



California's Solar Cities

Leading the Way to a Clean Energy Future



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Executive Summary

California's Solar Roofs

Solar power is a no-brainer energy resource for California. Cleaner than fossil fuels, safer than nuclear power, and one of the most reliable sources of electricity, solar power is a critical part of California's clean energy future.

At the beginning of 2009, California was home to nearly 50,000 solar roofs, totaling more than 500 megawatts of solar power capacity. California has seen tremendous growth in the amount of solar power installed since 1999 when just 500 rooftops hosted a solar system, as illustrated in Figure ES-1.

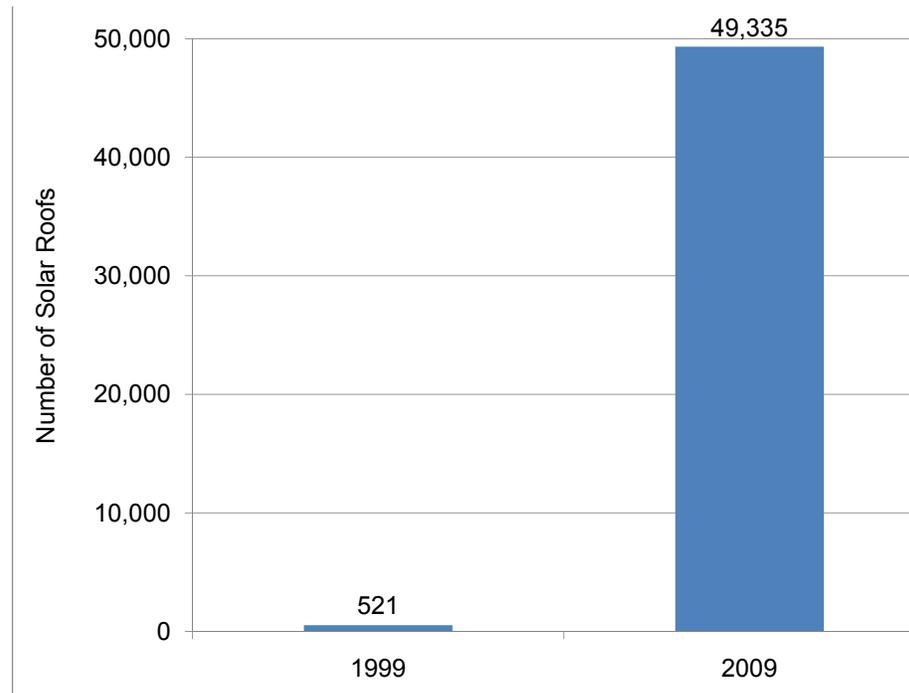
If California's solar market experiences a similar rate of growth over the coming ten years, approximately 45-50% of compound annual growth, the state will be on track to meet its million solar roofs goal by the start of 2017, as shown in Figure ES-2. Assuming the industry is able to achieve greater economies of scale, due to increased experience from a growing market, the price of solar power should drop by half, creating "grid parity" for the solar photovoltaic

market, meaning the cost of investing in a solar system is on par with the cost of purchasing retail electricity.

The vast majority of California's solar electric systems are on single family homes, typically as a retrofit project to an existing home. However, the number of California businesses, farms, schools, and government buildings hosting solar photovoltaic systems is on the rise, as is the number of new housing developments incorporating solar power into the home during construction.

This report combines data from all the state's solar photovoltaic rebate programs to determine which cities have the greatest amount of solar power. Data comes from the Public Utilities Commission's California Solar Initiative and Self Generation Incentive Program, the California Energy Commission's New Solar Homes Partnership and Emerging Renewables Program, and data from the state's municipal utilities such as Sacramento Municipal Utility District and Los Angeles Department of Water and Power. (See "About the Data" section at end of this report for more details on the numbers analyzed for this report.)

Figure ES-1. Snap-shot of Statewide Solar Roof Installations, 1999 vs. 2009



California has seen tremendous growth in the number of solar roofs installed statewide over the past ten years, from just over 500 solar roofs in 1999 to nearly 50,000 today. SOURCE: Data compiled from California Energy Commission, California Public Utilities Commission and the state's municipal utilities.

California's Top Ten Solar Cities

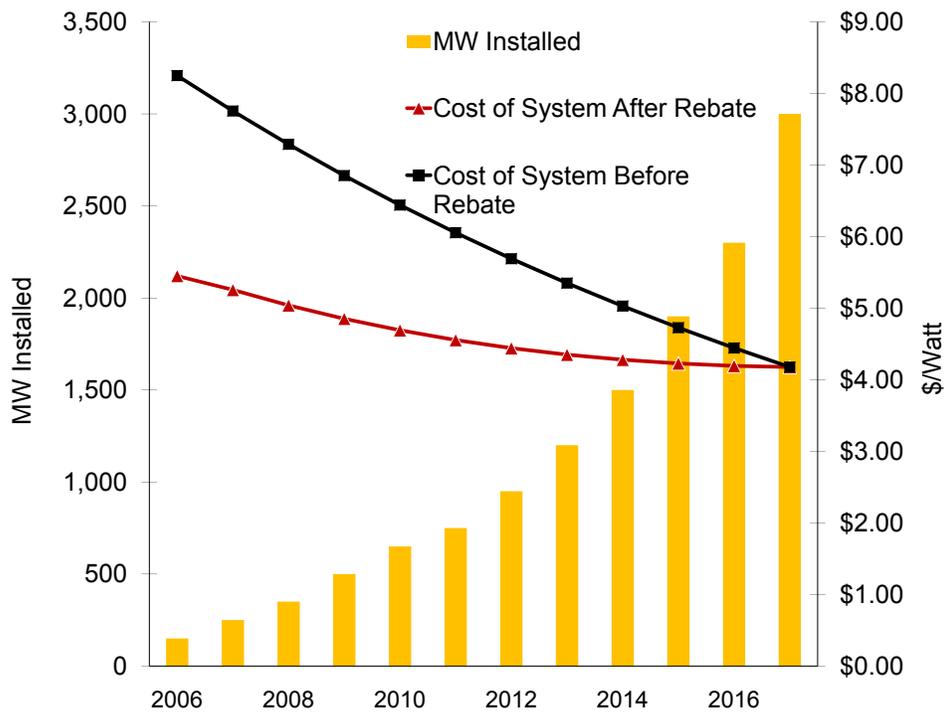
This report analyzes which cities host the largest amount of solar power, measured in terms of numbers of solar installations (e.g. roofs) and amount of solar power (e.g. installed capacity), as well as those cities that host the highest concentration of solar power based on population.

California's solar power market is broad, as supported by the findings of this report. A healthy and growing solar power market is taking hold in the state's large coastal cities, tiny mountain hamlets, and growing communities of the Central Valley. The cities with the greatest amount of solar power today include San Diego with 2,262 solar roofs totaling 19,427 kilowatts,

Los Angeles with 1,388 solar roofs totaling 13,000 kilowatts, San Francisco with 1,350 solar roofs totaling 7,050 kilowatts, and, surprisingly not far behind, are the cities of Fresno, Bakersfield and Clovis with more than 700 solar roofs each.

When population is taken into account, the top ten list shifts to smaller cities such as Trinidad along the north coast, remote and rustic Nevada City, and one of the state's fastest growing cities, Lincoln. The data for Nevada City, for example, shows that nearly one in every five households hosts a solar system. In the City of Industry, for every resident more than one kilowatt of solar power is installed. This impressive statistic is due to several large solar installations in a city that has a very small number of residents.

Figure ES-2. Getting to A Million Solar Roofs and Achieving Economies of Scale



California’s solar market must continue to grow at its current rate to reach the state’s million solar roofs goal by the start of 2017. If it does, economies of scale should cut the cost of installing a solar photovoltaic system in half, creating “grid parity” where rebates are no longer needed to make solar power a cost-effective investment for the consumer. SOURCE: Environment California Research & Policy Center, *Bringing Solar to Scale: California’s Opportunity to Create a Thriving, Self-Sustaining Residential Solar Market*, 2005.

Top 10 for Number of Solar Roofs

Rank	Cities	Number Solar Roofs
1	San Diego	2,262
2	Los Angeles	1,388
3	San Francisco	1,350
4	San Jose	1,333
5	Fresno	1,028
6	Bakersfield	751
7	Clovis	733
8	Santa Rosa	725
9	Sacramento	692
10	Berkeley	648

Top 10 for Solar Capacity (kilowatts installed)

Rank	Cities	Kilowatts-AC installed
1	San Diego	19,427
2	San Jose	15,450
3	Fresno	14,538
4	Los Angeles	13,000
5	Santa Rosa	8,954
6	Bakersfield	7,341
7	San Francisco	7,050
8	Oakland	6,972
9	Chico	6,417
10	Napa	5,947

Top 10 for Solar Roofs per Household

Rank	Cities	Solar roofs/# households
1	Nevada City	19%
2	Sebastopol	16%
3	Trinidad	12%
4	Portola Valley	10%
5	Los Altos Hills	8%
6	Ojai	8%
7	Point Arena	7%
8	Lincoln	7%
9	Grass Valley	6%
10	Plymouth	6%

Top Ten for Solar Capacity (watts-AC) per Capita

Rank	Cities	Watts-AC installed/population
1	City of Industry	1,563
2	St. Helena	558
3	Lakeport	454
4	Sebastopol	340
5	Sonoma	336
6	Auburn	311
7	Nevada City	289
8	Oroville	286
9	Plymouth	258
10	Portola Valley	256

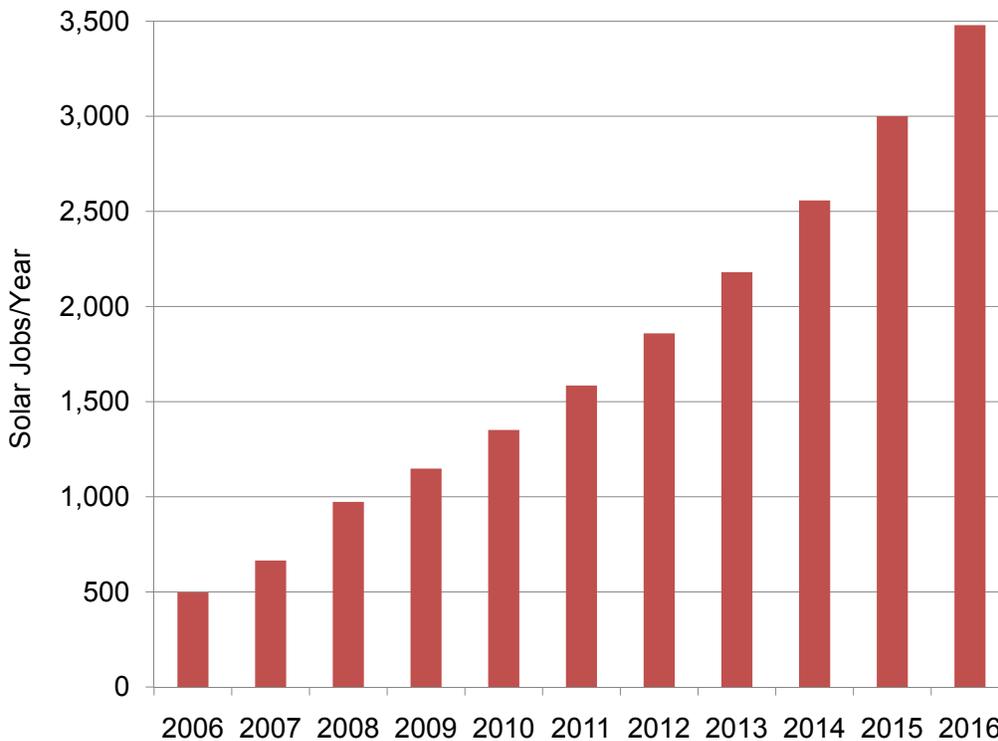
Solar Benefits

There are many benefits to the expansion of solar power in California. High among the list is job growth. Applying Electric Power Research Institute 2001 estimates for the number of jobs created per megawatt of solar power installed to California's projected solar roof growth through 2017 has California creating 20,000 person-years of employment. Figure ES-3 below illustrates the sustained growth in solar industry jobs as a result of the state's million solar roofs program.

Promoting Solar at Municipal Level

Government incentives in the form of rebates and federal tax credits are powerful forces driving consumers to invest in solar power. As California aims to make history by building a million solar roofs, totaling 3,000 megawatts of solar power by 2017, it is critical that California's cities—small and large—as well as counties embrace solar power and play a leading role in realizing a mainstream, cost-effective solar power market.

Figure ES-3. Employment Rates of California's Million Solar Roofs Initiative



Applying Electric Power Research Institute (EPRI) employment rates for solar photovoltaic systems to California's steady growth in solar roofs over the life of the Million Solar Roofs Initiative will create more than 20,000 person-years of employment, with steady annual employment growth throughout the program. SOURCE: Electric Power Research Institute, prepared for the CEC, California Renewable Technology Market and Benefits Assessment, November 2001.

Policy Recommendations

To build a million solar roofs in ten years, all levels of government must embrace this promising clean energy technology and play an active role in bringing about a mainstream, self-sufficient solar power market. California's cities, both those with and without a municipal utility, can make a significant contribution to the state's million solar roofs goal and in so doing help build thriving, sustainable communities.

California's county and municipal leaders should:

- Invest in solar power on municipal and county buildings.
- Provide city and county residents and businesses with additional financial incentives such as zero or low interest loans.

- Adopt on-bill financing programs through local utilities or property-secured financing mechanisms such as those enabled by Assembly Bill 811.
- Remove barriers to solar investments such as streamlining the permitting process, standardizing permitting requirements among jurisdictions and, in some instances, lowering or waiving permit fees.
- Ensure a well educated and trained city and county staff including building inspectors and permitting staff.
- Educate and encourage local residents and businesses to invest in solar power.

In addition, there are many things that state and federal decision makers can do to



Oregon's Solar Highway, Gary Webber, Oregon Department of Transportation Photo/Video Services

promote more solar power in California, including:

- Ensure continuity of rebate and tax credit programs through the ten-year (2006-2016) California Solar Initiative program at the Public Utilities Commission and the corresponding rebate programs at the state's municipal utilities per the Million Solar Roofs bill (SB 1).
- Support and provide rebates for solar hot water systems in addition to solar electric systems.
- Provide ratepayers with additional financing options such as on-bill financing through utility bills.
- Enforce SB 1, which requires that all new homes come with solar power as standard option beginning in 2010.
- Mandate that all new homes and businesses be built with solar power by 2020 and 2030, respectively.
- Extend net metering beyond the current 2.5% cap.

- Establish a feed-in-tariff policy to further spur solar investments.
- Encourage existing homes to invest in energy efficiency and renewable energy technologies at or near time of sale.

Conclusion

Cities and counties throughout California are playing a leading role in promoting and installing solar power. This report shows that California's top solar cities are diverse in geography and demographics and that California has enormous potential to meet its million solar roofs goal should government, utilities and the public work together to achieve this important vision. Ultimately, solar power is an energy resource that is here to stay, and grow. California's local governments should embrace this technology and allow it to grow sooner rather than later.

California's Top Solar Cities

California's market for solar power has grown from just 500 rooftop systems in 1999 to nearly 50,000 today and from a capacity of 26 megawatts to more than 500 megawatts of solar power today, as shown in Figure 1.¹

California's solar power market is diverse. Throughout the state, in both rural and urban areas, homes, businesses, farms, schools, and other buildings are hosting solar power systems.² The Top Ten charts contained in this chapter demonstrate the demographic diversity of California's solar power market.³

Quantity: California's Ten Cities with the Most Solar Power

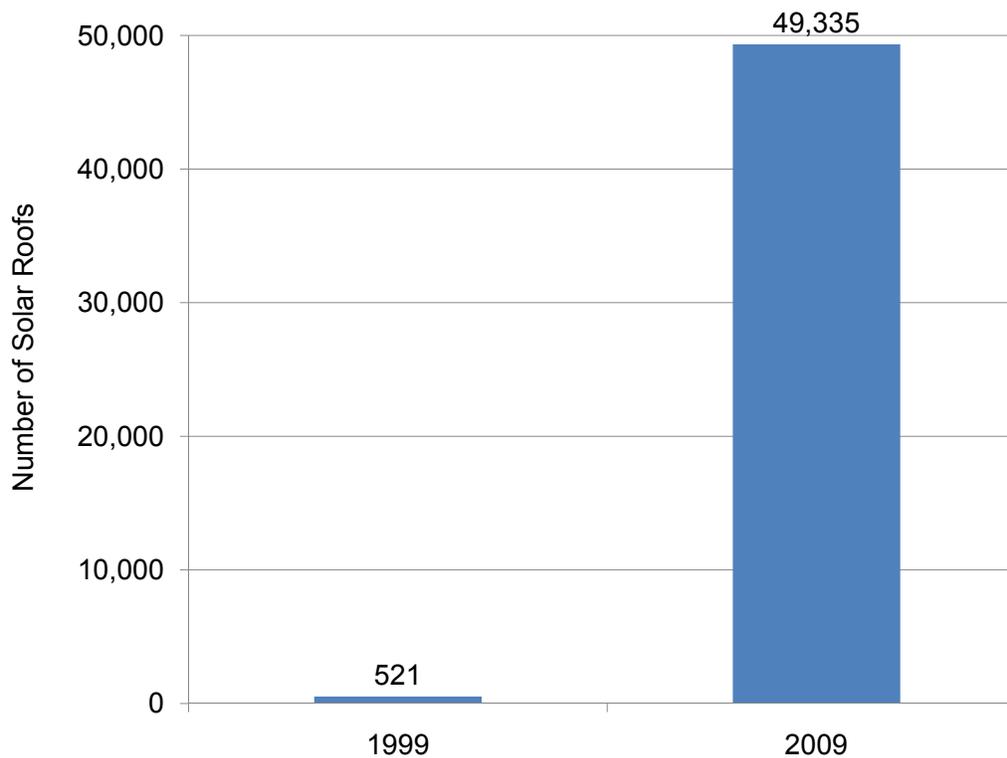
When measuring the quantity of solar power on a city-by-city basis, the state's most populous cities win out. San Diego is the state's clear solar power leader in terms of both the number of solar rooftops and the amount of solar energy generated by those solar systems (capacity installed),

with more than 2,000 solar roofs totaling nearly 20 megawatts installed to date, as seen in the Figures 2 and 3. It is noteworthy that San Diego is home to the only California solar rebate program administered by a non-profit organization, the California Center for Sustainable Energy, in concert with the local utility San Diego Gas & Electric. Surely, this unique collaborative program structure has contributed to the city's impressive expansion of solar power over the past ten years.

In terms of sheer quantity of solar rooftop systems installed to date, San Diego is followed by San Francisco, Los Angeles, San Jose and Fresno, which have more than one thousand solar roofs each. Bakersfield, Clovis, and Santa Rosa are all home to more than 700 solar roofs and Sacramento and Berkeley are home to more than 600 solar roof installations each, as seen in Figure 1. The presence of Clovis, Fresno and Bakersfield demonstrates that solar power is enthusiastically embraced outside the state's coastal cities and deep within growing Central Valley communities.

As mentioned already, San Diego is also the clear leader when it comes to the amount of solar capacity installed to date

Figure 1. A Snap-shot of Statewide Solar Roof Installations, 1999 vs. 2009



California has seen tremendous growth in the number of solar roofs installed statewide over the past ten years, from just over 500 solar roofs in 1999 to nearly 50,000 today. SOURCE: Data compiled from California Energy Commission, California Public Utilities Commission and the state's municipal utilities.

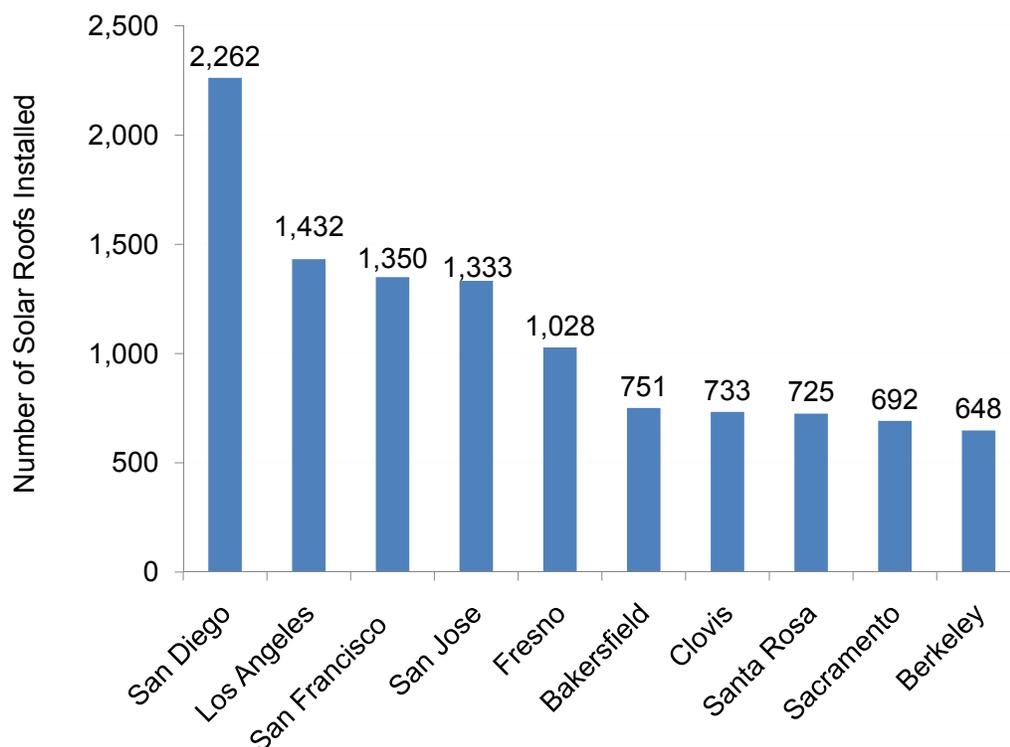
with more than 19 megawatts installed. San Diego is followed by San Jose and Fresno, which both have more than 14 megawatts, Los Angeles which has 13 megawatts, Santa Rosa, Bakersfield and San Francisco which have more than 7 megawatts each, Oakland and Chico which have more than 6 megawatts each, and Napa which has more than 5 megawatts installed, as shown in Figure 3. The difference between the top ten cities for number of solar roofs and the top ten cities for solar capacity is most likely due to a combination of larger residential systems and a greater percentage of large

commercial systems installed in places like Chico, Oakland and Richmond.

Solar per Capita: California's Top 10 Cities Factoring in Population

Another revealing way to measure enthusiasm and support for solar power is to take population into account. When population is factored in, a much different map of California's most popular spots for

Figure 2. Top Ten Solar Cities (number of roofs/city)



California’s largest cities, not surprisingly, lead the state’s “Top Ten” list for the number of solar roofs per city. The appearance of Fresno, Bakersfield and Clovis demonstrates that California’s solar roof market extends far inland as well as up and down the coast. SOURCE: Data compiled from California Energy Commission, California Public Utilities Commission and the state’s municipal utilities.

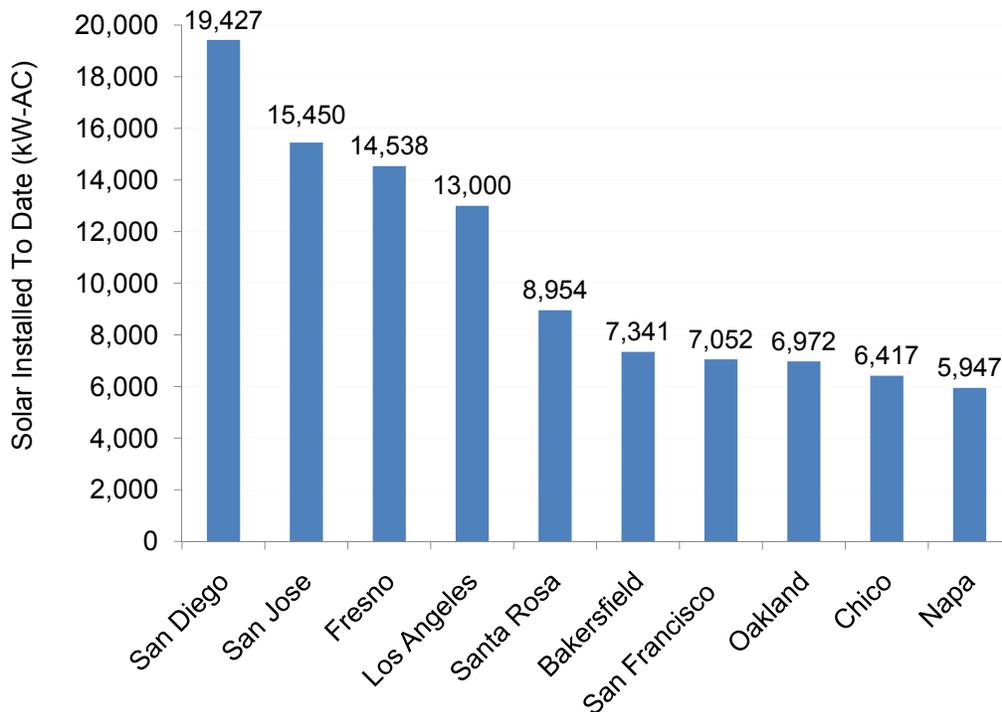
solar power emerges, with a shift in focus from the state’s largest cities to some of its smallest, such as Trinidad along the north coast, Nevada City in the Sierra Nevada foothills, City of Industry in Los Angeles, and Oroville in the Central Valley.⁴

Figure 4 illustrates the top ten cities for the number of solar roofs per household in California. Nearly one in every five households hosts a solar power system in Nevada City. Other top ten cities include Sebastopol where 16% of the households host a solar system, Trinidad with 12% and Portola Valley with 10%. The cities of Los Altos Hills, Ojai, Point Arena, Lincoln, Grass Valley and Sonoma all have solar power on

more than 6% of their households.

For every resident of the City of Industry, there is more than one kilowatt of solar power installed. This is largely due to a few large commercial installations in a city with a very small population. The other top ten cities in California in terms of the capacity of solar power installed per capita are St. Helena, Lakeport, Sonoma, Sebastopol, Auburn, Nevada City, Oroville, Portola Valley and Plymouth—with more than 200 watts of solar power installed per person on the low end and more than 500 watts per person on the high end, shown in Figure 5. (See “What’s a Watt” on page 11.)⁵

Figure 3. California's Top Ten Solar Cities (solar capacity (kW-AC/city))

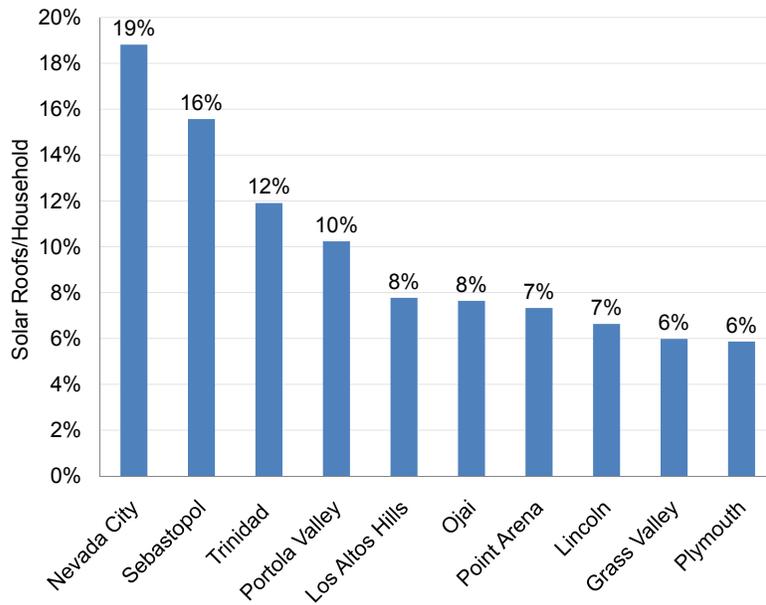


California's largest cities, not surprisingly, lead the state's "Top Ten" list for total solar power capacity installed per city. SOURCE: Data compiled from California Energy Commission, California Public Utilities Commission and the state's municipal utilities.

What's a watt?

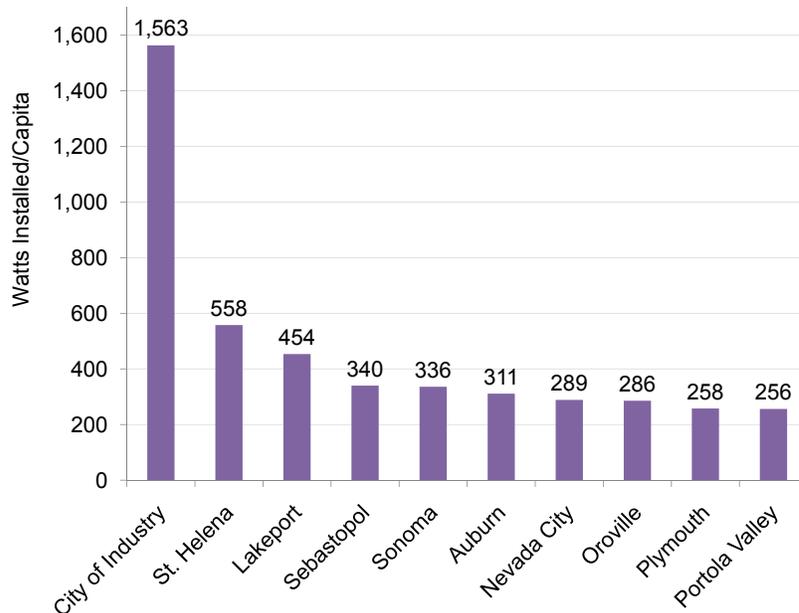
According to the US Department of Energy, to cook a pot of rice for 1 hour requires 1000 watt-hours of electricity, or 1 kilowatt-hour (a kilowatt is one thousand watts).⁶ On average, Californians consume 7,000 kWh per year according to the California Energy Commission.⁷ If the City of Los Angeles were to achieve the same solar penetration level (watts installed per person) as the city of Auburn, it would already be home to more than one gigawatt of solar power—one third of the state's entire Million Solar Roofs goal.

Figure 4. California's Top Ten Solar Cities (solar roofs/household)



A reverse image to the previous "Top Ten" lists, some of California's smallest cities have the highest concentration of solar roofs when measured on a roof/household basis. SOURCE: Solar roof data compiled from California Energy Commission, California Public Utilities Commission and the state's municipal utilities. Household data comes from 2000 U.S. Census.

Figure 5. California's Top Ten Solar Cities (solar capacity watts-AC/capita)



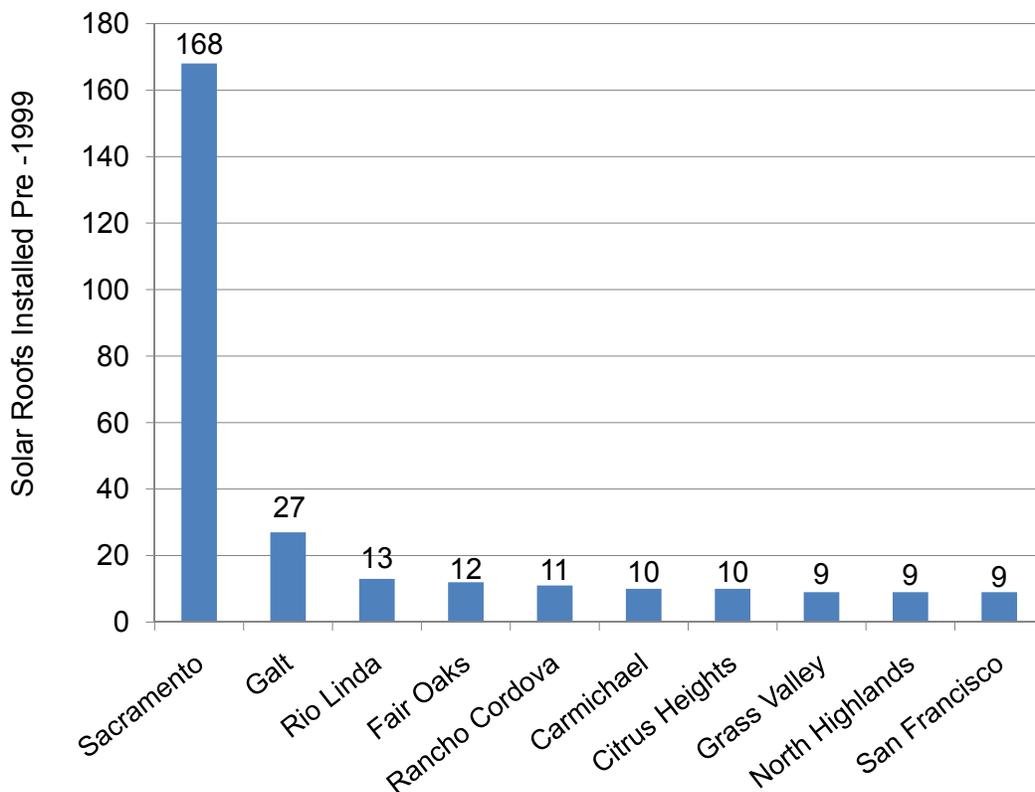
Some of California's smallest cities lead the state's "Top Ten" list for the total amount of solar power capacity installed per capita. SOURCE: Data compiled from California Energy Commission, California Public Utilities Commission and the state's municipal utilities. Population data comes from 2007 U.S. Census.

The Changing Face of Solar Power

What the previous figures fail to reveal is just how dramatically California's solar power market has changed and grown in the past ten years. In addition to sheer growth, the diversity of cities hosting a growing solar market has changed dramatically. Ten years ago, most of the solar

installed in the state was in the Sacramento region, thanks to the visionary support of solar power by the Sacramento Municipal Utility District and the residents and businesses of the region. San Francisco shockingly only had 9 solar roofs in 1999.⁸ Today, of course, as this report shows, the desire to generate electricity from the sun has spread well beyond Sacramento and San Francisco and is being embraced by people in cities throughout the state.

Figure 6. California's Top Ten Solar Cities Circa 1999



The profile of California's "Top Ten" Solar Cities was dramatically different ten years ago. Not only were all of the cities, with the exception of Grass Valley and San Francisco, located in the Sacramento Municipal Utility District, but Sacramento, the number one city, hosted just 168 solar roofs. SOURCE: Data compiled from California Energy Commission and the state's municipal utilities.

Solar Power Benefits California Cities and Counties

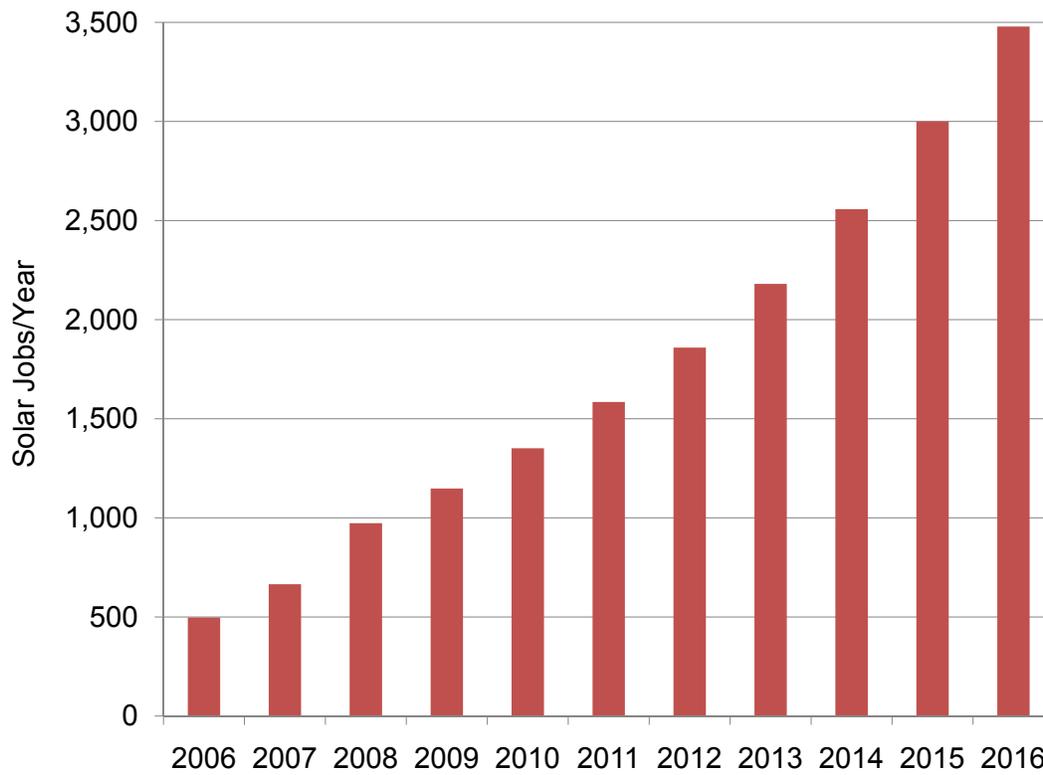
Solar power makes sense in California. Abundant sunshine provides a free and ample fuel supply. Peak electricity demands coincide with when solar energy

systems generate electricity. And a growing concern over air pollution and global warming provide a powerful incentive for consumers and governments alike to



Everyone benefits from solar power with cleaner air, more jobs, and a local supply of electricity during California's hottest summer days. Credit: SPS Energy Solutions

Figure 7. Employment Rates of California’s Million Solar Roofs Initiative



Applying EPRI employment rates for solar photovoltaic systems to California’s steady growth in solar roofs over the life of the Million Solar Roofs Initiative will create more than 20,000 jobs, with steady annual employment growth throughout the program. SOURCE: Electric Power Research Institute, prepared for the CEC, California Renewable Technology Market and Benefits Assessment, November 2001.

embrace solar power as a critical part of California’s clean energy future.

What’s more, solar power is cleaner and more environmentally sustainable than the energy resources that dominate California’s electricity landscape today, namely natural gas, coal, large scale dams and nuclear power. Thanks to the growth in the world-wide market for solar power, it is also becoming more affordable, as discussed in the next chapter.

California’s cities and counties have great potential to benefit, both economically and environmentally, from a growing solar power market.

Economic Benefits

Solar power can help cities by reducing strain on the electric grid and hedging against rate spikes by generating electricity on hot summer afternoons when air conditioners are running and electricity demand is at its highest. The pain cities can experience from California’s strained electricity grid was highlighted during the 2000-2001 energy crisis when California’s cities lost millions of dollars in increased electricity bills and lost worker days from rolling blackouts. For example, San Diego spent nearly \$10 million more than

it budgeted in 2001 on energy due to the skyrocketing peak energy prices during the energy crises.⁹ San Jose Chamber of Commerce estimated that the energy crisis cost the state \$1 - \$5 billion.¹⁰

Green Jobs

A robust solar power market can also bring new jobs to California cities and counties. This is because solar rooftop installations are more job-intensive than natural gas fired power plants, according to a study by the Electric Power Research Institute (EPRI) sponsored by the California Energy Commission in 2001.¹¹ The report “characterizes the status and prospects of each renewable energy resource in the state and estimates the potential economic and environmental benefits they provide.” The report concludes that renewable energy technologies “can make California’s electricity more reliable, affordable, and cleaner.”

The EPRI report estimated job creation from renewable energy development based on existing and planned projects in California and the market outlook of project developers and equipment manufacturers.



Installing solar panels on rooftops throughout California can create up to seven times more jobs than a natural gas power plant. Credit: National Renewable Energy Lab

The construction employment rate in the report for solar photovoltaic systems is 7.14 jobs/MW and 0.12 jobs/MW for operating a solar photovoltaic system. A 2004 University of California at Berkeley report also took a comprehensive look at several renewable energy job creation studies and found similar results.¹²

Applying these EPRI job creation figures to California’s Million Solar Roofs Initiative results in an estimate of 20,000 person years of employment by 2017.¹³ Figure 7 illustrates what this growth might look like on an annual basis. Because solar power installations are inherently local, an increased market for solar power will inevitably create jobs in California in or near where the solar power is installed.

Cleaner Air

California’s cities and counties can also benefit from cleaner air as a result of an increased use of solar power. This is because solar power works best when California needs it most: hot summer afternoons when electricity demand is at its highest and smog pollution at its worst. Instead of having to rely on peaking natural gas power plants that are typically dirtier than large, base-load natural gas power plants, California can increase its dependence on reliable solar photovoltaic systems. For every megawatt of solar power installed in California more than 300 pounds of smog-forming pollution is reduced.¹⁴

In addition, solar power can help cities and counties meet their global warming pollution reduction goals. For every megawatt of solar power installed in California, global warming pollution is cut by 946 tons per year.¹⁵ This means that for every two households that install a 3 kilowatt solar system, the clean air benefit is equivalent to one car being taken off the road.¹⁶

Building Toward a Million Solar Roofs

Over the years, solar power has moved rapidly from serving off-grid niche markets like calculators and emergency signs to becoming a mainstream electricity source. As the market has grown in California and elsewhere, the cost of installing a solar power system on a home or business has declined. In California alone, the cost of going solar dropped 40% between 1998 and 2004.¹⁷

The latest industry analysis shows that the cost of solar photovoltaic modules is on the decline yet again and may reach grid parity by 2015, meaning the cost of investing in solar power will equal the cost of purchasing retail electricity.¹⁸

Yet the cost of a solar photovoltaic system has still not fallen quite to the level where it makes long-term financial sense for a homeowner to install a system without financial incentives. In other words, without financial incentives, the installation costs are still high enough that they outweigh the savings on a homeowner's electricity bill—though these savings do not reflect all of the economic or environmental benefits of a solar photovoltaic system, like lessening the need for

transmission capacity upgrades, new power plants or cleaner air.

California's Million Solar Roofs Vision and Programs

It has often been said that it is not a question of if, but when solar power becomes cost-competitive with traditional electricity sources which have been heavily subsidized for decades. California policy makers have attempted to move this date up by launching the Million Solar Roofs Initiative.

By creating increased demand for solar power, California is helping the solar industry manufacture and install solar systems more cheaply. As prices go down, demand will increase, creating a “virtuous cycle” that will give solar power a tremendous boost in becoming a major source of California's power. Ultimately government incentives will no longer be needed.

There's recent evidence to support this theory. Japan's, Germany's and California's

government incentive programs have driven up demand and allowed solar manufacturers as well as silicon manufacturers, the base material of a solar photovoltaic system, to achieve greater economies of scale and lower prices.¹⁹

The Million Solar Roofs Initiative originated in the California State Legislature and was ultimately passed via Senate Bill 1, authored by Senator Kevin Murray (Los Angeles), in 2006. The primary goals of SB 1, the Million Solar Roofs Bill, are:

- 1) Build a million solar roofs by December 31, 2016.
- 2) Install a total capacity of 3,000 megawatts (MW) of solar electric generation capacity. For comparison, a typical natural gas power plant built to meet California's peak electricity load is around 75-100 megawatts.
- 3) Create a robust, diverse solar market by providing financial incentives to homes—new, existing and low income—as well as businesses, government agencies and non-profit entities.

As a result, in 2007, the California Public Utilities Commission launched the California Solar Initiative as the primary program to meet SB 1's goals at the state's three investor-owned utilities, Pacific Gas & Electric, San Diego Gas & Electric and Southern California Edison. Meanwhile, the California Energy Commission launched the New Solar Homes Partnership aimed exclusively at building new homes with solar power systems. Lastly, the state's municipal utilities have adopted their own ten-year solar rebate programs as well.²⁰

The main components of the Million Solar Roofs Initiative are: 1) upfront rebates for homeowners and businesses totaling \$3.3 billion over ten years, 2) access to net metering which enables solar

owners to get credit for any excess power their solar system generates on any given day, and 3) a mandate that solar power be a standard option for all new homes built after 2010.

The program assumes that a federal tax credit is available for consumers throughout the life of the program. Fortunately, Congress renewed the Renewable Energy Investment Credit in 2008, extending solar credits through 2016.²¹

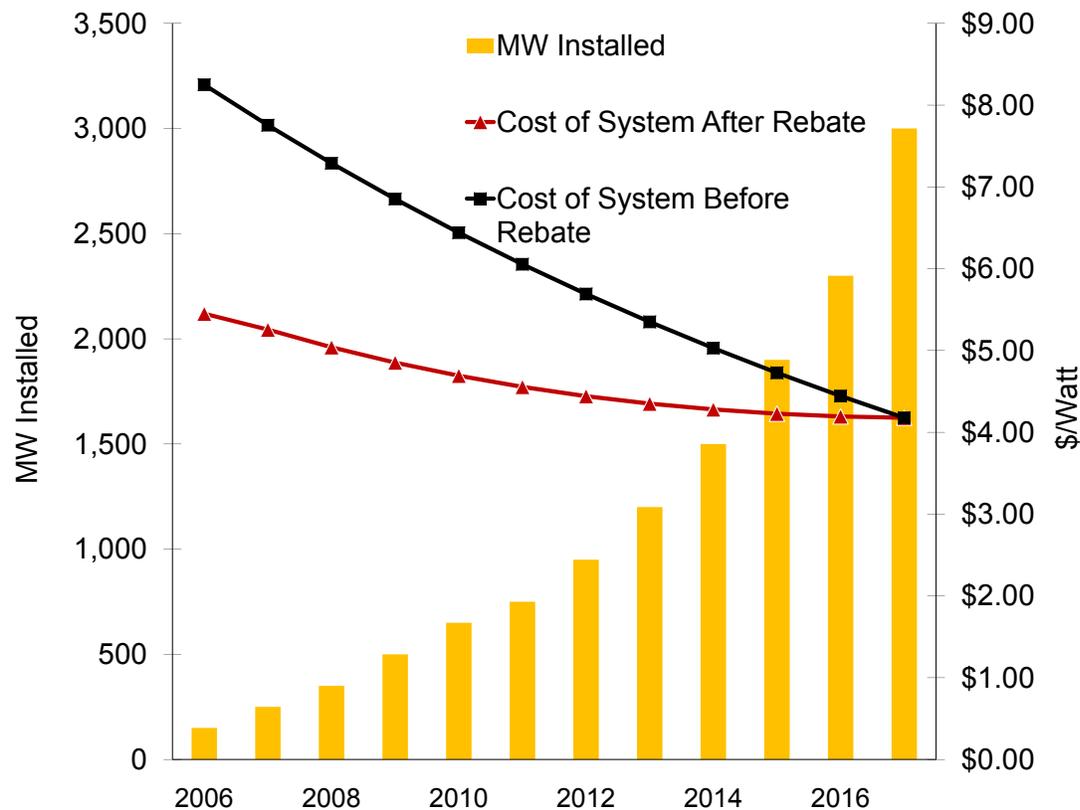
California's Million Solar Roofs Progress

When the Million Solar Roofs program began, the state had approximately 27,000 solar roofs, totaling nearly 300 MW.²² So far, two years into the program, California has added more than 200 MW and roughly 24,000 solar roofs.²³ Altogether, California has nearly 50,000 solar photovoltaic systems totaling more than 500 megawatts of power.²⁴

To achieve the million solar roofs goal by the end of 2016, bringing the state's cumulative amount of solar power to 3,000 MW, an exponential growth in demand for solar power is needed. Figure 8 documents the growth in solar power to date as well as the continued growth needed to meet the million solar roofs goal by 2017. The growth needed to meet the state's goals is approximately the same as has been experienced since 2002, roughly 45-50% compounded annual growth. In other words, California is on track to meet its million solar roofs goal provided the state's robust market growth continues throughout the ten year program.

To achieve these aggressive goals, California's local government leaders, as well as the state and federal government, need to employ every tool available to promote solar power and remove all unnecessary barriers to consumers investing in solar power.

Figure 8. Getting to a Million Solar Roofs and Achieving Economies of Scale



California’s solar market must continue to grow at its current rate to reach its million solar roofs goal by the start of 2017. If it does, economies of scale should cut the cost of installing a solar photovoltaic system in half, creating “grid parity” where rebates are no longer needed to make solar power a cost-effective investment for the consumer. SOURCE: Environment California Research & Policy Center, “Bringing Solar to Scale: California’s Opportunity to Create a Thriving, Self-Sustaining Residential Solar Market,” 2005.



Beginning in 2010, all new California homes must include solar panels as an option for homebuyers while the home is being built. This housing development in Watsonville, called Vista Montana and built by Clarum Homes, went one step further and included solar panels as a standard feature on all 250 homes. Credit: Clarum Homes

Policy Recommendations

Solar power represents a huge opportunity for California's cities and counties. As this report shows, the demand for solar power in California extends throughout the state. From cities and towns both small and large, rural and urban, across the map Californians are investing in solar power as a way to protect

the environment, save money and bring about greater energy independence.²⁵

With additional policies and programs to further spur consumer interest in solar power, California's cities and counties can play a leading role in meeting the state's million solar roofs goal, and most importantly, bring about a mainstream solar power market for future generations to enjoy.

In addition, the state policy makers along with the federal government can continue to do more to promote solar power and ensure the state reaches its million solar roofs goal.



Cinema West's Livermore Cinemas in Livermore, CA hosts a 132 kilowatt photovoltaic system. The massive solar installation was manufactured by Fremont-based Solyndra, Inc. and installed by Novato-based SPG Solar, Inc. It includes a unique tube-shaped solar system that eases installation on flat roof spaces. Credit: Solyndra Inc.

Municipal Policies and Programs

Solar on Municipal Buildings

When it comes to promoting solar power, local governments can lead by example. Government agencies are as eligible for state solar rebates as residents and private businesses. In fact, the state offers a higher

rebate for non-profit entities and others unable to take advantage of federal tax credits. In addition, government buildings can also contract with a third-party company that can pay for and install the solar system without any upfront cost to the municipality.

Financial Incentives

Local governments can put in place local incentive programs. First and foremost, cities with municipal utilities should make sure that the utility's SB 1-required rebate program is going well, and that, at minimum, consumers are aware of the rebates and encouraged to take advantage of them.

Beyond rebates, local government can also help consumers finance solar systems through property-secured financing mechanisms such as those enabled by Assembly Bill 811, which authorizes all cities in California to offer property owners opportunities to finance energy efficiency and renewable energy improvements, including a solar energy system.²⁶ AB 811 was largely based on a program adopted by the City of Berkeley that is offering a financing option for homeowners to pay for the installation of a solar system through property taxes. Such a program helps residents spread out payments for their solar system over time while minimizing the interest payments on their upfront investment. Many other cities in California, including San Diego, are also exploring this option.

In addition to the AB 811 financing mechanism, cities with a municipally-owned energy or water utility can offer on-bill financing as a simple and cost-effective way for consumers to invest in energy efficiency and solar power investments without the need for upfront payments. On-bill financing, such as a PAYS America program, allows ratepayers, including those who don't own property, to finance clean energy investments via their monthly utility bill. This program is especially promising for

multi-family dwellings or non-traditional single-family properties because it allows the payments to be attached to the utility meter, instead of the property itself.²⁷

Reduced Barriers

City and county governments can take steps to reduce or remove barriers to going solar. For example, local government officials can streamline the permitting process, work with nearby jurisdictions to standardize permitting requirements, and reduce or eliminate permitting fees for homeowners and businesses investing in solar power. It is also important that city and county inspectors are well-trained and that city inspection departments are sufficiently staffed to respond to an increase in solar installations.

Education and Outreach

Another way local government can play a leading role in building a million solar roofs is through education and outreach programs. City and county leaders are, in fact, one of the best messengers to encourage solar power as they are local, well-known and not directly connected to the solar industry. San Francisco, Sacramento and Marin County in particular have done an excellent job of educating and informing their residents about the benefits of going solar through projects such as solar mapping websites like sf.solarmap.org, smud.solarmap.org, as well as the County of Marin's Solar Program website.²⁸

Support State and Federal Programs

In addition to setting up programs to support solar power at the municipal level, it is also important that cities and counties continue to lobby for and encourage the state and federal government to continue supporting solar power. For example, local government should support expanding the state's net metering law as discussed below.

State and Federal Policies and Programs

While California already has some of the most progressive and aggressive solar power policies and programs, the biggest being the Million Solar Roofs Initiative, there are many other things that state and federal decision makers can do to promote more solar powered roofs in California.

Ensure Continuity of Financial Support for Solar Power

Over the past thirty years, government incentives for solar power have experienced extreme ups and downs depending on the politics of the day. These “fits and starts” have wreaked havoc on the solar industry, causing declining sales, stagnating prices and mixed messages to consumers about the government’s trust in solar power as a technology. In 2006, California paved the way for a new way of promoting solar power—through a consistent and uninterrupted ten-year-long incentive program. In 2008, the federal government followed California’s lead by extending federal tax credits for solar systems through 2016.

Looking ahead, it is imperative that state and federal decision-makers guard the state’s Million Solar Roofs Initiative and the federal tax credits to ensure that the programs continue uninterrupted through 2016.

In addition to the Million Solar Roofs Initiative, which focuses on solar electricity, California also passed The Solar Hot Water and Efficiency Act of 2007 (AB 1470), authored by Assembly member Jared Huffman (Marin). This policy creates a \$250,000,000 rebate fund and sets the goal of installing 200,000 solar hot water heaters by 2017. San Diego has been experimenting with a pilot program for solar hot water system rebates. It is imperative that the Public Utilities Commission roll out statewide rebates in 2009.

The federal government’s Solar America

Cities program, which provides federal funding as well as technical assistance to cities throughout the state and country committed to investing in solar power is another powerful program driving an expanded solar power market.²⁹ Of the 25 cities named a “Solar America City” by the Department of Energy in 2007 and 2008, six are in California. Not coincidentally, all six of these California cities: Berkeley, Sacramento, San Diego, San Francisco, San Jose, and Santa Rosa are also “Top Ten” cities in California for having installed the most solar power in the state.³⁰ In 2009, President Obama committed \$10 million in Recovery Act Funding for America Solar Cities program.³¹ Such programs, as well as R&D programs, should be continued and expanded.

Expand Net Metering

The expansion of California’s net metering law is critical to reaching California’s million solar roofs goal. Net metering is the policy that allows solar system owners to get credit for any excess solar power generated on a day-to-day basis. Current law caps net metering at 2.5% of a utility’s total load. In other words, once all of the solar roofs in any one utility service territory reach a total installed capacity equal to 2.5% of that utility’s total electricity demand, that utility is not obligated to sign any new net metering contracts. In order to build 3,000 MW of solar power, the cap for net metering needs to be lifted to at least 5%, though 10% would ensure uninterrupted implementation of the million solar roofs program. It is possible that the 2.5% cap will be reached in PG&E territory as early as 2009 or 2010.³² At the time of publication of this report, a bill, AB 560 (Skinner), that would increase the net metering cap to 10%, is moving through the state legislature.

In addition to lifting the cap on net metering, the state government should also require utilities to compensate those net

metered customers who generate surplus electricity over a 12-month period. Current law allows utilities to “zero-out” net metering tallies, essentially penalizing those customers who either conserved more than expected during a particular year or those who had a significant change in their electricity consumption, such as a smaller household than in previous years. This use it or lose it policy creates a perverse incentive for solar customers to waste their surplus solar electricity, thereby discouraging conservation and efficiency once a solar system is put in place, and it also creates an unnecessary barrier for new consumers to invest in solar power in the first place. At the time of publication of this report, a bill, AB 920 (Huffman), that would provide for surplus solar power compensation is moving through the state legislature.

Establish Strong Feed-in-Tariff

California’s distributed solar power policies are geared exclusively toward small-scale solar systems (under 1 megawatt) intended exclusively for meeting on-site electricity demands. What’s missing is a policy that can drive a market for medium-sized solar power projects (<20 MW) installed on warehouses, parking lots, brownfields and other places where there is little on-site electricity demand and ample space to install solar panels. Such a market could be created via a strong feed-in-tariff, or standard offer, policy. A feed-in-tariff is essentially a mandate that the state’s utilities purchase all of the electricity “fed into the grid” from a solar system. Typically, the utility is required to sign a contract with the solar system owner for a 20 year period. The rate, or tariff, must be high enough to drive interest in the program. Germany has one of the strongest feed-in-tariff policies in the world and has, in just a few short years, become the world’s number one market for solar power installing

more than 1,500 MW annually. California should quickly adopt an expanded feed-in-tariff policy to compliment other solar incentive programs. California currently has a feed-in-tariff policy offering up to 21 cents/kWh over 5, 10 or 15 year contracts for solar photovoltaic systems up to 1.5 MW in size. The current feed-in-tariff program adopted by the California Public Utilities Commission in February 2008 is capped at just under 500 MW statewide, across all three investor-owned utility territories.³³

Provide Additional Financing Mechanisms

In addition to direct subsidies, the state should also explore ways to ease financing of solar systems. This is especially important during the ongoing banking and mortgage crisis. One of the most promising policies that the state should explore is called on-bill financing, as discussed in the section on municipal policy recommendations. Under such a program, a ratepayer can finance their solar system through their utility bill. Utilities, in turn, can partner with third party financiers to provide low-interest loans, thereby making solar more affordable for consumers.

Solar Home Mandate

California should mandate that all new homes be built with solar panels as a standard feature. SB 1, The Million Solar Roofs bill, mandates that solar power become a standard option for all new homes built in California after 2010. Along with granite countertops, future homebuyers can select solar power as an additional feature on their home. California should go well beyond this policy by mandating solar power be automatically installed on every new roof in the state and that all new residential and commercial buildings be zero-energy buildings by 2020 and 2030 respectively.

About the Data

This report documents the number and installed capacity of all of the grid-connected solar electric systems installed in California on a city by city basis. This report focuses exclusively on solar photovoltaic installations that by-and-large are owned by ratepayers, as opposed to a utility, and are located on buildings throughout the state. Future editions of this report will include solar water heating systems and other forms of distributed solar power.

The data for this report comes from raw solar rebate numbers from the California Energy Commission, California Public Utilities Commission, the California Center for Sustainable Energy, and the state's private and public utilities.

Due to limitations in the data, this report does not include solar systems that are not connected to the electricity grid. While numerous and an important part of California's clean energy infrastructure, there is no complete source of information for these types of solar installations.

Furthermore, this report does not measure the amount of solar power installed on a utility by utility basis but is focused exclusively on city by city calculations. This

distinction is important as several cities are serviced by more than one utility.

Below is a detailed description of where the author obtained the raw data for this report and how it was interpreted.

Emerging Renewables Program³⁴

From 1998 through 2006, the California Energy Commission administered the Emerging Renewables Program, which provided rebates for small-scale (< 30 kilowatts) solar systems. The program still exists today but is limited to non-solar forms of small-scale renewable energy technologies. The bulk of the funds for this program were generated by a small surcharge on the bills of investor owned utility ratepayers. A very small number of rebates administered through this program came from special funds created by the state legislature after the California energy crisis in 2001. These funds were available to consumers throughout the state, including those living within the territories of

publically owned utilities. For this report, the author took the entire database for the Emerging Renewables Program from 1998 to December 2008, removed all of the installations that were either non-solar or were never completed (e.g. they applied for a rebate but never actually completed the projected), and sorted them by city. This database makes up the bulk of the data in this report.

Self Generation Incentive Progrms (SGIP)³⁵

Since 2001, the California Public Utilities Commission has overseen the Self Generation Incentive Program (SGIP), administered by the Pacific Gas & Electric, Southern California Edison, Southern

California Gas Company and the California Center for Sustainable Energy in San Diego Gas and Electric service territory. This program provides a rebate, generated from a small surcharge on gas and electric bills, for customers of investor owned utilities, toward large-scale distributed generation systems (>30 kilowatts). Prior to 2006, this program provided rebates for solar photovoltaic, wind, fuel cells and other forms of distributed generation. Today, it only provides rebates for non-solar technologies. For this report, the author took the entire database of SGIP rebates, excluded the non-solar reservations and deleted those projects that were never completed, and then sorted by city. There were roughly 300 installations for which there is no city listed in the database. This is in an attempt by the program administrators to protect the privacy of those customers who owned the only large solar installation



More than 1,000 solar panels cover this parking garage, providing pollution-free electricity for the Downing Downing Resource Center at Salinas Valley Memorial Healthcare System in Salinas, CA. The system was installed by Alteras™ Renewables and manufactured by Shell Solar. Credit: Shell Solar

in a particular city. While this creates a significant gap in the data, it is unlikely to significantly change the “top ten” city-by-city analysis of this report.

California Solar Initiative³⁶

January 1, 2007, the California Public Utilities Commission began the California Solar Initiative (CSI) to provide rebates for all solar electric systems < 1 megawatt on all existing homes plus all new and existing commercial buildings. The rebates are administered by PG&E, Southern California Edison and the California Center for Sustainable Energy in San Diego Gas & Electric service territory. The CSI program is open to all solar electric technologies though to date is exclusively focused on solar photovoltaic systems. Only those systems, from January 2006 through January 2009, for which a reservation has been confirmed or is far enough into the process to be reasonably expected to be completed were counted. Specifically, only those reservations with the following reservation status were included: Completed, Confirmed Reservation, Incentive Claim Request Review, Online Incentive Claim Request Submitted, PBI - In Payment,

Pending Payment, and Suspended-Incentive Claim Request Review. All those reservations with the following reservation status were excluded: Reservation Request Review, Reservation Reserved, Online Proof of Project Milestones Submitted, Online Reservation Request Submitted, Pending RFP, Proof of Project Milestones Review, Suspended - Milestone Review, Suspended - Reservation Review, and Suspended - RFP Review. It should be noted that the California Public Utilities Commission omits those reservations with a “Confirmed Reservation” status in their quarterly reports.³⁷ According to one of the CSI administrators, projects with this reservation status have roughly a 20% drop out rate.³⁸ There are approximately 5,000 installations counted in this report that fall within this category. This means that approximately 1,000 installations may not yet be installed or may have been withdrawn. These 1,000 installations are spread out among all the cities listed in this report and are unlikely to materially impact the city-by-city analysis of this report. Furthermore, because California’s solar market is continually growing, it is likely that there is more solar installed in each of the cities cited in this report. In calculating the installed capacity, the CSI rating figures were used.



Credit: Oberlin College

New Solar Homes Partnerships³⁹

In addition to the Emerging Renewables Program, the California Energy Commission also administers the New Solar Homes Partnership Program. This program was created by SB 1 to provide rebates specifically for new homes and new housing developments built with solar electric power systems. This program only encompasses solar housing developments and new homes

built within investor owned utility territories. New housing projects built in municipal utility districts are included in the municipal utility data. Similar to other databases, the author used data up through January 2009, excluded incomplete projects, and then sorted by city.

Municipal Utility Data

In compiling data for this report, the author contacted all of the individual municipal utilities in California and requested data on the total number of grid-connected solar PV systems in their service territories. The author received complete data reports from twenty six municipal utilities, some dating back to the early 1990's. In addition, the author also obtained data from the California Energy Commission on the amount of solar power installed per SB 1, which requires all of the state's municipal utilities to provide solar rebates for their customers and report their figures to the Energy Commission.⁴⁰ As with previous data sets, the figures used for this report

were only for installed solar photovoltaic systems through January 2009.

The municipal utilities that submitted complete data for this report were

1. City of Alameda
2. City of Anaheim
3. City of Azusa
4. City of Burbank
5. City of Cerritos
6. City of Colton
7. City of Corona
8. City of Gridley
9. City of Healdsburg
10. City of Hercules
11. City of Lodi
12. City of Lompoc
13. City of Needles
14. City of Palo Alto
15. City of Pasadena
16. City of Riverside
17. City of Roseville
18. City of Santa Clara/Silicon Valley Power
19. City of Shasta Lake
20. City of Ukiah
21. City of Vernon
22. Los Angeles Dept. of Water & Power
23. Modesto Irrigation District
24. Sacramento Municipal Utility District
25. Trinity Public Utility District
26. Turlock Irrigation District

Appendix A: Ranking of Cities by Number of Solar Roofs

The chart below contains the data for the total number of grid-tied solar systems installed in all of California's incorporated cities in order of greatest number of solar roofs to least. Some cities have the same number of solar systems installed and therefore share a ranking.

City	Solar Roofs	State Rank
San Diego	2,262	1
Los Angeles	1,388	2
San Francisco	1,350	3
San Jose	1,333	4
Fresno	1,028	5
Bakersfield	751	6
Clovis	733	7
Santa Rosa	725	8
Sacramento	692	9
Berkeley	648	10
Oakland	643	11
Roseville	607	12
Santa Cruz	543	13
Sebastopol	506	14
Watsonville	474	15
Davis	457	16
Santa Barbara	414	17
Chico	354	18
Los Gatos	343	19
San Rafael	340	20
Napa	327	21
Sunnyvale	327	21
Los Altos	312	22
Long Beach	306	23
Mountain View	304	24
Palo Alto	302	25
Escondido	300	26
Grass Valley	300	26
Visalia	290	27
Palm Desert	286	28
San Marcos	278	29
Mill Valley	270	30
Menlo Park	269	31
Lincoln	257	32
Sonoma	253	33
Rocklin	252	34
Pleasanton	250	35
Palm Springs	249	36
Vacaville	248	37
Nevada City	247	38
Redwood City	247	38
Ojai	236	39
San Luis Obispo	233	40
Walnut Creek	231	41
Auburn	230	42
Novato	228	43
El Cajon	224	44
Rancho Cordova	224	44
Saratoga	219	45
Livermore	215	46

City	Solar Roofs	State Rank
Los Altos Hills	213	47
Fremont	209	48
Danville	201	49
Stockton	200	50
Camarillo	199	51
Claremont	199	51
Cupertino	197	52
Madera	193	53
Paso Robles	190	54
Petaluma	189	55
Poway	187	56
Santa Monica	184	57
Riverside	175	58
Portola Valley	174	59
Woodland	173	60
Antioch	172	61
Arcata	169	62
Huntington Beach	168	63
San Mateo	167	64
Murrieta	165	65
Corona	164	66
Simi Valley	163	67
Temecula	163	67
Ventura	162	68
Lafayette	161	69
Arroyo Grande	160	70
Santa Clarita	158	71
Thousand Oaks	155	72
Vista	153	73
Healdsburg	146	74
Rancho Mirage	146	74
Carlsbad	145	75
Richmond	144	76
San Carlos	144	76
Placerville	140	77
Encinitas	137	78
Apple Valley	136	79
Oroville	136	79
Pasadena	136	79
Tracy	134	80
San Anselmo	133	81
Elk Grove	130	82
Redding	130	82
Gilroy	129	83
La Mesa	129	83
San Ramon	128	84
Oakdale	126	85
Morgan Hill	124	86
Orinda	123	87
Santa Ana	122	88

City	Solar Roofs	State Rank
Mission Viejo	121	89
Concord	120	90
Redlands	119	91
Brentwood	113	92
Irvine	112	93
Oceanside	112	93
Chula Vista	111	94
Yuba City	110	95
Atascadero	109	96
Hemet	108	97
Tiburon	104	98
Campbell	102	99
Sonora	101	100
Hayward	100	101
Woodside	100	101
Calistoga	99	102
La Canada-Flintridge	99	102
St. Helena	99	102
Cathedral City	98	103
Lakeport	96	104
Orange	96	104
Malibu	95	105
Pacifica	95	105
Loomis	92	106
Vallejo	90	107
Martinez	89	108
Costa Mesa	86	109
Manhattan Beach	86	110
Upland	86	109
El Cerrito	85	111
Manteca	85	111
Moreno Valley	85	111
San Leandro	84	112
Cloverdale	83	113
Merced	82	114
Anaheim	81	115
Atherton	81	115
Reedley	81	115
Hanford	80	116
Windsor	80	116
Salinas	79	117
Newport Beach	76	118
Victorville	76	118
Pleasant Hill	75	119
Sanger	74	120
Carmel-by-the-Sea	73	121
Monterey	72	122
Palmdale	72	122
Burlingame	70	123
Fairfax	70	123

Appendix A: Ranking of Cities by Number of Solar Roofs (continued)

City	Solar Roofs	State Rank
Rancho Palos Verdes	70	123
Belmont	69	124
Lemoore	69	124
Fairfield	68	125
Lancaster	68	125
Willits	68	125
Citrus Heights	67	126
Exeter	67	126
San Bernardino	67	126
Ridgecrest	66	127
West Sacramento	66	127
Agoura Hills	65	128
Milpitas	64	129
San Clemente	64	129
Moraga	63	130
Santa Maria	63	130
Scotts Valley	62	131
Westlake Village	62	131
Yorba Linda	62	131
Albany	61	132
Piedmont	61	132
Red Bluff	61	132
Ukiah	61	132
Winters	61	132
Eureka	60	133
Lodi	60	133
Corte Madera	59	134
Goleta	59	134
Culver City	58	135
Menifee	58	135
Dublin	57	136
Arcadia	56	137
Tulare	56	137
Chino	55	138
Hillsborough	55	138
Santee	55	138
Yucaipa	55	138
Fullerton	54	139
Half Moon Bay	54	139
Redondo Beach	54	139
Hollister	53	140
Moorpark	53	140
Rancho Cucamonga	53	140
Sausalito	52	141
Chino Hills	51	142
Coronado	51	142
Fort Bragg	51	142
Lompoc	51	142
Lakewood	50	143
Larkspur	50	143

City	Solar Roofs	State Rank
Live Oak	50	143
Porterville	50	143
Belvedere	49	144
Del Mar	49	144
Perris	48	145
Rohnert Park	48	145
Whittier	48	145
Benicia	47	146
Fountain Valley	47	146
Torrance	47	146
Anderson	46	147
Paradise	46	147
Lake Elsinore	45	148
Lake Forest	45	148
San Juan Capistrano	45	148
Escalon	44	149
Fontana	44	149
Garden Grove	44	149
Marysville	44	149
Oxnard	44	149
Bishop	42	150
Calabasas	42	150
Desert Hot Springs	42	150
Folsom	42	150
Hesperia	42	150
Laguna Beach	42	150
Atwater	41	151
Laguna Niguel	41	151
Los Alamitos	41	151
Ontario	41	151
Seal Beach	41	151
Burbank	40	152
East Palo Alto	40	152
Solana Beach	40	152
Dixon	39	153
Placentia	37	154
Santa Clara	37	154
Carpinteria	36	155
Clayton	36	155
Lindsay	36	155
South Pasadena	36	155
Tustin	36	155
Glendora	35	156
Laguna Hills	35	156
Angels Camp	34	157
Buena Park	34	157
Hermosa Beach	34	157
Kingsburg	34	157
Newark	34	157
Oakley	34	157

City	Solar Roofs	State Rank
South San Francisco	34	157
Tehachapi	34	157
Covina	33	158
Foster City	33	158
Wildomar	33	158
Clearlake	32	159
La Verne	32	159
Modesto	32	159
Norco	32	159
Twentynine Palms	32	159
Morro Bay	31	160
Orland	31	160
Canyon Lake	30	161
Cerritos	30	161
Beverly Hills	29	162
Cypress	29	162
Selma	29	162
Solvang	29	162
Indian Wells	28	163
Monrovia	28	163
Pinole	28	163
Pittsburg	28	163
Pomona	28	163
Yucca Valley	28	163
Dinuba	27	164
Highland	27	164
Sierra Madre	27	164
Walnut	27	164
Colfax	26	165
Cotati	26	165
Millbrae	26	165
Union City	26	165
Westminster	26	165
Alameda	25	166
Big Bear Lake	25	166
Capitola	25	166
Fillmore	25	166
San Gabriel	25	166
Brea	24	167
Chowchilla	24	167
Hercules	24	167
Monte Sereno	24	167
Rialto	24	167
Ross	24	167
Sutter Creek	24	167
Corning	23	168
Ione	23	168
Jackson	23	168
Loma Linda	23	168
Plymouth	23	168

Appendix A: Ranking of Cities by Number of Solar Roofs (continued)

City	Solar Roofs	State Rank
American Canyon	22	169
Palos Verdes Estates	22	169
Rancho Santa Margarita	22	169
Villa Park	22	169
Barstow	21	170
Colton	21	170
Downey	21	170
Galt	21	170
Imperial Beach	21	170
San Bruno	21	170
Santa Paula	21	170
Suisun City	21	170
West Covina	21	170
Beaumont	20	171
Dana Point	20	171
La Habra Heights	20	171
Trinidad	20	171
Turlock	20	171
Alhambra	19	172
Compton	19	172
Lemon Grove	19	172
Pacific Grove	19	172
Ripon	19	172
San Dimas	19	172
Woodlake	19	172
Brisbane	18	173
Diamond Bar	18	173
El Segundo	18	173
La Mirada	18	173
Rolling Hills Estates	18	173
Monterey Park	17	174
San Jacinto	17	174
Blythe	16	175
San Marino	16	175
Grover Beach	15	176
Los Banos	15	176
Seaside	15	176
Avalon	14	177
Daly City	14	177
Lathrop	14	177
Point Arena	14	177
West Hollywood	14	177
Wheatland	14	177
Aliso Viejo	13	178
Fowler	13	178
Hawthorne	13	178
Pismo Beach	13	178
California City	12	179
La Habra	12	179
Lomita	12	179

City	Solar Roofs	State Rank
Riverbank	12	179
Shafter	12	179
Duarte	11	180
Livingston	11	180
Willows	11	180
Bellflower	10	181
Coalinga	10	181
Gardena	10	181
Kerman	10	181
San Juan Bautista	10	181
Wasco	10	181
Fortuna	9	182
San Pablo	9	182
Taft	9	182
Temple City	9	182
El Monte	8	183
Gridley	8	183
Inglewood	8	183
La Palma	8	183
Marina	8	183
National City	8	183
Newman	8	183
Buellton	7	184
Carson	7	184
Colusa	7	184
Emeryville	7	184
Glendale	7	184
Montclair	7	184
Montebello	7	184
Norwalk	7	184
Rosemead	7	184
Arvin	6	185
Blue Lake	6	185
City of Industry	6	185
Gustine	6	185
Hughson	6	185
Laguna Woods	6	185
Mammoth Lakes	6	185
San Fernando	6	185
Yountville	6	185
Banning	5	186
Bradbury	5	186
McFarland	5	186
Commerce	4	187
Corcoran	4	187
Gonzales	4	187
Grand Terrace	4	187
Greenfield	4	187
La Puente	4	187
Lawndale	4	187

City	Solar Roofs	State Rank
Patterson	4	187
Pico Rivera	4	187
Port Hueneme	4	187
Signal Hill	4	187
South Gate	4	187
Williams	4	187
Azusa	3	188
Calimesa	3	188
Ceres	3	188
Colma	3	188
Cudahy	3	188
Dos Palos	3	188
Ferndale	3	188
Firebaugh	3	188
Hidden Hills	3	188
Huntington Park	3	188
King City	3	188
Needles	3	188
Rio Vista	3	188
Stanton	3	188
Adelanto	2	189
Avenal	2	189
Baldwin Park	2	189
Biggs	2	189
Farmersville	2	189
Mendota	2	189
Parlier	2	189
San Joaquin	2	189
Shasta Lake	2	189
Soledad	2	189
South El Monte	2	189
Truckee	2	189
Amador City	1	190
Artesia	1	190
Del Rey Oaks	1	190
Delano	1	190
Guadalupe	1	190
Huron	1	190
Indio	1	190
Irwindale	1	190
La Quinta	1	190
Maricopa	1	190
Paramount	1	190
Rio Dell	1	190
Rolling Hills	1	190
Santa Fe Springs	1	190
Tehama	1	190
Waterford	1	190
Alturas	0	
Bell	0	

Appendix A: Ranking of Cities by Number of Solar Roofs (continued)

City	Solar Roofs	State Rank
Bell Gardens	0	
Brawley	0	
Calexico	0	
Calipatria	0	
Coachella	0	
Crescent City	0	
Dorris	0	
Dunsmuir	0	
El Centro	0	
Etna	0	

City	Solar Roofs	State Rank
Fort Jones	0	
Hawaiian Gardens	0	
Holtville	0	
Isleton	0	
Loyalton	0	
Lynwood	0	
Maywood	0	
Montague	0	
Mount Shasta	0	
Orange Cove	0	

City	Solar Roofs	State Rank
Portola	0	
Sand City	0	
South Lake Tahoe	0	
Susanville	0	
Tulelake	0	
Vernon	0	
Weed	0	
Westmorland	0	
Yreka	0	

Appendix B: Ranking of Cities by Solar Capacity

The chart below contains the data for the total installed capacity of grid-tied solar systems in all of California's incorporated cities in order of greatest capacity installed to least. Some cities have the same amount of solar installed and therefore share a ranking.

City	kW Solar	State Rank	City	kW Solar	State Rank	City	kW Solar	State Rank
San Diego	19,427	1	Rocklin	2,317	50	Windsor	1,341	97
San Jose	15,450	2	Woodland	2,308	51	Davis	1,293	98
Fresno	14,538	3	Murrieta	2,296	52	Grass Valley	1,287	99
Los Angeles	13,000	4	Long Beach	2,228	53	Gilroy	1,274	100
Santa Rosa	8,954	5	Lakeport	2,186	54	Costa Mesa	1,268	101
Bakersfield	7,341	6	Yuba City	2,142	55	Palo Alto	1,259	102
San Francisco	7,052	7	Healdsburg	2,141	56	Orange	1,253	103
Oakland	6,972	8	Blythe	2,139	57	Danville	1,235	104
Chico	6,417	9	Fremont	2,051	58	Menlo Park	1,233	105
Napa	5,947	10	Camarillo	2,047	59	American Canyon	1,211	106
Sacramento	5,560	11	El Cajon	1,949	60	Antioch	1,188	107
Vacaville	5,304	12	Escondido	1,948	61	San Marcos	1,188	107
Clovis	5,284	13	Apple Valley	1,937	62	La Habra	1,184	108
Ontario	5,143	14	Clearlake	1,925	63	Cupertino	1,179	109
Richmond	5,076	15	Victorville	1,889	64	Placerville	1,176	110
Stockton	4,602	16	Rancho Cordova	1,887	65	Redwood City	1,175	111
Livermore	4,597	17	Santa Ana	1,802	66	Novato	1,153	112
Visalia	4,155	18	Rohnert Park	1,773	67	Thousand Oaks	1,149	113
Sunnyvale	4,147	19	Walnut Creek	1,764	68	Morgan Hill	1,145	114
Hayward	4,145	20	Los Gatos	1,726	69	Daly City	1,144	115
Oroville	4,141	21	Merced	1,689	70	Portola Valley	1,143	116
Riverside	4,133	22	Pleasant Hill	1,647	71	Santa Paula	1,143	116
Auburn	3,877	23	Lincoln	1,646	72	Upland	1,139	117
Milpitas	3,743	24	Moreno Valley	1,638	73	Loomis	1,136	118
Pleasanton	3,649	25	Rancho Mirage	1,613	74	Newport Beach	1,133	119
Fairfield	3,460	26	San Luis Obispo	1,613	74	Ventura	1,130	120
St. Helena	3,318	27	Burbank	1,582	75	Pomona	1,128	121
San Rafael	3,163	28	Petaluma	1,577	76	Rialto	1,094	122
Mountain View	3,144	29	Dublin	1,542	77	Mill Valley	1,082	123
Santa Barbara	3,092	30	San Ramon	1,542	77	Ojai	1,075	124
West Sacramento	3,081	31	Redlands	1,522	78	San Anselmo	1,072	125
Sonoma	3,066	32	Pittsburg	1,507	79	Kingsburg	1,067	126
Chino	3,055	33	Los Altos	1,503	80	Santa Clarita	1,065	127
Irvine	3,010	34	Vallejo	1,474	81	Manteca	1,061	128
Oakdale	2,981	35	Corona	1,453	82	Lakewood	1,049	129
Paso Robles	2,942	36	Cloverdale	1,443	83	Union City	1,029	130
San Bernardino	2,918	37	Lodi	1,426	84	Gonzales	1,022	131
Hanford	2,882	38	Roseville	1,421	85	San Mateo	1,018	132
Berkeley	2,821	39	San Leandro	1,419	86	Laguna Niguel	1,010	133
Chula Vista	2,773	40	City of Industry	1,410	87	Delano	998	134
Santa Cruz	2,717	41	Watsonville	1,407	88	Carson	996	135
Palm Desert	2,685	42	Saratoga	1,402	89	Beaumont	993	136
Sebastopol	2,642	43	Carlsbad	1,382	90	Brentwood	985	137
Temecula	2,623	44	Santa Maria	1,382	91	Santa Monica	941	138
Santee	2,602	45	Seal Beach	1,376	92	Concord	904	139
Palm Springs	2,588	46	Ukiah	1,374	93	Wasco	897	140
Palmdale	2,578	47	Madera	1,365	94	Westlake Village	893	141
Simi Valley	2,455	48	Los Altos Hills	1,354	95	Lafayette	890	142
Poway	2,365	49	Pacifica	1,349	96	Calistoga	878	143

Appendix B: Ranking of Cities by Solar Capacity (continued)

City	kW Solar	State Rank
Nevada City	866	144
Pasadena	865	145
Glendora	862	146
McFarland	861	147
Yorba Linda	861	147
Tulare	847	148
Vista	839	149
Perris	833	150
Porterville	833	150
Newark	820	151
Tracy	820	151
Fontana	816	152
Oceanside	812	153
Santa Clara	812	153
Atherton	794	154
Martinez	788	155
Woodside	784	156
Westminster	779	157
Moorpark	743	158
Red Bluff	741	159
Mission Viejo	734	160
Goleta	731	161
Salinas	728	162
Commerce	710	163
Arroyo Grande	706	164
Malibu	704	165
Dinuba	703	166
Oxnard	700	167
South Gate	694	168
San Clemente	692	169
San Carlos	680	170
Lindsay	667	171
Covina	649	172
Willits	647	173
Reedley	643	174
Huntington Beach	633	175
Encinitas	628	176
Hemet	628	176
Modesto	623	177
Redding	618	178
Anderson	608	179
Campbell	605	180
Taft	604	181
Hughson	596	182
Tiburon	588	183
Sonora	584	184
Orinda	579	185
Brea	572	186
Corte Madera	567	187

City	kW Solar	State Rank
Cathedral City	544	188
Hawthorne	543	189
Winters	542	190
El Segundo	535	191
Claremont	534	192
Burlingame	528	193
El Cerrito	513	194
La Canada-Flintridge	507	195
La Mesa	499	196
Carmel-by-the-Sea	484	197
Fairfax	484	197
Atascadero	478	198
La Verne	477	199
Anaheim	474	200
Rancho Cucamonga	474	200
Sanger	469	201
Downey	463	202
Elk Grove	457	203
Exeter	455	204
Fullerton	450	205
Whittier	449	206
San Gabriel	436	207
Agoura Hills	433	208
Culver City	431	209
Fountain Valley	427	210
Torrance	419	211
Arcata	416	212
Bishop	416	212
Lemoore	413	213
Cerritos	401	214
Larkspur	401	214
Loma Linda	401	214
Buena Park	397	215
South San Francisco	382	216
Tustin	377	217
Rosemead	374	218
Hillsborough	366	219
Manhattan Beach	363	220
San Pablo	362	221
Escalon	352	222
Dixon	351	223
Monterey	348	224
Lancaster	345	225
Scotts Valley	327	226
Arcadia	322	227
Monrovia	315	228
Ridgecrest	313	229
Rancho Palos Verdes	312	230
Atwater	311	231

City	kW Solar	State Rank
Coronado	309	232
Calabasas	308	233
Hollister	300	234
Yucaipa	296	235
Menifee	293	236
Rancho Santa Margarita	292	237
Colton	291	238
Chino Hills	284	239
Colusa	278	240
Moraga	278	240
Citrus Heights	273	241
Plymouth	269	242
Chowchilla	266	243
Cotati	265	244
Angels Camp	261	245
Half Moon Bay	260	246
Jackson	257	247
Paradise	257	247
Alhambra	250	248
Colfax	248	249
Belmont	238	250
Desert Hot Springs	238	250
Compton	227	251
Indian Wells	227	251
Montebello	227	251
Del Mar	224	252
Piedmont	222	253
Lake Elsinore	221	254
Eureka	218	255
South Pasadena	216	256
Marysville	215	257
Belvedere	214	258
San Juan Capistrano	211	259
Montclair	206	260
Lake Forest	204	261
Beverly Hills	201	262
Laguna Beach	199	263
Yountville	196	264
Folsom	195	265
Sausalito	194	266
Placencia	186	267
Fort Bragg	183	268
Walnut	183	268
Wildomar	182	269
Orland	179	270
Fillmore	176	271
Laguna Hills	176	271
Albany	174	272
Norco	174	272

Appendix B: Ranking of Cities by Solar Capacity (continued)

City	kW Solar	State Rank
Oakley	174	272
Clayton	171	273
Suisun City	171	273
Canyon Lake	167	274
Benicia	163	275
Hesperia	163	275
Selma	163	275
Sutter Creek	161	276
Alameda	158	277
Monte Sereno	157	278
Redondo Beach	157	278
Highland	156	279
Los Alamitos	151	280
Solana Beach	149	281
La Puente	146	282
Ross	145	283
Yucca Valley	141	284
Live Oak	138	285
La Mirada	136	287
Twentynine Palms	136	286
Hermosa Beach	132	289
Ripon	131	290
Ione	130	291
Villa Park	130	291
Cypress	129	292
Carpinteria	123	293
Foster City	122	294
San Jacinto	122	294
Galt	121	295
Solvang	121	295
La Habra Heights	120	296
Aliso Viejo	115	297
Corning	114	298
San Marino	114	298
Garden Grove	111	299
Pinole	111	299
Lompoc	109	300
Woodlake	108	301
Brisbane	106	302
Fowler	104	303
Sierra Madre	104	303
Palos Verdes Estates	102	304
Tehachapi	99	305
Millbrae	98	306
Hercules	96	307
Seaside	96	307
Morro Bay	93	308
East Palo Alto	92	309
Emeryville	91	310

City	kW Solar	State Rank
San Dimas	90	311
Turlock	88	312
Big Bear Lake	87	313
Diamond Bar	85	314
Dana Point	84	315
Rolling Hills Estates	82	316
Capitola	81	317
Newman	79	318
Riverbank	79	318
San Juan Bautista	79	318
Lemon Grove	76	319
Barstow	75	320
West Covina	75	320
Livingston	74	321
Los Banos	69	322
Monterey Park	62	323
Wheatland	62	323
Grover Beach	61	324
San Bruno	58	325
Point Arena	57	326
Willows	57	326
Shafter	56	327
Kerman	55	328
Lathrop	55	328
Huron	54	329
Lomita	54	329
Buellton	53	330
Trinidad	53	330
Pacific Grove	52	331
Marina	51	332
Imperial Beach	50	333
West Hollywood	49	334
Gardena	47	335
Inglewood	47	335
Guadalupe	46	336
Port Hueneme	45	337
Duarte	43	338
El Monte	42	339
Bradbury	41	340
California City	41	340
Coalinga	41	340
Firebaugh	40	341
Arvin	39	342
Bellflower	37	343
National City	37	343
Farmersville	36	344
Hidden Hills	36	344
Avalon	34	345
Mendota	34	345

City	kW Solar	State Rank
Norwalk	34	345
Glendale	33	346
Ceres	32	347
Gridley	31	348
Pismo Beach	31	348
San Fernando	30	349
Temple City	30	349
Laguna Woods	28	350
Gustine	27	351
Lawndale	27	351
La Palma	25	352
Avenal	24	353
Corcoran	24	353
Dos Palos	24	353
Patterson	24	353
Huntington Park	23	354
South El Monte	23	354
Greenfield	22	355
Azusa	21	356
Adelanto	20	357
Fortuna	20	357
Williams	20	357
Paramount	19	358
Banning	17	359
Needles	16	360
Blue Lake	15	361
Cudahy	15	361
Calimesa	14	362
Grand Terrace	14	362
Mammoth Lakes	14	362
Pico Rivera	14	362
Rio Vista	13	363
Signal Hill	13	363
Stanton	13	363
Baldwin Park	12	364
King City	12	364
Shasta Lake	12	364
Ferndale	10	365
San Joaquin	9	366
Biggs	8	367
Colma	8	367
Parlier	8	367
Waterford	8	367
Artesia	6	368
Rolling Hills	6	368
Maricopa	5	369
Irwindale	4	370
Soledad	4	370
Truckee	4	370

Appendix B: Ranking of Cities by Solar Capacity (continued)

City	kW Solar	State Rank
Amador City	3	371
Indio	3	371
Del Rey Oaks	2	372
La Quinta	2	372
Rio Dell	2	372
Santa Fe Springs	2	372
Tehama	2	372
Alturas	0	
Bell	0	
Bell Gardens	0	
Brawley	0	
Calexico	0	

City	kW Solar	State Rank
Coachella	0	
Crescent City	0	
Dorris	0	
Dunsmuir	0	
El Centro	0	
Etna	0	
Fort Jones	0	
Hawaiian Gardens	0	
Holtville	0	
Isleton	0	
Loyalton	0	
Lynwood	0	

City	kW Solar	State Rank
Montague	0	
Mount Shasta	0	
Orange Cove	0	
Portola	0	
Sand City	0	
South Lake Tahoe	0	
Susanville	0	
Tulelake	0	
Vernon	0	
Weed	0	
Westmorland	0	
Yreka	0	

Appendix C: Alphabetical Listing of Cities

The chart below contains the data for the total number and total capacity of grid-tied solar systems installed in all of California's incorporated cities in alphabetical order.

City	Solar Roofs	kW Solar
Adelanto	2	20
Agoura Hills	65	433
Alameda	25	158
Albany	61	174
Alhambra	19	250
Aliso Viejo	13	115
Alturas	0	0
Amador City	1	3
American Canyon	22	1,211
Anaheim	81	474
Anderson	46	608
Angels Camp	34	261
Antioch	172	1,188
Apple Valley	136	1,937
Arcadia	56	322
Arcata	169	416
Arroyo Grande	160	706
Artesia	1	6
Arvin	6	39
Atascadero	109	478
Atherton	81	794
Atwater	41	311
Auburn	230	3,877
Avalon	14	34
Avenal	2	24
Azusa	3	21
Bakersfield	751	7,341
Baldwin Park	2	12
Banning	5	17
Barstow	21	75
Beaumont	20	993
Bell	0	0
Bell Gardens	0	0
Bellflower	10	37
Belmont	69	238
Belvedere	49	214
Benicia	47	163
Berkeley	648	2,821
Beverly Hills	29	201
Big Bear Lake	25	87
Biggs	2	8
Bishop	42	416
Blue Lake	6	15
Blythe	16	2,139
Bradbury	5	41
Brawley	0	0
Brea	24	572
Brentwood	113	985
Brisbane	18	106

City	Solar Roofs	kW Solar
Buellton	7	53
Buena Park	34	397
Burbank	40	1,582
Burlingame	70	528
Calabasas	42	308
Calxico	0	0
California City	12	41
Calimesa	3	14
Calipatria	0	0
Calistoga	99	878
Camarillo	199	2,047
Campbell	102	605
Canyon Lake	30	167
Capitola	25	81
Carlsbad	145	1,382
Carmel-by-the-Sea	73	484
Carpinteria	36	123
Carson	7	996
Cathedral City	98	544
Ceres	3	32
Cerritos	30	401
Chico	354	6,417
Chino	55	3,055
Chino Hills	51	284
Chowchilla	24	266
Chula Vista	111	2,773
Citrus Heights	67	273
City of Industry	6	1,410
Claremont	199	534
Clayton	36	171
Clearlake	32	1,925
Cloverdale	83	1,443
Clovis	733	5,284
Coachella	0	0
Coalinga	10	41
Colfax	26	248
Colma	3	8
Colton	21	291
Colusa	7	278
Commerce	4	710
Compton	19	227
Concord	120	904
Corcoran	4	24
Corning	23	114
Corona	164	1,453
Coronado	51	309
Corte Madera	59	567
Costa Mesa	86	1,268
Cotati	26	265

City	Solar Roofs	kW Solar
Covina	33	649
Crescent City	0	0
Cudahy	3	15
Culver City	58	431
Cupertino	197	1,179
Cypress	29	129
Daly City	14	1,144
Dana Point	20	84
Danville	201	1,235
Davis	457	1,293
Del Mar	49	224
Del Rey Oaks	1	2
Delano	1	998
Desert Hot Springs	42	238
Diamond Bar	18	85
Dinuba	27	703
Dixon	39	351
Dorris	0	0
Dos Palos	3	24
Downey	21	463
Duarte	11	43
Dublin	57	1,542
Dunsmuir	0	0
East Palo Alto	40	92
El Cajon	224	1,949
El Centro	0	0
El Cerrito	85	513
El Monte	8	42
El Segundo	18	535
Elk Grove	130	457
Emeryville	7	91
Encinitas	137	628
Escalon	44	352
Escondido	300	1,948
Etna	0	0
Eureka	60	218
Exeter	67	455
Fairfax	70	484
Fairfield	68	3,460
Farmersville	2	36
Ferndale	3	10
Fillmore	25	176
Firebaugh	3	40
Folsom	42	195
Fontana	44	816
Fort Bragg	51	183
Fort Jones	0	0
Fortuna	9	20
Foster City	33	122

Appendix C: Alphabetical Listing of Cities (continued)

City	Solar Roofs	kW Solar
Fountain Valley	47	427
Fowler	13	104
Fremont	209	2,051
Fresno	1,028	14,538
Fullerton	54	450
Galt	21	121
Garden Grove	44	111
Gardena	10	47
Gilroy	129	1,274
Glendale	7	33
Glendora	35	862
Goleta	59	731
Gonzales	4	1,022
Grand Terrace	4	14
Grass Valley	300	1,287
Greenfield	4	22
Gridley	8	31
Grover Beach	15	61
Guadalupe	1	46
Gustine	6	27
Half Moon Bay	54	260
Hanford	80	2,882
Hawaiian Gardens	0	0
Hawthorne	13	543
Hayward	100	4,145
Healdsburg	146	2,141
Hemet	108	628
Hercules	24	96
Hermosa Beach	34	132
Hesperia	42	163
Hidden Hills	3	36
Highland	27	156
Hillsborough	55	366
Hollister	53	300
Holtville	0	0
Hughson	6	596
Huntington Beach	168	633
Huntington Park	3	23
Huron	1	54
Imperial Beach	21	50
Indian Wells	28	227
Indio	1	3
Inglewood	8	47
Ione	23	130
Irvine	112	3,010
Irwindale	1	4
Isleton	0	0
Jackson	23	257
Kerman	10	55

City	Solar Roofs	kW Solar
King City	3	12
Kingsburg	34	1,067
La Canada-Flintridge	99	507
La Habra	12	1,184
La Habra Heights	20	120
La Mesa	129	499
La Mirada	18	136
La Palma	8	25
La Puente	4	146
La Quinta	1	2
La Verne	32	477
Lafayette	161	890
Laguna Beach	42	199
Laguna Hills	35	176
Laguna Niguel	41	1,010
Laguna Woods	6	28
Lake Elsinore	45	221
Lake Forest	45	204
Lakeport	96	2,186
Lakewood	50	1,049
Lancaster	68	345
Larkspur	50	401
Lathrop	14	55
Lawndale	4	27
Lemon Grove	19	76
Lemoore	69	413
Lincoln	257	1,646
Lindsay	36	667
Live Oak	50	138
Livermore	215	4,597
Livingston	11	74
Lodi	60	1,426
Loma Linda	23	401
Lomita	12	54
Lompoc	51	109
Long Beach	306	2,228
Loomis	92	1,136
Los Alamitos	41	151
Los Altos	312	1,503
Los Altos Hills	213	1,354
Los Angeles	1,388	13,000
Los Banos	15	69
Los Gatos	343	1,726
Loyalton	0	0
Lynwood	0	0
Madera	193	1,365
Malibu	95	704
Mammoth Lakes	6	14
Manhattan Beach	86	363

City	Solar Roofs	kW Solar
Manteca	85	1,061
Maricopa	1	5
Marina	8	51
Martinez	89	788
Marysville	44	215
Maywood	0	0
McFarland	5	861
Mendota	2	34
Menifee	58	293
Menlo Park	269	1,233
Merced	82	1,689
Mill Valley	270	1,082
Millbrae	26	98
Milpitas	64	3,743
Mission Viejo	121	734
Modesto	32	623
Monrovia	28	315
Montague	0	0
Montclair	7	206
Monte Sereno	24	157
Montebello	7	227
Monterey	72	348
Monterey Park	17	62
Moorpark	53	743
Moraga	63	278
Moreno Valley	85	1,638
Morgan Hill	124	1,145
Morro Bay	31	93
Mount Shasta	0	0
Mountain View	304	3,144
Murrieta	165	2,296
Napa	327	5,947
National City	8	37
Needles	3	16
Nevada City	247	866
Newark	34	820
Newman	8	79
Newport Beach	76	1,133
Norco	32	174
Norwalk	7	34
Novato	228	1,153
Oakdale	126	2,981
Oakland	643	6,972
Oakley	34	174
Oceanside	112	812
Ojai	236	1,075
Ontario	41	5,143
Orange	96	1,253
Orange Cove	0	0

Appendix C: Alphabetical Listing

City	Solar Roofs	kW Solar
Orinda	123	579
Orland	31	179
Oroville	136	4,141
Oxnard	44	700
Pacific Grove	19	52
Pacifica	95	1,349
Palm Desert	286	2,685
Palm Springs	249	2,588
Palmdale	72	2,578
Palo Alto	302	1,259
Palos Verdes Estates	22	102
Paradise	46	257
Paramount	1	19
Parlier	2	8
Pasadena	136	865
Paso Robles	190	2,942
Patterson	4	24
Perris	48	833
Petaluma	189	1,577
Pico Rivera	4	14
Piedmont	61	222
Pinole	28	111
Pismo Beach	13	31
Pittsburg	28	1,507
Placentia	37	186
Placerville	140	1,176
Pleasant Hill	75	1,647
Pleasanton	250	3,649
Plymouth	23	269
Point Arena	14	57
Pomona	28	1,128
Port Hueneme	4	45
Porterville	50	833
Portola	0	0
Portola Valley	174	1,143
Poway	187	2,365
Rancho Cordova	224	1,887
Rancho Cucamonga	53	474
Rancho Mirage	146	1,613
Rancho Palos Verdes	70	312
Rancho Santa Margarita	22	292
Red Bluff	61	741
Redding	130	618
Redlands	119	1,522
Redondo Beach	54	157
Redwood City	247	1,175
Reedley	81	643
Rialto	24	1,094
Richmond	144	5,076

City	Solar Roofs	kW Solar
Ridgecrest	66	313
Rio Dell	1	2
Rio Vista	3	13
Ripon	19	131
Riverbank	12	79
Riverside	175	4,133
Rocklin	252	2,317
Rohnert Park	48	1,773
Rolling Hills	1	6
Rolling Hills Estates	18	82
Rosemead	7	374
Roseville	607	1,421
Ross	24	145
Sacramento	692	5,560
Salinas	79	728
San Anselmo	133	1,072
San Bernardino	67	2,918
San Bruno	21	58
San Carlos	144	680
San Clemente	64	692
San Diego	2,262	19,427
San Dimas	19	90
San Fernando	6	30
San Francisco	1,350	7,050
San Gabriel	25	436
San Jacinto	17	122
San Joaquin	2	9
San Jose	1,333	15,450
San Juan Bautista	10	79
San Juan Capistrano	45	211
San Leandro	84	1,419
San Luis Obispo	233	1,613
San Marcos	278	1,188
San Marino	16	114
San Mateo	167	1,018
San Pablo	9	362
San Rafael	340	3,163
San Ramon	128	1,542
Sand City	0	0
Sanger	74	469
Santa Ana	122	1,802
Santa Barbara	414	3,092
Santa Clara	37	812
Santa Clarita	158	1,065
Santa Cruz	543	2,717
Santa Fe Springs	1	2
Santa Maria	63	1,382
Santa Monica	184	941
Santa Paula	21	1,143

City	Solar Roofs	kW Solar
Santa Rosa	725	8,954
Santee	55	2,602
Saratoga	219	1,402
Sausalito	52	194
Scotts Valley	62	327
Seal Beach	41	1,376
Seaside	15	96
Sebastopol	506	2,642
Selma	29	163
Shafter	12	56
Shasta Lake	2	12
Sierra Madre	27	104
Signal Hill	4	13
Simi Valley	163	2,455
Solana Beach	40	149
Soledad	2	4
Solvang	29	121
Sonoma	253	3,066
Sonora	101	584
South El Monte	2	23
South Gate	4	694
South Lake Tahoe	0	0
South Pasadena	36	216
South San Francisco	34	382
St. Helena	99	3,318
Stanton	3	13
Stockton	200	4,602
Suisun City	21	171
Sunnyvale	327	4,147
Susanville	0	0
Sutter Creek	24	161
Taft	9	604
Tehachapi	34	99
Tehama	1	2
Temecula	163	2,623
Temple City	9	30
Thousand Oaks	155	1,149
Tiburon	104	588
Torrance	47	419
Tracy	134	820
Trinidad	20	53
Truckee	2	4
Tulare	56	847
Tulelake	0	0
Turlock	20	88
Tustin	36	377
Twentynine Palms	32	136
Ukiah	61	1,374
Union City	26	1,029

Appendix C: Alphabetical Listing

City	Solar Roofs	kW Solar
Upland	86	1,139
Vacaville	248	5,304
Vallejo	90	1,474
Ventura	162	1,130
Vernon	0	0
Victorville	76	1,889
Villa Park	22	130
Visalia	290	4,155
Vista	153	839
Walnut	27	183
Walnut Creek	231	1,764
Wasco	10	897
Waterford	1	8
Watsonville	474	1,407

City	Solar Roofs	kW Solar
Weed	0	0
West Covina	21	75
West Hollywood	14	49
West Sacramento	66	3,081
Westlake Village	62	893
Westminster	26	779
Westmorland	0	0
Wheatland	14	62
Whittier	48	449
Wildomar	33	182
Williams	4	20
Willits	68	647
Willows	11	57
Windsor	80	1,341

City	Solar Roofs	kW Solar
Winters	61	542
Woodlake	19	108
Woodland	173	2,308
Woodside	100	784
Yorba Linda	62	861
Yountville	6	196
Yreka	0	0
Yuba City	110	2,142
Yucaipa	55	296
Yucca Valley	28	141

Notes

1 Data for the installations up through 1999 came from municipal utility programs and the California Energy Commission's Emerging Renewables Program. The other programs around the state were not yet in operation.

2 Analysis of applications submitted to the California Solar Initiative show that while 92% of the total number of applications came from the residential sector, businesses and non-profit entities account for 75% of the installed capacity. California Public Utilities Commission, *Staff Progress Report on the California Solar Initiative*, April 2009.

3 Data for this report comes from a compilation of databases from rebate programs around the state. See the "About the Data" section for details.

4 In calculating these two sets of Top 10 cities, the author used 2007 U.S. Census data for population and 2000 U.S. Census data for number of households in each incorporated city.

5 Ibid.

6 <http://www1.eere.energy.gov/consumer/tips/appliances.html>.

7 California Energy Commission fact sheet: http://www.energy.ca.gov/appliances/tv_faqs.html

8 See Note 1.

9 City of San Diego Mayor's Office, *Dick Murphy's 10 Goals*. 7 March 2002, <http://genesis.sannet.gov/infospc/templates/mayor/goal9.jsp>.

10 San Jose Silicon Valley Chamber of Commerce, *Business Energy Information Center*. 7 March 2002 http://www.sjchamber.com/NEWS/FEATURE/energy_crisis.htm.

11 Electric Power Research Institute, prepared for the CEC, *California Renewable Technology Market and Benefits Assessment*, November 2001.

12 Kammen, D., Kapadia, K., and Fripp, M., *Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?*, University of California-Berkeley, 2004.

13 This is a simple calculation of multiplying seven (the EPRI figure for the number of jobs created for every megawatt of solar photovoltaic systems installed) by 3,000 megawatts (the Million Solar Roofs goal).

14 The California Air Resources Board estimates that for the average megawatt of electricity generated in California, .21 lbs/megawatt-hour (MWh) is emitted. If you multiply one MW solar x 8760 hours

in the year x 18% capacity factor (how often a typical California solar system is generating electricity), you get 1,577 MWh/year of solar electricity x .21 lbs/MWh nitrogen oxide (NOx) from grid electricity = 331 lbs/year.

15 A 2007 Itron study, *CPUC Self Generation Incentive Program Sixth Year Impact Evaluation Final Report*, estimates that for every megawatt-hour of electricity generated by a solar photovoltaic system in California, 0.60 tons of CO2 was reduced in 2006. (See page 5-42 at http://energycenter.org/uploads/SGIP_M&E_Sixth_Year_Impact_Evaluation_Final_Report_August_30_2007.pdf). If one applies this CO2 emission reduction factor to an average solar photovoltaic system operating at 18% capacity factor, the result is 946 tons/MW installed/year or .9 tons/kilowatt installed/year.

16 An average Californian car emits 6 tons CO2/year according to California Air Resources Board figures. So, 0.9 tons/year CO2 from 1 kilowatt of solar divided by 6 = 0.15 cars. Multiply by three for a typical residential solar system of 3 kilowatts and you get 0.5 cars per year. Therefore, two homes = one car.

17 Wisner, R., Barbose, G., and Peterman, C., *Tracking the Sun: The Installed Cost of Photovoltaics in the U.S. from 1998–2007*, Lawrence Berkeley National Laboratory, January 2009.

18 Solar Module Retail Price Index, SolarBuzz, downloaded January 19, 2009 from <http://www.solarbuzz.com/> and Mehta, S., *PV Technology, Production and Cost, 2009 Forecast*, March 2009, <http://www.gtmresearch.com/report/pv-technology-production-and-cost-2009-forecast/>.

19 Algosio, D., Braun, M., and Del Chiaro, B., *Bringing Solar to Scale: California's Opportunity to Create a Thriving, Self-Sustaining Residential Solar Market*, Environment California Research & Policy Center, 2005.

20 For more information about the Million Solar Roofs Initiative visit www.gosolarcalifornia.ca.gov.

21 Title 26 Internal Revenue Code <http://www.dsireusa.org/documents/Incentives/US37Fa.htm>.

22 Data for the installations up through 2006 came from municipal utility programs, California Energy Commission's Emerging Renewables Program and the California Public Utilities Commission's Self-Generation Incentive Program. The other programs were not yet in operation.

23 Data primarily comes from the California Solar Initiative, *Staff Progress Report*, California Public Utilities Commission, April 2009 with additions from municipal utility programs and the California Energy Commission's New Solar Homes Partnership.

24 These grand total numbers come from the combination of all of the solar rebate programs in the state, including those managed by the state's municipal utilities, the investor owned utilities and the state's two energy agencies. It does not include solar power systems that are not connected to the electric grid, nor does it include solar hot water systems. For more details, see the About the Data chapter.

25 Del Chiaro, B., *Rave Reviews for Solar Homes: A Survey of Homeowners in California*, Environment California Research & Policy Center, March 2006.

26 AB 811 (Levine) was passed and signed into law by Governor Schwarzenegger in 2008. For text of the bill, http://www.leginfo.ca.gov/pub/07-08/bill/asm/ab_0801-0850/ab_811_bill_20080721_chaptered.pdf.

27 For more information on the Pay As You Save America program visit <http://www.paysamerica.org/>.

28 http://www.co.marin.ca.us/depts/CD/main/comdev/advance/Sustainability/Energy/solar/solar_index.cfm

29 For more information about the Department of Energy's Solar America Cities program visit <http://www.solaramericacities.energy.gov/Home.aspx>.

30 For a complete listing of all twenty-five Solar America Cities visit <http://www.solaramericacities.energy.gov/Cities.aspx>.

31 For more information about the Recovery Act announcement visit http://www1.eere.energy.gov/solar/financial_opps_detail.html?sol_id=259.

32 See CPUC bill analysis for AB

560 (Skinner) at [ftp://ftp.cpuc.ca.gov/OGA/2010%20position%20letters/CPUC%20ANALYSIS%20-%20AB%20560%20\(AS%20AMENDED%20APRIL%2016\)%20-%20090513%20\(ASM%20FLOOR\).pdf](ftp://ftp.cpuc.ca.gov/OGA/2010%20position%20letters/CPUC%20ANALYSIS%20-%20AB%20560%20(AS%20AMENDED%20APRIL%2016)%20-%20090513%20(ASM%20FLOOR).pdf).

33 For more information about California's feed-in-tariff program, see CPUC resolution E-4137 <http://docs.cpuc.ca.gov/Published/Agenda/resolution/78711.htm>.

34 For more information about the Emerging Renewables Program at the California Energy Commission visit http://www.energy.ca.gov/renewables/emerging_renewables/.

35 For more information about the Self Generation Incentive Program visit <http://www.cpuc.ca.gov/PUC/energy/DistGen/sgip/>.

36 For more information about the California Solar Initiative visit www.gosolarcalifornia.ca.gov.

37 California Public Utilities Commission, *California Solar Initiative Staff Progress Report*, January 2009, Table 4.

38 Phone conversation with staff of the California Center for Sustainable Energy, February, 2009.

39 For more information about the New Solar Homes Partnership visit <http://www.gosolarcalifornia.ca.gov/nsbp/index.html>.

40 California Energy Commission, excel file *POU Report Summary, Jan-Mar 2008*.