



## SUN POWER FOR THE TOWN OF WESTWOOD, MASSACHUSETTS

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### ABSTRACT

Interfaith groups have increasingly become active in promoting and practicing environmental stewardship particularly related to energy consumption. By drawing upon various religious and spiritual experiences, they have been successful in working to help protect the environment through a variety of activities and projects. One such project was created by a unique relationship between a solar energy services company, a state renewable energy development agency and a non-profit eco-faith organization that will bring solar energy into a Massachusetts community. The ultimate goal of this project is to further the development of small commercial PV systems and bring it closer to mainstream community groups who are interested in retrofitting their buildings for solar energy. The standardized packages and easy-to-install mounting components result in reduced

costs and streamlined installations that are making PV more attractive and cost-competitive to system owners. Together with educating the system owners and their institutions about solar energy and the exposure the systems will receive within the community, CSGS is confident this program will increase awareness and promote solar energy technology in Massachusetts. This paper describes the origins of the relationships, the highly visible sites that were selected, the photovoltaic (PV) systems that were installed, and the impact on the community's awareness of renewable energy technologies and their impact on the environment.

### 2. INTRODUCTION

As a result of a partnership between 3 organizations and an active local community, the town of Westwood, Massachusetts is now receiving clean energy from photovoltaic (PV) systems. CSG Services, Inc. (CSGS) initiated the

project as a result of grant funds that were available through the Massachusetts Technology Collaborative (MTC). Massachusetts Interfaith Power & Light (MIP&L) is the organization that linked the town of Westwood with CSGS in order to implement this project. As CSGS and MIP&L have collaborated on projects in the past, CSGS was approached by MIP&L to create this project in the town of Westwood. The MTC provided approximately 62% of the total program costs, while the remaining amount was provided by a private donation from the community. The renewable energy credits (RECs) associated with these systems are also traded and retired on behalf of the participants by CSGS.

Four buildings were selected within the town to showcase PV technologies: 2 churches, a high school and the fire department. All sites are located in highly visible areas that are frequently attended by community members and that provide significant public exposure.

The goal of this project is to further the development of small commercial PV and bring it closer to mainstream community groups who are interested in retrofitting their buildings with solar energy. Standardized packages developed by CSGS with easy-to-install mounting components result in reduced costs and streamlined installations that are making PV more attractive and cost-competitive to system owners. By educating the system owners and their institutions about solar energy and from the exposure the systems will receive within the community, CSGS is confident this program will increase awareness and promote solar energy technology in Massachusetts. In summary, the overall objectives of this project are:

- To develop and utilize standardized 5.28 and 2.64 kW<sub>DC(STC)</sub> PV kits for existing commercial buildings for community groups in Massachusetts;
- To promote solar energy technologies and increase awareness within communities;
- To offer PV as a mainstream commodity when providing energy retrofits in existing commercial buildings in Massachusetts;
- To demonstrate the feasibility of aggregating and certifying RECs from small renewable generators;
- To reduce the cost of small-scale commercial PV by continually improving the design of the standardized systems throughout the project time frame.

A critical part of the program involves monitoring and tracking the performance of each home PV system. CSGS has developed innovative, reliable and inexpensive metering and monitoring equipment that is installed at each site. The site meters transmit PV performance via phone line or Internet to computer servers maintained by CSGS staff. Simultaneously, performance data is uploaded to MTC's centralized monitoring system. CSGS also uses the data to track performance and maintain the PV equipment.

### **3. PARTNERSHIP DEVELOPMENT**

The following sections list the partners that made this project a success and describe each of their roles:

#### **3.1. Massachusetts Interfaith Power & Light (MIP&L)**

(MIP&L) is a non-profit initiative that offers Massachusetts congregations of every religious tradition a comprehensive means of reducing energy consumption, lowering operating costs, and promoting non-polluting, renewable energy in houses of worship and related buildings. MIP&L is a religious response to caring for the earth and its resources. MIP&L assisted in identifying congregations to participate in the program and acted as the liaison between the PV system installers and the customer.

#### **3.2. Town of Westwood**

Westwood was established in 1897. It is made up of a community of 14, 626 located 12 miles southwest of Boston. The Town encourages and maintains many recreational areas and facilities, including numerous conservation areas, playgrounds, ball fields and an indoor pool facility. Westwood is home to over two hundred businesses in established commercial areas, each varied in character. The town is served by many boards of elected and appointed officers in addition to the municipal offices. The Board of Selectmen in particular were active in assessing the feasibility of installing the proposed PV systems on town buildings, and providing final approval. Finally, one town member provided the balance of the projects costs not covered by the grant. Because of this donation, all four institutions are participating in this program at no cost.

### 3.3. CSG Services, Inc. (CSGS)

CSGS is the for-profit affiliate of Conservation Services Group who specializes in the design, development and delivery of energy efficiency and renewable energy programs for utility companies, public housing authorities, public agencies, and private clients. CSGS is experienced with renewable energy power plant development, policy consulting, renewable energy system engineering, and education and training, and project management for residential and commercial clients. CSGS has provided standardized PV kits to homebuilders who offer solar energy to their new home customers. These standardized kits have also been offered to retrofit existing residential buildings.

### 3.4. Massachusetts Technology Collaborative (MTC)

The MTC is Massachusetts' state renewable energy development agency whose goal is to advance technology-based solutions that lead to economic growth and a cleaner environment in Massachusetts. The MTC administers the Renewable Energy Trust which is a fund created by the Massachusetts legislature in 1998 with the goal of generating the maximum economic and environmental benefits from clean energy resources (e.g. wind, solar) to citizens of the Commonwealth. The trust is funded through system benefit charges, a small monthly charge on customer electric bills. The MTC has provided grants for the following types of programs: green buildings, green power programs, and community outreach and siting programs. The MTC is providing approximately 62% of the total project costs for the town of Westwood. These costs are provided in the form of 2 incentives: an installation incentive (based on kW installed) once the system is operational, and a production incentive (based on kilowatt-hours generated over a 3-year period).

### 3.5. How the partnership formed

CSG (an affiliate of CSGS) has worked with MIP&L to provide energy assessments on facilities of its congregation members. Based on this relationship, when the MTC announced grant availability for PV projects, it seemed a natural partnership to bring solar energy to a community from both an energy production standpoint as well as a community awareness/outreach project. The town of Westwood was selected primarily because a Westwood community member offered to provide the remaining costs through a private donation. Additionally, another active community member is a solar and environmental advocate,

and works in the PV industry. Together the team put together a competitive proposal and project plan to the MTC, and was awarded the full amount requested.

## 4. SITE SELECTION

Four buildings were selected within the town to showcase PV technologies: 2 churches, a high school and the fire department. All sites are located in highly visible areas that are frequently attended by community members and that provide significant public exposure:

1. Westwood Fire Department: This facility has a highly visible building located on one of the main town thoroughfares with a significant number of cars passing by the site daily. This site received a 2.64 kW<sub>DC(STC)</sub> PV system. (See Figure 1)



Fig. 1: Westwood Fire Department – 2.64 kW<sub>DC(STC)</sub> PV System

2. Westwood High School: Westwood Public Schools is currently constructing a new high school facility. This site was selected mainly because of the tremendous educational value to the students, teachers and faculty. With the addition of PV to an already visible project, this site will receive significant media and community exposure, thereby increasing the town's awareness of clean energy options such as photovoltaics. This site will receive a 5.28 kW<sub>DC(STC)</sub> PV system.
3. First Parish of Westwood: The church's main building (Parish Hall) is one of the most heavily used buildings in town with many events being held regularly. Additionally, meetings, day care, and after school events are frequent and common in this space. First Parish has already had a comprehensive

energy use analysis and Environmental Stewardship Report and Plan prepared through MIP&L. This site received a 5.28 kW<sub>DC(STC)</sub> PV system.

4. St. John's Episcopal Church: St. John's Church in Westwood has recently joined MIP&L and has had an environmental stewardship assessment as well. The church views the installation of PV on its facilities as an important step, both practically and symbolically, toward environmental stewardship. This site received a 2.64 kW<sub>DC(STC)</sub> system. (See Figure 2)



Fig. 2: St. John's Episcopal Church with Rev. Steve Smith and Herb Radford - 2.64 kW<sub>DC(STC)</sub> PV System

As of this writing, PV systems have been installed at 3 of the 4 sites listed above. Because the new high school facility is still under construction, the PV installation will begin once the proposed building (gymnasium) has been completed.

## 5. PHOTOVOLTAIC SYSTEM SUMMARY

Although the bulk of the PV equipment has been standardized, the systems vary in size and physical mounting method. CSGS offered nominal 2.64 kW<sub>DC(STC)</sub> and 5.28 kW<sub>DC(STC)</sub> (24 and 48 PV modules, respectively) to the town of Westwood. All systems are grid-connected and use the same PV modules, inverters, safety disconnects, system monitoring datalogger and basic mounting hardware. Table 1 summarizes the equipment in each of the 4 systems.

By designing a standardized PV system package, CSGS has streamlined the installation process by allowing for little variance during construction.

And by ordering equipment in bulk quantity, CSGS is able to pass the pricing discount to the customer, in this case the private donor.

TABLE 1: SYSTEM SPECIFICATIONS

	First Parish	St. John's	Fire Dept.	High School
Output kW DC(STC)	5.28 kW	2.64 kW	2.64 kW	5.28 kW
PV Modules	Evergreen EC100 (110W) Qty. 48	Evergreen EC100 (110W) Qty. 24	Evergreen EC100 (110W) Qty. 24	Evergreen EC100 (110W) Qty. 48
Inverter	SMA 2500 Qty. 2	SMA 2500 Qty. 1	SMA 2500 Qty. 1	SMA 2500 Qty. 2
Mounting Rack	ProSolar Products	ProSolar Products	ProSolar Products	ProSolar Products
Mounting Method	Rooftop	Rooftop	Rooftop	Awning / Wall
Datalogger	SolTrex	SolTrex	SolTrex	SolTrex

## 6. DATA MONITORING AS EDUCATIONAL TOOL

All systems are equipped with a SolTrex datalogger, an inexpensive and accurate monitoring device for PV systems developed by CSGS. The datalogger records and transmits data to CSGS network servers, and data is posted on a dedicated website: [www.soltrex.com](http://www.soltrex.com). Through this website, the energy output from the system can be viewed in graphical format (see Figure 3); system specifications and a photo of the system are provided as well. Westwood community members can visit the website and see how their community is off-setting the use of fossil fuels through their systems energy generation. An energy calculator on the website can be used to estimate pollutants avoided from energy generated by PV systems as well.



Fig. 3: SolTrex On-line Data Monitoring Display – First Parish Church

Other resources available on the website include a glossary of energy terms and links to other related websites to learn more about renewable energy.

Users can download data over specified time periods for analysis or comparison to other similar systems.

The SolTrex datalogger has been used in several solar schools programs throughout the country as an educational tool for students and teachers. Users can learn about solar energy in general, determine the impact of weather variables on the energy production of their system, and compare systems throughout the country of different geographic and climatic conditions. The datalogger and the website are invaluable educational tools for anyone with an Internet connection.

## 7. RENEWABLE ENERGY CREDIT (REC) TRADING/AGGREGATING

One unique aspect of this project involves the renewable energy credits (RECs) associated with the four PV systems. RECs are tradable commodities associated with the environmental attributes of energy produced by a renewable energy generator (solar, wind, etc.) where 1 megawatt-hour (1 MWH) of renewable energy production is the equivalent of 1 REC. In Massachusetts, RECs are traded on their region power pool, the New England Power Pool (NEPOOL). Using a revenue meter that meets NEPOOL requirements, CSGS tracks the energy generated by each system (via the SolTrex datalogger) and quantifies the equivalent RECs that were produced. CSGS then purchases the RECs from the system owner and trades them into the NEPOOL power market making them available for green power electric providers. By purchasing RECs from small renewable energy generators (such as the ones in the Westwood project), additional financial incentives are provided to the system owners. Although the price does vary, if RECs are purchased at \$50/MWH (and if a 1 kW system generates 1 MWH a year or 1,000 kilowatt-hours a year), the system owner would receive \$50 annually. Typically owners of individual small PV generators do not trade RECs generated by their systems, but since CSGS is a certified REC aggregator on NEPOOL, the combined REC value of these 4 systems, in addition to other small systems managed by CSGS, creates a valuable contribution to the REC pool.

## 8. IMPACT ON COMMUNITY

Because the partners selected four highly visible sites to host PV systems, the project has had a significant impact on the community through public relations activities, interest in new projects, structured education, and increased awareness of community members.

### 8.1. Public Relations Activities

The project has been well publicized to the community and the region through the local media. Articles have been published in local newsletters as well as the regional paper. The Boston Globe published an article on this project titled "Grant, Gift Help Town in Move to Solar Power" (by John Laidler, October 2, 2003). Figure 4 is a clipping from an additional article printed in the Boston Herald. In addition to publicity by the local media, the MTC is creating an informative poster for each location.

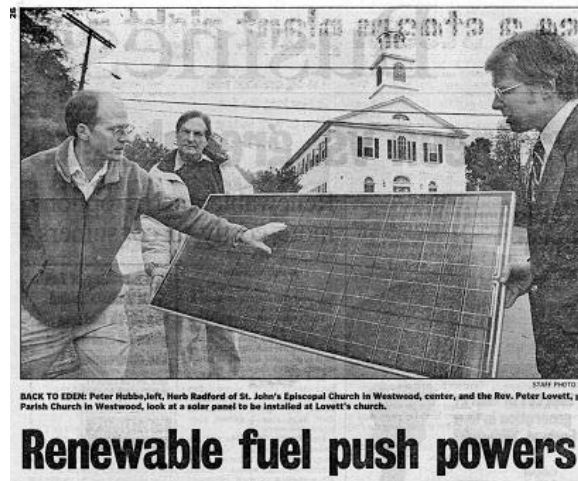


Fig. 4: Media Publicity – Boston Herald Article, October 2003

### 8.2. Interest in New Projects

In addition to those immediately served by the selected facilities (church members, fire fighters, students), other residents have expressed an interest in implementing similar projects on their properties. Town leaders have received requests from two other organizations (one church, one land reservation) and two individuals for information on how they may receive similar systems. In response to these requests, the Town has agreed to put aside all the money saved as a result of the fire station and high school projects for future energy conservation projects.

### 8.3. Public Relations Activities

As mentioned previously, the educational value of the on-line monitoring service will allow anyone with an Internet connection to view the output from each system and learn more about solar energy. In addition to the website, the high school has been presented with solar and renewable energy activities and lesson plans which can be integrated into their science curriculum. First Parish Church is also in the process of integrating solar energy teachings into their church school curriculum about the relationship between religion and the environment.

### 8.4. Increased Community Awareness

Westwood town leaders have stated that many people who were never familiar with photovoltaic systems are now more knowledgeable about the technology. Specifically, the town building inspector and wiring inspector became involved in the project and are now familiar with PV. The town selectmen (board of elected officials) have a new understanding of PV and can use this knowledge in planning for the community. Finally, the town is happy to report that the local environmental community is very pleased that their town has taken steps towards a sustainable future. Figure 5 shows a community gathering in front of First Parish Church.



Fig. 5: First Parish Church Members

## 9. OPPORTUNITIES FOR REPLICATION

The cooperative efforts of all entities involved in this project have shown that a few individuals can make a difference in a community. Communities anywhere can follow this model to begin similar programs by beginning with contacting local resources:

- a. State or local renewable energy agencies to learn of incentives available for solar or other sustainable technologies;
- b. Local renewable energy consulting companies (solar installers) to perform an assessment of the type of solar technology that is appropriate for identified facilities.
- c. Owners of highly visible facilities to ensure that the technologies get maximum exposure to as many community members as possible.
- d. Local interfaith groups and/or environmental groups who can spearhead initiatives on building sustainability.
- e. Regional REC aggregators who can purchase RECs associated with small renewable energy generators providing an additional financial incentive to system owners.

## 10. CONCLUSION

As a result of the project partners' efforts, a community in Massachusetts will be enjoying as much as 15 kW of clean energy from PV. By selecting highly visible sites and garnering community involvement, the project is meeting its goals including standardizing packaged kits small-scale PV systems (thereby minimizing costs), promoting solar energy technologies and increasing awareness within the community, offering PV as a mainstream commodity when providing energy retrofits in existing commercial buildings, and aggregating and certifying RECs from small renewable generators. Sun Power for the Town of Westwood has shown that a community can pull resources together to create a sustainable future for their residents.