

Control Your Energy Use & Costs

with Solar Monitoring

Horst Wend

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Author Horst Wend with the photovoltaic system that he can monitor from anywhere via the Web.

This past year, I installed a 2.5 KW solar-electric system with sixteen Sharp, 185-watt modules and an SMA Sunny Boy 2500 inverter at my home. I chose to go solar because I wanted to do something good for the environment, and I hoped to reduce my electricity bill in the process.

I was really excited about my new solar-electric system, but I was concerned that I might not know if I was making the best energy usage choices, or if I was getting the most out of my investment. How would I know if my system was working to its fullest potential, or if I was making effective energy usage decisions?

Real-Time Solar Monitoring

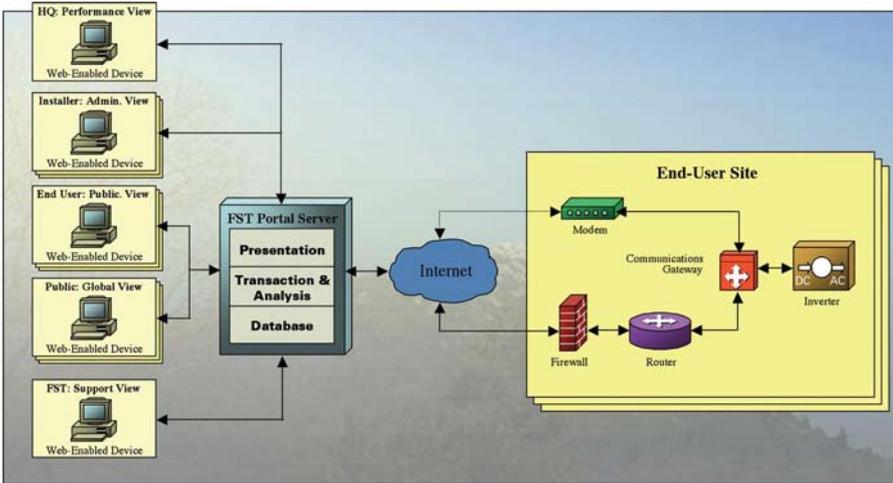
I realized that I would need access to energy data to gain an understanding of how I could optimize my solar energy system. I contacted my installer, Akeena Solar, and they recommended that I install a monitoring system. They suggested a new monitoring product, PV2Web, a Web-based system developed by Fat Spaniel Technologies (FST).

Here's how it works. Data from sensors at the inverters and the main electrical panel (and environmental channels, if ordered) is sent to a communications gateway. This is preprogrammed, so I did not need to load any software. The

Room for Improvement

On the downside, I would like to see more features, such as reporting capabilities for previously collected data, so I can do more in-depth data analysis. It would be nice if users could select different ways for the Web site to present the data (pie graph, bar graph, etc.).

I would also like to have an option to get into the data itself. I see a lot of possibilities to extend the monitoring system so I could, for example, insert data from electricity bills before the PV system to get a comparison and some idea how much I am saving with the PV system. I sent some suggestions to Fat Spaniel and they already have implemented many of them. It has been great working with them.



The Fat Spaniel PV2Web links photovoltaic system data to the World Wide Web.

information is then sent out to the Internet via broadband, modem, or wireless, where Fat Spaniel Technologies processes the data and presents the Web pages.

What I like most about the Web-based monitoring is that I can access the data in real time from anywhere I have a Web connection. It gives me the option to check on the system even when we are not at home, from any computer, or from my cell phone or PDA. For example, we recently had our roof redone, and the roofers accidentally disconnected one of the solar-electric arrays while I was away. With the monitoring system, I noticed that even though it was a sunny day, the system wasn't generating as much electricity as usual. So I had Akeena come out, and they fixed the system right away.

Production & Usage Data

With the standard PV2Web product suite, I can easily view my historical energy production and usage in real time. The PV2Web product gives reports of my peak energy usage and total energy usage for the day, week, and month. Using these reports allows me to increase my long-term return on investment by allowing me to select the utility rate that best matches my usage and projected solar output.

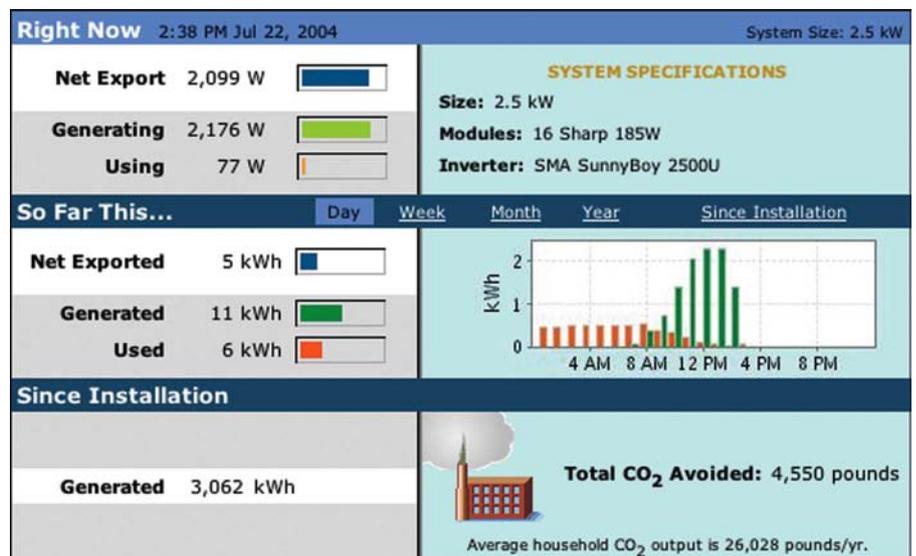
Another great feature PV2Web offers is automated alerts that let my installer know when my solar-electric system is not functioning to its capability. Akeena Solar is able to monitor my system remotely and immediately identify problems. This capability allows me to save on travel and service charges, and allows my installer to take immediate action to fix any issues I might be having with my system.

Cost

The overall cost of an FST system seems high, but to me it didn't look that bad when I looked at my total cost, and the very real benefits of the system. The total cost of our PV system was US\$27,000. However, we got a US\$11,700 refund from the state, as well as a tax deduction, which brought down the total out-of-pocket costs for us to about US\$12,000.

I work in the software industry and love technology, so I was very interested in all the monitoring capability Fat Spaniel provides. Adding usage monitoring enabled me to actually see how much the refrigerator, washer, dryer, Jacuzzi, and other appliances contribute to our electricity consumption.

Real-time PV2Web display of Horst Wend's photovoltaic system.



Fat Spaniel Monitoring System Cost

Item	Price (US\$)
Basic PV2Web monitoring system	\$1,428
Optional irradiance & temperature monitoring	400
Optional building demand monitoring	338
Channel for one additional inverter	275
Total	\$2,441

Increase Awareness & Control Costs

PV2Web is powerful yet simple to use, and provides easy-to-understand, real-time insights into my energy system. It's easy to work with because there is no software for me to install or maintain, and I can view my data from any Internet-enabled device. I have enjoyed being able to show my friends how well my system is performing.

I have been able to increase my awareness of electricity use, and I make more energy efficient decisions. For example, I know that when I use our washer and dryer, they draw several KW for about an hour (mostly the dryer). The monitoring system raised our awareness, so we now make sure the washer and dryer are fully loaded before we use them instead of doing smaller loads. Also, I saw after I filled the Jacuzzi in March that it used an enormous amount of electricity for two days to heat it up. Next time, I'll fill it from our hot water supply, since this is more cost effective.

I was able to improve my net metering results by maximizing energy export and load shifting, and reducing my electricity bill through tighter management of my energy production and usage. The PV2Web data allowed me to control my energy costs by taking advantage of inexpensive, off-peak rates.

By shifting my energy usage and producing electricity during peak hours, I've been able to reduce my electricity consumption significantly, and I've reduced my electricity bill by 50 percent! Based on the PV2Web data, I'm also considering expanding my system to gain the maximum energy production for my specific use, and to maximize my savings as well.

What I've learned is that installing a grid-tied solar-electric system is just one step in smart energy management. An even more important step is making efficient changes to your energy production and usage through monitoring of your renewable energy system.

Access

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Other monitoring systems:

Sunny Boy's system can publish data to the Web • www.sma-america.com

OutBack Power Systems is working on this capability • www.outbackpower.com

Fronius has data collection, and soon a networkable display • www.fronius.com

SolarQuest • http://data.solarquest.com

Northwrite • www.northwrite.com/monitoring.asp

Draker Solar Design • www.drakersolar.com

WinVerter-Monitor • www.righthandengineering.com

