



A Guide to State and Federal Solar Electric Incentives for Boston Affordable Housing Developers

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February, 2008



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1. Introduction

Solar energy is the largest available renewable energy resource in the City of Boston. Enough solar power falls on the Earth each day to meet the entire world's energy demand for over 20 years. The question is not whether there is enough solar power, but how to convert it to useful energy. The most prevalent solar technology in Boston is solar electric (aka photovoltaic, or PV) systems that convert sunlight directly into electricity.

PV is easily integrated into the urban environment and has been installed on over twenty new and existing buildings around the City, including the Maverick Landing housing development. Another 18 PV-powered affordable housing projects are projected to be installed during the next 12-18 months. Most of these systems are supported through the Massachusetts Technology Collaborative's (MTC) Green Affordable Housing Initiative (GAHI), which distributed over \$25 million in funds to partner organizations around the state. The GAHI partners that funded PV installations in Boston include: the City of Boston's Department of Neighborhood Development, Boston Community Capital, MassHousing, and the New England Joint Management Committee. The funds for most GAHI projects have been expended, and it remains to be seen whether MTC will renew the GAHI programs in the future.

In the meantime, there are several alternative avenues for affordable housing developers to finance PV systems. This document reviews several of the different incentive sources and financing strategies available outside the GAHI program.

2. Photovoltaic System Costs

A PV system consists of PV panels, an inverter, and "balance of system" components, which include roof-mounting systems, wires, etc.

PV panels generate direct current (DC) electricity. In order to serve the alternating current (AC) loads that are found in households connected to the electricity grid, PV electricity must pass through an inverter, which switches the DC electricity to AC electricity. Inverters are typically 90% efficient. Over the course of the year, a 1 kilowatt PV system in Boston¹ could be expected to deliver approximately 1,244 kilowatt-hours of AC electricity after the inverter efficiency and other losses are taken into account.

PV systems typically cost \$8-\$10 per watt. This cost includes the panel, inverter, balance of system costs, and installation costs. In Boston, average total cost over the past several years has been approximately \$9.30 per watt.

The cost of PV-generated electricity in Boston is currently higher than the retail price of electricity, and so both the federal government and the Commonwealth of Massachusetts provide incentives for PV installations.

¹ Optimally oriented due South, with a tilt angle equal to Boston's latitude of 42.4° per the National Renewable Energy Laboratory's PVWATTS software (http://rredc.nrel.gov/solar/codes_algs/PVWATTS/)

3. Cash Photovoltaic Incentives

3.1 Rebates

There are currently three different sets of PV rebates available to affordable housing developers in Massachusetts. The structure of state rebates for solar energy is currently in transition as the state shifts to the new Commonwealth Solar program.

Commonwealth Solar is a \$68 million solar rebate program targeting 27 megawatts of PV installed around the state within the next four years, and will be the only PV rebate program that developers can choose from by Summer 2008.

3.1.1 MTC Small Renewables Incentive

The MTC Small Renewables Incentive (SRI) program provides rebates for PV systems that are 5 kW or less. Full requirements and application forms for the SRI can be downloaded at: <http://www.mtpc.org/solar/>. **The SRI program will be phased out on March 23rd, 2008**, and small installations will be integrated into the Commonwealth Solar Initiative (see below). The SRI incentive starts at \$2.00 per installed watt of PV, and has a series of potential adders per the table below.

Incentive	PV (\$/watt)
Base incentive	\$2.00
+MA-manufactured components ²	\$0.25
+Moderate home value ³	\$1.25
+Moderate household income	
Option A: Moderate household income (\leq \$91,552)	\$1.00
Option B: Moderate household income (\leq \$76,296)	\$2.00

As can be seen from the table, affordable housing developers in Boston are able to get a sizable rebate through the SRI program. Assuming that developers will use a MA-manufactured component and that homes in the development will be of moderate value or less, developers would be eligible for an incentive of up to \$5.50 per watt.⁴ Private developers will also be able to take advantage of state and federal tax credits (see below) that should further improve system economics.

3.1.2 Affordable Solar-Powered ENERGY STAR Homes Program

As an alternative to the SRI program, developers building affordable ENERGY STAR Homes can apply for a rebate supported through the Joint Management Committee's GAHI funds, called the Affordable Solar-Powered ENERGY STAR Homes Program. This program **expires at the end of June, 2008**. Eligible PV systems are between 2.5 kW and 10 kW. Developments must have at least twenty-five percent (25%) of the ownership units affordable to households who earn no more than eighty percent (80%) of the area median income. For rental housing, twenty (20%) of the units must be affordable to households below fifty (50%) of median income. As can be seen in the Table below, the Affordable Solar-Powered ENERGY STAR Homes Program has different incentives for different building types:

² Examples include Evergreen Solar panels, Solectrica inverters, and SatCon inverters

³ Moderate home value in Suffolk County (i.e. Boston) is \leq \$350,000

⁴ The adders specifically targeting affordable housing and green building were eliminated as of December 27, 2007.

	Single Unit (\$/watt)	Multi-Unit	
		20%-49% Affordable (\$/watt)	50-100% Affordable (\$/watt)
Base Incentive	\$7.00	\$6.00	\$7.00
Green Building (LEED)	+\$1.00	+\$1.00	+\$1.00

There are several primary differences between the SRI and Affordable Solar-Powered program. The most obvious is that developers can get a higher rebate through the Affordable Solar-Powered home program than in the SRI. Affordable housing developments can receive up to an \$8/watt rebate, whereas a comparable development under SRI can only receive up to \$5.50/watt. A second difference is that installations can be up to 10 kW under the ENERGY STAR program, while they can only be 5 kW under the SRI. Third, as its name implies, host sites must be enrolled in the ENERGY STAR homes program to qualify for the ENERGY STAR rebates. An overview of the Affordable Solar-Powered program and how it fits within the state ENERGY STAR program can be found online at: <http://www.energystarhomes.com/ESHController.aspx?announcements>.

3.1.3 Commonwealth Solar Initiative Rebates

Currently, systems over 5 kW can apply to the Commonwealth Solar program, which was launched on January 23rd, 2008. Once the SRI and ENERGY STAR programs discussed above are phased out, PV systems from 1 kW to 500 kW will be eligible for the rebates below. The incentive is structured in tiers such that the first 25 kilowatts of a system are eligible for a base rebate of \$3.25 per watt, and the second 25 kilowatts of a system are eligible for a base rebate of \$2.50 per watt, and so on. A 50 kW system, for example, would get an averaged rebate amount of \$3.12 per watt. There are also adders for Massachusetts-manufactured components, and public sector buildings.⁵

Capacity	1 to 25 kW (\$1/Kw)	Next > 25 to 100 kW (\$/watt)	Next >100 kW to 200 kW (\$/watt)	Next >200 kW to 500 kW (\$/watt)
Base incentive	\$3.25	\$2.50	\$2.00	\$1.50
+MA-manufactured components	\$0.25	\$0.25	\$0.25	\$0.25
Public Buildings Adder	\$0.50	\$0.50	\$0.50	\$0.50

Unlike the SRI rebates and the ENERGY STAR rebates, there will be rebate adders that specifically target populations served by affordable housing developers under Commonwealth Solar. More information about the Commonwealth Solar program requirements can be found here: <http://www.masstech.org/solar/>.

⁵ Public sector is defined by the MTC as buildings owned by the Commonwealth of Massachusetts, municipalities, state and local agencies, and quasi-public entities. Additionally, a public entity must pay the electric bills for the facility where the system is proposed. Boston Housing Authority buildings meet this criteria.

3.2 Renewable Energy Credits

In order to support renewable electricity systems, a market has developed for so-called renewable energy credits. Each kilowatt-hour of electricity that is produced by a renewable energy system generates a corresponding renewable energy credit (REC). When electricity is fed into the grid, there is no way to distinguish a “green” electron from a non-green electron. RECs provide a way to track ownership of “green” electrons and the right to claim the benefits of green electricity. Utilities in the Commonwealth must comply with a state law called a renewable portfolio standard (RPS) that requires 4% of Massachusetts electricity to be derived from renewable sources by 2009. To demonstrate compliance with this target, utilities must purchase RECs from renewable generators.

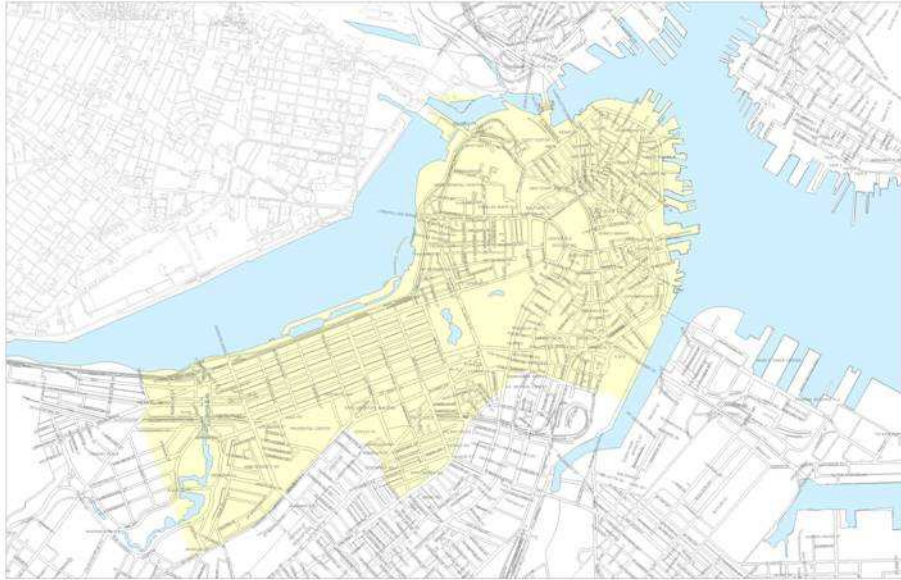
Individual or organizations that would like to purchase “green power” can purchase RECs voluntarily as well. The City of Boston, for example, currently purchases 11% of its power from renewable sources and accomplishes this through a REC purchase. Renewable energy systems installed on affordable housing developments will generate RECs. For most of the systems funded under the GAHI program, MTC claims the rights to the RECs. Under Commonwealth Solar, however, affordable housing developers retain REC ownership, and are able to sell the RECs from a PV system to brokers, like the Massachusetts Energy Consumers Alliance (MassEnergy). As of February, 2008, MassEnergy offers three-year contracts for PV output at \$0.03 per kilowatt-hour.

4. *Interconnection and Net Metering*

In order to offset retail electricity purchased from the grid and serve household loads, a PV system must be connected to the electricity grid itself. Massachusetts has standard interconnection guidelines governing the process through which PV can be connected. The configuration of Boston’s electricity grid, however, prevents PV from being connected in some parts of the City.

Most parts of Massachusetts (and the rest of the country) are served by radial electricity grids consisting of single distribution lines which branch out like trees to serve individual loads. In some dense urban areas like Boston and New York City, however, the grid has been configured to resemble a redundant web, with multiple lines connecting multiple loads.

This configuration, known as an area network, increases grid reliability but is also vulnerable to electricity that is fed in the reverse direction – such as the excess power from a PV system. When a PV system is planned for an affordable housing development, developers should contact NSTAR as soon as possible to determine if the building, or proposed building, is located on an interconnectable site (i.e. outside of the area network). The Interconnection Program Manager at NSTAR is Joe Feraci (781.441.8196; joseph.feraci@nstar.com). A rudimentary map of the area network is shown in yellow below. This map is intended as illustrative, however, and each potential PV site will need to be evaluated on a case-by-case basis as certain sites outside of the network depicted below may not support interconnection, and vice versa.



If the proposed PV system is located in a part of town served by a radial grid, rather than an area network, and is under 60 kilowatts AC (based on the capacity of the inverter) in size, the PV system is eligible to net meter. This means that when the PV system produces more power than the building needs, the electricity meter will effectively roll backwards. PV system owners can reduce their electricity bill to zero on a month-by-month basis, but cannot carry excess electricity credit forward to the next month. This law may be modified in the coming months, and updated information can be found on the Database of State Incentives for Renewables and Efficiency at www.dsireusa.org.

5. Tax Incentives for Solar

In addition to the cash incentives and net metering regulations that a wide range of customer classes can take advantage of, there are also tax incentives for solar energy that private sector affordable housing developers can benefit from. This section reviews federal and state tax incentives, and discusses how they interact with other policies.

5.1 Federal Tax Incentives

Prior to 2005, commercial customers who invested in PV could take advantage of a 10% investment tax credit. The Energy Policy Act of 2005 (EPAct), which was signed into law in August of 2005, established the first residential investment tax credit in the United States and increased the size of the commercial credit to 30%. In addition to the tax credit, commercial PV systems are also eligible for an accelerated depreciation schedule.

5.1.1 The Business Energy Tax Credit

Under the current business energy tax credit, facilities that install solar energy systems before December 31, 2008 will receive a tax credit equal to 30% of the installed cost of the PV system. This tax credit can be carried forward for 20 years if the value of the credit exceeds the entity's tax liability. After December 31st, 2008, the tax credit reverts back to 10%, but discussions to extend the 30% credit are ongoing. There is no cap on the size of the tax credit that a for-profit entity can claim. There is also a 30% residential investment tax credit that is capped at \$2,000. Please consult a tax professional to

determine whether the facility in question qualifies for the residential or commercial tax credit, and how the tax credit interacts with state rebates.

5.2.2 Modified Accelerated Cost-Recovery System (MACRS)

PV also qualifies for the Modified Accelerated Cost-Recovery System (MACRS), which outlines the schedule by which businesses can recover investments in solar equipment through depreciation deductions. Under MACRS, PV systems are eligible for the depreciation schedule shown in the table below.

Year	Percentage
1	20.00%
2	32.00%
3	19.20%
4	11.52%
5	11.52%
6	5.76%

Source: IRS (2005)

The business energy tax credit reduces the value that can be depreciated (i.e. the depreciable basis) by 50% of the tax credit amount. In other words, if the 30% tax credit is claimed, then only 85% of the PV system cost can be depreciated. Similarly, if the tax credit reverts back to 10%, the depreciable basis will be 95%.

5.2.3 State Corporate Excise Tax Deduction

The Commonwealth Massachusetts allows corporations to deduct the value of PV system investments from their taxable income. The state corporate excise tax rate is 9.5%. Practically speaking, the excise tax deduction can be seen as a 9.5% investment tax credit. In other words, the value to the taxpayer is 9.5% of the PV system's value. Developers should consult a tax professional with regard to how the state credit interacts with state rebates. It should also be noted that the benefit provided by the state tax deduction is considered taxable income by the federal government and is subject to federal income tax.

6. Innovative Financing Methods

Affordable housing developers can use the current incentive mix to finance and install PV systems themselves, but project economic performance can still be daunting. During the past two years, there have been several innovative approaches to financing PV in affordable housing that could make PV investment more attractive. The Boston Housing Authority (BHA), for example, is exploring how to blend PV into an energy savings performance contract. Under an energy savings performance contract, an energy service company (ESCO), arranges financing for energy efficiency measures,⁶ installs the measures, and guarantees the savings that those measures will generate over time. The host site then repays the ESCO using the savings the energy efficiency measures are guaranteed to generate. By blending PV into a performance contract, the savings from quick payback measures, such as high-efficiency lighting, can be used to accelerate the payback of longer-payback measures, such as PV. Under the proposed BHA performance contract, an ESCO will be investigating blended installations of energy efficiency and photovoltaics on several BHA properties simultaneously.

⁶ ESCOs can typically arrange for third-party financing, or self-finance energy efficiency installations

Boston Community Capital (BCC) is also exploring performance contracting through its Energy Advantage Program, which was launched with GAHI funding from MTC. Under BCC's model, energy efficiency measures will be installed across a portfolio of buildings under a performance contract. Rather than blending the PV into the performance contract like the BHA is currently considering, however, PV systems will be installed under a separate contract. Under the BCC model, a solar company will install PV on affordable housing at no upfront cost to the owners or residents. The solar company will then enter into a long-term contract to sell PV electricity to the development at rates competitive with utility electricity prices. This will be one of the first uses of this PV financing model, known as third-party ownership, in Massachusetts, and one of the first uses of the model on affordable housing in the country. One of the reasons that the model is attractive to investors, financiers, and project developers is that, like the BHA model, it targets an aggregated group of affordable housing developments, rather than a single building. If the BHA or BCC approaches prove successful, they could open the door to the models being replicated for other affordable housing developments in the future.

Not all affordable housing developers may be able to take advantage of models that require large-scale aggregation, such as the energy savings performance contract, or the third-party ownership model being explored by BHA and BCC. A third emerging financing option has been piloted by the New Jersey Housing Mortgage Financing Authority (NJHMFA). Under the Authority's SUNLIT (Solar Underwriting with Low Income Tax credits) Program, affordable housing developments with rental units were screened for their solar energy potential. Sites with good solar exposure were then encouraged to install PV and take advantage of the state's solar rebates and REC sales. Developers then include the PV system as part of the qualified basis for either the 9%, or the 4%, Low Income Housing Tax Credit (LIHTC).⁷ The payback for developers was reportedly almost immediate when the 9% tax credit was used, while systems installed using the 4% tax credit were still economically feasible. Once the PV systems were installed, the NJHMFA was able to approve larger loans than usual because of projected savings stream generated the PV systems.⁸ Although a similar program has not been institutionalized by the state in Massachusetts, it is still possible for Massachusetts rental property developers to replicate the SUNLIT program.

To date, at least one affordable housing developer⁹ in Massachusetts has opted to combine the MTC's Small Renewables Incentive with the 9% LIHTC to finance a PV system, in lieu of taking advantage of the MTC's Green Affordable Housing Initiative funds. There are trade-offs with using the LIHTCs to finance PV systems, but for certain developers, taking this route can be a sensible alternative to waiting to see whether the MTC authorizes another program dedicated specifically to Green Affordable Housing.

⁷ These are available from the Department of Housing and Community Development, and the

⁸ See Clark, R. E. (2005). *Financing affordable housing: A primer for the State Clean Energy Funds*. Montpelier, VT: Clean Energy States Alliance and Peregrine Energy Group, & Clean Energy Group. (2006). *Strategies to foster solar energy & advanced efficiency in affordable multi-family housing*. Montpelier, Vermont: Clean Energy Group.

⁹ Community Builders in western Massachusetts