E³A: Solar Electricity for the Home, Farm or Ranch

Costs

A grid-tied residential solar electric system without batteries costs approximately $5,000 to $7,000 per kilowatt (kW); larger systems typically cost less per installed kilowatt. An installed kW price includes the purchase and installation costs. Using the St. Louis home system-sizing example, a 3.5-kW system that provides half of the home's electricity would cost about $17,500 (2.5 kW × $5,000 = $17,500).

Incentives that lower costs

There are a variety of federal, state and local government and utility incentives for energy efficiency and renewable energy. These incentives vary by state and length of time they are available. The Department of Energy's Database of State Incentives for Renewables and Efficiency (DSIRE) keeps track of tax credits, rebates and other incentives available to reduce a system's final cost.

Be prepared to pay or finance the full purchase price because some incentives that lower the final cost are received after the system is installed.

Estimating cost savings and simple payback for a net-metered system

First, calculate the yearly cost savings of your PV system using this formula:

$$\text{(PV system size)} \times \text{(energy production factor)} \times \text{(electricity rate)} = \text{dollars saved per year}$$

For the St. Louis home example:
- PV system size: 3.5 kW
- Energy production factor: 4.8 kWh/m²/day × 365 days/year = 1,642.5 kWh/kW-year
- Electricity (utility) rate: $0.12 per kWh

$$3.5 \text{ kW} \times 1{,}642.5 \text{ kWh/kW-year} \times \$0.12\text{/kWh} = \$689.85 \text{ saved per year}$$

Simple payback is calculated by dividing the system price by the amount saved per year. Examples below use the St. Louis home numbers.

Without incentives:
- System cost: $17,500 ÷ $689.85 saved per year = 25.4-year simple payback

With current incentives:
- First, apply any utility rebates. None are available for this example.
- Federal Income Tax Credit (expires Dec. 31, 2016) is 30 percent of system cost (after utility and local rebates). $17,500 × 30 percent = $5,250 tax credit
- System final net cost: $12,250 ÷ $689.85 saved per year = 17.8-year simple payback

Payback times decrease when electricity costs increase. Some conservation and efficiency measures that can reduce PV system size also qualify for a tax credit. Visit the DSIRE website at *http://dsireusa.org/* for complete and up-to-date information.

PV system financing

There are several options for financing a solar electric system:

- Bank loan
- Home refinance — roll into a mortgage payment
- Construction loan
- Home equity loan
- Some PV system companies provide financing

References

U.S. Department of Energy.
Database of State Incentives for Renewables and Efficiency (DSIRE). (2011, February). *Residential Renewable Energy Tax Credit*; Residential Alternative Energy System Tax Credit; and Northwestern Energy-USB Renewable Energy Fund. Retrieved May 19, 2011 from http://dsireusa.org/incentives/index.cfm?getRE=1?re=undefined&ee=1&spv=0&st=0&srp=1&state=MT
Estimating Energy Cost Savings for a Net-Metered Photovoltaic System. (2011, Feb.). Retrieved March 11, 2011, from http://www.energysavers.gov/your_home/electricity/index.cfm/mytopic=10860

National Renewable Energy Laboratory Engineer and Montana-based NABCEP-certified PV system installers, personal communication regarding current PV system purchase and installation costs, April 12, 2011.

Solarbuzz: Solar Market Research and Analysis. *Solar Electricity Prices*. (2011). Retrieved April 11, 2011, from http://www.solarbuzz.com/facts-and-figures/retail-price-environment/solar-electricity-prices