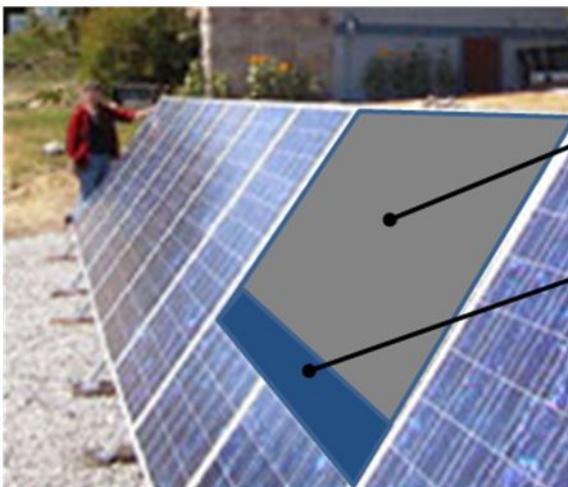


PV Economics

Under the best circumstances, one thousand Watts falls on each square meter of a solar panel. To get that 1000 Watts, the panel must be facing south on a clear day close to noon with the sun's rays perpendicular to the panel. In other cases (late afternoon sun, cloudy day, humid) less than 1000 Watts falls on the panel's surface.

Only in odd cases – like snow in front of the panel reflecting more sun onto the panel – will there be more than 1000 Watts of sunlight falling on a square meter of solar panel. The 1000 Watts/m² is called “peak Watts”. It's the most sunlight that can be captured on the earth.

In conventional solar panels less than 200 Watts of that 1000 Watts is converted to electricity. What happens to the rest? The remaining 800 W is lost energy. The panel's silicon wafers get hot and the wind blows that heat away. The percentage of energy captured divided by the peak Watts is the panel's efficiency. Conventional flat plate PV panels have a “best case” efficiency of less than 20%.



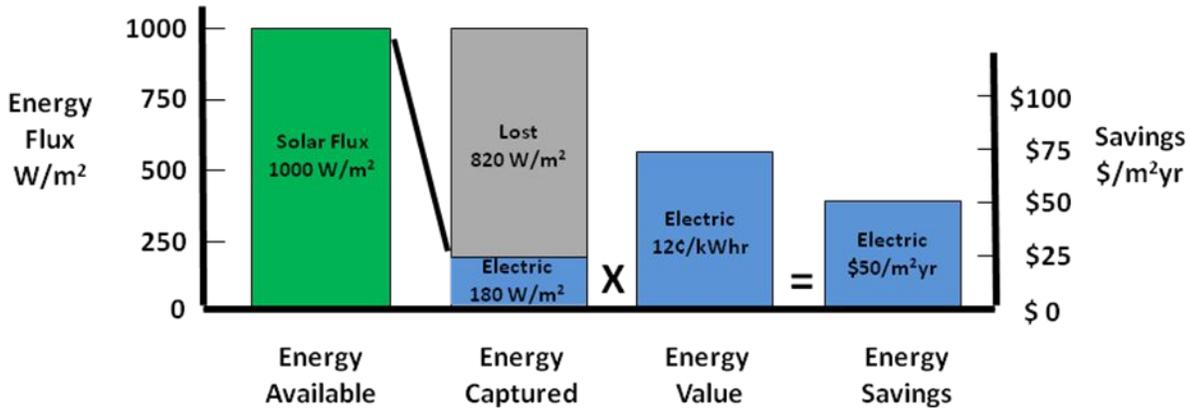
820 W/m²
Lost Energy

18% efficiency
180 W/m² Captured
Energy

The installed cost of a PV panel system in the U.S. is about \$5/Watt (€3.7/W) before government tax rebates and about \$3/W (€2.2/W) after the tax rebates. Rebates from the Federal government are 30% of the installed cost. State tax rebates are typically 10% more, giving a total government rebate of 40%.

The payback of a PV panel is its cost divided by its savings per year. While the cost is more or less fixed, the savings per year depends on the utility price of electricity. In most of the U.S., utility electricity costs 12¢ (€0.09) for each kilowatt hour of electricity used. Some electricity is more expensive. In California, houses that use twice the average amount of electricity pay 22¢ (€0.16) per kilowatt hour. In New York State, the average utility rate is 17¢ (€0.13) per kilowatt hour. Electricity from a small generator in rural Africa is even more: 35¢ (€0.26) per kilowatt hour.

In the chart below, the electricity savings is calculated for flat plate PV panels used in a solar energy system. Beginning with the 1000 Watts/m² available from the sun, each square meter of collector converts 180 Watts/m² to electricity. Multiplying that by the average price of electricity, 12¢ (€0.09) per kilowatt-hour, and the average sunlight hours in the U.S. gives annual energy savings of about \$50/m² (€37/m²).



Costs for this average solar energy are \$3/W (€2.2/W). Multiplying by the 180 Watts delivered by a PV panel gives a cost of \$540 (€370) per square meter of panel. The Payback is the costs divided by the savings per year (\$50 m², €37/m²) or about 10 years. That means the typical PV solar energy system in an average U.S. climate will pay for itself in 10 years.