

Environment**Solar gets overshadowed in energy debate**

by Jenn Kight

Despite gas prices projected to hit \$4 per gallon by summer and rising electricity rates, homeowners and businesses alike aren't using a low-maintenance and sustainable technology that has been around since the 1890s: solar.

"This has been around since the turn of the 20th century," explained Andy Lau, an associate professor of engineering design at Penn State. "Back in the early 1900s, before there was even an electricity grid, there were solar water heaters all over the south and west, especially in southern California and Florida. Some of those systems are still working."

There are three ways to harvest solar energy: through the use of passive solar energy, a solar electric system, known as a photovoltaic system, or a solar thermal system.

Passive solar refers to building methods that use the structure to capture the sun's heat and then store or distribute it, thus reducing the need for conventional heating, cooling or lighting, according to the Pennsylvania Department for Environmental Protection. The department cites south-facing windows, dark-tile floors, stone fireplaces, brick interior walls and super-insulation as examples of passive solar design.

The term "photovoltaic" describes the conversion of light into electricity at the atomic level. The Pennsylvania Solar Web site explains that photovoltaic technology converts sunlight into electricity, or voltage. The PV cells are composed of semi-conducting materials.

Each cell is approximately four inches square and produces about one watt of power. By grouping the cells together, enough power can be generated to provide lighting for a small light bulb.

Two local examples are the 22 solar electric panels on the roof of the State College Friends School, 1900 University Dr., and the tracker array at Penn State's Center for Sustainability.

Solar thermal systems are fairly simple, explained Lau.

"Solar thermal is basically some sort of metal painted black," he said. "The special coating makes it perform more efficiently. Either way, it's just a specially coated metal sheet with tubing."

Solar electricity, which is generated by a photovoltaic panel on a roof, can be used many different ways, but it is relatively expensive, due to the semi-conducting materials, Lau said. There are federal and state subsidies for photovoltaic systems even though it's not yet cost-effective to buy the system itself.

Lau told *Voices* that his solar thermal system was salvaged in Philadelphia, from an area where about 80 panels were going to be thrown away. Lau and Robert Forsberg, who founded the Julian Woods Community, are working to repair the panels. Lau's system should be ready for installation in the next couple of months, he said.

Lau's household spends about \$300 on hot water each year, using a regular water heater, he said. His solar thermal system will work to heat the water and will probably provide about half of his heated water, saving his family \$150 to \$200 each year.

Because he salvaged the panels, Lau expects his system to pay for itself within seven years, but a typical commercial installation of one of these systems costs about \$3,000 to \$5,000, Lau said. Such a system will pay itself off in about 20 years, depending on usage. Payback sound too far off?

"Electricity rates are going up, so people are extra concerned about doing something now, because we really don't know how much [the electricity will go up]. The average estimate I've seen is 30 percent," he said.

The State College Friends School received a \$30,000 grant from West Penn Power to pay for about half of its solar electric system, Lau said.

The 3.6-kilowatt system saves the school about \$250 a year, covering the cost of powering the lights in the community room and the lights in the kitchen, according to Dan Hendey, the business and facilities manager at the school. Hendey said the school uses a lot more energy than it produces through the panels, but that the panels, located on the school's roof facing University Drive, have a visibility benefit to them. "It makes a statement for the school," said Hendey.

Brittany Harris, president of Eco-Action, a Penn State student group, was unimpressed with the numbers.

"I would think they would save more than that," she said, adding that a better system would be a passive tracking system, one in



Photo by Ben Brewer

State College Friends School is one of the few locations in the Centre Region that uses photovoltaic cells. The solar panels, installed in 2006, only save the school an estimated \$250 per year.

which the panels move with the sun throughout the day.

Lau said that it can be discouraging to some people to hear the actual cost savings from a solar system.

"People want an answer. You hear a lot of hubbub about solar systems, so the initial excitement diminishes when the [cost savings] are revealed." The Friends School system was state-of-the-art when it was installed in 2006.

At the Earth Day celebration on the Penn State campus in April, the Center for Sustainability used six 20-year-old solar panels to power a modest sound system. Even though it was a gray, rainy day, the system generated excess energy.

Anthony Dente, former student president of Engineers for a Sustainable World, said it's a myth that areas like "Soggy Valley, Pa." aren't good for solar energy use.

"Germany is worse off than Pennsylvania in terms of location for optimal sunlight, and they're leading the way," Dente said.

Dente said it's not the weather but other, more predictable factors that decide who invests in what research at Penn State.

"The fact that the university isn't jumping into the solar industry right now probably can be related to how our government isn't jumping into it either," he said. "Penn State

just received a grant from Exxon to research clean coal. It's very apparent in the way we address engineering education at this school."

In March, Gov. Ed Rendell broke ground on a \$20 million solar energy plant in Bucks County, Pa. The Exelon-EPURON Solar Center boasts 16,500 solar panels on 16 acres of land and is expected to meet the energy needs of 400 homes when completed later this year, according to the Pennsylvania Department of Environmental Protection.

A study of the governor's budget shows solar is still a relatively small percentage of his overall energy independence plan, which includes processing waste coal. Chevron donated \$17.5 million to Penn State last year for so-called "clean coal" research.

Where to save?

"The main message is to invest in panels, not to save a lot of money," said David Riley, executive director of the sustainability center. "I could walk through that building, finding things that need to be made more efficient. Most people don't put enough emphasis on making their energy

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Look for redstart on its mission to save trees

by Alice Fuller

Like a small piece of charcoal just bursting into flame, the American redstart whirls around leaves and branches quite as though it were attempting to torch the woodlands.

Fortunately, there is no danger, for the bit of charcoal is a bird and has better things to do than burning woodlands. Rather, our redstart goes about the business of saving trees by devouring a multitude of the creatures devoted to harming their leafy hosts.

Our neighbors to the south were more imaginative in naming this diminutive warbler. Latin Americans call it "candelita," the "little torch," which brightens the deep shadows of their tropical forests.

These busy birds do seem to dance like candle flames as they whirl and search leaves, buds and blossoms for even the tiniest of insects.

Mature males are jet black with bright orange-red on the tail, wings and sides, while the undertail coverts and belly are white. Sometimes we birders are a bit taken back when we focus our binoculars on a singing male redstart.

The little chap is not black at all but looks like the grayish-green female, with yellow instead of red-orange patches. This individual happens to be a first-year male, who sings but still resembles his female parent.

Whether he is the striking mature male or the upstart youngster, the redstart's song is

not very scintillating to the human ear. It is short, simple and high-pitched. I learned it as "si si si si kamp." Peterson's Field Guide describes it as "zee zee zee zee zwee" (last note higher).

Just to make life more difficult for the birder, a male redstart may sing three different songs interchangeably, according to the author who wrote the account of this species for the A. C. Bent life history series. Once, on a State College Bird Club June field trip, I think our corps of birders heard all the redstart's variations as we trudged up a mountain road.

Several years ago, my husband, Ted, and I explored a bit of the Blue Ridge Parkway. We were too late to see the spectacular blooms of the catawba rhododendron, but we did have some interesting bird watching.

One morning, we followed the instructions of a local birder and drove along a quiet road that parallels the Parkway. We climbed out of the car one place to listen for birds and discovered an old road heading down the hillside.

We had proceeded on it for just a few yards when we heard some little chips coming from shrubs a few feet away. The maker was a very agitated female redstart; she probably had a nest close to where we walked. We did not attempt to locate it and instead returned to our car to leave the little mother in peace.

Most of our local birders could relate to



the experience with this warbler described by Alfred Gross for the Bent series: "One of the most pleasant experiences I have had with warblers in the Maine woods occurred on a bright morning in May, when I suddenly came upon three male redstarts. One of them was working along a horizontal birch limb with its wings lowered in characteristic fashion and eagerly scanning every twig in its quest for insects. The other two were whirling about, darting upward, floating downward, displaying their gorgeous colors, then snapping up their victims as they dashed again and again through a haze of midges hovering in the sunshine of the clearing."

The sprightly male redstart in Dorothy

Bordner's drawing already has captured its insect lunch.

Gross continues: "The redstart's manner of catching insects, as well as the shape of its bill and the well-formed rictal bristles, suggest the flycatcher, but instead of perching and patiently waiting for his prey to come near, as does a true flycatcher, the redstart is continually in action, dashing here and there after flying insects or perhaps snapping up larva dangling in midair at the end of its long silken fiber."

I also learned in Gross' account of the American redstart that our bird was given this name by early settlers who thought it resembled a bird by that name in the Old World. I looked up the European redstart, but I find little resemblance to our bird, except perhaps for the fact that their species has an orange tail that it likes to wag.

The European redstart also belongs to a completely different bird family, called wheatears. Further, none of the large family of birds in the Old World called warblers is related to our New World warblers. Our little birds are strictly birds of the Americas.

So what's in a name? Whether it is redstart, candelita or little torch, that lovely bit of animated feathers is a joy for the human observer to behold and is one of the many blessed caretakers of the woodlands in North America and the tropical forests in South and Central America and the Caribbean.

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use more efficient."

Riley said we need to build homes and buildings that don't waste electricity.

"If you do that, you don't need a big solar system," he said.

Harris said there are two ways to cut energy waste: at the user end and the source end. There are preventative measures people can take even in apartments, she said, such as using power strips, unplugging appliances when not in use and turning down the heat during the colder months.

Homeowners can also use solar energy without ever putting panels on a roof. Passive solar, which means taking the best advantage of the sunlight available, could mean adding more windows to the south side of an existing house, Lau said.

"If you're building a new house, this means getting the house oriented to the south side," he said, warning that it is possible to have too many windows, overheating

the home. Lau said the solution would be to get some thermal mass in the house to help soak up the extra heat, such as a concrete slab floor on the south side of the house.

One way for everyone to support solar technology is to buy energy credits. Harris said that during her time in California, she saw cards for energy credits that customers could purchase at checkout lines in grocery stores.

Pennsylvania has yet to implement such a program, but people can buy wind credits, as Lau does. Every month, a wind power company deducts a set amount from his credit card to go towards supporting the wind energy industry.

This year, the Friends School will begin to earn energy credits for being a producer of clean energy. Companies can buy the school's credits to offset their own dependence on coal, for example. Additionally, the school buys wind energy credits from Community Energy. About 20 percent of the school's energy comes from wind

power, said Hendey.

Solar technologies are like any new systems, said Riley. It takes a while for people to fully comprehend them. Solar energy requires people to understand that we're building inefficient buildings, so we need to fix that first, he said.

At a recent lecture at Penn State titled "Here Comes the Sun: The Business Case for Solar Energy," Riley said solar technology has a "Prius effect" on people. As people become more conscious of their energy consumption, they become more motivated to use less.

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Addressing climate change requires change in mindset

by Chris Uhl

My daughter Katie, now 18 months old, is offering me a new way to think about how we might respond to climate change.

It was just a month ago, as the first crocuses appeared, that Katie took her first steps. Wishing to celebrate her newfound mobility, I took her outside to walk on the thawing ground. Only now do I realize that this was a kind of initiation rite. For the first time, Katie was on her own two feet—walking on Earth—taking her own steps, shaping her own destiny!

Ever since that day, the first thing Katie does when she wakes up each morning is press her nose against the glass of our backdoor window and repeat “owwhh, owwhh,” her vocalization for “outside.”

I have noted that when we go outside together, it is often Katie who is the first to see Cat, Squirrel, Crow. So it was no surprise a few days ago that she was the first to spot the stiff body of a dead mourning dove lying in our garden. She pointed down to the bird. Then she registered a look of confusion. Next, she pointed to the sky, and to

Our
World

my astonishment, she began to whimper softly. As I sought to console her, a solitary tear ran down her cheek.

It seems that Katie knows that she belongs to Earth. It was this, I believe, that caused her distress when she came upon Mourning Dove lying lifeless in the garden.

To connect all this to climate change, consider this question: Do you live on Earth, or in Earth? Though saying that you live on Earth may sound right, the truth is that we all live in Earth.

If you doubt this, go out in the afternoon and lie on your back and look up at the sky. In particular, observe the clouds and consider that, at our latitude, Earth is spinning at more than 500 miles per hour to the east. So why aren't those clouds up there racing across the sky to the west at hundreds of miles per hour?

The answer is that all the stuff up there

that we blithely refer to as “atmosphere” is part of Earth. Yes, that's Earth up there! If you still doubt this, hold your breath! Just as a fish is utterly dependent on water for life, our life medium is the atmosphere.

The language we use shapes our perceptions, and this, in turn, determines how we act or fail to act. To explore this more deeply, go out at night and again lie on your back, looking up at the night sky. As you do this, consider that you are not really looking up. Indeed, up and down are human constructs. When we stand on Earth, we are not standing up, so much as sticking out into space. So as you lie there, it is just as legitimate to think of yourself as looking down into the star-studded night sky.

If you achieve this perceptual shift, you will be surprised that you are not falling down to join the stars below you. Of course, you don't fall because of something called gravity, the powerful attractive force between the body of Earth and your body. This mutual allurements between two bodies sounds to me a lot like “eros,” the Greek word for love. If we use one word—gravity—the world is rendered silent, mechani-

cal, dead; if we use another word—eros—the world becomes juicy, sensuous, alive!

It is the same with our perception of air. The prevailing consciousness leads us to see air as empty space or, if you are of a scientific disposition, to define atmosphere as a mix of gases. Caught in this limited world view, we hear things such as, “Humans can only pump so many tons of greenhouse gases into the atmosphere each year without disturbing Earth's climate systems.”

Sadly, this way of speaking fails to acknowledge that we are intimately entangled with this stuff called “atmosphere.”

The upshot of all this, in my view, is that we will not make genuine progress in mitigating climate change until we learn to speak of the atmosphere from the inside, understanding it as the breath of life. In short, what is needed is a reverential ecology—a way of seeing that reminds us that Earth doesn't belong to us, but rather that we belong to Earth!

Let us substitute hubris with humility, recognizing, as David Abrams points out, that “our breathing bodies are simply our part of the exuberant flesh of Earth.”



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