

SUSTAINABILITY TIMES

A Monthly Electronic Newsletter Published by ZWORC, © ZWORC 2010

www.zworc.com

How Big a Solar System Do You Need?

By Paul McCright



For a couple of years, I've been planning to install a solar panel system atop my home in Albuquerque, NM. Once you start visiting installation companies, you quickly see that it is not as simple to buy a solar panel system as it is to buy a car or television. That made me think a series of articles about solar panel systems might help anyone else thinking about getting one. There are many decisions that must be made in order to determine the type of system you should buy. In future articles I will discuss some of the choices we have available and some of the finer points of system design.

The first decision you need to make when shopping for a solar panel system is to determine the capacity you want in your system. How many kilowatt-hours (kWh) do you need? How many kilowatts of capacity does your system need in order to produce the needed kWh?

One of the best tools to use in answering these questions can be found at www.PVCalc.com. All the information you need to use the calculator is your zip code, what utility company you have, and your average monthly power bill. The internal workings of the calculator can determine from that information the costs of purchasing electricity and the average solar insolation available in your area. You then need to enter the percentage of your power you wish to generate from the system and check the installed cost per watt for the system. This information can be obtained from an installation company.

Some of the particulars for my personal situation include a monthly average power bill of \$80. My home is heated with natural gas, I have a natural gas water heater, and my home is cooled by evaporative cooling, which uses only a fraction of the power used by air conditioning. Albuquerque is in one of the best locations in the U.S. for solar systems because we have a high average insolation rate. In case you are not familiar with this term, "insolation" is a measure of the amount of solar energy that lands on a spot. It is usually expressed in kWh/m²/day and for my zip code averages 6.30. (For comparison, Phoenix averages 6.54 and Seattle averages 3.78. Most everywhere else is somewhere in between.)

The results of my calculations at PVCalc show that a system supplying all my power needs to be 7.11 kW in size, will cost \$35,849 after governmental rebates, will pay for itself through savings in 21 years 7 months, and will save 15,541 pounds of CO₂ annually. Clearly, you have to think long-term about these systems.



Founder's Corner

Taking Advantage of the Downturn

By Paul McCright

The world-wide economic downturn that began in Dec. 2007 is now well into its third year. While we are seeing the occasional article in the popular press claiming the worst is over, it has yet to become obvious that we are coming out of the recession.

Times are still hard, unemployment is still over 10% almost everywhere, and most companies are still trying to control costs and survive until the good times return. But, here and there, a few forward-thinking companies are seizing the opportunity presented by slower growth or some decline. These companies know there is growth ahead and that those companies that will own the future are the ones most prepared to meet higher demands when the economy heats up again.

So, we have a suggestion for all companies finding themselves with lower production requirements. We suggest this slack time be used for the implementation of Zero Waste Operations. We have several reasons for making this suggestion. First, ZWO helps reduce operating costs by applying lean production techniques to reducing the direct labor, energy, and material costs of doing business. Second, ZWO helps reduce the costs of purchasing materials, the costs of spoilage in all its forms, and the costs of waste disposal. Third, at a time when employees are afraid and disheartened in their normal duties, the implementation of empowering, challenging, future-oriented activities such as those involved in ZWO sends a great signal to employees that the company plans to be around for a long time into the future and is planning to be a better company than now. Such programs will likely motivate and invigorate employees while streamlining and improving production procedures.

You can help save the environment while you help save the company and the jobs of its employees. A Zero Waste Operations Program implementation can be the catalyst to greatness that can remake the company and ensure its long-term sustainability. So, what are you waiting for?

ZWORC Website Temporarily Down

The **ZWORC** website has been temporarily shut down as we make some changes to the content. Hopefully it will be back up very soon. We apologize for any inconvenience. Please watch for our return!

Did You Know...?

Ford recently showed a plug-in hybrid electric car that has been tested by Florida Power and Light and the University of Central Florida. The car is expected to get 120 miles to the gallon.

(Source: WOFL-TV, 3/2/10.)

Waste Reduction Technique of the Month

5S and 6S Plans



One of the fourteen principles widely attributed to Lean Production Systems is "Standardized tasks and processes are the foundation for continuous improvement and employee empowerment." (Full discussions of this and the other principles may be found in Jeffrey Liker's *The Toyota Way* and *The Toyota Way Fieldbook* coauthored by David Meier.) Standardization leads to predictability of results and reduces variations in both quality and productivity. Many techniques can be used to help establish and maintain standardized production, but this month we want to focus on one, the 5S Program.

The 5S Program is a method for organizing work areas to be sure that needed tools, supplies, materials, and information are readily available to each worker, according to the requirements of the tasks comprising the job. The five S's are:

- **Sort** : Dividing tools, materials, and other items into those always required or often required by the process and those required only rarely due to unusual events or circumstances.
- **Straighten** : Organizing the regularly used items into the most efficient arrangement and creating storage or resting places for each item. Many companies even outline the resting spot with strips of tape in the shape of the tool or item. Labels affixed to furniture eliminate any confusion as to what belongs where. This allows a very quick visual assessment to determine if the item is in its resting place or in use.
- **Shine** : Cleaning the work area, removing any items not required by the task.
- **Standardize** : Creating procedures to maintain the work area in exactly this fashion.
- **Sustain** : Creating a sustainable (how we love that word!) work area by holding all employees responsible for maintaining the work areas according to the 5S requirements. The use of periodic audits is suggested.

Leading companies are now adding a sixth S:

- **Safety** : Focusing attention on working safely by keeping the work area and equipment clean and well-maintained and following proper procedures.

Linvatec, a world-class maker of surgical tools and supplies located in St. Petersburg, FL, has had a very strong 6S program for a number of years. A stroll through the company's production facility is like walking through a spotless kitchen or a surgical suite (perhaps a better analogy for this company). The company believes the 6S Program makes a significant contribution to productivity, quality, and profitability. 5S/6S Programs contribute directly to environmental sustainability by reducing material waste and processing times (thus often saving energy). **ZWORC** believes 5S/6S Programs are necessary for a company to be a fully sustainable enterprise.

Universities Going Green

Many US universities are getting on the Sustainability bandwagon by developing recycling, energy efficiency, and alternative energy production.

The University of Utah is remodeling its 40-year-old Architecture building into a structure that will have "net-zero energy consumption and zero carbon emissions each year." The building will also conserve water, give users feedback on energy consumption, and feature recycling. (*Deseret Morning News*, 3/30/10).

Geddes Hall, a new building at **Notre Dame** received a gold LEED certification. The building features low-flow plumbing and low water use landscaping. It was built with a significant amount of recycled materials and 97% of construction waste was diverted from landfills. (*South Bend Tribune*, 3/31/10)

New Mexico Tech is considering building a \$5 million geothermal heating system on its campus with federal stimulus money. The plant would replace virtually all the natural gas heating currently used on campus, saving the university over \$500,000 annually, showing this project is both environmentally and economically sustainable. (*El Defensor Chieftan*, 2/17/10)

Florida State University completed a zero-emissions demonstration house on its campus in 2009. The house combines several examples of passive solar design with solar panels and hydrogen technology to provide electrical power. (<http://www.fsu.edu/news/2009/08/14/clean.energy/>, accessed 10/5/09)

Stanford University uses waste heat to improve the performance of a fossil-fuel power plant. Stanford's on-campus power plant generates power from a 39.2 MW natural gas powered turbine that feeds a heat recovery system operating a 10.7 MW steam-powered turbine. This installation improves the efficiency of the process by about 20% over a typical gas system without the cogeneration add-ons. (<http://www.stanford.edu/group/EMG/html/cef.html>, accessed 9/8/09)

Arizona State University is installing 2 megawatts of photovoltaics on 135,000 square feet of rooftops and parking garages on its main campus. This system will meet 7% of the university's power requirements, save about \$425,000 annually and reduce ASU's carbon footprint by 2,825 tons. (*ASU Alumni Magazine*, Fall 2008)

These are but a few examples of the dozens of universities that have taken concrete steps to reduce their use of non-renewable resources, reduce their carbon footprints, and save money. These universities are making a valuable contribution to the future of America and the world.

Did You Know ... ?

A 2009 study by the Sustainable Futures Institute (Michigan Technological University) concludes that jet fuel produced from an oilseed crop called camelina could reduce greenhouse gas emissions by over 80% compared with jet fuel made from petroleum. Camelina needs little water and is considered well-suited for growing conditions in the northern plains. Boeing spokesman Terrance Scott says, "Camelina is one of a handful of crops with the potential to provide sufficient feedstock to make large quantities of jet fuel.

(Source: Associated Press, 4/29/09)

Sustainability Times is published electronically monthly by Zero Waste Operations – Research and Consulting (ZWORC). All content is copyrighted by ZWORC. Suggestions and submissions may be made at editor@zworc.com. If you wish to be added to or removed from the mailing list, contact editor@zworc.com.