Addendum to Information on Solar Zoning and Siting in Maryland

Prepared for: St. Mary's County, Maryland

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Source: Pixabay

INTRODUCTION

This document is an addendum to the Information on Solar Siting and Zoning in Maryland report (Report) that was submitted to the St. Mary's County Solar Task Force (Task Force) on July 8, 2020. The addendum provides further information requested by the Task Force while discussing the original Report.

DUAL-USE SOLAR & AGRICULTURE

The Report briefly examined the conflicts between utility-scale solar projects and agricultural uses on the same land plot. One clear advantage of wind energy over solar energy is the ability to conduct a large array of agricultural activities on the wind energy site. Solar energy sites are far more challenging with regards to agricultural dual-use.

This is not to say there is not significant research and experimentation occurring regarding dual-use for solar projects, and this is leading to the creation of more viable dual-use technologies and practices. However, many dual-use practices still involve one of two significant trade-offs: (1) reducing solar panel coverage to increase agricultural production and vice versa; or (2) requiring pole mounted tracking systems that are more expensive than the cheaper ground mounted systems favored by most solar developers. Overcoming these trade-offs remains an important challenge.

The Vietnam Experience

Recently, Vietnam has commissioned research regarding dual-use technologies and practices and the country may serve as a good comparison to Maryland. Like Maryland, Vietnam is heavily investing in solar and renewable energy to offset climate change and pollution caused by fossil fuels. While rice is a staple crop, Vietnam also boasts a highly diverse agricultural output, including aquaculture. Finally, 69 percent of Vietnam farms are family run and under 0.5 hectares in size, which is similar to many Southern Maryland farms.

Of particular use to the Task Force is a report summarizing international efforts in dual-use research as well as outlining a case study for implementing dual-use in the City of Can Tho and its surrounding agricultural districts.[1]

The report summarizes current international research on: (1) "full" solar dual-use concepts that apply an equal focus on agricultural and solar energy generation; (2) "add-on" concepts that

[1] *See "Dual-Use Approaches for Solar Energy and Food Production: International Experience and Potentials for Vietnam", Green Innovation and Development Centre (GreenID),* http://rainer-brohm.de/wp-content/uploads/2019/02/Dual-use-approaches-for-solar-energy-and-food-production-international-experience_en.pdf (November, 2018).

prioritize solar energy generation; (3) solar photovoltaic (PV) greenhouses; and (4) dual-use concepts for aquaculture.

An Italian full solar dual-use system that allows for mechanized agriculture. Source: RemTech S.r.l.

The international research applied to crops (vegetables and fruits), livestock grazing, and aquaculture and discussed current pilot programs and operational facilities throughout Europe and Asia.

The report made numerous key findings. Those relevant to the Task Force include:

- Solar PV dual-use or agrivoltaic concepts can resolve this land-use conflict between energy and agriculture production by combining both on the same site. Developed in the early 1980's in Germany, the concept has been implemented in a number of countries with hundreds of (mainly small scale) projects and applications. Recently, a growing number of larger, commercial projects have been implemented in countries such as China, Japan, Italy, or France.

- Further benefits of solar dual-use for farmers and public [beyond increased land productivity] include energy cost savings (solar self-consumption), additional income of local farmers with potentially higher investments and tax revenues, improved marketing opportunities and competitiveness (sustainable production/supply chain), potentially improved agricultural practices, the reduction of (peak) energy demand, a reduction of CO2 and hazardous local emissions from conventional thermal power plants (such as coal), and the development of a more competitive sustainable agricultural sector in general (for domestic and export markets).

- The application of the dual-use concept in a case study for Can Tho shows great potential for solar dual-use. Suitability for solar dual-use (agrivoltaic) applications could be identified for nine agricultural and aquaculture products (rice, corn/maize, soybean, sesame, vegetables, cassava/starch roots, livestock, fish and shrimp).

- Based on these crops, an overall "realistic" technical potential (as such realizable within the next 5-8 years) could be calculated for Can Tho. Excluding rice production, this potential is in the range of 700 to 1,100 MWp, equaling an electricity potential of 1 to 1.5 TWh. This solar electricity generation would cover 46% to 70% of Can Tho's annual electricity demand.

- Including dual-use application on rice production areas, the "realistic" potential would increase to 7,500 to 11,300 MWp or 5 to 16 TWh. This amount of clean electricity far exceeds the city's electricity demand and could thus contribute to the demand of the wider Mekong Delta region and further neighboring provinces.[2]

Pollinator-Friendly Habitat

In the United States, there is interest in the creation of pollinator-friendly habitat as a dual-use. Given the serious decline in pollinator populations (bees, butterflies, and birds), it has become increasingly important to create protective habitat for these species.

Using pollinator-friendly flowers and plants at a solar site rather than gravel, dirt, or turf can help boost pollinator populations that in turn help boost agricultural production. Apiaries housed on a solar site can also produce honey and related products.

Maryland has passed legislation requiring the Department of Natural Resources (DNR), Maryland Environmental Service, and State Highway Administration to create their own pollinator habitat plans, in consultation with the Maryland Department of Agriculture (MDA). The plans must be as protective as MDA's own Maryland Pollinator Protection Plan that was adopted in 2016.[3]

Additional legislation authorizes DNR to designate a solar project as a pollinator-friendly habitat provided the project meets certain requirements.[4]

[2] *Id*.
[3] *See* HB 132 of 2016 and HB 830/SB 386 of 2017.
[4] SB 1158 of 2017.

Massachusetts Dual-Use Fact Sheet

The Massachusetts Department of Energy Resources has established a Solar Massachusetts Renewable Target (SMART) program that provides incentives for solar development in the state. The University of Massachusetts Clean Energy Extension has created a series of fact sheets for farmers on solar development, including one on dual-use. The fact sheet is reproduced in Appendix 1 at the end of this addendum. [5]

Source: University of Massachusetts Clean Energy Extension

Dual-Use Research in Arizona

A recent University of Arizona paper that was published in *Nature Sustainability* highlights the potential benefits of dual- use.[6] The paper found that growing certain crops under raised solar panels resulted in better crop outcomes and also cooled the panels above. University of Arizona School of Geography and Development Associate Professor Greg Barron-Gafford was the lead author of the paper.

The study found that crops under the array were better protected from Arizona's temperature extremes, required less water from irrigation, increased local air humidity, and produced

[5] A PDF version of the dual-use fact sheet can be found at: https://ag.umass.edu/sites/ag.umass.edu/files/fact-sheets/pdf/dual-use_012419.pdf.

[6] *See "*Agrivoltaics Proves Mutually Beneficial Across Food, Water, Energy Nexus", University of Arizona News, https://news.arizona.edu/story/agrivoltaics-proves-mutually-beneficial-across-food-water-energy-nexus (September 2, 2019).

greater yields than traditional open-sky control crops. The crops also cooled the overhead panels, limiting panel overheating and increasing their energy efficiency.

> "The study focused on chiltepin pepper, jalapeno and cherry tomato plants that were positioned under a PV array….
>
> "We found that many of our food crops do better in the shade of solar panels because they are spared from the direct sun," Baron-Gafford said…."In fact, total chiltepin fruit production was three times greater under the PV panels in an agrivoltaic system, and tomato production was twice as great!"
>
> Jalapenos produced a similar amount of fruit in both the agrivoltaics system and the traditional plot, but did so with 65% less transpirational water loss. [7]"

Source: University of Arizona News

Dual-Use in Maryland

As Maryland is still a "new" territory when it comes to utility-scale solar development on farmland, there are few innovative dual-use examples. Two that do stand out are a pollinator-friendly habitat in Frederick County and the use of solar panels on poultry houses on the Eastern Shore.

[7] *Id*.

In Frederick County, the Baker Point solar project became the first utility-scale solar project to qualify as a pollinator-friendly habitat. The project can provide energy for around 2,000 homes and commercial customers include Monumental Sports (for the Capital One Arena) and National Geographic. The project was designed by Cypress Creek Renewables.[8]

Another example is the use of solar panels on poultry houses on the Eastern Shore. This is a true dual-use that does not diminish either the agricultural or solar output. However, most traditional poultry houses were not designed to take the weight of solar panels on their roofs. This means that adding solar panels may be cost-effective when constructing new houses but cost prohibitive to retrofit existing houses.

SOLAR PROJECTS ON BROWNFIELDS

Developing solar projects on developed land where possible is usually preferable to developing solar on productive agricultural land or open space. Brownfield sites that may not be suitable for other uses could be repurposed for solar generation. However, these sites also pose several unique challenges.

Challenges of Solar Development on Brownfield Sites

There are four key concerns when developing community or utility-scale solar projects on brownfield sites:

- Viability: The site must first meet the basics for any successful large solar project, including having good solar coverage, proximity to high voltage transmission lines, and the potential to receive grid injection approval from regional transmission organization PJM.

- Safety: Obviously, the environmental and public health dangers posed by a site must be addressed so as to allow for the safe construction and operation of a solar energy generation project.

- Liability: A primary concern by a solar developer over the use of a brownfield site is the liability of the developer. Without appropriate legal protections in place, it is unlikely any developer would want to assume the liability risks of such a project.

[8] *See* "Maryland's First Pollinator-Friendly Solar Site Comes to Frederick County", LocalDVM.com, https://www.localdvm.com/news/marylands-first-pollinator-friendly-solar-site-comes-to-frederick-county/ (Updated November 17, 2017).

- Distance: Some brownfield sites, such as landfills or industrial areas, are located away from developed areas that could use the energy, potentially requiring additional grid infrastructure to be constructed along with the solar generation project.

Potential for Solar Development on Brownfield Sites

A report prepared by the Utility Scale Solar Energy Coalition of Maryland (USSEC) examined the solar development potential on brownfield sites in the state. The report used site data from the United States Environmental Protection Agency (EPA) and the Maryland Department of the Environment and applied a methodology that accounted for developer needs. Based on 370 sites for which there was sufficient data, the report concluded that Maryland could generate between roughly 200 to 400 Megawatts (MW) of solar energy from brownfields. This amount includes utility-, medium-, and small-scalel solar projects. In contrast, the state's 14.5 percent "solar carveout" requires roughly 5,000 MW of solar capacity.[9]

It is important to note that the report's totals are much lower than the EPA's estimate of 17,100 MW of solar development capacity for the EPA-listed sites alone. However, the EPA estimate does not take into account other state and local restrictions or economic viability, and thus likely overstates what can be actually developed.

Even assuming the USSEC results are somewhat conservative based on solar developer preferences, it is questionable whether Maryland's solar load target could be met solely through brownfield development. However, maximizing brownfield development to the extent practicable can offset the need for solar development on farmland and open space.

SOLAR PROJECTS ON GRAYFIELDS

Developing solar projects on grayfield sites, such as parking lots (active or abandoned) or other sites with a large amount of impervious surface, can also be preferable to farmland and open space development.

In contrast to brownfields, grayfield sites are typically located within developed areas that can use the energy generated by the site, reducing the need for completely new grid infrastructure. Also, such sites do not pose the same environmental or public health concerns as brownfields.

[9] *See* Solar Development Potential on Contaminated Lands in Maryland, Utility Scale Solar Energy Coalition of Maryland (October 9, 2018). The report, summary presentation, database information, and GIS data can be found at https://www.mdsolarcoalition.com/.

Challenges of Solar Development on Grayfield Sites

However, that does not mean grayfield sites are not without their own challenges:

- Viability: The site must first meet the basics for any successful large solar project, including having good solar coverage, proximity to high voltage transmission lines, and the potential to receive grid injection approval from regional transmission organization PJM.

- Expense: Placing solar canopies or pole mounts in parking lots is more expensive than developing solar projects on farmland or open space. This can undermine the economic viability of the solar project.

- Size: Individual grayfield sites are usually smaller than farmland, open space, or brownfield alternatives, meaning grayfield solar projects will often be less than utility-scale in size.

- Stormwater Management: Stormwater management is a greater concern for grayfield sites than open space or farmland sites and some brownfield sites, due to the large amounts of impervious surface involved. While many grayfield sites already have adequate stormwater management facilities installed, some sites may need costly upgrades to comply with current stormwater standards.

Source: Pixabay

Potential for Solar Development on Grayfield Sites

While identifying and developing solar on grayfield sites will not completely abrogate the need for some utility-scale solar development on farmland or open space, it can meaningfully reduce the amount of farmland or open space development needed. As referenced in the Report and separate discussions by the Task Force, undertaking a solar siting exercise similar to the one conducted for Baltimore County and Baltimore City may be worthwhile:

Presentation on Determining Optimal Solar Siting Pilot for Baltimore County and City (September 2019):

https://www.thevpc.org/wp-content/uploads/2019/09/Optimal-Siting-for-Solar-Facilities-Susan-Minnemeyer.pdf

COUNTY EXAMPLES

The Report provided examples of solar zoning in 10 different Maryland Counties. This addendum adds Caroline County, which significantly amended its solar zoning ordinance in 2017.

CAROLINE COUNTY

Zoning and Permit Requirements

Caroline County has zoning requirements for "commercial" solar projects, which are primarily utility-scale. The County purposely adopted a 2,000 acre countywide aggregate cap for projects rather than impose specific zoning limits for R-Rural Zoning and Industrial Zoning Districts. Covered projects are prohibited on lands that are designated as transferable development rights receiving areas or are under land preservation easements.

The zoning ordinance covers project design standards, site plan requirements, screening and setback requirements, and project decommissioning standards.

§ 175-46. Solar energy systems. [Added 8-12-2014 by Ord. No. 2014-1; amended 12-12-2017 by Ord. No. 2017-2]

A. Siting. A commercial solar energy system that complies with the provisions of this section may be permitted as described in § 175-13, Table of Uses, except as follows:

(1) The combined additional aggregate acreage of commercial solar energy systems utilized throughout the County shall not exceed 2,000 acres.

(2) Parcels located in the transferable development rights receiving areas.

(3) Parcels under land preservation easements excepting rights-of-way for infrastructure buried at least three feet.

(4) Where solar energy systems are proposed for parcels identified as "greenbelts" or "growth areas" in any comprehensive plan for an incorporated municipality, the impacted jurisdiction must be notified.

B. Design standards; siting. Considerations shall be made to siting, such as avoiding areas/locations with a high potential for biological conflict such as wilderness study areas, areas of environmental concern, County and state parks, historic trails, special management areas or important wildlife habitat or corridors; avoiding significant impacts to visual corridors that are prominent scenic viewsheds, or scenic areas designated by the County; avoiding significant impacts to areas of erodible slopes and soils, where concerns for water quality, severe erosion, and/ or high storm runoff potential have been identified; and avoiding known sensitive historical, cultural or archeological resources.

(1) Screening. Considerations shall be made for visual screening to ensure the solar energy system does not cause negative significant impacts to the aesthetic and scenic quality of the project area/location. Where screening buffers are required, they shall be opaque within three years and shall consist of mixed vegetation, including trees, shrubs, and ornamental grasses. Where appropriate, pollinator habitat may be used in lieu of screening buffers.

(2) Tree removal. The structures comprising the solar facility shall be constructed and located in a manner so as to minimize the necessity to remove existing trees upon the parcel, and in no event shall wooded acreage comprising more than 2% of the deeded acreage of the parcel or portion of the parcel devoted to the solar facility use be removed without demonstrating that such removal is necessary for the reasonable construction and efficient performance of the use.

(3) Setbacks.

(a) Required setbacks. Solar energy system structures shall meet the minimum zoning setback for the zoning district in which located, or 25 feet, whichever is greater. In addition, solar energy systems must be located at least 200 feet from all residentially zoned parcels and existing residences.

(b) Setback modifications. Modifications from these requirements may be granted by owners of residentially zoned parcels or existing residences, provided that a setback modification agreement is submitted. A setback

modification agreement shall be required for each property line abutting a solar energy system structure for which a modification is requested and shall set forth the property owners' consent to a modified setback. Setback modifications on any parcel shall not be interpreted as applying to required setbacks from any other parcel. Setback modification agreements shall be in a form provided from the Department and after review shall be filed in the land records for Caroline County. Where a solar energy system encompasses multiple parcels, setbacks shall not be required from inner parcel boundary lines. Additional setbacks may be required to mitigate aesthetic, noise, safety, glare, or any other identified significant impacts, or to provide for designated road or utility corridors.

(c) Intent. Setback modifications run for the duration of the underlying solar energy system contract and do not run with the land. This section shall not be construed to allow a property owner to modify a setback for any other property owner.

(4) Height. Solar energy system panel structures shall not exceed the height of 15 feet as measured from the grade at the base of the structure to the apex of the structure. Necessary accessory structures (e.g., lightning rods) are subject to approval.

(5) Utility connections. Reasonable efforts shall be made to place all utility connections from the solar installation underground, depending on appropriate soil conditions, shape, and topography of the site and any requirements of the utility provider. Electrical transformers for utility interconnections may be above ground if required by the utility provider. All electrical interconnections and distribution components must comply with all applicable codes and public utility requirements.

(6) Visibility. Solar energy systems shall be designed to blend into the architecture of the building or be screened from routine view from public rights-of-way or adjacent residentially-zoned parcels. To the extent reasonably possible, use materials, colors, and textures that will blend the facility into the existing environment.

(7) Glare. No solar energy system shall produce glare that would constitute a nuisance to occupants of neighboring parcels or persons traveling neighboring roads.

(8) Lighting. Lighting of the solar energy system and accessory structures shall be limited to the minimum necessary for safety and operational purposes, and shall be reasonably shielded from abutting properties. Lighting shall be activated by

motion sensors and shall be fully shielded and downcast to prevent light from shining onto adjacent parcels or into the night sky.

(9) Fencing. A secure chain link fence at least six feet in height shall enclose the entire solar energy system to restrict unauthorized access.

(10) In addition to these design standards, all solar energy systems shall meet all applicable state regulations and permit requirements.

C. Decommissioning. The solar energy system shall be completely decommissioned by the facility owner within 12 months after the end of the energy producing, abandonment or termination of such facility. Decommissioning shall include removal of all solar electric systems, buildings, cabling, electrical components, roads, foundations, pilings, and any other associated facilities, to the extents that any agricultural ground upon which the facility was located is again tillable and suitable for agricultural uses. Any components of the solar energy system buried greater than three feet may remain to avoid unnecessary topsoil disturbance. Disturbed earth shall be graded and re-seeded unless the landowner requests in writing that the access roads or other land surface areas not be restored. The owner of the facility shall secure the costs of decommissioning by appropriate bond, letter of credit, or escrow agreement satisfactory to the County and shall include a mechanism for calculating increased removal costs due to inflation. Both a decommissioning plan and estimate costs shall be submitted by the owner and subject to approval by the County prior to issuance of any permits required.

D. Signs. A sign, not to exceed one square foot, shall be posted at each entrance to the solar energy system to identify the property owner, the solar energy system owner, and twenty-four-hour emergency contact phone number. Information on the sign shall be kept current. The sign shall be posted at the site in a clearly visible manner.

E. Agreements/easements. If the land on which the project is proposed is to be leased, rather than owned, by the solar energy development company, all property within the project boundary must be included in a recorded easement(s), lease(s) or consent agreement(s) specifying the applicable uses for the duration of the project.

F. Public safety. Identify and address any known or suspected potential hazards to adjacent properties, public roadways, communities, aviation, etc., which may be created by the project.

G. FAA. Must demonstrate compliance with federal aviation administration (FAA) regulations pertaining to hazards to air navigation.

H. Project rationale. Project rationale, including estimated construction schedule, project life, phasing, and likely buyers or markets for the generated energy must be provided.

I. Site and development plans. A site plan drawn at an appropriate scale shall be provided identifying the following:

(1) At the time of application, a concept plan drawn at an appropriate scale shall be provided identifying the following:

(a) A copy of the interconnection application or a written explanation why an interconnection agreement is not necessary for an interconnected customer-owned generator;

(b) Parcel lines, setbacks and physical features including access routes and proposed road improvements;

(c) All existing and proposed structures, including impervious surface calculations;

(d) Proposed changes to the landscape of the site, grading, vegetation clearing and planting, exterior lighting, and screening vegetation or structures;

(e) Any existing residential dwellings within one-fourth mile of the solar energy system project;

(f) Existing utilities and transmission lines, proposed utility lines, and utility and maintenance structures;

(g) Existing topographic contours and mapped soils;

(h) Existing vegetation (list type and percent of coverage; i.e., grassland, plowed field, wooded areas, etc.);

(i) Revegetation areas and methods;

(j) Dust and sediment and erosion control;

(k) Proposed stormwater management measures;

(l) Any floodplains or wetlands;

(m) Fencing location;

(n) Total site acreage;

(o) Landscape and buffer areas.

(2) Before final approval, a major site plan drawn at an appropriate scale shall be provided identifying all items listed in Subsection I(1), as well as:

(a) Engineered drawings of the solar installation showing the proposed layout of the system and any potential shading from nearby structures or vegetation.

(b) The number of panels to be installed, the proposed location and spacing of solar panels, and location of any associated accessory structures.

(c) An operation and maintenance plan.

(d) Landscape and landscape maintenance plan.

(e) A copy of the interconnection agreement or a written explanation why an interconnection agreement is not necessary.

Process Used for Development of Solar Requirements

The County went through a seven-step process to develop its new solar zoning ordinance:

1. The County placed a one-year moratorium on commercial solar projects for the sole purpose of addressing the regulations.

2. The County established two committees – one to work on solar zoning and siting regulations and one to work on solar project taxing and revenue. The regulation committee included industry representatives, farmers, citizens, planning staff, planning commission members, environmental community representatives, and a Maryland Association of Counties (MACo) representative.

3. The regulatory committee reviewed existing regulations, identified key issues to be addressed (with a primary focus on farmland conversion), and reviewed solar ordinances from other jurisdictions.

4. The committee, County staff, and the Planning Commission considered solar energy ordinance guidance from the American Planning Association (APA) and the solar industry.[10]

5. The County held a public forum, moderated by the County's Chief of Staff, to take citizen comment.

[10] Available APA resources for local government planners can be found at: https://www.planning.org/knowledgebase/solar/. APA members can also download a PDF of the 2019 PAS Memo "Planning for Utility Scale Solar Energy Facilities" at https://www.planning.org/publications/document/9184153/.

6. The committee combined the best parts of the County's existing ordinance, the APA model ordinance guidance, and solar industry input into a draft ordinance. The ordinance tried to balance the competing concerns of farmland conversion and private property rights.

7. The County held several public hearings on the draft ordinance and made several minor edits to the draft. After extending the moratorium for several additional months in order to complete the process, the County adopted with draft ordinance with the minor edits.

CONCLUSION

The Consultant hopes that this addendum provides further useful background information to the Task Force and offers some potential directions for the Task Force to continue its solar zoning and permitting deliberations.

Source: Pixabay

Appendix 1: Massachusetts Dual-Use Fact Sheet

UMassAmherst

The Center for Agriculture, Food and the Environment

Home of UMass Extension & Mass. Ag. Experiment Station

Published on *Center for Agriculture, Food and the Environment* (https://ag.umass.edu)

Dual-Use: Agriculture and Solar Photovoltaics [1]

Print a PDF of this fact sheet. [2]

The Massachusetts Department of Energy Resources has established the Solar Massachusetts Renewable Target (SMART) program, which will regulate incentives associated with new solar photovoltaic (PV) development in the state, beginning November 26, 2018. This is one of a series of fact sheets designed by UMass Clean Energy Extension to help farmers navigate the program.

What does dual-use mean?

In general, dual-use refers to agricultural production and electricity production from solar photovoltaic (PV) panels occurring together on the same piece of land. It is expected that in most cases individual crop yield (lbs/acre) or electricity output (kWh/acre) will be lower in dual-use than it would be if either activity was carried out alone, but that the combined value of crops and electricity produced will be equal to or higher than single-use of the land for production of crops or electricity alone.

In the state of Massachusetts, specific kinds of dual-use systems are known as "Agricultural Solar Tariff Generation Units," and can qualify for financial incentives under the SMART program. In these systems, every square foot of land possible must be maintained in continuous agricultural production. The SMART regulation can be found on the MA DOER website [3].

The requirements to qualify for compensation as a dual-use system are further defined by two guidelines.

Land Use and Siting Guideline [4]

Agricultural Solar Tariff Generation Unit Guideline [5]

What types of land can dual-use systems be installed on?

For a dual-use system to qualify for compensation as an Agricultural Solar Tariff Generation Unit under the SMART regulation, it must be installed on property officially defined as **Land in Agricultural Use** or **Prime Agricultural Farmland.**

Land in Agricultural Use is defined under Mass General Law 61A. If your land is taxed as agricultural land under Chapter 61A, or has been within the last five years, it qualifies as Agricultural under the regulation. If you are not sure of the tax status of your land, contact your town tax assessors' office.

Prime Agricultural Farmland. You may also qualify as Agricultural under the SMART program if your land is defined as having Prime Farmland Soils by the Natural Resources Conservation Service. You can find soil definitions for your property on the MassGIS OLIVER website [6] using the following process:

1. Under "Available Data Layers," select "Physical Resources," and then "Soils."
2. Select "Prime Farmland Soils," which will add it to the list of "Active Data Layers" under "Legend."
3. You can then find for your property by zooming in to the Massachusetts map, or entering a street address into the "Search for a location" box. To qualify as Prime Agricultural Farmland, the land must be in dark green – identified in the Legend as "All Areas are Prime Farmland."

If you have difficulty with this process, please contact CEE for assistance.

You can have an additional canopy or building-mounted PV system on the same parcel of land as a dual-use array, but there are significant restrictions regarding placement of additional ground-mounted PV arrays on the same property or parcels adjacent to a dual-use system.

What system parameters are required for dual-use arrays?

Under the Agricultural Solar Tariff Generation Unit Guideline, dual-use systems incorporating the following design parameters will be reviewed in an expedited process:

- **System Size.** The capacity (rated electricity production) of the system must be no more than 2 MW.
- **Height:** The lowest edge of the panel must be at least 8 feet above the ground for a fixed tilt panel system, or 10 feet at horizontal position for tracking systems.
- **Shading:** During the growing season, the maximum sunlight reduction due to shading from the panels on any square foot of land under the dual-use system may be no more than 50%. This shading analysis must be completed using the Shading Analysis Tool [7] provided by the state. Your solar developer and CEE can assist with this analysis.
- **Agricultural Use:** The system should be designed to optimize a balance between electrical generation and agricultural production, and the land must be under continuous agricultural production over the 20-year SMART program period.

If you believe these design parameters are not appropriate for your particular situation, you can apply for a waiver for one or more provisions. The waiver application process requires submission of detailed documentation to MA DOER, demonstrating that the proposed alternative design parameters will meet the intention of the regulation (see the Agricultural Solar Tariff Generation Unit Guideline for further details).

What is the financial compensation associated with a dual-use system?

Qualifying solar PV systems receive a base compensation rate of $0.14-$0.26 per kilowatt-hour (kWh) of electricity produced, depending on the size of the system and the local utility supplier (e.g. National Grid, Eversource). Dual-use systems qualifying as Agricultural Solar Tariff Generation Units receive an additional $0.06 per kWh. As capacity is added to the electric grid, this base rate declines at a rate of 4% per capacity block. For more details, please see the CEE Fact Sheet entitled *SMART Program Incentives for Solar Arrays on Farms [8]*.

What documentation do I need to apply?

All solar PV systems applying to qualify under the SMART program must submit a Statement of Qualification Application to the Massachusetts Department of Energy Resources (MA DOER). The application information must be submitted by the solar system owner, in consultation with the solar developer. The application process is detailed under the "Apply" tab on the SMART program website [9]. Dual-use systems applying to qualify as Agricultural Solar Tariff Generation Units must also apply for a Pre-Determination Letter from MA DOER, using a Pre-Determination Form [10].

What are the annual reporting requirements?

In order to continue to qualify for financial compensation over the 20-year SMART program period, the owners or managers of Agricultural Solar Tariff Generation Units must submit annual reports. The reporting form, which is currently under development, will require reporting of the following information:

Productivity of crop or herd: Including pounds harvested or grazed, herd size growth and/or success of the crop, as applicable, and actual productivity relative to expectations.

Crop management: Detailing any observable differences in necessary crop treatment relative to solely agricultural systems, including irrigation, soil amendments, disease and weed management, etc.

Potential changes for future years: Including revised crop or grazing plans.