

## GOOD WEB RESOURCES

☀ Federal Tax Credits for energy efficiency

<http://www.energystar.gov/>

Use search box – type in tax credits.

☀ Stay tuned for State Renewable energy development program.

<http://www.ahs.dep.state.pa.us/newsreleases/default.asp?ID=5150&varQueryType=Detail> or

[www.depweb.state.pa.us/energyindependent](http://www.depweb.state.pa.us/energyindependent) for PA's Energy Independence Strategy.

☀ Financial Opportunities for Consumers at U.S. Dept. of Energy-Energy Efficiency and Renewable Energy

[www1.eere.energy.gov/financing/](http://www1.eere.energy.gov/financing/)

☀ PA's Special Financing Plan for ENERGY STAR® Home Performance and High Efficiency Home Improvements from Keystone HELP HOME ENERGY LOAN PROGRAM

[www.keystonehelp.com/](http://www.keystonehelp.com/)

☀ The Tax Incentives Assistance Project (TIAP)

[www.energytaxincentives.org/](http://www.energytaxincentives.org/)

☀ Database of State Incentives for Renewables & Efficiency (DSIRE)

[www.dsireusa.org/](http://www.dsireusa.org/)

☀ American Solar Energy Society

[www.ases.org/](http://www.ases.org/)

☀ Solar Energy Industries Association (SEIA)

[www.seia.org/](http://www.seia.org/)

☀ To find a solar dealer near you click link

[www.findsolar.com/](http://www.findsolar.com/)

### Adams County Conservation District

670 Old Harrisburg Road, Suite 201

Gettysburg, PA 17325

Phone: 717-334-0636

Fax: 717-337-0730

Email: [lmartick@adamscounty.us](mailto:lmartick@adamscounty.us)

Web: [www.adamscounty.us](http://www.adamscounty.us)

(Click on Administrative-Conservation District)

## Adams County Conservation District's

# SOLAR PHOTOVOLTAIC DEMONSTRATION PROJECT



**Dual Axis Tracker - 2.8 kW**



**Fixed Ground Mount - 8.4 kW**

## BACKGROUND

In 2005, the Adams County Conservation District (District) applied for a Department of Environmental Protection Energy Harvest Grant.

([www.depweb.state.pa.us/energy](http://www.depweb.state.pa.us/energy))

The goals and objectives of the \$40,500 state funded grant were to:

- Install, promote, and demonstrate an 11.2 kilowatt (kW) solar photovoltaic (PV) system that generates electricity at the Adams County Agricultural and Natural Resources Center.
- Compare the performance, costs, and electricity generated between the dual-axis tracker located in front of the building and the fixed array located behind the building. The dual-axis tracker moves on two axis – a daily east-to-west axis and a seasonal angle-altering axis. The fixed array is positioned facing south and has no moving parts. It is composed of 48 separate panels divided into three groups of 16. Each 16 panel group is rated at 2.8 kW. The dual-axis tracker is composed of a total of 16 solar panels with a rated output of 2.8 kW.
- Install a monitoring system that can track the performance of both systems and be accessed through the internet or at the Ag Center. (Sunny Portal website: <http://www.sunnyportal.com/Templates/PublicPageOverview.aspx?plant=8abde64-d743-4278b22ae8396ade784f&splang=en-US>).

- Improve air and water quality by producing electricity on site, thus reducing air emissions.
- Provide educational materials about solar PV systems.

Based on the EPA's Power Profiler

<http://www.epa.gov/powerprofiler/>,

the annual emissions attributable to the electrical use by the Ag Center ranges between 906 to 1,617 pounds of nitrogen oxides; 2,800 to 5,000 pounds of sulfur dioxides; and 401,969 to 717,801 pounds of carbon dioxide a year. An 11.2 kW system will reduce the emissions of NO<sub>x</sub> by 46 pounds; SO<sub>4</sub> by 182 pounds; and CO<sub>2</sub> by 32,800 pounds every year.

## FUNDING & COSTS

Funding for the PV project came from three separate sources:

- DEP Energy Harvest Grant – ([www.depweb.state.pa.us/energy](http://www.depweb.state.pa.us/energy)) **\$40,500**
- Department of Community and Economic Development (DCED) Single Application grant – ([www.dced.state.pa.us](http://www.dced.state.pa.us)) **\$44,000**
- Balance of the funding came from the Adams County Conservation District. **\$20,762**

Total contracted project costs = **\$105,262.**

Additional costs were incurred to purchase the TV monitoring system (\$700); install the fence around the tracker (\$500); and to increase our insurance coverage to protect

us from theft, vandalism, lightening strikes and other weather related risks (\$80/year.)

SunTechnics, Inc. ([www.suntechnics.com](http://www.suntechnics.com)) of Peoli, PA was the company that was contracted for this project.

## RESULTS

The completed PV system only began generating electricity at the end of July, 2008. In trying to simplify the comparison between the cost of installing a dual-axis tracker and the amount of electricity that it produces with a fixed array panel, it is easiest if the comparison is made between the 16 panel 2.8 kW dual-axis tracker and the same sized fixed array (Only 16 panels/2.8 kW of the 48 panels.)

The **2.8 kW dual-axis tracker in 2008 cost \$28,975**. Because the dual-axis tracker moves with the sun and the season and is more efficient in converting the sun's energy into electricity, it is expected to produce somewhere between 20 to 40 % more electricity per year than a similarly sized fixed array system. According to information provided by SunTechnics, Inc. the estimated cost of electricity generated by the dual-axis tracker is estimated to cost **\$10.63/watt**.

The three 2.8 kW or 8.4 kW combined fixed array system cost \$76,287 or an average of **\$25,429/2.8 kW array**. The estimated cost per watt for the electricity generated by the fixed array is **\$8.99/watt**.

\$10.63/watt tracker  
-\$ 8.99/watt fixed array  
\$ 1.64/watt difference

However, even though the dual-axis tracker costs approximately 15% more than the fixed array, at present it is more cost effective because it is producing roughly 20 to 40% more electricity compared to the 15% increased cost. (You may go to the Sunny Portal website for an actual comparison.) With the more efficient dual-axis tracker, we might incur additional maintenance costs as there are some moving parts that may break or require additional costs compared to the fixed array system. The fixed array system has no moving parts and should require very little maintenance.

## COST BENEFITS

- ☀ Average home uses 1250 kW per month.
- ☀ Average home electric bill is **\$83.75** a month using a price compare value of **\$0.067** per kW (August 2008).
- ☀ A 16 panel dual axis tracker produces about 500 kW per month.  
Results in a saving of **\$33.50** a month while in use.  
Total cost of unit is approximately **\$30,000** and at current cost rates will take **75 years** to recoup value.
- ☀ A 16 panel fixed array produces about **375 kW** per month.  
Results in a saving of **\$25.00** a month while in use.  
Total cost of unit is approximately **\$25,000** and at current cost rates will take **100 years** to recoup value.

☀ If a **30% electric rate increase** were to occur:  
Average home electric bill is **\$108.88** a month using a price compare value of **\$0.0871** per kW (30% increase from August 2008).

A 16 panel dual axis tracker produces about 500 kW per month.

Results in a saving of **\$43.56** a month while in use.  
Total cost of unit is approximately **\$30,000** and at current cost rates will take **57 years** to recoup value.

A 16 panel fixed array produces about 375 kW per month.

Results in a saving of **\$32.67** a month while in use.  
Total cost of unit is approximately **\$25,000** and at current cost rates will take **64 years** to recoup value.

☀ If a **50% electric rate increase** were to occur:  
Average home electric bill is **\$125.00** a month using a price compare value of **\$0.10** per kW (50% increase from August 2008).  
A 16 panel dual axis tracker produces about 500 kW per month.

Results in a saving of **\$50.00** a month while in use.  
Total cost of unit is approximately **\$30,000** and at current cost rates will take **50 years** to recoup value.

A 16 panel fixed array produces about 375 kW per month.

Results in a saving of **\$37.50** a month while in use.  
Total cost of unit is approximately **\$25,000** and at current cost rates will take **56 years** to recoup value.

## IMPROVING THE ECONOMICS OF A SOLAR PHOTOVOLTAIC SYSTEM

Presently, based on our data of this project and as shown in this brochure, the present economics (the cost/return benefit) of installing a solar PV project are not favorable. Looking to the near future, several things will need to occur to improve the cost/return payback including:

- Hopefully, the cost of purchasing and installing a solar PV system will continue to drop based on changes with improvements of the technology as well as due to increased supply and demand.
- Government support – Federal and state grants and tax-credit programs need to improve the present cost/benefit payback. In July 2008, Governor Rendell signed House Bill No. 1 which is a \$650 million package of loans, grants, reimbursements and rebates to support energy conservation and weatherization projects.  
<http://www.depweb.state.pa.us/energyindependent/site/default.asp>
- Electricity Costs- As electricity deregulation is set to occur between 2010 and 2011 in Pennsylvania, electric rates are expected to rise dramatically. The increased electric rates will help to improve the economics of installing a solar PV project.