

Solar Electric Systems for Educational Institutions



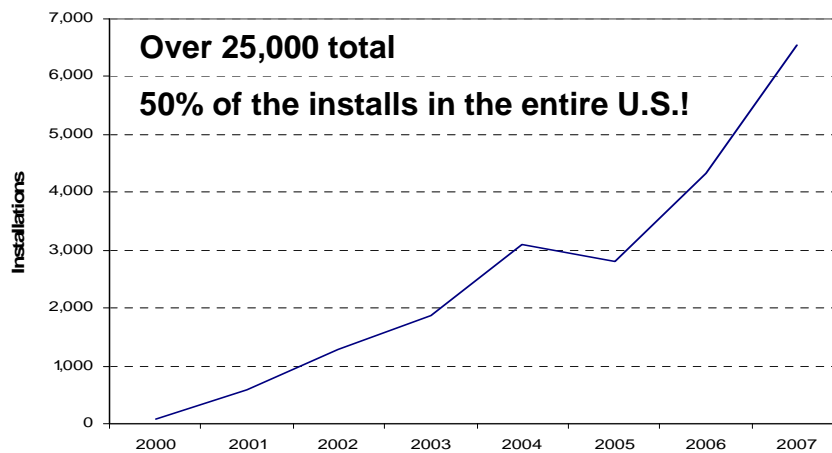
Courtesy: Sunpower Corporation



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Annual PG&E Solar Interconnections

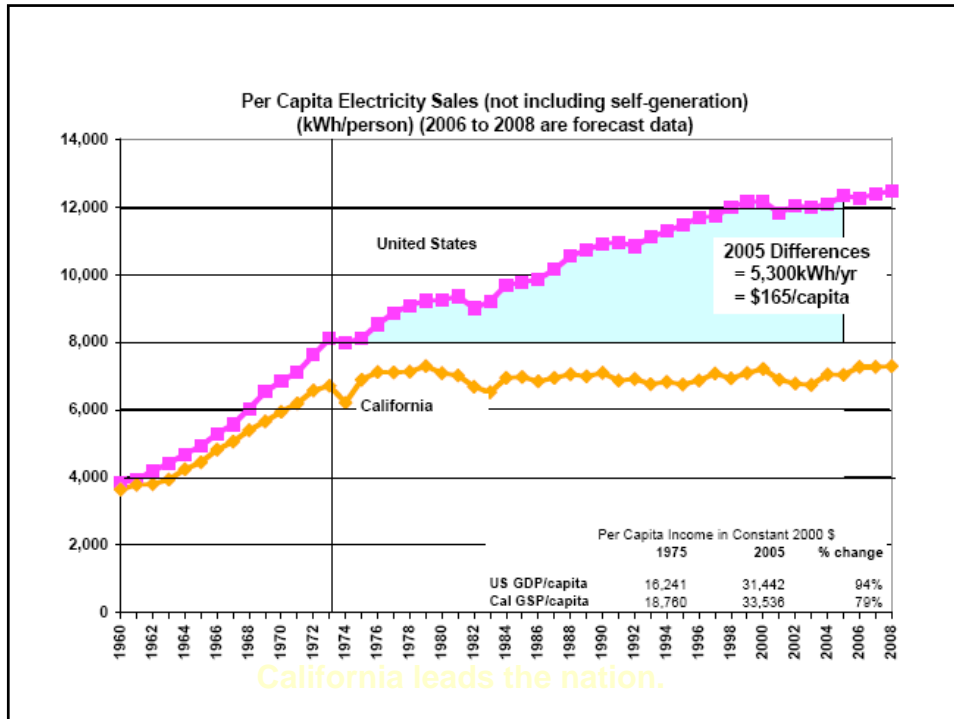


Key Information

- **Current electrical power situation**
- **PV basics and interconnection**
- **Multiple parties in sales process**

Current Situation

- **IOU: Investor Owned Utility (PG&E)**
- **MUNI: Municipal Utility (LADWP)**
- **IOUs are “decoupled”:** profits separate from sales
- **Incentivized for energy efficiency and renewables**

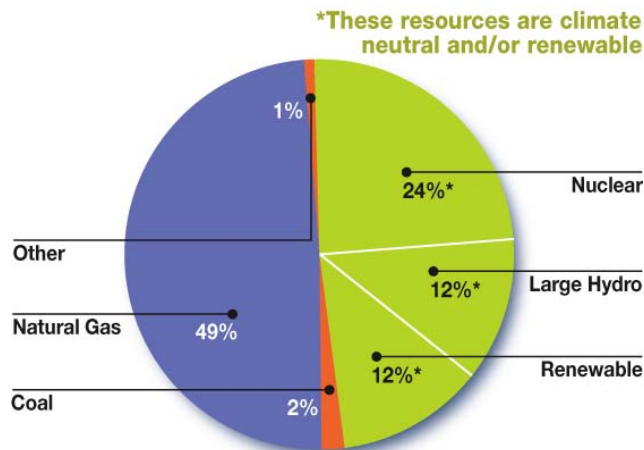


Conclusion

- **Utilities are “bought in” to PV**
- **Both legal and financial incentives**
- **Fundamental investment conditions are unlikely to change**

PG&E's 2008 Electric Delivery Mix

--on average over 50% of the energy PG&E delivers comes from sources that emit almost no carbon dioxide



Investing in Renewables and Emerging Technologies

- California's goal of 20% renewable energy by 2010 is most aggressive renewable energy goal in U.S.
- Since 2002, PG&E has contracted for more than 2,100 MW of renewable energy from wind, solar, geothermal, biomass, and hydro resources.
- We are exploring a number of emerging renewable technologies.



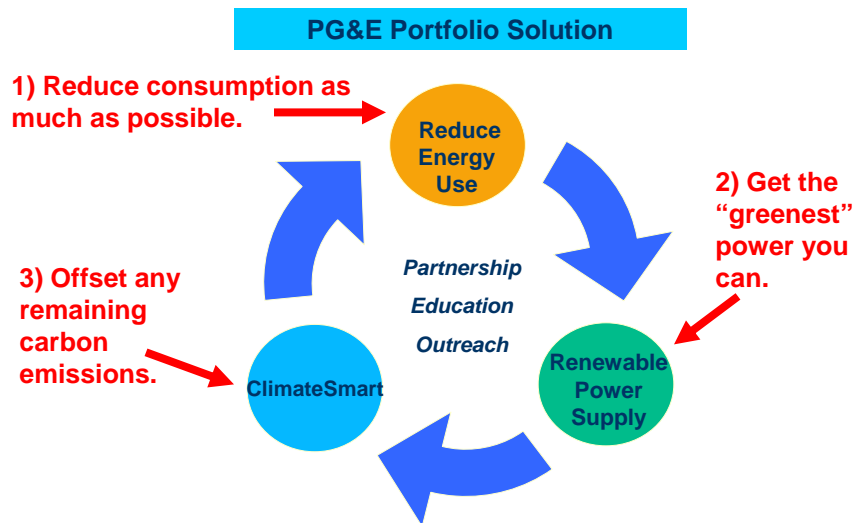
PG&E's recent agreement with Solel-MSP-1 for 553 megawatts— one of the world's largest solar commitments — is expected to be fully operational in 2011.

The Big Picture

California Public Utilities Commission (CPUC) “Loading Order”

1. Conservation and efficiency
2. Demand response
3. Renewables
4. Conventional generation

PG&E as a Partner and Solutions Provider



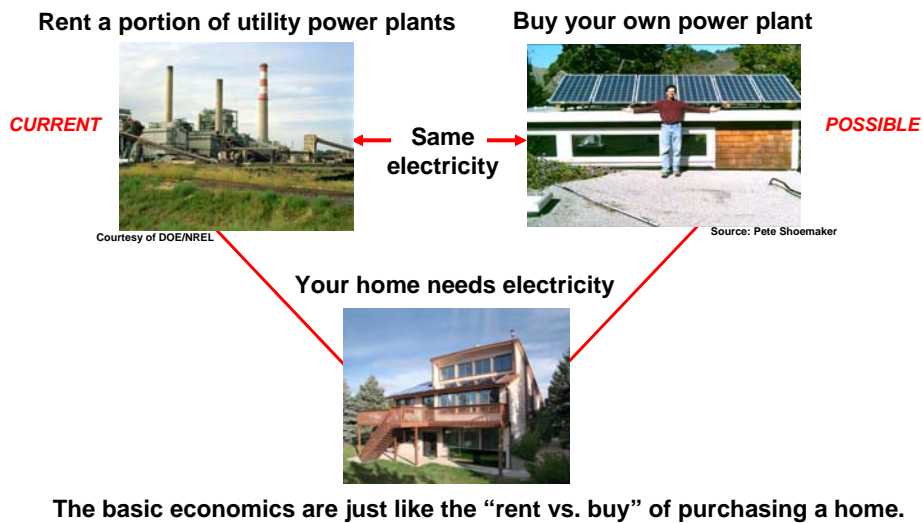
PG&E's Climate Change Commitment

“PG&E is committed to leading by example when it comes to climate change. That means more than just minimizing the greenhouse gas emissions from our operations. It also means maximizing the opportunity we have to lead efforts to establish responsible policies and programs to address global climate change.”

— Adopted by PG&E Corporation, May 2006



One Minute Summary



One Minute Takeaway

- It works reliably for a long time.
- It requires good sun access in the middle of the day.
- Our weather is great—fog is a minor factor.
- It is not taxable and will likely raise the value of your house.
- Accurate financial analysis is key.

PV Terminology

Cell



Module



Array



Courtesy of DOE/NREL

PV System Sizing



200 HP engine: means that 200 horsepower is the **MAXIMUM** it will produce.

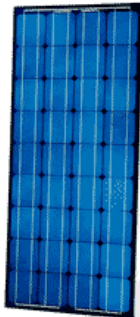


4 kW PV system: means that 4,000 watts (4 kW) is the **MAXIMUM** it will produce in full sunlight.



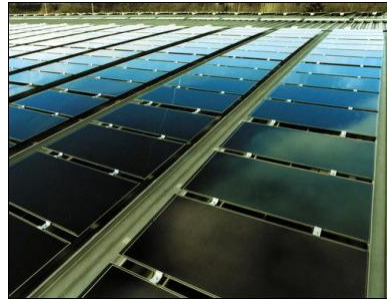
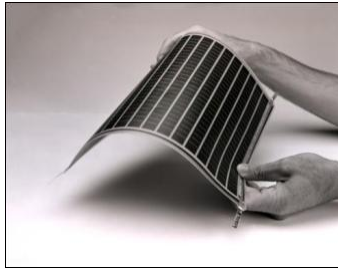
Typical school systems are from 50 to 500 kW.

Crystalline Silicon PV Products



- Firm, like crystals
- Longest track record, over 50 years
- Most common, over 85% of the market
- Highest efficiencies: avg. 15%, up to 22%
- Requires about 100 sf. per kilowatt

Thin-Film PV Products



Source: DOE National Renewable Energy Laboratory

Inverter



**Changes Direct Current (DC) to
Alternating Current (AC)**

Inverters

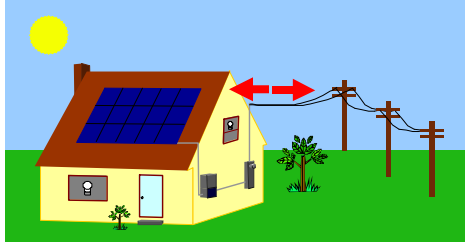


Source: Darren Bouton

Reliability

- **Mature technology—over 50 years old**
- **Essential to the space program**
- **Millions in use**
- **Products tested and approved by CEC**
- **Long warranties backed by large, stable companies**
 - **20 to 25 years on panels**
 - **10 years on inverters**
 - **10 year labor warranty**

Net Metering



Source: Andy Black

The utility grid is a two-way street!

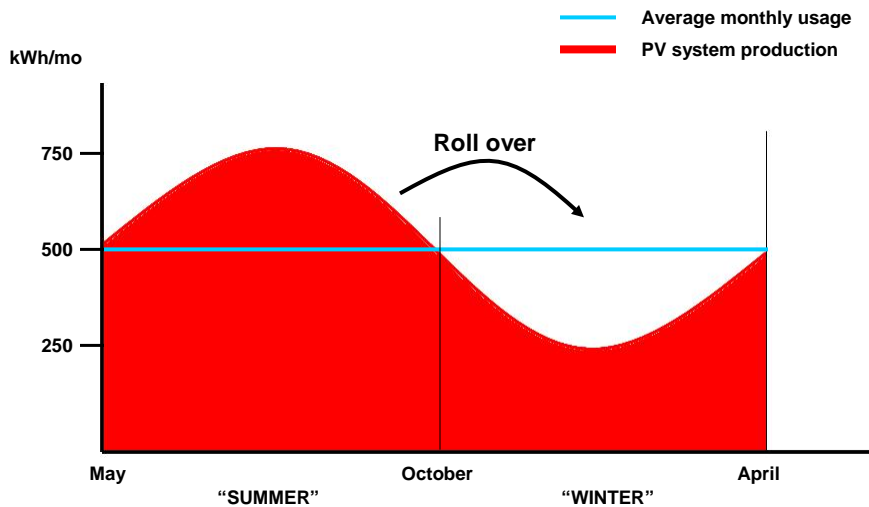
Electricity can be “sent back” to the grid by the customer.

- Eliminates the need for batteries.
- Reduces cost and maintenance.
- Ensures a constant supply of electricity.

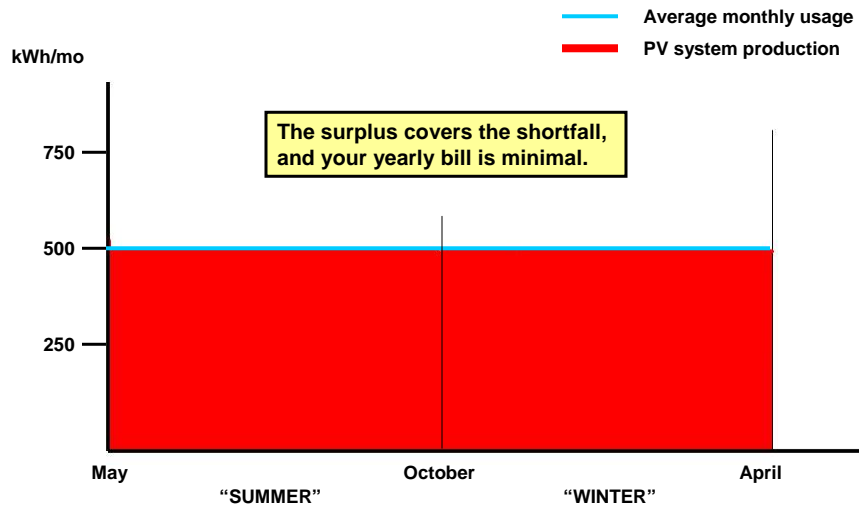


Source: DOE NREL

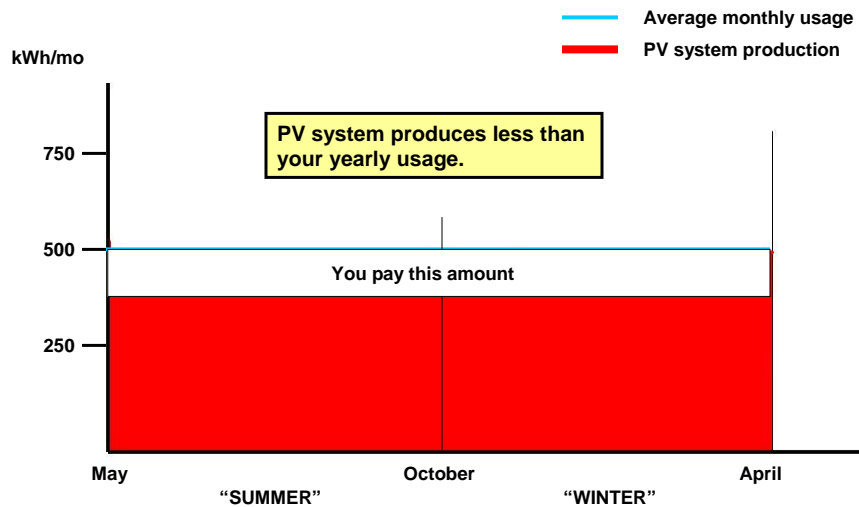
Net Metering



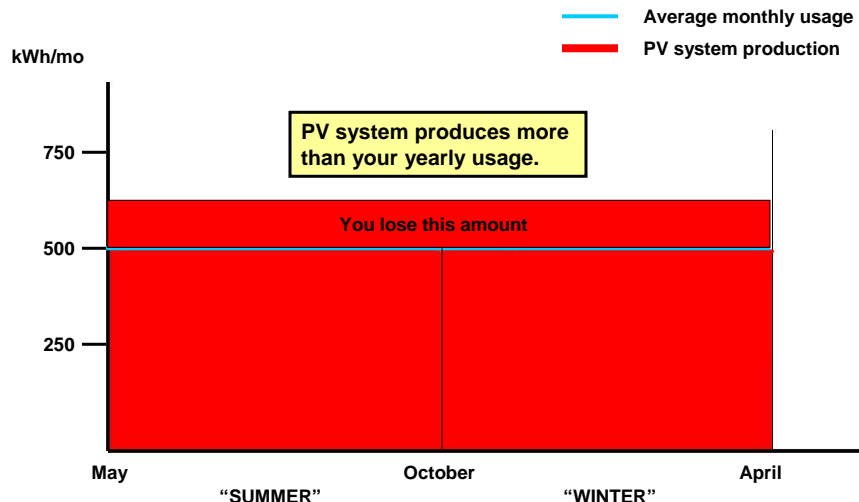
Net Metering



Net Metering

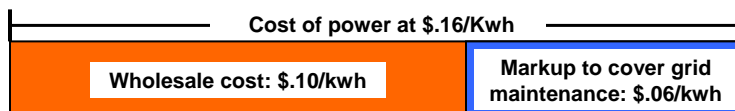


Net Metering



Net Metering

Why don't you get paid if your system over-produces?



- CPUC rule—PG&E must comply
- The “full retail” rate that PV owners get paid for their power includes a subsidy (markup) that comes from all rate payers
- The CPUC determined that this subsidy would only be allowed to cover your usage, not for you to go into the power-generation business

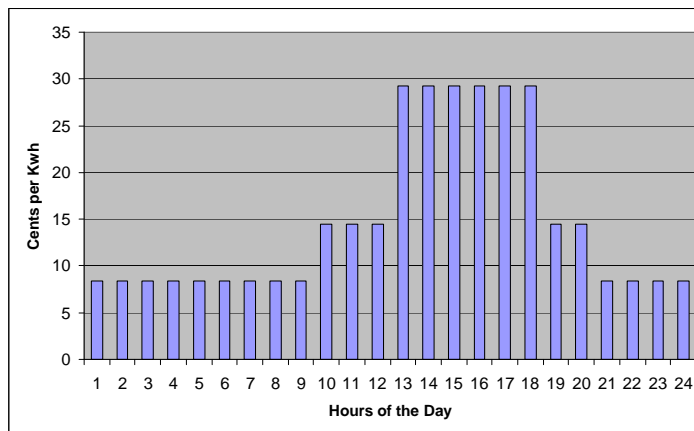
Time of Use Rates

Residential "E6" Time-of-Use Pricing Periods

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Midnight - 6am	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak
6am - 10am	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak
10am - 1pm	Off-Peak	Part-Peak	Part-Peak	Part-Peak	Part-Peak	Part-Peak	Off-Peak
1pm - 7pm	Off-Peak	Peak	Peak	Peak	Peak	Peak	Off-Peak
7pm - 9pm	Part-Peak	Part-Peak	Part-Peak	Part-Peak	Part-Peak	Part-Peak	Part-Peak
9pm - Midnight	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak

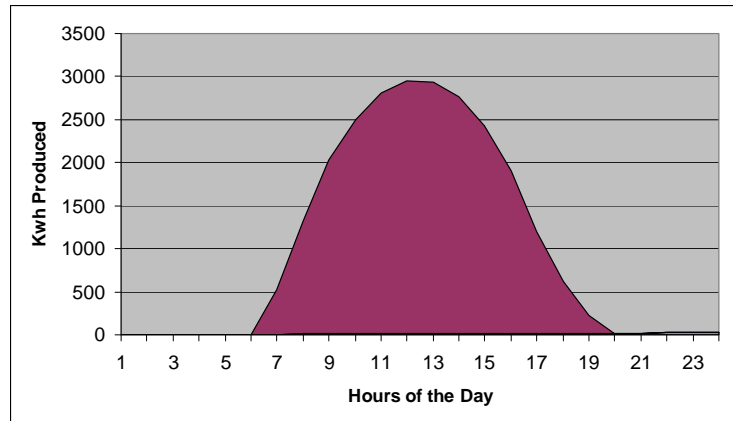
- Peak rates in Summer Afternoons 29¢/kWh + tier surcharges
- Part-Peak rates: 14¢/kWh + tiers
- Off-Peak rates (Nights & Weekends) 8.5-10¢/kWh + tiers

Time of Use Rates



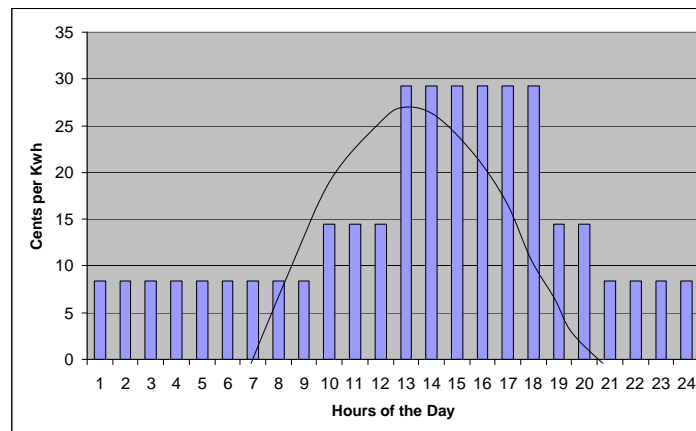
E-6 summer rates (May – October)

Time of Use Rates



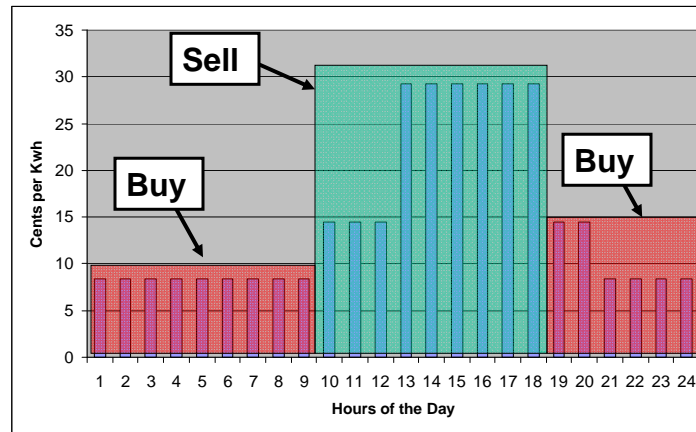
Typical summer production

Time of Use Rates



Summer pattern (May – October)

Time of Use Rates



Buying low and selling high adds value.

CSI Financial Incentives—numbers

Step	Statewide MW in Step	EPBB Payments (per Watt)			PBI Payments (per kWh)		
		Residential	Commercial	Government/Non-Profit	Residential	Commercial	Government/Non-Profit
1	50	n/a	n/a	n/a	n/a	n/a	n/a
2	70	\$2.50	\$2.50	\$3.25	\$0.39	\$0.39	\$0.50
3	100	\$2.20	\$2.20	\$2.95	\$0.34	\$0.34	\$0.46
4	130	\$1.90	\$1.90	\$2.65	\$0.26	\$0.26	\$0.37
5	160	\$1.55	\$1.55	\$2.30	\$0.22	\$0.22	\$0.32
6	190	\$1.10	\$1.10	\$1.85	\$0.15	\$0.15	\$0.26
7	215	\$0.65	\$0.65	\$1.40	\$0.09	\$0.09	\$0.19
8	250	\$0.35	\$0.35	\$1.10	\$0.05	\$0.05	\$0.15
9	285	\$0.25	\$0.25	\$0.90	\$0.03	\$0.03	\$0.12
10	350	\$0.20	\$0.20	\$0.70	\$0.03	\$0.03	\$0.10

Overall outline:

Incentives step down according to amount of PV installed (MW)

CSI Financial Incentives—numbers

Current status:

For each utility, shows step # and volume amounts.



Last updated 2/05/2009

Administrator	Customer Class *	Current Step	Initial MW In Step	Unused MW from Previous Steps	Revised Total MW In Step	Issued Conditional Reservation Letters (MW)	MW Remaining	MW Under Review
PGE	Residential	5	23.10	0.10	23.20	3.67	19.53	0.54
	Non-Residential	5	46.80	23.66	70.46	54.51	15.95	9.13
SCE	Residential	3	15.20	0.38	15.58	9.93	5.66	1.02
	Non-Residential	5	49.30	20.72	70.02	11.62	58.39	3.00
CCSE	Residential	4	4.40	0.02	4.42	1.32	3.11	0.07
	Non-Residential	5	11.10	1.72	12.82	1.24	11.58	0.86

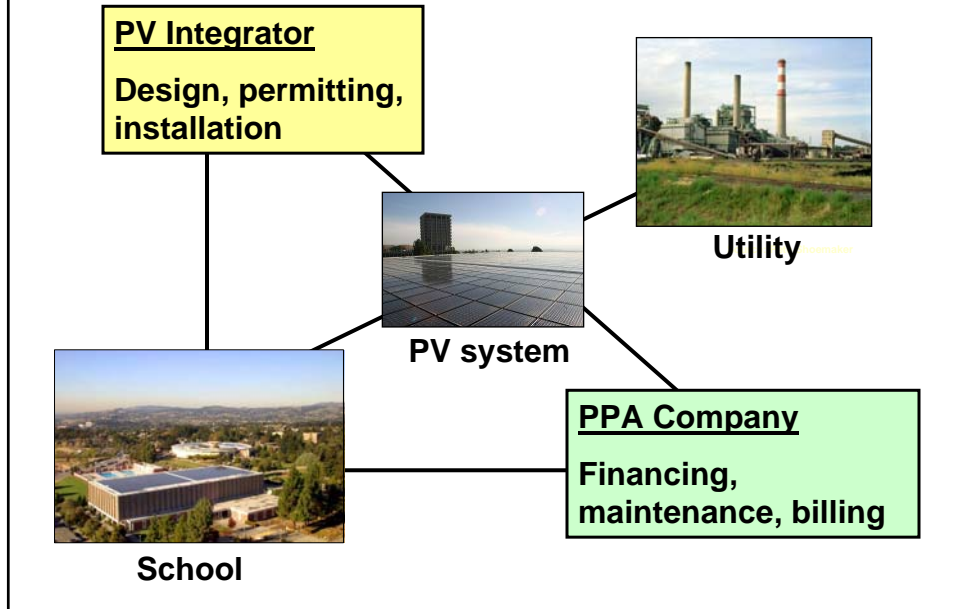
“Trigger Tracker”: <http://www.sqip-ca.com/>

Data as of 2/5/09. It is constantly changing.

Federal Incentives

- **Federal Tax Credit**
 - 30% of net cost
 - Extended through 2016.
- **Tax Incentives for Businesses**
 - Accelerated Depreciation (first 5 years)

Participants



Contact Information

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