

Renewable Energy

A How-To Guide for Southern Arizona Residents



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1. What is Renewable Energy?

Renewable Energy (RE) comes from resources that are nearly unlimited in duration, but somewhat limited in the amount of energy available per unit of time. RE includes biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action. The most common and most practical RE options for southern Arizona are **solar** and **wind**.

Useful RE terms (from <http://www.eia.doe.gov/>):

Alternating Current (AC)	an electric current that reverses its direction at regularly recurring intervals, usually 50-60 times per second
Direct Current (DC)	an electric current that flows in a constant direction
Grid	the layout of an electrical distribution system
Incentives	subsidies and other Government actions where the Government's financial assistance is indirect
Kilowatt (kW)	1,000 watts of electricity
Kilowatthour (kWh)	1,000 watthours
Megawatt (mW)	1,000,000 watts of electricity
Photovoltaic (PV) Cell	an electronic device consisting of layers of semiconductor materials capable of converting incident light directly into electricity (direct current)
Photovoltaic (PV) Module	an integrated assembly of interconnected photovoltaic cells

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Useful RE Terms (Continued):

Solar Energy	the radiant energy of the sun, which can be converted into other forms of energy, such as heat or electricity
Watt (W)	the electrical unit of power
Watt-hour (Wh)	the electrical energy unit of measure equal to 1 watt of power supplied to, or taken from, an electric circuit steadily for 1 hour
Wind Energy	energy present in wind motion that can be converted to mechanical energy

SOURCE:

Energy Information Administration, <http://www.eia.doe.gov/>

2. Is Renewable Energy Right for Me?

Switching to renewable energy often takes a significant amount of time and money upfront. However, renewable energy systems (e.g. solar panels or wind generators) will pay for themselves in time, and will avoid the carbon dioxide emissions associated with electricity produced from coal or other nonrenewable sources. There are also many incentives, loans, and tax credits available now to help offset the costs (see **Section 4, p. 5**).

The first step is to reduce your energy bill through **free or low-cost energy conservation methods**. Examples include: hanging laundry outside to dry instead of using a clothes dryer, switching incandescent light bulbs to compact fluorescent light bulbs (CFLs), or unplugging electronics when not in use. See **Section 5, p. 6** for more tips. If you regularly practice energy conservation in your home, you won't have to invest as much in a renewable energy system, which usually costs several thousand dollars.

SOLAR

PV modules require unshaded, unblocked, south-facing exposure. They may need anywhere from 120 to over 1,000 square feet of space. PV modules can be installed on sloped or flat roofs, walls, or the ground. Most people have PV modules installed on their roof—in this case it is important that the roof is in good condition before installing PV panels.

WIND

If the terrain around your home is open, flat and/or on a hill top, a wind generator may be worth considering. Wind generators require a large amount of space (i.e. a large backyard). While the sun may be a more reliable source of energy in Arizona, wind generators are a feasible alternative in an area that receives a constant supply of wind.

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Another useful step in this process is to use an **energy calculator** to help determine the best ways to save energy and whether renewable energy is right for you. The U.S. Department of Energy provides several such calculators at this website: <http://www1.eere.energy.gov/calculators/>

After practicing energy conservation methods, self-assessing your property, and utilizing an energy calculator, the next step is to research and talk with renewable energy vendors in your area. Companies should come out to assess your property for renewable energy systems. Compare costs and do as much research as possible to become an educated consumer.

SOURCES:

Sierra Club Green Home Solar Center, <http://www.sierraclubgreenhome.com/solar-center/>
U.S. Department of Energy, <http://www.energy.gov>

3. How Do I Switch to Renewables?

If you have determined that renewable energy is right for you and your home, it is time to consider the options of solar and wind systems.

SOLAR PANELS

A PV Module is a large investment that typically lasts between 20 and 30 years. Depending on the size of system you wish to install, a PV module can produce part or all of the energy needed to power your home.

SOLAR WATER HEATERS

Solar water heaters are much less expensive than solar panels, and may pay for themselves sooner as well. They are a good option if you do not want to go completely “off the grid.” Solar water heaters will provide electricity to heat water for showers, clothes washers, dishwashers, baths, sinks, etc.

WIND GENERATORS

Residential wind systems consist of a wind turbine and a tower. The towers can range from 80 to 120 feet tall. Wind turbines do not typically include a battery, so when there is not sufficient wind, an alternate power source is necessary.

Renewable energy vendors will provide specific costs and model information. For more information, visit the web sources listed below.

SOURCES:

U.S. DOE Wind Systems, http://www1.eere.energy.gov/windandhydro/small_wind_system_faqs.html
American Wind Energy Association, <http://www.awea.org/faq/rsdntqa.html>
Sierra Club Green Home Solar Center, <http://www.sierraclubgreenhome.com/solar-center/>

4. Financial Incentives and Tax Credits

Incentives, tax credits, and loans can help offset the costs of renewable energy systems. The following is a list of local, state, and national financial assistance. To search for others, visit the **Database of State Incentives for Renewables & Efficiency** at <http://www.dsireusa.org> and the U.S. Department of Energy at <http://www1.eere.energy.gov/financing/consumers.html>.

GRANTING ENTITY	BRIEF DESCRIPTION	WEBSITE (PLEASE VISIT FOR MORE SPECIFIC DETAILS)
Arizona Department of Revenue	<i>Solar Energy Credit</i> Receive an AZ income tax credit equal to 25% of the cost of a solar energy device installed. This credit cannot exceed \$1,000 per year or per residence.	http://www.revenue.state.az.us/brochure/543.pdf
Internal Revenue Service (IRS)	<i>Solar Water Heating Tax Credit</i> Receive a tax credit equal to 30% of the cost of a solar water heating system installed before December 31, 2016.	http://www.energystar.gov/index.cfm?c=tax_credits.tx_index#s1
Internal Revenue Service (IRS)	<i>Photovoltaic Systems Tax Credit</i> Receive a tax credit equal to 30% of the cost of a PV system installed before December 31, 2016.	http://www.energystar.gov/index.cfm?c=tax_credits.tx_index#s1
Internal Revenue Service (IRS)	<i>Residential Small Wind Turbines Tax Credit</i> Receive a tax credit equal to 30% of the cost of a residential small wind turbine installed before December 31, 2016	http://www.energystar.gov/index.cfm?c=tax_credits.tx_index#s1
Sulphur Springs Valley Electric Cooperative (SSVEC)	<i>SunWatts Program</i> SSVEC customers receive \$4.00 per installed watt, or up to 50% of the total installed cost of the system, whichever is less.	http://www.ssvect.org/programs/energySunWatts.php
Tucson Electric Power Company (TEP)	<i>Solar Hot Water/Space Heating Systems Incentive</i> TEP customers choose between an Up-Front Incentive (\$750 plus \$0.25/kWh to a maximum of \$1,750) or a Performance Based Incentive (between \$0.051 and \$0.057 per kWh over 10-20 year payment agreements)	http://www.tep.com/Green/Home/Solar/spaceheating.asp

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GRANTING ENTITY	BRIEF DESCRIPTION	WEBSITE (PLEASE VISIT FOR MORE SPECIFIC DETAILS)
Tucson Electric Power Company (TEP)	<i>Residential Solar Electric Systems Incentive</i> TEP customers choose between an Up-Front Incentive (\$3.00/Watt On-Grid or \$2.00/Watt Off-Grid) or a Performance Based Incentive (between \$0.180 and \$0.202 per kWh over 10-20 year payment agreements)	http://www.tep.com/Green/Home/Solar/electric.asp

Some banks may also offer loans to help pay for renewable energy systems. Inquire at your local bank for details.

5. Energy-Saving Tips

Regardless of whether or not you have determined renewable energy is right for you, implementing as many energy conservation habits into your daily routine will reduce your energy bill and relieve the environment of harmful carbon emissions and other pollutants. The following free or low-cost energy-saving tips were taken from <http://www.energy.gov>, where many more tips can be found.

DRIVING

- Combine errands into one trip. Many short trips can actually use twice as much gasoline as one trip covering the same distance because the engine stays warm during a single trip with many stops.
- Using cruise control on the highway will save gas in most cases.
- Avoid high speeds. Gas mileage greatly reduces above 60 mph.

APPLIANCES

- Unplug appliances when not in use, or use a power strip to cut off power to multiple appliances when not in use. VCRs, TVs, stereos, computers, cell phone chargers, and other appliances still draw a small amount of power even when they are switched off.
- Turn off your dishwasher's drying cycle.
- Hang your laundry outside to dry. The Arizona sun and heat are great alternatives to clothes dryers!
- Computer screen savers do not save energy. Adjust the power monitor settings on your computer to turn off your monitor after 15-20 minutes. (On a PC: click "Start" > "Performance and Maintenance" > "Power Options")

HEATING & COOLING

- In the summer, close windows and drapes during the day and open them at night to let cooler air in. Use fans to circulate the air.

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- In the winter, open drapes during the day to let in the heat of the sun, and close them at night to insulate.

LIGHTING

- Compact fluorescent light bulbs (CFLs) last longer and use less energy than incandescent light bulbs. Consider replacing incandescent light bulbs with CFLs, especially bulbs used for exterior lighting, table lamps, and floor lamps.
- Make a habit of turning off lights in any room you are not using. Incandescent light bulbs should be turned off whenever they are not needed, and CFLs should be turned off whenever they are not needed for 15 minutes or more.

WATER

- Run dishwashers just before going to bed and do laundry later in the evening to avoid peak water demand.
- Use the cold-water cycle for more clothes.
- Repair leaky faucets as soon as possible.
- Never leave the water running when not in use.
- Take shorter showers. Turn off the water while you shampoo, and turn it back on to rinse.

SOURCES:

U.S. Department of Energy's Energy-Saving Tips, <http://www.energy.gov/energysavingtips.htm>
Arizona Department of Commerce, <http://www.azcommerce.com/Energy/SavingTips/>

Additional Information

For more information, the following websites may be helpful:

American Solar Energy Society (ASES), <http://www.ases.org>

Arizona Department of Commerce's Energy Office, <http://www.azcommerce.com/energy>

Database of State Incentives for Renewable Energy (DSIRE), <http://www.dsireusa.org>

Energy Information Administration, <http://www.eia.doe.gov>

Energy Star, <http://www.energystar.gov>

U.S. Department of Energy (DOE), <http://www.energy.gov>

U.S. DOE Energy Efficiency and Renewable Energy (EERE), <http://www.eere.energy.gov>