

# [harvesting the sun]



Imagine a clean, reliable, inexhaustible energy source that in one minute can supply enough energy to meet the planet's demand for one year. Imagine, also, this source delivered to your home daily for free. You have imagined the SUN!

Now, imagine an area the size of metropolitan Phoenix that is capable of generating enough energy to meet the total electrical demand of the entire United States. The solar electric generating system (SEGS) at Kramer Junction, California is the operational model for this scale of project (see [www.kjcsolar.com](http://www.kjcsolar.com)). This plant in the Mojave Desert along with several others owned and operated by private enterprise now generate over 300 megawatts of power and sell it at a profit to public utilities.

Arizona Public Service (APS) has come a long ways in the commercialization of solar energy. Any customer can purchase solar power today through the Solar Partners Program. APS is also building solar electric power plants totaling about 1 megawatt of power. Significant APS solar incentives are also through the EPS Credit Purchase program.

### Some Energy History

The problem, however, is the United States' absolute preference historically for fossil fuels and nuclear over any alternative form of energy production. And, despite some tepid attempts in the 70's to turn to alternative energy sources, this preference has dramatically increased our use and, thus, demand for fossil fuels by 25%. Today, 60% of these fuels are imported, 29% from the volatile Middle East. In fact, since 1985, our petroleum imports have increased overall by 125% and from OPEC by 150%. And, to make things worse, attempts to find more national sources of energy (i.e., in Alaska and elsewhere), exacerbate the environmental degradation that reliance on fossil fuels engenders. Most experts agree that world oil production will peak by 2008. What we need is an energy mix where solar energy plays a major role.

The good news, notwithstanding, is that per capita energy consumption in the U.S. actually has not increased since 1973 despite an increase in economic development of 74% and growth in population. Obviously, we have done something to help lower our energy demand.

### Efficiency = effective energy

This "something" is energy efficiency. Indeed, energy efficiency is the key to the cost effective use of energy of any kind. So much so that according to the American Council for an Energy Efficient Economy, we could easily lower energy use by up to 18% by 2010 and 33% by 2020 simply by adopting a comprehensive set of policies for advancing energy efficiency.

This is a lesson not lost on many other countries like Germany, Japan and Britain where per capita energy use is half that of the U.S. But that result takes dedication; a dedication presently lacking in the U.S. Although the White House pledged three years ago to increase R&D funding for renewable energy and energy efficiency, it has been substantially reduced. Over the past 50 years federal money allocated for solar energy research and development has been a fraction of a percent of the money spent on fossil fuels and nuclear. The amount of money allocated for research and development closely mirrors how much energy those sources provide today to the US economy.

Are we going backwards? Perhaps, but there is something that we, as individuals and private enterprise can do on a grassroots level to create and use a more efficient source of energy – the sun. In the southwest, we have, on average, delivered daily to our rooftops 4 times the amount of energy from the sun necessary to provide electrical, heating, cooling and hot water.

So, let's begin with solar hot water. In the early 1980's, solar hot water received a "black eye" that, unfortunately, still lingers today. Large government tax credits, offered to boost this alternative energy source, failed because there was no governmental oversight, no consistent system to certify quality and maintenance was non-existent. The upshot was predictable. When tax credits were eliminated, the industry quickly dried up and purchasers were left holding the "hot water bag."

### Positive changes

But much has changed since then. In 1980, the Solar Rating and Certification Corporation (SRCC) was created. This public non-profit, charged with the development and implementation of certification programs and national rating standards for solar energy equipment, now rates most solar hot water products and systems. You can look any of these up easily at [www.solar-rating.org](http://www.solar-rating.org). Underwriters Laboratory (UL) certifies solar electric products and systems, and the National Electric Code (NEC) set standards for product and installation.

### Solar Hot Water

But how does solar hot water work and why use it? (For information and diagrams regarding how it works, see [www.fsec.ucf.edu/solar](http://www.fsec.ucf.edu/solar)). You will hear the old saws that the payoff period is too long, the rooftop panels are unsightly and the system is unreliable. All not true.

Once purchased (and if well maintained), these systems should last more than 20 years. In terms of payback, the time depends upon your fuel source. If your source is propane or electricity, the system will pay for itself within 5-8 years thus providing "free" hot water for years afterward. If you are on natural gas, the payback period stretches out a bit. However, as energy costs escalate (and we all know they are going up, not down), these payback periods are



Photo: Ken Anderson

Finally, check into solar tax breaks and utility rebates. With a little work, you can save hundreds if not thousands of dollars. For example, APS offers a rebate on solar hot water that pays \$750 and amazing EPS Credit Purchase Program ( see [www.aps.com/eps](http://www.aps.com/eps)) that pays up to \$12,000 (!) for a photovoltaic line tie system.

The state offers a 25% solar tax credit up to \$1000, and the new Federal Energy Policy is expected to offer a 15% tax credit up to \$2000.

So, remember, the cost of present fuel sources: BILLIONS. The cost of solar energy: PRICELESS. ☺



Photo: David Rib

Photo top: The use of solar in residential design

Photos at left, courtesy of Kramer Junction Company - The world's largest solar power facility, located near Kramer Junction, CA. The facility consists of five Solar Electric Generating Systems(SEGS), with a combined capacity of 150 megawatts. At capacity, that is enough power for 150,000 homes. The facility covers more than 1000 acres, with over 10 million square feet of collector surface.

The SEGS utilize parabolic trough collectors to focus the sun's energy on a pipe carrying a flow of heat transfer fluid (synthetic oil). The fluid flows to heat exchangers where the heat turns water into steam to drive conventional steam turbine generators, which produce electrical power.



Photo: Martin Bond

becoming ever shorter. With presently available rebates and tax credits this payback period can be cut up to 1/2.

### Photovoltaics (PV)

Photovoltaics, or solar cells, are semi-conductor devices that convert sunlight into electricity. Basically, these systems are used to charge batteries that provide (and store) electrical current for home and commercial use. You can also use a "grid tie system" that doesn't involve batteries. During the day, the system generates energy for your personal use with extra being "fed" back to the utility for monetary rebate; during the night, energy is drawn from the utility company. Utility bills are minimal given proper system sizing.

PV systems were first developed in the late 50's and 60's to provide power for earth orbiting satellites. Today, due to technological advances, PV systems are readily available, reliable, and economically sound. And, due to this rapid growth, prices continue to come down. Even given the payback period (approximately 10 years), the tax free return on investment is 12% a year and growing. See [www.fsec.ucf.edu/solar](http://www.fsec.ucf.edu/solar) for details.

When selecting a solar hot water or PV system, being informed of pricing, efficiencies, dealer reputation and warranties is vital. Here are sites and info to get you started:

- For Arizona dealers, contact (ARISEA) at [www.arizonasolarindustry.org](http://www.arizonasolarindustry.org) or their solar hot line @ 602-253-8180.
- To calculate the size of a photovoltaic system, see [www.evsolar.com](http://www.evsolar.com).
- To confirm that the system, not just the collectors, are SRCC certified, contact [www.solar-rating.org](http://www.solar-rating.org)
- Remember, this is a long term investment and warranties should reflect that. A minimum of 2-5 years on parts and service is critical for solar hot water. (P.V. modules carry a 20-25 year warranty)
- A good supplier will provide an operation and maintenance manual and complete product data sheets. Discuss availability and the cost of a maintenance program. Talk to other owners of the same system.
- Make sure that suppliers take aesthetics into consideration when integrating the system into your home. State law has been passed that makes it illegal for home-owners associations to ban solar collectors.
- For more detailed information regarding how PV systems work, see [www.fsec.ucf.edu/solar](http://www.fsec.ucf.edu/solar).
- For an Arizona listing of events, courses, distributors, dealers, and Arizona solar applications, see [www.Azsolarcenter.org](http://www.Azsolarcenter.org).

Recommend Installers :  
EV Products - Chino Valley  
Perfect Power - Phoenix  
ETA Engineering - Scottsdale/Tempe

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