



# 1 Million Solar Roofs

## A California Clean Energy Milestone

In 2006, California made international news when Governor Arnold Schwarzenegger signed the Million Solar Roofs Initiative (SB 1-Murray), setting a goal of building a million solar energy systems on homes, schools, farms and businesses throughout the state. At the time, this was seen as a bold and even remote goal but the combination of consistent government policy, committed businesses, and willing consumers achieved not only the million roof mark but created one of the most stable and successful clean energy markets in the world.

Today, in 2019, California celebrates hitting the 1 million solar roof milestone at a time when the future of our state's energy system and climate strategies are more critical than ever. The backdrop to today's victory creates even more urgency to continue to grow the rooftop solar market and to add energy storage, or batteries, to the mix to ensure continued environmental benefits, grid reliability and consumer savings in the years ahead.

The million solar roof mark is only the beginning. The declining cost of solar, advanced experience from installers, and huge leaps forward in battery technology mean that solar systems can continue to provide benefits to the state power grid while creating tangible savings for consumers. Solar and battery systems can transform our energy and climate efforts in the years ahead if we make a new commitment to harnessing technology and empowering consumers.

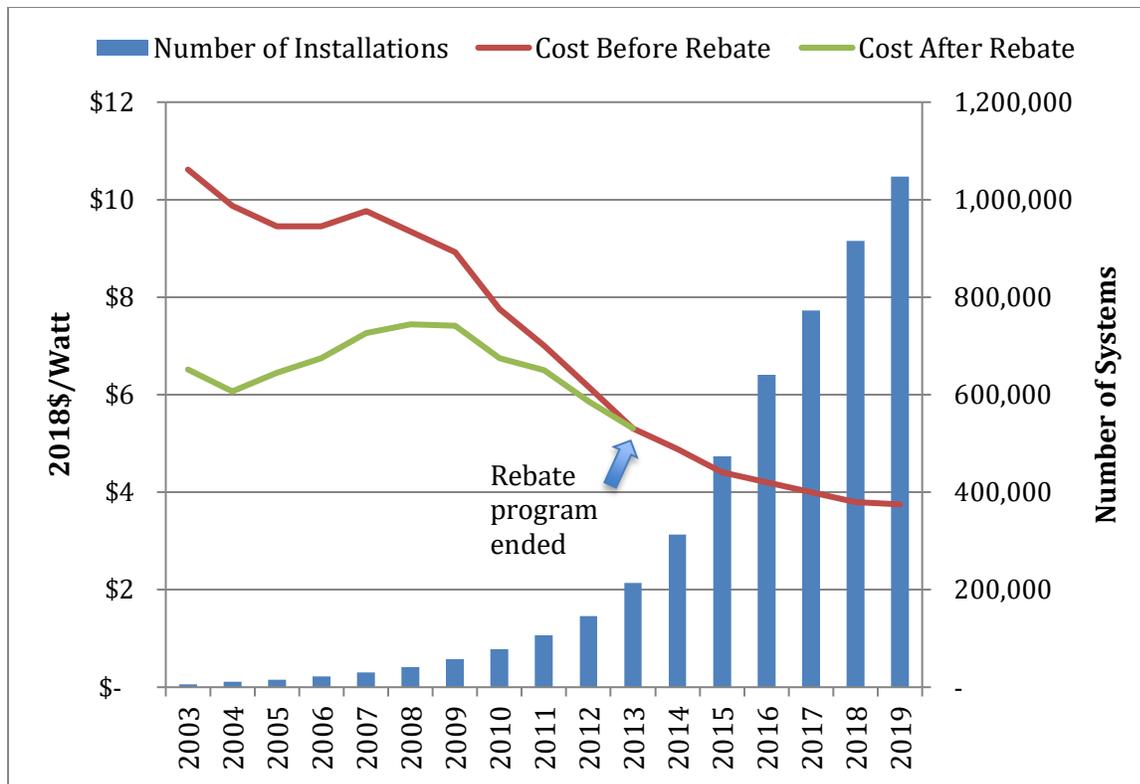
### **Growing Energy Production & Pollution Reduction**

- Since 2006 customer solar systems have *avoided*:
  - 22 million metric tons of CO<sub>2</sub> (the equivalent of getting 4 million cars off the road for a year)
  - 16,000 tons of smog pollutants (equivalent to the annual pollution of 3.8 million cars)
  - 360 trillion BTUs of natural gas (equivalent to annual consumption of 20 large natural gas-fired power plants)
- Today, 1 million solar roofs:
  - Create over 10 billion kWh of electricity per year, which is equivalent to the output from six large natural gas-fired power plants
  - Avoid 5 million metric tons of CO<sub>2</sub> per year, the equivalent of taking a million cars off the road

- Market stimulation worked
  - Approximately 970,000 of the first million solar systems were on homes and approximately 30,000 were for commercial customers, farms, and government buildings.
  - While the original goal was to build 3 gigawatts (GW) of rooftop solar, the market continued to grow even after the rebate program ended, allowing California to far surpass its goal with nearly 9 GW installed today.
  - Every day, over 350 consumers go solar in California with an increasing number including solar-charged batteries.
  - 6.6% of Californians have their own solar system. This is now growing by nearly 1% per year.

### **Benefitting More Consumers**

- Costs for solar have reached a major turning point.
  - Costs have plunged two-thirds since 2006.
  - Solar pays off within ten years, and much faster for consumers with significant air conditioning needs or an electric vehicle. Solar panels are guaranteed to last at least 20 years and normally last much longer. For the state, customer solar uses private capital to meet clean energy goals and lowers utility costs by reducing strain on the grid.
  - Financing or leasing means that consumers can go solar and save money on their monthly electricity bill without an upfront expense.
- Lower-income homeowners and rural residents are benefitting significantly from adopting solar.
  - In recent years, a growing share of solar has been installed for lower-income households, which spend more of their income on electric bills than middle- and upper-income households.
  - Nearly 50 percent of California's rooftop solar market is in neighborhoods at or below the median household income of \$70,000 a year.



### Supporting Good Jobs & Small Businesses

- Rooftop solar energy and energy storage is a job-intensive clean technology.
  - More than 77,000 Californians work year-round building local solar and storage.
  - The solar and storage industry employs more people than the state's five largest utilities combined.
  - A large majority of solar and storage employers are local small businesses. Nearly half employ fewer than 10 people.
  - Each year, California workers install more than 3 million solar panels on rooftops, parking lots, and farms.
  - Every day, California workers install 3.3 MW of rooftop solar. Sixty jobs are created for every MW installed.
  
- Many apartment buildings, businesses and government agencies across the state benefit from distributed solar systems
  - The non-residential solar market has been stronger than originally envisioned in the Million Solar Roofs initiative. Because commercial systems are larger, this caused California to reach its energy capacity goal (3 GW) in 2015, four years ahead of reaching the million solar roofs goal.
  - More than 2,000 schools in California have solar on their roofs or parking structures.
  - More than 500 low-income apartment buildings have solar.

## Behind the 1 Million

### Top 10 Large, Medium, and Small Cities

Large Cities	# of Systems	Medium Cities	# of Systems	Small Cities	# of Systems
San Diego	45,324	Clovis	10,259	Chico	6,158
Los Angeles	34,901	Escondido	9,959	Rocklin	5,903
Bakersfield	28,145	Chula Vista	8,998	Brentwood	5,548
Fresno	22,992	Corona	8,246	Vacaville	5,533
San Jose	22,614	El Cajon	8,220	Manteca	5,083
Sacramento	10,161	Murrieta	7,868	San Marcos	4,957
Stockton	9,857	Lancaster	6,681	Lake Elsinore	4,676
San Francisco	8,272	Fontana	6,288	Vista	4,490
Oakland	5,883	Visalia	6,280	Tracy	4,369
Long Beach	5,470	Temecula	6,195	Menifee	4,157

- Unexpected places:
  - Republican Assembly and Senate districts have twice as much rooftop solar capacity installed on average than Democratic districts
- Overperformers:
  - Among large cities, Bakersfield has the largest number of systems installed per capita at 1 system for every 13 residents, nearly twice as many as Fresno, the city with the second highest amount per capita
  - Among medium-sized cities, Clovis has the largest number of systems per capita at 1 system for every 10 residents
  - Among small cities, Rocklin has the most systems per capita at 1 system for every 10 residents

## Rooftop Solar in the Five Largest Electric Utilities

While PG&E has the most rooftop systems and the largest amount of capacity installed among the five largest utilities, SDG&E has the most solar per account. LADWP has a much lower share of solar systems per account than the other large utilities.

Utility	Number of Solar Systems	Total Solar Capacity	Number of Customer Accounts (millions)	Percentage of Accounts with Solar
PG&E	410,916	3,724,244	5.4	7.6%
SCE	304,701	2,487,685	5.0	6.1%
SDG&E	149,779	1,076,624	1.4	10.7%
LADWP	34,410	267,132	1.5	2.3%
SMUD	22,909	195,763	0.6	3.8%

### **Bakersfield has 3x the number of people with solar as San Francisco, with half the population.**

Bakersfield solar roofs: 28,145; San Francisco solar roofs: 8,272

Bakersfield population: 387,874; San Francisco population: 884,363

### **Fresno has nearly 4x the solar roofs as Oakland, with the same population**

Fresno solar roofs: 22,992; Oakland solar roofs: 5,883

Fresno population: 494,665; Oakland population: 425,195

### **Clovis has over 3x the number of solar roofs as Berkeley, with the same population**

Clovis solar roofs: 10,259; Berkeley solar roofs: 2,701

Clovis population: 109,691; Berkeley population: 122,324

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## **What's Next: 1 Million Solar Batteries** **Solar + Storage Can Transform Our State**

Today, solar and battery technologies are transforming the future of energy and creating new opportunities for California to reach 100% clean, renewable energy. The ability to store energy where it will be needed and ready for use when it is needed is a simple but revolutionary step forward. With today's batteries, homeowners and businesses can store solar energy for use after sundown or during a blackout. This smooths out prices, takes pressure off the electric grid, and gives consumers a degree of independence unheard of a few years ago.

It's time for a new goal: 1 million solar batteries across California. This next step forward in clean solar technology will transform our state and our energy system even more than the first million.

### **Breakthroughs in battery technology are transforming clean energy**

- Battery companies have introduced dozens of products for residential and commercial customers
  - Bundled with solar panels, batteries store power to use throughout the day and evening.
  - Today's home batteries can capture enough solar energy to power a home for a whole day.
  - Battery costs will decline as adoption increases and technology improves.

### **Building a stronger, more resilient energy system**

- Solar batteries are the best defense against an unreliable grid
  - Solar batteries give consumers more control and self-reliance during the uncertain conditions that will last for years.
  - With batteries, homeowners, businesses and schools can withstand widespread blackouts in Northern California and smaller but ongoing power shutoffs in Southern California.
  - Solar batteries, with their long-term savings and 100 percent clean energy, are far more beneficial than gas-fueled backup generators.
- Stored energy smooths out the peaks of energy consumption that currently drive costs and infrastructure needs
  - More stored energy takes pressure off of long-distance electric lines and our grid as a whole.
  - The energy system is overbuilt to deal with spikes in energy use. These inefficiencies can be reduced by smoothing out our consumption patterns.

### **Supporting electric vehicles and other climate strategies**

- Solar batteries are critical to California's goal of 100 percent clean, renewable energy. Solar energy stored at the point of use helps to wean us off of natural gas and other non-renewable energy sources.
- Storage and electric vehicles go hand and hand. California has set a goal of 5 million EVs by 2030. The full climate benefit of this change can be reached if most drivers fuel their cars with energy they generate themselves.
- An electric car increases the typical household's electricity consumption by 60-70%. Rooftop solar panels and solar-charged batteries are important insurance against ever-rising electricity costs, helping lock in what it costs to "fill your tank" for 20 years.

## **Seizing the Opportunity**

### **California Can Adopt Policies to Move Solar + Storage Forward**

California did not reach 1 million solar homes by accident. The state enacted policies that created long-term certainty and helped solar technology grow and spread.

Much more must be done. California still allows rooftop solar and storage to be held back from its full potential in ways that would surprise California’s staunchly pro-solar voters. The utilities continue to stifle local energy systems through delays and unreasonable requirements for installing larger systems. They also ignore the benefits of local power and overbuild major infrastructure, which shifts costs to all ratepayers and crowds out the ability to modernize our electric system.

**The policies that California enacted to get us to 1 million solar homes need to be protected.**

Million Solar Roofs Initiative – SB 1 (Murray)	Created the state target and the California Solar Initiative (CSI) incentive program
Net Metering – AB 520 (Skinner)	Expanded a fair policy that is essential to customer solar
Solar Hot Water – AB 1470 (Huffman)	Created the CSI-Thermal program with incentives for solar water heating systems
Energy Storage Incentives – AB 1637 (Low) and SB 700 (Wiener)	Expanded the budget for energy storage incentives in the Self-Generation Incentive Program
Low-Income Rental Incentives – AB 693 (Eggman)	Created the Solar on Multifamily Affordable Housing program
New Home Solar Mandate (California Energy Commission)	Requires that all new homes have solar starting in 2020

**The state can take these actions for the next wave of customer solar and storage:**

- **Set a statewide goal for 1 million solar batteries**
  - Just as we set a goal for 1 million solar roofs, the state should set a goal for one million batteries to be installed with solar or at homes, businesses and farms that already have solar.
- **Fund technical assistance for customers investigating energy storage**
  - The process of contracting for the installation of batteries at schools, nursing homes, emergency shelters, and other non-residential locations can be facilitated by providing customers with independent site analysis and system design.
- **Resume support for schools and public buildings with funding for storage**
  - California has invested in solar on schools and public buildings. Adding storage will allow schools and public services to stay open during blackouts and meet community needs.

- **Restructure utility financial incentives**
  - Utilities have the financial motivation to maintain a system that is heavily dependent on transmission lines. This causes them erect roadblocks to local energy while overbuilding major infrastructure. We need to align their incentives with the goal of creating a decentralized energy system.
  - Annual planning for grid needs should prioritize options to meet objectives with local solutions.
  
- **Maintain net metering**
  - Net metering is the cornerstone of customer solar. Utilities would like to gut the policy but regulators should resist that push.
  - Net metering rates will evolve over time, but the core policy is fair to everyone.
  
- **Remove barriers to solar and storage at commercial buildings and farms**
  - Seeking utility approval to install large solar and storage systems can take months or years and can involve unreasonable costs. The process needs to be streamlined.
  - Utilities should prioritize customer service and adhere to timelines for approving and integrating new systems.