines panels with blueberry farming. *Brianna Soukup/Staff Photographe*

BlueWave has designated three distinct areas to study the impact of construction on berry production. In a 10,000-square-foot “extra careful” area, poly mats were placed over the low-lying bushes to minimize soil compaction and plant disturbance. In a 101,000-square-foot “careful” area, only vehicles with rubber tracks were allowed. There were no restrictions in a 148,000-square-foot section.

Racks flow across the landscape in undulating lines that follow the terrain, with the modules tilted toward the sun. These racks are a bit more than 4 feet off the ground on their low sides; at least 8 feet on their high sides. That extra clearance will allow people and harvesting equipment to get underneath.

Some of the modules are special, too. They’re bifacial, meaning they can produce some energy through their back sides, from reflection off the ground. They’ll also let the bushes get more sunlight.

But even gentler construction techniques have left their mark. Between the rack rows, dark earthen paths reveal where the drilling rigs and other equipment have torn up the bushes.

They should grow back in a few years, said Paul Sweetland, as he reached down to show some new runners beginning to emerge. Sweetland has managed this land for years. Through a sublease, the farmer is working with BlueWave and Navisun to help run the crop trial for at least five years, which will include annual reporting and fabricating special equipment that can be pulled behind an ATV.

“It’s a very interesting, educational experiment,” Sweetland said. “I’m optimistic about it.”

Blueberry farmer Paul Sweetland stands last month at a new solar project in Rockport that installed solar panels on the blueberry fields he farms. *Brianna Soukup/Staff Photographer*

DUAL-USE STRATEGIES

Maine is the world’s largest producer of wild blueberries, which are native to New England and Atlantic Canada. Roughly 36,000 acres are in commercial production, according to UMaine. Much of it is on the vast barrens Down East, but bushes also carpet the rolling hills along the midcoast.

To avoid conflicts, it may seem desirable to keep all solar projects away from any farmland. Solar arrays instead could fill so-called brownfield sites, such as closed landfills, or building roofs and parking lots.

But those sites can be more costly to develop and they’re limited, developers say. At the same time, there’s resistance to clearcutting large swaths of carbon-storing woodland.

That brings the solar siting discussion back to farmland, notably open fields and the dual-use strategies under study.

“The initial, knee-jerk reaction is, ‘why tie up farmland?’ ” said Alan Robertson, a senior development director at BlueWave Solar. “At public hearings, most abutters see it as a warm and fuzzy way to get the project built. There has been some pushback from folks who don’t understand the nuances of what we’re doing and why we’re doing it.”

Blueberry farmer Cary Nash at a new solar project in Rockport that combines solar panels with blueberry farming. *Brianna Soukup/Staff Photographer*

Often overlooked in the discussion about solar and farmland, Robertson and other solar developers say, is the importance of lease payments for farmers. It’s not unusual for farmers in Maine to be paid $4,000 or so an acre annually for the 20-30-year life of a project. If a solar project has a footprint of 10-20 acres, that $40,000 to $80,000 a year can be an important supplement to help keep a working farm in businesses.

And while the expanse of metal and glass seems permanent, wherever solar rises on farmland, someday it will be gone. The permit in Rockport includes a decommissioning bond. And a state law passed this year requires owners of three-acre or more projects to have a decommission plan that includes farmland restoration.

Developers of the Rockport project declined to discuss the specific reimbursements for the landowner and the farmer. They did say the payment to the landowner is based partly on the power generated and acreage under production.

All this information was helpful to growers who participated in the tour, and reactions were mixed.

Cary Nash of Nash Farms LLC in nearby Appleton isn't ready to go solar. He farms roughly 600 acres in the midcoast, is certified organic and supplies berries for a new sparkling wine. His first impression is that it would be too hard to move trucks and equipment around the solar arrays for an effective harvest.

"But I'm going to be very interested to see how it works," he said of the project.

Ronald Ramsay of Columbia, who drove from the heart of Washington County's blueberry barrens, said he was encouraged by what he saw. He harvests 27 acres and is working to put more into production.

"If they told me they'd come and put one on my land tomorrow," he said, "I'd say 'yes.' "

HOARD'S DAIRYMAN

THESE SOLAR PANELS harness energy while also serving as an option for shading pastured cows.

Making money in the shade

Some solar panels can capture the sun's energy while providing shade for cattle — a win-win for farmers.

by Brad Heins, Kirsten Sharpe, Eric Buchanan, and Mike Reese

THE agricultural industry relies on fossil-fuel in the production of food, feed, fiber, and energy. Electricity cools milk; fuel is burned in combines and tractors in grain fields; trucks bring goods to market; and nitrogen fertilizer nourishes plants.

That makes agriculture captive to large and constant supplies of a wide range of fossil energy. Agriculture's dependence and thirst for fossil-fuel carries significant economic, environmental, and social risks for the nation and world.

Utilizing the sun

Agrivoltaics is one way producers might be able to become less dependent on fossil fuels. These dual-use solar installations could lower production costs, enhance land efficiency, improve forages and crops for use by dairy cattle, and bolster milk production and health in dairy cows. Using a ground-mounted photovoltaic (PV) system in a dairy setting could give shade to dairy cows during extreme heat events and provide farmers with an alternative means of income.

The University of Minnesota West Central Research and Outreach Center (WCROC) in Morris, Minn., has a dairy operation that milks 275 cows twice daily and is representative of a mid-sized Minnesota dairy farm. The cows are split almost evenly between a conventional and a certified organic grazing herd. Through past investments and institutional experience in renewable energy and dairy production research, our team has a globally unique opportunity to lead a new green revolution — a revolution that creates energy currently consumed within the agricultural industry.

No previous research investigated the use of a ground-mounted solar system to provide shade for dairy cows and to determine the effects on dairy cows. Therefore, our team wanted to investigate the effects of shade from solar photovoltaic panels on the production, health, and behavior of pastured dairy cows.

During the summer of 2018, a 30-kilowatt ground-mounted solar system was installed in a pasture at the WCROC (see photo). The panels were mounted at 35 degrees south and 8 to 10 feet from the ground so that cows could not reach the panels.

The solar panels were Heliene panels using Solar Edge inverters and optimizers. They were installed by Zenergy. The extra cost for mounting the panels above the cows was minimal, and the total expense was about $90,000.

The pastured dairy cow study was conducted from June 2019 through September 2019. Twenty-four crossbred dairy cows were assigned to one of two treatments: shade from solar PV or no shade. The no-shade cows did not have access to any shade on pasture.

All cows had a CowManager ear tag sensor to record ruminating, eating, not active, and active behaviors for all cows. Also, a SmaXtec bolus was placed in the reticulum of the cow to record internal body temperature, as well as activity and drinking bouts of the cows. Daytime ambient high temperatures during the study ranged from 81°F to 93°F.

Keeping cows cooler

The shade and no-shade cows were similar for behavioral measurements, and fly numbers on cows were also similar. The shaded cows had less overall high activity than did no-shade cows because they were standing underneath the solar panels during the hot hours of the day. Daily drinking bouts were similar for all cows. Respiration rates for shade and no-shade cows were consistent during the morning hours, but in the afternoon, shaded cows had lower respiration rates (66 breaths per minute) than no-shade cows (78 breaths per minute).

Surprisingly, milk, fat, and protein production were not different for cows whether they had shade or no shade. Quite possibly, no difference was observed for production because cows were only under the shade for 28 days of the 175 days the cows grazed during the summer. Long-term effects of milk production may have been observed had cows been under the shade for the entire summer.

Hourly body temperature results show that no-shade cows had greater internal body temperatures (more than 1°F) than shade cows from 1 p.m. to 12 a.m. (see figure) Between milking times (10 a.m. to 8 p.m.), the shade cows had lower internal body temperatures than no-shade cows. All cows had similar body temperatures during the nighttime hours.

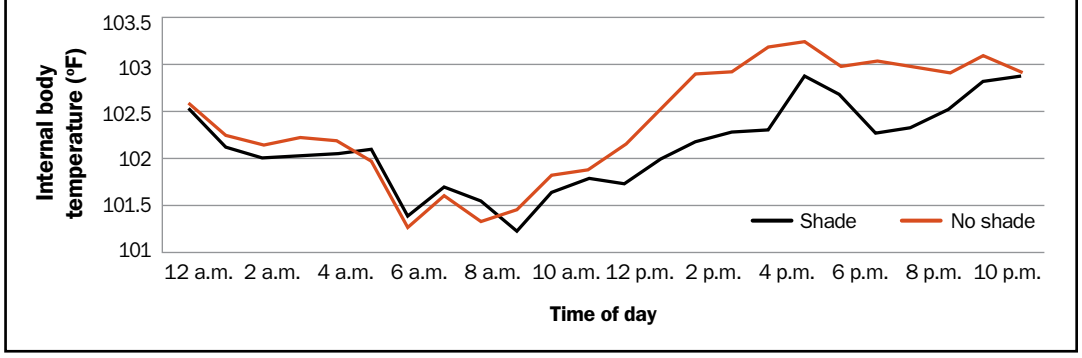
Based on the results of this study, cows may have sacrificed grazing time to stand in the protection of the shade. Future research with our solar panel will investigate the reproductive performance of the cows, plus long-term effects on milk, fat, and protein production, body weight, body condition, and animal health and well-being.

A smaller footprint

Our study indicates that agrivoltaics may provide an acceptable method of heat abatement to pastured dairy cows, as well as generating electrical energy for farmers. This would reduce the carbon footprint of the dairy operation.

In the future, we will explore tracking systems for solar power on livestock farms, using solar panels as windbreaks for cattle, and evaluating crops and forages that will grow best under solar systems. Economic impacts of the agrivoltaic system and land productivity from solar farms will drive the adoption of solar photovoltaic systems on farm.

Average body temperatures of cows in the study



The authors are all with the University of Minnesota West Central Research and Outreach Center in Morris, Minn.

Guide to Farming Friendly Solar

With the proliferation of solar energy generation throughout Vermont, interest in on-farm solar generation has grown. For many communities, this has raised concerns about loss of valuable farm land and impacts to the visual landscape.

Local planners can protect primary agricultural soils (often referred to as "prime ag") and the working landscape as a matter of town policy by acknowledging and promoting on-farm solar and active agricultural use on the same land.

For the farmer, a properly designed solar project can deliver electricity and/or income while supporting local efforts to preserve agriculture and move the state toward its energy goals.

Why Farm-Compatible Solar?

Farms use a significant amount of energy, including diesel fuel for tractors and trucks, heating oil and/or propane for buildings, water heaters, and greenhouses, and electricity for refrigeration, lighting, and ventilation. Dairy farms use a lot of electricity, especially for cooling the milk and for ventilation.

For farms seeking to reduce expenses, generating electricity on the farm is appealing. Additionally, the possibility of a steady income stream for electricity generated beyond what the farm uses can be an important economic asset.

Important Consideration for Farmers

While solar can be an excellent opportunity to generate income, and reduce electricity costs, there may be more cost-effective efficiency improvements that should be considered a priority. For dairy farms, collecting, cooling and shipping a high volume of product is energy-intensive. In addition, keeping barns lit and properly ventilated adds to energy use. Installing equipment that will reduce energy use, such as a plate cooler or a heat-recovery unit, can significantly reduce energy expenses.

Solar is not the only option available to farmers. Depending on location, a farm might find that wind generation is possible. Wind turbines have a smaller footprint than solar, for the same amount of energy generated. Farm-scale turbines come in a variety of sizes. On the small end, a wind turbine can generate enough electricity for the equivalent of two or three homes. A larger turbine can generate enough for a 100-cow farm.

More than Just Solar

This document focuses specifically on solar energy generation that's designed to be compatible with continued farming, whereby little or no land is taken out of production. Despite this focus, it should be recognized that there are other forms of on-farm generation that may be even more suitable for some agricultural operations. In addition, there are significant opportunities for on-farm efficiency improvements. Vermont Farm to Plate has analyzed food-system energy issues, including on-farm generation and efficiency. For more information go to

http://www.vtfarmtoplate.com/plan/chapter/4-6-food-system-energy-issues.

Sheep Grazing, Open View Farm

Solar on Conserved Land

Conservation easement holders address solar in their guidelines. Generally, they support solar meeting up to 100% of the farm's usage, however they also provide guidance as to the footprint of the solar both as a percentage of the land base of the farm and as a total acreage. They may also recognize the potential for agricultural activity to occur within a solar facility. It stands to reason that the holder(s) of the farm's conservation easement would look more favorably on a proposal to amend the easement for solar if the agricultural usage was an inherent part of the proposal.
Contact your easement holder to get their guidance document and to give them an idea of your potential project.

For larger farms, a methane digester may also be a viable option, although the financial investment in the equipment needed for generation using manure can be significant.

Before considering solar, farmers should check the ramifications of where a facility is sited. First, if the farm is located on conserved property, the land trust that holds the easement will need to confirm that renewable energy generation is allowed under the easement, particularly if over an acre of land is being dedicated to generation.

Second, the Current Use Program, has specific criteria (see inset on next page) regarding solar on lands enrolled in the program.

A 150kW system with 572 solar panels, utilizing a south facing roof on the Ayers Brook Goat Dairy in Randolph, VT. Photo Source: Aegis Renewable Energy

Important Considerations for Local Planners

When considering specific policy related to on-farm solar installations, the obvious focus is on soil types. Primary agricultural soils are those defined as having the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops[1] . Because of the value of these soils from a productivity standpoint, it is generally desirable to protect them from uses that would otherwise remove them from agricultural use.

Preference should be given to solar installations that utilize existing structures (such as the rooftop solar installation at the Ayers Brook Goat Dairy in Randolph – pictured on previous page). Rooftop solar is only viable on a south-facing roof when the structure can bear the weight of the system. For ground-mounted solar projects, local planners should understand that not all land being actively farmed includes primary agricultural soils. Communities developing policy around solar projects may want to identify a preference for ground mounted systems to be located on low quality soils when possible.

Finally, as is illustrated in the case studies on the next few pages, farming-friendly solar is possible. In our examples, several

1 These soils are protected in Vermont statute, where they are defined in Title 10 (10 V.S.A. § 6001) as "An important farmland soils map unit that the Natural Resources Conservation Service of the U.S. Department of Agriculture (NRCS) has identified and determined to have a rating of prime, statewide, or local importance…" The USDA NRCS provides maps on-line via the "Web Soil Survey." Soil maps are also found in the Vermont Agency of Natural Resources on-line maps.

farms have married on-farm solar with rotational grazing of livestock. Another has located their solar system in a buffer area required as part of their organic certification. As planners, it is important that we do not simply reject the concept of solar on farms or farmland out of hand. Instead, we need to consider how these systems can benefit our farmers and how they can be utilized in conjunction with active farming to achieve our energy goals and protect the viability of agriculture in our communities.

Solar and Eligibility for Current-use Taxation

To be eligible for use-value appraisal (the "current use program"), a solar array must be owned or leased by the farmer, with half or more of the electricity used on the farm. The land on which a solar array is placed cannot be enrolled in current use unless the facility itself is eligible – to be eligible, the solar facility must qualify as a "farm improvement," as defined in Vermont law (32 V.S.A. § 3752(14)) – essentially the two criteria stated above. By the same token, a solar facility that is not eligible cannot be located on land enrolled in the current use program. If the land is in current use prior to the installation of a solar project, and the solar facility will not qualify as a farm improvement, the landowner must pay the land-use change tax to take the land out of the program.

The overlapping requirements of the solar property tax exemption and the current use program provide a twist – please review the details on page 2 of the Tax Department's Technical Bulletin TB-69. It can be found here: http://tax.vermont.gov/research-and-reports/legal-library/technical-bulletins, and more general information on the current use program can be found here: http://tax.vermont.gov/property-owners/current-use, including removing your property from current use and paying the land-use-change tax.

Solar array in the buffer zone at the McKnight Farm

On Farm Solar: Case Studies

Seth Gardner – McKnight Farm, East Montpelier

Medium sized organic dairy farm

A solar array of 416 panels provides 120,000 kilowatt-hours (kWh) electricity annually – which supplies nearly all he needs for the farm –the primary purpose for choosing to install the structures.

Seth chose to take advantage of his location and the incentives provided at the time for putting up a solar array on his farm. Catamount Solar built the array on 1.5 acres of land that is a buffer zone between his fields and a non-organic neighbors' field. The land is rough with large areas of exposed bedrock.

"I was fortunate to have this spot – I needed a buffer between me and the next farm as I am organic and he is not. I was lucky in that it was close to the existing power line. It was a good use of land that I could not use otherwise" explains Seth.

Sheep hanging out, using the solar array as a refuge from the heat on a hot day- Open View Farm

Seth believes it is a good idea to combine solar panel arrays and farms – if there is good thoughtful planning beforehand. Siting is the biggest challenge he says, and it doesn't make sense to put these on the prime farmland, but rather to seek out the least intrusive places that can reasonably support the structures and are near three-phase power lines. He points to a barn or building roof as ideal if the structure is adequate and the roof is well-exposed to sunlight. In Seth's case, utilizing land that cannot be part of the farm production, is also an ideal spot. He is adamant that the farmer be involved with all stages of the project, including siting, construction, and payback schedules and receive full benefit of hosting a solar array on their farm.

Anna and Ben Freund – Open View Farm, New Haven

Diversified farm – maple, organic sheep and vegetables

Anna and Ben Freund operate Open View Farm on land leased from Winooski based Crosspollination Inc. The farm is home to a 2.49 Megawatt DC solar array, which produces enough energy annually to power 350 to 400 homes. From the beginning, one of Crosspollination's project goals was to incorporate sustainable energy with sustainable agriculture and have sheep graze within the solar array, mitigating the need for the grass beneath the panels to be mowed regularly, while providing prime pasture for sheep.

The original project design had the array spanning 40 acres with the intention of leaving enough space for haying equipment to pass between the rows of panels. That plan was revised and groSolar built an array compressed onto 17 acres, which still allows for maximum solar capture.

Once constructed, a woven wire fence was placed around the entire array. The disturbed ground beneath was seeded with a sheep-grazing mix, with some additional birdsfoot trefoil and clovers added as it is a clay type soil that dries out quickly in late summer if there is no precipitation. Anna has noticed that the bees also benefit from the clover blossoms in the solar array, especially after the surrounding hay has been harvested.

Anna and Ben partition the acreage inside the fence for a rotational grazing system, aligning their fences with the rows of solar panels. Anna says," We aim to have the

Forage and shade opportunities are good under Open View Farm's Solar Panels

sheep in the array during the hottest part of the summer and again in late fall. The panels provide a huge amount of shade, which the sheep appreciate and the array provides a stockpile of feed when other areas of the farm are being hayed. We also use the array as a secure place for the sheep to be on the rare occasions that we leave the farm to a sitter ".

The array has worked well as part of the sheep grazing system and the arrangement that Anna and Ben have with Crosspollination Inc. has allowed them access to farmland and infrastructure to establish a farm business. Until Crosspollination purchased the land, there had not been farm animals on the premise since the late 80's when the previous owners sold their dairy cattle.

Anna feels there are a lot of positives for having solar panels on farms – such as the clean renewable energy source they provide, and the economic benefits. Anna believes that the siting process must be thoughtful and deliberative to be most practical, and useful. Each site has variables to contend with, and each will need careful consideration.

Greg Hathaway – Maple Ridge Meats, Benson

Beef and Solar Enterprise

Hathaway Farm formerly operated as a dairy. Greg Hathaway, grandson, decided he wasn't interested in dairy, but wanted to raise beef cattle and has created a commercial slaughterhouse at the farm. As Maple Ridge Meats, the Hathaway's raise 250 head of beef cattle on their 650-acre farm. They process their own beef and provide the same services to producers from all over New England.

Greg thought it prudent to include alternative power generation as second revenue source for the farm. He investigated several solar developers and decided on the Green Lantern Group, based in Waterbury, VT. Working with Sam Carlson of Green Lantern Group, a 150-kW ground-mounted, group-net-metered solar array was installed over five acres, on a portion of land that has a Vermont Land Trust easement. Maple Ridge Meats will receive a monthly rental fee from Green Lantern.

This is first instance of grazing beef cattle under solar panels in Vermont. Greg says "Since [the array] has to be fenced, if that area was not grazed, it would be wasteland. So it really makes sense to have animals graze beneath the panels."

Greg plans to use the area with panels for cows during calving season. It's close to the barn and provides some shelter – yet open air for animals. Then once they are moved

Still to be seeded down before cows come- Maple Ridge Meat

on, he will use the area for yearlings to graze. The animals are smaller, so that will help in handling them while learning how to manage cattle within the solar array.

Greg feels very strongly that all ideas should be thought through and discussed before embarking on a solar array project. "The farmer knows the land and probably has a good idea of how they want it used. You also have to think about whether the income from this will offset the loss of that land. And whether the array is to be set up for machinery to pass through too or clustered closer together – but then losing some ability for vegetation to grow beneath due to being shaded out. Lots to think about."

Conclusion

All of these farmers were pleased with the arrangement they had made for the dual purposes of grazing and providing land space for solar panel arrays. Yet each one of them also mentioned a deep commitment to preserving the best agricultural land for agricultural uses first – and thus the common refrain of thinking it all through before any breaking of ground.

The structures are large and change how the land is used. All encouraged the idea of using lower-impact places such as a roof or land that cannot be used for agricultural purposes, first. And secondly, the importance of a revenue source to the farm/farmer for the use of that land supporting the solar array.

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