

Current Efforts to Address Solar & Land Use Issues

at UMass Clean Energy Extension



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UMass Clean
Energy
Extension

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UMass**Amherst**

Clean Energy Extension

UMass Clean Energy Extension

- Part of Center for Agriculture, Food, and the Environment (CAFE) at UMass Amherst
- Website: ag.umass.edu/clean-energy
- Renewable energy and energy efficiency
- Outreach and applied research
- On-going technical assistance services
- Current initiatives
 - Offshore wind workforce training
 - Offshore wind and wildlife research and coordination
 - Energy storage
 - Energy efficiency in municipal buildings
 - Reducing fuel use by municipal fleets
 - **Western Mass Solar Forum ☺**
 - **Community Planning for Solar**
 - **Pollinator-friendly Solar Certification**
 - **Agrivoltaics (Solar PV and Agriculture) Research**

Community Planning for Solar Toolkit



SOLAR ENERGY
INNOVATION
NETWORK
U.S. DEPARTMENT OF ENERGY

ag.umass.edu/solarplanning

Core Research Team: UMass Clean Energy Extension, UMass Department of Environmental Conservation, Colby College

Local Municipal Partners: Towns of Blandford, Wendell, Westhampton; Pioneer Valley Planning Commission; Franklin Regional Council of Governments

Regional Resource Partners: UMassFive College Credit Union, Co-op Power, PV Squared (Worker-Owned Cooperative), Northeast Solar (Certified B Corp), Western MA Community Choice Aggregation

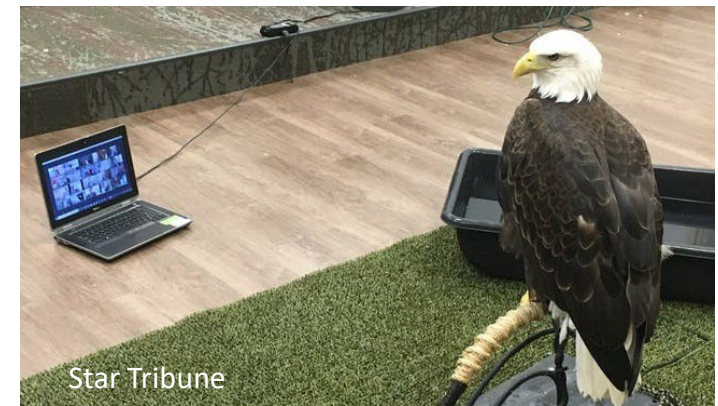
State Partners: Massachusetts Clean Energy Center, Massachusetts Department of Energy Resources, Massachusetts Department of Agricultural Resources

Creates a process for municipalities and residents to **proactively** plan for solar development aligned with local preferences



Solar Resource & Infrastructure Assessment

- Municipal zoning bylaws
- Planning documents (e.g., OSRP, MVP, Master Plan)
- Access publicly-available data regarding:
 - Electricity grid infrastructure
 - Renewable energy facilities
 - Businesses and farms
 - Households and tax parcels
- Access and map publicly-available geospatial data layers, including:
 - Tax parcels
 - Building roofprints
 - Streets and other impermeable surfaces
 - Protected land
 - Land of conservation value
- **Check for accuracy with municipal representatives!**



Solar Resource & Infrastructure Assessment

Desktop/GIS Analysis

- Areas available for development on:
 - Residential rooftops and properties
 - Medium to large-scale rooftops
 - Parking lots
 - Landfills and brownfields
 - Other previously developed sites
 - Farms
 - Undeveloped land suitable for commercial development

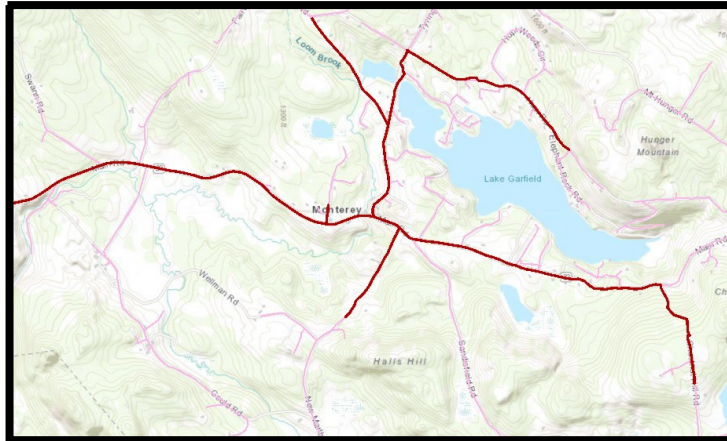


Town of Concord, MA



Solar Resource & Infrastructure Assessment

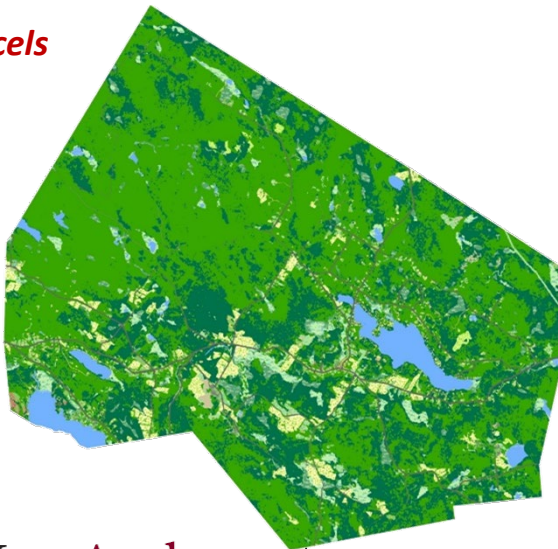
Grid Infrastructure



Building Rooftops & Parking Lots



Land Parcels



Outcome: Solar Resource & Infrastructure Report

RESOURCE TYPE	AVAILABLE RESOURCES	ESTIMATED TECHNICAL POTENTIAL
Residential-Scale Solar	<ul style="list-style-type: none"> - Estimated 248,300 sf of small building roof space suitable for solar - Estimated 636 buildings (67%) could support some solar - Estimated 318 buildings (34%) could support at least 1.75 kW of solar 	At least 1.7 MW, if 67% of households can install a roof or ground-mounted system
Medium to Large Scale Roofs	<ul style="list-style-type: none"> - Estimated 67,700 sf of roof space suitable for solar 	Estimated at 1.1 MW
Parking Lots & Impervious Surfaces	<ul style="list-style-type: none"> - 1.85 paved acres on municipal property (Swift River School, Highway Garage, Town Offices) - 1.75 acre lot at Scott's Garage - 2.7 gravel or paved acres at Djemand Farm - 3.3 paved acres at Kemsley Academy 	<ul style="list-style-type: none"> - TBD - Potential for 80 kW system at Swift River School, based on on-site evaluation
Landfills and Brownfields	<ul style="list-style-type: none"> - two landfill properties, 12.6 and 21 acres respectively 	Maximum of 6.6 MW
Agricultural Resources	<ul style="list-style-type: none"> - Multiple active farms - Barns with large roofs - Estimated 491 acres in agricultural production - Approximately 57 acres in Chapter 61a program for agriculture 	Dependent on project type
Undeveloped Land	<ul style="list-style-type: none"> - 74 large land parcels have at least 5 acres that are not protected, meet current state solar incentive criteria, municipal slope requirements, and do not have a structure worth more than \$25,000 on the property = 1,444 acres - development of most large land parcels would require significant forest clearing 	<p>Approximately 1 MW per 5 acres: 1,434 acres = 287 MW</p> <p><i>It is not expected that all undeveloped land available would be built out for solar development.</i></p>

Assessing Community Preferences

Approach:

- Work with Solar Planning Committee
- (Optional) Focus group of community residents
- **Community Solar Survey** open to all town residents and property owners

Goals:

- Understand the community's experience with solar development to date
- Use the survey to canvas the town as a whole and inform preferred development options (capacity, ownership structures, locations, types) and actions

Blanford Survey



8. Please indicate the reason(s) you do not have solar at your home. Please check all that apply.

I've had, or am aware of, negative experiences with solar energy.

I don't trust solar developers to work in my best interest.

I don't know enough about my options.

The upfront cost is too high.

Paying my electricity bill is cheaper than paying for solar panels.

My property is too shaded to allow for solar panels.

I am concerned that solar on my roof will be a safety hazard.

I don't own the property.

I am interested, but I need to wait until the next time my roof is replaced.

I am interested, but haven't found the time.

I am not interested.

Other: _____

Large, Ground-Mounted Solar

These projects are large enough to generate electricity for dozens or hundreds of households. Many systems like this exist in Western Massachusetts. These projects are an assembly of many solar panels connected together, installed on the ground, on various types of land, such as the images below.



Image: <https://www.whar.org>

9. What is your attitude toward large, ground-mounted solar energy in general?

Very positive Positive Neutral Negative Very negative

10. What is your attitude toward large, ground-mounted solar energy in Blandford?

Very positive Positive Neutral Negative Very negative

11. In general, do you believe development of large, ground-mounted solar energy should be:

Encouraged and promoted Allowed but not promoted

Allowed and promoted in appropriate circumstances Prohibited in all instances

Not sure

12. To what extent do you agree or disagree that the process of large, ground-mounted solar energy development in your town has been fair?

Strongly agree Disagree

Agree Strongly disagree

Neither agree or disagree Not Sure

The next set of questions will ask you about your thoughts regarding future solar energy in your community. Massachusetts is considering setting a goal of 100% renewable electricity by 2050, in order to reduce pollution from fossil fuel power plants. This will mean that large amounts of renewable energy will be needed, including solar energy. To meet this goal, many communities in Massachusetts will see proposals for new renewable energy development, including large-scale solar energy.

If you have questions about this survey, please contact Dr. Alison Bates, 207-859-5354 or alison.bates@colby.edu

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Develop *Community Solar Action Plan*

Bring together information from:

- Solar Infrastructure & Resource Assessment
- Financial Scenarios
- Community Solar Survey

Identifies next steps, actions, and who will carry out these steps:

These might include...

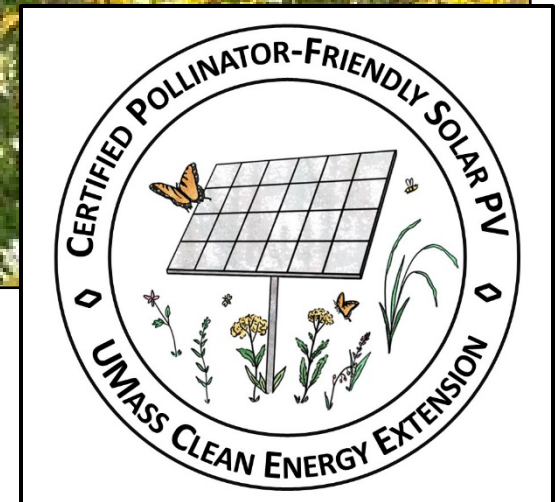
- Updates to solar bylaws/ordinances
- Pursuing specific projects on municipal land or buildings
- Campaigns to promote rooftop solar projects on residences or businesses
- Working with interested private landowners to encourage development on locations preferred by the community and encourage conservation of locations not preferred by the community

Next Steps: How can we expand this work?

- Three pilot communities (2020-2022) (Blandford, Wendell, Westhampton)
- Ten communities (August 2022-present) (Ashfield, Colrain, Deerfield, Heath, Leverett, Leyden, Northfield, Montague, Monterey, Whately)
 - With class of 12 UMass juniors and seniors

How to bring this to 351 towns and cities?

Pollinator-Friendly Solar Certification



Array Footprint



Stormwater Retention Basin



Wildlife Passage



As of January 2023...

- 45 certified projects, 11 solar development companies
- 9 of 14 counties
- 215 MW DC (128 MW AC), 600+ acres
- BUT...
 - 12 projects (33 MW DC) have withdrawn
 - Regulatory uncertainty threatens continued participation of additional projects

Pollinator-Friendly Solar Incentive

- Solar incentive adder (\$0.25/kWh) for pollinator-friendly Silver certification (or above) introduced April 2020
- DPU decision struck down adder in December 2021
- AGO opinion in support of adder, industry appeal
- 2022 Climate Bill – specific reference to pollinator-friendly “rebate”
- Uncertainty remains about how incentive will be implemented

Next Steps

- DPU/DOER decision-making will (hopefully) relieve regulatory uncertainty
- Research: *How can pollinator-friendly solar work in practice?*



Agrivoltaics (Solar and Agriculture)



UMass Extension Involvement in Agrivoltaics

- Review draft Pre-Determination applications for ASTGU under the Massachusetts state solar incentive program (SMART)
- Provide information to farmers and developers
- Conduct research on small-scale array at UMass Research Farm
- Conduct research on dual-use cranberry projects
- **DOE-funded research study**



IMPACTS OF DUAL-USE SOLAR ON CROP PRODUCTIVITY AND THE AGRICULTURAL ECONOMY IN MASSACHUSETTS AND BEYOND

Support from U.S. Department of Energy, Solar Energy Technologies Office

Research Objectives

- Contribute significant research to better understand the impacts on agriculture productivity of agrivoltaic installations
- Assess the role of agrivoltaics on farm financial viability and the agricultural economy broadly
- Disseminate this information to research and stakeholder communities

Research Site Trials - Cranberries



Small portion of array has been completed. Special matting used to install poles and structures to reduce damage to soils and cranberry vines.



Soil compaction sampling. Array support poles (CCA pressure treated) installed for 2 sites.

Installation across PineGate projects is now delayed ~6 months to replace CCA poles with precast concrete poles.

Array completion across all three sites anticipated spring or early summer 2022.

Site trials in first year will focus on soil and cranberry vine (perennial) recovery, along with fruit production.

Research Site Trials - Crops, Hay, Grazing



BlueWave/AES, two Grafton projects mechanically completed in fall 2021. Bi-facial array, animal fencing installed.

Baseline testing and cover crops completed in fall/winter 2021.

Preparing for site trials on both sites (vegetables and grazing) – spring 2022.

Dighton project is facing delay due to supply chain issues on racking with financial implications.



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Research Site Trials - Crops, Hay, Grazing



Sun Bug, Monson
project installed 2020

Preparing for site trials
(hay) – spring 2022

