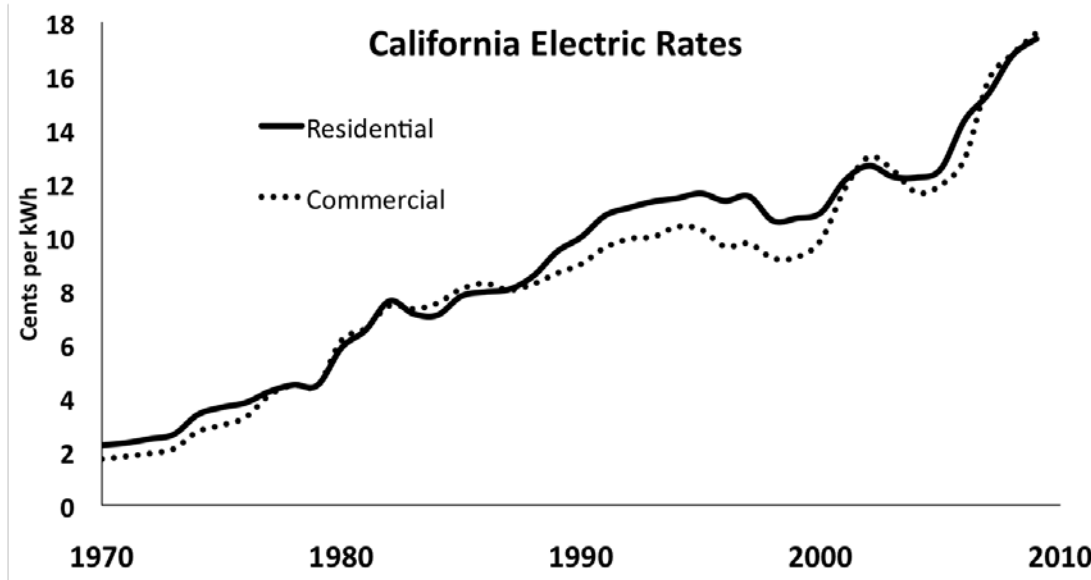


Electricity Rates and Photovoltaic Systems

As shown in Figure 1, electricity rates in California have gone up an average of 5.4% per year for the last 39 years. There is no indication that this increase will not continue; in fact, many industry observers feel that given the continual rise in demand, the aging electricity grid, and unrest in the Middle East, electricity rates will likely continue to rise in the future.



Sources: Energy Information Administration, PG&E

Fig 1. California Electricity Rates, 1970-2010

Residential electricity usage is billed in tiers, with higher usage resulting in a higher rate per kilowatt-hour (kWh). The tiers are shown below.

Tier	Usage	Rate per kWh
Baseline		\$0.12233
2	101-130% of Baseline	\$0.13907
3	131-200% of baseline	\$0.30180
4	201-300% of baseline	\$0.34180
5	Over 300% of baseline	\$0.34180

Table 1. Electricity Billing Tiers for E-1 Rate Schedule

As can be seen, the rate at the highest tier is almost 3 times the baseline rate. When a photovoltaic (PV) system is installed in a home, thereby reducing electricity usage from the grid, the renewable energy replaces the most expensive grid electricity first. This helps bring down the electric bill fast.

Most homeowners are on a utility rate schedule, or billing plan, called E-1. This plan charges users for usage without regard to time of day or day of the week. California law (Assembly Bill AB 58) requires utilities to allow homeowners to sign up for Net Metering, if they install a renewable energy system. Under Net Metering, the power generated locally is used to power residential loads; any excess load that the PV system cannot supply is powered from the grid; and any excess power that the PV system generates is sent back to the grid to be used in other locations. In this latter case the electric meter actually spins backwards (which PV system purchasers find very satisfying!), effectively building up a credit against future consumption. Once a year, on the anniversary of the installation of the PV system, the meter is read by the utility, and the homeowner is presented with a “true-up” bill.

A PV system will generally make good economic sense if a homeowner's monthly electric bill is \$100 or more. The utility is required by law to buy the power from the homeowner; however, the utility is not required to pay the homeowner if the net usage is less than zero. In other words, historically, PG&E will not send the homeowner a check; they will just offset PV power against power consumed (AB920 may change this in the future; stay tuned). Also, PG&E may charge a minimum meter fee or monthly fee, even if there is no net electricity usage. This is because you are still connected to their grid and you can draw power at any time, such as at night when there is no sunlight on your PV array.

California was the first state to enact a Net Metering law, in 1995. Currently 42 states have Net Metering laws on the books. Japan, Germany, and Switzerland have Net Metering laws.

Another residential tariff called Time of Use (TOU) Metering, or rate schedule E-6, is generally very beneficial if loads in the household are low during the day. Under TOU, the homeowner pays a much higher rate during the weekdays in the summer months, and a lower rate at other times. The TOU rates (with an approximation of surcharges, depending on the size of your bill) are as follows:

Time of Day	Summer May 1 to Oct 31	Winter Nov 1 to Apr 30
Peak Time	1-7 PM, Mon-Fri \$ 0.28229	N/A
Partial Peak	10 AM-1 PM Mon-Fri 7 PM-9 PM Mon-Fri 5 PM-8 PM Sat-Sun \$ 0.17881	5 PM-8 PM Mon-Fri \$ 0.12889
Off Peak	All Other Times+Holidays \$ 0.10987	All Other Times+Holidays \$ 0.11378

Table 2. PG&E Residential E-6 Rates per kWh (Note: Tier 2 Shown)

TOU is advantageous for PV systems because PV systems generally produce their most power between 10 AM and 4 PM during the spring and summer months. The good news is that the utility must pay the retail rate to the homeowner for locally generated electricity if TOU is selected. Therefore a homeowner may install a PV system, sign up for TOU Metering, and sell power during weekdays (Peak Time) at almost 3 times the rate that they buy power back at night and on weekends (Off Peak times). This "leverage" is a great deal for homes with PV systems where loads in the household are light during weekdays – such as homes with two working spouses, or children in school.

Palo Alto is served by The City of Palo Alto Utilities (www.cpau.com) and does not have TOU Metering. Electric rates in Palo Alto are low; residential rates are \$0.09524 per kWh for the first 300 kWh, \$0.13020 for 301-600 kWh, and \$0.17399 over 600 kWh per month. Palo Alto Utility customers have benefited from long-term wholesale electricity purchase contracts which CPAU negotiated long ago; however, these contracts are expiring over the next few years, and electric rates in Palo Alto are expected to take a sharp rise upwards to match market rates.

The City of Santa Clara is served by Silicon Valley Power (www.siliconvalleypower.com). Electric rates in Santa Clara are \$0.08877 per kWh for the first 300 kWh, and \$0.10205 per kWh for usage over 300 kWh per month.

With the combination of a well-designed PV system, TOU metering, and some conservation efforts such as changing incandescent lights to Compact Fluorescent Bulbs (CFBs) or LEDs, a homeowner or business can significantly reduce their monthly electric bill, and help the environment at the same time.