



WASHINGTON Sunrise

Solar gains in the Evergreen State

2008-2009 SEASON



Up on the roof:

U.S. Rep. Jay Inslee, D-Bainbridge, (right) climbs up on the solar-panel installation training roof, May 17, 2008, at Shoreline Community College during a ceremony honoring the first graduating class of state-certified residential solar-energy system designers. Mike Nelson, SCC Zero-Energy Technology Program Director and Director of the NW Solar Center, narrates.



On the cover:

A cottage housing project in Shoreline, Wash., incorporates solar panels into the design of the homes which help offset power costs.

Washington Sunrise is powered by:

- Northwest Solar Center
- Shoreline Community College
- Washington State University Energy Program

With thanks to:

- Outback Power Systems
- Silicon Energy
- Washington PUD Association
- Puget Sound Energy



Contributors:

- Max Scherr
- Mike Nelson

Edited by:

- Jim Hills

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FACT – On some sunny days, Bavaria (with a solar resource comparable to Western Washington), gets 20 percent of its electricity from the sun.



“Washington state has modeled its solar program after Germany, which developed long-term sustainable solar policy that has resulted in the deployment of far more solar than anywhere else in the world.”

- Julia Hamm,
Executive Director of the
American Solar Energy Power Association



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Circa 415 B.C. – Socrates observes, “In houses that look toward the south, the sun penetrates the portico in winter, warming its interior.”

Dwindling resources, increasingly expensive energy, concern over environmental and related policy issues and an aging workforce are bringing a perfect storm to Washington.

Green jobs are growing in industries built on renewable energy



Every storm brings new opportunities. The storm facing Washington right now can bring new jobs, but only if the state is ready for the challenge.

The first State Economic Development Policy Office Renewable Energy study (1998) showed green-industry jobs contributed more than \$1 billion in revenue and added almost 4,000 jobs to the state's economy.

In 2005, a study update indicated those numbers had more than doubled, to 8,700 green-industry jobs. Almost half (49 percent) of these jobs are in efficiency and smart energy – jobs that leverage traditional trade and building skills with green technological skills and knowledge. That combination can help tap the sun's energy by:

- Increasing the energy efficiency of commercial and residential structures;
- Providing energy efficient and environmentally sensitive building management systems in new construction;
- Facilitating installation and maintaining the necessary control systems to level utility demand peaks;



- Taking better advantage of natural lighting.

Green-industry jobs pay well, generally ranging from \$16 an hour to \$40 an hour depending on skill level and experience. The relatively broad spectrum of jobs means opportunities are available for persons with a variety of skill levels and training. Around the state, institutions such as the Washington

Above:

Participants in a summer program at Shoreline Community College fit a solar panel on a training roof.

Left:

Workers install a building wall at the Wild Horse Solar Project near Ellensburg.

State University Energy Program and Shoreline Community College, along with partners from industry, labor, the workforce development system, and associated community-based organizations are developing and expanding training programs and related services. These programs are designed to connect the growing number of employment opportunities to both new and incumbent workers who have the needed skills.

And, with Gov. Chris Gregoire calling for 25,000 new green-industry jobs by 2020, the demand will continue to grow.

FACT – All TV and communications satellites are powered by solar energy using photovoltaic cells.

FIVE YEARS AGO

The Washington State Energy Program issued a report titled: *The Washington Solar Electric Industry: Sunrise or Sunset?: A closing window of opportunity*. A critical finding in the report was that while the solar electric industry was growing at a 25 percent growth rate worldwide, Washington, an early major player in the fledgling industry, was beginning to lose capacity. If the trends seen in 2003 continued, Washington would actually lose jobs and businesses.

THE PATH TO A SOLAR MANUFACTURING CLUSTER

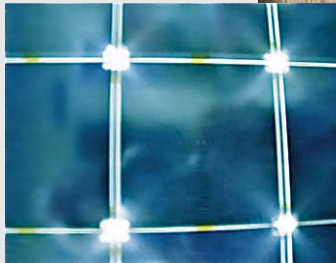
In part, this study led to the passage in 2005 of senate bills 5101 and 5111, the first state-level production incentives in the nation and a jump-start for silicon production. After clearing a set of legislative hurdles that required 80 percent of Washington utilities to create interconnection standards that were 90 percent in agreement, Washington utilities began paying customers for renewable kilowatts generated on the customers' property.

GROWING IN THE SUN

In the two years since the legislation passed, the number of home-based systems has doubled each year, from a base of 200 to nearly 800 as of 2008. At an average size of approximately 2.5-3 kilowatt/hours each, this represents 2.2 megawatts of power generation financed by customers. Washington citizens have spent about \$17 million on small-scale, distributed renewable energy generation in the past few years. From a utility perspective, this is a lower cost resource than almost all of their conservation programs. The cost of the program to the state so far has been about \$160,000. That means that each penny of public money

Watching Washington's sunrise

Five years ago the question was asked: *Would this state watch the sun set or rise on a green-jobs industry based on power from the sun?*

**Silicon still rules:**

Silicon based modules still dominate the markets after 30 years of predictions that thin-film solar would become a market leader. Silicon may dominate the markets for as many as 20-30 more years.

has resulted in more than a dollar of private investment.

SUCCESSFUL BUSINESS MODEL ...

Outback Power Systems in Arlington, Wash., has grown from 35 employees to 120, and a subsidiary of Outback, Silicon Energy, has begun to manufacture prototype solar modules that will be market ready this spring.

The level of investment in Washington manufacturing by REC Silicon, Moses Lake, Wash., is unprecedented in recent years. The Norwegian-based REC is finishing a \$1 billion expansion at the Moses Lake facility. REC currently employs about 500 people in Washington, a number that will undoubtedly grow.

Other major solar-industry employers in Washington include Solarworld (formerly Siemens) in Vancouver, Wash., with 100 employees; Alpha Technologies, in Bellingham, employs around 40 people; and Infinia, in the Tri-Cities, has about 25 on staff. Nearly 30 small businesses around the state that are focused on system installations employ an additional 100 people.

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FACT - It takes 8 minutes, 17 seconds for light to travel from the sun's surface to earth.

FROM/previous page

Nearly 1,000 people in Washington are employed in solar-related businesses.

At the time of the sunrise/sunset report, it was estimated that solar-electric businesses would be a \$15 billion industry worldwide by the year 2020. That apparently bold projection made only five years ago, has turned out to be profoundly cautious according to a 2007 story in the *Financial Times of London*. (See story at right).

POTENTIAL BUMPS ALONG WAY

Clearly, this industry is on a dramatically increasing growth curve, but the road ahead is not completely without potholes.

The original legislation, SB 5101 and SB 5111, called for a program through 2020. However, that goal was reduced by six years and then 18 months of the remaining time was needed to establish the mandated interconnection policies. In addition, few private system owners have taken advantage of renewable-energy credits associated with the bills due to a lack of easy-to-use methods to market the credits.

REC's aggressive expansion plans are prompting the company to seek opportunities outside of the region. They have been unable to secure firm power commitments from Washington utilities and are planning to build the next five silicon processing plants - worth billions of dollars - in Quebec, Canada.

Against this background, other competitive interests are moving aggressively to position themselves in the solar industry, including Germany, Japan, China and now the state of Oregon. Oregon is competing directly with Washington and succeeding in attracting cell manufacturing. Solarworld with offices already in Vancouver, Wash., chose to locate a new facility that will be the largest solar cell plant in the United States directly across the Columbia River in Hillsboro, Ore.

RECOMMENDATIONS FOR THE ROAD AHEAD:

If Washington is to remain competitive and continue riding this

'Solar energy demand soars'

Higher demand for solar energy, triggered by concerns about global warming, will drive a four-fold increase in the annual revenues of the global solar equipment industry from \$20bn last year to \$90bn in 2010, according to projections published today.

Profit growth is expected to accelerate even faster, as costs are contained, pushing margins up to nearly 60 percent.

The interest manifested by many electricity customers in solar cells as a "green" alternative to fossil fuels is also likely to spur a ten-fold surge by 2015 in production of high-purity silicon required for the cells, according to the report by Photon Consulting, a German research group. Demand for the silicon needed for solar cells is likely to rise from 41,000 tonnes last year to 120,000 tonnes in 2010, and 400,000 tonnes in 2015, the report says. The price



Solar panels mounted on a demonstration trailer in front of the Washington state Capitol building.

of this silicon, due to scarcity, has rocketed to as much as \$300,000 a tonne.

But Michael Rogol, Photon's managing director, said falling costs overall made solar power increasingly competitive and propelled its growth. "We are seeing incremental changes in innovation which are pushing down costs and helping the sector's expansion," Mr. Rogol said.

By Peter Marsh
The Financial Times of London
April 4, 2007

wave of growth in the solar industry, the expiration date on SB 5101 should be extended to the original 2020 termination date. The cap on payments should be raised from the current \$2,000 to \$5,000. Systems should be allowed on leased properties, as long as that allowance is for net-metered systems. The base incentive should be increased from 15 cents per kilowatt-hour to 30 cents to boost program activity. The renewable energy credits associated with the project should be allocated to the

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FACT - As the universe goes, the sun isn't a renewable resource. It is estimated that the sun will run out of fuel in 5 billion years.



Nature's way:

The Wildhorse alternative energy installation east of Ellensburg includes both solar and wind technologies. The solar panels are making the most of this clear, sunny day, but note the curve of the windmill blade in the background, bending to the strong breeze.

FROM/previous page

utilities to help them meet their renewable portfolio standard requirements.

A solar electric system is roughly the same price as a new automobile, but it doesn't lose value as soon as it is driven off the lot. Rather, solar electric systems increase property value and can operate for decades.

Currently, public utilities can loan for up to 10 years at favorable rates. By extending the state authorized conservation loan authority to 20 years, solar electric purchases can be made significantly more affordable. Utilities could be encouraged to finance solar electric systems for their customers as a cost-

effective method for utilities to acquire new generation. Utility loans for solar can give the utility a better return on investment than building more conventional generation facilities.

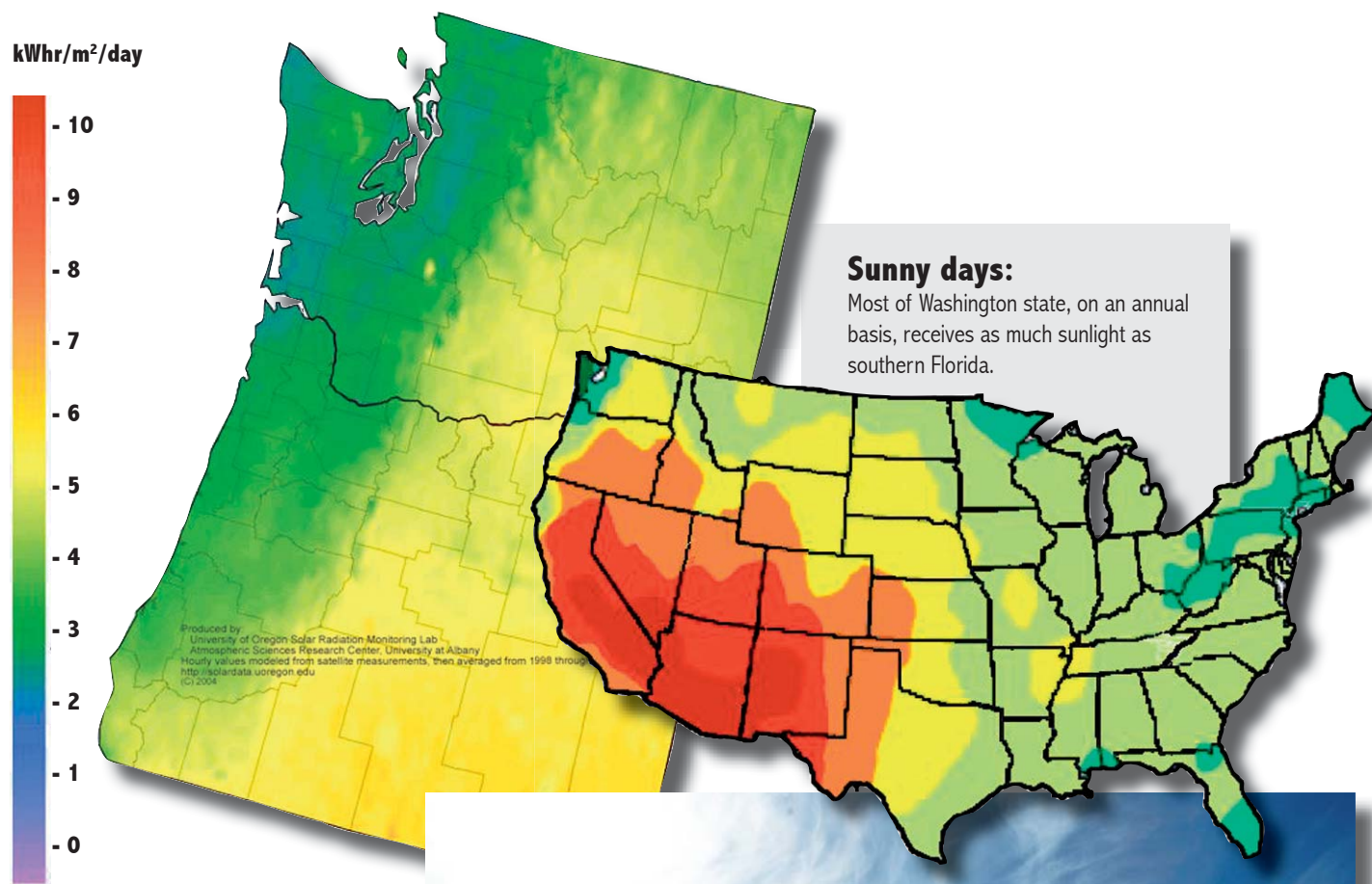
Another financing option that local and state governments could assist with is the creative use of property taxes. The price of a solar system could be added as a voluntary tax assessment on a home, spreading the payment out much like a local improvement district, or the cost could appear on a utility bill. These are very low risk loans because they can be secured against the home.

State government could be encouraged to simplify the permitting and installation processes for solar electric systems.

Government could develop clearly stated policies dealing with the overlapping trade issues surrounding installation of solar electric products. Many solar products resemble roofing materials more than electrical equipment. Individually, they pose little electric shock hazard, yet roofers are not allowed to place solar roofing tiles or solar shakes. At the same time, certified electricians may be unwilling to accept liability for roofing installation.

Solar electric technologies are rapidly becoming more and more appliance-like, with the use of plug-to-plug technologies. As solar system design and engineering improve, the solar system will become more and more like many other consumer appliances.

FACT – Enough sunlight falls on the earth every minute to meet the world's energy demands for an entire year.



Only the dusty, hot Southwest United States is a significantly better solar resource than Washington state.

Although the Southwest receives more annual sunlight, the climate is hotter. As temperatures go up, the efficiency of solar modules decrease. Long transmission distances just add to cost of power. Better to generate power where it is needed.

Given the existing transmission constraints, locating solar-electric generating systems for a community like Seattle in Eastern Washington is less efficient than smaller, local installations. If such systems are located on the rooftops of homes, offices, stores and factories, solar generates power closer to where it is needed.



Solar makes sense for Washington

In addition, that power is provided at a retail value instead of competing with other wholesale resources like wind or coal.

Solar frees up Washington's greatest resource, the river system, allowing the water to be used as virtual storage, providing additional water for fish management and agriculture. Solar gives river management more flexibility.

FACT – If a small fraction of the U.S. southwest desert (100 miles x 100 miles) were covered with photovoltaic cells, they could generate all the U.S. electricity requirements.

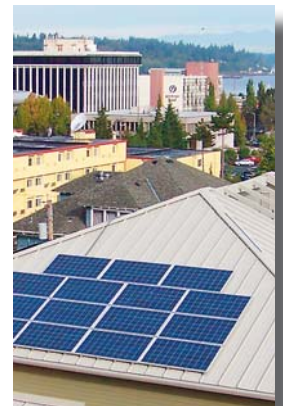
In the sun ...

A portfolio of Washington solar homes, projects, and communities



In the first six years following the passage of the net-metering law in 2000, the number of grid-connected solar-electric systems grew to about 200 systems statewide. In the two years since SB 5101 became effective, that number has grown to nearly 800.

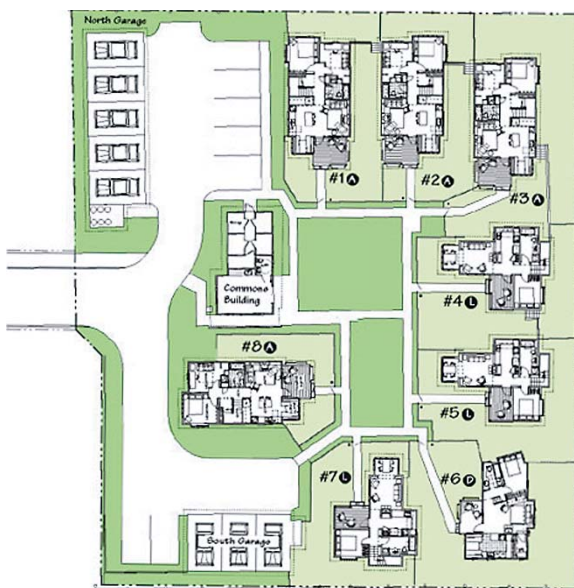
In the past two years, Washington has seen nearly a 100 percent a year growth rate in solar-electric systems. While there are far too many exciting solar projects providing clean reliable power to present them all, the following pages represent just some of the ways and places that solar power is becoming a part of everyday life in Washington state.



1767 – Horace de Saussure, a Swiss scientist, invents the world's first solar energy collector, or 'hot box', and carries it to the summit of Mont Blanc on his first ascent to test it at altitude.



A community solar project ...



The small houses of this 'pocket neighborhood' of energy-efficient cottages surround a shared community green. The owners have worked together to install solar on nearly half of the homes and their commons building.

Each dwelling has a private yard, surrounded by a low fence and garden gate. Garages and parking areas are clustered to the side, a design feature that has residents walking through the commons, helping to foster a strong sense of community.

The cottages range in size from 768 to 998 square feet. The small size alone is a major step toward a gentle footprint. They only require 2-3 kilowatts of solar-generated power to displace over half of the electric load. The homes are built to high quality green standards, with extra insulation, windows that are above code and excellent daylighting.

FACT - A small fraction of the Sahara Desert, if covered with photovoltaic cells, could generate the electricity requirements for all of the people living on earth.



A community arts center reaches for the sun in Wenatchee through a community solar endowment...

This 10 kilowatt solar power installation is the showcase of the Alcoa Community Solar Endowment. Solar panels and equipment were purchased by Alcoa and installed by Alcoa workers in partnership with the International Brotherhood of Electrical Workers. The work was performed by union electricians and aluminum plant workers under licensed electrical contractor, L.W. McCandlish Electric, Inc. This \$77,000 installation was then donated to the Wenatchee Performing Arts Center by Alcoa.

Renewable energy is a SNAP in Chelan County:

SNAP (Sustainable Natural Alternative Power) is Chelan County PUD's renewable energy program. The program connects customers who want to produce solar and wind power with other local customers who want to support such efforts.

Under the program, customers voluntarily pay a little extra on their utility bills to support solar and wind power. These customer donations are collected by the PUD and distributed once a year to individuals, schools and nonprofit agencies that are generating solar and wind power. Renew-

able energy generated by SNAP producers goes into the PUD's electrical grid and is distributed to PUD customers.

Customers who support SNAP are helping build a base of renewable energy in Chelan County. Customers who produce energy for SNAP are helping grow a new, renewable resource to complement the already abundant hydropower. Thanks to Alcoa, McCandlish Electric of Wenatchee, the International Brotherhood of Electrical Workers (IBEW), and all SNAP contributors, Chelan County is a solar leader in the state.

1839 – a French scientist, Edmund Becquerel, discovers the photovoltaic effect – light falling on certain materials can produce electricity.

An Olympia home arcs toward zero energy ...

Sam Garst is not a linear thinker, and the new home he built with a view of Puget Sound near Olympia, Wash., reflects his disposition to think outside the box, at least a rectangular box.

The home's underlying concept began with predominately south-facing glazing, which includes a

greenhouse buffer zone. The building was insulated to above code and earth-bermed to reduce energy costs.

The design called for installation of both solar hot water and photovoltaics. Sam added a ground-source heat pump and outfitted the home with carefully considered daylighting and energy-efficient lighting. He and his wife picked their appliances for energy efficiency and chose finishes and building materials that were non-toxic and sustainable.



FACT – If photovoltaics (solar cells) were used for just 10 percent of new electricity generation outside the U.S., industry revenue would amount to approximately \$13 billion per year.

A community's library green roof goes solar ...

The Ballard Branch of the The Seattle Public Library and the adjacent Ballard Neighborhood Service Center opened May 14, 2005.

The 15,000-square-foot library, more than twice the size of the previous branch, is the largest outside of the central downtown library. As part of the dedication celebration, an architectural panel addressed the building's key features including a discussion of the gently arched roof, which is capped with green plants and solar "green" power.

While the sod roof provides insulation and helps retain rainwater to slow stormwater runoff, the solar modules act as a sponge for solar energy, helping to reduce the building's electricity requirements.

In the first application of its type in Seattle, thin-film solar cells are integrated into a portion of the south and west-facing glass units surrounding the Neighborhood Service Center. By intercepting the sun, the cells provide critical shading of the glass while allowing just enough light to penetrate and illuminate the space.



FACT – Capturing just 2 percent of the market for the 900,000 new megawatts needed in solar-competitive countries over the next 15–20 years would create \$20 billion in projects.



This 2.5 kilowatt solar system located on this rural Vashon Island home, uses a new and exciting approach to solar. Each module has its own inverter, making it possible for an individual, a business, or even a community to install one solar module at a time and be able to monitor the production of each and every module for its real-time and long-run output.

Several manufacturers are coming to market with single module inverter systems. The Enphase Energy Micro-inverter system is one of the first of these products available on the market. It is a set of small units that connect

Inverted thinking:

Traditional Approach - An inverter is a power converter that converts direct current (DC) into alternating current (AC). In a solar module installation, the inverter performs two key functions: it performs the DC-to-AC conversion and it optimizes the modules' Maximum Power Point Tracking (MPPT). Traditional solar-energy installations deploy a single centralized inverter to convert the DC output from multiple solar modules into AC power.

Enphase Approach - The Enphase Micro-inverter system is a fully integrated device that converts the DC output of a single solar module into grid-compliant AC power. This integrated system maximizes energy harvest, increases system reliability, and simplifies design, installation and management.

directly to each solar module to convert DC power into grid-compliant AC power. It transmits valuable performance data on each module to the system owner. The result is more power, a more reliable system,

and the ability to monitor and respond quickly to performance issues. Homeowners and business-owners get more energy, lower costs, and greater control of their solar investment.

FACT - In the city of Tokyo, Japan there are nearly 1.5 million buildings with solar water heating, more than in the entire United States.

Harnessing a Wild Horse ...



Near Vantage, Wash., just east of the Columbia River, Puget Sound Energy's Wild Horse facility harnesses the sun and the wind to generate electricity. The facility's solar panels, at 500 kilowatts, generate enough to serve the power needs of 300 homes. Wild Horse is PSE's second and largest solar and wind farm, following the Hopkins Ridge Wind Facility. Together they produce enough electricity to serve nearly 100,000 households. Hopkins Ridge and Wild Horse make PSE the first and, so far, the only Northwest utility to solely own and operate large alternative energy facilities. PSE is exploring the acquisition of additional wind-power resources.

They call the wind (and sun) sustainable:

PSE's goals for the Wild Horse project are to:

- Explore synergies of large-scale solar-power and wind-power generation at a shared site;
- Increase understanding of solar power's capabilities in Washington state;
- Have the ability to make use of wind-farm land and infrastructure (substation, transmission lines);
- Help promote development of a

renewable power resource still in relative infancy;

- Jump-start the manufacture of made-in-Washington solar panels, thereby boosting financial incentives for consumers who have their own home-based or office-based renewable generating systems. Under PSE's Renewable Energy Advantage Program, consumers will be able to earn much larger incentive payments for systems employing Washington-made components.

1878 – William Adams wrote the first book about Solar Energy, entitled: "A Substitute for Fuel in Tropical Countries."



Washington utilities lead with a building so green it's platinum ...

The Washington Public Utility Districts Association's new solar-powered headquarters building in Olympia has received "Platinum" certification under the U.S. Green Building Council's Leadership in Energy and Environmental Design program. The WPUA headquarters, which boasts the largest rooftop solar installation in the state, is the first new-con-

struction office building in Washington to achieve Platinum certification — the highest possible rating under the LEED program.

REC Silicon, located in Grant County and the world's largest producer of high-grade polysilicon for use in solar panels, agreed to donate 160 solar panels for the build-

ing. It was this donation that made LEED Platinum certification possible.

Even on overcast days, the 34-kilowatt solar installation generates more than enough electricity to meet the building's daytime needs, with the surplus sold to Puget Sound Energy through net metering.

FACT – During his years at the Vatican, Leonardo Da Vinci planned an industrial use of solar power by employing concave mirrors to heat water.

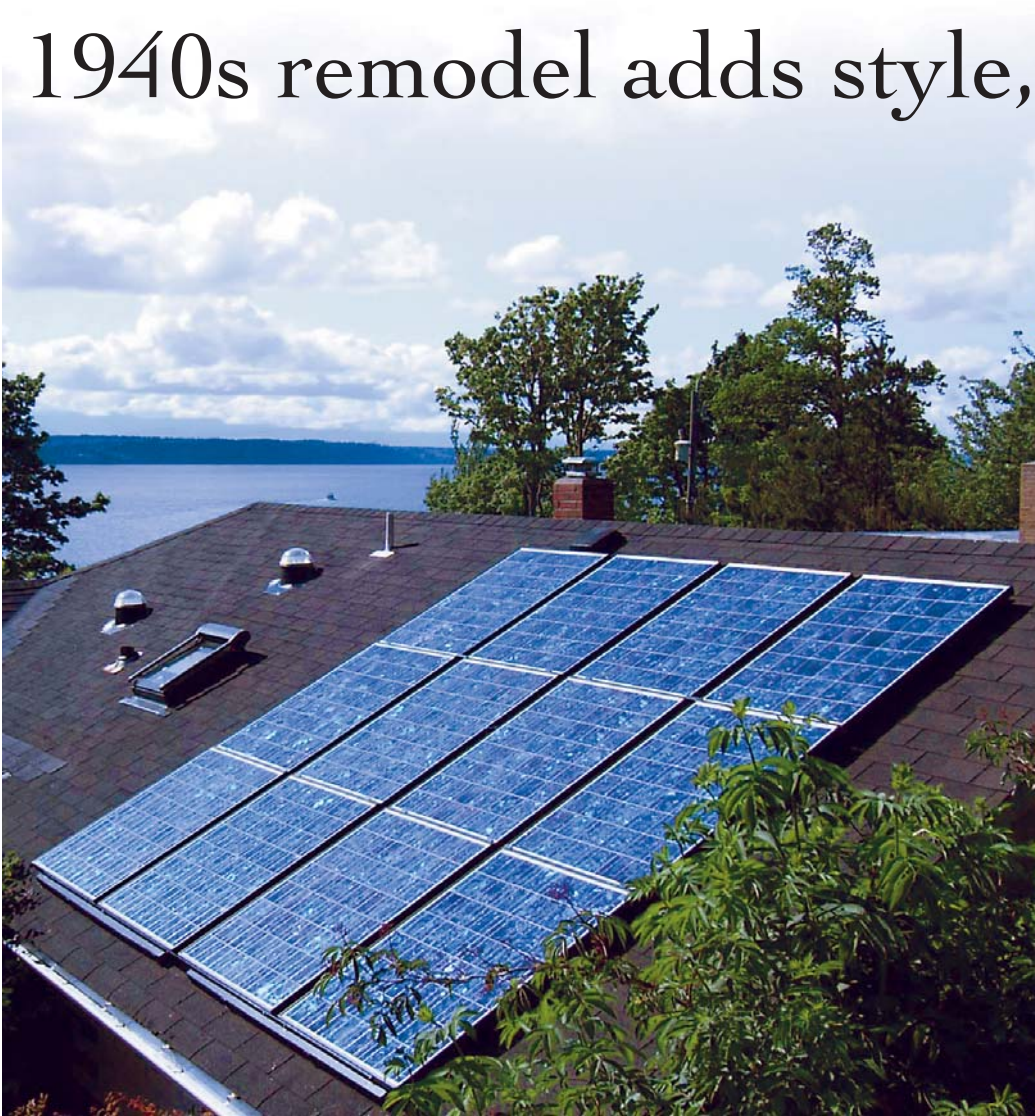
Accommodating all the angles ...

Many people looking to invest in a photovoltaic system are worried that their non-rectangular roof will not support a system. In fact, many different shapes and sizes of solar panels exist in order to fit most rooftops for optimal energy output. By using

triangular panels, the owners were able to optimize their roof space. The home is equipped with a grid-tied photovoltaic system producing 5.6-kilowatts. By Earth Day in 2006, the home had produced a total of about 10 megawatts.



1940s remodel adds style, value ...



This house, built in the 1940s, has increased immensely in value since a sustainability focused remodel in 2005.

The remodel addressed a number of sustainability areas, including conservation of energy, materials and water. The appliances were replaced with Energy Star-certified models. Natural lighting was emphasized where possible and energy efficient lighting used throughout. By installing a rainwater cistern and more efficient toilets, the home's water usage has been decreased.

Overall, energy consumption decreased, with a roof-mounted 2 kilowatt photovoltaic system as the primary strategy.

FACT – A world record was set in 1990 when a solar powered aircraft flew 4,060 kilometers across the USA, using no fuel.

A cooperative approach to solar ...

PCC (Puget Consumers Co-op) is the biggest natural foods cooperative in the United States. There are eight stores located around the Puget Sound region. Each one brings environmentally friendly food to its 40,000 registered members as well as thousands of non-members.

PCC is also a major supporter of local farms, and a major contributor to the PCC Farmland Trust, a not-for-profit organization with a goal to create and maintain organic farms.

Clearly, the Puget Consumers Co-operative is an environmentally conscious corporation. It is no surprise that the Fremont PCC was the first business in Seattle to install a photovoltaic system. The system is so ergonomically installed that few passersby even notice it. In fact, the solar panels themselves double as a canopy under which customers can enjoy coffee from the outdoor café.



FACT - A completely solar powered aircraft holds the world's record for altitude at over 80 thousand feet.

Solar goes to school ...

Puget Sound Energy (PSE) funded the Redmond High School installation, the 13th such project in the Bonneville Environmental Foundation's Solar 4R Schools program. Attached to the Bonneville Power Administration, the program is part of ongoing efforts to promote the use of renewable energy. The 1.1-kilowatt solar electric power system enhances the school's reputation as a leader in sustainable design and technology, and provides a demonstrable means of educating students on the functions and benefits of solar electric power at no financial cost to the school.

In addition to producing clean, renewable energy, the solar power system includes a curriculum package that uses Web-based, real-time data generated by the installation. The school added the solar curriculum units to its physics and environmental science classes in the spring of 2006. An extensive exhibit further increases the educational value of the project. A kiosk and Web site display the current electrical output of the system, as well as weather factors (solar irradiance and temperature) that affect energy production.



Utility-owned, customer-financed community solar power...

In 2006, the city of Ellensburg's municipal utility installed a 36-kilowatt photovoltaic system in a field just off the I-90 freeway, a high-profile location that results in numerous inquiries.

An additional 20.8-kilowatt facility is under construction and scheduled for completion soon. With continued

community support, the city officials have plans to expand the project to an additional 24 kilowatts in the summer of 2009.

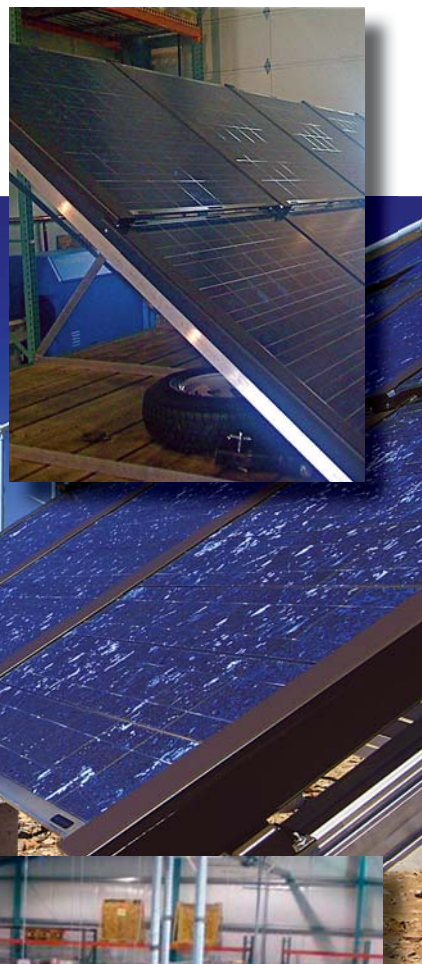
People in the community were asked to partner with the city to help fund the project. In exchange for their financial support, the city gives the contributors credit on their

electric bill for the retail value of the electricity produced by the solar system.

For example, if a customer's contribution represents 3 percent of the total funds contributed by utility customers, that customer receives 3 percent of the power produced by the solar project, which is deducted from the electric bill.

1921 - Albert Einstein wins the Nobel Prize in physics for his research on the photoelectric effect—a phenomenon central to the generation of electricity through solar cells.

Module manufacturing comes of age in Washington ...



Over the past several years, Silicon Energy, located in Arlington, Wash., has been developing a line of solar modules called the Cascade Series.

These new solar modules, now in the final stages of testing and certification, are scheduled to be on the market shortly. Industry observers say the new modules could be “game-changers.”

Silicon Energy’s new product is the first solar module ever built to standard U.S. construction dimensions, one of several design features intended to ease and speed installation. Unlike conventional modules, the mounting system is integrated into the product. Rather than requiring a separate racking system used in most modules, these panels integrate the appropriate brackets, making installation easier and faster.



In addition, the new panels’ transparent construction allows light to pass between cells. Silicon Energy’s module will have a Class A fire rating and a limited warranty of 20 years on power performance. The Cascade Series uses highly efficient polycrystalline cells from silicon processed by REC in Moses Lake, Wash.

FACT – Each day, more energy falls to the earth from the sun’s rays than the total amount of energy the planet’s 5.9 billion inhabitants would consume in 27 years.

Field of dreams:

REC Solar, the firm that put the world's first facility dedicated to producing solar-silicon in Moses Lake, also put this billboard in a field in its home country of Norway.



Moses Lake leads the world ...

Over the past few years, REC has invested more than \$1 billion in Washington state.

REC Solar Grade Silicon LLC in Moses Lake, Wash., is the world's first dedicated producer of polycrystalline silicon for solar applications. REC Silicon's first plant was established in November, 2002, after con-

verting a former facility into the world's largest producer of solar-grade silicon.

Because only solar-grade silicon qualities are produced, REC Silicon has been able to simplify the production and associated business processes compared to other plants that also serve the market.

The Moses Lake plant has approximately 400 employees. Currently REC is completing a new facility that will use a proprietary process to produce high quality silicon. Such increases in production efficiencies are expected to further drive down the cost to consumers for solar-electric systems.

1889 – Charles Tellier, a Frenchman, experiments with a non-concentrating/non-reflecting solar motor and installs the first solar energy system for heating household water on his own roof.

The first platinum LEED remodel leads the solar way in Spokane...

In only a few years, a block of empty storefronts on Spokane's Main Avenue reinvented itself as "the largest concentration of non-profit organizations in the city."

Among the remodeled buildings was the Saranac Hotel. Not only does this hotel feature one of the state's largest solar arrays, it is also the first Platinum LEED certified renovation in Washington. Leadership in the Energy and Environmental Design (LEED) serves as a third-party rating system for evaluating a building's energy and water-use efficiency. The platinum level rating is the highest rating any building can receive. It involves obtaining 52-69 points out of the 69 possible points in the LEED rating system. The points come from a number of separate categories: Suitable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, Indoor Environmental Quality, and Innovation & Design Process. There are very few Platinum LEED certified buildings in the U.S.

The hotel project was recently recognized by the Washington Association of Landscape Professionals and received the highly coveted Grand Award in the Water Wise entry category.

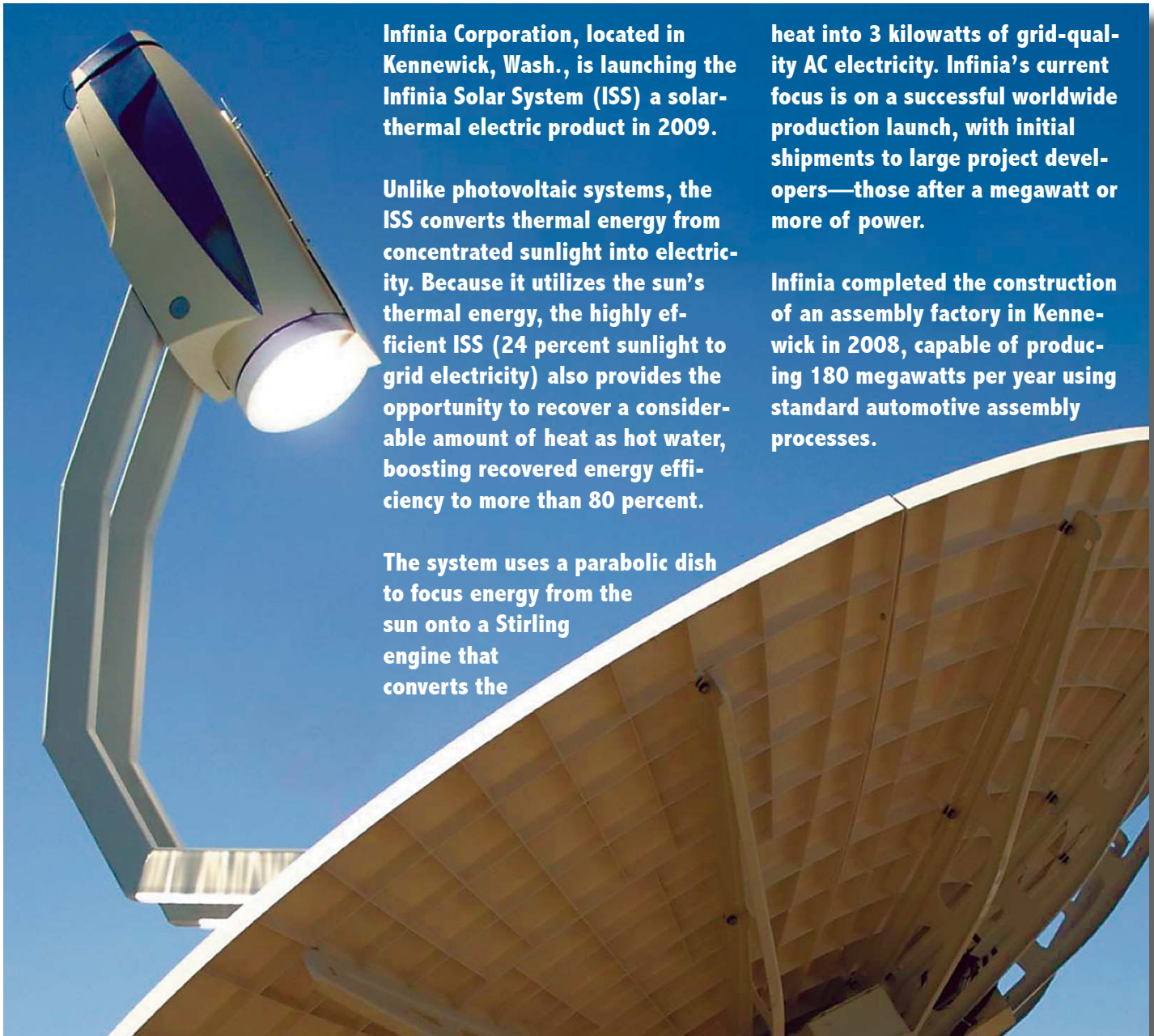


The portion of work completed by Clearwater Summit Group includes installation of a living green roof system using indigenous plants and innovative rainwater collection methods as well as a rooftop patio with 24-inch square architectural concrete slabs. The irrigation system design and selection of drought tolerant plants will save 36,667 gallons of water usage compared to a standard system.

CONTINUED/next page

FACT – Solar energy is delivered every day, to every corner of the globe, free of charge, until the end of time.

Dishing up infinite energy...



Infinia Corporation, located in Kennewick, Wash., is launching the Infinia Solar System (ISS) a solar-thermal electric product in 2009.

Unlike photovoltaic systems, the ISS converts thermal energy from concentrated sunlight into electricity. Because it utilizes the sun's thermal energy, the highly efficient ISS (24 percent sunlight to grid electricity) also provides the opportunity to recover a considerable amount of heat as hot water, boosting recovered energy efficiency to more than 80 percent.

The system uses a parabolic dish to focus energy from the sun onto a Stirling engine that converts the

heat into 3 kilowatts of grid-quality AC electricity. Infinia's current focus is on a successful worldwide production launch, with initial shipments to large project developers—those after a megawatt or more of power.

Infinia completed the construction of an assembly factory in Kennewick in 2008, capable of producing 180 megawatts per year using standard automotive assembly processes.

FROM/previous page

The water reuse system uses five, 2,500-gallon drums that capture and store all rain and spring water for bathrooms and irrigation.

On the outside, recycled metal siding from old car bodies is used. Inside, the insulation was made from recycled jeans. All existing nails, glass pieces, and larger boards were reused from the old building. Tiles were made of recycled glass, not

ceramic. Low VOC paints were used. The concrete is actually ash from a coal-fired chimney stack. Rooftop gardens assist with temperature control through drought tolerant plants, and contribute basil, thyme and oregano to local users.

1904 – Henry Willsie recognizes the need to store generated power and builds two huge plants in California. He is the first to successfully use power at night after generating it during the day.



Island life includes a home planned for the sun ...

In 2007, the Rolling Bay Land Company and Studio Hamlet finished the Valley Farm House, Bainbridge Island's first LEED certified home. This certification cemented the goal of the home as the most energy- and water-efficient home on the island.

A large achievement such as this comes with the combination of many smaller things. Key in this is the use of photovoltaic

Unto itself:

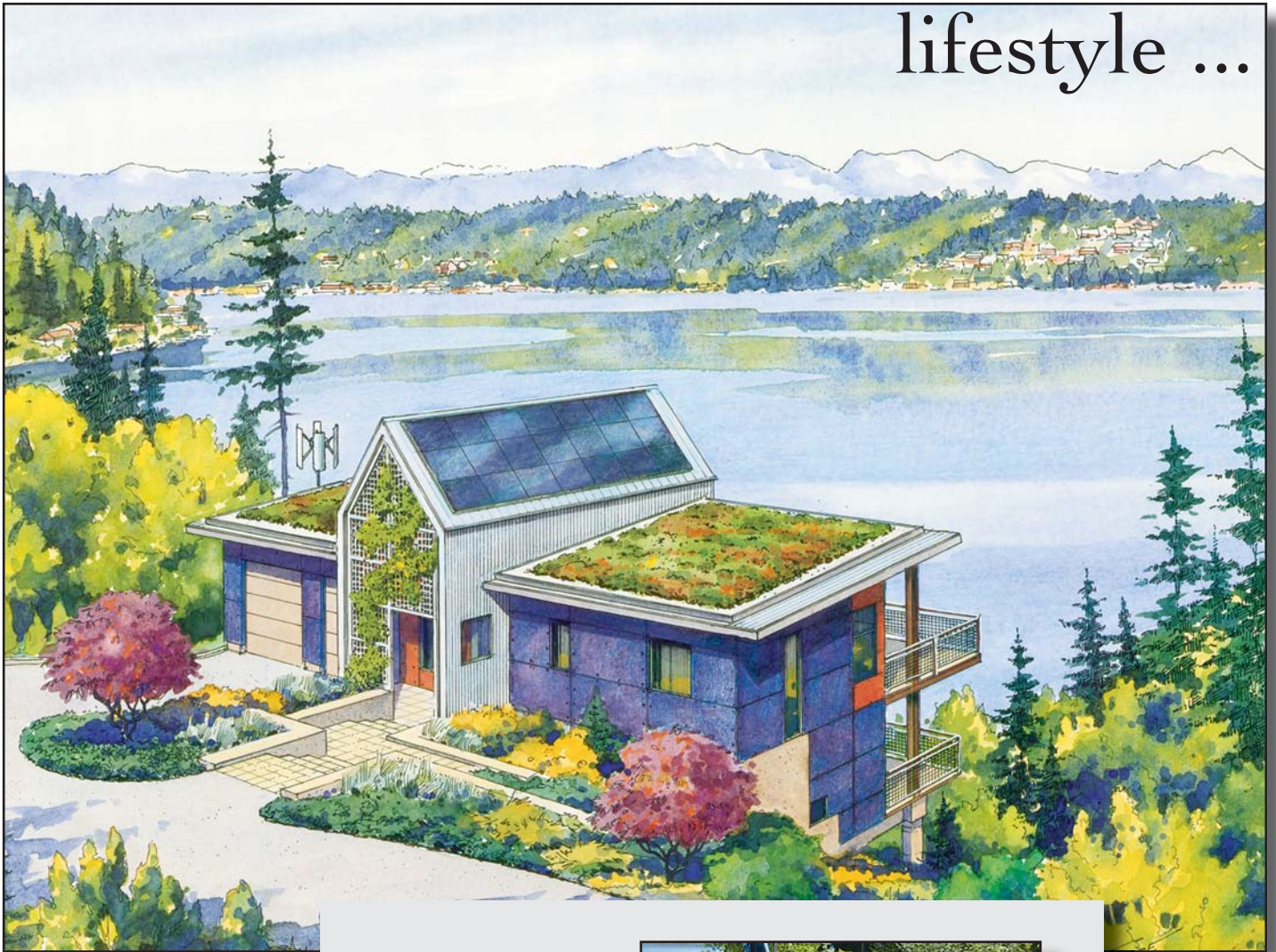
Site orientation and planning that integrates solar panels into the design of the house were used in this Bainbridge Island home.

and hot water systems to reduce energy use. By building the home facing south, the solar panels receive the optimal amount of sunlight. This also results in natural lighting and a non-existent utility bill. Also, the homeowner receives \$1,300 in pay-backs for the energy generated by the system. That system in

combination with above-grade insulation and air filtration made this house a clear choice for LEED certification.

FACT – The photovoltaic cell was discovered in 1954 by Bell Telephone researchers examining the sensitivity of a properly prepared silicon wafer to sunlight.

Looking toward a zero-energy lifestyle ...



Some of the most progressive builders in Washington have focused on the 2030 Challenge (see box).

Construction is underway in Bellevue, Wash., on a cutting-edge, single-family home named the Zero Energy Idea House at Bass Cove. When complete, it will demonstrate how green home modifications and technologies, in addition to lifestyle changes, can reduce a home's

Forward thinking:

The 2030 Challenge is an industry-wide initiative aimed at completely eliminating the use of fossil-fuel energy and emission of greenhouse gases in the construction and operation of buildings.



energy consumption. Built by Issaquah-based Shirey Contracting, the home's sustainable features will include photovoltaic

(PV) solar panels, structural insulated panels (SIPs), a wind turbine, a living wall and a green roof.

FACT – Solar energy (photovoltaic) prices have declined on average 4 percent per annum over the past 15 years, primarily due to increasing conversion efficiencies and manufacturing economies of scale.

Sun comes up, power goes on ...

Sunlight turned into electricity

It works any time the sun is shining, but more electricity will be produced when the light is more intense and perpendicular to the solar electric modules.

Solar cells

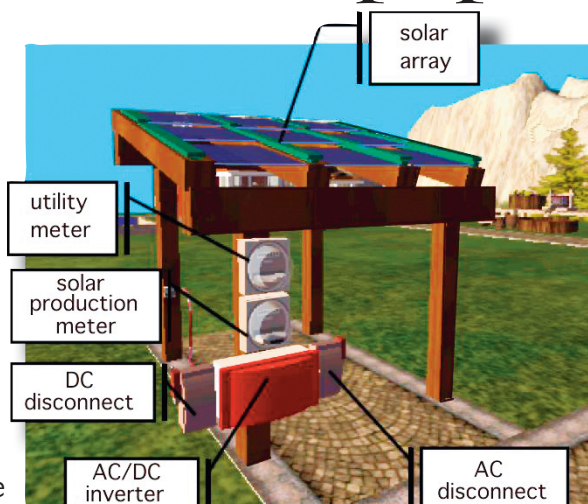
Solar electric cells are wired together to produce a solar electric "module," the smallest solar electric component sold commercially, and these modules provide power output up to 300 watts. A solar electric system tied to the utility grid consists of one or more solar electric modules connected to an inverter. The inverter changes the system's direct-current (DC) electricity to alternating current (AC), which is compatible with the utility grid and able to power home appliances.

Semi-conductive material

The most common semiconductor is silicon. The photovoltaic effect works much like a battery. Photons strike the atoms of the solar cell and drive electrons from the negative side (-) through the device and back to the positive side(+).

Direct current

To meet the needs of homes and industry running on alternating current, direct current must be transformed to run appliances, lights, refrigerators, machines, etc. That



conversion is accomplished with an inverter. For Washington's production incentive the customer uses a grid-tied inverter. It works by regulating the amount of voltage and current that is received from the direct-current solar panels and converting this into alternating current. It also ensures that the power supplied will be in phase with the grid or utility power. Homeowners with surplus power are able sell this converted power back to the utility.

Spinning the meter backward

Inverters limit AC voltage to no higher than the utility voltage and automatically disconnect from the utility if the utility power goes out. This means with line-tie inverters, when the power goes out your solar system shuts down to protect the utility lineman. For safety reasons a circuit breaker is provided both on the AC and DC side to enable maintenance. The AC output usually goes through an electricity meter into the public grid.

Now is the time: Incentive program

Washington utilities will buy solar-generated power at 15 cents per kilowatt/hour through July, 2014. Choose an inverter manufactured in Washington and that rate goes to 18-cents/kWh. Washington-made solar modules net 36-cents/kWh. If both modules and inverter are made in state, the payment jumps to 54-cents/kWh.

Utility meters turn both ways

All net-metered solar energy is truly "community energy." Solar electricity generated but not used at the home or business gets fed back to the utility, so that solar power can be used by others. The electric meter spins backward and the monthly utility bill is the difference between what is produced and used. In the summer, systems "make hay while the sun shines." Those credits act as "stored summer sunlight" during the winter.

No state sales tax

There's no state sales tax on solar-energy systems, including both solar hot water and solar electric systems.

Federal tax credit

Starting in 2009, a 30 percent tax credit is available on the installed cost of solar-electricity systems. The credit is set to expire in eight years.

FACT - 1 kilowatt-hour (kWh) = the amount of electricity required to burn a 100-watt light bulb for 10 hours.



A high note:

McCaw Hall in Seattle is known as an innovative building for many of its features, including solar panels mounted vertically on the side of the structure where they are better able to catch the sun's rays.

Solar is music to designers' ears ...

While some designers consider solar panels an architectural burden, newer systems are allowing the near-seamless integration of modules into the buildings themselves. As prices drop, facade materials will become a part of the energy generation designed into modern buildings.

McCaw Hall in Seattle is a precursor to this newer way of mounting photovoltaic systems. McCaw Hall is home to the Seattle Opera, Pacific Northwest Ballet, and a myriad of guest performers from around the world. It is also one of Seattle Green Powers premier solar projects.



The building features a 6.3 kilowatt photovoltaic system, unique for a number of reasons. Unlike most systems, this one is mounted vertically instead of horizontally.

to roof mounted systems, especially in northern latitudes which must capture sunlight coming to them at lower angles for much of the year.

At the time of its inception this type of mounting was rare, but it paved the way to more advanced photovoltaic-system design. These types of systems are being implemented more and more as an architecturally-friendly alternative

FACT – 100 square feet of solar panels on a roof will support about a kilowatt of solar. A typical new home has 1,000 square feet of suitable space for solar panels.

Committed To The Future. Committed To Solar.



Shoreline Community College's cutting-edge Zero Energy Technology Program is leading the way and providing solutions to the issues surrounding global warming and America's energy independence. Students gain the skills required for the green economy, including:

- Solar/Photovoltaic Design and Installation
- Energy Audit
- Zero Energy Technology

The Solar/Renewable Energy Career Pathway leads to a new high-growth, high-wage industry that is literally the dawn of a new age. Partners include leading industry experts, the K-12 public school system, Washington State University, King County Workforce Development Council and organized labor.



WSU's Extension Energy Program's mission is to advance environmental and economic well-being by providing unmatched energy services, products, education and information based on world-class research.

Program Areas:

- Commercial and industrial engineering
- Technical assistance clearinghouses
- Renewable energy
- Climate and rural energy development
- Public sector resource conservation management
- Applied building science
- Distributed generation

Our Customers:

- Utilities
- Industrial plant managers
- Building professionals
- Business and building owners
- Universities
- Federal facilities/national labs
- Government agencies

The Northwest Solar Center is a collaboration between Shoreline Community College, Washington State University and the WSU Energy Extension Office. NWSC is dedicated to:

- Market transformation of solar technologies from off-grid niche markets to grid-connected.
- Integration of distributed renewable energy systems with efficiency and conservation technologies.
- Increase technical knowledge among utilities and the public through education and training.
- Community-level deployment of job-creating renewables.
- Evaluation and improvement of renewable technologies appropriate to the Pacific Northwest.
- Accelerated installation of solar electricity throughout the Pacific Northwest.

The Zero Energy House — a solar demonstrator designed and built by WSU Students, housed at Shoreline Community College.

