

UMASS CLEAN ENERGY EXTENSION

Quarterly Progress Report to MA Department of Energy Resources

Period ending March 30, 2019

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This Progress Report provides a summary of work accomplished by the UMass Clean Energy Extension (CEE) during the period January 1, 2019 to March 30, 2019.

During this reporting period, the Clean Energy Extension continued its support of the Green Communities and SMART solar-agriculture dual-use programs, advanced efforts in support of clean heating and cooling markets, continued to explore the early-stage battery innovation ecosystem in Massachusetts, and facilitated interactions across industry, the university, and a range of research and outreach activities. Some key highlights, further discussed below for this reporting period include:

- Began a pilot project for DOER and in collaboration with the Metropolitan Area Planning Council to review the progress of and offer support to Green Communities that have been in the program for more than five years and not yet achieved the 20% energy reduction goal.
- Advanced research initiative to explore the early-stage battery innovation ecosystem in Massachusetts and facilitate interactions across industry and the universities – in collaboration with DOER and MassCEC. Supported a technical consultant, finalized a database of findings, and drafted a project report. Final report forthcoming in next reporting period.
- Advanced collaborations with farmers, developers, UMass Agricultural Extension, DOER, and Massachusetts Department of Agricultural Resource (MDAR) to develop tools, guidance, and a pre-determination form for those considering dual-use PV systems under the recently launched SMART program. Over this reporting period, CEE has continued its review of Pre-Determination forms for SMART applicants (2 forms reviewed with comments provided to applicant and DOER/MDAR), and conducted one on-farm meeting to offer direct assistance. In addition, we continue to update our fact sheets, add resources to our website, and provide one-on-one guidance to farmers and developers, and communities as new information becomes available.
- Provided DOER with preliminary results of 2017 performance by CHP systems in the APS program and a scope of work to continue that analysis.

- Supported 10 communities and non-profit organizations with UMass Clean Energy Corps building-energy site assessments, clean energy project evaluation and implementation, and general technical assistance.
- In coordination with DOER and Clean Cities Program, continued to develop fact sheets, reports, and other outreach materials to support municipalities in addressing rural transportation challenges and identifying opportunities to reduce municipal fuel consumption.
- Continued work with MassCEC to organize two April training sessions on heat pump and variable refrigerant flow technology.
- CEE Director and the campus Sustainability Manager are co-chairing the Chancellor's Carbon Mitigation Task Force charged with charting a plan for the University to rely on renewable energy and eliminate greenhouse gas emissions. Co-chairs have convened a 17-member taskforce including faculty, administration, and students. Task Force held two meetings during this reporting period. The Task Force will issue an RFP for a consultant to support technical tasks this summer.
- Continued training of six Clean Energy Corps students to support the development of a greenhouse gas inventory and clean energy plan for the newly acquired UMass Amherst Mount Ida campus during the spring and summer of 2019. This public service learning initiative is in coordination with campus Sustainability Manager, and will be integrated with DOER Leading by Example.
- Supported the Western Massachusetts Community Choice Energy (WMAcce) effort (comprised of Amherst, Northampton, and Pelham) by participating in Task Force activities, including project planning, developing funding proposals, and supporting research efforts.
- Convened a Review Board of stakeholders and experts and finalized a set of criteria and Best Management Practices for establishing and maintaining pollinator-friendly vegetation under and around solar PV arrays.

1. Extension Administration and Management

CEE Director and Associate Director participated in a UMass Risk Management workshop on January 15 to better understand and articulate organization and institutional risks associated with providing products and services.

2. Public Events and Outreach Activities

During this reporting period, CEE staff and affiliates have engaged in the following public events.

Event	Date and Location	Extension Presenter/Attendee	Presentation Title	Audience	Estimated Attendance
EOEEA/DOER Renewable Thermal Infrastructure Grant Awards Announcement	February 11, Wagner Wood, Amherst	Breger, Strong, Beebe	n/a; (CEE provided advisory support for Wagner Wood's proposal)	State, local officials, industry participants, citizens	100
Environmental Business Council of New England meeting with DOER commissioner and division directors	January 9, Boston	Mattison	N/A	Energy/environment professionals	60
DOER meeting with Japanese delegation	March 7, DOER office	Mattison	N/A	Staff from DOER, Eversource, Mitsubishi Research Institute, Tokyo Electric Power	11
Pollinator Habitat Conference	March 14, Connecticut Agricultural Station	Dowling	Presented on BMPs for pollinator-friendly habitat under and around solar arrays	Pollinator researchers from MA and surrounding states	75
Green New Deal Forum with Senator Ed Markey and Congressman Jim McGovern	March 24, Northampton High School	Mattison	N/A	Elected officials, community members	400
Massachusetts Sustainable Communities and Campuses Conference	March 29, Cambridge	Mattison, Simon Pereira (Clean Energy Corps)	Simon Pereira, Campus Student Leaders panel	Campus sustainability and facilities managers, educators, industry vendors.	200

3. Green Communities and other State/Municipal Assistance

Community Choice Energy (Northampton, Amherst, Pelham)

CEE continues its engagement with the Western Massachusetts Community Choice Energy organizers to support the towns of Northampton, Amherst and Pelham, which have all approved the exploration of a municipal aggregation for electricity with innovative efforts to enhance strategic investments in local energy efficiency, demand reductions, and renewable generation. CEE is providing analytical support, and is participating in Task Force activities, including project planning, developing funding proposals, and supporting research efforts. During this quarter, CEE helped to develop an awarded proposal, submitted by Northampton to the Urban Sustainability Directors Network from which the services of two consultants were secured. The consultants commenced analyzing the feasibility and specifics of further developing and implementing the WMCCE.

Green Communities

CEE continue its project with DOER, in collaboration with the Metropolitan Area Planning Council, to support a Green Communities program evaluation of a sample of designated communities' progress on the energy reduction criterion. In this quarter, we held initial meetings with staff from four municipalities (Monson, Northampton, Mashpee, and Westford). We carried out data analyses to evaluate the accuracy of the baseline, compare MEI data and annual reports, and accurately tally and report implemented ECMs. We began development of an Excel-based tool to help municipalities better understand their building energy usage, and identify areas for improvement.

We continue to develop information and resources regarding opportunities for communities to reduce fuel consumption of municipal fleets. During this reporting period, we completed a fact sheet providing an overview of practices to reduce fuel consumption by municipal fleets. We shared a final draft of our report regarding strategies to reduce fuel consumption with DOER Green Communities and Mass Clean Cities Coalition staff, and finalized recommendations for the DOER Green Communities program, regarding measures that could be implemented through the program to help municipalities reduce fuel consumption.

CEE continues to provide technical assistance to Massachusetts towns in support of Green Communities. During this reporting period, CEE engaged with 10 communities and non-profit organizations with UMass Clean Energy Corps building-energy site assessments, clean energy project evaluation and implementation, and general technical assistance. As part of our work helping municipalities to understand their energy usage, we also updated and streamlined our Municipal Energy Assessment tool. This updated tool was used to develop Municipal Energy Assessments for New Salem and Cohasset.

As part of Green Communities (or outside this program), CEE staff and affiliates have engaged with the following communities:

City or Town	Status	Technical Assistance
Cohasset	Green Communities/Municipal technical assistance	CEE (Weil, Clean Energy Corps) conducted a Clean Energy Site Assessment and analyses for the town's historic town hall. CEE (Strong, Weil) also provided the town with a Municipal Energy Assessment.
Colrain	Green Communities/Municipal technical assistance	CEE (Beebe, Weil, Clean Energy Corps) conducted a Clean Energy Site Assessment and analyses for the Colrain Central School. In addition, Weil conducted a building energy educational classroom session with the school's 4 th -grade students.
Drama Studio	Non-profit technical assistance	CEE (Weil, Clean Energy Corps) conducted a Clean Energy Site Assessment and analyses for this non-profit's newly acquired facility located in Springfield, MA.
Leyden	Green Communities/Municipal technical assistance	CEE (Weil, Clean Energy Corps) conducted a Clean Energy Site Assessment and analyses for Leyden's town hall.
Mashpee	Green Communities	Held initial meeting (Mattison) and began analysis for Green Communities review pilot project.
Monson	Green Communities	Held initial meeting (Mattison, Dowling) and began analysis for Green Communities review pilot project.
New Salem	Green Communities/Municipal technical assistance	CEE (Weil, Clean Energy Corps) conducted energy savings analyses and estimates associated with ECMs in the town's Green Communities Energy Reduction Plan. CEE (Weil, Dowling, Strong) finalized the Clean Energy Site Assessment for New Salem's Swift River School, and provided New Salem with a Municipal Energy Assessment.
Northampton	Green Communities/Municipal technical assistance	CEE (Weil, Clean Energy Corps) conducted a Clean Energy Site Assessment and analyses for Northampton's Leeds Elementary School. Held initial meeting (Mattison, Dowling) and began analysis for Green Communities review pilot project.
North Quabbin Harvest Co-op	Non-profit technical assistance	CEE (Weil, Clean Energy Corps) conducted a Clean Energy Site Assessment and analyses for this community co-op located in Orange, MA.
Pittsfield	Green Communities/Municipal technical assistance	CEE (Breger, Strong) advised Pittsfield regarding strategies and approaches for updating of its municipal Climate Action Plan.
South Hadley	Green Communities/Municipal technical assistance	CEE (Weil, Clean Energy Corps) conducted a Clean Energy Site Assessment and analyses for South Hadley's high school building.
Westford	Green Communities	Held initial meeting (Mattison) and began analysis for Green Communities review pilot project.
Westhampton	Green Communities/Municipal technical assistance	CEE (Beebe, Dowling) worked with Westhampton to correct their GC baseline, adding solar generation from the library, and evaluate boiler options at the elementary school.
Whately	Green Communities/Municipal technical assistance	CEE (Weil, Clean Energy Corps) conducted a Clean Energy Site Assessment and analyses for the Whately Elementary School.

4. Business 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
MassCEC, InnovateMass	January 15, report	Beebe	Served as a Technical Reviewer for the InnovateMass program; entailed scoring applications for early stage clean energy businesses on technical and commercial viability
Peregrine Energy Consulting	January 17, conference call	Breger, Strong	Discussed collaborative efforts and potential partnerships related to the MassEnergyInsight energy management platform.
Paul Fenn, Local Power	January 18, conference call	Breger, Strong	Discussed collaborative efforts and potential partnerships related to a Community Choice Energy UMass incubator proposal directed to the Barr Foundation.
Dave Timmons, UMass Boston	January 23, CEE	Breger, Dowling, Strong	Meeting to discuss projects related to microgrids, biochar and other areas for potential collaboration.
Danish Embassy Representatives	January 23, UMass Geosciences	Breger, with Steve Mabee (state geologist)	Met with Danish embassy representatives regarding Danish experience and industry capacity for campus planning for low temperature distribution and GHG reductions.
Bob O'Connor, Massachusetts Executive Office of Energy & Environmental Affairs	January 30, UMass	Breger, Strong	Discussed progress and next steps for the cross-laminated timber life-cycle analysis project underway in partnership with New England Family Forests.
Clean Energy States Alliance	February 7, conference call	Beebe, Breger, Strong	Discussed progress and next steps for a Renewable Heating & Cooling screening tool being developed for participating state energy offices.
Synergy Energy	February 6, conference call	Dowling, Strong	Discussed Synergy's dual-use solar-ag pre-determination application.
Institute for Social Science Research – Funding Workshop	February 7, UMass	Breger, Strong	Workshop to discuss funding opportunities and proposal development for forthcoming ISSR Seed Grant RFP.
Michael Lehan, Hyperion Systems, LLC	February 11, conference call	Breger, Strong	Call to discuss CEE support of Hyperion's grant proposal to the U.S. DOE's Solar Technology Office, <i>Solar Power on Agricultural Production Land for Farm Sustainability</i> .
Suddekor, LLC	February 12, site visit	McDaniel, Kosanovic	Conducted site visit and analysis for a combined heat and power system for

			the Suddekor LLC in East Longmeadow, MA
DeWitt Jones, BlueHub Capital	February 14, CEE; and Wind Energy Fellows Seminar	Breger, Strong	CEE hosted DeWitt Jones for Wind Energy Fellows seminar series topic on energy equity. CEE met with DeWitt prior to seminar to discuss MA solar policy, opportunities and challenges to serve low-income communities, and potential project collaborations.
Southern Light Solar	February 20, conference call	Dowling, Strong	Call to discuss MA SMART program and dual-use solar-ag project ideas.
New England Family Forests	February 20, conference call	Breger, Strong	Call with NEFF and Peggi Clouston of UMass BCT to discuss status and next steps for cross-laminated timber life-cycle analysis project.
The Nature Conservancy	February 22, CEE	Breger, Dowling, Strong	Meeting with Laura Marx to discuss a range of projects and collaborations, including solar-pollinator certification and cross-laminated timber life-cycle analysis.
Fairland Farm Dual-Use Project Site Visit – MDAR, Next Sun Energy, UMass Cranberry Station, Cape Cod Cranberry Growers’ Assoc.	February 26, Norton, MA	Dowling, Strong	Site-visit to review and discuss dual-use solar-ag project application.
Eureka/Girls Inc.	February 27, UMass	Dowling	Prepared for summer program with high school students regarding renewable energy development
American Farmland Trust	February 27, UMass	Dowling	Discussed issues regarding solar development and agriculture in the state
Tom Bowman, Bowman Engineering	March 5, CEE	Breger, Strong	Meeting with Tom Bowman to discuss municipal energy analysis and potential areas of collaboration.
Electric Power Research Institute	March 6, conference call	Dowling, Strong	Call with Ashley Bennett of EPRI to discuss dual-use solar-ag research, solar-pollinator certification, and other areas of potential collaboration.
UMass Physical Plant, ACES Energy Storage Research	March 7, UMass	Breger, Strong, Kosanovic, McDaniel	Meeting with the UMass Physical Plant ACES research team to discuss project organization, roles, and data availability.
Nantucket Sound Group	March 8, UMass	Kosanovic, McDaniel	Conduct analysis for micro-grid in Yarmouth, MA
Lynn Benander, Co-op Power	March 14, CEE	Breger, Strong	Discuss providing support and financial services to Co-op Power’s expanding portfolio of community-owned solar projects.
Massachusetts Water Resources Authority, Clinton, MA WWTP	March 15, site visit	McDaniel, Kosanovic	Conducted site visit and analysis for a biogas combined heat and power system for the Clinton WWTP
MassCEC, Town of Amherst, Blue Thermo, Center for Energy Efficiency and Renewable Energy, Water Innovation	March 21, conference call	Strong, McDaniel	Call to discuss contracting details related to the Amherst WWTP/Blue Thermo heat recovery project

Network for Sustainable Small Systems			supported with funding from MassCEC.
Pennsylvania State University - Energy Extension Program	March 25, CEE	Breger, Strong, Kosanovic, CAFE	Meeting to review CEE's mission, strategy, programming, and potential collaborations with Penn State as they establish clean energy programs and services.
Sharon Weber, MassDEP	March 27, CEE	Breger, Strong, School of Earth and Sustainability	Hosted Sharon Weber as guest speaker in class, and lunch seminar speaker for undergraduate and graduate students on state climate policy and career opportunities.
Nantucket Sound Group	March 28, UMass	Kosanovic, McDaniel	Conduct analysis for micro-grid in Brockton, MA

5. Research Activities and UMass Clean Energy Corps

Research Activities and Funding Opportunities

CEE partnered with Peregrine Energy and Optimizer on a proposal to DOER in response to an RFQ to provide continued maintenance and user support of the MassEnergyInsight tool. CEE primary role in the proposed effort is to provide user/customer support and training, which is well aligned with our current role in supporting MA municipalities.

CEE collaborated with industry partner Sustainable Energy Advantage, LLC and UMass colleagues in Resource Economics and Environmental Conservation to submit a proposal in response to an RFP from the Institute for Social Science Research's Seed Grant program. Seed Grants are intended to support proposals that are not likely to be funded by traditional granting organizations because they are early in development and interdisciplinary in nature. The project proposes examining distributional impacts of the economic rents from Massachusetts solar programs.

CEE was awarded a Center for Agriculture, Food and the Environment (CAFE) Summer Scholar to support an undergraduate intern for a project on Municipal Planning for Carbon Neutrality.

CEE continued work on the Renewable Thermal Alliance (Yale U.) Seed Innovation Grant award project: *Understanding Renewable Thermal Market Penetration Outcomes – Comparative Evaluation Tool*. This proposal was awarded \$20,000, and the effort was kicked-off at the RTA webinar on December 11.

CEE continued providing technical input to support the selection and design of a clean heating and cooling system calculator tool, in partnership with the Clean Energy States Alliance and northeast regional state energy offices. These efforts are in service of the Renewable Thermal Alliance (Yale U.) Seed Innovation Grant project: *Consumer-Facing Cost-Carbon Calculator for RH&C Technologies*.

CEE continues to explore a program design for an offshore wind professional graduate certificate program in coordination with the University College of Natural Sciences and the Office of Online / Continuing & Professional Education. CEE submitted a proposal in November to MassCEC's Massachusetts 2018 Offshore Wind Workforce Solicitation, and awaits the review and decision from MassCEC.

CEE and its project partners (the Center for Energy Efficiency and Renewable Energy and the Water Innovation Network for Sustainable Small Systems, the Town of Amherst Wastewater Treatment Plant, Blue Thermo) were awarded funding from MassCEC's Wastewater Treatment Innovative Technology Program. The project will pilot an innovative wastewater-source heat pump at the town WWTP and deliver heat to the building facility.

CEE continued to provide technical support to the communities of Northampton, Amherst, and Pelham under the Urban Sustainability Directors Network (USDN)-funded project to advance the western MA towns intent to establish a progressive Community Choice Energy Aggregation 3.0. The consulting team of Paul Gromer, Peregrine Energy and Paul Fenn, Local Power commenced work in January and are providing regular progress updates.

CEE is collaborating with partners in the Mechanical and Industrial Engineering, Computer and Electrical Engineering, Environmental Conservation, and Resource Economics on an NSF Research Traineeship (NRT) "convergence" proposal to establish a graduate student research collaboration on a Transition to a Sustainable Energy Future. CEE has led the proposal development in the area of integrating economics, equity, and policy into the proposed program scope and design.

CEE and the Center for Energy Efficiency and Renewable Energy (CEERE) collaborated with Dr. David Reckow in the Department of Civil and Environmental Engineering on his proposal to the NSF Mid-scale Research Infrastructure solicitation on research technology testing in the water-energy nexus.

CEE in collaboration with Benjamin McDaniel, Dr. Beka Kosanovic and graduate researchers (CEERE) are currently developing deep learning models to forecast energy loads for optimal distributed energy resource dispatch. This research effort is tied to the ACES battery demonstration project at UMass Amherst supported by MassCEC and the University Physical Plant and aims to provide campus microgrid operators with models for optimal dispatch of the newly built battery system.

CEE in collaboration with Dr. Beka Kosanovic and Benjamin McDaniel (CEERE) have started work on the Design Preparation for Large Scale, Long Duration Thermal Storage to Enhance Electric Generation and Reduce Fuel Oil Use for UMass Campus CHP Plant in association with the ACES battery demonstration project. This project will be the thesis topic of a newly hired graduate researcher who will work closely with Dr. Kosanovic and Mr. McDaniel to explore the potential of thermal energy storage within the campus microgrid.

Clean Energy Corps

CEE staff, in collaboration with CEE co-PI Ben Weil, has been engaged with local Green Communities and other organizations in identifying energy problematic town/school/non-profit buildings for Prof. Weil's spring 2019 Clean Energy Corps class. Fifteen students in Professor Weil's spring course Clean Energy Corps provided building walkthroughs, energy diagnostics, and energy efficiency and renewable thermal recommendations to seven towns (Cohasset, Colrain, Leyden, New Salem, Northampton, South Hadley, Whately) and two non-profit facilities (Drama Studio, North Quabbin Harvest Co-op). The towns and organizations approached CEE for such support and energy data was used to identify buildings to target. Findings and final reports to the town will be provided in May.

During this reporting period, Clean Energy Corps interns have worked on the following projects with CEE staff mentors:

- Support of Green Communities program providing western MA towns with Mass Energy Insights support, preparation of Municipal Energy Assessment and Clean Energy Assessment reports.
- Evaluation and data analysis of the challenges, opportunities and best practices to reduce fuel use and greenhouse gas emission in rural municipal fleets, in coordination with DOER Clean Cities program.
- Transportation policy research regarding opportunities and barriers to increasing access to public transportation and electric vehicles for underserved populations.
- Research on offshore wind professional education programs around the U.S. and world, and development of industry contact database.