

**Photovoltaic Payback
for
Pennsylvania 2009-2010
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The following is a quick primer on calculating the payback for a Photovoltaic System installation.

Introduction

Photovoltaic systems are systems that use solar panels to produce electricity using the sun's energy.

The concept of installing solar panels to "get off the grid" and power your home solely with a photovoltaic system makes no economic or environmental sense. The batteries needed to store power generated from the sun are expensive in both economic and environmental terms.

Therefore, the system most homeowners and businesses will install is called "**a grid tied system**". These systems feed the excess electricity you generate back to your electric company's power grid, and draw electricity from the grid when you need more than you are generating.

System Components

The 3 main components of a Photovoltaic system are:

1. **Solar panels** - these convert sunlight into direct current electricity.
2. **Racking or mounting hardware** - this holds the panels to the roof or supports them on the ground.
3. **Inverter** - changes the direct current coming from the panels to alternating current that can be used in the home/business.

Photovoltaic systems are sized and sold by the watt. Most residential systems range in size from 3000 watts (3kW) to 10000 watts (10kW) .

The solar panels are rated in watts. Most solar panels have between a 200 and 300 watt rating. At peak performance a 200 watt panel can produce about 200 watts of electricity.

System Siting

Should you decide to install solar panels you will need an area of ground, or roof, that is **unshaded** most of the day.

The roof area should be flat or facing in a southerly direction.

Calculating Payback

A traditional 32 year payback can currently be reduced to a 5 year payback.

Cost of Electricity - \$0.18 per kilowatt hour

We will assume that over the next 5-10 years electric prices will be about \$0.18 per kilowatt hour.

The current price for electricity is approximately \$0.16 per kilowatt hour, but is due for a 20+% increase in 2011.

Solar production - 1 watt produces 1.1 kilowatts per year

In Pennsylvania each watt installed on the roof produces about 1.1 kilowatts of electricity each year.

Cost of installing a residential photovoltaic system - \$6.50 per watt

A good price for installing a photovoltaic system is between \$6.00 and \$7.00 per watt. This includes panels, racking, and inverters.

Large systems are generally cheaper than smaller systems per watt installed.

We will use \$6.50/ watt for our calculations.

Generation - 1 watt generates \$0.20 of electricity per year

For every watt installed on the roof you will generate \$0.20 (1.1 kilowatts per year, per watt installed, X \$0.18 per kilowatt hour) of electricity each year.

***So you will spend \$6.50 to generate \$0.20 each year.
Your payback will be about 32 years.***

Not so good, but:

Here is why solar makes sense right now:

Government Incentives:

The PA State Sunshine program will give you a grant of \$2.25 (not taxed by the federal government) for every watt you install.

The US Federal Government will give you a 30% tax credit on the price of a system

With both these discounts your installed cost has now dropped from \$6.50 per watt to \$2.30 per watt. Payback is now about 15 years.

Good, but things are even better:

Government Mandates:

The PA State, Act 213 mandates that electric power companies produce a percentage of renewable, clean energy each year. That percentage increases each year until 2020 when 18% of electricity must be generated using clean renewable energy.

The electric companies have not invested in the capital equipment to meet these requirements. To meet this mandate the electric companies are permitted to buy **Solar Renewable Energy Certificates (REC)** from those generating solar power.

There is a market for these **solar RECs**. Solar aggregators, or brokers, will buy these RECs from you, the solar producer. Five year contracts to buy these RECs are now being offered for about \$0.23 - \$0.25 per kilowatt hour (which works out to \$0.26 per watt of solar installed).

So, for the next 5 years, and probably many more years, for each watt you install you will generate about \$0.46 of revenue each year. (\$0.18 per KWH/year electricity savings + \$0.24/ KWH/year for Solar RECs) x 1.1 KWH/year for each watt installed))

*Your cost has now dropped from:
\$6.50 to generate \$0.20 of electricity each year to:
\$2.30 to produce \$0.46 of revenue each year*

Payback is now about 5 years for a system with a life expectancy of at least 25 years.

Real World Example

A 5000 watt (5 kW) system will cost about **\$32,500** installed. It will produce about 450 kilowatt hours of electricity each month.

The 30% Federal Tax Credit brings the price down to **\$22,750**.

The PA Sunshine Program grant at \$2.25 per watt is worth \$11,250.00 reducing you cost to **\$11,500**.

You have installed **5000 watts of solar panels** on your roof and will produce about **5500 kilowatt hours (kWh)** of electricity each year.

This electricity is worth **\$0.18/kWh** in payments which you did not have to make to the power company.

This electricity is also worth an additional **\$0.24/kWh** in Renewable Energy Certificates.

So **(\$0.18 + \$0.24)** of revenue per kWh of electricity produced x **5500 kWh** produced each year, **nets you \$2310.00 each year**.

This savings allows you to pay for your system in about 5 years.