



By Steve O'Rourke

Keys to Energy Independence

Steve O'Rourke (www.StephenRO'Rourke.com) is a native of Jefferson City, and currently resides in St. Louis. Steve is an independent consultant who advocates for efficiency and sustainability through the intelligent use of energy and information. He currently works with Microgrid Energy to promote renewable energy and efficiency, and in the process educates those prospects about the importance of energy efficiency and conservation. He also writes a monthly column in *Spirit Seeker* magazine called *Going Green*. You can find these and other articles on his blog - www.IntelEfficient.com.

In order to achieve energy independence in our homes, we need to create a *net-zero* energy home. In short, this is where we produce as much energy as we consume using any number of renewable forms of energy. To do this, though, we need to use renewable energy *conservatively and efficiently*.

Conservation

This should be the no-brainer, but reprogramming our brains and behaviors is probably the most difficult challenge. In the era of cheap energy, there wasn't a great deal of incentive to turn out lights or turn off appliances. However, just as you would conserve precious water in the desert, we can learn to conserve energy in our homes.

When Jimmy Carter first suggested that one way to conserve energy was to turn down the thermostat and put on a sweater, he was scoffed at by many Americans. We had just emerged from a time when horsepower under your hood was a status symbol, and our trophy cities boasted high-energy lights and fast freeways. So when Ronald Reagan assumed the presidency, one of the first things he did was to remove the solar panels from the White House. Our pride was largely based on our power, and the flamboyant use of energy was a way of showing that power.

What's amazing is the growth in electronics in our homes. We have digital clocks and phones, multiple computers, printers and network equipment, home theaters and boom-boxes, televisions and DVD players, VCRs and DVRs, fans and space heaters, plus power tools and all kinds of kitchen and bathroom appliances. While some of these devices are truly dormant when not in use, many of them continue to draw small amounts of power while waiting to be powered up. For example, anything with a remote control is in a ready-state - waiting for the signal from the battery-powered remote.

We can find chargers for our laptops, cell phones, digital cameras, and personal music players all over the house, and even when they're not charging the device, they continue to consume power, which is distributed as heat.

Some of the stealthiest energy vampires are those digital picture frames that are currently all the rage. It is estimated that by the end of the year, more than 20 million units will have been sold in the United States. Here's the alarming concern. According to the Electric Power Research Institute, if every household in America owned a digital picture frame and let them run 24 hours a day 7 days a week (which they do unless you turn them off), it would require **five 250 megawatt power plants to provide the electricity to run them.** Are you getting the picture?

So, while our parents harped on us to *turn off the lights*, we need to get down and *unplug the appliances*. I know some people need to break the habit of leaving a television on for background noise (or powering up the flat screen while we play digital music on the satellite radio!) But in the average home, nearly **75% of all electricity used to power electronics is consumed by products that are switched off.** One solution is to plug non-essential electronics (obviously not clocks) into a power strip, and turn it on only when needed. Turning it off when you turn off the power is the only way to turn it truly off. New building technologies are enabling lighting and appliances to be controlled remotely through a web interface, with programmable schedules for shutdowns. Another popular money-saver is the occupancy sensor, which automatically turns lights on when you walk in a room, and off when there's no activity in the room for a programmable duration.

While these are just a few of many ways to conserve power, a much larger gain can be achieved with *energy efficiency*.

Efficiency

The most critical factor in energy efficiency is the quality of the *building envelope*, or the shell of your home or office. Whatever you can do to minimize heat transfer – or allowing heat to escape in the winter or intrude in the summer – will minimize your biggest source of energy consumption: the heating and air-conditioning (HVAC) systems. A tight building envelope includes insulation in the outer walls, floors and ceiling, and a tight seal with caulk or weatherstripping around doors, windows, ductwork and pipes.

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If you're building a new home, the best options include **insulating concrete forms (ICFs)**, **structural insulated panels (SIPs)**, or spray foam insulation like **lcynene**. Each of these alternatives will minimize heat transfer, and the corresponding load on your HVAC system. The spray foam can also be used to provide superior insulation on an existing home, though it is more costly than in new construction.

If your HVAC system doesn't have to work hard, that's great. But what's even better is if it works smart. A geothermal heating and cooling system will enable you to leverage the natural heat stored in the earth to heat your home in the winter, and conversely exhaust your heat into the earth in the summer. Geothermal systems are actually **ground-source heat pumps**, and are much more efficient than the air-source heat pumps that were popularized years ago.

Your refrigerator(s) and other major appliances are next on the list. If you have an old refrigerator (manufactured before 2000) you can probably cost-justify a new refrigerator and pay for it with the energy savings in a few years. New ENERGY STAR refrigerators typically use

40 percent less power than traditional models, and can often pay for themselves within ten years. If you're looking for a new appliance, including dehumidifiers, dishwashers, washers & dryers, televisions and computers, be sure to look for the ENERGY STAR label. You may pay a little more for it, but the additional cost will almost always be offset with energy savings within a few years.

The last area with the most low-lying fruit is lighting. Lighting typically accounts for 20-30 percent of your total electric bill, so it's a great place to start. Many people have begun switching over from traditional incandescent bulbs

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to compact fluorescent bulbs, or CFLs. CFLs use 25% of the energy of a comparable incandescent bulb, and typically last 5-6 times longer. One primary concern about CFLs is that they contain mercury, so it is very important to recycle them rather than simply throwing them away. Many home stores, like Scruggs Lumber, have a recycling program so that the bulbs can be properly de-manufactured.

An increasingly attractive alternative is LED lighting. Light-Emitting Diodes are by far the most efficient lighting technology, and they are quickly becoming an affordable option. While CFLs use one-fourth of the energy of an equivalent incandescent, LEDs use only one-tenth of the power of a comparable incandescent. And while CFLs typically last 10,000 hours, LEDs are designed to last 60,000 hours – 40 times that of a traditional incandescent! Here's the fascinating point: 90 percent of the energy used by an incandescent bulb is heat, and only 10 percent is converted to light. LEDs, on the other hand, use 90 percent of the energy for light, so only 10 percent is wasted as heat. In the summer, this will also reduce your cooling bill!

One shortcoming that is often overlooked is dimmers. Indeed, dimming an incandescent does reduce the amount of power consumed, although some of that energy is still wasted as heat. Some CFLs are dimmable, but tend to be 4-5 times more expensive than their non-dimmable counterparts. The lighting variance on CFL the dimmer is also not nearly as wide. LEDs are also available with a dimmable option, but are also very expensive (\$30-90 per bulb).

An energy audit will often identify a number of home improvements, and can often reduce your energy use by as much as 50 percent. Once you've stopped wasting electricity, it's time to start producing your own using clean, renewable energy from the sun.



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Renewable Energy

From a global standpoint, there is no "silver bullet" that is going to replace our mix of fossil fuels. That should be no surprise – neither coal, oil nor natural gas would be a panacea solution even with unlimited supplies. However, the mix of renewable sources of energy forms "silver buckshot."

Virtually all of our power originates from the sun. This great fireball in the sky produces more energy than is fathomable – it has been cited that more energy falls on the earth in one hour than what is used by the entire human population in a year. Clearly, this is an abundant resource that has tremendous potential.

The sun's energy is the basis of fossil fuels, as the decayed plant matter originated from photosynthesis. The condensation of water from sunlight causes clouds to fill, rain to fall, and rivers to run. While much of the solar radiation is absorbed and stored in the earth, the irregular heating causes weather patterns and the resulting winds.

Solar energy can be converted to electricity with *photovoltaic* (solar PV) systems, or the thermal heat can be transferred to water or air. Solar PV systems are becoming much more affordable, particularly with the host of financial incentives now available. The solar arrays must be oriented south, facing the sun, in order to most fully capture the sun's energy. So if you have a south-facing roof (or property to install a ground-mounted system) you should be able to create a cost-effective solution.

Wind is another attractive source of renewable energy. It has been widely cited that there is enough wind in three states – Texas, Kansas and North Dakota – to satisfy the electric demand of the entire country. The problem is that our outdated grid is not designed to distribute the power long distances, and the electricity is not easily stored. Many people are interested in using wind to power their home or business, and it makes sense if you live in an area that has 12 mph average winds and sufficient property. It certainly won't work for everyone though.

Your renewable energy system can be *grid-tied* to supplement existing power, or you can have an *off-grid* system that charges batteries off of which your lighting and appliances run. With grid-tied systems, you can store your power on the grid in the rare situations when you produce more than you consume.



If you want to protect yourself from occasional power outages, you can include a battery backup system to power your essential lighting and appliances, usually from 1-2 days to as much as a week! The switchover is transparent, and provides peace of mind in an increasingly unstable time.

Bottom Line

There have been a number of moments in American history where we came together and focused our efforts to produce something remarkable. The dark days following the Great Depression created an electrified and better-connected country. In WWII, we rationed our resources, retooled our factories, and put women to work while men enlisted in the military. In the 1960's, our space program put a man on the moon. With leadership and commitment, we can pull together to create true energy independence.

The cheapest energy is that which is not used. By using energy more efficiently and conservatively, we can eliminate the need to build more fossil-fueled power plants. By generating our own power, we can do for the energy industry what the personal computer did for the computer industry.

Take a look around
your home, and see
what you can do
to make a difference!