



## CONTENTS

Green Schools.....	2
Green Buildings.....	3

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## Berkeley Lab and the Clean Energy Group

# CASE STUDIES OF STATE SUPPORT FOR RENEWABLE ENERGY

## Massachusetts' Green Buildings Program

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### CASE SUMMARY

#### *Case Description*

Green buildings can provide a niche market for renewable energy technologies. Specifically, renewable energy technologies may be more cost-effective when incorporated into the design of a building rather than when retrofitted on an existing building, and renewable energy systems may provide added value as an educational tool when incorporated into a green building.

Massachusetts is implementing an aggressive program budgeted at about \$28 million through 2004 that is aimed at inducing construction of green buildings that incorporate renewable energy technologies. Massachusetts' program supports feasibility studies and provides design and construction grants for both green schools and green buildings.

#### *Innovative Features*

- Massachusetts' program is, by far, the largest and most aggressive effort among state clean energy funds at promoting the use of renewable energy in green buildings.

- Funding is available for different stages of building construction, from feasibility studies to design and construction.
- Projects must meet certain criteria to be considered a green school or green building.
- Grants cover only the "incremental" costs of studying, designing, and constructing a building that incorporates eligible renewable energy technologies, and, to a more limited extent, other technologies and measures that improve the energy efficiency of the facility.
- In general, funding for each program element is allocated in multiple rounds, rather than all through one solicitation.
- Leverage with other programs (especially utility-sponsored energy efficiency programs) is essential.

#### *Results*

- Operational data are not yet available, as the Green Schools Initiative was launched in October 2001 and the Green

Buildings Initiative began in March 2002. However, with several RFPs out on the street, more results will soon become available.

- So far, funding has been awarded to 10 Massachusetts schools under the first Green Schools RFP that closed in January 2002, and another 22 schools have received early stage planning and design assistance. In addition, seven

owners/developers have received Green Buildings Design and Construction grants and an additional 17 owners/developers have been awarded funding to undertake green building feasibility studies. Some of the awardees are described later in the case study.

## CASE STUDY DETAILS

Buildings account for a substantial amount of total electricity consumption in the United States and, since buildings often last for 50-100 years, the energy consumption of buildings can have a major impact on energy use patterns. "Green buildings," which are typically newly constructed or renovated energy efficient buildings that place a high value on demonstrating environmentally friendly building materials and technologies, are one attempt to minimize the environmental impacts of the building sector.

Green buildings typically use energy efficient measures such as high-performance windows and doors; energy efficient heating, cooling, and lighting systems; passive solar design; tight construction; improved landscaping; and natural lighting and ventilation. Water conservation, waste minimization, and the increased use of natural and recycled materials and renewable energy technologies further reduce the environmental impacts of green buildings.

To explore green building practices, the Massachusetts Technology Collaborative (MTC) – the state's renewable energy system-benefits charge administrator – initially provided funding and support for green design charrettes at the New England Aquarium and the Boston Convention and Exhibition Center. Subsequently, MTC decided to launch a more aggressive and structured campaign promoting green building practices that incorporate renewable energy technologies. The current Green Buildings Program is a \$28 million

program budgeted through 2004 and consisting of two core components: green schools and green buildings. In addition, MTC is planning to target green building practices on affordable housing in the near future.

### *Massachusetts Green Schools Initiative*

The Massachusetts Green Schools Initiative was launched in October 2001 as a cooperative effort with the Massachusetts Department of Education School Building Assistance Program. MTC is adapting criteria from California's Collaborative for High Performance Schools (CHPS) for use in certifying green schools. Although certain criteria must be met, such as using at least 20% less energy than a baseline Massachusetts school, project participants need not meet every high-performance characteristic. Instead, participants can trade off the CHPS high-performance characteristics in a way that suits their project needs and economics. In addition, to ensure leveraged funding, applicants are required to apply for any assistance that may be available from utility energy efficiency programs.

About \$13.5 million of funding is allocated in two funding tracks. Track 1 targets schools slated for construction between 2002 and 2004. In early 2002, MTC selected 10 Track 1 schools to receive up to \$130,000 each for the incremental planning and design costs of incorporating renewable energy and enhanced energy efficiency technologies, and up to an additional \$500,000 each for the incremental

construction costs associated with renewable energy technologies and enhanced energy efficiency measures. MTC will pay the lesser of up to 90% of the incremental construction costs or the amount that produces a five-year payback. MTC defines incremental costs as costs in excess of those that would have been incurred absent the renewable energy or energy efficiency attribute being installed. Incremental costs may be proposed in comparison to a code-compliant base case developed by the grantee's design team. These costs can range from zero (e.g., some lighting designs) to full cost (e.g., rooftop PV). Incremental first costs do not include financing costs. The awardees are listed below:

- **Ashland High School** (Ashland) – \$130,000, for investigating the use of fuel cells and solar energy. Ashland subsequently withdrew from the Green Schools Initiative because the town did not approve funding for the new high school.
- **Centerville Elementary School** (Beverly) – \$623,300, for designing and installing combined solar energy skylight systems and a wind turbine.
- **North Quincy Street Elementary School** (Brockton) – \$130,000, for designing a solar energy system and other energy-efficiency improvements.
- **Falmouth High School** (Falmouth) – \$130,000, for researching and designing a fuel cell, a solar system, and a geothermal heat pump.
- **Great Falls Middle School/Turner Falls High School** – \$630,000, for design and construction of a rooftop PV system, a heat recovery unit, a high efficiency boiler and energy monitoring equipment.
- **Newton South High School** (Newton) – \$130,000, for designing a 60-70 kW solar array and researching a variety of other renewable and energy-efficiency opportunities, including fuel cells.
- **Carlton Elementary School** (Salem) – \$630,000, for designing and installing a solar energy system, two small wind

turbines and various energy-efficiency measures.

- **Edgerly Early Childhood Development Center** (Somerville) – \$630,000, for designing and installing a solar energy system, a small wind turbine, skylights, light shelves, clerestory windows and a sub-metering system that will monitor the school's energy production and use.
- **South Street Elementary School** (Waltham) – \$598,900, for designing and installing solar panels, a wind turbine, improved insulation, high efficiency lighting and building commissioning.
- **Williamstown Elementary School** (Williamstown) – \$568,300, for designing and installing a 24 kW solar system, a biomass system to supplement the gas-fired boiler, and a solar greenhouse.

An additional \$500,000 in construction funding is available to Newton, North Quincy, and Falmouth upon completion of their design work. The other projects have already received their construction awards, as they are further along in the design/construction process.

Criteria used in selecting winning bidders included: (1) qualitative criteria (e.g., evidence of school district support, realistic timelines, significant depth and breadth of planned green attributes, and evidence of strong interest in renewable technologies were essential aspects of successful applications), and (2) distributional goals (e.g., new construction vs. renovation and geographic spread).

Track 2 is aimed at schools that are at an earlier stage of planning and design and are scheduled to be constructed between 2003 and 2005. For Track 2 candidates, MTC will sponsor community workshops and provide up to forty (40) school districts \$20,000 grants on a non-competitive basis to fund feasibility studies. As of August 2002, MTC has awarded 22 projects for funding under this solicitation. MTC intends to issue a supplemental Track 2 RFP in the Fall of 2002 seeking 10 additional school districts to

participate in the design and construction portion of the Initiative.

### ***Massachusetts Green Buildings Initiative***

The Massachusetts Green Buildings Initiative was launched in March 2002 and funding is available pursuant to three separate grant opportunities: feasibility studies, design and construction assistance, and public education and awareness. For all three categories, a project must qualify as a green building. The preferred benchmark is the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system, although applicants can suggest a comparable alternative. More detail on the three categories is presented below:

**Early-Stage Feasibility Study Grants:** MTC has budgeted \$520,000 overall for early stage feasibility study grants. The grants are awarded competitively in quarterly rounds in 2002 and in 2003, with separate consideration for funding given to public and tax-exempt non-profit organizations, and for private and other taxable non-profit organizations to ensure a wide range of green building types. MTC will provide successful applicants with grants of up to \$20,000 for considering renewable energy technologies as part of a green building project. A 100% matching cost share is required of private/taxable organizations, and the projects must be scheduled for either new construction or major renovation within two years of the application date, and be completed within five years of the date of the grant award. Awardees are as follows:

- **Massachusetts Innovation Center** (Fitchburg) – \$20,000 to investigate the use of photovoltaics and a ground-coupled heat pump in a renovated, mixed-use development.
- **Cape Cod Community College** (West Barnstable) – \$20,000 to investigate the use of fuel cells, photovoltaics, and microturbines in its new information technology center.
- **Division of Fisheries and Wildlife** (Westborough) – \$20,000 to investigate the use of a fuel cell and geothermal heat in its new administrative and educational facility.
- **Lawrence Community Works** (Lawrence) – \$20,000 to investigate the use of photovoltaics, fuel cells, and biomass power, as well as several energy efficiency measures, in its renovated community center and educational facility.
- **Nature's Classroom** (Adams) – \$19,100 to investigate the use of photovoltaics and several energy efficiency measures including solar hot water, passive solar design, and efficient systems in its new educational and residential facility.
- **MassDevelopment** (Adams) – \$18,774 to investigate the use of photovoltaics, fuel cells, and biomass power and to conduct energy modeling for an office building renovation.
- **National Marine Life Center** (Buzzards Bay) – \$20,000 to investigate wind energy, photovoltaics, and solar hot water and to conduct energy modeling for a renovated veterinary hospital.
- **YWCA, Boston** – \$20,000 to investigate photovoltaics, wind, fuel cells, and energy storage techniques in the energy efficient renovation of a high-rise residential facility.
- **Columbus Center Associates** (Boston) – \$17,137.87 to investigate the use of photovoltaics and a fuel cell in a new commercial and residential development.
- **Hammes Company** (Falmouth) – \$20,000 to investigate the use of several renewable energy technologies, including wind, photovoltaics, fuel cells, and biomass power in a renovated hospital and office facility.
- **Mass. Audubon Society** (Welfleet) – \$20,000 to investigate wind, photovoltaics, fuel cells, and solar hot water in a renovated nature center and dormitory.
- **Episcopal City Mission** (Boston) – \$20,000 to investigate roof mounted, wall mounted, and sun canopy photovoltaics, as well as solar thermal and solar hot

water technologies in a low-income housing complex for the elderly.

- **Rural Development, Inc.** (Franklin County) – \$20,000 to investigate the use of photovoltaics in rural, scattered-site affordable housing.
- **Town of Brookline** – \$20,000 to investigate the use of photovoltaics, wind, fuel cells, and geothermal energy in a renovated municipal health facility.
- **Boston Housing Authority** – \$20,000 to investigate photovoltaics, solar hot water, solar thermal heat, and geothermal heat pumps in a new affordable rental housing development.
- **New England Wildlife Center** (Weymouth) – \$20,000 to investigate the use of a fuel cell in a veterinary hospital.
- **Allston-Brighton CDC** (Boston) – \$20,000 to investigate the use of photovoltaics, fuel cells, and cogeneration in a new low-income housing development.

**Green Buildings Design and Construction Grants:** MTC has allocated \$13.5 million in this category and will award grants competitively in bi-annual rounds between April 2002 and September 2004. Again, public and tax-exempt non-profit organizations are competitively ranked and considered apart from private and other taxable for-profit organizations. To maximize fund leverage, applicants must also apply for any assistance that may be available from utility energy efficiency programs. MTC will award grants of up to \$500,000 per project to support up to 75% of the incremental costs of incorporating renewable energy technologies in green building projects. At least 70% of the grant must be used for the purchase, installation, and commissioning of the renewable energy system that generates electricity. The other 30% can be used for other renewable energy and energy efficiency features. Applications will be ranked by the amount of renewable energy capacity being installed and the amount of renewable energy attributes being generated (30%), cost efficiency (30%), probability of completion

(20%), and contribution to objectives such as public visibility, support of economic development, and the potential for replicability (20%). Awardees are as follows:

- **Artists for Humanity** (Boston) – \$500,000 to install 45 kW of photovoltaics, a glass curtain wall, and related energy efficiency measures in a renovated educational facility.
- **Cambridge City Hall** – \$337,500 to design and install 28 kW of photovoltaics, a ground source heat pump, and energy efficiency measures in a renovation of the City Hall annex.
- **Genzyme Corporation** (Cambridge) – \$321,750 to install 2,800 square feet of roof-mounted photovoltaics on its new office building in Cambridge.
- **Trustees of Reservations** (Leominster) – \$361,515 to install 4,600 square feet of roof-mounted photovoltaics and a ground coupled heat pump on its new administrative and exhibition facility.
- **Tufts University** (Medford) – \$500,000 to design and install 32 kW of roof-mounted and curtain wall photovoltaics on a new residence hall.
- **Woods Hole Research Center** (Falmouth) – \$226,308 to install 26.4 kW of photovoltaics, a ground source heat pump, and an energy monitoring system in its new headquarters facility.
- **MATCH School** (Allston) – \$385,030 to design and install a 20 kW photovoltaic array with a data acquisition system, to conduct energy modeling, and to finance some energy-efficiency features, such as high-efficiency lighting, high performance windows, and occupancy sensors for the lighting system.

**Public Education and Awareness:** MTC has allocated \$600,000 through 2006 and is accepting applications on an on-going basis until the funds are exhausted. Grants are limited to \$30,000 per project, and potential activities are left to applicants to define. Examples suggested by MTC include workshops for building professionals, public

awareness displays and tours, information dissemination activities, and use of the green building as part of an educational curriculum. As of August 2002, no awards had been given out.

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Comments provided by: Kim Ashton, Quincy Vale, Caroline Conway, and Dick Tinson (Massachusetts Technology Collaborative)

### ABOUT THIS CASE STUDY SERIES

A number of U.S. states have recently established clean energy funds to support renewable and clean forms of electricity production. This represents a new trend towards aggressive state support for clean energy, but few efforts have been made to report and share the early experiences of these funds.

This paper is part of a series of clean energy fund case studies prepared by Lawrence Berkeley National Laboratory and the Clean Energy Group, under the auspices of the Clean Energy Funds Network. The primary purpose of this case study series is to report on the innovative programs and administrative practices of state (and some international) clean energy funds, to highlight additional sources of information, and to identify contacts. Our hope is that these brief case studies will be useful for clean energy funds and other stakeholders that are interested in learning about the pioneering renewable energy efforts of newly established clean energy funds.

Twenty-one total case studies have now been completed. Additional case studies will be distributed in the future. For copies of all of the case studies, see:

<http://eetd.lbl.gov/ea/ems/cases/> or <http://www.cleanenergyfunds.org/>

### ABOUT THE CLEAN ENERGY FUNDS NETWORK

The Clean Energy Funds Network (CEFN) is a foundation-funded, non-profit initiative to support the state clean energy funds. CEFN collects and disseminates information and analysis, conducts original research, and helps to coordinate activities of the state funds. The main purpose of CEFN is to help states increase the quality and quantity of clean energy investments and to expand the clean energy market. The Clean Energy Group manages CEFN, while Berkeley Lab provides CEFN analytic support.

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