



**A Million Solar Roofs:  
A Consumer Guide to Going Solar in California**

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## INTRODUCTION

The Million Solar Roofs Initiative is one of California's most important and ambitious public policy endeavors. Historic in both scope and scale, this initiative marks the first time a state has used a single initiative to create a mainstream market for solar power and turn a boutique, niche technology into a commonplace and affordable energy resource for average Californians.

First established via the California Solar Initiative—adopted by the Public Utilities Commission (PUC) on January 12, 2006, and then followed up with Senate Bill 1, authored by Senator Kevin Murray and signed into law by Gov. Schwarzenegger on August 21, 2006—the Million Solar Roofs Initiative aims to build a million new solar homes and businesses by 2016; install 3,000 MW of small-scale solar power systems on buildings statewide; and, build half of all new homes with solar panels by 2017.

Broad and diverse support for the initiative was driven largely by a desire for greater energy stability and energy independence, by a growing concern over global warming and the health impacts of air pollution, and by a desire for the economic benefits of solar power such as increased jobs and lower energy bills.

It has been said by many solar industry observers, that it is not a question of *if* solar power becomes mainstream but *when*. Should California be successful with its Million Solar Roofs Initiative, the answer to this question will be within a decade.

Yet the success of the Million Solar Roofs initiative depends on successful implementation by the PUC and California Energy Commission (CEC) as well as on whether or not California consumers take advantage of the state's solar incentives.

Toward that end, this guide is intended to provide California homeowners, businesses, policy makers and solar power enthusiasts with a basic understanding of the Million Solar Roofs Initiative and the policies and programs set up to drive a mainstream, roof-top solar power market in California.

In addition to this guide, more information can be found at [www.environmentalcalifornia.org](http://www.environmentalcalifornia.org) or at the PUC and CEC joint website [www.gosolarcalifornia.ca.gov](http://www.gosolarcalifornia.ca.gov).

## OVERVIEW: THE MILLION SOLAR ROOFS INITIATIVE

Since the California Energy Crisis of 2000/2001, demand for solar power increased by 2,800%.<sup>1</sup> Yet, despite this progress, solar power today makes up less than one half of one percent of the state's electricity supply.<sup>2</sup> While the third largest market for solar power in the world, following Japan and Germany, solar power in California remains a small and highly specialized market.<sup>3</sup>

It is this very dynamic—this huge missed opportunity to tap into one of California's most abundant natural resources—combined with pressing concerns about energy independence, environmental problems and economic growth, that drove California's top policy makers toward establishing the Million Solar Roofs Initiative.

On January 12, 2006, the California Public Utilities Commission (PUC) approved the California Solar Initiative, authorizing the state to invest \$3.2 billion in small-scale solar electric power systems over eleven years and establishing the statewide goal of building a million solar electric roofs, or 3,000 megawatts (MW) of solar electric power. The amount of money committed and the scope of this new program is by far the largest solar investment of any state in the nation, and an investment to rivals that of any nation in the world today.

Six months later, on August 21, 2006, Governor Arnold Schwarzenegger signed the Million Solar Roofs Bill (SB 1) into law establishing much-needed policies that compliment the California Solar Initiative and that the PUC had no authority to establish on their own.<sup>4</sup> This law, authored by state senator Kevin Murray (D-LA), further enables California to achieve the goals of building a million solar roofs in ten years and of making solar power a mainstream energy resource over the coming decade.

Together, these two complimentary decisions put in place a multi-faceted state-wide solar power program designed to cut the cost of solar power in half and create a mainstream market for solar power within then years.

Given that California is currently home to approximately 25,000 solar homes and businesses amounting to more than 100 MW of solar power capacity, this program aims to increase California's solar market roughly 30 fold. In so doing, the program strives to

### Goals of the Million Solar Roofs Initiative

The overarching goal of California's Million Solar Roofs Initiative is to "establish a self-sufficient solar industry in which solar energy is a viable mainstream energy option for homes and businesses in 10 years".

To get there, the Initiative sets out to accomplish the following:

1. Install solar systems on a million rooftops, including new and existing homes, businesses, industry, farms and schools.<sup>1</sup>
2. Install 3,000 megawatts (MW) of solar power capacity on rooftops throughout the state. This capacity would equal approximately 3-5% of the state's peak electricity demands. For reference, a typical coal-fired power plant is 500 MW.
3. Build half of all new homes with solar power within thirteen years. Currently, less than 5% of California's new homes come with solar power.

### Primary Components of the Million Solar Roofs Initiative

The Million Solar Roofs Initiative will take full effect on January 1, 2007. Solar rebates for homeowners and businesses are available right away. The primary elements of the Initiative are:

- **CONSUMER REBATES:** Up to \$3 billion over ten years.
- **EXPANDED NET METERING:** Five fold increase from 0.5% of a utility's total load to 2.5%. Ultimately, 5% will be needed to reach the million roofs goal.
- **NEW HOME MANDATE:** Solar to become a standard option for all homebuyers by 2011.

<sup>1</sup> Dave Algosio, Mary, Braun & Bernadette Del Chiaro, Environment California Research & Policy Center, Bringing Solar to Scale: California's Opportunity to Create a Thriving, Self-Sustaining Residential Solar Market 12 (April 2005) available at [http://www.environmentalcalifornia.org/uploads/CG/RN/CGRNI2aeOwAL\\_DGcyK9ewA/Bringing\\_Solar\\_to\\_Scale.pdf](http://www.environmentalcalifornia.org/uploads/CG/RN/CGRNI2aeOwAL_DGcyK9ewA/Bringing_Solar_to_Scale.pdf).

<sup>2</sup> Melissa Jones et al., *supra* note 3, 38.

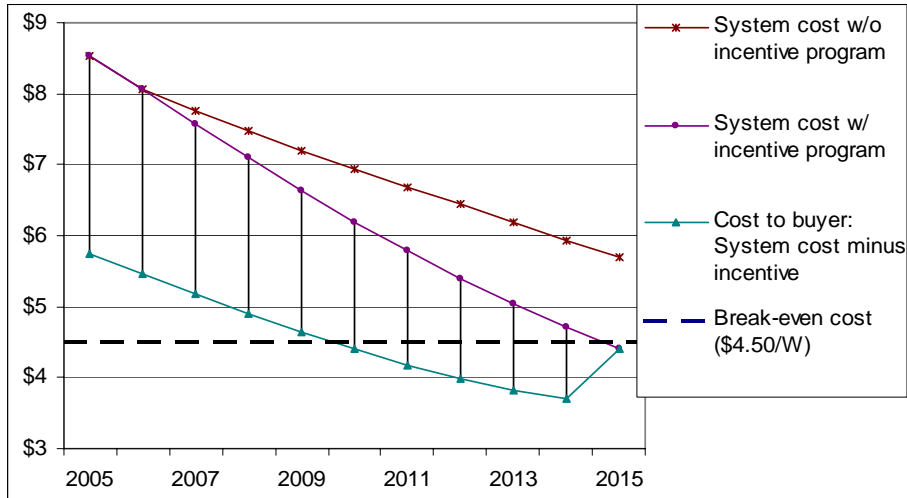
<sup>3</sup> Solarbuzz, Photovoltaic Industry Statistics: Countries, at <http://solarbuzz.com/StatsCountries.htm> (last visited Mar. 4, 2006).

<sup>4</sup> While SB 1 predates the California Solar Initiative, the legislature's failure to pass it in 2005 combined with dwindling funds for solar power rebates spurred the Public Utilities Commission to take immediate action by adopting the California Solar Initiative in early 2006. After this action by the PUC, the legislature revised SB 1 so that it complimented, instead of duplicated, what was already established by the PUC. For detailed analysis and comparison of the California Solar Initiative and SB 1, see [www.environmentalcalifornia.org](http://www.environmentalcalifornia.org).

cut the cost of solar power in half by the end of the ten year program, phasing out government rebates, and making solar power affordable for average California consumers.

The chart 1 below demonstrates how California’s market growth could be help drive down the cost of solar power.<sup>5</sup>

**Figure 1: Impact of a Sustained Solar Incentive Program on the Cost (\$/W) of Solar**



<sup>5</sup> For a more detailed analysis of this expected decline in the cost of solar power, see “Bringing Solar to Scale: California’s Opportunities to Create a Thriving, Self-Sustaining Residential Solar Market” at [www.environmentalcalifornia.org](http://www.environmentalcalifornia.org).

## TYPES OF SOLAR POWER

When deciding whether or not to “go solar”, it is important to consider all the types of solar power installations and technologies. Specifically, there are three things to consider when making the decision to invest in solar power:

1. What type of solar power system? Solar electric or solar hot water?
2. Where to locate the solar power system and what type: building integrated or roof-mounted?
3. Is the building connected to the electric grid or is it “off-grid”?

There are basically two types of solar power technologies for homes and businesses. The most popular technologies are **solar photovoltaic systems (PV)** that turn sunlight into electricity. The second technology is **solar hot water** or **solar thermal systems** that use sunlight to heat water. This heated water can be used to offset natural gas demands for a hot water heater or can be used for pool heating or space heating or cooling. For more information on solar hot water technologies, go to [Solar Hot Water](#). The Million Solar Roofs Initiative was established to offset electricity demand and therefore is set up to primarily drive a market for solar PV systems.

### Locations and System Types

Solar electric power systems can be installed anywhere that receives sunlight. The best location is a spot that receives plenty of sunshine, which in California is when a system faces south or southwest. That said, there are different ways to locate a solar panel on a property:

**1) Roof-mounted systems:** these systems are the most common in California. They typically are 20'x20' in dimension, located a top a south-facing roof or on a flat roof and are mounted via bolts. The system can be mounted on a home or business roof or on a trellis or garage that is either connected or detached from the main building.

**2) Ground mounted systems:** These systems are located in open space areas, usually a backyard with plenty of space. They are typically the same technology as is found on roof-mounted systems but are sometimes installed as “tracking” systems where the solar panel rotates to follow the sun across the sky throughout the course of the day.

**3) Building integrated:** By far the most exciting development in solar power technology, building integrated systems literally take on the form and shape of the building on which they are installed. The most common of these types of systems are solar shingles that seamlessly blend into a roof, replace roofing material. Other promising developments along these lines include solar windows.

### Off-Grid and Grid-Tied Solar

Some Californians are choosing to install solar on an “off-grid” solar home or business. In this situation, the building does not receive electricity from a utility or from the electric grid but rather is entirely self-sufficient for its electricity. While a more expensive way to go solar (costly batteries are usually required), one of the main benefits of an off-grid system is that the home or business is protected against blackouts.

The vast majority of Californians are installing “grid-tied” solar systems, however. In fact, connection to the grid is a basic eligibility requirement of California’s rebate program. The upside of installing a grid-tied system is that it is generally cheaper, as it negates the need for a battery. The downside is that the building is not actually protected from blackouts. This is because the solar panel is on the utility side of the meter so if the grid goes down, so does the solar system.

## SOLAR REBATES

The main thrust of the Million Solar Roofs Initiative is to provide cash rebates to consumers who invest in solar power over the next ten years. The rebates are intended to make solar power cost-effective for the consumer thereby spurring consumer interest in solar power, ultimately creating an economy of scale at which point solar power no longer will need government funds to compete with fossil fuel-derived power. To understand how these rebates help make solar power cost effective for a consumer, see [The Cost of Solar](#)

While consumer rebates pre-date the Initiative, no other program in California, or elsewhere in the country, compares with the size and scope of California’s Million Solar Roofs Initiative. In fact, in the past, California’s rebate program frequently ran out of funds requiring waiting lists and bringing about “fits and starts” to the solar market. With today’s \$3 billion pot of money created by the Million Solar Roofs Initiative, California’s solar market can enjoy ten years of continual growth.<sup>6</sup>

The size, source and administration of the rebate vary by size and location. The chart below summarizes the various pots of money and rebate managers.

**Figure 2: California’s Consumer Rebate Funds**

Amount in Fund	Date Funds Available	Managing Entity	Who is Eligible	Eligible Technologies
\$2 billion <sup>7</sup>	Jan. 1, 2007 through Dec. 31, 2016.	Public Utilities Commission (PUC)	Existing and custom-built homes; all business, commercial and industrial buildings; non-profits; government agencies located within investor-owned utility territory (PG&E, So. Cal Edison and SDG&E)  Note: 10% of funds, at least \$217 million, earmarked for low-income and affordable housing projects.	Solar photovoltaic (PV) systems between 1 kW and 5 MW.  Other technologies that generate electricity (subject to approval)
\$200 million <sup>8</sup>	Through Jan. 1, 2012 (more money must be made available via legislation)	California Energy Commission (CEC)	New housing construction projects (50+ homes) within investor-owned utility territory (PG&E, Edison and SDG&E)	Solar photovoltaic (PV) systems between 1 kW and 5 MW in size.  Other technologies that generate electricity subject to approval
\$784 million	Must be established by Jan. 1, 2008; Many municipal utilities already have solar rebate programs set up (see appendix for listing)	Municipal Utilities (e.g. LADWP, SMUD, Roseville Electric, etc.)	Depends on program	Solar PV systems. Size restrictions and other technologies subject to approval by utility

<sup>6</sup> The intention of the Million Solar Roofs Initiative is to spend up to \$400 million on rebates for new residential construction via the CEC program bringing the total pot of money to \$3.2 billion. However, SB 1250 which renewed the Public Goods Fund in 2006—the sole source of money for solar on new residential construction—only allocated \$253 million to the Emerging Renewables Program of which \$60 million was spent in 2006 and of which some will likely go toward other emerging technologies such as small scale wind and fuel cells.

<sup>7</sup> In addition to this amount, the PUC’s California Solar Initiative also includes \$3 million for solar thermal or solar hot water technology rebates and \$50 million for research and development of solar power technologies.

<sup>8</sup> See previous note.

From a consumer point of view, the key question is what is the value of the rebate? The answer is complicated as it involves different rebate programs depending on the size of the solar system and the type of consumer, e.g. residential or commercial.

There are three types of cash incentives in California:

- 1) Upfront buy-down, based on installed capacity of solar system
  - \$2.50/watt residential & taxable commercial
  - \$3.25/watt government & non-profit entities (no tax credit eligibility)
  - Rebate level declines over time, phased out in 2016.
- 2) Performance-Based Incentive (PBI):
  - Initially required of systems >100kW, smaller systems to be phased in over time
  - Paid monthly over 5 years for metered output
- 3) Expected Performance Based Buy down (EPBB):
  - Applies initially to solar systems under 100kW,
  - Paid up-front based on site-specific installation parameters determined by PUC

The table below summarizes the different types of rebates available. In all cases, the rebate may be paid to the consumer, the installer or the builder depending on the program. For more detailed information about the performance based incentive program at the PUC see Appendix A and B or visit [www.gosolarcalifornia.ca.gov](http://www.gosolarcalifornia.ca.gov).

**Figure 3: California’s Solar Rebate Amounts and Programs by Project Type**

Type of Project	System Size	Rebate Size and Type	Program Management
Existing home, custom-built home or small business in investor owned utility territory	>100 kW	<p>\$2.60/watt or \$3.25/watt for low-income/affordable housing or non-profit entities</p> <p>Rebate levels are scheduled to decline 20 cents/watt every 6 months (Jan 1st and July 1st.).</p> <p>Self-installed systems by homeowners receive a 15% discounted rebate.</p> <p>Beginning in 2007, homeowners will be able to opt into having their rebate paid to them over time based on the actual performance of their system. This Expected Performance Based rebate is 50 cents per kilowatt-hour (kWh) over a three year period of time. See appendix C for more info.</p>	PUC
New home built as part of a development of 50 homes or more in investor-owned utility territory	>100 kW	<p>\$2.60/watt</p> <p>The rebate level is subject to the same declining schedule as existing homes.</p>	CEC
Large business in investor owned utility territory	<100 kW	Starting Jan. 1, 2007, rebate paid out over time via the PUC’s performance based incentive program. See appendix D for more information.	PUC
All rooftops located in municipal utility territories	Depends on municipal program.	Subject to programs of each municipal utility.  See Appendix B for more information.	Local municipal utilities.

## NET METERING

California is one of forty states that offer net metering for the owners of solar power systems.<sup>9</sup> In addition to consumer rebates and tax credits, net metering is a key financial driver making solar power a cost-effective investment for consumers.

Net metering is the ability for a solar system owner to “capture” all the electricity generated by their solar system without the use of a battery. With net metering, a solar system owner essentially uses the electric grid as their storage and back up power supply. In return, the electric grid benefits from a supply of pollution-free electricity during peak-demand time periods, such as hot summer afternoons.

Here’s how it works:

When a solar system generates more electricity than the residence or business is consuming at any point in time, the extra electricity is fed back to the grid where it is sold to other utility customers.

When this happens, the solar system owner gets a credit for that excess power on their electric bill. In California, the value of this credit is the rate that the utility would have otherwise charged the customer for the electricity they provide at that point in time.

For example, if a home generated an excess of a kilowatt of electricity between the hours of 4:00 and 5:00 pm on July 25<sup>th</sup>, the homeowner would get a credit on their electric bill valued at the price of electricity during that hour. In most places in California, electricity purchased during this peak-demand hour is several times higher than electricity purchased at midnight that same day resulting in a net financial benefit to the solar system owner and reflecting the value of peak, pollution-free electricity.

Under net metering, the consumer installs a special electric meter that runs backwards during times of excess electricity generation and runs forward during times when the home or business is relying on the grid for power, such as at night. The consumer’s electric bill reflects the net difference between the two.

If, at the end of the month, more electricity was generated by the solar system than was consumed, the credits are rolled forward to the next month for up to one year.<sup>10</sup> At the end of the year, the credits are erased and the credit tally begins anew.

Some states require the utility company to purchase excess credits at year’s end at a wholesale power rate. Others require the credits to roll forward year to year. Neither of these options is required in California and is therefore not offered by the state’s utilities.<sup>11</sup>

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<sup>9</sup> For more information on other state programs see [www.dsireusa.org](http://www.dsireusa.org).

<sup>10</sup> Database of State Incentives for Renewable Energy, *California Incentives for Renewable Energy: Net Metering*, downloaded from [www.dsireusa.org](http://www.dsireusa.org), 10 January 2005.

<sup>11</sup> The logic behind the absence of this year-end purchase is that most systems should be sized to simply cover a home or businesses electricity demands and not more since solar power systems today are only economical for the consumer if measured against retail electricity prices (10-30 cents/kWh), as opposed to wholesale electricity prices (2-4 cents/kWh). However, even if a system is appropriately sized, the absence of this albeit small buy-back could serve as a disincentive for consumers to do more to conserve electricity.

While all California utility companies must offer net metering (including municipal utilities), not all utilities allow time-of-use pricing (where the value of a kilowatt hour of electricity generated is higher during peak demand times than during off-peak times), and total enrollment in net metering is currently capped at 2.5 percent of a utility's peak demand, a five-fold increase over previous limits thanks to SB 1.

As more Californians install solar power, raising or eliminating the net-metering cap and expanding time-of-use billing will be necessary to ensure that solar is cost-effective for all consumers.<sup>12</sup>

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<sup>12</sup> Approximately 5% is needed to reach the goals of the Million Solar Roofs initiative.

## **TAX CREDITS AND ASSESSMENTS**

### **Credits**

In addition to cash rebates, California homeowners and businesses can also qualify for a one-time tax credit on their federal income taxes. There is no longer a state tax credit for solar power.

The federal tax credit was established in The Energy Policy Act of 2005 ([H.R. 6, Sec. 1335](#)). It expires at the end of 2007 and must be renewed by Congress to best coordinate with California's Million Solar Roofs Initiative.

For residential installations, the value of the credit is 30% of the cost of the system, after state or local rebates, or \$2,000, which ever is less. In other words, if a California homeowner bought a solar system for \$8,000 but received a state rebate valued at \$2,000, they would only qualify for an \$1,800 federal tax credit ( $\$8,000 - \$2,000 \times 30\% = \$1,800$ ). However, since most residential systems cost well over \$8,000, most homeowners will qualify for the \$2,000 cap.

This tax credit is valid for all residential solar systems installed between January 1, 2006 through December 31, 2007. For new homeowners, the date of installation is the date the new solar home is first occupied. There is no cap on system size.

For commercial installations, the Energy Policy Act of 2005 provides for a 30% credit based on the final cost of the system, again accounting for local or state incentive programs. There is no cap on the amount of this tax credit nor on system size.

It is important to note that for both homes and businesses, a state income tax credit is no longer available. However, California law does allow for a property tax exemption for 100% of the value of a solar system installed before 2010.<sup>13</sup>

### **Assessments**

California law exempts the value of a solar power system from being added to property taxes. In other words, California home and business owners can not be taxed on their solar power systems. This exemption was established with [AB 1099](#) in 2005.

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<sup>13</sup> Section 73 of the California Revenue and Taxation Code.

## THE COST OF GOING SOLAR

The chart below shows the simple upfront costs involved in installing a typical 2.5 kilowatt (kW) solar photovoltaic system. For a home with above average energy needs (e.g. above 1000 kWh per month), a larger system may make sense. Any home or business owner looking into going solar should first invest in energy efficiency measures as it will allow for a smaller solar system and ultimately save more money.

**Figure 4: Cost of Going Solar Post Rebates/Credits**

	Per watt cost/value	Typical 2.5 kW system	Balance
<b>Cost of solar system</b>	\$8.00	\$20,000	\$20,000
<b>Value of rebate*</b>	\$2.60	\$6,500	\$13,500
<b>Federal Tax Credit</b>	30% of post-rebate cost or \$2,000, which ever is less	\$2,000	\$11,500
<b>Final Cost</b>			\$11,500

\*If in investor-owned utility territory, value of the rebate will depend on expected performance calculated by PUC or rebate levels in municipal utility territory.

The above chart shows the upfront cost of installing a solar power system after government rebates and credits. However, since these upfront installation costs lead to a supply of electricity that is essentially free for 20-30 years, to fully understand the value of a solar power system, one must calculate the value of the electricity *NOT* consumed by a home or business over that same time period. With net metering, these energy savings happen during the day, when the sun is out, as well as at night when the home is able to tap into excess credits generated during the day.

Furthermore, as the price of electricity goes up, so will the value of the avoided electricity and therefore the value of the solar system. In fact, solar power technologies are one of the few investments a consumer can make that increases in value over time. The CEC expects the cost of electricity to increase 1.5% per year for the next decade. In the chart below, this increased value is shown as the estimated \$541/year savings in 2031 versus the \$427/year during 2006.

Finally, when the upfront costs of a solar system are rolled into a low-interest mortgage or loan, the homeowner can save additionally via annual interest deductions from taxes.

**Figure 5: Annual Savings for a typical solar home in San Diego due to Net Metering**

Year	Annual number of hours solar system will generate electricity*	Rated capacity of system (size)	Annual amount of electricity generated by 2.5 kW system	Average cost of electricity avoided (per kWh)**	Annual value of electricity avoided
2006	1,706	2.5 kW	4,265 kWh	10 cents	\$427/year
2031	1,513	2.5 kW	3,782 kWh	14 cents	\$541/year

\* While solar systems are warranted for 20-25 years and expected to last longer, the actual output of a solar panel declines slightly over time. Further, while there are 8760 hours in a day, a typical solar system in San Francisco is only expected to generate electricity (at max output) for 1,644 hours per year. Sunnier San Diego will get 1,706 hours per year. It is important to note that these calculations for each region in California are averages over time. A solar system will start generating electricity in the early morning, peaking around noon-1pm and then declining until sunset. Actual output will also depend on the quality of the installation, the slant of the roof, whether there is any shading, etc.

\*\*Based on average of peak rates for SD&E. Actual value will depend on home's energy usage. Homes consuming large amounts of electricity during peak times will see a higher value for their avoided electricity. This is because electricity rates increase the more a home uses during each month. For example, once a home consumes 600 kWh, every kWh consumed above that costs 19 cents/kWh during peak compared to 4 cents for the first 300 kWh consumed.

## **SOLAR ON NEW HOMES**

In addition to the expanded rebate program and net metering, another cornerstone of California's Million Solar Roofs Initiative is the goal of building half of all new homes with solar panels by 2017. This goal was established by the legislature via the Million Solar Roofs Bill, (SB 1), as a primary way to lower the cost of solar power, create a more mainstream market for solar power and build more a more energy independent and sustainable California.

Currently, around 130,000 single family homes and an additional 50,000-70,000 multi-family homes are built each year in California.<sup>14</sup> Despite the construction of several large all-solar housing projects in northern and southern parts of the state, less than 5% of California's new homes include solar energy systems as an option and even fewer homes come with solar power as a standard built-in feature.<sup>15</sup>

In order to achieve the goal of the Million Solar Roofs Initiative, the legislature created the nation's first-ever solar mandate requiring that by 2011 all new homes built as part of a commercially developed housing project of 50 homes or more, come with solar power as a standard option.<sup>16</sup> Such a mandate gives homebuyers the choice to add solar panels to their home during construction, much the way consumers are given the choice of adding marble or granite countertops to their new kitchen.

In addition to making the systems available, the sellers of these homes must give consumers important, California Energy Commission-derived information about solar power such as the pay back, efficacy and environmental benefits.

While stopping short of a mandate that solar power become a standard feature of new homes, this standard option mandate is expected to increase the number of solar homes built in California and is a first step toward building half of all new homes with solar power and making this technology a mainstream energy resource within the next decade.

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<sup>14</sup> CBIA data

<sup>15</sup> For a list of California's all-solar housing projects, see [www.environmentalcalifornia.org](http://www.environmentalcalifornia.org).

<sup>16</sup> SB 1 allows a builder to forego offering solar power options to their homebuyers if they instead install solar power on another local development. The capacity of this alternative installation must be equal to the capacity that would have otherwise been installed were 20% of the homebuyers to have opted for a solar power system.

## MUNICIPAL SOLAR PROGRAMS

While 70% of California’s electricity supply comes from the state’s three investor owned utilities – Pacific Gas & Electric, Southern California Edison and San Diego Gas & Electric, a significant portion of the state’s electricity comes from more than three dozen municipal utilities.<sup>17</sup>

The largest municipal utility in California is the Los Angeles Department of Water and Power (LADWP) generating approximately 10% of the state’s total electricity supply. Other large electrical municipal utilities in California are Sacramento Municipal Utility District (SMUD), Imperial and Modesto Irrigation District and the Cities of Anaheim and Riverside.<sup>18</sup>

Under SB 1, the Million Solar Roofs bill, all of California’s municipal utilities must adopt their own solar rebate programs that are in accordance with the statewide goals of building a million solar roofs, installing 3,000 MW of solar power and building half of all new homes with solar panels within the coming decade.

To get there, SB 1 mandates that of the state’s municipal utilities aggregate solar rebate programs equal \$700 million over the next ten years.

**Figure 6: Municipal Utility Solar Rebate Programs**

Municipal Utility	Rebates Currently Available	Amount of Rebate (\$/watt)	Restrictions, Notes
Alameda Power & Telecom	No		
<a href="#">Anaheim Public Utilities - PV Buydown Program</a>	Yes	\$4.00	2 kW limit for homes 12.5 kW limit for business
Azusa Light & Water	Unclear		
Banning Public Utilities	Unclear		
<a href="#">Burbank Water &amp; Power - Residential &amp; Commercial Solar Support Program</a>	Yes	\$3.00	2 kW limit for homes 3 kW limit for business
<a href="#">Colton Public Utilities - PV Rebate Program</a>	Yes	\$4.00	5 kW limit for homes 12.5 kW for businesses
El Dorado Irrigation District	Unclear		
<a href="#">Glendale Water and Power - Solar Solutions Program</a>	Yes (residential only)	\$4.00	10 kW limit for both homes and businesses
Gridley	Unclear		
Healdsburg Electric & Water	Unclear		
<a href="#">Hercules Municipal Utility - PV Rebate Program</a>	Yes	\$3.00	3 kW limit for both homes and businesses
<a href="#">IID Energy - PV Solutions Rebate Program</a>	Yes	\$2.80	10 kW limit for homes 30 kW limit for businesses
Kings River Conservation District	Unclear		
<a href="#">LADWP - Solar Incentive Program</a>	Yes	\$0.04 - \$0.16/kWh; up to 75% of costs	None but rebate varies by system size, tilt, position and location;

<sup>17</sup> California Energy Commission, *2005 Integrated Energy Policy Report*, November 2005 (CEC-100-2005-007-CTF), Page E-2.

<sup>18</sup> For a complete list of municipal utilities and links to each utility website, go to [www.cmua.org](http://www.cmua.org).

		for <30 kW; and up to 50% for > 30 kW	
Lassen Municipal Utility District	Unclear		
Lodi Water & Electric	Unclear		
Lompoc Utility Department	Unclear		
Merced Irrigation District	Unclear		
Modesto Irrigation District	Solar hot water only		
Moreno Valley	Unclear		
Needles Water & Elect	Unclear		
<a href="#">Palo Alto Utilities - PV Partners</a>	Yes	\$3.00 for homes and nonprofits  \$2.00 for businesses	3 kW limit for homes  10 kW limit for nonprofits  25 kW limit for businesses
<a href="#">Pasadena Water and Power - Solar Power Installation Rebate</a>	Yes	\$3.50	2 kW limit
Pittsburg/Pittsburg Power Company	unclear		
<a href="#">Redding Electric - Earth Advantage Rebate Program</a>	Yes	\$2.80-\$3.55 depending on orientation and installation specifications	
<a href="#">Riverside Public Utilities - Residential PV Incentive Program</a>	Yes	50% of installation costs or \$150,000 which ever is less for new construction  \$3.00 for existing homes	5 kW limit
<a href="#">Roseville Electric - PV Buy Down Program</a>	Yes	\$4.00/watt for homes and businesses	5 kW limit
<a href="#">Santa Clara Water &amp; Sewer - Solar Water Heating Program</a>	Solar Hot Water only		
Shasta Lake	Unclear		
<a href="#">Silicon Valley Power - Solar Electric Buy Down Program</a>	Yes	\$3.00 for homes  \$2.50 for businesses	3 kW limit for homes  50 kW limit for businesses
<a href="#">SMUD</a>	Yes	\$2.80 for homes  \$2.00-3.00 (depending availability of other incentives)	7 kW limit for homes  30 kW <i>minimum</i> for businesses
Trinity County Public Utility District	Unclear		
Truckee Donner Public Utility District	Unclear		
<a href="#">Turlock Irrigation District - Residential PV Rebate</a>	Yes (residential)	\$4.00	5 kW limit

	only)		
<a href="#">Ukiah Utilities - PV Buy-down Program</a>	Yes	\$3.00	2 kW limit for homes 8 kW limit for businesses
Vernon Utilities Department	Unclear		
Victorville	Unclear		

## CONSUMER PROTECTIONS

California has a number of policies in place to protect the consumers of solar power systems. These policies range from minimum warranty requirements to training of installers as well as an emphasis on coupling energy efficiency with solar power system installation. This section outlines some of these policies.

### Solar System Requirements

In order to qualify for a rebate in California, a solar energy system must meet the following requirements:

- The entire solar system is covered by a minimum of a 10-year manufacturer warranty to protect against defects and undue degradation of electrical generation output.
- All of the components are new and unused.
- The solar energy system is intended primarily to offset part or all of the consumer's own electricity demand. In other words, the system isn't too big for the customer's need.
- The solar energy system has meters or other devices in place to monitor and measure the system's performance and the quantity of electricity generated by the system.
- The solar energy system is installed in conformance with manufacturer specifications and in compliance with all applicable electrical and building code standards.
- The major system components are on the CEC's lists of eligible equipment ([www.consumerenergycenter.org/erprebate](http://www.consumerenergycenter.org/erprebate)).
- All systems, if installed under contract, must be installed by appropriately licensed California contractors in accordance with rules and regulations adopted by the State of California Contractors State Licensing Board. Contractors must have an active A, B, or C-10 license, or a C-46 license for photovoltaic systems. Self-installations are allowed but qualify for a lower rebate.
- All solar equipment sellers must be registered with the CEC, a process that requires proof of an updated license number and be in good standing with the State of California. Registered sellers or installers can be found at [www.consumerenergycenter.org/erprebate/database/index.html](http://www.consumerenergycenter.org/erprebate/database/index.html).

In addition, SB 1 requires that by January 1, 2008, the CEC establish additional requirements that cover the following:

- Additional siting and installation guidelines that maximize performance of the system and prevent qualified systems from being inefficiently or inappropriately installed.
- Optimal solar energy system performance during peak electricity demand.
- Appropriate energy efficiency improvements in the new or existing home or commercial structure where the solar energy system is to be installed.
- Rating standards for equipment, components, and systems to assure reasonable performance and standards for compliance with the minimum ratings.

## **SOLAR RIGHTS**

California law protects the right to own and operate a solar system for a home or business. This means that no one person or entity (such as a neighborhood association or local government) can, within reason, prohibit a property owner from investing in solar power. It also means that one property owner can not encumber another's access to the sun.

The first policy establishing rights for solar power system owners was the Warren-Alquist Act (Solar Shade Control Act, [Public Resources Code Section 25980-25986](#)), which states:

"...It is the policy of the state to promote all feasible means of energy conservation and all feasible uses of alternative energy supply sources. In particular, the state encourages the planting and maintenance of trees and shrubs to create shading, moderate outdoor temperatures, and provide various economic and aesthetic benefits. However, there are certain situations in which the need for widespread use of alternative energy devices, such as solar collectors, requires specific and limited controls on trees and shrubs."

The law goes on to state that no person shall allow a tree or shrub to be placed, or, if placed, to grow subsequent to the installation of a solar collector on the property of another so as to cast a shadow greater than 10 percent of solar collector area. Further, [Civil Code 801.5](#) establishes the right of property owners to "receive sunlight", referred to as a "solar easement".

In addition, [Government Code 65850.5](#), states that it is the "policy of the state to promote and encourage the use of solar energy systems and to limit obstacles to their use" and that the timely and cost-effective installation of solar power is not a municipal affair but rather a matter of statewide concern. This statute goes on to prohibit local agencies from adopting "ordinances that create unreasonable barriers to the installation of solar energy systems, including, but not limited to, design review for aesthetic purposes, and not unreasonably restrict the ability of homeowners and agricultural and business concerns to install solar energy systems."

In an attempt to further clarify legislative intent, the statute requires that local agencies comply with the legislature's "intent to encourage the installation of solar energy systems by removing obstacles and minimizing costs of permitting for such systems."

Lastly, [Civil Code 714](#) prohibits any covenant, restriction, deed, contract, or security instrument from effectively prohibiting or restricting the installation or use of a solar energy system. Any such document found to do so shall be rendered void and unenforceable.

State law clarifies that, reasonable restrictions withstanding, "it is the policy of the state to promote and encourage the use of solar energy systems and to remove obstacles thereto." Reasonable restrictions are defined as those that do not significantly increase the cost of the system (defined as not exceeding \$2,000) or significantly decrease its efficiency or specified performance (defined as cutting efficiency by 20%). The law also requires that all solar applications be approved in the same manner as any other architectural modification and not "willfully avoided or delayed". The law does allow systems installed on common areas to be restricted.

Unfortunately, even with the clear language protecting consumer rights to solar power, there are a number of situations in which a neighborhood association or local government will still try to get around these laws in order to prevent a solar power installation. The reasons for this kind of activity differ from one to the other but often stem from concerns over property value or aesthetics.

For example, some cities prohibit any solar system from being visible from the street. If a home faces south, it may be impossible to install a system that is not visible from the street. Others require unreasonably high permitting fees that make the investment cost-prohibitive. While for others, a \$2,000 fee for installation is enough of a financial burden to prohibit their investment in solar power.

Ultimately, all consumers should be aware of their rights first and foremost. If unreasonable restrictions are encountered, we encourage the use of education, information and community support as the first response. Often, a little information or public spotlight on the situation goes a long way toward a favorable resolution.

**Appendix C: How the Expected Performance Based Incentive Will Work (PUC chart)**

For most small-scale solar installations, rebates will be paid based on the expected performance of the installation based on a number of factors including rated capacity plus design factors such as orientation, tilt, shading, and geographic location.

The idea behind this program is to maximize solar output for every dollar invested as well as to prevent poor performance installations. Since in most cases, the rebate is applied to the final cost of the solar system and managed by the installer, the incentive is for the installer to recommend the highest performing solar system and installation possible, better protecting the interest of the homeowner.

In the example below, the home in San Francisco would receive \$8,500 in rebates compared to a \$10,000 rebate. However, if the San Francisco system were installed in a more favorable manner, e.g. no shade blocking the system, installed at a 30 degree tilt, etc, the rebate would be closer to the \$10,000 mark.

*Example for 4 kW residential system in San Francisco*

*EPBB Incentive = \$2.50/W x 4,000 W x 85% = \$8500*

	If Reference System (1)	Actual System (2)	Site's Design Factor (2) / (1)
Location	San Diego	San Francisco	
Tilt	30 Degrees	15 Degrees	
Azimuth	South	Southeast	
Shading	None	5%	
Annual Output (kWh/kW-AC CEC)	1,706	1,454	85%

**PUC Chart from Panel on "California: The World's Third Largest Solar Market and Growing" Oct. 17, 2006, Solar 2006 Conference**

Under this program, the areas of California with the greatest amount of sunshine will likely receive the highest incentives. Many of these places are also the hottest and cause the greatest strain on the energy grid during peak times. That said, the cost benefit of solar installations is complicated and goes well beyond the rebate itself.

**Reference Locations**

Arcata	1360
Sacramento	1619
San Francisco	1644
Fresno	1688
Bakersfield	1694
Santa Maria	1786
Los Angeles	1678
Long Beach	1656
San Diego	1706

**PUC Chart from Panel on "California: The World's Third Largest Solar Market and Growing" Oct. 17, 2006, Solar 2006 Conference**

**Appendix D: How the Performance Based Incentive works (PUC chart)**

The PUC’s newly adopted Performance Based Incentive Program is based on the idea of rewarding energy output instead of installed capacity. Under this program, mandatory for solar systems above 100 kW, the rebate is paid on metered kWh output over first 5 years. To reward performance, the incentive level is higher for well-performing systems than it otherwise would have been under a simple capacity based incentive.

The second chart below summarizes how higher performance will be rewarded with a higher incentive payment.

<b>Step 2: PBI = \$.39 per kWh, EPBB = \$2.50 per Watt, Reference CF = 18%</b>					
System Size (kW)	200	<b>200</b>	200	200	200
<b>Capacity Factor</b>	<b>16%</b>	<b>18%</b>	<b>20%</b>	<b>22%</b>	<b>25%</b>
Monthly Output (kWh)	23,360	<b>26,280</b>	29,200	32,120	36,500
PBI Incentive (per kWh)	\$ 0.39	<b>\$ 0.39</b>	\$ 0.39	\$ 0.39	\$ 0.39
Monthly PBI Payment	\$ 9,012	<b>\$ 10,138</b>	\$ 11,265	\$ 12,391	\$ 14,081
Annual PBI Payment	\$ 108,141	<b>\$ 121,658</b>	\$ 135,176	\$ 148,694	\$ 168,970
Present Value of PBI Payments	\$ 444,444	<b>\$ 500,000</b>	\$ 555,556	\$ 611,111	\$ 694,444
<b>Present Value Per Watt (8% discount)</b>	<b>\$2.22</b>	<b>\$2.50</b>	<b>\$2.78</b>	<b>\$3.06</b>	<b>\$3.47</b>

<b>Step 4: PBI = \$.26 per kWh, EPBB = \$1.90 per Watt, Reference CF = 20%</b>					
System Size (kW)	200	200	<b>200</b>	200	200
<b>Capacity Factor</b>	<b>16%</b>	<b>18%</b>	<b>20%</b>	<b>22%</b>	<b>25%</b>
Monthly Output (kWh)	23,360	26,280	<b>29,200</b>	32,120	36,500
PBI Incentive (per kWh)	\$ 0.26	\$ 0.26	<b>\$ 0.26</b>	\$ 0.26	\$ 0.26
Monthly PBI Payment	\$ 6,164	\$ 6,935	<b>\$ 7,705</b>	\$ 8,476	\$ 9,631
Annual PBI Payment	\$ 73,968	\$ 83,214	<b>\$ 92,460</b>	\$ 101,706	\$ 115,575
Present Value of PBI Payments	\$ 304,000	\$ 342,000	<b>\$ 380,000</b>	\$ 418,000	\$ 475,000
<b>Present Value Per Watt</b>	<b>\$1.52</b>	<b>\$1.71</b>	<b>\$1.90</b>	<b>\$2.09</b>	<b>\$2.38</b>

PUC Chart from Panel on "California: The World’s Third Largest Solar Market and Growing" Oct. 17, 2006, Solar 2006 Conference

## **Appendix C: Solar Power Installers in California**

A solar power system can be installed by the home or business owner or by a professional, certified installer. Self-installations trigger a lower rebate.

The best advice for making any kind of major purchase—such as a solar energy system—is to shop around. It is commonly recommended to get at least three bids from qualified installers.

California certifies solar installers and maintains a list of installers statewide at [www.gosolarcalifornia.ca.gov](http://www.gosolarcalifornia.ca.gov).

In addition, some municipal utilities also have their own list of qualified installers such as Sacramento Municipal Utility District. Also, the California Solar Energy Industry Association has its own list of affiliated installers available at [www.calseia.org](http://www.calseia.org).

## **Appendix D: Other Resources**

The California Energy Commission publishes a [handbook](#) on solar available at [www.gosolarcalifornia.ca.gov](http://www.gosolarcalifornia.ca.gov).

[California Solar Energy Association](http://www.norcal solar.org) provides workshops and guides for homeowners at [www.norcal solar.org](http://www.norcal solar.org).

[www.californiasolarcenter.org](http://www.californiasolarcenter.org) provides general information about solar power.

Real Goods' [Solar Living Institute](http://www.solarliving.org) provides workshops, sales and installation resources [www.solarliving.org](http://www.solarliving.org).

### **California Solar Homes Tours**

NorCal Solar Energy Association 2005 Solar Home Tours  
<http://norcal solar.org/tour>

Solar Events in Sebastopol  
<http://www.solarsebastopol.com>

Tours throughout California—find the tour nearest you:  
[http://www.ases.org/tour/2005\\_tour/listings.htm](http://www.ases.org/tour/2005_tour/listings.htm)