



Solar Washington Newsletter

WINTER SOLSTICE 2005

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Seattle City Light reaches climate-neutral goal

Seattle City Light has reached its 10-year-old goal of releasing no "net emissions" of greenhouse gases. Although the utility still releases 200,000 metric tons of greenhouse gases each year, it spends about \$756,000 a year to reduce an equivalent amount of emissions elsewhere. (*Seattle P-I*)

Public buildings go green

Washington is the first state in the nation to require new schools, offices and other publicly funded buildings to meet a national environmental standard. (Law signed in April by Gov. Christine Gregoire that is expected to affect billions of dollars of construction on public buildings larger than 5,000 square feet.)

Organic crops save fuel

It takes 30 percent less fossil fuel to grow corn and soybeans organically. Yields of organic crops are equal to conventionally grown crops, but require less water and cause less erosion and environmental damage. (*Science Daily*)

Solar panels that will rock your socks

Today's new thin-film solar modules turn only 6 percent of sunlight they see into electricity, and even the snazzy single-crystal panels are just 15 percent efficient? But change is in the wind.



The hottest solar modules coming out of local labs are 35 percent efficient. Some new-tech panels concentrate the power of 500 suns on solar cells. They use multiple layers, trackers and mirrors. And you won't believe the Cassegrain module, which is half solar panel and half telescope. These panels are made right here in Issaquah by local scientist/hero Dr.

Lewis Fraas and the gang at JX Crystals. You're not likely to see one on your neighbor's roof, but China has just bought \$2 million worth. Find out where solar is going and why America has a leadership crisis, not an energy crisis. See [<http://www.solarwashington.org/newsletters/0512/1-Fraas.pdf>]

The moss is welcome on green roofs

The green roof is an old concept that will keep your house cool in the summer and warm in the winter. It reduces storm run-off, cuts pollution and saves energy. It costs less than a metal roof and will last for 40 years. This is no infomercial. It's Val's story on a building technique that makes sense. See [<http://www.solarwashington.org/newsletters/0512/2-Roof.pdf>]

The dark side of off-grid solar systems

OK, we're Solar Washington, and that means we're really, really big fans of off-grid solar. That's our story, and we're sticking to it. And it's true. Off-grid solar is wonderful. We even love it today, the darkest day of the year. But there is a dark side, and we're not talking about the solstice. Off-grid solar is challenging for the novice to design, install and operate – sometimes even when the novice gets technical help. Read all the gory details in Marlene and John's stories. We are not pulling punches on this one. (But there are happy endings.) See [<http://www.solarwashington.org/newsletters/0512/3-OffGrid.pdf>]



Era of easy oil is over

"It took us 125 years to use the first trillion barrels of oil. We'll use the next trillion in 30... One thing is clear: The era of easy oil is over." (David J. O'Reilly, chairman and CEO of Chevron Corp., as part of the company's current \$40 million PR campaign, which acknowledges that the world is consuming two barrels of oil for every barrel discovered.)

World RE growth booms

The world's investment in renewable energy hit a record \$30 billion in 2004, although that's still less than the third-quarter profits of the world's Big Five oil companies. Nonetheless, power from solar, wind, biofuel, geothermal and other renewable technologies makes up 4 percent of the world's total energy production. (Worldwatch)

Oil production vulnerable

The world's oil fields are working at full capacity and are fragile to even small disruptions. An impact that reduces output by as little as 4 percent – such as political unrest in Nigeria or a terrorist attack in Saudi Arabia – could send oil prices soaring to \$161 a barrel. (National Commission on Energy Policy)

We're Solar Washington

Solar Washington is a chapter of the American Solar Energy Society. We're a private, not-for-profit association for people and organizations interested in solar power, energy efficiency and renewable energy.

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Next meeting: January 19.
Please watch our website for more information. We hope to see you then.

Our president's column

Decathlons, zero-energy house and more

The 2005 Solar Decathlon results are in, and the college kids did incredible work, including our own students at WSU. Some 100,000 people saw the latest in energy-efficient home designs. Pam has the lowdown. She also has lots to say about her and Jeremy's zero-energy house, a super-insulated Craftsman powered by a whopping 6-kilowatt solar system.

For details, see [<http://www.solarwashington.org/newsletters/0512/4-Prez.pdf>]

Solar project cuts electricity bill to \$0

What do you get when you wire a solar system to the home of an engineer? You get some really good numbers, which is how we know that Steve Zenovic and Nina Pitts can now power their large, almost all-electric home in Port Angeles for free, thanks to the array of solar panels that they bolted to the roof of their garage. See

[<http://www.solarwashington.org/newsletters/0512/5-Couple.pdf>]



SW's website taking lots of hits

Webmaster George Meyer reports that the action on our website is smokin'. We're getting double the action of a year ago – probably because of all the great new features that George has added. Check out his report for full details. See [<http://www.solarwashington.org/newsletters/0512/6-Web.pdf>]

The last word

The Kyoto Protocol expires in 2012, and America's leaders have just walked out of climate talks in Montreal, agreeing only to discuss the looming crisis so long as that dialog specifically rules out "negotiations leading to new commitments." This position is what the Canadians call "the horror show down south." And climate scientists such as Michael Oppenheimer of Princeton say, "If we don't get a serious program in place for the long term in this post-Kyoto phase, we will simply not make it."

And early last month, oil company executives were allowed by Congress to testify without swearing to tell the truth. So they said they didn't talk to Dick Cheney's energy task force; the *Washington Post* said they did.

What connects these two events is leadership – or lack thereof. Dr. Lewis Fraas sees this issue clearly. [[See our lead story.](#)] His company is sitting on solar technology that could revolutionize our energy policy. China is funding this technology, but American leaders have no interest. *Forbes* magazine carried a story recently calling solar subsidies, such as the ones featured in our story [above] about Steve and Nina's solar home – a "boondoggle." I asked the reporter why tiny subsidies for climate-friendly solar power are a boondoggle, while massive subsidies for oil, nuclear and coal are fine. She declined to give a reason. I think the reason is clear: Our leaders and corporate media cater to powerful special interests rather than the common welfare.

As always, if you want to make your voice heard in this newsletter, contact us at newsletter@solarwashington.org.

– Josey Paul, editor

Cheap, powerful solar ready for showtime

By Josey Paul

I was lost in the moment. At the other end of the table, one of the world's pre-eminent scientists in solar energy, impressively maned with unruly white hair, was attacking the last of a Burger King sandwich while simultaneously discussing the follies of America's energy policy and describing the most successful business plan that he had ever drawn up, so to speak, on the back of a napkin.

So I hardly noticed when Dr. Lewis Fraas' wife, Jany, came in quietly and lit the wick of a small table lamp. Almost as soon as the flame flickered to life, a radio started up, forcing my attention to the lamp.

But this was no surprise.

I knew from reading Dr. Fraas' book, *Path to Affordable Solar Electric Power & the 35 Percent Efficient Solar Cell* (2005, JX Crystals Inc.), exactly why that radio had suddenly come to life. Surrounding the flame was a ring of gallium antimonide (GaSb) crystals. These thermophotovoltaic (TPV) crystals are similar to ordinary photovoltaic (PV) solar cells, except they produce electricity when exposed to photons in the infrared range, what we feel as heat.



Dr. Fraas with thermophotovoltaic lamp. Tiny TPV crystals turn infrared energy in the flame into electricity to power a tiny radio.

The little ring of GaSb crystals surrounding the flame was cranking out 100 milliamperes of electricity at 3 volts of electromotive force, plenty to run that noisy radio.

The radio is a neat trick, but Dr. Fraas has put his GaSb crystals to much better use. One of the best is the 35-percent efficient solar cell, an invention that may someday power much of the world.

But first a little background, just in case you slept through that lecture in high-school physics.

The vast majority of today's commercial solar panels convert between 6 and 15 percent of the sunlight they see into electricity. Thin-film panels fall at the lower end of that range, and single-crystal modules are clustered at the upper end. The most efficient cells on the market are made by Sunpower Corp. These single-crystal cells are 20-percent

efficient, largely because the metal contacts needed to collect and conduct electricity are on the back surface of the cells. This configuration eliminates the reflective metal contacts that are normally wired across the top of the solar cell. The rear placement exposes the cell to more sunlight.

Dr. Fraas' multijunction solar cells do much better. Here's how he does it:

The intensity of bright sunlight at noon is 970 watts per square meter (a little less than 11 square feet). So 10.8 square feet of the most efficient commercial panels can turn bright sunlight into 150 watts of electricity – or 200 watts in the case of the best Sunpower panels.

Now go back to the 970 watts per square meter of bright sunlight. Only a bit more than half of those watts – 490 to be exact – come from visible light, which is what conventional solar panels use. The remaining power in sunlight comes from infrared energy, which is what Dr. Fraas' gallium antimonide (GaSb, remember) cells use.

During his days as a top scientist for The Boeing Co., Dr. Fraas led a research team that perfected a two-layer solar panel. That panel had a top PV layer – much like today's solar panels – that converted visible light to electricity. Dr. Fraas and his team added a second layer of gallium antimonide cells under the first layer. The GaSb cells converted the infrared energy that passed through the first layer into electricity. So these panels had two layers: a PV layer for visible light and a TPV layer for infrared energy.

The result was a solar module that was 35 percent efficient (340 watts per square meter). And, oh yeah, that was back in 1989.

Boeing wasn't much interested in these panels, so Dr. Fraas left Boeing with the license to produce the dual-layer panels and joined JX Crystals, a solar research and development company based in Issaquah, where he has been president for the past 11 years.

The 35-percent efficient, multilayer solar panels have the potential to greatly increase our ability to convert sunlight into electricity while greatly decreasing the costs of this electricity to the point where solar is cheaper than many other forms of energy.

You might think that in this day of dwindling oil supplies and increasing energy costs that this kind of discovery would be seized upon by policy-makers. But remember that this super-efficient panel was invented 16 years ago, and it is still not in production.

Although the technology is ready, the problem, Dr. Fraas says, is that small companies don't have access to the capital necessary to bring that promising technology to the commercial marketplace. Bringing the costs of solar-energy systems down to a commercially competitive cost, say \$1.50 a watt, would require growing the industry to 100 gigawatts. Taking solar to that scale, Dr. Fraas estimates, would require an investment of about \$100 billion.

“The amount of investment required to make an impact in the energy field is massive,” he says. The investment needed is too big for small business, and the U.S. Department of Energy’s budget for solar research is in the millions, not billions, and little of that money is available to take promising research to the marketplace.

The solar industry’s older-technology market is growing fast. Shipments of photovoltaic (PV) panels nearly doubled in 2004, rising from 48,664 peak kilowatts in 2003 to 78,346 kilowatts in 2004, according to the U.S. Energy Information System. Incentives are driving much of that market. But those incentives apply to the older-technology modules, not the hot new technology that is struggling to get from the laboratory to the marketplace.

“It is ironic that the subsidies in place for solar energy today are locking in 20-year-old solar technology and discriminating against innovations,” Dr. Fraas says.

That’s the bad news. On a happier note, progress is being made on other fronts. The Chinese, for one, are using American technology breakthroughs to electrify their rural areas. Thanks to Jany’s contacts in China, JX Crystals just won a \$2 million contract to build a 100-kilowatt solar power plant in China using a new technology that the company developed to greatly reduce the cost of generating solar power.



The mirrors on the 3-Sun module below allow much more PV power to be produced with fewer solar cells.

The idea behind the new “3-Sun” technology is remarkably simple. JX Crystals has solar-module makers cut single-crystal solar cells in half (or in thirds, in the case of Sunpower’s cells). These cut cells are laid out between rows of angled mirrors that reflect concentrated sunlight onto the high-efficiency cells. They are called 3-Sun modules because the mirrors triple the sunlight intensity delivered to each solar cell. Because mirrors are far cheaper than solar cells, these 3-Sun modules are very cost effective.

A regular 32-cell Sunpower module produces 90 watts of electricity. By cutting just 24 cells into thirds and lining them up between angled mirrors, the JX Crystal 3-Sun module produces 180 watts. [see photo]

This type of module has to be mounted on a tracker so that it constantly faces the sun, otherwise the mirrors would shade the solar cells during much of the day and reduce efficiency.

JX Crystals has also won a contract to build a demonstration project of 3-Sun modules for the California Energy Commission. That demonstration could help these modules make the state's approved list of solar panels eligible for California's subsidy program.

In the meantime, JX Crystals is sitting on a wealth of solar technology that is ripe for a market to develop. Those GaSb crystals, for example, can be arrayed in a propane or natural gas furnace – just like that cute little table lamp that runs the radio – to cogenerate electricity.

Such cogeneration would squeeze far more energy out of our remaining fossil fuels. Only about one-third of the chemical energy in natural gas is converted into electricity when burned in a central power plant. The rest is thrown away as waste heat. That heat can be converted into electricity with the GaSb cells, and fuel efficiencies would rise to about 90 percent.

JX Crystals built 20 demonstration propane heaters between 1998 and 2000 under the brand name Midnight Sun. These 25,000 Btu heaters cogenerated 100 watts of electricity. The technology worked, but the company was unable to raise enough money to take the heater to full manufacturing scale. Lately, however, Dr. Fraas says some large furnace makers – including Trane – are showing interest in the technology.

Dr. Fraas is even more excited about a new 500-Sun module called the Cassegrainian Solar Module [see photo], which borrows from the light-management systems of reflecting telescopes.

The Cassegrainian module contains a series of concave mirrors (think of a mirrored satellite TV dish) that collect and reflect large amounts of sunlight to secondary mirrors raised above the centers of the primary mirrors. Sunlight reflects off the large primary mirror and up to the secondary mirror, which in turn reflects the light in concentrated form back down to the center of the primary mirror where a high-efficiency solar cell converts the light into electricity.

The Cassegrainian module has a second trick that makes it extremely efficient. Behind the secondary mirror is a GaSb thermophotovoltaic (TPV) cell that converts the infrared energy to electricity. This system converts both visible and infrared energy into electricity, and the large primary mirrors effectively focus large amounts of sunlight onto these cells.

Like the 3-Sun module, the 500-Sun Cassegrainian module must be tracked to keep it directly facing the sun.



Dr. Fraas with a Cassegrainian prototype solar module. This module concentrates 500 times more sunlight on each solar cell.

What makes the Cassegrainian module so effective is that it is a direct reflector, which means that it reflects light coming directly from the sun itself. Global reflectors, such as regular solar modules, capture reflected light from the entire sky as well as direct rays from the sun itself. Because about 80 percent of the power of sunlight is in the direct rays, direct reflectors are extremely efficient.

Oak Ridge National Laboratory is beta testing a roof-mounted Cassegrainian light collector. It works like the Cassegrainian module, except that instead of shining concentrated visible light onto a solar cell, the Oak Ridge version shines the light onto an array of fiber optic cables that pipes the sunlight into office buildings.

The hybrid light is tied to a panel that also controls overhead florescent lights, dimming or brightening them as sunlight intensity requires. Oak Ridge estimates that installing a million of these collectors nationwide would save ratepayers billions of dollars a year in reduced electricity costs.

Dr. Fraas hopes to one day put his TPV cells into these light collectors so that they cogenerate electricity as well as light up rooms.

But all that potential is still in the future. Most of the really hot technology is waiting for funding that will enable it to scale up to full manufacturing and marketing. “We do a lot of show and tell,” says Dr. Fraas, “but it’s like planting seeds and hoping something will grow. But it takes money.” ☼

[Note: Dr. Fraas’ book, *Path to Affordable Solar Electric Power & the 35 Percent Efficient Solar Cell*, can be purchased for \$35. (Include \$5 for shipping to Canada and \$9 for shipping to Europe.) Make checks payable to Lewis M. Fraas, JX Crystals, 1105 12th Ave. NW, Issaquah, WA 98027.]

Green roofs: old concept that is new again

By Val Streeter, staff writer

“The only regret that I have about my green roof is that we didn’t face it towards our house. Then, we could enjoy it rather than the neighbors enjoying it,” said Jim Sproull as he was showing off his workshop sporting a beautiful green roof.

The Sproulls live in Kirkland, in a fairly dense residential neighborhood on the east side of Lake Washington. On a rare sunny December day, their roof made with mostly sedums and grasses reflects green, purple and brown rather than the traditional black of shingles. Jim added his own touch of pumice stones and branches to simulate a forest floor.



Jim Sproull's workshop.

A green roof is an old concept that is gaining ground as a way to offer energy efficiency, storm-water control and natural beauty in the face of growing urbanization. America is being paved over at a rate of 3.2 million acres a year, approximately the size of the state of Delaware.



Side view of the workshop and roof.

Green roofs help keep in the heat during winter and keep out the heat during summer. The living layer protects the roof membrane from harmful sun rays and extends its life to 40 years, far longer than a conventional roof.

Because the plants and soil on a green roof soak up more water than an impervious roof, storm-water run-off is reduced. Run-off picks up pollution and carries it to nearby streams, lakes and bays. Less storm-water run-off means less water pollution.

Natural beauty is an added bonus. Jon Alexander, the green builder who installed Sproull’s green roof, has his own green roof on his garage. He gushes over the ever changing colors, flowers and birds that visit his roof. After 2½ years, he hasn’t lost his fascination with it.

Composed of several layers, a green roof is based on a roof membrane, root barrier, insulation and a layer for water collection and drainage. Sproull describes the water collection and drainage layer as “resembling plastic egg cartons that collect some water and let the excess drain off.”

While Sproull has only a few inches of soil medium on top of the layers, extensive green roofs generally have 1 to 7 inches of soil. The roof is planted with drought-resistant plants, mostly different types of sedums and mosses for the Pacific Northwest.

The other type of green roof is considered intensive, such as the rooftop garden areas on commercial buildings and large apartments. These gardens require more maintenance than extensive roofs, because of issues such as weeding and pruning.

Patrick Carey, a Seattle architect who has helped design 32 green roofs over the last five years, reports that installing an extensive green roof can cost between \$15 and \$17 per square foot. The more angle that a roof has, the more expensive it will be to design and install a green roof. Usually a green roof has a 5- to 20-degree angle.



The rooftop of Jim Sproull's workshop.

“Green roofs can come in all shapes and sizes. It doesn’t have to be a full house. It could be over a porch, garage or workshop,” says Carey. Retrofits are possible if the structure can handle the extra load of the layers, soil and plants.



The Sproulls' roof is planted with a variety of sedums, mosses and grasses.

The Northwest EcoBuilding Guild (www.ecobuilding.org) is a local resource for people interested in green roofs. Carey and Alexander are both members. The Sproulls received assistance from the guild in assembling their green roof. The Sproulls participated in its Green Roofs project and ended up receiving a King County Earth Hero award for their roof.

Small steps can add up to big changes on a watershed scale.

Be it shed, doghouse, garage, workshop or house, next time make it green on top! ☀

Off-grid solar still a challenge for amateurs

By Josey Paul

From the back porch of her cabin, Marlene Herman can follow the twists and turns of a small salmon stream for about 200 yards before it disappears into thick forest. Like a lot of remote homesteads on the Olympic Peninsula, trees crowd her cabin from every side, so the views are cozy. But sometimes she catches sight of an eagle slipping past low enough to make eye contact. And this time of year she can see coho or early-run steelhead crashing about in the riffles.



Marlene has to drive her truck two miles to find asphalt, seven miles to see a power line and 12 miles to find a mailbox. Life is simple here, except for the solar power.

Solar power in the backwoods is still a complicated affair.

Most people buying solar systems today are city folks who simply plug their panels

into an inverter and plug the inverter into their home's breaker box. That's it. Simple.

But off-grid systems – with their batteries, charge controllers, DC disconnects, extra wiring and low design tolerances – take a lot more thought and effort. How much more thought and effort? Solar Washington asked Marlene to find out.

Marlene has no background in electronics or solar power, but with some prior coaching, she called up a well-known and respected mail-order solar shop and asked for help in buying a complete off-grid solar system.

Like most people in her situation, Marlene ordered her system after a couple conversations with a salesperson.

She ordered what she thought was a turnkey system, something that would be easy for her, a solar novice, to set up.

So how did it go?

Not bad, but it could have been better. It could have been a lot better.

When the UPS truck drove up, Marlene expected the driver to drop off one big box containing a complete, pre-wired setup – AC and DC – that she could bolt to the wall. She thought she might have to hook up a couple cables from the batteries and a couple wires from the solar panels, and then she would be done.

What she got was a “kit” that consisted of stack of boxes that contained the components (inverter, solar panels, DC disconnect, charge controller) and a few pre-cut wires. She also got a pile of manuals that for sheer bulk would rival the Chicago Yellow Pages. Few of those manuals were written by someone whose first language is English.

There was a helpful set of instructions from the retailer about installing the kit, but it was not enough for a novice to do the complete install.



The control panel.

On the plus side, the components were excellent in quality and a close match to what Marlene needed. (Solar Washington backstopped her on that part of the order so that nothing too bad would happen.) She got an Outback 24-volt, true sine wave FX inverter, an excellent Outback charge controller, a Tri-metric battery meter, an Outback DC disconnect system and six 120-watt Kyocera multicrystal solar panels. She purchased eight Trojan L16HC batteries separately at a local battery shop.

So what went wrong? Lots, though mostly small stuff. The kit was not what Marlene thought she had ordered. The pre-cut wires were helpful, but some had the wrong size connectors attached and required modification or replacement.

The kit contained no AC breaker box, which Marlene had expected. And the AC breaker box that she subsequently ordered had no main breaker to protect the feed wire. One salesperson said that a main breaker was not needed, but a combined load from several circuits could easily overload the 60-ampere feed wire, creating a fire risk. A solar technician was able to wire the breaker box so that one 60-amp breaker protected the feed line, but that fix is not something most people will figure out for themselves.

Another problem was the size of the main battery cables. The DC disconnect used large, 4/0 cables to the inverter, but the kit came with smaller, 2/0 cables to the batteries, even though these cables would typically carry more current than the larger cables.

The solar panels had no grounding hardware. Marlene later ordered some grounding lugs, but they came with mounting screws that did not fit the panels.

The kit came with lengths of both red and black 10 gage wire and weatherproof strain relievers for wiring the solar panels together. These wires were too small and not bundled in a jacket, a shortcoming that meant that the weatherproof strain relievers were neither weatherproof nor capable of relieving strain. Marlene had to order special wire packaged in a round rubber protective jacket so that the solar technician could make the proper connections.

The kit did not include a fused disconnect for the solar panels, which is required to satisfy NEC code.

The component manuals were too technical and murky to be useful to someone not familiar with solar systems. And the kit did not come with a clear guide to setting up and maintaining the solar system.

The retailer was helpful in resolving these issues, and the kit presented only nuisance problems for a trained solar technician. However, a novice would have trouble assembling such a system and even more trouble maintaining it.

Unfortunately, this problem is all too common in our industry.

The other day I received a call from a local man who had an off-grid system installed by a professional. He said his name was John. His system had stopped working, and he wasn't getting much help from the dealer.

The problem was easy to diagnose: the batteries were dead. And little wonder. John had no way to know the state of his battery bank. He had no voltmeter or system monitor. The batteries were set up in an uninsulated outbuilding. Batteries that drop to 32 degrees or colder will lose close to half of



Eight Trojan L16HC batteries. The white powder at the base is baking soda, which is cheap insurance against a future spill. The battery-box fan is not yet installed.

their power, and this is a typical condition for Northwest winters when there is little sun and when battery storage is most critical.

His solar panels were more than 100 feet from the batteries, and they were connected with 12 gage wire. That wire is too small, so more than 5 percent of the power was lost before it even got to the batteries.

The panels were mounted where they would be partly shaded during much of the day, a condition that robs solar panels of their power. The panels were not grounded. And the charge controller was a single-stage controller, one that held battery voltage at a high, gassing voltage that will shorten battery life. Three-stage controllers, which step down the voltage to protect fully charged batteries are much better.

There were other design problems, too. The settings on the inverter were incorrect for the system. And the John's only back-up generator was a 6,500-watt Honda. Batteries can take a lot of charge when they are low, but as they fill up they can tolerate only progressively smaller amounts of current delivered over a longer time. The giant, noisy, gas-hogging generator was way too big to efficiently deliver the long finishing charge. For that, a smaller, inverter generator – such as a Honda EU1000i or EU2000i – is much better. These generators are very quiet and save huge amounts of fossil fuel.

Perhaps the worst part of his system was the training John received after the installation was completed. He received none. I told him that a properly designed and installed system would run like a dream. John looked at me and said, “It’s been a nightmare for me.”



Marlene with 6 Kyocera 120-watt modules.

Off-grid solar systems are complex, and we as an industry need to do a better job in three areas: 1) Help people design the right system for their circumstances; 2) give people clear instructions on how to install these systems; and 3) show people how to operate and maintain their systems.

Marlene's system is operating better than she hoped for, and John is learning how to rebuild and properly operate his system.

The winter solstice is the toughest time of the year for off-grid solar users. We shouldn't make it any harder than necessary. ☀

Our president's column by Pamela Burton

Lots of solar energy in the news



2005 Solar Decathlon

Washington State University students competed in the Solar Decathlon against 18 student teams from across the United States, Canada and Spain. With an entry that showcased what team fundraising leader Andrea Read says, "kept our house true to the green that people associate with our area," the students created an excellent entry. The solar competition was heightened by cloudy and rainy weather. Despite downpours, more than 100,000 people visited the little homes on the mall in our nation's capital. The WSU solar home was shipped back to Seattle and will go on display in the spring at the Northwest Solar Center at Magnuson Park, where it will be open to the public as a facility in which solar technologies can be tested and monitored year-round. Solar Washington members donated a set of used Thermomax tubes, manifolds and expertise. To see all of the decathlon entries, go to http://www.eere.energy.gov/solar_decathlon.

Besides exposing hundreds of students to the basics of building a solar-powered house, the competition generated many national news stories, including an article in January 2006 issue of *Popular Mechanics*, a story on *Free Speech Radio* (Dec. 8) and an interview with a student from the winning University of Colorado team on Air America's *The Al Franken Show*. (Nov. 16).

Our zero-energy home

My husband, Jeremy Smithson, and I were thrilled to be included in the front-page *Seattle Times* article "Greener' heat sources cost money, save energy," on Nov. 28. Staff reporter Warren Cornwall visited our 1908 Craftsman home on Phinney Ridge, and we showed him our remodeling project to retrofit and insulate it to run largely on solar power. Cornwall reported that our house is so tightly insulated "that a Btu can't wiggle out of it."

Jeremy told Warren, "What we discovered is that if you super insulate, then you reduce your heat requirement to the point where you can solar heat." Over the year, our home will need roughly 2,000 kilowatt-hours of power from outside sources, down from around 18,500.



We began by installing efficient fluorescent bulbs and reclaimed low-E, argon-filled vinyl windows. Polyiso foam boards and two-by-four insulated walls brought up the insulation factor in the walls to R-34 and attic insulation to R-57. We used reclaimed lumber and trim (both inside and out), and reclaimed cedar siding, stone, cabinets and millwork. Recycled solar equipment included a Thermomax hot-water collector (30 tubes) and a 60-gallon storage tank that will be expanded to 90 tubes for our radiant heating system. A 6-kilowatt, net-metered photovoltaic system, made up of 32 Sanyo 190-watt panels and two Xantrex inverters, was added this fall to meet the goal of achieving a zero-energy home. (This includes all sources of energy). Rainwater is gathered in 24 55-gallon recycled food-waste drums that are integrated with rain-gutter system.

To read the Seattle Times article, go to <http://archives.seattletimes.nwsource.com/cgi-bin/texis.cgi/web/vortex/display?slug=greenheat28m&date=20051128&query=smithson>. Free registration is required.

2006 Solar Washington happenings: growing the board

By now you may have heard about our need to change the sections of the bylaws to hold our annual election in the first quarter of the year instead of the last. I would love to hear from members who are willing to commit their time and talents either as board or committee member. We are especially in need of people who are experienced at fund raising, grant writing and organizational development. Those of you who have been doing solar for years are encouraged to make a presentation at a monthly membership meeting next year. Please contact me if you are willing to become more involved. I would also like to hear members' ideas about how our organization should grow. With SW chapters developing around the state, we are reaching the point where we may need to go beyond being a volunteer organization. Our next membership meeting is January 19, and all of you are invited to attend and become involved in our planning for the next year. We will hear a presentation on the statewide energy initiative. Thank you to retiring board member Lisa Noble Rennick for her contributions to Solar Washington.

Update on SB5101

Thank you to those members of Solar Washington who attended the Interconnection



Chris Herman, Mike Nelson and Pamela Burton address commission

Workshop of the Washington Utilities and Transportation Commission on Dec. 2. We accomplished our goal of letting the group know that there are utility customers who expect a resolution of the housekeeping that needs to be done so that the utilities can implement SB5101. Mike Nelson believes that the meeting yielded a final agreement from all of the parties involved. To those of you who are net metered and are planning to participate in the state incentive program we have been advised to submit the 82.16RCW form to the Department

of Revenue. That form can be found on the Northwest Solar Center website:

<http://www.northwestsolarcenter.org/> . ☀

Average house + solar = no more electric bills

By Josey Paul

Steve Zenovic and Nina Pitts built a beautiful house in Port Angeles in 1992. The house sits on a knoll, with south-facing windows that catch a killer view of the Olympic Mountains.

As houses go, it's energy efficient, but nothing out of the ordinary. It is modestly big at 2,500 square feet. Heat comes from an electric heat pump, with a solar assist from those south-facing windows.

The water is heated with a conventional gas hot-water tank. Phantom loads are ignored. Most of the

lights are incandescent, many recessed in the ceiling where they are even less efficient.

The home's insulation is good, with double-paned windows and full insulation in the ceiling (R-38) and walls (R-19). The appliances are electric, including the oven and washer and drier.

In a normal year, the couple consumes about 13,000 kilowatt-hours of electricity – about average for newer homes.

But the last year and a half has not been average.

In the summer of 2004, the couple bolted 4 kilowatts of Sharp 165-watt panels to the roof of their garage. Then they wired two 1,800-watt Sunny Boy inverters to pump all that sunlight power straight into the grid. (Power Trip Energy Corp. in Port Townsend did the wrench work.)

The panels are not tracked, but the roof is about 45 degrees, close to the local latitude, and south-facing. That orientation is about as good as it gets for fixed mounting. And because the roof has raised metal seams, the panels could be mounted without drilling holes in the roof, much to Steve's relief.



So what happened to the couple's electric bills after this system was installed? Fortunately, Steve is an engineer, so we have the numbers to tell you.



Steve with his 4-kilowatt system.

The solar panels cut Steve and Nina's grid-energy usage by 43 percent. Average daily use of grid power fell from 35.71 kwh before solar to 20.25 kwh after solar. And remember, the couple took no other energy-conservation steps.

The financial side of things is even better. Steve and Nina are on the now defunct Green Tag program, which pays them 10 cents for each kwh they produce. And that reimbursement is in addition to the net metering agreement they have with the local utility, which pays them 6.2 cents for each kwh they pump back into the grid.

When the arithmetic settles out, the couple comes out about even –

meaning they no longer have electric bills for a large house that is almost all-electric. This year looks as though they will come out \$100 ahead. "Of course, that isn't going to pay off the capital costs of the system," Steve says. But engineers always say stuff like that.

Steve was involved with solar systems in the 1970's, when he helped a contractor install a solar hot-water system. So solar has been in the back of his mind for a long time. When prices came down, he thought he would give solar a try.

His goal wasn't to save money, just to help take a load off the grid. "It wasn't meant to be a money maker from our standpoint," he says. We just wanted to help avoid the need to build new power plants."

Mission accomplished. ☀

Heavy website use continues!

By **George Meyer**, Solar Washington webmaster

Numbers continue

In our last newsletter, I wrote about our site usage leading up to the Solar Tour, and I'm glad to say that since the tour our site continues to experience about double the action of a year ago!

Privacy concerns

Recently, some tour participants have asked to have their personal info removed from our website. They did so because of a growing concern for privacy and security. I mention this so that all of the folks who were gracious enough to open their homes for the solar tour and have similar concerns know that they are welcome to send me an email requesting to have their info removed from the web. I'm glad to comply. Eventually, I expect the "scrapbook" will replace the purpose for leaving our tour online, and it will be removed.

If you want your info removed from our website, please send an email to me at gmeyer@solarwashington.org and indicate your tour region and your full name so I can find and edit it. I'll send a reply when it's done so you can verify the changes. If you don't get a reply within three days, then send another request to info@solarwashington.org (in case my email messed up).

Email issues

Speaking of email, I have been having issues with my email this year. I'm working on it and hope to have it together by the time you read this. In case you sent something to me this year and expected an answer but didn't get one... Now you know a possible reason why.

RFQ

This month, I received an RFQ (Request For Qualification) for a large solar demo project at the Oregon Zoo in Portland to post to our website. I was told that we might be getting more, and it was suggested to create a section for RFQs. But I am not quite sure how I want to set it up yet. So for now... they will be found in the "articles" section.

Items needed for calendar

As the release of this newsletter indicates... It's winter! One issue I always have about this time of year is having something for our calendar. If you know of anything coming up in the next few months, please send it to me at gmeyer@solarwashington.org. ☀

