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What is the Cost, Value & Net Savings for a Solar Electric System?

A solar electric system may generate energy less expensively than some utilities charge when comparing the life cycle investment for the systems estimated life. So how does one compute the life cycle cost of electricity for a photovoltaic (PV) system? *This can easily be computed by dividing the after rebate cost of a photovoltaic system by the number of kilowatt hours (kWh) the system is forecasted to generate during its estimated useful life.*

First, one must know the cost of the system. Second, one needs to compute how much energy a solar system will generate during its lifetime. For high efficiency crystalline solar modules mounted on a south facing sloped roof, at a 20 degree tilt, the forecasted annual output (using real world data) is 1,700 kWh per rated kW (AC) per year. Third, one needs to know the size of the photovoltaic system. Solar electric systems have a standard rated size as defined by the California Energy Commission for rebate purposes. This standard is measured in peak AC watts determined by the cumulative module size in DC watts multiplied by the inverter efficiency to convert to AC watts. Lastly, one needs to estimate the life of the system. This is conservatively estimated at 30 years (modules could easily last longer).

Formula to compute price per kWh for PV: $\text{Investment} / \text{Energy} \times \text{Size} \times \text{Years}$

Example for a medium sized 3 kW solar electric system for a typical home:

Investment after all rebates and tax credits (\$1.10/Watt buy down):	\$13,500
Energy output in kWh per kW per year (at 20 degree south facing tilt):	1,700
System size (CEC watts AC):	3 kW

$\$13,500 / (1,700 \text{ kWh per kW per year} \times 3 \text{ kW} \times 30 \text{ years}) = \underline{\$0.09 \text{ per kWh}}$

NOTE: Using a 40 year system life yields a cost per kWh of \$0.08

For comparison, PG&E residential rates are \$0.12 per kWh for baseline and up to \$0.44 for tier 5 as of 10/1/09.

What is the value per kWh of a photovoltaic system? This depends on the amount of electricity offset by solar. For example, a 3 kW AC solar electric system for a home with a monthly electric bill (before solar) of \$104 generates electricity worth \$0.19 per kWh when using a time of use meter. The net value will be more for electricity users paying surcharges in tiers 4 & 5, since price per kWh is greater than the \$0.19 per kWh credit computed below (for tier 4 it is \$0.38 per kWh, tier 5 is \$0.44 as of 10/1/09). Value per kWh can be computed by using the Clean Power Estimator's predicted savings:

Formula to compute value per kWh for PV: $\text{Avoided electric cost per year} / \text{kWh generated per year}$

$\$921 \text{ per year in solar electric savings} / 4,863 \text{ kWh per year} = \underline{\$0.19 \text{ per kWh}}$

Formula to compute the Net Value per kWh for PV: $\text{Value} - \text{Cost} = \text{Net Value}$

$\$0.19 \text{ per kWh value} - \$0.09 \text{ per kWh cost} = \underline{\$0.10 \text{ per kWh Net Value}}$

This system will save \$486 per year. Computed: 4,863 kWh per year X \$0.10 kWh Net Savings = \$486