



Renewable Energy for Homes

The four most common options for residential renewable energy installations are solar photovoltaics, solar thermal, small wind and geothermal.

1) Solar photovoltaics (PV) are used to convert solar power into electricity, and thus can be used to reduce or eliminate your grid electricity needs.

2) Solar thermal systems capture the sun's energy by heating liquid (i.e. water), which can then be used in various applications. In residences, these systems are typically used to heat domestic hot water, to heat pool water or for space heating (i.e. radiant floor heating). Depending on your current energy sources and the type of application, you could replace some of your natural gas, oil, or electricity needs with solar thermal.

3) Small wind turbines harness wind energy to produce electricity for homes, farms and small businesses. Therefore, small wind installations can be used to reduce or eliminate grid electricity needs.

4) Geothermal systems use the nearly constant temperature of the Earth to heat (and cool) buildings. Therefore, geothermal could replace whichever fossil fuel you use to heat your home, whether it be oil, natural gas, electricity etc.

Which Has the Shortest Return on Investment?

The payback period, also known as the **return on investment**, is the time it takes to "repay" the amount of the original investment. With a renewable energy investment, the initial cost is repaid in energy savings. It is difficult to choose one type of renewable energy that will have the shortest return on investment across the board. This is because a variety of factors affect the payback period of your renewable energy investment, including:

- the availability of the renewable resource in your area (sunlight, wind, ground source heat)
- the size and type of energy load that the renewable energy installation will replace
- the prices of the fossil fuels you are replacing
- local, state and federal incentives

For instance, when considering green energy options, you must keep in mind that each type of energy may only fulfill certain needs and that this might affect the payback period. Wind and PV systems typically replace electric loads, while solar thermal and geothermal typically replace heating loads. For example, if you have gas or oil heat, this would slow the payback period on a wind or PV installation, because the installations would not alleviate your heating load or detract from your gas or oil bill. Alternatively, if you have electric heat, the wind or PV installation would alleviate your heating load and have a much smaller payback period.

Incentives for Green Energy

One factor that affects the renewable energy payback period is availability of federal, province, local and utility incentives for renewable energy installments.

Solar PV vs. Solar Thermal

In general, solar thermal systems are more efficient than solar PV systems – with solar thermal systems converting over 50% of the solar energy into heat and PV systems converting less than 15% of the solar energy into electricity. This means that a solar thermal system would be smaller than a solar PV system, given that they produce equivalent energy outputs. Plus, solar thermal materials are typically cheaper than solar photovoltaic materials.

In general, this means that solar thermal systems have a smaller up-front cost and have a shorter payback period than solar PV.

Wind Turbines for Homes

A wind turbine rated between 5 and 15 kilowatts should meet an average home's needs. According to NAHB, "initial costs (of wind turbines) can run between \$40,000 and \$50,000 for a 10-kW system, or a simple payback of approximately 21 years without factoring in tax or other incentives that may be available". An average system will save up to \$200 per month if the electricity costs are 10 cents per kilowatt. As you can see, the payback period of your small wind system will depend on your energy usage, electricity costs and available incentives.

Geothermal for Homes

As a general rule, installing a geothermal heat pump will cost about \$3,000 more per ton than an air-to-air heat pump. According to the National Association of Homebuilders Research Center, "Overall, one could expect to pay between \$4,000 and \$11,000 more for a 3-ton GHP system than for an air source heat pump system". An article in Scientific American states that geothermal systems are often "\$7500 or more". According to the Environmental Protection Agency, geothermal heat pumps can save homeowners 30 to 70 percent on heating and 20 to 50 percent on cooling costs over conventional systems. According to the NAHB, "reports by builders who monitor their in-place systems indicate heating and cooling savings between \$358 and \$1,475 annually".

This shows that the payback period of your geothermal system will vary greatly depending on the initial cost and your heating and cooling savings.