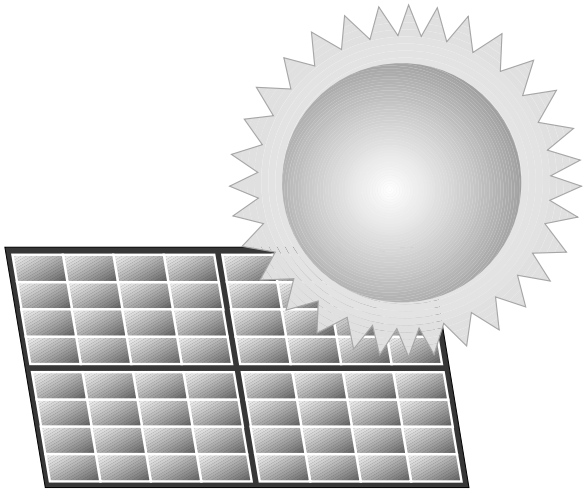
HANDBOOK

Buying a PHOTOVOLTAIC SOLAR ELECTRIC SYSTEM:

A CONSUMER GUIDE



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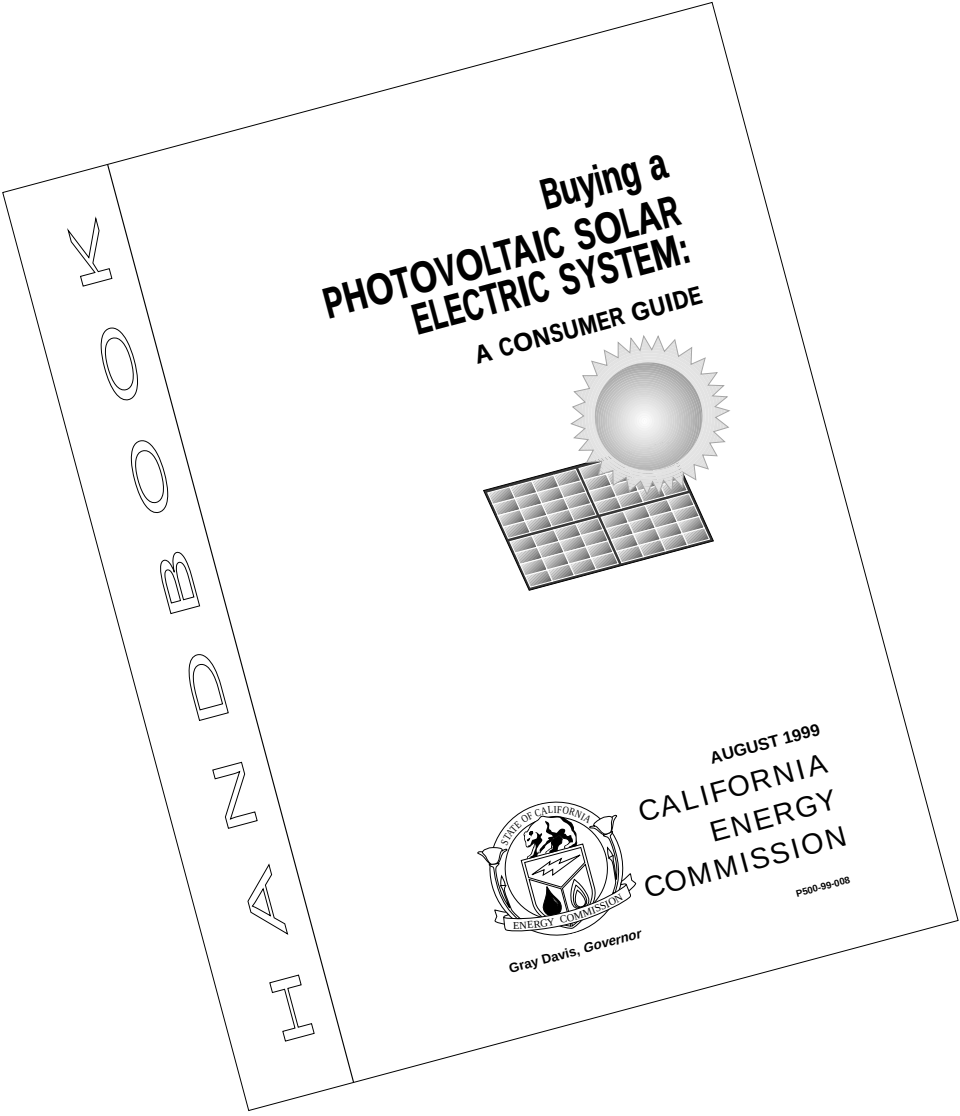

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Disclaimer

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Introduction

Buying a Photovoltaic Solar Electric System: A Consumer Guide walks you through the basic technical, economic and regulatory information you need to know before buying a photovoltaic (PV) solar electric generation system. It also describes how to take advantage of financial rebates offered through the Energy Commission's Emerging Renewables Buy-down Account.

> **A word of caution:** This *Guide* is not a comprehensive technical or economic guide on photovoltaic systems. For that information, see the "Getting Help" section or consult an experienced photovoltaic system designer or supplier.

What is a solar electric or photovoltaic system?

Unlike solar systems for heating water, photovoltaic technology does not use the sun's heat to make electricity. Learning from the word itself, the prefix "photo" means "produced by light," and the suffix "voltaic" refers to "electricity produced by a chemical reaction." PV technology produces electricity directly from the electrons freed by the interaction of sunlight with certain semiconductor materials, such as silicon, in the PV module. The electrons are collected to form a direct current (DC) of electricity.

The basic building block of PV technology is the solar "cell." Many cells may be wired together to produce a PV "module," and many modules are linked together to form a PV "array." PV modules sold commercially range in power output from about 10 watts to 300 watts, and produce a direct current like the current from a car's battery.

A complete PV system usually consists of one or more modules connected to an inverter that changes the PV's DC electricity to alternating current (AC) electricity to power your electrical devices and to be compatible with the electric grid.[1] Batteries are often included in the system to provide back-up power in case of utility power outages. If you are seeking a reliable generation system that can function independently of the utility grid, batteries may be a viable component to your total system.

PV cells can be made from several processes or technologies. They all do the same job -- produce electricity from sunlight. Types of PV cells include:

- Crystalline Silicon
- Poly-crystalline Silicon
- Amorphous Silicon
- Cadmium Telleride
- Copper Indium gallium
- Diselenide

The basic types of inverters include:

- True sine wave inverter. If you plan to take advantage of net metering (see "What is Net Metering?") and feed electricity into the transmission grid, then you must have this type of inverter.

  Most households use alternating current in their electric circuits, with power supplied from the utility at 120 volts and 60 cycles per second. A true sine wave inverter transforms the direct current from the PV modules to alternating current of 120 volts and 60 cycles per second. This transformation may also synchronize your system with the utility's system.

- Modified sine wave inverter. Although similar to a true sine wave inverter, a modified inverter does not provide the same quality of 60 cycle-current that can be fed back to the utility grid. This quality of power, however, can be used at your home or business to power many AC loads.

Instead of an AC inverter, a DC converter or charge controller may be used. This device converts the AC power from the utility grid into DC power that can be used to power DC loads at your site, or to charge batteries.

PV systems produce power intermittently because they work only when the sun is shining. More electricity is produced on a clear, sunny day with more intense sunlight and with a more direct light angle, as when the sun is perpendicular to PV modules. Cloudy days can significantly reduce output, and no power is produced at night. PV systems work best during summer months when the sun is higher in the sky and the days are longer. Because of these variations, it is difficult for PV systems to furnish all the power you need; they are typically used in conjunction with utility-supplied electricity.

Is photovoltaic electricity more expensive?

PV-generated electricity is still more expensive than conventional utility-supplied electricity when amortized over the life of the system. Although improved manufacturing has substantially reduced the cost since the 1970s, PV electricity can still cost about 25 cents or more per kilowatt-hour (kWh). Depending on the installed cost of the system, the retail price is roughly twice what most California residents pay for utility-supplied electricity.

Most of PV electricity's cost comes from the expense of initially purchasing the system. This investment is like paying for years of electricity bills all at once. Although you will appreciate the reduction in your monthly electricity bills, the initial investment is substantial.

The Energy Commission's Buy-down Account is intended to reduce this up-front investment cost to make PV

systems more affordable. Before we discuss ways the Buy-down Account can help you reduce the cost of a PV system; you should first consider these questions.

Is my home or business a good place for a PV system?

First consider how much sun your site receives. Your property should have clear, unobstructed access to the sun for most of the day, and throughout the year. In California, the sun is always in the southern half of the sky and is higher in the summer and lower in the winter.

Generally speaking, the southern part of the state will produce more PV electricity. Also, inland regions have more sunny days and can potentially produce more electricity than coastal areas. (See "How much electricity will a PV system produce?")

The best orientation for a PV system is on a south-facing roof; however, roofs that face east or west may also be acceptable. Flat roofs also work well for solar systems because the PV array can be mounted either flat on the roof facing the sky or on frames tilted toward the south at an optimal angle.

If a rooftop cannot be used, your PV array can also be placed on the ground; either in a "fixed" mount or a "tracking" mount that follows the sun and orients the PV array to maximize the amount of electricity it generates.

Other options (primarily for businesses) include using mounting structures that do double-duty by creating covered parking areas or window awnings.

If your location looks promising, a PV provider can trace the sun's path for you and determine whether your home or business would benefit from a PV system.

Is my site free from shading?
To make the best use of your PV system, you need most or all of the sun's path to be clear and not shaded by trees, roof gables, chimneys, buildings, or other features of your home and the surrounding landscape.

Shading will substantially reduce the amount of electricity that your system can produce. Should you be in a situation where neighboring trees are shading your roof, keep in mind that existing California law establishes your rights to receive sunlight on your property (California Civil Code Section 801.5 and California Public Resources Code sections 25980, et. seq.).

Do I have enough area?
The amount of roof space needed to roof-mount a solar system is based on the size or "generating capacity" or "rating" of the system you purchase. Most residential systems require as little as 50 square feet of mounting area for a small "starter" system, or as much as 500-1,000 square feet for a PV array capable of meeting all of a homeowner's

needs. Commercial systems are typically much larger than residential systems.

Discuss the size of your system with your PV provider. A rule of thumb is that a square foot of single- or poly-crystalline PV module area produces 10 watts of power in bright sunlight. Therefore, a 1000-watt system requires about 100 to 200 square feet of roof area, depending on the type of PV module.

The amount of roof area needed also depends on the PV module's efficiency in converting sunlight to electricity. Table 1 provides approximate roof area requirements as a function of PV efficiency (percent) and rating (watts).

Table 1: Roof Area Needed for Various Sizes of PV Systems

*PV module efficiency * (percent)*	*PV capacity rating (watts)*							
	100	*250*	*500*	*1000*	*2000*	*4000*	*10000*	*100000*
	Roof area needed in square feet							
4	30	75	150	300	600	1200	3000	30000
8	15	38	75	150	300	600	1500	15000
12	10	25	50	100	200	400	1000	10000
16	8	20	40	80	160	320	800	8000

*Although the efficiency (percent of sunlight converted to electricity) varies with different types of PV modules, higher-efficiency modules typically cost more.

Do I have a good roof?

While a PV system can be installed on any type of roof, some types of roofs are simpler and cheaper to work with than other types.

Typically, composition shingle roofs are the easiest to work with, and slate roofs are the most difficult. Between these are shake roofs, flat concrete tiles and mission tile roofs. In any case, an experienced PV installer will know how to work on all roof types and should use roofing techniques that eliminate any possibility of leaks.

Solar electric roofing tiles are new PV products on the market. These tiles, similar in appearance to slate, are used instead of regular roofing materials, and can be used on both new construction or re-roofing. Solar electric roofing tiles can be sized to fit a conventional roof layout, or customized for different roof configurations.

Ask your PV provider if installing a PV system impacts your roof warranty. If your roof is older and needs to be replaced in the very near future, you may want to replace it at the time the PV system is installed and avoid the later cost of removing and reinstalling your system. If, however, your roof must be replaced after the system has been installed, some roofers will insist on a

type of mounting system that uses common roof flashing techniques to ensure a watertight seal.

How big should my PV system be?

Several factors will influence the size of the PV system you select. As a starting point, consider how much of your present electricity needs your PV system should supply.

If you want to meet 50 percent of your electricity needs with your PV system, you should choose a system sized to produce about half of your usual electricity demand. One way to do this is by examining past electric bills. You could also contact your utility and request the total electricity demand, measured in kilowatt-hours, for your household or business over the last 12 months. Ask your PV provider how much electricity your PV system would produce on an annual basis (also measured in kilowatt-hours) and compare it to your annual electricity demand. This will also give you an idea of how much money you will save on your electricity bill once your PV system is installed and generating.

There is no **minimum** system size restriction to qualify for the Emerging Renewables Buy-down Account; however, the **maximum** size cannot be more than 125 percent of the site's annual historical or current needs.

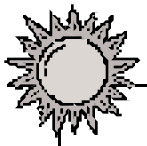
For example, if you used 6,000 kilowatt-hours last year, a system that produces more than 7,500 kilowatt-hours per year would not qualify for the buy-down.

What features should my PV system have?

Some PV systems have batteries that can provide back-up power to your home or business in case of utility grid outages. Batteries certainly add value to your system, but at an increased price. Keep in mind that batteries and other electricity storage devices are not covered under the Energy Commission's Buy-down Account, and are not considered in determining eligible rebates.

You may also want to consider the "economies of scale" associated with your system, which means that a larger system costs less per kilowatt-hour generated, even though it costs more overall.

For example, many inverters are sized to accommodate systems up to 4 to 5 kilowatts. If your PV array is smaller (say 3 kilowatts) you may still end up buying the same inverter. Similarly, your PV provider is likely to offer you a better price to install a 2-kilowatt system all at once than 1 kilowatt this year and 1 kilowatt next year, because multiple orders and multiple site visits are more expensive. On the other hand, putting a system together in this "modular" fashion may be more attractive



The usable energy a typical house in California gets from sunshine in one year is enough to satisfy eight times its total annual electricity needs!

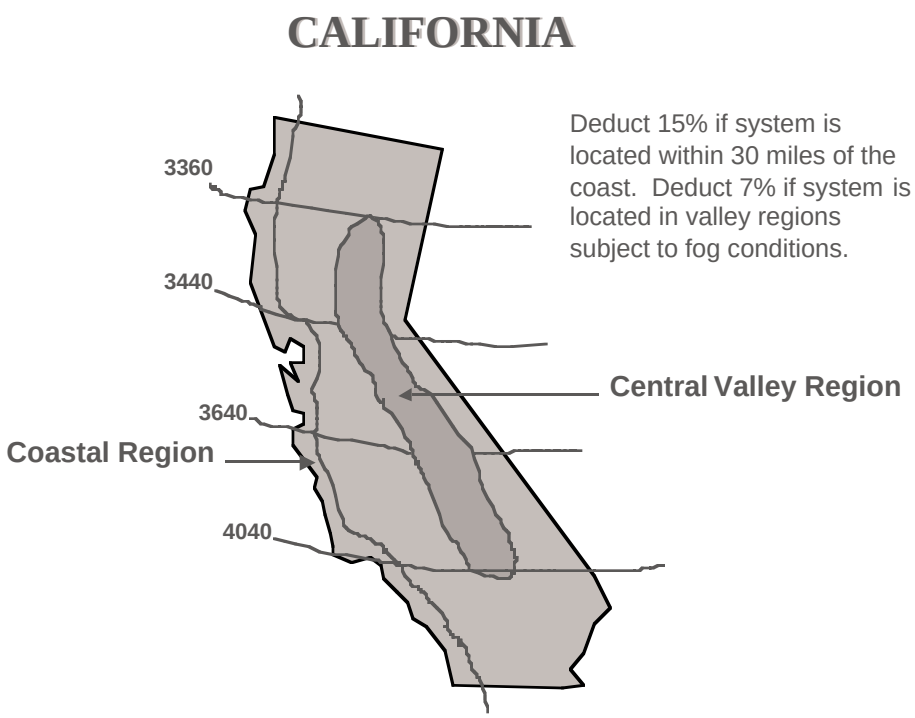
financially, as it allows a pay-as-you-go approach.

How much electricity will a PV system produce?

PV systems produce the most electricity from spring through fall when the sun is shining. Energy production will vary, of course, depending on geography and climate. The following map provides *very approximate* statewide production estimates for a 2-kW rooftop PV system facing due south at a 20-degree tilt.

In California, the "average" residential customer uses 6,500 kilowatt-hours (kWh) per year. As the map shows, a 2-kilowatt system would supply about 62 percent of the average customer's total demand. A 1-kilowatt system would probably supply about one-third of a customer's load, while a 3-kilowatt system might supply almost all of an average customer's needs. Naturally these estimates vary depending on the geographic location, whether tracking devices are used, weather conditions, and so on.

Figure 1: 2-kW PV Statewide System Production



Source: Energy Commission staff estimates derived from Pacific Energy Group estimates.

Electricity production and savings example
On an approximate basis, a 2-kW rooftop PV system in an inland area of Los Angeles would potentially produce the following amount of electricity:

2,020kWh/kW x 2kW = 4,040 kWh

This reflects an annual "capacity factor" of 23 percent

4040kWh/8760 hours per year / 2kw = 23

System size x annual capacity factor x hours per year = total kWh per year

2kW system x .23 x 8760 hours = 4,030 kWh per year

Using the above 2-kilowatt system as an example, average annual savings might be:

4,030 kWh x 12¢/kWh = $484 per year, or about $40 per month

The electric rate of 12¢/kwh is an approximate rate and reflects the higher rate tier of Pacific Gas & Electric and Southern California Edison. Check your local utility rates to estimate the value of the electricity your system would produce.

Remember that actual energy production will vary by up to 20 percent from these figures, depending on your specific geographic location, the system's angle and orientation, and the quality of the system's components and installation. Be sure to discuss these issues with your PV provider and consider asking for a written estimate of the average annual energy production from the system. An estimate can be accurate for an average year, but actual electricity production will fluctuate from year to year, based on natural weather and climate variations.

Recent California law allows you to use the electric grid like a battery and store any surplus electricity produced from the PV system on the electric utility grid to be used later (see "What is net metering?"). This is a real advantage to you, placing a value on the electricity you generate at the full retail electricity rate.

Reminder: If electric rates increase in future years, savings will also increase. Conversely, if electric rates decline, savings from the PV system will go down.

Investing in a PV system

How much does a PV system cost?

The cost of a PV system depends on the system's size and the types of components, but also scales somewhat with the system size or rating, and the amount of energy produced.

As shown in Table 2, a small, single-PV panel system with a built-in inverter that produces about 100 watts may cost around $900 installed, or $9 per watt. Such a small system would offset only a small fraction of your electricity bill.

A 2-kilowatt (2,000-watt) system may cost $13,000 to $20,000 installed, or $6.50 to $10 per watt. At the other extreme, a 5-kilowatt system that will completely offset the energy needs of many conventional homes may cost $30,000 to $40,000 installed, or $6 to $8 per watt. (All above costs are **before** deducting the Buy-down rebate.)

These are rough estimates; your costs will depend on the system's configuration, equipment options, and labor costs. Prices vary depending on other factors as well, such as the PV provider, whether or not your home is new, if the PV is integrated into the roof or mounted on top of the existing roof, and the PV manufacturer.

Table 2: PV System Cost Estimates (before rebate)

Watts	Cost per Watt (dollars)	Total System Cost (dollars)
100	$9	$900
2,000	6 – 10	13,000 – 20,000
5,000	**6 – 8**	**30,000 – 40,000**

Prescription for a Least-Cost PV System

1. Select a standardized PV system (offered by some retailers).
2. Have an easy-to-install system, mounted on a composition roof or the ground.
3. Buy as a group to get volume discounts.
4. Above all, shop around.

Are incentives available to help reduce my costs?

Yes! Reducing your cost is the primary feature of the California Energy Commission's Emerging Renewables Buy-down Account.

What is the Emerging Renewables Buy-down Account?

The California Legislature set aside $54 to reduce, or "buy down," the up-front price consumers pay to purchase and install emerging renewable energy technologies, such as solar photovoltaic. Buy-down amounts are based on the generating capacity of the systems, measured in watts.

The amount of the buy-down will decline over the lifetime of the Account, starting with a block of funds that provides rebates of $3 per watt, or 50 percent of the total eligible system cost, whichever is lower. It ends with a final block of funds that provides rebates of $1 per watt, or 20 percent of the total cost. Rebates are given on a first-come, first-served basis; if you apply early, you will receive higher rebates.

What are the eligibility requirements for the Buy-down Account?

Site requirements

Your site is eligible if:

- it is located in the utility service territory of Pacific Gas & Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), Southern California Edison (SCE), or Bear Valley Electric Company, and

- it is connected and remains connected to the utility grid (or will be connected, in the case of new construction).

Technology requirements
Technologies eligible for rebates are:

- photovoltaic systems
- small wind turbines with an output of 10 kilowatts or less
- fuel cell systems using renewable fuels
- solar thermal electric generation systems.

This *Guide* focuses on photovoltaic systems. The Energy Commission plans to develop a similar buying guide for wind technologies. Buying guides for fuel cells and solar thermal applications will be considered as markets develop for these technologies.

You can install your own PV system and be eligible for the rebate, providing you are technically proficient in understanding wiring schematics, electrical codes, and mounting techniques for roofs or other locations.

Otherwise, you should hire a professional PV provider to help you select the system size and its installed location, and to install your system (see "Selecting a PV retailer or provider").

Here are additional questions you should consider before making your final purchase decision.

How can I benefit from the Emerging Renewables Buy-down Account?
The Buy-down Account offers financial incentives that encourage you to purchase renewable energy electric generating systems. If you are thinking about buying a PV system, the Energy Commission provides rebates that will reduce your initial cost. This makes generating electricity from solar energy more affordable.

If you purchase a PV system during the initial phase of the program, your rebate would be $3 per watt or 50 percent of your total installed costs, whichever is lower. For a 2-kilowatt system costing $12,000 or more, for example, the rebate amount would be $6,000: $3 per watt x 2000 watts. If the system cost $18,000, the rebate would still be $6,000, based on the lower $3 per watt amount, equivalent to a 33 percent discount.

You or your PV retailer can reserve a rebate amount at a specified funding level block. Each block of funds is available on a first-come, first-served basis until it is depleted. You have nine months from the date of reservation to buy and install systems up to 10 watts in size.[2]

When the system is installed and operating, you must submit a claim form to the Energy Commission. Include documentation verifying proper installation (a copy of the building permit is required). The Energy Commission will then issue a check to either you or your PV retailer, whomever reserved the rebate, typically within 30 days of receiving the claim form.

What would my monthly payments be?
Earlier we estimated the cost of a 2 kW PV system at $13,000 to $20,000, before rebates. In this example we assume that an installed 2 kW-system costs $13,000 before rebates.

If you receive a rebate of $3 per watt through the Buy-down Account, your net costs would be $7,000 ($3/watt x 2000 watts = $6000 rebate). Table 3 shows your estimated net system cost and monthly payments, based on a 2 kilowatt, $13,000 system. In a similar way, you can calculate your monthly loan payments and estimate your possible net system cost -- assuming a system is financed through a bank, savings and loan or credit union (more about financing later).

Table 4 summarizes the electricity savings, loan costs, and tax deductions for a 2-kilowatt system costing $13,000.

Table 3: Estimated Net System Cost and Monthly Payments (2kW system)

Total System Cost	*$13,000*
Buy-down Account rebate	**$6,000**
Net cost/loan amount	**$7,000**
Loan period	**20 years**
Interest rate	**7 percent**
Annual payments	**$660/year ($55 x 12 months)**
Approximate amortized monthly payments*	**$55/month**

Table 4: Estimated Net Savings (2 kW system)

Monthly Costs/Savings	
Monthly electricity savings	**$40.00**
Minus loan payments	**-55.00**
Income tax deduction[3]	**17.00**
Net savings*	**2.00**

*Tables 3 and 4 assume a loan of $7,000 for a 2-kilowatt system financed over a 20-year period at a 7 percent interest rate (typical of the terms of many home equity loans).

Note: The low-end estimate of $13,000 is used in these examples because it represents the approximate the "break-even" investment cost you should be aware of when pricing systems. To break even, the cost of owning and operating a PV system (including electricity savings, loan payments and tax considerations) must equal your present electric costs with your local electric utility. The net costs of a more expensive system will probably be higher than the anticipated savings, making it more economical to purchase electricity from your utility.

Are there other California incentive programs?
Yes. Even if you do not qualify for the Emerging Renewables Buy-down Account, you are not necessarily excluded from receiving other financial incentives. Many municipal utilities — including the state's largest, LADWP and SMUD — are offering buy-downs or other programs to help their customers obtain PV systems for their homes or businesses. Contact your local utility for more information.

Are there Federal incentive programs?
Yes, the U.S. government also provides financial support for developing PV technology — through a tax credit for commercial uses of solar energy. This energy investment credit provides business taxpayers (but not individuals or utilities) with a 10 percent tax credit and a five-year accelerated depreciation for the cost of equipment used to generate electricity using solar technologies.

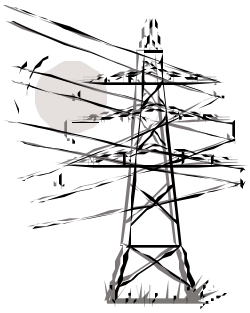
How can I finance my PV system?

While there are some special programs for financing solar and other renewable energy investments, most financing options are already familiar to you.

The best way to finance PV systems for homes is through a mortgage loan. Mortgage financing options include your primary mortgage, a second mortgage, such as a U.S. Department of Housing and Urban Development Title 1 loan, or a home equity loan that is secured by your property.

There are two advantages to mortgage financing. First, mortgage financing usually provides longer terms and lower interest rates than other loans, such as conventional bank loans. Second, the interest paid on a mortgage loan is generally deductible from your federal taxes. If you buy the PV system at the same time that you build, buy, or refinance the house on which the system will be installed—adding the cost of the PV system to your mortgage is likely to be relatively simple and may avoid additional loan application forms or fees.

If mortgage financing is not available, look for other sources of financing, such as conventional bank loans. PV systems purchased for business applications are probably best financed through a company's existing sources of funds for capital purchases—usually Small Business Administration loans or conventional bank loans. Because your PV system is a long-term investment, the PV financing terms and conditions are likely to be important factors in determining the effective price of your PV-generated electricity.



Will a PV system increase my property taxes?

No. All PV systems installed from 1999 until 2006 will not be subject to property taxes (Revenue and Taxation Code, section 73).

Connecting a PV system to the utility grid

All utilities in the state must offer the option of interconnecting on a net metering basis to residential and small commercial customers with PV or small wind systems 10 kilowatts or less (California Public Utilities Code section 2827).

What is net metering?

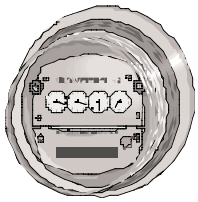
As an eligible customer with a PV or small wind system, net metering allows you to interconnect with your utility and feed your surplus electricity to the utility grid. You can use an equivalent amount of electricity later without additional cost to you.

Net metering allows your electricity meter to spin forward when electricity flows from the utility into your building, and backward when your system produces surplus electricity that is not immediately used. Your excess electricity is "banked" on the utility grid.

At least once a year, you are charged for the net energy consumed over the previous 12 months.[4] Under federal law, utilities must buy any excess electricity you generate beyond what you use in your home or business. Utilities are not required to carry over your credit from year to year, however, so any "net" energy you generate may be lost at the end of the 12-month period.

Net metering simplifies the metering process in two ways: it eliminates the need for a second meter, and it streamlines the accounting process by eliminating the need for payments from your electricity service provider. Most utilities have established simplified agreements for customers that qualify; be sure to ask your PV provider or your utility for a net-metering agreement.

How does net metering affect me?



Net metering allows you to get more value from your generated electricity by offsetting your future retail electricity purchases, rather than selling your excess electricity to your utility at the lower wholesale, or "avoided cost," price.

Without net metering, you would lose much of the value of your excess electricity. The electricity you generate from your PV system would supply your own immediate needs, and you would purchase any shortfall from the utility at the retail rate. Without net metering, any electricity you generated and did not immediately use would be sold back to the utility at the avoided cost rate. This rate is much lower than the retail rate—about 2 to 3 cents per kilowatt-hour, as opposed to a retail rate of 10 to 15 cents per kilowatt-hour.

At a residence, net metering can usually be accomplished by using your existing electricity meter. Utilities usually require business customers without net-metering agreements to use two meters: one to measure the flow of electricity into the building, the other to measure

the flow of electricity out of the building. For large commercial and industrial customers who generate their own power, this "dual metering" arrangement is still the norm.

What is an interconnection agreement?

Interconnecting your PV system to the utility transmission grid will require you to enter into an interconnection agreement, and a purchase and sale agreement. Most California utilities have developed standardized interconnection agreements for small-scale PV systems as part of their implementation of California's net metering law. These agreements may be a single contract with your local utility or separate contracts with your utility and your electrical service provider.

The interconnection agreement defines the terms and conditions under which your system will be connected to the utility grid, including the technical requirements necessary to ensure safety and power quality. Other items in the agreement include your obligation to obtain all necessary permits for the system, maintain the system in good working order, and generally be responsible for the system's safe operation.

The interconnection agreement also specifies the metering arrangements (usually net metering for residential customers, dual metering for commercial and industrial customers), and any other related issues.

Most utilities have established simplified interconnection agreements; be sure to ask your provider or utility. The language in these agreements should be simple and straightforward. If you are unclear about your obligations, you should contact your utility or electric service provider for clarification. If your questions are not adequately addressed, contact one of the "Getting help" listings at the end of this *Guide*.

What should I know about Utility Interconnection Standards?

Recent progress has been made in developing nationally recognized standards for utility interconnection of PV systems. Although these standards are not necessarily binding on utilities, many utilities are adopting them rather than developing their own.

The most important standard focuses on inverters. Traditionally, inverters simply converted the DC electricity generated by PV arrays into AC electricity that is used in your home. More recently, inverters have evolved into remarkably sophisticated devices to manage and condition power. Many new inverters contain all the protective relays, disconnects, and other components necessary to meet the most stringent national standards.

Two of these standards are particularly relevant:

1. Institute of Electrical and Electronic Engineers, *P929: Recommended Practice for Utility Interface of Photovoltaic Systems*. Institute of Electrical and Electronic Engineers, Inc., New York, NY (1988, with revision being finalized in 1999).

2. Underwriters Laboratories, UL Subject 1741: Standard for Static Inverters and Charge Controllers for Use in Photovoltaic Power Systems (First Edition). Underwriters Laboratories, Inc., Northbrook, IL (December 1997).

You do not necessarily need to know about these standards, but your PV provider and utility should. It is your obligation to ensure that your PV provider uses equipment that complies with these or other relevant standards.

What should I know about permits and codes?

In most locations, you will need to obtain various permits from your city or county building department before adding a PV system. You will likely need to purchase a building permit, an electrical permit, or both to legally begin installation. Typically, your PV provider will take care of this task, rolling the price of permits into the overall system price. In some cases, however, your PV provider may not know how much time or money will be involved in "pulling" a permit. In that case, permitting may be priced on a "time and materials" basis. Always make sure that permitting costs and responsibilities are addressed with your PV provider at the start.

Code requirements for PV systems vary somewhat from one jurisdiction to the next, but most requirements are based on the National Electrical Code. NEC Article 690 carefully spells out requirements for designing and installing safe, reliable, code-compliant PV systems. Because many local requirements are based on the NEC, your building inspector is likely to rely on Article 690 for guidance in determining whether your PV system has been properly designed and installed.

If you are among the first people in your community to install a grid-connected PV system, your local government may never have permitted one of these systems, and the building inspector may have never seen one. If this is the case, you and your PV provider can speed the process along by working closely and cooperatively with your local building officials to help educate them about the technology and its characteristics.

You may live in a location where you must gain installation approval from an architectural committee or homeowners' association to comply with the "Covenants, Codes and Restrictions" applicable to your home. If so, you or your PV provider may need to seek agreement from your neighbors and submit your system plans to a homeowner committee before you install a system. Complying with "CC&Rs" is a very important step that you should undertake *before* you begin installing your PV system. If this process