

SOL MATES

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CREATING A SOLAR FUTURE Customers and APS — Partners in Progress

APS' STAR Center, Redhawk Power Plant Win Environmental Excellence Awards

APS' was lauded for its environmental stewardship at the 25th Annual Environmental Excellence Awards in September as the APS Solar Test and Research Center (STAR) and the Redhawk Power Station



took home the coveted Crescordia Award and an award of merit respectively.

"I couldn't be more proud for APS," said Scott Davis, APS director of Environmental Health and Safety and Valley Forward Association's chairman of the board. "These are very prestigious awards for the company and for the individuals at both STAR and Redhawk who strive to make APS an environmentally-conscious corporate citizen. These awards speak volumes about our company's dedication to work in harmony with the environment."

Hosted by Valley Forward Association, the Environmental Excellence Awards are given in several environmental categories, with hundreds of entries being submitted from Arizona's private and public sectors.

The APS Star Center, which hosts some of the most advanced renewable technologies in the world and is the crown jewel of APS' solar efforts, won the Crescordia in the Environmental Technologies category.

"Winning the Crescordia is very humbling," said APS Technology Development Leader Peter Johnston. "I am very proud of every employee at STAR and am thankful to the company for maintaining this important commitment to developing renewable technologies."

The Redhawk Power Station, a major component of APS' power generation and delivery system, took home an award of merit in the Livable Communities category for its efforts to create a sustainable environment. From the re-vegetation of the arid land it occupies, to its commitment to a zero-liquid discharge site, to its employees

creating habitats for local burrowing owls, the plant is a prime example of industry working in concert with the community and the environment.

Redhawk Plant Manager Scott Takinen also expressed his gratitude for having Redhawk selected as an award of merit winner.

"Our job at Redhawk is to produce power for our customers, but it is also to protect and nurture our natural resources," Takinen said. "I am very proud of the fact that our plant uses no groundwater in our operations and that we are working to bring back arid lands to their natural state through our re-vegetation program. We also are friendly to our indigenous neighbors, the burrowing owls which we help by creating nests for them to live in. I think that's a great story to be able to tell about our plant and our company."

APS Allocates an Additional \$2 Million for Residential, Commercial Solar Energy Projects

Funding Covers Solar Water Heating

An additional \$2 million is now available for APS customers who want to install residential or commercial solar energy projects.

The funds, available on a first-come, first-served basis, are available under the APS Environmental Portfolio Standard Credit Purchase Program (CPP). The additional funds bring the total money available in the CPP to \$4.25 million in 2005.

To ensure availability, customers must first call APS and reserve monies for their projects, which must be professionally installed and completed in 180 days.

Under this program, customers receive up to \$4 per watt of installation, or up to 50 percent of the installed projects for grid-tied systems and up to \$2 per watt for off-grid systems. In addition, customers may receive up to \$700 for solar water heating systems.

For more information, customers may access the APS Web site at www.aps.com/my_community/Solar/eps.html.

Customers may also call 602-250-4990.

The program is currently under review by the Arizona Corporation Commission (ACC) which regulates APS. Any modifications to it are expected to be announced by year end.

H i g h l i g h t s



- Southwest Sustainability Expo
- APS' Renewable Energy Projects
- New Solar System For NAU
- APS, Yuma Team For Solar Garden



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Yuma, APS Harness Sunshine at West Wetlands Park 'Solar Garden'



The City of Yuma's abundant sunshine is helping to bring additional, clean, renewable energy to the Yuma community. Through a new partnership, the City of Yuma and APS are harnessing the sun's rays to generate energy in a "solar garden" at the Yuma West Wetlands Park.

"I'm extremely excited to see this facility come to fruition," said Roger Blakeley, Park Development Manager when the site was dedicated in October.

"I'm also thankful to work for a city that has the motivation and vision to undertake a project that creates an opportunity for all of us to learn about solar power and how it can affect our lives."

The "solar garden" consists of 24 single-axis photovoltaic trackers that produce a total of 86.4-kW of power that will be fed directly into the electrical grid. This is enough energy to power approximately 20 homes in the Yuma area. Over a year, the tracker technology will provide up to 30 percent more energy than equally sized,

traditional, fixed photovoltaic panels, which do not follow the sun's movement. Facing south, the trackers rotate approximately 80 degrees from the east in the morning to the west in the afternoon. They rotate from 9:30 a.m. until 3:30 p.m., and work with the utilization of a clock, controller and hydraulic pump to move about two degrees every eight minutes.

Like all other projects in the Yuma West Wetlands Park, the project will be linked to educational opportunities.

The park is an environmental haven of trees, trails, and burrowing owl habitats, all intertwined with educational outreach.

"This particular project will increase awareness of viable alternatives for producing clean energy," said Ed Fox, APS Vice President, Communications, Environment & Safety. "Perhaps the biggest benefactors of this project are the young people of Yuma, who will grow up with alternative energy in their backyard and realize its potential in everyday applications."

New Solar System Planned for Northern Arizona University

Northern Arizona University recently broke ground on what will be the new Applied Research and Development building on the Flagstaff campus. The building has been designed to platinum (LEED) standards, the highest of the Leadership in Energy and Environmental Design program.

As part of the platinum certification, the building must draw at least 20 percent of its electricity from a dedicated renewable energy power plant. NAU has contracted with APS to build a 160-kW single-axis tracking photovoltaic system to provide that electricity.

Modeled on APS' successful tracking system design, the solar power plant should be completed in time for the dedication of the new building.

The APS Foundation presented NAU with a \$1 million gift in June to be used toward construction of the University's Applied Research and Development building and to provide scholarships and internships for students.

About \$500,000 of the APS \$1 million donation will be directed toward construction of the new building. The other \$500,000 will support the APS Scholars, Leadership and Innovations Fund, which will support student scholarships and internships, as well as other initiatives selected by NAU and APS.

APS Sponsors Southwest Sustainability Expo, More than 2,000 Attend



The APS booth was especially busy during August's sustainability exposition.

More than 2,000 people attended the Southwest Sustainability Expo on the grounds of Northern Arizona University (NAU) in August.

The APS Technology Development department was a major sponsor of the event and talked with hundreds of people about the company's renewable energy efforts, hand-

ing out educational materials including some geared for young readers.

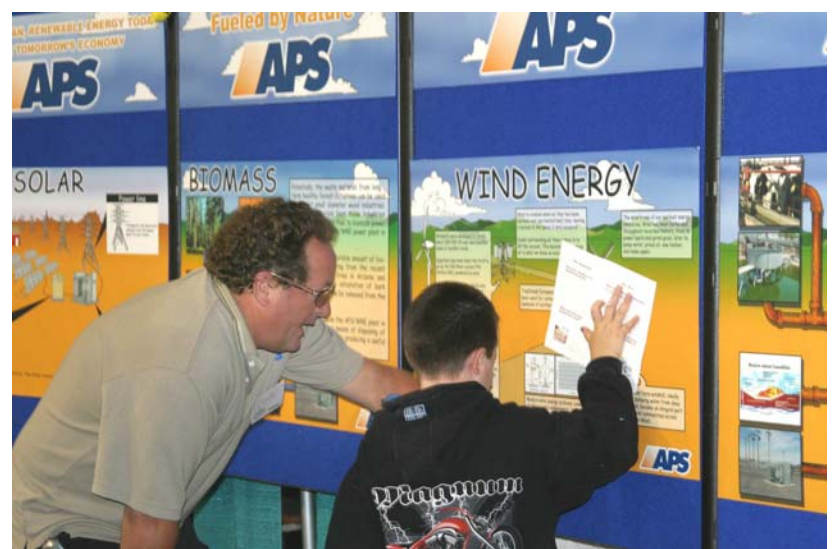
The company provided speakers for workshops and staffed the department's renewable energy booth both days.

"This was the perfect event to showcase APS' commitment to

renewable energy," said Peter Johnston, leader, Technology Development, about the event, which included more than 80 vendors showcasing sustainability products and education-related information and services.

"We get to showcase our efforts and the progress that APS is making in the development of green technologies," he said.

The Center for Sustainable Environments at Northern Arizona University and the Greater Flagstaff Economic Council co-produced the event.



Youth being served at the APS renewable energy project display.

APS Builds State's First Commercial Solar Trough Power Plant

On an otherwise bare, APS-owned patch of desert in Red Rock, 30 miles north of Tucson adjacent to APS' Saguaro Power Plant, APS has completed Arizona's first commercial solar trough power plant.

The plant is rated at 2,000 megawatt-hours and will generate enough electricity to power about 200 homes. The solar trough plant also will be the first of its kind to be constructed in the United States since 1988.

"We're putting one of the most successful, large-scale, proven solar technologies back in the forefront," says Scott Canada, APS project engineer, Technology Development Department. The plant's \$6 million construction cost will come from the APS Environmental Portfolio Standard (EPS) Program, made possible by the Arizona Corporation Commission's adoption of the program in 2001.

How Solar Trough Technology Works

Solar trough technology absorbs heat from the sun. The parabolic shaped mirrors concentrate the sun 30 to 60 times the sun's normal intensity onto a receiver pipe along the focal line of the trough. Synthetic oil circulates through the pipe capturing the heat, reaching temperatures between 250 and 550 degrees F. The hot oil is then pumped through a heat exchanger on the power production side of the plant to produce pentane vapor.

The vapor powers a small, compact turbine and is then condensed back to pentane fluid in a cooling tower. The pentane is then pumped back through the heat exchanger.

A unique aspect of the plant is the combination of the relatively low-cost parabolic solar trough thermal technology with the commercially available, smaller turbines, usually associated with geothermal generation plants.

While the basic technology of the solar trough has not changed, the technology has advanced.

"The controls, the tracking and the supporting structures have all been improved. They all add up to increased efficiencies," said Canada.

Bob Cable, project manager for APS subcontractor Solargenix Energy, agrees. "The advances in this technology have not changed by leaps and bounds, but they



Northern view of the new solar trough plant near APS' Saguaro Power Plant.

have been fine tuned, lowering overall costs," he said.

With the technology so promising, one wonders what put the big chill on the industry; a chill that lasted for the past 15 years. Gilbert Cohen is a mechanical engineer and vice president of Operations and Engineering for Solargenix Energy. He also has conducted research and development in solar energy for 30 years.

The way he sees it, the industry died out in the 80s when incentives for such plants in California were discontinued, triggering skittish investors to pull away when the tenth solar trough plant was under construction. When the oil crisis ended around the same time, so did interest in the alternative energy technology.

"Those plants are still operating today," said Cohen. "And, the operators of those plants have been very active, gathering data and improving and developing the next generation of solar trough generation," he says. Interest is growing, in part,

due to the rise of state mandates of renewable energy.

In fact, the Red Rock plant will help APS meet the goals of the Commission's EPS program, which requires that 1.1 percent of APS energy come from renewable sources.

After the plant's construction is completed in June, 2006, Canada and his crews will spend about six months running tests and tending to all details associated with ramping up any power plant.

It turns out that the once desolate patch of desert extends to about 25 APS-owned acres, of which 12 to 15 will be occupied by the solar trough plant. Canada hopes that's enough space for either expansion of the plant, or use of other renewable technologies on site. And, it turns out that the one power line that angled the property was no accident. All that renewable energy will connect to the electrical grid via that line, reducing the overall costs of building the plant due to its proximity to the solar trough plant itself.

Other Renewable Energy Projects

In addition to the above projects, the following are due for completion in the next two years:

Project	Description	Capacity (kW)	Project Type	On-Line Date
Cochise Community College	Solar HVAC	250	Credit Purchase	2006
Desert Outdoor Center	Solar HVAC	50	Credit Purchase	2006
Western Wind	Wind farm in Kingman	15,000	PPA	2007
Snowflake Biomass	Biomass power plant	3,000	PPA	2007
NAU	PV Solar System	160	Credit Purchase	2006
Phoenix Civic Plaza	PV Solar System	100	APS build	2007
Abitibi Biomass	Biomass power plant	10,000	PPA	2007