

Building Energy - FY 23

Status: NIFA REVIEW

Project Director

Benjamin Weil

Organization Project Number

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Accession Number

7004884

Start & End Date

10/01/2021

Organization

University of Massachusetts

To Project / Program

"Building Energy"

Primary Critical Issue

Sustainable Energy

Fiscal Year

2023

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Municipally owned buildings often are the largest energy user in each city or town. Cities and towns are usually under-resourced but many have statutory commitments to reducing carbon emissions. In short, they have many large, inefficient buildings that will not be replaced, and they want to get to zero carbon emissions, but they don't know how. Further, many small cities have intentions to decarbonize all energy use. Lower-cost, higher-efficiency approaches such as district energy networks is an increasingly urgent problem to solve, but involves tremendous complexity in design, regulation and management.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Working alone and with my Clean Energy Corps teams, I provide energy analysis and high-level energy planning to Massachusetts cities and towns. These are unique, actionable, and specific plans that municipalities use to apply for grant funding to implement. All plans, when completed, will result in zero-carbon emissions buildings. After plans are delivered, I follow up with all municipalities to aid in the pursuit of funding. Once funded, I provide technical assistance and play the role of owner's agent in educating contractors on the latest energy efficient technology and the reason for the system design choices. During and after the implementation period, I also provide verification and diagnostics to make sure that all measures were implemented correctly.

Briefly describe how your target audience benefited from your project's activities.

Municipal officials and volunteers gained building science knowledge, better understanding of their buildings, and specific plans that will enable them to pursue zero carbon emissions operations in all major municipal buildings through many phases, that -- depending on financing availability -- may take as much as a decade to complete.

Mass DOER Green Communities Program benefits from my municipal services through the development of actionable, vetted, plans that are the basis of many grants that they fund.

Utility companies (investor owned and municipal) are able to more effectively direct their municipal and commercial energy efficiency budgets to projects that are funded by multiple sources and have benefit of being developed by an independent, non-conflicted, third-party expert from the UMass Extension system.

Contractors and Engineering firms who are selected by the municipalities to implement components of the plans gain exposure to new and improved ways to use existing technology, how to specify some of the newer technology, and improved ways to specify and control the products they install.

Briefly describe how the broader public benefited from your project's activities.

The buildings we work to improve are schools, department of public works and public safety buildings, and city halls. In all cases, our recommendations improve indoor environmental quality, reduce energy costs (and thus public budget devoted to energy expenditures), and thermal comfort. Improvements in thermal comfort and ventilation have been shown to improve cognitive abilities, reduce absences, and

improve standardized test scores for school children. Similar benefits in worker productivity and worker safety are found in contexts like offices (city halls) and technical field (police, fire, DPW). More broadly, these projects serve as models for future decarbonization of existing buildings in the public and private sector. Thus, the public benefits by increased experience and solution sets for decarbonizing buildings as demands for a zero-carbon economy increase.

I also worked with local advocacy organizations, local government energy and sustainability commissions, and provided policy advice to mayors, city councils, and municipal department directors on energy and building-related topics. This allowed broader dissemination of important ideas and increased the capacity of these organizations.

Comments (optional)

Publications

- Elton, Harper, Bullard, Griffith and Weil. 2022. Volunteer engagement in urban forestry in the United States: A review of the literature. *Arboricultural Journal* 44:1-23.
- Elton, Harper, Griffith and Weil. 2022. Exploring urban forestry non- governmental organisations (NGOs) in the Eastern United States. *Arboricultural Journal* 44:1-18.
- Baker, Weil, Sheikh, Wilen, Soto, and Ansari, The Giant Dipper effect: electrifying heat and grid integration, *Solar Energy*

Grants: EPA STAR: Community-Engaged Co-Design for a Just and Sustainable Energy Transition; USDOE Healthy Learning Environments Matter: Improving Health, Education, Equity, and Environmental Outcomes at Bennett-Hemenway Elementary School.

Comprehensive Decarbonization Plans: Orange Town Hall, Worcester City Hall, Framingham Municipal Complex, Newburyport Town Hall, Northfield Elementary School

Consulting

- Holyoke. Guided measure specification for 4 municipal buildings + entire school fleet. Main concept, writing and technology assessment for DOE geothermal district grant
- Northampton. Library emergency boiler replacement plan. New building energy efficiency standards for special permits. Hiring Cttee for new CAPA director.
- Undaunted K-12: ventilation-driven decarbonization road map
- North Adams. Solved failing open loop geothermal heat pump for Library.
- Hopkinton. High School guidance on prioritization.
- Saint Joseph's Abbey. Produce process steam for preserves factory, with wood pyrolysis cogeneration plus biochar for carbon sequestration from waste wood chips.
- DOER. Decarbonization plan template, building asset detailed data collection tool, upload mapping to MEI database.
- Lowell Mason House museum consultation.

Frontier Regional School. Consultation on replacement of failing boilers with hydronic heat