

UMASS CLEAN ENERGY EXTENSION

Quarterly Progress Report to MA Department of Energy Resources

Period ending December 31, 2022

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This Progress Report provides a summary of work accomplished by the UMass Clean Energy Extension (CEE) during the period October 1, 2022 to December 31, 2022.

Externally Funded Project Activities¹

In this section, we provide updates and progress on projects for which CEE has received substantial funding support from outside the DOER Interagency Service Agreement (ISA). We recognize that these activities still rely critically on the ISA for enabling CEE to pursue external funds and to sustain our staff and office needs generally.

Impacts of Dual-Use Solar on Crop Productivity and the Agricultural Economy in Massachusetts and Beyond

Prime Funding: U. S. Department of Energy

CEE, in collaboration with state solar industry partners, state agencies (DOER and MDAR), a non-profit organization, and UMass collaborators, is leading a \$1.8M research project for *Impacts of Dual-Use Solar on Crop Productivity and the Agricultural Economy in Massachusetts and Beyond*, funded by the U.S. Department of Energy, Solar Energy Technology Office. This quarter, CEE and the project team entered into a No Cost Time Extension for the Budget Period 1 for 6 months (through March 31, 2023). The extension reflects that late start on the project due to protracted contract negotiations and improves the schedule of the research by ending each budget period well after the end of each agricultural growing year. Research continued on the three site trials with constructed arrays during this start-up year, deploying and testing field sensors and data collection systems, and evaluating and troubleshooting data integrity and verification procedures. The team dismantled the equipment for the winter and are well prepared to deploy again for robust data collection at the start of agricultural season in 2023. On the economic research, a uniform tool for on-site cost and yield data tracking throughout the project was substantively completed. Work continued on the literature reviews on economic theoretical models for solar renewable energy production on agricultural land, and on existing social acceptance of renewable energy projects. The project was presented or included in presentations/discussions at five venues, and a conference presentation abstract was submitted for an national annual agricultural conference in January/February 2023.

¹ Note on External Funds and CEE: An important strategic objective of CEE is to attract funds beyond our ISA with DOER. These external funds are tied to specific scopes of work and displace a portion of CEE core staff salaries from DOER funds; however, the bulk of these funds are typically used to extend CEE's capacities with other faculty, graduate students, consultants, and expenses tied to the project scope.

MassEnergyInsight Technical Support

Prime Funding: OptiMiser, as subcontract with DOER Green Communities

CEE continued to provide user support services to Green Communities MassEnergyInsight (MEI) users in partnership with DOER and OptiMiser, LLC. During this quarter, CEE successfully addressed 133 requests for user support across 84 municipalities and other entities. Other key tasks for this quarter included:

- Held an office hours session in October to provide user assistance in preparation for the upcoming Annual Report deadline.
- Published one newsletter listing training and support resources, in particular those relevant to the filing of Annual Reports.
- Participated in weekly team meetings with DOER and OptiMiser.

Community-Informed Proactive Solar Siting and Financing

Prime Funding: iCons Program, UMass

CEE staff (Dowling, Strong) developed and are co-instructing a UMass Carbon Zero Living Lab pilot course in collaboration with faculty from UMass Integrated Concentration in Science (iCons) program. The course, entitled *Clean Energy Living Lab: Community Solar Planning Teams*, is a two-semester, six-credit, project-based learning course, in which students facilitating proactive community planning for solar development in collaboration with ten Massachusetts municipalities. The course utilizes CEE's *Community Planning for Solar Toolkit*, developed under a grant with the National Renewable Energy Laboratory's (NREL) Solar Energy Innovation Network program in the category of *Solar in Rural Communities*. Students drafted solar resource infrastructure assessment reports for the project's 10 partner communities, and reports are being finalized for delivery in January.

Offshore Wind Energy Professional Graduate Certificate Program

Prime Funding: UWW Registration Fees; Mass Clean Energy Center, OSW Workforce Development Program (see two related MassCEC grants below).

CEE continued to develop the program in coordination with the UMass Department of Environmental Conservation, the College of Natural Sciences (CNS), and University Without Walls (UWW). During this quarter, CEE concluded the Fall 2022 program course (ECO 610 *Offshore Wind Energy: Technology, Resources, Grid Integration, and Trends*), with enrollment of 56 students (10 UMass graduate students and 46 professional continuing education students). This registration sustains the substantial growth of the program.

Creating Equity in the Offshore Wind Professional Workforce

Prime Funding: Mass Clean Energy Center, OSW Workforce Development Program

CEE received a grant from MassCEC to expand access to our Offshore Wind Professional Certificate Program to underrepresented and target populations, starting with BIPOC/ethnic minorities, followed by Veterans, individuals in Gateway Cities/EJCs, and indigenous populations, and women. Through its Offshore Wind Career Access Program, CEE will build capacity and a sustainable program for STEM-oriented near-term and recent graduates from 4-

year college degree programs from these Priority Groups, providing tuition scholarships and non-curriculum student support, a comprehensive professional development program, development of a robust recruitment pipeline, and solutions to potential barriers for the Priority Group students. We anticipate supporting 8 participants over this two-year pilot and developing recruitment pipelines with UMass campuses and other targeted institutions and workforce and economic development organizations. We will also establish a framework to expand our program across other higher education institutions and Priority Groups, and leverage foundation and industry support for a sustained scholarship fund.

During this reporting period, CEE, in collaboration with contractor and workforce diversity specialist Libby DeLucia, engaged in the third round of scholarship funding. We received 18 applications, which we prepared for review by the Selection Committee, which was scheduled to meet in early January. We also expanded our recruitment protocol to include new organizations and networks; with our additional outreach and recruitment avenues, we successfully reached over 50 organizations involved with underrepresented students, including community programs, nonprofits, business networks, and education programs across the state. Our current cohort of scholarship awardees continued to receive support during their third and final course in the series.

Expanding, Broadening, and Sustaining the UMass Amherst Offshore Wind Professional Certificate Program

Prime Funding: Mass Clean Energy Center, OSW Workforce Development Program

CEE was awarded a grant from MassCEC to expand, broaden, and sustain our Offshore Wind Professional Certificate Program. During this reporting period, the contract with MassCEC was finalized. This grant will fund focused outreach and recruitment from the Massachusetts workforce targeting the North Shore Blue Economy initiative, Gateway Cities, and MA Veterans, along with national targets including the offshore oil and gas industry; will provide increased support for our successful Career Access Scholarship program to fund an additional cohort of students from underserved backgrounds targeting MA and HBCUs; and will support enhancements to our curricular and pedagogical design and delivery with increased enrollment to 60-80 students per semester. It will also support the development of an undergraduate OSW overview course; and the provision of linkages to applicable training programs – such as the UMass Lowell OSHA safety trainings and the UMass Wind Energy Center FAST course – to our Certificate students. Further, the award will support the development of an Industry Partnership Program to 1) generate sufficient revenue for our long-term stability and growth, 2) mutually serve diversity workforce goals of CEE and the industry, and 3) further enhance the program’s value to industry needs.

Municipal GHG Inventories & Net-Zero Planning

Prime Funding: Pioneer Valley Planning Commission

As part of a collaboration with PVPC, we are developing GHG inventories for 11 Massachusetts communities located in Hampshire and Hampden counties, as well as assisting with basic scoping for municipal-level net zero planning in 6 municipalities. During this reporting period,

we made significant progress on the GHG inventories, including continuing to collect data, refine our methodology, and analyze results, and laying out the inventory report template.

Offshore Wind & Wildlife Science & Collaboration

Prime Funding: Regional Wildlife Science Consortium for Offshore Wind (RWSC)

During this period, we held two meetings with the RWSC Bird & Bat Subcommittee. We made progress in developing detailed recommendations regarding priority scientific activities necessary to assess and adequately address potential impacts offshore wind development on wildlife. We also continued to collect information about current and recent bird and bat research activities occurring in the Northwest Atlantic. These recommendations and information are informing draft components of the RWSC Science Plan, which will address collaboration opportunities and research priorities regarding effects of offshore wind development on wildlife species of interest to state and federal agencies, environmental NGOs, and offshore wind developers.

Green Communities and Municipal Support

In this section, we provide updates and progress on our activities directly serving Massachusetts municipalities in coordination with the Green Communities program. These activities are funded by DOER under the scope of our ISA.

CEE provided direct support to 31 communities, including arranging in-depth projects with five communities for the 2023 Clean Energy Corps class, providing support for implementation of past recommendations, and continuing planning for solar development using CEE’s toolkit (ag.umass.edu/solarplanning) as part of a service learning program with UMass students (see *Community-Informed Solar Siting & Financing* above).

City or Town	Technical Assistance
Agawam	Continued data collection and analysis for draft GHG inventory.
Amherst	Began to conduct the building inventory pilot in Amherst for the Climate Leaders program. Planned for a Clean Energy Corps study of Amherst Town Hall in spring 2023.
Ashfield	Students compiled complete draft <i>Solar Resource & Infrastructure Assessment</i> report.
Belchertown	Developed draft community GHG inventory.
Blandford	Continued data collection for draft GHG inventory.
Colrain	Students compiled complete draft <i>Solar Resource & Infrastructure Assessment</i> report.
Cummington	Continued data collection and analysis for draft GHG inventory.
Deerfield	Students compiled complete draft <i>Solar Resource & Infrastructure Assessment</i> report.
East Longmeadow	Continued data collection for draft GHG inventory.
Framingham	Continued discussion with Sustainability Coordinator and facilities staff, analysis of energy data and review of building information, leading to selection of Framingham Memorial Building (City Hall) for a Clean Energy Corps study next year.
Heath	Students compiled complete draft <i>Solar Resource & Infrastructure Assessment</i> report.
Holyoke	Continued to support study of water-source heat pump proposal made by Clean Energy Corps in 2021. Assisted with city’s proposal to DOE Community Geothermal grant program, submitted in October.
Hopkinton	Met with school department staff to review energy data, assist with prioritization of energy-related projects, and select a school for a 2024 Clean Energy Corps study.

City or Town	Technical Assistance
Leverett	Students compiled complete draft <i>Solar Resource & Infrastructure Assessment</i> report.
Leyden	Students compiled complete draft <i>Solar Resource & Infrastructure Assessment</i> report.
Longmeadow	Continued data collection for draft GHG inventory.
Montague	Students compiled complete draft <i>Solar Resource & Infrastructure Assessment</i> report.
Monterey	Students compiled complete draft <i>Solar Resource & Infrastructure Assessment</i> report.
Natick	Assisted with proposal to DOE Renew America’s Schools grant program for Ben-Hem Elementary School, as follow-up to 2022 Clean Energy Corps project.
Newburyport	Continued data collection to prepare for 2023 Clean Energy Corps study of City Hall.
North Adams	Continued assistance with improving operation of dysfunctional GSHP system in library.
Northfield	Students compiled complete draft <i>Solar Resource & Infrastructure Assessment</i> report.
Orange	Continued data collection to prepare for 2023 Clean Energy Corps study of Town Hall.
Palmer	Continued data collection and analysis for draft GHG inventory.
Pelham	Continued data collection and analysis for draft community GHG inventory.
Springfield	Continued data collection for draft community GHG inventory.
Sunderland	Discussed with Energy Committee a possible Clean Energy Corps study of Sunderland Elementary School in 2024.
Westhampton	Developed draft community GHG inventory.
Weston	Offered ongoing support for renewable district energy system proposed in 2022 Clean Energy Corps study.
Whately	Students compiled complete draft <i>Solar Resource & Infrastructure Assessment</i> report.
Worcester	Analyzed energy data to identify potential buildings to consider for a 2023 Clean Energy Corps study, and planned a meeting with staff to review and make a selection.

Climate Leaders

Lauren Mattison and Ben Weil continued working with DOER and OptiMiser on planning for the Climate Leaders program, including continuing to develop a data collection plan for building inventories, hiring students to pilot the inventories in Amherst, and beginning to train the students and conduct inventories.

Other Project Activities and Initiatives

In this section, we provide updates and progress on projects and initiatives that CEE pursues using funding primarily supported under the scope of our ISA.

Floating Offshore Wind Technology Research and Development

CEE is collaborating with the Professor Krish Sharman of the UMass Amherst College of Engineering in the research and development of a new technology designed to support enhanced performance of floating offshore wind installations. During this reporting period, technology design and testing advanced, a scale prototype was deployed and tested, and intellectual property and commercialization strategies were further refined in coordination with the UMass Amherst Technology Transfer Office.

ASTGU (Dual-Use Solar) Pre-determination Application Review for DOER SMART

CEE continues to advance discussions relating to dual-use research needs and opportunities with industry, state policymakers, and UMass stakeholders. During this quarter, CEE and Extension

staff reviewed five dual-use pre-determination applications (including one that was a revision of a previously submitted application) and completed the review of two additional applications. CEE has also formalized a process and financial compensation for our UMass agricultural extension colleagues who support the application reviews.

Pollinator-Friendly Solar Certification Program

During this reporting period, we provided certification to three projects which completed the review process. We continued to field questions and offer technical support to solar developers considering pollinator-friendly development, as well as discuss potential pollinator-friendly solar projects with environmental consultants and municipal board members.

UMass Campus – Carbon Mitigation Planning and Sustainability Strategies

CEE has taken an active role in a set of university-wide committees that have been established by the administration to plan for the campus’ own carbon mitigation and clean energy transition, and to design and establish an integrated “Living Lab” to bring widescale multidisciplinary learning, research, and engagement of the campus community as a vital part of this energy transition.

Paper Published: *Income and racial disparities in financial returns from solar PV deployment*, Energy Economics, Volume 117, January 2023.

With lead author Christine Crago (Resource Economics), Ph.D. student Emma Grazier, and CEE Breger, paper looks at Massachusetts SREC II program and evaluates outcomes with regard to disparities of solar project financial returns across race and income. Available at: <https://doi.org/10.1016/j.eneco.2022.106409>.

Business and Community Outreach and Support

The Clean Energy Extension staff held substantive direct interactions with the following businesses, state entities, and other organizations.

Entity and Attendees	Date and Format	Extension Staff	Purpose and Outcomes
DOER, Renewable and Alternative Energy Division Director	October 5, virtual	Breger, Strong	Provided overview and status of CEE to new Division Director, Samantha Meserve.
UMass DOE Dual-Use Research – Economic Advisory Committee	October 14, virtual	Breger, Fitzsimmons, Strong	Presented for input economic research and methods under DOE dual-use grant.
Clean Energy Workforce Development - Training Provider Meeting	October 18, virtual	Strong	Provided feedback and strategic direction to MassCEC-engaged clean energy workforce researchers.
Williams College, Student group project	October 19, virtual	Breger	Supported student project considering opportunities for agrisolar projects at Williams College.
Mass Clean Energy Center, Amplify MA	October 25, review submission	Breger	Provided outside review of technology/company proposal competing for MassCEC support.
Clean Air Task Force, Director, Clean Energy Infrastructure Deployment	October 28, virtual	Breger, Strong	Discussed market conditions and research activities regarding dual-use, agrivoltaics.

Entity and Attendees	Date and Format	Extension Staff	Purpose and Outcomes
Mass Clean Energy Center, Long Duration Energy Storage group	October 31, virtual	Breger, UMass WEC, ETI colleagues	Discussed UMass research on long duration energy storage, focused on offshore wind and hydrogen/ammonia concepts.
Worcester Polytechnical Institute, NSF project on solar siting	November 7 and November 18, virtual	Breger	Part of research project stakeholder group. Provided comments and discussion on project scope, methods, and data needs.
Greentown Labs, Katie Geusz, others	November 9, virtual	Breger, Strong, Dilthey	Discussed GTL planning, in partnership with Vineyard Wind, to support startups entering the offshore wind space, and how CEE may be a useful collaborator.
Town of Amherst, Town officials and company representatives	November 14, in person	Breger	Represented CEE in ribbon cutting marking start of operation of 4 MW solar plus battery storage project on capped landfill.
Rute Suntracker, (U.S. DOE Solar Prize winner)	November 21, virtual	Breger, Strong, Palano (MDAR)	Discussed cable supported dual-use array and provided linkages to dual-use research and market activities in MA.
Pace University Law, Law student review article	November 29, virtual	Breger	Discussed dual-use research and program policies in MA in support of legal research paper on issue being prepared for New York.
Pioneer Valley Planning Commission, Strategic Planning Scoping Focus Group	December 6, virtual	Breger	Participated in Focus Group with western MA officials on economic development planning around the energy transition.
UMass Donahue Institute, Strategy Renewal Listening and Engagement Session	December 9, in person	Breger	Invited representative from CEE to hear about UMDI renewal strategies and engage in discussion on areas of collaboration.
InSPIRE Advisory Committee	December 13, virtual	Breger, Strong	National NREL-supported forum for sharing market and research activities on agrivoltaics.
Mass Audubon-hosted Regional Discussion on Agrivoltaics	December 14, virtual	Breger, Strong	Discussed dual-use research as part of regional discussion on dual-use solar perspectives.
Saint Joseph's Abbey, Spenser, MA	December 14, virtual	Breger, Strong, Mattison, Weil	Reviewed Abbey's USFS report on wood district heating options for campus and offered broad range of energy options and next steps.
Mott MacDonald, Eric Steltzer, Principal Project Manager - Offshore Wind	December 16, virtual	Breger, Strong, Dilthey	Caught up with new position and discussed CEE OSW Professional Certificate program.
PA Southwestern School District, student project	December 20, virtual	Breger	Interviewed by middle school students regarding the future of clean energy.

Public Events and Outreach Activities

In this section, we itemize significant public-facing events and outreach activities in which CEE participated.

Event	Date and Location	Extension Presenter/ Attendee	Presentation Title/Topic	Audience	Estimated Attendance
Energy News Network, Emma Foehringer Merchant	October 18, virtual	Breger	Media interview regarding agrivoltaics and cable supported technology, Rute Suntracker	National energy industry news outlet	
Municipal Electric Association of Massachusetts – Communications & Energy Services Annual Conference	October 21, in person	Breger	<i>Community Planning for Solar Toolkit: Community-Informed Proactive Solar Siting and Financing in Massachusetts</i>	MA municipal electric program leaders	50
Envirothon, class offering to high school students	November 10, UMass campus, in person	Dilthey, Strong	Creating and delivered hands-on class on wind energy to participating MA high school students.	High school students participating in state Envirothon	20
Cornell Cooperative Extension, In-Service Program	November 16, 2022; virtual	Strong	Overview of MA solar, dual-use, pollinator programs and research	University extension researchers and professionals	20
UMass Institute of Diversity Sciences, Climate & Environment Research Group	November 22, in person	Breger	<i>Preparing for Renewables at Scale</i>	Students and faculty	25

Prospective Activities and Proposals

In this section, we provide updates and progress on proposals and collaborations that CEE pursues for prospective funded work to support CEE directly or in collaboration with activities led by other units on campus.

National Science Foundation – Planning Grant Proposal

CEE and colleagues contributed to the development of a substantial proposal for a planning grant under the NSF Regional Innovation Engine program. The proposal Northeast Carbon Zero provides a collaboration across the rural and second tier cities of New England states and New York to create a coordinated partnership in economic development and equity as we work collaboratively on common energy transitions issues. The planning grant is led by the University of Vermont, includes academic and community organizations. The Clean Energy Extension is the lead center for UMass. We await funding decision from NSF.

Cooler Communities, with Ener-G-Save and MassEnergize

CEE is collaborating at the invitation of Ener-G-Save in the expansion of the [Cooler Communities Program](#) – a statewide initiative dedicated to providing community-based climate, clean energy, and science education via K-12 educational curriculum in conjunction with school- and community-based events and engagements. CEE has supported the work in helping to develop a program budget, researching potential foundations and other financial supporters, and engaging with MassEnergize in a potential collaboration. During this reporting period, CEE continued to communicate with Ener-G-Save to discuss fundraising efforts, program updates, and program collaborations.

U.S Department of Energy, Deploying Solar with Wildlife & Ecosystem Services Benefits (SolWEB)

This quarter, UMass was selected for funding through the U.S. DOE’s competitive SolWEB grant competition. CEE’s role in the project is to coordinate with developers and ensure the inclusion of pollinator-friendly solar facilities in a research study of pollinator and bird ecology at solar facilities. Award negotiations were ongoing through this reporting period.

University-based Proposals and Initiatives

CEE is engaged with university colleagues as participants in the following proposals and initiatives.

CEE plays an active role in the Steering Committee of the UMass Energy Transition Institute (ETI) led by the Colleges of Engineering, Natural Sciences, and Behavior Science, and the School of Earth and Sustainability. ETI is a broad campus initiative to bring faculty across diverse disciplines to collaborate on cutting-edge research focused on encouraging a clean energy transition that increases social equity.

Carbon Zero Living Lab. CEE (Breger, Strong) plays a leadership role in the steering committee established to vision, plan, and establish a Living Lab to integrate academics, research, service, and campus operations as educational and applied learning opportunities associated with the campus goal of achieving carbon neutrality by 2032. As part of the UMass Amherst [Carbon Zero](#) initiative, CEE staff (Dowling, Strong) developed and are co-instructing a Living Lab pilot course in collaboration with faculty from UMass Integrated Concentration in Science (iCons) program. The course, entitled [Clean Energy Living Lab: Community Solar Planning Teams](#), is a two-semester, six-credit, project-based learning course, in which students are facilitating proactive community planning for solar development in collaboration with Massachusetts municipalities.

During this period, River Strong continued serving as a Civic Engagement & Service-Learning (CESL) Faculty Fellow for the 2022-23 academic year. This fellowship program is designed for university faculty to share experiences and assist in developing new learning opportunities for students in collaboration with off-campus community partners. River is applying this fellowship to the development of the *Clean Energy Living Lab: Community Solar Planning Teams* course reported above.

Student Engagement

In this section, in keeping with our mission to support students and workforce development, we list graduate and undergraduate students who have engaged with CEE during reporting period. Given confidentiality concerns, we provide only the students' initials in this publicly accessible report.

Student Initials, Status	Department	Extension Staff Mentor	Project Description
M.D., Graduate Student	Environmental Conservation	Breger, Strong	Support pedagogy and instruction of OSW Certificate program courses.
L.D., Graduate Student	Building Construction Technology	Mattison	MEI support
C.W., Undergraduate Honors Thesis	Environmental Conservation	Breger	Thesis Committee Chair on project evaluating and planning for reusable/returnable carry out containers for UMass Dining facilities
J.M., Graduate Student	Sustainability Sciences	Breger, Dilthey	Support services for administration of Offshore Wind Professional Certificate program
C.B., Undergraduate Honors Thesis	Environmental Conservation	Breger	Thesis Committee Member; UMass Amherst Campus Wellness Policy: Synergies Between The Okanagan Charter and Green Building Certifications
A.K., Undergraduate Honors Thesis	Public Policy	Breger	Thesis Committee Member; Implications of new federal IRA and Justice40 Initiative for Massachusetts residents and policy opportunities
H.C., Undergraduate	Environmental Conservation	Dowling	Senior capstone thesis regarding solar bylaws