



# Sustainable Development Fund Solar Photovoltaics Grant Program



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## Solar PV Grant Program Description

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### **PART I. INTRODUCTION**

PECO Energy customers can participate in a program to install photovoltaic panels on their home or business. Photovoltaic (PV) panels convert sunlight into electricity. The electricity can then power the home or business, with any excess going to battery storage or back into PECO Energy’s electric system. This program favors the latter.

This four-year program is overseen by the Sustainable Development Fund, which is a project of The Reinvestment Fund in Philadelphia. The program administrator is Ron Celentano, who will be assisted by Andrew Rudin.

Complete information about this program, including all associated forms and standards, are available on the SDF website above.

### **PART II. PHOTOVOLTAIC SYSTEM GRANTS**

#### **A. Introduction**

Beginning in late 2001, SDF will offer grants for PV systems that are purchased and installed by a PECO Energy distribution company customer (regardless of customer class). Eligible systems are those sized between 1 kW and 5 kW (nominal dc watts at Standard Test Conditions) and preference will be given for systems that are interconnected to the electric grid (i.e. not stand-alone). Each system must meet the program’s hardware standards (see Part III) and installation standards (see Part IV) and be installed by a participating installer (see Part V). All systems must be inspected and certified by the Program Administrator as complying with the program requirements. Also, the system owner must agree to allow the system to be used for research purposes and promotion of the program.

#### **B. Grant Payments**

The PV Grant will be paid for qualifying systems in three installments:

- i) The first grant payment follows the installation inspection. The amount of this first payment is equal to \$4 per watt dc (based on the nominal STC rating), up to a maximum payment of \$20,000 – until further

notice; then it will be revised to \$3/watt, up to a maximum of \$15,000. [See note on grant payment limitation]. This payment will be made directly to the Participating Contractor.

ii) The second grant payment is at the completion of the first 12 months of operation. The amount of this second payment is equal to \$1 per kWh generated by the system in its first 12 months of operation, up to a maximum payment of \$5,000. [See note on grant payment limitation]. This payment will be made to the system owner.

iii) A third grant payment will be made directly to the Participating Contractor at the completion of the first 12 months of operation. The amount of this installer payment is equal to \$0.10 per kWh generated by the system in its first 12 months of operation, up to a maximum payment of \$250 per system.

**Note on grant payment limitation:** The combination of the first and second grant payments (i.e., buydown and production subsidies) will be limited to 80% of the total installed cost of the PV system.

**Note on co-funded grants:** The SDF Solar PV Grant Program will fund PV projects which are funded by other sources using its current incentive mechanism (i.e., \$4/watt buydown and \$1/kWh production); however, it will depend on how the other funding is structured. The total payment of a SDF Solar PV Grant will be limited relative to the total installed cost of the PV system based on \$10/watt – each project will be reviewed individually and a final payment will be determined at the discretion of the PV Program Administrator.

### C. Procedure

i) The first step of the process is for the customer to select a Participating Contractor. This selection is made by the customer.

ii) Prior to the installation of the PV system, the Participating Contractor completes the PV Grant application on behalf of the customer and submits it to the PV Program Administrator. This application collects information about the Participating Contractor, the system owner, the results of a solar audit, the components of the proposed system, the characteristics of the proposed installation including a line diagram and the proposed system costs.

iii) The PV Program Administrator reviews the application and responds in writing to the Participating Contractor and the system owner. If the application is in order and the proposed system appears to meet the program requirements, the response will indicate the conditional approval of the application and the reservation of PV Grant funds for the installation.

iv) The Participating Contractor installs the system, following PECO's requirements for interconnection.

v) Following the installation of the PV system, the Participating Contractor completes the installation completion form and submits it to the PV Program Administrator. This form includes acceptance testing results, breakdown of costs, a check list of completed requirements, and a signature of the system owner and a certification by the Participating Contractor. Along with the installation completion form, a copy of the contract and /or copies of customer invoices must also be submitted, as well as a copy of the parts/labor warranty signed by the Participating Contractor.

vi) After the PV Program Administrator reviews the submitted installation completion form and accompanying documents, an on-site inspection of the PV system is conducted. This consists of verifying the solar audit results are sound, the intended PV system components are properly installed, the solar production meter(s) is installed (the initial reading is noted for the production credit), the system has passed an electrical inspection (e.g., approval sticker), and the two PECO meters are installed (indicating PECO's approval of the interconnection). It is also verified that the customer has system manuals and manufacturers' warranties, and that the customer has been

educated about their PV system. The PV Program Administrator also repeats the acceptance testing procedure to verify expected system performance.

vii) If the system fails to meet the program requirements, the Program Administrator will notify both the system owner and the system installer in writing of the specific changes that are needed in order for the system to qualify. Upon notice that the deficiencies have been corrected, the PV Program Administrator will make a second inspection of the system. No more than two follow-up inspections will be made. If the system does not pass the second inspection, it will no longer be eligible for the PV Grant Program funds. The PV Program Administrator's time and expenses for any follow-up inspections will be covered by the Participating Contractor.

viii) If the system meets the program requirements, the PV Program Administrator makes the first payment to the Participating Contractor based on \$4 per Watt dc (nominal STC) of the system through 2003, and \$3 per Watt dc thereafter. [Grant payment limitations defined in PART II, section B. Grant Payment].

ix) After one year of system operation, the PV Program Administrator makes a second visit to the system and records how much energy was produced by the system.

x) The PV Program Administrator makes the second payment based on \$1 per kWh produced in the first year of operation. This payment is sent to the owner. [Grant payment limitations defined in PART II, section B. Grant Payment].

xi) The PV Program Administrator makes the third payment based on \$0.10 per kWh produced in the first year of operation. This payment is sent to the Participating Contractor.

#### **D. PV Consumer Loans**

AFC First Financial Corporation of Allentown, PA, is one of six financial institutions in the country participating in Fannie Mae's Energy Loan Program. AFC First Financial's home energy loan is available for PV, solar water heating systems and a variety of energy-efficient home improvements and appliances. This consumer loan is an unsecured, no-hassle consumer loan for up to \$20,000 at an interest rate that is below the market rate of traditional unsecured consumer credit. Information about this loan opportunity will be provided to Participating Contractors. For more information about this energy loan, visit the [AFC First Financial](#) website.

### **PART III. PV HARDWARE STANDARDS**

#### **A. Introduction**

The purpose of the hardware standards is to ensure that the systems receiving financial support under this program are of good quality.

#### **B. PV Systems**

Most PV customers will be best served by selecting an approved PV system, thereby not only receiving the assurance that the components are sound but also that they are engineered to work together. The PV systems that are eligible for this program are those systems that have been approved by the Florida Solar Energy Center for the Florida PV Buildings Program. The list of these approved systems is available on the Web at:

<http://fsec.ucf.edu/pvt/BuyInstallPV/pvapprovals/approvals1.htm>.

### **C. PV Modules**

The PV modules that are eligible for this program are those modules that have been approved by the California Energy Commission for the California Emerging Renewable Buy-Down Program. The list of these approved modules is available on the Web at:

[http://www.consumerenergycenter.org/erprebate/eligible\\_pvmodules.html](http://www.consumerenergycenter.org/erprebate/eligible_pvmodules.html)

### **D. Inverters**

The PV inverters that are eligible for this program are those inverters that have been approved by the California Energy Commission for the California Emerging Renewable Buy-Down Program. The list of these approved inverters is available on the Web at:

[http://www.consumerenergycenter.org/erprebate/eligible\\_inverters.html](http://www.consumerenergycenter.org/erprebate/eligible_inverters.html)

### **E. Metering**

In addition to metering equipment that satisfies the interconnection requirements of PECO Energy, all PV systems receiving support under these programs must have the capability to easily display the gross energy production by the system in kWh units. This capability must be satisfied by installing a utility grade kWh meter between the inverter and the service panel; for PV systems with battery backup, a second kWh meter must be installed between the inverter and the sub-panel. Other monitoring devices may be used either by the inverter (if it has data logging capability) or by other metering configurations, but these will not substitute the kWh meter(s) requirement. This feature is necessary to enable the PV Program Administrator to calculate the second payment under the PV Grant Program (based on kWh production) and to enable the system owner to monitor system performance and to easily determine if the system is not performing properly.

### **F. Warranties**

All PV systems that receive financial support under this program must be covered by the following warranties to the system owner:

i) A full parts and labor warranty for the entire system for two years from the date of installation. The parts and labor warranty is to cover any and all component failures or defects, whether covered by the original manufacturer or not, and any and all installation-related malfunctions. The warranty shall provide for parts, labor and incidental repair costs such as shipping. The warranty is not required to cover problems resulting from exposure to fire, flood, hurricane, tornado, earthquake, lightning or other Acts of God, vandalism or alteration of the system by anyone not authorized by the installation company.

ii) A limited warranty on all system parts and components other than the batteries and the controller for an additional three years (years three, four and five from the date of system installation). The limited warranty is to include any and all component failures or defects whether covered by the original manufacturer or not, and any and all installation-related malfunctions. The warranty is not required to cover problems resulting from exposure to fire, flood, hurricane, tornado, earthquake, lightning or other Acts of God, vandalism or alteration of the system by anyone not authorized by the installation company.

The above language must be included in the contractor's warranty to the system owner.

### G. Non-Listed Systems and Components

PV systems or PV components that are not on the lists of approved hardware in sections B, C and D above may apply for inclusion in these programs provided they meet the following standards:

- i) IEEE Standards Coordinating Committee 21, IEEE Recommended Practice for Qualification of Photovoltaic (PV) Modules, IEEE Std. 1262-1995, April 1996
- ii) IEEE Standards Coordinating Committee 21, IEEE Recommended Practice for Utility Interface of Photovoltaic (PV) Systems, IEEE Std. 929-1998, December 1998
- iii) IEEE Standards Coordinating Committee 21, IEEE Recommended Practice and Requirements for Harmonic Control in Electrical Power Systems, IEEE Std.519-1992
- iv) IEEE Standards Coordinating Committee 21, IEEE Guide for Terrestrial Photovoltaic (PV) Power System Safety, IEEE Std.1374-1998
- v) IEEE Standards Coordinating Committee 21, IEEE Recommended Practice for Installation and Maintenance of Lead-Acid Batteries for Photovoltaic (PV) Systems, IEEE Std. 937-1987, March 1987
- vi) IEEE Standards Coordinating Committee 21, IEEE Recommended Practice for Installation and Maintenance of Nickel-Cadmium Batteries for Photovoltaic (PV) Systems, IEEE Std.1145-1990, November 1990
- vii) Underwriters Laboratories, Standard for Safety: Flat-Plate Photovoltaic Modules and Panels, Standard UL 1703, August 1986
- viii) Underwriters Laboratories, Standard for Static Inverters and Charge Controllers for Use in Photovoltaic Power Systems, Standard UL 1741 (Draft), August 1997
- ix) National Fire Protection Association, National Electric Code Handbook 1999, December 1998
- x) the 1999 National Electric Code (NEC 99)
- xi) local building codes
- xii) Sandia National Laboratories, The Design of Residential Photovoltaic Systems, Sandia Report No. SAND87-1951/0 to 9, December 1988
- xiii) Wiles, J.W., Photovoltaic Power Systems and the National Electric Code: Suggested Practices, Southwest Technology Development Institute Report, 1996.

A complete resource guide on the *Codes and Standards for PV Systems and Equipment* can be downloaded from Florida Solar Energy Center's Inspecting Solar Systems Handbook webpage:

[http://www.fsec.ucf.edu/pvt/education/inspgcps/handbook/pdf/PVCodes\\_Standards.pdf](http://www.fsec.ucf.edu/pvt/education/inspgcps/handbook/pdf/PVCodes_Standards.pdf)

**PART IV. INSTALLATION STANDARDS****A. Placement and Orientation of the PV Array**

To qualify for the PV programs, the placement and orientation of all PV modules must be shown to allow the system to produce not less than 70% of the electrical output on an annual basis of a system with optimal placement and orientation. This is demonstrated using the following process:

i) First, the output of the PV array with optimal placement and orientation (the “optimal array”) is calculated using the PVWATTS program (version 1) of the National Renewable Energy Lab for Philadelphia. This program is located at:

[http://rredc.nrel.gov/solar/codes\\_algs/PVWATTS/version1/Pennsylvania/Philadelphia.html](http://rredc.nrel.gov/solar/codes_algs/PVWATTS/version1/Pennsylvania/Philadelphia.html).

This optimal array assumes the modules are facing due south (azimuth = 180°), the tilt of the modules is 35° above horizontal and there is no shading of the array at any time of the day. After inputting the rating of the system, PVWATTS calculates the annual system output in kWh for the optimal placement of the array.

ii) Next, annual output of the proposed array is calculated using a two-step process:

- (1) First, the PVWATTS program is used to calculate annual output of the proposed array, using the actual proposed orientation and tilt of the modules.
- (2) Second, this figure is reduced by the percentage of shading that is identified by the *Solar Pathfinder*. Information about Solar Pathfinder is available at:

<http://www.solarpathfinder.com>.

iii) The annual output for the proposed array is compared to the annual output of the optimal array installation. The annual output of the proposed array must be not less than 70% of the annual output of the optimal array (unshaded).

This procedure can also be carried out by using the *Solar Audit Assistance Tool* software provided by the PV Program Administrator, available only to Participating Contractors.

**B. Mounting of Panels**

All PV modules must be mounted securely in a fashion that complies with state and local building codes.

**C. Mounting of Inverter**

The inverter must be mounted in a way that is consistent with PECO Energy's *Requirements for Parallel Operations for Customers with Generation Not Exceeding 40 kW*. A utility disconnect must be located outside of the facility in sight of the electric meter (if the electric meter is not located outside, the utility disconnect must still be installed outside the facility).

#### **D. Interconnection with the Grid**

Those PV systems that are interconnected must comply with PECO Energy's *Requirements for Parallel Operations for Customers with Generation Not Exceeding 40 kW*. These requirements and all related information can be downloaded from the web at:

<http://www.peco.com/peco/library/pdfs/text.pdf>

and

[http://www.exeloncorp.com/peco/regulatory\\_extaffairs\\_communications/epr\\_our\\_rate\\_price.shtml](http://www.exeloncorp.com/peco/regulatory_extaffairs_communications/epr_our_rate_price.shtml)

#### **E. Customer Education and Systems Manual**

i) As part of the installation process, the Participating Contractor must provide the system owner with a systems manual that has been approved by the PV Program Administrator. The manual shall explain the operation and safety features of the system and where to call if there are any problems with the system. The manual shall also include a wiring diagram of the PV system and copies of all warranties.

ii) As part of the installation process, the Participating Contractor must provide the system owner with a written statement of how energy the system is expected to produce each month and written directions for the steps the system owner should take to verify that the system is performing well.

### **PART V. PARTICIPATING CONTRACTORS**

#### **A. Introduction**

The purpose of the Participating Contractors is to ensure that the systems receiving financial support under this program are installed by contractors who are competent, solvent, honest and fair.

#### **B. Listing of Participating Contractors**

The PV Program Administrator will be responsible for maintaining the list of Participating Contractors that are qualified to participate in the PV program and for reviewing applications for listing by individual contractors. To qualify for listing, a Participating Contractor must meet the requirements of sections C and D below.

#### **C. Solar PV Proficiency**

To demonstrate an acceptable level of solar proficiency, all Participating Contractors that participate in this program must pass the examination given by the Florida Solar Energy Center "Installing Grid-Connected Photovoltaic Systems" or by Solar Energy International or by an approved equivalent.

#### **D. Business Standards**

All Participating Contractors must demonstrate their financial stability by showing that they:

i) use an electrician properly licensed by the State of Pennsylvania or the appropriate unit of local government for the improvements and measures being installed.

ii) are a contractor in good standing, as evidenced by favorable reports from three references and by the absence of a negative report from the Better Business Bureau. In addition, Financing Program customers will be surveyed about contractor performance.

iii) carry at least \$50,000 property insurance and \$100,000 bodily injury insurance for all activities relating to the installation.

iv) carry Workers Compensation Insurance (only if the contractor is an employer of installers, laborers, salespeople, administrators, etc.).

#### **E. Installer Training**

The PV Program Administrator will work with neighboring jurisdictions to coordinate and expand the opportunities for PV installer training.

### **PART VI. PV PROGRAM ADMINISTRATOR**

The PV Program Administrator is Ron Celentano. He will be assisted by Andrew Rudin. They will:

- A. review and approve/reject requests by Participating Contractors to be listed;
- B. review and approve/reject all initial PV Grant Program applications;
- C. review and approve/reject all non-listed systems and components and all non-standard system designs and configurations;
- D. review all installation certifications and perform the inspection of all systems in the PV Grant Program and approve/reject the systems and their installation;
- E. prepare a written statement of specific changes that are needed for non-complying systems to qualify and perform the follow-up inspection;
- F. complete the grant payment authorization form and forward it to SDF;
- G. perform the first-year inspection of all systems in the PV Grant Program and certify the first-year electricity production;
- H. complete the system performance payment authorization form and forward it to SDF; and,
- I. perform other program tasks as appropriate.