

Location Considerations for Ground-Mounted Solar Photovoltaic Arrays



In 2018, the Massachusetts Department of Energy Resources (DOER) established the Solar Massachusetts Renewable Target (SMART) program, which regulates incentives associated with new solar photovoltaic (PV) development in the state. This document is part of a series of fact sheets designed to help farmers and others navigate the program. Additional fact sheets and information are available on the UMass Clean Energy Extension (CEE) website, <https://ag.umass.edu/clean-energy>.

There are many factors that go into choosing the right location for a ground-mounted solar PV system on your property. A solar developer or installer can work with you to determine the best site for a ground-mounted solar PV array, but it is helpful to have a sense of what characteristics should be considered when choosing a site. Some important considerations include:

Utility Zone

National Grid, Eversource, and Unitil are the three commercial electricity utilities that serve Massachusetts residents. All three companies are required to participate in the SMART program and provide solar incentives as determined by the regulation. However, some residents are served by municipal utilities, which may have their own solar incentive programs, but do not participate in the SMART program. It may not be possible to receive financial incentives to develop solar PV systems in municipal utility zones, which could affect the economics of an individual project.

Land Status

The SMART program compensates solar projects differently based on a property's status in terms of zoning, previous development, and other factors. In order to determine what financial compensation a solar development on your land may be eligible for, what restrictions may apply, and applicable permitting processes, you will want to determine your property's status under municipal zoning bylaws, including if your property is zoned for industrial or commercial development or located within a solar overlay district. Many municipalities have specific zoning requirements for solar facilities, including property line setbacks and other requirements. Zoning bylaws may be available on the

municipal website; otherwise, the town clerk, city planning department, or mayor's office should have this information on file.

Agricultural Land Status

Under the SMART program, Agricultural and Non-Agricultural lands are treated differently, and solar facilities sited on these lands may be eligible for different incentives. In addition to other considerations, you will want to determine whether your property qualifies as land in agricultural or horticultural use (as described under M.G.L. Chapter 61A), has been in the Chapter 61A program within the last five years, or is located on prime farmland soils, unique farmland soils, or soils of statewide importance, as defined by NRCS. For more information about determining Chapter 61A and farmland soil status, see our fact sheet [*Dual-Use: Agriculture and Solar Photovoltaics*](#).

If your land is under an Agricultural Preservation Restriction (APR) or part of the Farm Viability Enhancement Program (FVEP), additional restrictions also apply.

See our fact sheet [*Legal and Financial Considerations for Solar PV Arrays on Farms*](#) for more information about APR and FVEP restrictions, as well as requirements associated with the Chapter 61A program.

Interconnection Distance

A solar array must connect to the electricity grid in order to be eligible for financial compensation through the SMART program. Interconnection costs can be quite high for large systems, and interconnection distance is perhaps the most important site consideration for solar developers. Appropriate sites for medium to large solar facilities (> 50 kW) must be near a three-phase electric distribution line (ideally less than 2000 feet away), which has spare capacity and appropriate voltage to accommodate a solar facility.

Interconnection opportunities are something a solar developer or installer will investigate in consultation with your local electricity utility. You can gather your own preliminary information using navigable, on-line "hosting capacity" maps available from the electricity utilities, Eversource and National Grid (see **Figure 1** below for an example). On these maps, single-phase lines are shown in gray (Eversource) or pink (National Grid); it may be difficult to connect systems larger than 50 kW to these single-phase lines. Three-phase lines are color-coded to display their current capacity to interconnect larger solar facilities. Clicking on a distribution line will bring up an information box providing more detail about the circuit, the related substation, and the line's remaining capacity to connect additional solar arrays or other distributed generation electricity sources. If the map shows that a line has little remaining capacity to connect additional solar arrays, it doesn't mean that interconnection is not possible. However, it could mean the line or substation may require significant upgrades before interconnection is possible, and the utility may require the solar project to pay for the cost of these upgrades.

Hosting capacity maps are available at the following links:

- Eversource East: <http://tinyurl.com/56nb94he>
- Eversource West: <http://tinyurl.com/yudsbzwe>
- National Grid: <https://systemdataportal.nationalgrid.com/MA/>

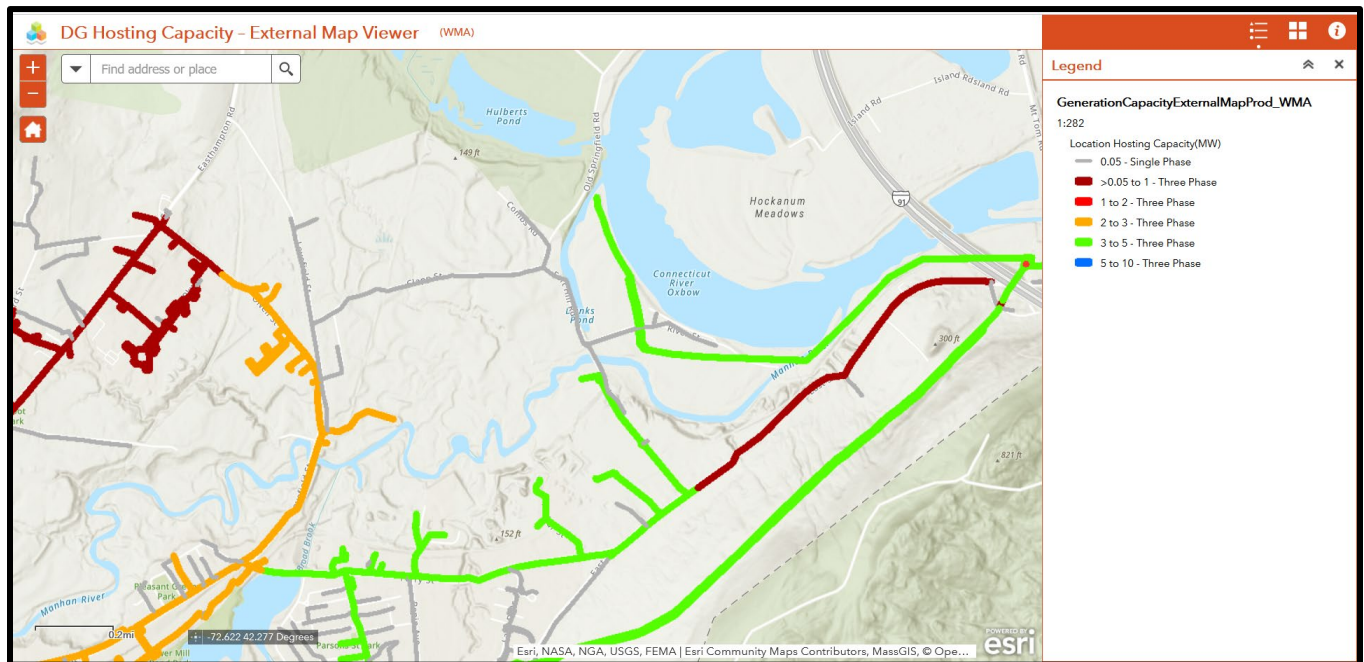


Figure 1 Example hosting capacity map showing single-phase lines (gray) and three-phase lines with the capacity to host solar PV systems less than 1 MW (dark red), 2-3 MW (orange), or 3-5 MW (light green).

The Massachusetts Clean Energy Center and several Massachusetts utilities have also developed interconnection guidance.

- MassCEC Interconnection Guide: <http://files.masscec.com/uploads/attachments/InterconnectionGuideforDistributedGeneration.pdf>
- National Grid Interconnection Process: https://www9.nationalgridus.com/masselectric/home/energyeff/4_interconnection-process.asp
- Eversource – Massachusetts Application to Connect: <https://www.eversource.com/content/wma/about/about-us/doing-business-with-us/builders-contractors/interconnections/massachusetts-application-to-connect>

Land Quality & Previous Land Use

Previous land use at the site will also play a major role in determining potential economic incentives for development. Siting projects on properties where there was previous development or disposal of hazardous materials may be more logistically, financially, and legally complicated, but often is associated with higher incentive rates (\$ per kWh) under the SMART program, and with lower impacts on agriculture and the environment.

Certain previously undeveloped properties or portions of properties may be ineligible for incentives for large, ground-mounted solar development if they are characterized as valuable wildlife habitat by the Massachusetts Natural Heritage and Endangered Species Program (NHESP). To determine whether portions of your property are characterized as BioMap2 Core Habitat, Critical Natural Landscape, or Priority Habitat by NHESP, see DOER's *Solar Installation Site Evaluation map* (<https://mass-oeea.maps.arcgis.com/apps/webappviewer/index.html?id=757833bf8c784d6c868379a8f929fdb>).

Productive Farmland

Installation of a large, traditional, ground-mounted solar array will in many cases eliminate your ability to farm the land, with the possible exception of sheep grazing. Under dual-use arrays, agricultural

production will continue, but shading from solar panels is expected to decrease crop yields to a greater or lesser extent. It is likely not in your best interest to locate panels on your most productive farmland. Certain types of agricultural use, like pasture or hay production, may be less affected by solar panels.

Accessibility

Is the property easily accessible from the road? Heavy equipment will need to enter the site to install the solar array racking system, panels, and transformers. Once the array is active, it becomes a regulated electric generation facility that must meet and maintain safety standards. The local fire marshal will need to approve a fire safety plan that enables appropriate vehicles and equipment access to the site in case of fire. The solar array may also require fencing for security reasons. If this is required at your site, it is important to consider whether having a locking gate will pose logistical problems for accessibility to the array site or other parts of the property. This is particularly true for properties where other activities, such as agricultural production, are on-going on a daily basis.

Slope

If you are considering putting solar on a sloping site or otherwise uneven ground, there may be additional issues and costs associated with array design and installation. Arrays are typically not installed on slopes greater than 20%, and some municipalities have restrictions on the maximum slope on which a solar facility can be installed. In the case of farms, most agricultural land is relatively flat, which is an asset for solar array installation.

Wetlands Regulations

Solar arrays are subject to Massachusetts Wetland Protection Act (WPA) regulations. Solar arrays placed in protected wetland resource areas will generally not qualify for financial compensation under the SMART program, although placement in wetland buffer zones may be allowable under some circumstances. Your town Conservation Commission can help you determine if any protected wetlands are present on your property, and if necessary, what modifications would need to be made in design or installation to allow solar development on your property.

The Massachusetts Department of Environmental Protection (MassDEP) has produced a guide to wetlands policy with regard to solar arrays. <https://www.mass.gov/guides/massdep-wetlands-program-policy-17-1-photovoltaic-system-solar-array-review>

Farm - Specific Considerations: Be aware that a number of agricultural activities are exempt from requirements of the Massachusetts Wetlands Protection Act (WPA), so you might not be aware if wetland habitats or buffer zones are present on your property. This exemption does not apply to solar arrays.

MassDEP has also released guidance regarding the development of solar PV arrays on existing cranberry bogs. See: https://ag.umass.edu/sites/ag.umass.edu/files/pdf-doc-ppt/guidance_on_agriculture_and_solar_energy_under_the_wpa_and_smart_programs_10_5_18.pdf

Proximity to Airports

Solar arrays are a potential hazard for airports and air traffic controllers due to glare. If your land is more than 5 nautical miles from an airport, there is no cause for concern. If your land is closer to an

airport, you should check with your local airport to ensure the solar array will not create a problem for air traffic.

The Federal Aviation Administration has a tool on its website where you can enter your latitude and longitude in order to determine if you need to file a notice with the agency when developing a solar array. <https://oeaaa.faa.gov/oeaaa/external/gisTools/gisAction.jsp>

Aesthetics

Are you or your neighbors going to be looking at the array on a daily basis? Abutters will be informed of the solar installation as part of the permitting process, and it is worth considering their feelings about the project. Attractive screening vegetation may be appropriate in some circumstances.

More Information

For more information, visit our website: <https://ag.umass.edu/clean-energy/solarag>.

After reviewing website materials, you can contact Zara Dowling (zdowling@umass.edu, 413-545-8516) with any additional questions related to solar PV use on your farm.