

**Project: Building Energy**

**Project Leader: Ben Weil**

**Project Overview**

The Building Energy Extension Program conveys current energy efficiency, renewable energy, and building science information to stakeholders including those in the building trades, design professionals, state government agencies, and building owners and occupants through workshops, web publication, and consulting. Applied research in building energy systems and is conducted to respond to perceived stakeholder need.

**Activity Summary – 2015**

- Board Member Western Mass Green Consortium
- Consultant and facilitator for Utility energy efficiency program for RCS Energy Services
- UMASS Energy Extension Consultant for citizens of the State of Massachusetts

***Total Educational contacts***

	Youth Contacts	Adult Contacts
In Person		561
Indirect Contacts (Print, Web, etc...)		737

**Narrative summary and Impact**

With the building energy extension program I have focused on serving three main constituencies: municipalities and other governmental agencies, non-profit and public institutions, and residential energy users. I work with commercial and industrial partners to serve those markets and to develop technologies or processes that can grow markets for energy efficiency.

Municipal governments make decisions that can have large impacts on energy development and have building portfolios with a large potential for greenhouse gas emissions reductions. However they are also typically under-resourced and most lack expertise in energy issues. I have become a regular resource for the energy committees of cities and towns across the state.

I have worked extensively with towns on planning new—or renovating old—school buildings to push them towards low and net zero energy building design. The modeled energy use of the Greenfield High School was 30% lower than the design model indicated it would be before my intervention. The new Rowe Elementary School will be a very high performing building that is net-zero energy capable. The Warwick Elementary School had significant ice-dam issues, which I helped to resolve, while also cutting heating energy use by 20%. Sunderland requested my peer review of an engineering study to retrofit the school with pellet boilers: my recommendations will reduce the proposed project first costs by \$130,000, and will enable a 75% reduction in greenhouse gas emissions.

In May 2014, in collaboration with Massachusetts DOER, I organized and promoted a conference for municipal officials called “Helping Communities with Renewable Energy and Energy Efficiency”. Over 200 municipal officials from across the Commonwealth attended this conference, sharing information, best practices, and resources for clean energy projects. DOER officials, and UMass subject area experts presented workshops on PV, wind, building efficiency, combined heat and power, and biomass heating.

Working with other UMass collaborators, I was instrumental in securing a \$6 Million seed grant to create a Massachusetts Energy Extension Initiative. The Initiative provides Energy Extension service to municipalities and commercial enterprises through collaboration and applied research. It leverages UMass existing resources to provide test bed facilities for overcoming barriers to energy efficiency and renewable energy technologies and practices.

Mass DCR and EEOEA, used an earlier result from a research project I conducted (Impact of trees on residential energy use) to justify a pilot tree planting program. Through an ISA, I have worked with DCR and Clark University researchers to assess the impact of the Worcester tree-replanting program and create a long-term monitoring project to evaluate the impact of the pilot tree-planting program on urban microclimates and energy use.

Non-profit organizations need to control energy costs to maintain their ability to serve their primary mission under severe budget constraints. They often miss energy saving opportunities and state grant funding due to their inability to afford professional engineering services. The Energy Extension Program offers lower cost, more customized services to this diverse sector. Stavros, a disability services organization, asked me to provide a building enclosure remediation plan for their new offices (in an old metal building that was formerly a car dealership). Their contractor’s plan would have resulted in an annual energy cost reduction of 9%. The plan I provided will result in an 80% reduction and avoids the need to purchase an entire new heating and cooling system. The North Quabbin Food Coop purchased an antique structural masonry historic building which means that insulating on the outside is not possible for historic preservation reasons and insulating on the inside can result in excessive freeze-thaw cycles that can lead to catastrophic building failure. I performed a customized analysis to determine the safest way to insulate given their desire to maintain the interior finish of the bank. As they have food storage and food quality issues related to retail grocery, I helped them design a low-energy walk-in cooler that uses evaporation enhanced economizer cooling (a technology developed as part of my NIFA integrated extension and research project) such that the compressor should only operate 20% of the year based on an hourly simulation. The NQFC now intends to build a net-zero energy building with the addition of PV on the roof. I was instrumental in helping them apply for and win a grant from Mass CEC to complete the net-zero project. The largest single budget item for the Food Bank of Western Massachusetts is for energy, most of which is spent on the warehouse scale cooler and freezer. I worked to transfer evaporative enhanced cooling technology I developed and provided operations engineering advice to dramatically reduce energy costs and food wastage. Data are preliminary, but changes implemented should reduce energy use by about 30%.

I have also served the residential market through retail extension and with commercial partners. Through site visits, phone and email communications, I served 82 individuals over the past year representing approximately 290,000 square feet of building floor area. A rough estimate of annual savings generated is about 164 MWh (electrical and thermal).

### **Collaborating Organizations**

- **Food Bank of Western Massachusetts**
- **The North Quabbin Food Coop**
- **Massachusetts DOER**
- **RCS Energy Services**
- **Western Mass Green Consortium**