

Financing Photovoltaic Systems for Multifamily Housing

Introduction

This fact sheet provides information to affordable multifamily housing providers interested in adding photovoltaic (PV) panels to their properties.

Why Use Solar?

PV technologies have many benefits and will play a crucial role in California's emerging renewable energy market. California is already the world's third-largest market for solar technology and is poised to expand that demand with the Governor's proposed million solar homes plan.

In California, solar energy is an abundantly available, sustainable, and secure natural resource. From an environmental standpoint, solar powered buildings help keep the air cleaner because they cause no emissions of greenhouse gases. Choosing solar power for your project reduces our dependence on imported oil and helps to establish the U.S. as a leader in renewable power technologies.

It is generally easiest to install photovoltaic systems during the construction phase. However, solar power is well suited as a retrofit strategy. Solar systems can be used in a variety of applications and they are relatively easy to install, maintain, and use. PV systems are also easily scalable – they can grow as demand grows.

Installing PV systems in multifamily housing can create significant energy cost savings for the building owner. Using solar energy to power common areas, such as hallways, parking areas, community spaces, and laundry facilities will reduce energy costs.

Net Metering

Overview

According to the Environmental Protection Agency (EPA), net metering is a method used by utilities to credit customers for any electricity that they generate on site in excess of their own electricity consumption. Building owners who install photovoltaic systems can reduce energy costs by taking advantage of net metering. Energy meters, which register both incoming and outgoing electricity, are required for buildings with PV panels. The meter runs forward as energy flows from the electric grid into the building, and backward as solar-produced energy flows from the building back onto the grid. Similar to a balance sheet, net metering adds in the kilowatt-hours used by the building and subtracts out the kilowatt-hours provided by the solar array. This "balance", calculated over a calendar year, cannot drop below the zero kilowatt-hour mark. In other words, excess power generated in one season (i.e., summer) can offset power consumed in another season (i.e., winter) but the utility will never purchase power from the PV system. Pursuant to State legislation, every California electric utility is required to develop a standard contract or tariff for net metering of customers generating electricity using solar and wind facilities. Some utility companies will provide a free two-way meter.

Net Metering Challenges for Multifamily Projects

The major net metering challenge for multifamily projects revolves around sizing the PV system to serve tenants as well as common areas. Because each tenant unit must be individually metered—no master metering and no sub-metering is allowed—each unit would have to be equipped with its own net meter, inverter, shut-off, electrical conduits, etc. The extra hardware and labor required will typically add 15-20 percent to the cost of the PV system.

Market-rate multifamily property owners have the option to increase tenant rents to recover the cost of the PV installation. Affordable housing property owners, however, face additional challenges in recovering the economic value of the solar electricity because tenant rents are

fixed. Maximum rents are calculated as a function of tenant income, after subtracting the expected cost of utilities. The cost of utilities is determined by the local Housing Authority's utility allowance schedule, which typically has not taken into account the presence of PV. Some programs, including the California Energy Commission (CEC) Emerging Renewables Program, offer higher rebates and other incentives to affordable housing developers. More information about special funding available to affordable housing developers can be found on page 4 of this fact sheet, under the "Rebates" section.

Another possible solution that would allow affordable housing property owners to recoup the cost of installing a PV system is for the Housing Authority to adopt a resource-efficient utility allowance. This mechanism is simply a tiered allowance structure that recognizes that tenant units equipped with PV impose a lower utility burden on the residents. It splits the savings between the tenant and the property owner, enabling the property owner to charge more rent while lowering the tenant's overall rent-plus-utilities burden.

Sizing a Solar System

Whether it will power only common areas, or individual tenant units, properly sizing your PV system is one of the most critical steps in the PV installation process.

The size of a PV system depends on many variables. First and foremost, it is important to build your project to be as energy efficient as possible. By reducing overall electricity needs and improving energy efficiency, you can install a smaller, less expensive PV system. If your project is a new building, design it to take advantage of passive solar opportunities, which will minimize the need for supplemental heating, cooling, and lighting. Implement as many energy-efficiency measures as possible, including insulation, high R-value windows or storm windows, compact fluorescent lights and ENERGY STAR appliances. Also, consider handling large electrical loads such as cooking, water heating, and refrigeration with a combination of solar hot water and geothermal heat pumps.

General information and resources for energy-efficient building can be found at:

- ◆ US Department of Energy's Energy Efficient and Renewable Energy
(<http://www.eere.energy.gov/buildings>)
- ◆ Green Affordable Housing Coalition
(<http://www.greenaffordablehousing.org>)
- ◆ State of California Green Building Design and Construction
(<http://www.ciwmb.ca.gov/GreenBuilding>)

After designing the most energy-efficient building possible, you will need to determine how much electric power it will take to meet the building's energy needs and how much roof space will be needed to house your PV system.

PV Power Rule of Thumb

According to The Guide to Photovoltaic System Design and Installation (www.energy.ca.gov/reports/2001-09-04_500-01-020.PDF) published by the CEC, an accepted rule of thumb is that a 1-kilowatt system will generate between 1,379 and 1,724 kWh per year in San Francisco. A recent study noted that the 8,000 square foot common area of a 15-year old apartment complex in San Francisco used approximately 46,400 kWh in 2004. These numbers indicate that a system rated between 27 and 34 kW would be sufficient to meet the needs of this common area.

For estimating costs for individual units, a typical one-bedroom apartment uses about 3500–4500 kWh/year. These numbers indicate that systems rated between 2 and 4 kW are generally sufficient to meet the needs of typical one-bedroom apartments.

PV Array Space Requirements

When determining whether your project has enough unshaded roof space to support your PV power needs, keep in mind the rough sizing requirements for PV. According to the CEC's Guide, you'll need about 100 – 150 sq ft of unshaded roof area for each kilowatt of system capacity.

Using the above property as an example, we have already calculated that 27–34 kW of installed capacity would be required to meet the

common area load. Using the guide of 100–150 sq ft of roof space per installed kW, we can roughly estimate that the amount of roof space needed to support a 27-34 kW system would be 2700 – 5100 sq ft of unshaded roof area.

Shading

In addition to figuring out power and space requirements for the PV system, you will need to perform a shading analysis of your site and building outline in order to calculate (and optimize) the best solar exposure. In Northern California, systems should have a southern exposure and be tilted +/-10 degrees of latitude.¹ The goal is to angle the panels so they receive maximum sun exposure between 9 a.m. and 3 p.m. during the longest days of the year. Other placements are viable but may entail a loss of productivity.

Shading is a critical issue for PV performance. The PV array should not be located in the shadow of other building elements (e.g., facades and parapets, mechanical/ plumbing elements (including vent pipes and flues), and landscaping (when at full growth).

When considering possible shade problems, look both at your site and at buildings that shade your site, as shading constraints from neighboring properties are common, especially given the urban setting for many multifamily buildings. Pay particular attention to nearby properties to the south, and consider whether the site could be developed in the future with a structure taller than your own.

PV System Costs

After determining your net metering structure, the PV system size that will best suit your project, and any space or shade constraints, it's time to focus on cost.

Even with the declining costs of the technology, installing a PV system still represents a major up-front investment for most projects. By far, the most common question asked about installing a PV system is: *"How much does it cost?"* The most accurate answer is always going to be: *"It*

depends." The cost question is very difficult to answer definitively because of the many variables involved in choosing a system.

Estimating Your PV System Costs

Estimates for PV costs vary widely across different publications. When estimating costs for your system, it may help to keep in mind the following general guidelines.

Module Costs. Many PV modules can be purchased for about \$5 per watt for most small systems in the 150 to 8,000 watt range. Of course, there are opportunities to purchase modules for a lower price, especially when your system is larger. When purchasing modules, look for a UL listing (certifies that the modules meet electrical safety standards) and long-term warranties. Some manufacturers offer modules with 10-20 year warranties.

Battery Bank Costs (if needed). Multifamily projects usually will not use battery storage.

Inverter Costs (if needed). An inverter will be needed for systems that output AC power. For stand-alone systems, the inverter should be sized to provide 125% of the maximum loads you wish to run simultaneously at any one moment. For example, if the total loads you wish to run will be 1,600 watts (a dishwasher, television and ceiling fan) choose an inverter with a rated continuous power output of 2,000 watts. For grid-connected systems, the maximum continuous input rating of the inverter should be about 10% higher than the PV array size to allow for safe and efficient operation. The input rating of the inverter should never be lower than the PV array rating. Inverters can be purchased at retail for about \$1 per rated watt.

Balance of System Costs. Besides PV modules and batteries, complete PV systems also use wire, switches, fuses, connectors and other miscellaneous parts. Many guidebooks suggest using a factor of 20% to cover balance of system costs.

Typical Costs

Energy consumption will vary from project to project; however, the CEC web site estimates that an average system can cost about \$8.00 a watt. Smaller systems funded through California's Buy-Down Program have been

¹ San Francisco is at 38° latitude.



averaging \$7.00 a watt, after rebates. Keep in mind that affordable housing projects often receive higher rebates than market-rate housing projects.

The Clean Power Estimator

This software program from Clean Power Research provides California residential and commercial electric customers with a personalized estimate of the costs and benefits of investing in a photovoltaic (PV) solar or small wind electric generation system. The Clean Power Estimator™ takes into consideration customer-specific information in order to provide the best estimate of a given system's costs and benefits. It is available online, free of charge, from the California Energy Commission - www.consumerenergycenter.org/renewables/estimator

Financing PV Systems

Overall, the largest barrier to widespread PV use is the high up-front cost. Fortunately, many rebates, tax credits and other incentives are available to mitigate up front costs.

Types of Financing

This fact sheet discusses four types of financing assistance:

- ◆ Rebates
- ◆ Public financing programs
- ◆ Tax credits, equity and bond financing
- ◆ Private low and no interest loans

Rebates

Funds for rebates and incentives are rapidly growing in California. However, because of the popularity of the rebates, the incentive rates are steadily decreasing. Owners or developers usually have to pay the up front cost of installing the PV system. Be sure to reserve your rebate funds before purchasing and installing the equipment.

Program	Contact Info
CEC Emerging Renewables Program	1-800-555-7794

CPUC Self Generation Program	1-415-703-1974
PG&E Self Generation Program	1-415-973-6436
Southern California Edison	1-800-736-4777
SMUD-PV Pioneer Program	1-877-622-SMUD (7683)

CEC Emerging Renewables Program

The Emerging Renewables Program provides funding to offset the cost of emerging renewable energy technologies and has allocated special funding for affordable housing projects. The special funding allows an extra 25% rebate above the normal rebate amount. For example, if the rebate rate is \$2.80/watt + 25% = \$3.50/watt. Rebates cannot exceed 75% of total system cost. The program uses a fixed per watt incentive rate to reduce (or buy down) initial costs of installing PV systems and is for systems under 30kW.

CPUC Self Generation Program

Statewide, the program receives \$125 million annually to provide financial incentives for business and residential customers who install large "clean" distributed generation (minimum 30 kW system).

Qualifying "self-generation" equipment must be certified to operate in parallel with the electrical grid and meet other criteria established by the CPUC. The program is administered through four California utility companies and runs through January 1, 2008.

SMUD-PV Pioneer Program (applies only to SMUD customers)

The Program pays a one-time cash incentive to commercial and industrial customers who produce their own electricity. With a 30 kW or larger system, SMUD will pay a one-time incentive of \$2.50 for every watt the system is capable of generating (up to \$250,000). For example, your business would get \$75,000 from SMUD if you install a 30 kW system.

Public Financing Programs

Federal, state and local public agencies have funds available for a variety of affordable housing activities. Sometimes these funds are



very flexible and can be used for stand-alone, energy-efficiency upgrades, or the upgrade may be included in a new construction or substantial renovation project. All agencies have low-income eligibility requirements.

Program	Contact Info
Community Development Block Grant	List of CA HUD offices
HOME Investment Partnership	1-916-322-0356
Redevelopment Agency Funds	Local redevelopment agency or 1-916-448-8760
USDA Rural Development Multifamily Housing	1-530-792-5800

Community Development Block Grant

CDBG is a federal program funded by HUD and administered independently by city, county or state agencies. CDBG programs are federally mandated to support energy-efficiency and renewable energy technologies in property rehabilitation.

HOME Investment Partnership

A grant/loan program funded by Housing and Community Development and administered locally. HOME funds must be used for significant renovations or new construction only in units that are at or below 80% of area median income. This program is used to assist cities, counties and nonprofit community housing development organizations (CHDOs) to create and retain affordable housing.

Redevelopment Agency Funds

Redevelopment funds are based on tax increment financing (TIF) generated by incremental increases in property tax revenue through public investment in an area that has been designated a redevelopment project area. Funds are available for flexible use, and energy-efficiency upgrades can be included in new construction or renovations. Each local agency determines eligibility criteria and priorities.

USDA Rural Development Multifamily Housing

Grants or loans are available to provide affordable multifamily housing for lower income households. Funds are not generally used for stand-alone energy improvements; however, the agency is interested in incorporating energy conservation measures in accordance with the National Energy Strategy.

Tax Credits, Equity and Exemptions

Program	Contact Info
CEC Solar or Wind Energy System Tax Credit	1-800-852-5711 or 1-800-555-7794
California Tax Credit Allocation Committee	1-916-654-6340
California Debt Limit Allocation Committee	1-916-653-6827

CEC Solar or Wind Energy System Tax Credit

For taxable years beginning on or after January 1, 2004, and before January 1, 2006, the tax credit can be applied against net income tax in an amount equal to the lesser of 7.5 percent of the cost paid for the purchase and installation of a solar or wind energy system after deducting the value of any municipal, state, or federal sponsored financial incentives, or \$4.50 per rated watt of the solar or wind energy system. To qualify for the tax credit, solar and wind energy systems must satisfy a number of requirements as specified in the law. In addition, the law requires solar and wind energy systems to be certified using a simple "self-certification" worksheet published by the California Energy Commission.

California Tax Credit Allocation Committee

Low-income housing tax credits are available on a competitive basis to owners or developers of affordable housing. Including energy-efficiency improvements will raise your "score" and raise the threshold limits of the tax credit.

California Debt Limit Allocation Committee

This competitive, tax-exempt, bond financing program lowers the interest rate paid by builders or developers of low-income housing. This program cannot be used for stand-alone energy-efficiency improvements; however, energy efficiency is a factor in scoring the applications



and projects must, at a minimum, be at least 15% more efficient than Title 24 standards.

Private Low and No Interest Loans

Program	Contact Info
Bay Area Local Initiatives Support Corporation	1-415-397-7322
State Assistance fund for Enterprise, Business and Industrial Development Corporation (SAFE-BIDCO)	1-707-577-8621

Bay Area Local Initiatives Support Corporation

These short-term loans can be used for stand-alone energy-efficiency projects. They are generally offered to projects that are slated to receive rebates or significant energy cost savings. Up to \$50,000 is possible with a 0% interest rate.

State Assistance fund for Enterprise, Business and Industrial Development Corporation

SAFE-BIDCO offers low interest loans to projects that conserve energy equal to 15% of normal usage or contribute to peak load reduction. Loans are capped at \$350,000, or ten times the amount of estimated annual savings, whichever is less, at a 4% interest rate.

For More Information

California Public Utilities Commission's California Solar Initiative:

<http://www.gosolarcalifornia.ca.gov/> is a "one-stop shop" for information on rebates, tax credits, and incentives for solar electricity systems in California.

Database of State Incentives for Renewable Energy (DSIRE): <http://www.dsireusa.org> resource information on state, local, and utility incentives for renewable energy

California Multifamily Housing Consortium
<http://www.seiinc.org/multifamilyconsortium/index.html>

The California Solar Center
<http://www.californiasolarcenter.org/index.html>

Multifamily Project Case Study – Temescal Place
http://www.ccenergy.com/news/TemescalPlace_installation.html

For more information about Build It Green, visit our web site at www.BuildItGreen.org or call us at 510-845-0472.

Disclaimer

Development of this fact sheet was funded by California ratepayers under the auspices of the California Public Utilities Commission (Commission). It does not necessarily represent the view of the Commission, its employees, or the State of California. The Green Affordable Housing Coalition, the Commission, the State of California, its employees, contractors, and subcontractors make no warranty, express or implied, and assume no legal liability for the information in this report, nor does any party represent that the use of this information will not infringe upon privately owned rights. This report has not been approved or disapproved by the Commission, nor has the Commission passed upon the accuracy of the information in this report. Contents are provided for general education and informational purposes only. The actual suitability and applicability of this information for a given use depends upon a host of project-specific considerations. The Green Affordable Housing Coalition strongly encourages the reader to consult with a construction professional and/or product supplier before applying any of this information to a specific use or purpose.