Today's Energy Choices for a Cleaner Environment

Want to slow global warming? It's the Architecture, Stupid!, page 48

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MAY/JUNE
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VOL. 17, NO. 3

MAY/JUNE 2003

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Solar Design Associates

NASA

Bob Hammond

AstroPower

Building-Integrated Photovoltaics

On Our Cover

Bert Schendel

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In Our Next Issue

Emissions from cars and trucks are major contributors to global climate change. In our next issue, we'll explore the options available today to reduce the environmental impacts of our transportation system and take a look at what products we can expect to see on the market in the near future.

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Chair's Corner

Solar's Sleeping Giant Wakes

Just days before Christmas 2002, Sierra Pacific Resources announced that its two Nevada-based utility subsidiaries, Nevada Power and Sierra Pacific Power, had signed a twenty year power purchase contract for 50 megawatts of concentrating solar power (CSP). In March 2003, the Public Utilities Commission of Nevada approved this agreement, paving the way for the system to come on line in March 2005. I am very proud to be part of the Solargenix (formerly Duke Solar) team that will soon be starting construction of the largest solar system to be built in the last 12 years. Despite more than a decade of challenges, the solar thermal electric industry appears to be back.

Mike Nicklas

In 1990, the future of solar thermal electricity could not have looked sunnier. Luz had just started its ninth Solar Electric Generating System (SEGS), which would bring their total capacity to 354 megawatts. With a 25 percent natural gas backup, the combined price of electricity produced at the installation had dropped from $0.24 per kilowatt-hour (kWh) in 1984 to less than half that in 1990.

But just as the concentrating solar power (CSP) industry was gearing up and investors were starting to pay closer attention, the political winds shifted and changed the fate of this technology, which at the time was supplying 95 percent of all the solar electricity in the world. As political support waned, so did support for retaining the incentives that had stimulated the industry to that point. Soon Luz, in a rush to beat the elimination of the tax incentives, found itself with nervous investors and a project that was over budget. By 1991, the final 80 megawatts had come on line, but—primarily due to inconsistent federal and state tax policies—Luz was bankrupt.

Since the demise of Luz over a decade ago, there have been no large-scale solar thermal generating plants built anywhere in the world. To those in the solar electricity industry, this is puzzling, to say the least. How could a technology that showed such promise a decade ago just go to sleep? The answer cannot be traced to a single reason.

First, these systems are large and require significant capital. While SEGS plants can be built incrementally, to be as cost-effective as the Luz SEGS, the plants needed to be in the 40 to 50 megawatt-plus range. This necessitated single plant investments of hundreds of millions of dollars. Although raising this much capital was limiting, a more important consideration was the same issue that brought Luz down—the continued uncertainty about federal and/or state incentives. This factor alone has kept many investors out of the solar market for years.

The third significant problem has centered around a historic lack of support by the U.S. Department of Energy (DOE) that spans several administrations and still plagues the industry. The DOE in the 1990s wasn't supportive of trough technologies primarily because Luz was a foreign company and the U.S. trough industry was, at the time, small in comparison to Luz. But when Luz went under, DOE squandered the opportunity to bolster the research and development (R&D) efforts of U.S. companies and regain a worldwide leadership position. That lack of support not only hurt the process of advancing the technology but, more significantly, it sent a negative message to the energy and investment communities. DOE's lack of support has hurt the U.S. CSP trough industry's ability to attract capital, and it has kept new intellectual talent from entering the field. Today, the CSP programs within NREL and Sandia have been decimated and the Administration's plan to eliminate the CSP budget continues to send the wrong message.

Challenging the technical basis of DOE's positions on CSP, the American Solar Energy Society and the solar industry have had some success in encouraging DOE to re-evaluate its position. For example, DOE commissioned Sargent and Lundy to conduct an assessment of the potential of CSP. The analysis concluded that CSP trough technology has already been demonstrated at commercially relevant sizes. The document also projected near-term costs of troughs to be approximately $0.104/kWh and estimated that—with aggressive R&D—the cost of solar electricity could reach $0.04/kWh by 2020.

But, despite the positive nature of this evaluation, DOE has continued to hold to its original position—supported by its own commissioned studies conducted by the National Research Council—which concluded that "the Office of Power Technologies should limit or halt its research and deployment on power-tower and power-trough technologies because further refinements would not lead to deployment."

The second of these evaluations, completed prior to the recent announcement of the 50-megawatt Nevada CSP power purchase agreement, argues that the CSP industry is in a "chicken and egg" situation. According to this study, the industry will not succeed because it cannot obtain the initial utility power purchase agreements that would begin to reduce overall system costs. The NRC, challenging the more positive Sargent and Lundy assessment, stated that this document's assumption that a large commercial CSP plant would be built within the next several years was "unrealistically optimistic" and therefore not credible.

This, happily, has not proven to be the case. And with this important breakthrough in Nevada, I believe many more companies will soon enter the CSP field. DOE has simply misjudged the industry and the CSP technology.

I remain hopeful that DOE will now see what the industry has been able to accomplish and reverse its position regarding the many promising CSP technologies. But even without DOE's support, I think we will see more CSP installations, and, very possibly, solar-produced electricity at $0.04/kWh well before 2020.

Mike Nicklas
chair@ases.org ✪

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Austin-Bergstrom International Airport Taxi Stand Project, 26.4 kW (2000)

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Silicon Jewels and a Fond Farewell

A colleague of mine calls photovoltaic cells "silicon jewels." For me—an admittedly non-technical type—this characterization captures some of the appeal of this intriguing technology.

There's an ongoing discussion among renewable energy advocates about why photovotaics (PV) seem to be catching on in the marketplace when more cost-effective solar technologies are not. It seems obvious to me (this may be my Irish heritage expressing itself) that the magic of this technology is irresistible at any price. If you've ever seen a PV module in full sunlight, you know how the light sparkles and dances over the cells—clearly the sun fairies at work.

In addition to being lovely to look at, these devices are silent, emission-free, last for decades and make electricity from an inexhaustible source—the sun. What's not to love?

Apparently, even the Bush White House isn't immune to PV's allure—there is now a PV system on the roof of the maintenance shed in the White House compound. Solar thermal collectors are also back at the White House, as Mark Fitzgerald tells us in "Solar at the White House" (page 36). For pure symbolic value, you can't beat solar systems on the White House. Let's hope these installations signal a shift in the thinking of this Administration toward the real energy security of indigenous, clean renewable energy technologies.

Businesses are also investing in PV. In "Truss Plant Goes Solar" (page 40), Rich Binsacca relates the story of the Hayward Corporation's "people, planet, profits" approach to business sustainability. A California lumber and building materials supplier, the company installed a 14,400-square-foot building-integrated PV (BIPV) array as part of an effort to "green" their new manufacturing plant. CEO Bill Hayward's personal passion initially drove the initiative, but the Hayward Corporation has leveraged the use of solar energy equipment at the plant into a brand—Solar Truss™.

Although electricity from PV installations is still pricey, it gets more cost-effective by the day. As Joe McCabe describes in "Mining the Sun in California" (page 44) Public Interest Energy Research (PIER) Programs are funding research, development and demonstration projects designed to reduce the cost of PV equipment. Because BIPV add value by displacing other construction materials like roofing or glass façades, PIER has taken a particular interest in these technologies.

Architect Ed Mazria, in "It's the Architecture, Stupid!" (page 48), makes a compelling case that architects should follow Bill Hayward's lead and embrace green design and building strategies. Mazria points out that architecture consumes almost half of all the energy produced in the U.S. today and buildings are typically used for 50 to 100 years. That means that energy-intensive buildings built today could still be wasting resources when our grandkids are geezers—definitely food for thought.

In our "Back to the Future" offering for this issue, ("The PV World: Then and Now," page 52), former publisher and editor of *PV International* Mark Fitzgerald describes the ten largest PV installations two decades ago and today. Clearly, the PV industry and marketplace has gone through dramatic changes over the last twenty years.

Finally, SOLAR TODAY is also going through some changes—this issue is my last as editor and publisher. Over my thirteen years at SOLAR TODAY, I have been impressed again and again with the extraordinary enthusiasm and generosity of the many contributors to this publication. The vast majority of the writers and photographers whose work you see in these pages donate their time and talent. Their commitment to moving the world toward a clean, secure, sustainable energy future is an inspiration.

In addition, our art director, Cindy Richards of Red Cedar Design, will be leaving after the July/August 2003 issue. I have worked with a number of designers during my twenty years in magazine publishing, and Cindy is the best of the best. She is not only a talented graphic artist, but also has the patience and skills to attend to the countless details that the process of taking a magazine to print requires. Perhaps most remarkably, she manages the entire process alone, under often crushing deadline pressures and with persistent good cheer.

Thank you all. It's been a pleasure and a privilege working with you. ✪

Maureen McIntyre
mcintyre@indra.com

Letters to the Editor

Charging for Pollution

Editor:

State budget crises and the impending war are related. Many say the war and its collateral slaughter of innocent civilians are meant to control Iraq's oil. Notwithstanding the administration's "patriotic" assertions, I find it deeply immoral and unpatriotic. Only a little less immoral is California's budget crisis, worse this year than ever and due mainly to the legislature's 1996 decision to restructure electricity supply. It allowed companies like Enron to loot the California treasury and, some say, to send proceeds to the Bush for President campaign. But the state borrowed money to pay those bills, and we have to pay it back. From what I read, California is not the only state with a budget mess.

That's history, but what are the choices now? We'll lose services our families need, like schools, fire, police, counseling services, community development and health care, unless we ante up that $34 billion. Without it the legislature will relegate us to third world status.

Nationwide, the environment is suffering too, laden with filthy air, excess auto traffic, water pollution, impending climate change and toxics. Don't we all know someone with asthma or cancer? Much of that comes from the way we use energy.

When legislators look beyond lobbyists' stories, they'll note that Europe has shown us the way—charge fees to reduce pollution we don't want. Easiest is to charge a fee for carbon dioxide emitted by burning fossil fuels.

No matter how we pay California's $34 billion or other states' billions, it can't be cheap. But we are less afraid of paying our way than legislators may believe. Most of us realize there's no free lunch, and all of us who've lived there reject being third-worlded.

With political will a bit obscured just now, neither governors nor legislatures want to raise taxes. However, there comes a time when nervous politicians must take a stand for what is right, and now is that time.

If we pay California's $34 billion with fees on carbon dioxide pollution, electricity on average would cost about 3 cents more per kilowatt-hour (a 25 per cent increase), gasoline would cost about 81 cents more per gallon (little more than the increase the oil companies just gouged us for) and natural gas would cost about 44 cents per therm more (roughly a 50 per cent increase). Numbers are probably about the same elsewhere.

These fees are costly, no doubt, but there are compensating benefits. They'll enable excellence in schools and health care. They'll reduce dirty fuel usage and clean up the air. They'll encourage some of us to use mass transit. They'll pay for security against the terrorist attacks the Bush war may cause. More important, they'll put us on the road to independence from fossil fuel barons at home and abroad.

But most important, they help free us from the future "need" to slaughter innocent souls to control fossil fuel supplies, by encouraging conservation and renewable energy. Nothing could be more patriotic and moral than that.

John Schaefer
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Here We Go Again…

Editor:

After reading the opinion column by Joel Stronberg in the March/April 2003 issue of SOLAR TODAY (*View from Washington*, "Trust Him?"), I couldn't help but be discouraged for the future prospects for the American Solar Energy Society and for solar energy itself. If the tone of this editorial is the tone that Mr. Stronberg takes on our behalf in Washington, we can write off having any constructive input into what progress might be made during this administration's four or eight years in office, and possibly beyond.

I quote Mr. Stronberg: "It is my personal belief [that] people are not stupid and …the Administration's foreign policies—including those that take us to and beyond the brink of war—are being driven by the need for foreign petroleum. …I am as frightened by the arrogance of the Administration as I am of what Saddam Hussein might do." Such personal, political vitriol doesn't help our efforts one bit. In fact, it invites a perception of irrelevance by responsible policy makers.

I sincerely hope Mr. Stronberg's personal beliefs about stupidity, foreign policy, politics or Saddam Hussein are not the guiding principles of the American Solar Energy Society in Washington. If they are, the future of a technology struggling to wean itself from federal subsidies is dim indeed.

Surely we can find a more constructive way to engage policy makers on both the executive and legislative sides of government without this type of inane, immature name-calling. Surely we can do better for our money if we truly want to positively advance solar energy in our country.

Bill Baxter
Knoxville, Tennessee

Business Basics

Editor:

As a long-time solar advocate and supporter with experience in practical solar applications, I am writing to share my thoughts about some problems in the solar industry. I have no ax to grind and feel the best solution to the concerns I raise is simply to begin a dialogue. In my attempts to procure solar energy systems (lighting, water heating and grid-tied) over the years for a facility I manage, I have run into a discouraging series of bad business practices. These have included poor communication (notably not listening to what the customer wants), unreliability and problems with scheduling, follow-up and quality monitoring. This has been my experience with small installers and fairly large companies alike. Compared to any other industry I have dealt with in my many years as a facility manager, the solar industry has, as a whole, been the most difficult to deal with. Were I not a "true believer" in solar energy technologies, I would have given up on the process early on.

It would be easy to dismiss my words as those of an isolated, disgruntled customer, but this would be to the detriment of the ultimate progress of solar energy technologies. I am writing this letter only after having heard a number of other such accounts of poor business practices. Basic communication and follow-up are initially called for, followed by emphasis on marketing and education necessary to provide a good business base in which companies can thrive and produce reasonable schedules and incomes for their employees. I encourage dialogue about these matters as they will play a big role in the success of solar.

Name withheld by request

Updating the System

Editor:

I appreciated Mike Nicklas' thoughts in the March/April 2003 issue of SOLAR TODAY (*Chair's Corner*, "Breathe Easier") especially the statistics on lung cancer,

Continued on page 81

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First Legacy School

The District of Columbia Schools Partnership, Barnard Elementary School and the American Solar Energy Society's (ASES') "Legacy" Adopt-A-School Program joined to celebrate the ribbon cutting at the new Barnard Elementary School in Washington, DC, on March 5, 2003. The U.S. Department of Energy's (DOE's) EnergySmart Schools program, the Interstate Renewable Energy Council (IREC) and several ASES Chapters were key partners in the event.

Rebuild America

Students join ASES' Onage Jackson (second from right, back row) at the ribbon cutting ceremony for the new Barnard Elementary School in Washington, DC, on March 5, 2003.

Rebuild America

Barnard Elementary School features a two-story atrium with skylights that fill the hallways with natural light.

ASES established the Legacy Program to support solar education, solar career development and energy leadership among under-served, lower income, inner-city school communities. The Program is meant to encourage quality teaching and learning about solar energy, technologies, applications and related topics. It provides ongoing solar education and other resource support to a deserving school in the location of each annual ASES National Solar Energy Conference. The local organizing committee of each Conference selects the school.

Barnard Elementary School is the first-ever ASES Legacy School, selected in April 2001 as part of the FORUM 2001 Conference. The initial project was to provide energy educational training to faculty and support materials to the students, but the project has grown beyond curriculum to bricks and mortar. The new Barnard School, which opened in February, is a state-of-the-art energy-efficient building with daylighting, a solar roof and light sensors in the classrooms.

The materials provided to Barnard Elementary as a Legacy School include: a complimentary library subscription to SOLAR TODAY magazine; a DOE Energy Smart Schools "Solar on Schools Kit—Energy from the Sun": a student lab book and model home with solar powered lights and fans; IREC's "Solar in a Box," to help teachers understand and teach the principles of solar energy; sets of Solar Cookers and Solar Car Kits from SUNRISE: Sustainable Resources Group, the Nevada ASES Chapter; and a Solar Coloring Book from the Texas Solar Energy Society, another ASES Chapter. In addition, a scholarship for a teacher to the National Energy Education Development Project (NEED) summer training program was provided by NEED.

EnergySmart Schools, a part of DOE's Rebuild America program, provided technical support throughout the construction

Continued on page 18

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Let the People Speak

by Joel B. Strongberg

The U.S. requires a rational and responsive national energy policy. What is a rational and responsive energy policy? It is one that recognizes the need for technological and resource diversity and responds to the realties of the world.

Energy is an important component of many of the thorniest issues facing the U.S. Whether the war on terrorism, the war with Iraq, negotiations with North Korea, global climate change, the health of individuals, economic wellbeing or national security, energy issues play a prominent role. The simple truth is energy choices made by the nation have consequences. Which choices it makes and how it makes those choices affects its ability to triumph over adversity.

The not-so-simple truth is that energy is an issue without enlightened political leadership at the national level. In today's political environment, it is unlikely that anything approximating an objective debate about energy will occur. Absent such a debate, there is very little likelihood that the U.S. will be prepared to meet successfully the considerable challenges of the present and the future.

It is no coincidence that China and North Korea include energy in their negotiations on human rights and nuclear disarmament. Neither is it a coincidence that our traditional allies in Europe have become possible adversaries because of the unwillingness of the U.S. to sign the Kyoto Agreement and its stance on invading Iraq. Not entirely altruistic, France, Germany and Russia have something to lose in an Iraqi regime change—existing oil contracts. Similarly, these nations feel they would be less competitive if U. S. companies are not held to the same environmental standards as those in the European Union.

Unfortunately for America, the debate about energy in this country has become polarized and has more to do with passion than logic. Logic dictates that the nation develop technologies and markets for domestically available clean energy technologies. Moreover, it requires that we simultaneously develop ever better—i.e., more efficient and cleaner—ways of using fossil and nuclear fuels.

It is time for others to step in to fill the federal leadership void and to engage the nation in a rational discussion about the need for a balanced, diversified and sustainable national energy plan. This plan must be both bi-partisan and "bi-technology," and must address the nation's economic, security and environmental needs, incorporating public and private input and defying efforts to polarize both the questions and the answers.

If Congressional and Administration decision-makers cannot lead in the energy arena, then it is up to public and private sector organizations to establish the needed dialogue. The effort should be national in scope and designed to provide political decision-makers with the information they need to propose and enact a balanced and achievable market-based energy strategy.

Not just a conversation between institutions, the dialogue must include the American people. Political leaders incorrectly assume that sustainable energy sources are of no matter to their constituents. Yet polls, surveys, focus groups and other efforts to discover what Americans are thinking have clearly identified expanding reliance on clean domestically available energy sources as an important post-9/11 priority.

A national deliberative polling project could provide the balance and media attention needed to make the current energy debate in Washington a productive one. By their very nature, deliberative polls require the presentation of information on all energy resource possibilities to a scientifically derived sample of the population. Not just limited to solar or petroleum options, deliberative polls would provide participants with access to experts from multiple technologies and the experts the opportunity to make the case for their particular approach or product.

The results of a deliberative poll are measured in terms of reliable guidance to policy makers about *what is important* to constituents and consumers and *what* it is *they would be willing to support* in both the marketplace and the voting booth. Historically, energy policy in the U.S. has been top-down. Perhaps it is time for a different approach—one that recognizes the role of consumers and incorporates their thoughts into the design of the policies and products they are expected to buy.

When engaged in a balanced dialogue—one in which multiple points of view are fairly discussed—the average consumer places a high priority on clean domestic energy sources and sees the middle road as the path the nation should follow to the kind of future they want for their children. Although most people understand that reliance upon petroleum can lead to costly foreign policies, they do not believe that the nation could just wake up one morning and go solar. Neither do they believe that the nation can simply produce its way out of the problem—by burning more coal and drilling for oil—without regard to the environment.

Although there are those politicians who claim to eschew the use of focus and polling groups, most political leaders have embraced them as a way to gauge public sentiment and to gain a better understanding of what their constituents are thinking. Similarly, private sector executives use direct communication with consumers as a reality check on their products and services. Success in the marketplace comes both from having a good product and knowing the customer.

Americans want to be active in the effort to keep the U.S. a safe and secure place to live. If they are willing to buy duct tape and plastic sheeting, it is because they feel they are then doing something active to secure their future. The same would be true of changing national energy habits to reflect the nation's need for domestically available clean energy technologies.

The experience in Texas with deliberative polls shows that they offer the proverbial win/win situation. Public and private sector decision-makers are able to learn with some confidence what constituents and consumers seem ready to do. This knowledge results in better and more complete public policies and more economically viable products in the marketplace. For consumers and voters they have had the opportunity to participate in policy and product development. They are then able to assist in the implementation stage through their purchasing decisions. ✪

Joel B. Stronberg is ASES' representative in Washington, DC. He can be reached through the JBS Group, 15605 Ashbury Church Road, Purcellville, Virginia 20132, (540) 668-6865, email: jstronberg@anent.com.

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Renewable Energy Fair

The Midwest Renewable Energy Association (MREA) is hosting the Renewable Energy and Sustainable Living Fair in Custer, Wisconsin, June 20-22, 2003. The event attracts over 15,000 environmentally conscientious people each year from 36 countries and 49 states. The Fair provides fairgoers with entertainment, speakers, workshops, exhibitors and like-minded people interested in our standard of living and preserving the earth through renewable energy.

Featured speakers this year include Randy Udall, director of the Community Office for Resource Efficiency (CORE) and Will Williams, Vietnam veteran and peace activist.

There will be over 120 options for workshops including photovoltaics (PV), wind systems, water and hydro electric systems, energy efficient and passive solar buildings, green building materials, heating and cooling, transportation and fuels, sustainable lifestyles, issues and activism, gardening and landscaping. There will also be a special set of workshops taught by women for women.

Midwest Renewable Energy Association

2002 Renewable Energy and Sustainable Living Fair

Also in the mix, exhibitors will be showcasing what their businesses can offer to environmentally concerned buyers. Exhibitors will be showing solar panels, wind turbines and energy-efficient light bulbs and refrigerators, cob and straw bale construction, cordwood masonry, radiant in-floor heating and electric cars.

A guided bus tour of energy-efficient local homes will be offered each day. The tour is $10 and participants will visit 2-3 homes.

The event is family-friendly with activities including solar oven making, musical entertainment and face painting. There will also be a designated tent for children's activities where they can participate all weekend. And while the children are busy in the children's tent, parents can get a much-needed "recharge" with massage and yoga.

For more information, contact MREA (see page 17 for a list of ASES Chapters).

Green Car Festival

The Northeast Sustainable Energy Association (NESEA) is organizing the 2003 Tour de Sol: The Great American Green Transportation Festival, May 10-14, 2003. Cars, buses and scooters that sip gas or use an alternative fuel such as biodiesel, electricity, hydrogen, natural gas or propane will be in Philadelphia, Trenton and Washington, DC during the Tour de Sol.

"The need to decrease our dependency on foreign oil and to reduce greenhouse gases is more important than ever before," said Nancy Hazard, director of the Tour de Sol. "Fortunately, the number and type of cars and buses that use domestically-produced environmentally-friendly fuels is increasing rapidly. Owners of new gas-sipping hybrid vehicles are reportedly very happy with their new cars and new electric scooters and neighborhood vehicles are offering new ways of getting around. This year's Tour de Sol will showcase all these options."

The Tour de Sol began in 1989 as a competition for solar-powered racing vehicles. Over the years, it has expanded into the largest over-the-road event in the country for an ever-growing variety of "greener" vehicle technologies.

Festivals, free and open to the public, will be held in Philadelphia, Burlington County and Trenton, New Jersey, and Washington, DC. The festivals will showcase new green vehicles and other green consumer products, programs and services. The festivals are connected by a road rally competition open to all types of greener vehicles. Entrants include individuals, companies and schools and include everything from one-of-a-kind prototypes to vehicles that are already available on the market.

For more information, contact NESEA (see page 17 for a list of ASES Chapters).

Solar Boat Regatta and Energy Fair

The Minnesota Renewable Energy Society (MRES) presents the Solar Boat Regatta and Energy Fair, May 17, 2003 (rainout date May 18, 2003), at Snail Lake in Shoreview, Minnesota.

Activities include boat races judged on speed, slalom ability (maneuverability) and endurance, vendors of energy products, energy projects from schools, experimental vehicles, political interest contacts and food vendors.

For more information, contact MRES (see page 17 for a list of ASES Chapters).

Million Solar Roofs in Maine

The Maine Solar Energy Association (MESEA), a chapter of the Northeast Sustainable Energy Association (NESEA) is entering into an agreement with the Maine State Department of Economic and Community Development to be the official Million Solar Roof (MSR) Partners for the entire state of Maine. A small $1200 preliminary grant has allowed the first part of this work to start already, and MESEA president Richard Komp took part in a three-day U.S. Department of Energy workshop in September of 2002, planning for the next step in the program.

MESEA has submitted a proposal for a grant that will fund development of a preliminary Maine MSR program plan, which will consist of three parts—tracking and counting of all existing MSR-compliant systems, technology assessment to determine the products most likely to succeed in Maine's market and thereby achieve the Maine MSR goal of 500 installed systems by 2010 and preliminary determination of and contact with the firms and organizations best suited to accelerate market penetration of solar. The list will include professional organizations, educational institutions and nonprofit organizations.

For more information, contact MESEA, RR2, Box 7751, Jonesport, Maine 04649, (207) 497-2204, web site: www.ellsworthme.org/mesea or NESEA (see page 17 for a list of ASES Chapters). ✪

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Continued from page 12

process as well as energy education materials for students and teachers.

Future Legacy Schools are being coordinated for Reno, Nevada, the site of SOLAR 2002, and Austin, Texas, the site of upcoming SOLAR 2003—America's Secure Energy.

For more information, contact Onaje Jackson, Chair, ASES Legacy Schools Program Committee, e-mail: citstx@viaccess.net or Becky Campbell-Howe, ASES, 2400 Central Avenue, G-1, Boulder, Colorado 80301-2843, (303) 443-3130, ext. 103, FAX (303) 443-3212, e-mail: ases@ases.org, web site: www.ases.org.

Proposed Membership Changes

The American Solar Energy Society (ASES) Membership Committee and ASES staff are working on modifications to the Society's current membership structure, to simplify and expand membership offerings.

Possible changes include: converting current subscribers into non-voting ASES Associate members at a proposed dues amount of $29 per year; establishing an Outreach membership category targeted at non-professional solar enthusiasts at a proposed dues amount of $50 per year; including an option for current members to purchase one special Associate membership, at a reduced rate, as a gift for their local library; updating and enhancing membership benefits for all membership categories; collapsing the Library and Nonprofit groups into one category with benefit options that include all of the current benefits; collapsing the Supporting, Sustaining and Contributing individual membership categories into one category with a menu of benefit options; and eliminating the Patron, Benefactor and Sustaining categories from the organizational membership choices to be replaced with new donation categories and associated benefits.

Please visit the Member Services section of the ASES web site, www.ases.org, for a detailed list of changes including proposed dues amounts and benefits.

Member voting on any proposed changes will occur at the Membership meeting at ASES' National Solar Energy Conference, SOLAR 2003, in Austin, Texas, on Wednesday, June 25, at 12:00 pm.

For more information, contact Carolyn Beach at ASES, 2400 Central Avenue, G-1, Boulder, Colorado 80301-2843, (303) 443-3130, ext. 107, FAX (303) 443-3212, e-mail: cbeach@ases.org, web site: www.ases.org.

ASES Fellows

On June 20, 2000, at SOLAR 2000 in Madison, Wisconsin, the American Solar Energy Society (ASES) announced the first group of ASES members to be named Fellows of the Society. This new title recognizes longtime ASES members who have provided exceptional service to the Society. To acquaint SOLAR TODAY readers with these capable and dedicated ASES members, we periodically feature brief biographies of ASES Fellows in SOLAR TODAY.

Phil Niles

Phil Niles earned a BS in Mechanical Engineering and an MS in Engineering Science at the University of California—Berkeley. Niles spent a number of years working on a graduate degree in fluid mechanics and applied math at the University of California—Los Angeles while working on turbomachinery design for the Apollo program. Subsequently, he taught thermal/fluid/solar courses in mechanical

engineering at Cal Poly University, where he is a Professor Emeritus.

Niles has authored and co-authored over 35 publications in the solar energy area including the *California Passive Solar Handbook* and the "Simulation Analysis" chapter in *Passive Solar Buildings*, edited by J.D. Balcomb.

He has presented a number of passive solar design workshops and seminars in the U.S. and Africa. He was involved in the design and testing of a roof-pond solar home in Atascadero, California. Niles wrote the original Calpas passive building simulation program and has authored many of the algorithms in the engines of its offspring, Calres and Energy-10.

Niles has been a member of the American Solar Energy Society (ASES) since 1972, and received the ASES Passive Pioneer award in 1993. While doing some consulting on passive building performance, his current distractions include home improvement, surfing, astronomy and hand drumming.

Phil Niles

Michael H. Nicklas

Mike Nicklas is an owner/officer and co-founder of Innovative Design, Inc., founded in 1977. Since it opened, the firm has completed over 650 projects—all of which have incorporated renewable energy technologies as a significant aspect of the design. Innovative Design's active research program has pioneered design features such as the integration of photovoltaics into building skin design and development of high-temperature, thermal solar systems for roof-integrated industrial and commercial roof assemblies.

Throughout his career, he has developed several energy guidelines for state and federal agencies, has done energy consulting for school districts and has held leadership positions in numerous advocacy groups such as the American Solar Energy Society (ASES), where he is currently serving as the Chair, and the North Carolina Governor's Energy Council. He has presented lectures and organized conferences around the globe to educate and encourage

Mike Nicklas

Continued on page 20

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the use of sustainable energy technologies. Nicklas holds a Bachelor of Architecture degree from North Carolina State University.

Nicklas was made a Fellow of the American Institute of Architects in 2001 and has received several awards, including the ASES Charles Greeley Abbot Award for Contribution to Advancement of Solar Energy in 1996, the ASES Special Recognition Award for Contribution to Society in 1994, the International Solar Energy Society's Highest Award for Service to Society in 1993 and the North Carolina Solar Energy Society's Highest Award for Leadership and Service to Solar Energy in 1983.

Ronald Stewart

Ron Stewart retired from the Atmospheric Sciences Research Center at the University at Albany, the State University of New York, after thirty years. At the University, he taught and carried out research projects in solar, wind, energy conservation and limnology.

Ronald Stewart

Stewart has a BS in math and physics from C.W. Post College of Long Island University in New York and an MS from the Department of Meteorology at the University of Wisconsin. He completed his coursework for his Ph.D. at the University of Wisconsin, but he and his family lost all of their material possessions in a fire, including books and notes, before he could complete preliminaries. His projects include the solar heat pump in the Alumni House at the University at Albany, a photovoltaics communication system at the 1980 Winter Olympics with ARCO Solar, and the U.S. Department of Energy Solar Energy Meteorological and Training Site at Albany.

He has coauthored two papers with Richard Perez, which received the Lof/Duffie Best Paper Award. He was the Associate Editor of the Solar Energy Journal for five years and authored or coauthored over 100 articles, reports and books. In 1992, Stewart received the American Solar Energy Society Charles Greeley Abbot Award.

Some of Stewart's other projects include his direction of a New York State Energy Conservation project, which consisted of completing over 8500 energy audits of schools, hospitals and government buildings. He worked with the National Science Foundation on the International Biological Program and with the New York Sea Grant Institute on an Atlas for the Great Lakes.

Stewart is very proud of his three children, Jane, Beth and John, and his six grandchildren. His wife, Wendy, passed away in 2001, after 40 years of marriage. He considers himself fortunate to have enjoyed his family and career. ✪

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Seeing Green Elephants

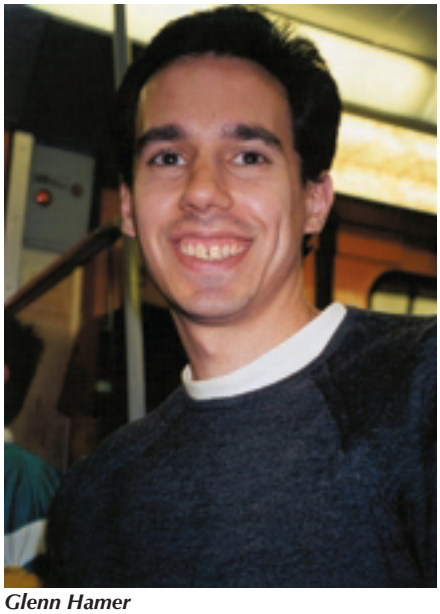
by Glenn Hamer

A recent *New York Times* article focused on the advice that prominent GOP advisor Frank Luntz is providing to Republicans—that they need to close the gap with Democrats on the environment. This is good news for renewables. When an issue is in the province or mainly in the province of one party, it tends to be ignored by one party and taken for granted by the other. A renewables "bidding war" between the two parties is a much preferable position.

The Republican Party suffered a high double-digit polling deficit on education for years. This changed in several phases. First, the rhetoric shifted. No longer was the mantra to abolish the Department of Education and to block grant funds. The theme changed to softer rhetoric, like "no child left behind." Then proposals emerged to dramatically *increase* the federal role with more money in exchange for greater accountability. In the end, President Bush teamed up with Senator Ted Kennedy to pass the largest increase in federal spending for education in history.

I believe that we're seeing the first phase of the effort on the part of the GOP to close the gap on an issue of great importance to so-called swing voters and Soccer Moms. Just as before, the language has softened, with the disappearance of discussions of disabling the renewables budget. After rhetoric, comes action. As a Republican, I pass along the following simple options, which the GOP could easily implement without hurting itself among its traditional base, devaluing its principles or harming conventional energy industries. The positive agenda I suggest will translate directly into votes. After all, wouldn't most Members prefer to head into an election talking about their work to expand solar power—which nationwide polls confirm *enjoys greater than 90 percent* public support—rather than being assaulted for relaxing environmental measures?

The first and easiest initiative is an aggressive, targeted tax package. The Administration is already close to the renewables industry's position on most tax matters. Why not go the extra distance, sweeten the package and hold a press conference with all of the major players in the renewables industry? Start with a doubling of the existing Investment Tax Credit for commercial installations of solar to 20 percent while adding a permanent Residential Solar Energy Tax Credit at the same level with a $5000 cap. Allow all distributed renewables to participate in both credits. Then, propose a permanent extension of the wind Production Tax Credit and expand it to solar, geothermal, wind, incremental hydropower and all appropriate forms of biomass.



Glenn Hamer

The second proposal is to submit a budget that would accomplish a doubling of the renewables budget over the next five years. A similar commitment to the National Institutes of Health saw this agency double in size over this time period. A doubling of the budget would guarantee stable and more efficient research—unlike the zigzag historical pattern, which makes it difficult to retain staff and make long-term capital investments. It would also accelerate our push towards energy independence.

The third suggestion is as Republican an idea as it gets. As we all know, interconnection standards vary from jurisdiction to jurisdiction, substantially increasing the cost and decreasing the retail marketability of grid-connected distributed renewables such as photovoltaics and fuel cells. This "barbarian patchwork" of regulations is based on unreasonable and sometimes specious claims of grid idiosyncrasies from place to place, when in reality, both the IEEE and UL have issued standard connection guidelines, which the Solar Energy Industries Association (SEIA) worked very hard to incorporate into the Federal Energy Regulatory Commission's current rulemaking.

The President seems enamored with fuel cells as a way to achieve his goal of a hydrogen-based automobile industry—and rightly so. But many experts believe the best path to a fuel cell-powered automobile is through developing the stationary (building) market for that technology, and these cells are just as dependent on a nationally coherent and reasonable set of interconnection standards as we are. Let's propose an interconnection law that sets national standards for all systems 1 megawatt (MW) and below—as the FERC is working on and similar to what Representative Joe Barton has introduced. Further, take the modest step of requiring retail-rate net metering for all systems. This simple policy mechanism could reduce the price of a residential system considerably, at zero government expense and through simply guaranteeing and protecting fair market access—a core Republican ideal.

The fourth item involves taking a fine report that the Administration prepared on renewables on Federal lands and using it to actually develop the resources. Secretary of Interior Gale Norton deserves great credit for spending much time and staff effort in studying the potential of renewables on Federal lands. However, this is a treasure map, not a treasure itself, and now it's time to turn the reports into action. Propose a well-funded initiative to develop these resources. As a part of this plan, unveil a systematic, public strategy to replace noisy, dirty, expensive and unreliable diesel remote power systems on Federal facilities with photovoltaic (PV) systems as a matter of default policy. An earlier series of reports detailing where to install PV on Federal lands provides a still-useful set of sites to begin deploying PV systems.

Fifth, let's make a statement—flat-out plaster Federal buildings with renewable energy systems. The White House now has PV for the first time in its history (see "Solar at the White House," page 36) and once again solar hot water graces the most famous home in the world. But there are countless other Federal facilities where on-site renewables make sense. A simple requirement to change the cost analysis of these systems and *require* deployment when either a twenty-five year lifecycle payback analysis is positive or security con-

cerns argue for an uninterruptible power supply capability. For projects where simple payback and mission benefits do not recoup the initial investment within a twenty-five year horizon, let's use Energy Savings Performance Contracts (ESPC). We could plow the savings into on-site renewables, in a nationwide imitation of the revenue-neutral Powershift/Vote Solar model in use in a growing number of municipalities. The Alliance to Save Energy estimates that there is about $1 billion of savings to be found on existing federal buildings, which have become market leaders in the energy efficiency arena. Even investing a fraction of those savings into solar would do wonders for this market in the U.S.

Sixth, use the Export-Import Bank of the U.S. and our other export credit and market development authorities to help our national manufacturers compete aggressively in the competitive world market for renewables. SEIA among others has provided Ex-Im with a workable and comprehensive set of recommendations for doing just this.

Seventh, extend Energy Star designation to all PV and solar hot water products that pass appropriate scrutiny. There is an Energy Star mark on my 15-watt DVD player, but no such certification on equipment that can displace 20 percent or more of a home's electricity needs. That doesn't make sense. Customers deserve and will appreciate this mark of quality.

Finally, announce that the sitting President will be the first one to use green tags to displace all of the energy—transportation, electricity, etc.—used in his 2004 re-election effort. There are any number of backdrops that would make an excellent photo-op for this one along the campaign trail, and the comparative expense would be minimal.

Readers will note that I offered these recommendations without mentioning what is perhaps most obvious—embracing a federal renewable portfolio standard (RPS). Republicans could achieve a blockbuster record in this area with other initiatives. However, if Republicans do propose an RPS at the federal level, it could offer a next generation proposal, one that guarantees the development of all of our core renewable technologies where they make most sense. A more regional approach—one that, for example, develops 1000 MW of solar in the Southwest—is preferable to one that would result in states ignoring resources and simply purchasing credits or paying a penalty. Additionally, a "Rooftop RPS," which guarantees the development of PV, solar water heating, small wind and other on-site technologies belong in a dedicated "distributed band," perhaps in partnership with energy efficiency technologies. This not only is green, potentially cost neutral (if done in the form of an ESPC), but also will improve the security of our grid as we transition from the central station mode of delivering power to a more robust, Internet-style model. Finally, a more sophisticated RPS would place additional value on energy that displaces the dirtiest (peak load) or is dispatchable.

All of these actions are not enough to completely close the gap—after all, renewables are just one part of the environmental picture—but they are hard-hitting, visible, relatively uncontroversial and very low-cost measures that align well with the party's ideological base. Further, they support a high-tech and growing domestic manufacturing sector. It's enough to make us consider a new acronym—**G**reen **O**ur **P**ower, perhaps? ✪

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Solar Marketing— Customer Service That Makes a Difference

Mark McCray, Ph.D.

In the January/February 2003 issue of SOLAR TODAY, I discussed the benefit of quality customer service. In this article I share examples of customer service, both good and bad, that had an impact on our customers, or on RMS Electric (RMSE) as a customer. As you read these examples, think about how you value and practice customer service in your company.

Over RMSE's 21 years in business, a significant portion of our sales have come from customer referrals. Looking back to see why our clients referred so many new customers, I realized we developed and maintained good relationships, during the sales processes and throughout the years after the sale. These relationships are epitomized by providing timely responses to their requests, delivering fair quotations for products and services, helping them understand the products and systems and fulfilling their expressed needs, etc.

We do our best to maintain a positive attitude in relationships with our prospects and clients. However, there are some obvious ways that sales or service people can damage customer relationships. How often have you heard someone say "I'm too busy to be bothered helping solve his problem," or "I don't get paid enough" to be bothered helping that prospect or customer.

One of the classic excuses sales and support people use for not providing customer service arises when your company didn't sell the product or system. How often have you heard, "we can't help you because you didn't buy it here." I often hear this line from sales people or friendly competitors who are angry because they lost a sale to a discounting competitor. Many companies that build their business on discount prices don't provide all necessary system components. Sometimes they lack the financial and personnel resources to provide quality customer support. They may also have limited knowledge, skills and other resources to support customers after the sale.

We willingly take on these abandoned or orphaned customers, if they are reasonable to work with. First, we qualify them. Does the customer's personality seem compatible with our organization? Do they really need help, or are they after free help with their project? Is there an opportunity to make this a win-win situation—that is, can we help the client and also benefit our company? We recognize most of these customers come to us because they thought they could save some money by buying from a discounter, but didn't realize the complexity of the project they were undertaking.

Our near-term goal is to help customers succeed with their projects. Our long-term goal is to acquire satisfied customers who speak well of the support we provide. I imagine a scenario where someone asks this customer where they bought their system and who installed it. Their response is, "Well, I bought it from ABC Discount Solar, but they were no bargain. They didn't provide all the necessary installation materials, and they were no help getting it installed. I had RMS Electric install it, and they were great to work with. They've always been there when I needed help." This may seem like fantasy, but it has come true many times during our 21 years in business.

Equipment manufacturers and distributors can also increase sales, customer loyalty and product loyalty by maintaining high quality customer service. Unfortunately, we've seen many instances of poor quality service by manufacturers and distributors. It's a major source of frustration for us and, sometimes, our clients.

Because we stock many items, manufacturers will send a client to us to provide products they don't have in stock. Having this stock, as well as knowing how to effectively help a customer, can have a high payoff. One time, a manufacturer referred a new customer to us because the manufacturer didn't have stock to replace a defective unit that had failed on a remote site in Alaska. The manufacturer quoted eight weeks to replace the failed unit with new stock. An important and expensive project was at a dead standstill without it.

Because the specifications on the item were unusual, we didn't have a unit in stock either. However, our commercial sales rep had a better understanding of the manufacturer's resources than some people working for the manufacturer. The manufacturer could repair these units in 24 to 48 hours, a service the manufacturer failed to offer the customer as an option. (A failure in customer service!) She arranged for the unit to be returned, repaired under warranty and sent back to the customer within three days. We were not paid, nor did we charge anything for providing this service. However, the customer was so pleased with our support that in the two years following this event, they have come to us for many thousands of dollars worth of products.

How many times have you ordered products and expected delivery in a reasonable time, only to find, for any number of reasons, that the product didn't ship as expected, or the wrong product shipped? Manufacturers and distributors often fail to keep buyers apprised of order status. This can be a significant customer service problem. It reduces a supplier's credibility as well as causes credibility problems for your company. Often a customer is expecting products from you in a timely manner, or you need products to complete a customer project.

RMSE instituted a policy requiring all suppliers to confirm ship dates and products on our orders. (Sometimes, we find a supplier "lost" our order, or say they never received the fax or email for the order!) We enter the purchase order and confirmation information (confirming what we ordered as well as ship date) on a purchase order log for ease of tracking all orders. If the ship date is ten days or more from time of order, or it is a high priority order, we'll follow up a with the supplier just before the ship date to make sure the shipment is on schedule. Because this is our standard operating procedure, many of our suppliers recognize we are holding them accountable for quality customer service. The benefit we see is improved service from them and for our customers.

We also keep our customers advised of their purchases, without their requesting it. It is a service most of our competitors fail to provide. Customer feedback is that they greatly appreciate this service. Sometimes, an order is delayed because of extenuating circumstances. When a customer is informed about this in advance of the due date, they are seldom upset. They are often appreciative of the advance warning so they can alter their schedules accordingly.

These are but a few examples of how customer service impacts the reputation and profitability of your company. Quality customer service usually costs very little, but provides great return on the investment. It will definitely reap rewards for you and your business. ✪

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Interview with an Angel Investor: Joshua Lampl, EcoElectron Ventures

by Rona Fried, Ph.D.

Last year (2002) was a dismal year for venture capital around the world. Investments worldwide dropped by about half from 2001. Given that, just under $1.1 billion was invested in 179 green businesses, 5.1 percent of the pie in North America. That's a high figure considering that the green sector of just about every mainstream business sector tends to be about 1 percent. (The organic industry, for example, stands at about 1 percent of the total food industry.) One hundred companies received close to $900 million in the third quarter. The totals for the year, due out soon, are expected to top $1.2 billion. [statistics from Clean Tech Venture Network].

Investors focused on this space are diverse and growing. Only a few years ago, there were just a handful of firms focused on investing in green businesses. Now there are hundreds around the world. Conventional venture capital firms and corporate venture capital are showing increasing interest too.

Stirling Energy Systems

Stirling Energy Systems manufactures utility-scale solar generators.

Energy-related companies receive the most attention. Within the energy sector, companies involved in energy generation got almost half of all investments (48 percent), followed by storage (25.2 percent), then infrastructure (18.5 percent). Energy efficiency technologies received only 7.6 percent. Water-related investments are becoming increasingly popular. At Clean Tech's first Venture Forum this fall in Toronto, In-Pipe Technology Company was voted "Most Promising Presenter " by attendees. In-Pipe is commercializing a patented microbiology technology for municipal wastewater treatment.

Although the IPO and other exit opportunities are dry, this is a great time for investors who are willing to take the plunge. Valuations are low and there is increasing support for green business technology worldwide.

Metallic Power

Metallic Power's initial products address applications that require a stationary power source. The first of these products is now shipping and is suited to providing extended backup power for computer, communication and control equipment.

I interviewed Joshua Lampl of EcoElectron Ventures, an angel investor focused on clean energy technology companies. He's been investing for about 5 years and holds investments in eight companies. The only new investment the company is looking for now is a start-up energy-related technology business in San Diego they can get actively involved in building. Angel investors are typically individual investors. They invest smaller amounts and usually have longer time horizons than Venture Capital firms.

Rona Fried: What got you interested in clean energy and what kind of investing do you do?

Joshua Lampl: I'm interested in the environment, and energy has a big impact on it. It's a market where there is something in demand—people need energy. I invest in energy technologies. That's the riskiest thing. There are millions of technologies—which one will be successful? People are trying to make breakthroughs in solar with thin film, for example, and that's a big risk. I think nanotechnology is partly just buzz. It's not really molecular building, it's just making things smaller at this point. But making things smaller generally makes them more efficient. People who come up with techniques for that can be successful.

I think materials science—using different types of materials to do things more efficiently—is an interesting area that cuts across all different kinds of products.

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Investing in Clean Energy

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Materials to conduct electricity or heat better and membrane-type materials are interesting, for example.

RF: At what stage do you typically invest in a company?

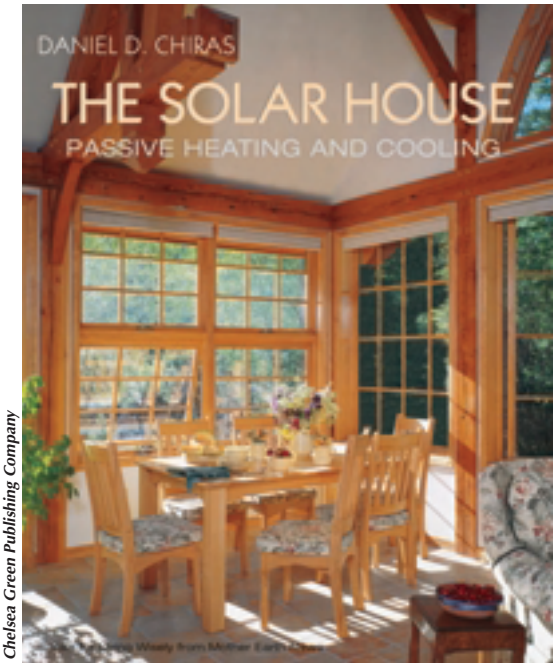
Josh: I usually invest in start-up companies. I find them at conferences or through networking. I'm not looking for new investments now because my money is tied up in the companies I've invested in. Other than the start-up I'd like to find in San Diego, these days I'm looking to invest larger sums with companies where there is venture capital money involved.

A company needs have muscle behind it—enough people putting money in to get it to a point where they get a pilot plant running or they have to have a working prototype. It's got to be further along than just an idea. It also depends on the people. If it's an accomplished scientist that's very different from someone who says they have an idea they think they can bring to fruition.

RF: How would you summarize what's been going on in the private side this year in sustainability investing?

Josh: Companies are finding it hard to raise money and they have to lower their valuation to do so. Companies that don't have a product yet are having an even harder time. It's taking longer to get new technologies into the market.

People don't feel as rich as they used to so they're not willing to write a check on a story. Say you allocate 10 percent of your portfolio to invest in private companies. A few years ago you were worth $10 million. Now you're worth $4 million—your allocation goes from $1 million to $400,000. It's not as easy to write a check.



Chelsea Green Publishing Company

Chelsea Green Publishing Company publishes books for sustainable living, such as this book by Daniel D. Chiras, **The Solar House: Passive Heating and Cooling.**

RF: What do you see for the coming year?

Josh: I think it will get better. It's pretty bad right now. The money going into energy deals is about half of last year.

RF: With the stock market in the dumps, if I had the kind of money available for private investing, should I consider it as an option for some of the money?

Josh: You have to take a portfolio view of it. Decide how much of your money you want to invest in private companies and how much you want to invest in public companies. You want to diversify.

Private investing is more risky, in general, than public investing. You don't have liquidity—you can't just sell stock if you want to get out like you can with a public company. Once you buy into a private company, you have to wait until it's sold or goes public. They will have to raise money a number of times. A public company has already raised money. Start-up companies are more risky than companies that have been funded. But if a public company is out of cash and can't raise more money and there's a private company that has lots of cash and many people behind it ready to put in more cash, then the private company may be in a better position.

It has to do with valuation. You could've bought Ballard six months ago and doubled your money. If everyone thinks Ballard is great and buys the stock the price goes up—you have to analyze whether the valuation makes sense. The same for a private company—you want to invest in the right valuation relative to the risk and the stage of the company.

RF: What would you say to people who want to get involved as investors in this space?

Josh: People wanting to get into this space should go do some research and try to identify the problems with the electrical system or the energy system. There's a lot of focus on the hydrogen economy, but we don't know how far away that is and that's a concern for short or medium-term investors. If you're setting up a fund right now, it's a good time to invest. Valuations are low.

Diversify. Don't put your eggs in one basket—invest in more than one company. Do your homework. For the novice investor, make sure you go in with enough people so you have enough money to keep the company going to achieve milestones. If you just put enough money in to last a year that's not a good invest-

Evergreen Solar

This 4-kilowatt (kW) Evergreen Solar system in California feeds excess power into the grid.

EcoElectron Investments

ENERGY

Evergreen Solar: solar technology designed to reduce the cost of manufacturing solar panels;
Metallic Power: zinc regenerative fuel cell technology for backup and portable power markets;
Stirling Energy Systems: utility-scale dish solar engine;
Sun Power Systems: solar components in consumer electronics products (e.g., cell phone battery with a little solar panel on it).

GENERAL SUSTAINABILITY:

Coyuchi: organic cotton product manufacturer
Wildlife Works: sustainable employment in Africa to preserve rainforest
Chelsea Green: book publishers
Commons Capital: venture capital fund
Angels With Attitude: angel fund

ment. You have to think about what the likelihood is of getting more financing rounds, because all these companies require lots of capital.

It's less risky to invest in companies that are not technology plays, like systems integrators or companies that put projects together. They are more management-oriented. You probably won't make as big a return though.

I'm not an expert in these technologies—I talk to experts. When an entrepreneur says, "I've got a better wind turbine," I talk with a turbine expert. Even if the technology is better, in an industry like wind where there are a few dominant players, the product has to be accepted by them. A technology has to be radically better, not just a little better. It costs so much money to scale up to build these products. That's why I don't spend much time on the private wind companies.

As a private investor you are looking for a company that has the potential to be "disruptive"—to make a difference cost-wise or performance-wise or something like that. Sometimes innovation comes from within the big companies and sometimes it comes from small companies that big companies then buy. You're hoping to have such a big advantage that the big company will buy you.

Diversify across stages—you don't want to be in companies at all early or all later stages. And also diversify across industries. You also don't want to put all your money in sustainable investing. I participate with the angels in town here in investments that aren't necessarily sustainably-oriented.

Rona Fried is President of SustainableBusiness.com. This article first appeared in the February 2003 issue of Progressive Investor, *an electronic newsletter available by subscription at www.sustainablebusiness.com. Each issue includes conversations among world-class sustainable investment analysts on viable green business investments. To purchase this issue ($29), please contact rona@sustainablebusiness.com.*

Solar at the White House

After more than two decades, solar equipment is back at the White House, quietly heating water and generating electricity and serving as a symbol of real energy security.

by Mark C. Fitzgerald

Solar Design Associates

Solar Design Associates

(above) Steven Strong and his son Hunter at the White House during a trip to commission the solar systems. Hunter is an electrical engineer and has supported many of Solar Design Associates' projects.

(right) The PV array on the roof of the maintenance building in the White House compound consists of 167 silicon ribbon PV modules manufactured by Evergreen Solar. The system produces solar-generated electricity, which is fed into the White House distribution system.

Every President since Richard Nixon has acknowledged that America is at risk in its dependency on foreign sources of energy. And, in the aftermath of the first world oil embargo, every President has attempted—in his own way—to try to correct this situation with a new program emphasizing American energy independence.

Perhaps it was President Carter who first fully understood the dimensions of the problem. Under his leadership, American energy efficiency improved dramatically and renewable energy technologies began to enter the marketplace as major U.S. companies made significant investments in research, product development and commercialization.

Steven Strong was with President Carter when he dedicated the first solar energy application at the White House in June 1979. The system, which provided domestic hot water for the West Wing, worked fine until President Reagan removed it shortly after he took office. The Carter-era solar collectors wound up in government surplus and were subsequently acquired by Unity College in Maine, where they still heat the water for the school's cafeteria.

Over the intervening 25 years, Strong has advocated tirelessly for solar energy. His firm, Solar Design Associates of Harvard, Massachusetts, has earned an international reputation for the pioneering design of energy-autonomous buildings and the engineering and integration of the renewable energy systems to power them.

It was fitting, then, that Strong should be invited back when solar energy returned to the White House. Last spring, the National Park Service retained Solar Design Associates to design and install three solar energy systems at the Presidential compound. These systems demonstrate the most popular solar applications in use today. Two of the systems deliver thermal energy for hot water and pool heating and one produces electricity directly from the sun with photovoltaics.

The National Park Service, which is responsible for all work done at the White House, had decided that any refurbishment of its facilities should include environmentally friendly design wherever possible. Architect James Doherty, the National Park Service liaison for the White House, proposed the solar systems as part of a larger program of upgrades at the Presidential compound. "We felt if we were able to reduce our energy consumption, that would be a positive step forward," Mr. Doherty said.

Solar Electricity

It was time to upgrade the roof on what is affectionately called the "Pony Shed," a maintenance building on the southwest corner of the White House compound. The building occupies the site of the stable that once housed Macaroni, the pony given to President John F. Kennedy's daughter Caroline by then Vice President, Lyndon Johnson. Doherty saw this as a good opportunity to install a rooftop solar electric system.

Solar Design Associates

Solar installers carry an absorber plate by the oval office to be installed on the first family's pool cabana adjacent to the west wing.

The White House photovoltaic (PV) system consists of 167 "Cedar Series" solar modules from Evergreen Solar in Marlboro, Massachusetts, using cells manufactured with the company's string ribbon process. Evergreen's Vice President for Sales and Marketing, Rex D'Agostino, said their modules met several key criteria set out by the White House including using an American-made product manufactured in an ecologically friendly process. He said the company—from management to production—was excited about the opportunity to work on the project.

"Evergreen Solar is the classic, homegrown American success story, where a small group of dedicated individuals, starting from modest beginnings in a 'garage,' proved the commercial viability of a new and innovative technology," remarked Strong.

"This company literally rallied around that flag," D'Agostino said. "Everybody not only did what they had to do but went above and beyond the call of duty. It provided some significant internal morale escalation."

"We are very pleased to see this kind of governmental support for solar electricity. Evergreen Solar's panels were chosen for this installation by Steven Strong, one of the world's most respected solar designers and a true pioneer in the industry," said Mark A. Farber, President and Chief Executive Officer of Evergreen Solar. "We hope the success of this project will spur future applications of highly reliable, pollution-free solar power. Whether it is on a single residence or a commercial building, solar electricity is an important option in the quest for energy independence."

The 9-kilowatt (kW) (peak) PV system covers the roof of the grounds maintenance facility and directly feeds solar-generated power into the White House distribution system, providing electricity wherever it is needed. The DC-AC inverters were provided by SMA-America and consist of a bank of Sunny Boy 2500 inverter modules. The project represents a step in the right direction, according to the company. "I think it is important to the public to see the government embracing clean energy," said Sam Vanderhoof of SMA-America. "SMA is proud to be a partner of the greening of the White House."

Solar Design Associates worked with Jason Fisher of Aurora Energy, a local PV installer in Annapolis, Maryland, to install the system. The entire system installation was completed over a three-day period late last August and includes a data acquisition system for monitoring the performance of the array and its ancillary electronic components.

"We appreciated the opportunity to work with Jason," said Craig Munger, the SDA Project Engineer on the PV system. "He's capable, effective and professional, and got the job done in the tight time frame we had."

Solar Thermal

The White House solar installations include two separate solar thermal systems. The first is installed on the grounds maintenance facility and employs standard 4 foot by 8 foot factory collectors in a drainback configuration to provide domestic hot water for use by maintenance personnel. The second is a roof-integrated thermal array built into the new roof of the First Family's pool cabana and provides domestic hot water for the cabana, heats the out-

door presidential spa and also helps heat the outdoor pool.

The pool cabana was scheduled for a major renovation, and First Lady Laura Bush had considerable input into what was to be accomplished and how it was to be done. It was decided that the existing flat, built-up roof, which was in need of replacement, should be replaced with a new, sloping copper-clad, standing-seam, hipped roof that would be more in keeping with the rest of the architecture.

Architect James Doherty asked Solar Design Associates if they could integrate a solar thermal array into the new roof to be flush with the new standing-seam roofing and harmonize the aesthetic impact. "Can you make the solar look like a large skylight?" he asked.

Strong worked with Doherty to develop the design for the solar array to be recessed into the new cabana roof such that the collector glazing would be in the plane of the finished roof and become the weathering skin. This is one of Solar Design Associates' signature design elements, and many of the buildings they design feature fully integrated solar thermal and photovoltaic arrays as their roofs.

Strong specified selective-surfaced, all-copper solar absorber plates from SunEarth, Inc., of Ontario, California, for the array. These were also installed in a drain-back configuration serving a small drain-back tank in the basement of the cabana, which, in turn, serves the domestic hot water, spa and pool by means of heat exchangers. Both solar thermal systems use water as a transfer medium.

"We have always preferred water as a working fluid for our solar space and water heating systems," said Strong. "It provides a much better rate of thermal transfer, requires less pumping energy, needs no maintenance or attention and is nearly free."

Rick Reed, President of SunEarth remarked, "We are very pleased to work with Solar Design Associates and have our hardware incorporated on this special project." He added, "Our premium all-copper solar absorbers will last at least as long as the copper roof on the building."

Solar Design Associates' personnel worked on-site closely with Dan Lunceford of Daystar Energy Service, a local solar thermal specialist in Silver Spring, Maryland, to install the solar thermal systems.

"Dan was great to work with," said Robert Erb, SDA Project Manager. "He's a good craftsman, quickly got up the learning curve and was willing to work the long days necessary to meet the tight schedule. Everything went as planned."

Logistical Challenges

The logistics of installing anything at the White House are rather complex, especially with the increased emphasis on security imposed as a result of the war on terrorism. Everyone working on the project, including the SDA design team, had to pass an extensive background security check and obtain White House Secret Service clearance.

All of the materials and components for the systems had to be specially packaged and shipped to a Secret Service warehouse well in advance of installation for detailed inspection. They were then held there until they were delivered by secure shipment to the White House.

Solar Design Associates

The solar thermal array on the White House pool cabana provides solar domestic hot water first to the cabana and then heats the first family's outdoor spa (at right). Any remaining solar capacity heats the pool.

All installers' tools and equipment were thoroughly inspected and, of course, everyone involved had to go through a security screening each time they came onto the White House property. Any vehicles that were to enter the property were inspected and searched. This caused a number of the trades to proactively clean out their trucks—perhaps for the first time ever—to make the inspections go easier.

The month of August has traditionally been the First Family's vacation period, and it is the only time during the year when "serious" maintenance efforts can go on without everyone being overly concerned about intruding on the nation's business or the First Family's privacy.

This results in a rush of activity on all areas of the property, as White House maintenance staff, Park Service employees and outside contractors all pitch in to accomplish 12 months of maintenance in about 4 weeks. Coordination is essential and—as a veteran of many years of the "August work frenzy"—the Park Service was a tough taskmaster.

Working with the Park Service went very smoothly, according to Strong. "They set up a brisk schedule involving many different operations and kept things moving. They helped greatly in coordinating the delivery of our materials and equipment with the Secret Service. Despite the logistical challenges, we were done early."

"We believe in these technologies, and they've been working for us very successfully," James Doherty said. "The National Park Service as a whole has long been interested in both sustainable design and renewable energy sources. We also have a mission to lower our energy consumption at all our sites, and we saw an opportunity to do both at the White House."

When asked why there hasn't been a bigger splash made about these installations, Doherty replied that the Park Service doesn't like to advertise what it does at the White House. "We call it 'silent stewardship,'" he said. "We have always sought to stay in the background and not compete with what the White House does."

"The Park Service is supporting the use of clean, renewable energy from the sun with these systems at the White House. It's an important milestone in building awareness for solar energy usage in residential and commercial buildings, and a step in the right direction in promoting energy independence," said Strong

Strong considers it a privilege to be invited to design and install solar systems at the White House. He expressed appreciation for Scott Sklar and Steve Kalland, whose early advocacy at the Solar Energy Industries Association (SEIA) had set the stage. "Each solar roof is another small but important step toward greater energy self-reliance," he said. "I would hope that these installations will lead to a broader acceptance of solar energy as a way to reduce our dependence on foreign oil."

Looking Ahead

In April of 2002, President Bush appointed John Howard as the Federal Environmental Executive. Among other things, the mission of the Office of the Federal Environmental Executive includes "promoting sustainable environmental stewardship throughout the federal government." Speaking of the solar systems at the White House, Mr. Howard said, "Installing solar panels at the White House is yet another example of President Bush's personal stewardship commitment."

As the Texas Environment and Natural Resources Policy Director for then-Governor Bush, Mr. Howard helped to sign up the Governor's Mansion in Austin as one of the first to receive renewable electricity from the City of Austin's municipal utility. Austin's utility has invested heavily in west Texas wind farms and also supports the installation of solar electricity on city- and state-owned facilities within its service territory.

Solar Design Associates

The solar thermal array is integrated into the historically correct, lead-coated copper, standing-seam roof on the White House pool cabana. The site-fabricated assembly uses selective-surfaced absorbers from SunEarth.

According to Mr. Howard, the President and Mrs. Bush are very supportive of renewable energy and sustainable design and have incorporated a number of measures at their ranch in Crawford, Texas. "The Bush family has installed a 25,000-gallon rainwater cistern for irrigation and planted native plants. The President is also busy removing invasive trees. The family's geothermal heating and cooling system sends water 300 feet into the ground to keep it at a constant 67 degree. The system uses 75 percent less electricity than traditional heating and air-conditioning systems, and it heats the outdoor pool so efficiently that the Bushes shelved their plans to install solar panels," he said. The Bush ranch also features passive solar heating and cooling, daylighting and enhanced insulation.

In an address on energy that he gave February 6, 2003, President Bush said, "It's important for our country to understand that by being bold and innovative, we can change the way we do business here in America. We can change our dependence upon foreign sources of energy; we can help with the quality of the air; we can make a fundamental difference for the future of our children.

"By what we do today, we can make a tremendous difference for the future of this country. How we invest taxpayers' monies today can help change the world." He added, "We've got some responsibilities in our nation. We've got a responsibility to our environment.

"It's important for our country to understand—I think most Americans do—that we import over half of our crude oil from abroad. And sometimes we import that oil from countries that don't particularly like us. It jeopardizes our national security to be dependent on sources of energy from countries that don't care for America, what we stand for, what we love. It's also a matter of economic security, to be dependent on energy from volatile regions of the world. Our economy becomes subject to price shocks or shortages or disruptions or cartels.

"We can make the world more peaceful, and we will; we can promote freedom, and we will. Those will be wonderful legacies. But also think about a legacy here at home, about making investments today that will make future citizens of our great country less dependent on foreign sources of energy."

The President delivered these encouraging comments as he unveiled his major new initiative for hydrogen fuel. Renewables advocates along with the majority of "mainstream" energy specialists see hydrogen as the essential common denominator in the next generation energy system, and many see it as the only logical choice for a long-term energy solution.

The president also said: "Hydrogen power is also clean to use. Hydrogen power will dramatically reduce greenhouse gas emissions, helping this nation take the lead when it comes to tackling the long-term challenges of global climate change."

Unfortunately, the way the new hydrogen initiative is currently being defined, electricity needed for the bulk production of hydrogen as a fuel is envisioned as coming from fossil fuel and nuclear sources—including major investments in "clean coal" and nuclear fusion. There is no mention of solar or wind energy—the two fastest growing sources of new electricity in the world today.

Even the most zealous advocates of nuclear fusion agree that it is 30 to 50 years away and uncertain at best. The president acknowledged this uncertainty, saying, "We've spent quite a bit of money, as the senators here will tell you, on whether or not fusion works. And we're not sure if it will be able to produce affordable energy for everyday use."

How can we be so close to understanding the problems before us and yet so far from the right solution?

As the president has said, "It won't be easy to get there because there are obstacles. It's important for the American people to know. There are obstacles to overcome."

I recall the words of Winston Churchill when, clustered with his inner circle and deeply despondent with the U.S. over deep differences in foreign policy, he mustered enough optimism to postulate, "The Americans can always be counted upon to do the right thing—after they have tried everything else."

Renewable technologies are here. They are clean, safe, secure, proven and reliable. And we have tried everything else. ✪

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Truss Plant Goes Solar

Hayward's new manufacturing facility uses a 14,400-square-foot, roof-mounted array to help achieve an overall commitment to environmental design, operation and profitability.

by Rich Binsacca

Hayward Corporation, ©2002 Earl Richmond/Richmond Productions.

The Hayward Building Systems manufacturing plant in Santa Maria, California, is one of a handful of buildings to achieve a Gold Certification level from the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (or LEED) program.

Even before you walk into the new Hayward Building Systems manufacturing plant in Santa Maria, California, you know it's different than any facility of its kind. That sense starts with the interlocking concrete pavers in the main parking lot and the 5-foot diameter glass globe in the building's arched entry. It carries through the exposed trusses in the front lobby to the fragments of colored glass and 4-inch square solar tiles set into the concrete of the reception desktop. One other thing—there's no "new building smell"—the scent of off-gassing fumes from paints, floor coverings, furniture and other finishes is noticeably absent.

All of these and several other integrated elements, products and systems combine to help the plant comply with arguably the most stringent environmental building standards in the world, as established by the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (or LEED) program. They also embody a commitment by Hayward Corporation, an 84-year-old, $120-million lumber and building materials supplier in Monterey, California, to fulfill its "people, planet, profits" approach to business sustainability.

At the new Hayward plant, the most dramatic illustration of that commitment is a 14,400-square-foot array of photovoltaic (PV) panels on the facility's east-facing roof, a 115 kilowatt (peak) (kWp), building-integrated system that serves the plant's entire operation while putting excess electricity back onto the local power grid.

A Learning Experience

After a year of design and engineering work toward the construction of a new, if conventional, manufacturing facility to produce plated roof trusses, wall panels and floor trusses for residential and light commercial building projects along California's Central Coast, Hayward Corporation abruptly stopped the process. Bill Hayward, the company's fourth-generation president and CEO (and self-appointed Chief Sustainability Officer) had been searching for an opportunity to illustrate his personal passion and respect for the environment in a business realm, and to enlighten Hayward's contractor customers about the concept of green building and sustainability.

Problem was, Hayward wasn't exactly sure what "green building" entailed, and specifically how to design and build a facility able to both efficiently manufacture commodity building products and meet a viable environmental standard. "A few of our builder customers had asked us about green building products, and we had started stocking a few items, but this was a much bigger challenge," says Hayward.

Hayward Corporation, ©2002 Earl Richmond/Richmond Productions.

A series of skylights mounted between the photovoltaic modules on the east-facing roof provide daylight to the production area of the Hayward plant.

Hayward Corporation, ©2002 Earl Richmond/Richmond Productions.

The Hayward plant features infrared-sensor lighting systems that automatically adjust the lighting to daylight conditions. A series of skylights mounted between the PV modules on the east-facing roof provide the daylight.

Though somewhat reluctant at the beginning of this new direction, the plant's original design-build team of architect Charles Cebulla and general contractor Berto van Veen eventually appreciated green building for its overall performance benefits. "Not only is the plant environmentally superior, it's simply better built," says van Veen. "Now that we know how to get over all of the hurdles, we wouldn't hesitate to do it again."

Hayward knew about the USGBC's LEED certification program, and hired San Francisco consultant Lynn Simon to shepherd him and the company through its complex criteria. Using the LEED certification standards as a guide, Simon addressed each of the program's five main categories—including credits awarded for the use of renewable energy—to focus Hayward's green building vision for the truss plant. "The LEED standards help set the priorities and parameters for this building," says Simon. "Hayward was willing to invest all-out in the various technologies required."

The Decision to Go Solar

It was van Veen, in fact, who connected Hayward with the eventual supplier of the plant's PV system. At a building industry trade show in San Francisco, the builder found PowerLight, a Berkeley-based supplier of solar power systems and consulting services.

At the time, the plant's plans had evolved to include a small array of solar panels on an entry overhang, the purpose of which was still undetermined. "They knew they wanted solar and they wanted people to see it [for its educational value]," recalls Mark Bronez, vice president of sales for PowerLight. "They were still learning about

solar and really hadn't thought about its application."

Bronez took the plans for the plant and offered Hayward an alternative—a roof-mounted array of the company's PowerGuard PV system, consisting of insulated roof panels and 884 lightweight PV modules connected to a DC inverter at the electrical main inside the building. Based on calculations to determine the facility's various electricity needs, including credits for the plant's energy-efficient lighting, air handling, daylighting and passive cooling systems, the PowerGuard system is designed to achieve net-zero electricity use. "Our biggest concern was to not exceed the load," says Bronez.

Hayward Corporation, ©2002 Earl Richmond/Richmond Productions.

Workers install the PowerLight PowerGuard photovoltaic system on the east roof of the Hayward Building Systems manufacturing plant.

Deploying a building-wide system also allowed the Hayward plant to far exceed LEED standards for renewable energy use. To achieve the program's Gold Certification level, reached only by a handful of buildings to date, a structure must depend on renewable energy for at least 20 percent of its energy demand. "To Bill Hayward's credit, he shot for 100 percent," says Simon.

In addition, any "extra" or surplus power generated by the PV system is automatically fed back into the Pacific Gas & Electric (PG&E) power grid, earning the Hayward plant energy credits (should they ever be needed) and hedging against the area's recent power deficiencies. Connecting to the power grid also saved Hayward the expense and maintenance of using off-grid storage batteries.

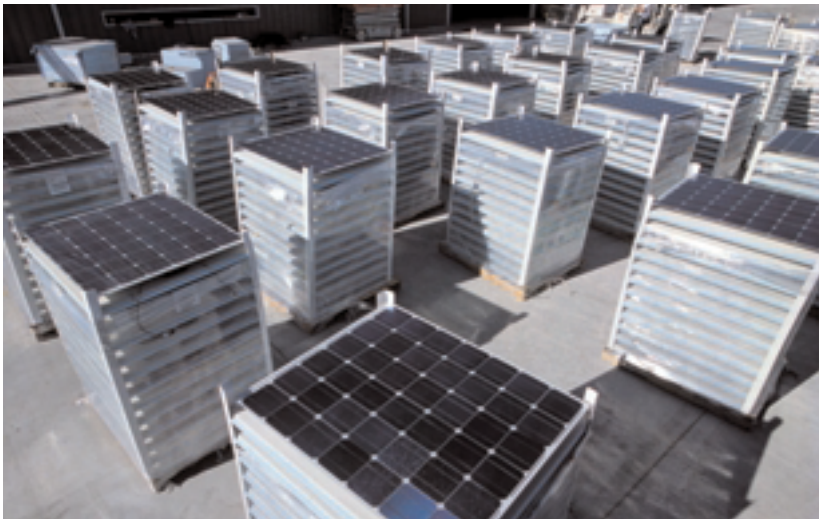
In his office at the company's corporate headquarters up the coast in Monterey, or even on his laptop on the road, Bill Hayward monitors the plant's energy use (and any resulting credits) via an Internet link.

Room to Grow

Bronez' proposal for the Hayward plant's PV system called for placing the array on the building's low-sloped, east-facing roof, a slightly smaller surface area than the west side that would better accommodate the system's design without sacrificing its output potential.

The 4 by 8-foot panels, which Bronez says achieve a higher output per square foot than conventional PV modules, are connected in series of 20 units. Each series features a pair of thin wires that, combined with those from other series', connect to a DC converter inside the building via a 1-1/20 inch conduit through a single roof penetration. "Ninety percent of our systems are installed without penetrating the roof," says Bronez, including conduits running along the outside of the building or through a perpendicular (or parapet) wall. "It's really the customer's choice."

At full demand capacity since it opened in May 2002, the 50,000-square-foot Hayward plant is designed to expand its production of factory-built framing components as more builders realize their cost and time efficiencies compared to traditional building methods. Annual sales are currently about $7 million, with the potential to expand operations at the facility to accommodate $20 million or more.



Hayward Corporation, ©2002 Earl Richmond/Richmond Productions.

The PowerGuard photovoltaic (PV) system combines insulated roof panels and lightweight PV modules that help move the Hayward plant toward the goal of net-zero electricity consumption.

If and when Hayward adds more production equipment to meet increased demand for its "SolarTruss™" components—thus boosting electricity loads—the company can continue its commitment to solar power by using the larger, west-facing side of the building's roof for additional PV panels. "Our goal is to maintain 100 percent solar power for the plant's operation," says Bill Hayward.

As important to Hayward's commitment to profitability, as well as the planet, the PowerGuard PV system offers a seven-year payback in electricity savings—one of several sustainable aspects of the plant that are delivering remarkable returns on Hayward's investment in green building.

Results and Recognition

In addition to direct energy savings, among a variety of efficiencies afforded by the plant's design, construction and operation per the LEED criteria, Hayward has effectively marketed and showcased its new manufacturing facility as a successful (and profitable) example of green building.

The use of solar power specifically is now leveraged in a brand name—SolarTruss™—for the components produced at the plant. "No one else brands their trusses, but we have a reason to," says Hayward. "We want contractors and architects to know that these components are built in a different and better facility that adds value to their projects."

The company has also hosted several all-day events at the plant for contractor customers of its six branch locations long the Central Coast, using those opportunities to introduce them to Hayward's commitment to sustainability and its ability as a producer of superior factory-built framing components.

The sustainable features of the Hayward plant embody a commitment by Hayward Corporation, an 84-year-old, $120-million lumber and building materials supplier in Monterey, California, to fulfill its "people, planet, profits" approach to business sustainability.

The facility also has garnered local and regional green building accolades, and was recognized nationally by *ProSales* magazine, a construction industry publication, as a foremost manufacturing facility among lumber and building materials dealers. It also was a stop on the 2002 Parade of Green Buildings, an annual event sponsored and hosted by various environmental groups in nearby Santa Barbara.

With solar energy as its flagship component, the Hayward Building Systems plant has applied for Gold Certification from the LEED program. Once certified, it will be the only building of its kind in the world to achieve such distinction and one of only a handful nationwide to reach the Gold level.

Beyond Solar

Of course, to qualify for LEED certification, and certainly the program's Gold level, the Hayward plant incorporates a variety of integrated resource-efficient systems and products that complement the PV system on the roof. To reduce the overall electricity load, the Hayward plant features infrared-sensor lighting systems—which are even more efficient than motion sensors—and overhead lighting in the 43,000-square-foot production area. These sensors automatically adjust the lighting to daylight conditions. A series of skylights mounted between the PV modules on the east-facing roof provide the daylight.

The building is also situated to take advantage of the area's notorious afternoon winds to passively cool the production area. Casement windows along the building's administrative wing also catch prevailing breezes for cooling benefits, supplemented by deep window awnings that provide shade. In fact, the plant has no mechanical provision for air conditioning, and instead uses air handlers to refresh, if not cool, indoor air. Spray-applied, recycled cellulose insulation retards thermal transfer through the building, saving additional energy. As a result, the Hayward plant exceeds California's stringent Title 24 energy standards by 40 percent, earning the building the maximum number of points in the LEED certification calculation for that criterion.

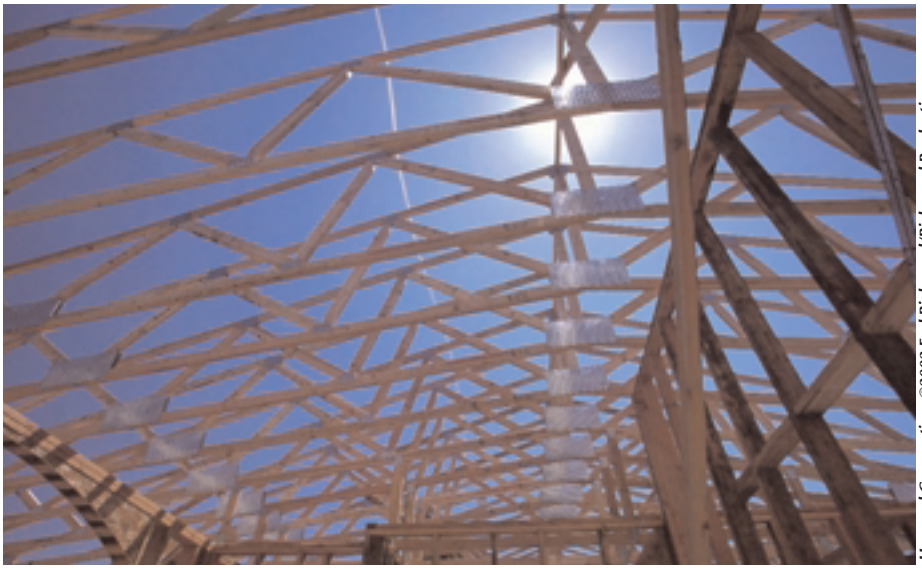
The facility employs an equally efficient system for renewable water use. Buried on site are a pair of 30,000-gallon cisterns, which hold rainwater from the roof for irrigation of the 7-acre site via an automatic sprinkler system. It only requires 1-1/2 inches of rain on the roof to fill the cisterns.

Water use is further reduced with hands-free faucets, low-flow showerheads and waterless urinals in the restrooms—the latter alone save an estimated 50,000 gallons of water a year each. Hayward hopes to eventually achieve a net-zero water use standard at the plant as well.

In the main parking lot, interlocking concrete paving stones allow rainwater to filter back into the water table below. That accommodation, in addition to the cisterns, allowed Hayward to save nearly an acre of land—a $100,000 value—that would have been required for the standard-size, on-site stormwater retention basins mandated by city code. Instead, the size of the on-site basins were reduced, as was the size (and cost) of the pipe connecting the basins to the city's water management system.

The construction of the building also includes elements of green building and resource efficiency—another tenet of LEED certification criteria. The structure for the production area is framed in recycled steel, while the administration wing was built using wood-efficient engineered lumber and framing components certified by the Forest Stewardship Council (FSC), the world's leading third-party forest certification agency. (In fact, Hayward is the West's leading retail supplier of FSC lumber through its branch locations, and offers it as an optional upgrade for SolarTruss™ components.)

In addition, Hayward pushed the envelope of resource-efficient concrete by specifying a 50 percent fly-ash mix for the production area floor and outdoor staging and shipping area. The use of fly ash, a recycled industrial by-product, reduced the amount of virgin cement required for the job without sacrificing the performance of the concrete surfaces.



Hayward Corporation, ©2002 Earl Richmond/Richmond Productions.

The use of solar power at the Hayward plant is now leveraged in a brand name—SolarTruss™—for the components produced at the plant.

In fact, almost everywhere you look in and around the Hayward Building Systems plant, you find green building—from the globe on the entry made from recycled industrial glass to the no-VOC fabrics, flooring, furnishings and other finishes.

Even the computers used by on-site engineers and sales associates are on a recycling program with IBM, while the break room features an island that accommodates the recycling of various containers. A pump for two hybrid-fuel cars sits just outside the production doors. "Instead of doing just 'less bad' by installing some basic energy-saving measures, we're turning our back on fossil fuels," says Hayward. "We want to do something truly positive for our environment and our business." ✪

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Mining the Sun in California

Building-integrated photovoltaic equipment is becoming more common in sunny California with a little help from Public Interest Energy Research programs.

by Joseph McCabe

AstroPower

Electricity-generating photovoltaic shingles replace conventional roofing shingles on this newly constructed Premier Power Home in Lincoln, California.

Solar energy research and development is beginning to reap benefits in sunny California, thanks to the state's public goods Public Interest Energy Research (PIER) programs. Administered by the California Energy Commission, PIER has funded over $50 million in renewable energy research, development and demonstration (RD&D) projects that promise to reduce the costs of renewables, and make renewables more valuable to California's rate payers.

Building-integrated photovoltaic (BIPV) projects, which may reduce the cost of solar-electric generation equipment or photovoltaics (PV) to between $3.50 and $5.00 per installed AC watt by 2005, are a major focus of the PIER Renewables Program Area research and development.

Erickson Equine Images

United Solar's building integrated photovoltaic standing seam roof replaces conventional roofing materials on this house in Historic Eureka, California.

Solar in California

Solar energy represents the single largest renewable resource in California. The state is literally drenched in sunlight that could provide a tremendous amount of electricity if developed cost-effectively. Theoretically, solar energy could provide an eye-popping 40 million megawatts (MW) of installed generating capacity if the entire state were covered with photovoltaic systems with 10 percent conversion efficiencies. The concept of covering the entire state with solar panels is unrealistic, but demonstrates the enormity of California's solar resources.

PV must be more affordable and provide high value to the state's electricity system to help achieve significant sustained growth. The manner in which PV systems are deployed in California will help determine their value to the electricity system. As a result, the specific focus of PIER Renewable PV research activities is to increase the value of PVs to California's electricity system.

Major California Legislation Affecting Renewables

- AB 1890, Birth of Renewables Incentives and RD&D programs at the CEC
- SB 1078 Renewable Portfolio Standard (RPS), 20% renewables by 2017 with "least cost and best fit"
- SB 1038 (Renewables Development) PIER Investment Plan, Renewable electricity development plan, Comprehensive transmission plan for renewables.
- SB 90 (PIER), PIER mission and goals; extension of the PIER and Renewable Energy Programs.
- AB 2228 (Net metering), Extends sunset date for net metering provisions, expands net metering to biogas on dairies.

Like many of today's distributed generation technologies, PV systems are dependent on net metering and interconnection standards to provide ratepayers with the highest value for their on-site generated energy. This also means that PV systems must be fully integrated into the market as complete systems solutions. Consequently, PIER Renewable research efforts in the PV area are closely integrated with other non-PIER activities to ensure the developed products are market connected and represent complete system solutions. For example, PIER Renewables is working to develop standardized installation designs and approaches that will reduce the cost and increase the ease of installing pre-packaged building-integrated PV systems by qualified installers.

Small-scale PV in general, and BIPV-generated electricity in particular, has the potential to provide enormous benefits to California ratepayers and electricity suppliers. PV systems provide individual ratepayers with choice over their electricity sources, and the ability to stabilize their electricity costs, while making meaningful contributions to a cleaner environment.

Californians have installed over 50 MW of grid-tied PV systems across the Golden State. Last year approximately 16 MW from over 3700 grid-tied PV systems were installed using the California Energy Commission's Emerging Renewables Buydown Program. When designed and implemented as part of an overall energy efficiency strategy, PV systems can help consumers offset the need to purchase expensive grid-generated peak electricity.

In addition, the PV systems can benefit utilities by alleviating the need to expand or add new transmission and distribution lines. PV systems also increase system reliability and help diversify electricity supplies. This can save cash-strapped California utilities the expense of adding new peaking facilities. Some of these benefits can be realized immediately. In fact, PIER-sponsored research shows that each kilowatt of customer-owned PV in the Sacramento Municipal Utility District (SMUD) service territory provides at least $1100 of value to SMUD (regardless of who owns the system). SMUD has nearly 11 MW in solar electric power installations in over 1000 systems, which is enough to meet the annual needs of more than 3300 homes. In the longer term, benefits from PV will play an increasingly important role for California's ratepayers and electricity suppliers.

PIER Goals and Objectives

- Developing renewable energy technologies that help make California's electricity more affordable, more diverse, cleaner and safer, and which enhance customer choice.
- Renewable development that addresses special California needs or opportunities and which contribute to achieving the RPS goals.
- Recently, unable to compete favorably in wholesale markets, near term renewable development has shifted to retail energy markets.
- California Energy Commission's Renewable Energy Program provides incentives to drive development of green fields and deployment of smaller systems.

Improving Affordability

The major barriers facing further deployment of small-scale PV systems in California are the capital installation costs of the systems. Today, roof-based PV systems in California in the 100-watt to one-MW size range cost between $6.00 and $9.00 per watt. These systems produce electricity at a cost of between $0.18 and $0.25 per kilowatt-hour (kWh) (not including state or federal incentives). If BIPV systems attain a targeted cost of $3 per installed watt, they will produce electricity at prices approaching $0.10 per kWh. At this electricity production cost, BIPV competes favorably with other options for supplying peak daytime demand in California.

To help achieve this electricity generation cost, PIER Renewables PV research activities largely focus on reducing the cost of PV to $3.50 an installed watt (unsubsidized) by 2005. With its focus on near-term affordability of PV systems that benefit California ratepayers, the PIER Renewables PV research provides a good complement to the PV incentives used in the Emerging Renewables Buy-Down Program at the California Energy Commission. Specific projects that are accomplishing these system cost goals include four BIPV projects that are ready for market entry from United Solar, AstroPower, RWE Schott Solar and PowerLight. All are reducing the balance of system costs while providing products that are more effective with new construction and retrofit markets.

PV and the Grid

PIER Renewables efforts to help reduce capital costs of PV systems involve lowering costs of components, systems and project execution (design, engineering and installation). There is an emphasis in PIER Renewables on reducing balance of systems costs. Due to national lab expertise and the high cost of fundamental research work, the federal PV research work focuses on PV costs, modules and inverters, which represent approximately 55 percent of the total PV system cost. Systems research involves integrating components in a cost-effective and efficient manner to satisfy market requirements.

Industry efforts have indicated that integrating BIPV during new construction may be the best way to achieve overall system cost reductions. PIER Renewables research is taking a leading edge position in this area with projects focused on new materials and installation methods that reduce the costs of deployment, labor and balance of systems of BIPV systems. Thus, PIER is concentrating on the 45 percent of installation costs that have the highest potential for reduction in California.

In addition, some of the projects include ways BIPV can be installed to provide shade and insulation, thereby generating multiple benefits from the BIPV system. These projects are being funded under two programmatic contracts administered by SMUD and Commonwealth. Endecon Engineering, funded under the Commonwealth programmatic contract, is developing system performance standards. These standards are replacing module and inverter ratings, currently seen by PV buyers, with systems performance ratings in AC watts. PIER believes these standards will increase consumer confidence and reliability regarding performance of installed systems.

AstroPower

At this subdivision in Lincoln, California, roofing equipped with solar electric cells replaces some of the concrete roofing tiles.

When It's Hot...

Like other electricity suppliers whose service territory is located in the hot inland regions of California, SMUD faces intense "needle peak" demand driven primarily by air conditioning loads during high summer temperatures. In addition, like a number of municipal utilities, SMUD has traditionally purchased a significant amount of its electricity from outside the district, leaving it vulnerable to volatile market conditions. The challenge to electricity suppliers facing high summer peaks is using the same solar resource creating the peak demand problem to help cost-effectively resolve it. The following are some of the PV RD&D projects funded by PIER Renewables under the SMUD Regen Program.

United Solar has developed a low-cost and dual function (roof and PV system) prototype. The laminate and batten PV system is delivered as a roll of material that's easy to install and can be applied as the roofing material on any new or existing roof underlay. Consisting of triple-junction thin film amorphous PV cells, the United Solar product has the capability for low-cost manufacturing.

Another prototype that has been completed involves a unique flat roof mounting system developed by RWE Schott Solar. One of the major hurdles facing the use of PV systems on flat roofs involves roof pen-

Technologies That Respond to California Needs

- Keeping California's renewable fleet as a vital part of the grid by reducing costs and improving performance.
- Developing smaller-scale residential and commercial technologies that help alleviate local capacity and congestion issues.
- Establishing the next generation of industrial and utility-scale renewable energy technologies.

Web-Based Analysis of PV Value

Clean Power Estimator is "economics of PV" software available free of charge on the Internet at www.clean-power.com. PIER Renewables is funding an upgrade of the software to quantify additional benefits from shading and insulation of BIPV systems.

RWE Schott Solar

RWE Schott Solar

RWE Schott Solar's prototype photovoltaic system for flat roofs uses an approach that eliminates roof penetrations but stays safely secured even in very high wind conditions.

etrations that occur when fastening the PV system onto the roof. Roof penetrations represent a potential for water damage from leaks. Consequently, most PV systems for flat roofs typically use expensive means to avoid leakage from roof penetrations. The prototype developed by Schott uses a flat roof mounting approach that eliminates roof penetrations but stays safely secured even in very high wind conditions.

PowerLight® is a success story for the Energy Commission. The Commission has supported the development of PowerGuard® and a Photovoltaic/Thermal product, PowerTherm™, as well as the new PowerLight® project which increases PowerGuard's® effectiveness in getting packaged PV systems into the marketplace. The goals of this new project are to develop a new residential PV roofing product, reduce roof deck temperatures, increase roof durability, reduce cooling loads, create a high performance affordable product and develop a product that is easily installed.

SMA is developing a new battery inverter/charger with Maximum Power Point Tracking (MPPT) and grid dispatch capability, greatly improving total system efficiency compared to existing technologies. It will simplify hardware, reducing material and installation costs and the ability to remotely control power delivery to the grid.

Under their PIER award, AstroPower is developing a new PV system for concrete tile roofs. By working with leading concrete tile manufacturers, this new system integrates into the new home construction market, with major reductions in costs of conventional building applied retrofit systems.

Other projects under the SMUD Regen award include World Water Corp doing PV Pumping; Davis Energy Group doing two-stage evaporative cooling; the National Renewable Energy Laboratory (NREL) investigating PV values for utilities; Oak Ridge National Labs (ORNL) demonstrating a roof-mounted daylighting system; and Unisun performing non-vacuum thin film PV improvements. These projects support national efforts, as well as California-specific interests in photovoltaics.

Two of the Commonwealth projects involve developing BIPV systems that can help meet peak demand on commercial buildings. These include the above-mentioned Endecon Engineering project and a project by the Renewable Energy Development Institute, which is streamlining BIPV for public sector projects.

Other Renewables

In addition to BIPV projects, PIER Renewables is also supporting the development of renewable technologies that will provide public benefits while helping meet the state mandated Renewable Portfolio Standard (RPS). PIER technology development activities are occurring in geothermal, biomass, wind and concentrating solar energy projects.

PIER is identifying California's wind resources, establishing wind energy systems performance and targeting ways to lower the cost and improve the value of wind energy in California. Aside from repowering activities at present wind parks, future wind development in California will mean tapping into a significant quantity of lower wind speed resources.

PIER is also working to improve the economics of California's biomass power plants, develop distributed generation biomass energy responsive to local needs and establish ways to capture the substantial environmental benefits tied to the state's biomass resources. In addition, PIER is increasing revenue streams for geothermal energy, lowering costs of geothermal drilling and exploration and improving management of geothermal resources and uses. And finally, PIER is developing small-scale concentrating solar power (CSP) options by teaming with the U.S. Department of Energy (DOE) and Solargenix (formerly Duke Solar) for lower cost Concentrating Solar Power.

Tapping into California's solar and other renewable resources reaps benefits for the state's environment and economy, as well as the residents and businesses who choose to purchase the equipment. With the help of the California Energy Commission's PIER programs, costs are coming down and more Californians will have access to clean, secure, local sources of energy. ✪

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Web Sites

SMUD RD&D Project:
www.smud.org/pier

California Energy Commission Public Interest Energy Research:
www.energy.ca.gov/pier

AstroPower: www.astropower.com

PowerLight: www.powerlight.com

United Solar: www.ovonics.com

RWE Schott Solar: www.asepv.com

Clean Power Estimator: www.clean-power.com

California State Legislation: www.sen.ca.gov

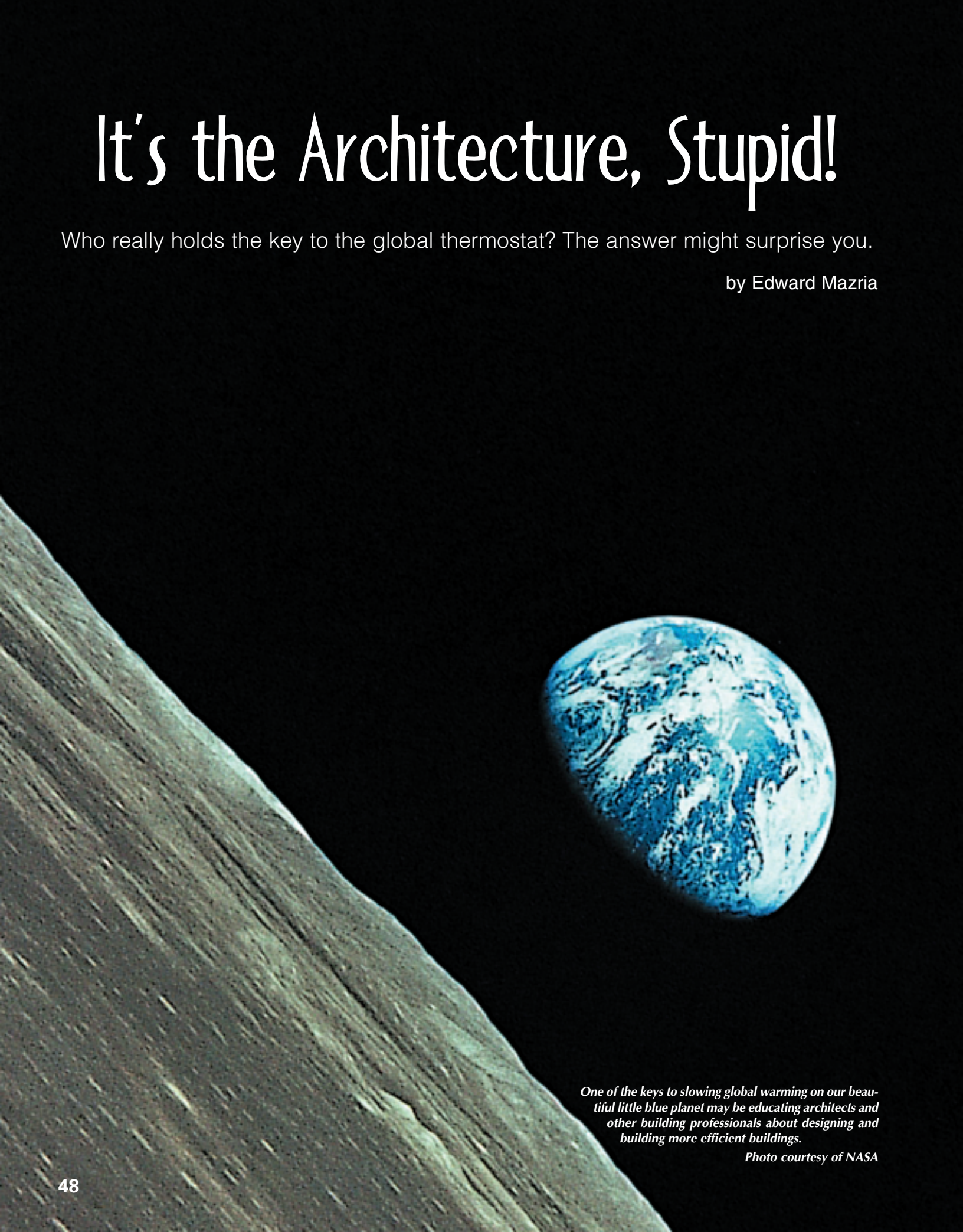
California Energy Commission Buy-Down:
www.consumerenergycenter.org

California Solar Center:
www.californiasolarcenter.org

It's the Architecture, Stupid!

Who really holds the key to the global thermostat? The answer might surprise you.

by Edward Mazria



One of the keys to slowing global warming on our beautiful little blue planet may be educating architects and other building professionals about designing and building more efficient buildings.

Photo courtesy of NASA

How do we dramatically cut down on greenhouse gas emissions, lessen our dependence on fossil fuels and become more energy-efficient without arguably wrecking the U.S. economy?

So far, no one's come up with a viable answer, largely because we keep looking at global warming from the same angle. The result is tunnel vision—we keep missing the forest for the trees with remedies like cleaner cars, fewer smokestacks, more renewable energy sources. Each is necessary, but solves only part of the problem.

What we need is a paradigm shift in the way we view energy consumption in this country. It's architecture—residential, commercial and industrial buildings and their construction materials—that account for nearly half of all the energy used in this country each year. And it's the architects who hold the key to turning down the global thermostat.

Gordon H. Schenck, Jr.

The Mount Airy library, in Mount Airy, North Carolina, a U.S. Department of Energy demonstration project built in 1981, is a completely daylit, passively heated and cooled facility that uses 75 percent less energy than a typical library in the region.

The government doesn't recognize this. The scientific community and public do not recognize this. The architects themselves do not recognize this. Why not?

The answer is simple. Most people don't understand what architects really do and most architects don't have a deep understanding of the relationship between architecture and the natural environment.

Missing the Obvious

The biggest problem with the current thinking on global warming is that solutions have been focused on areas where nominal reductions in energy consumption and emissions can be achieved. For example, environmental watchdogs and the media have made sport utility vehicles (SUVs) the chief villain of the green movement. But if you took every SUV off the road tomorrow and replaced them with hybrids, the impact on global warming would be minimal.

That's because the entire fleet of SUVs, mini-vans and light-duty trucks in this country account for only 6 1/2 percent of the total U.S. energy consumed each year. That doesn't mean we should abandon efforts to produce more efficient, environmentally-friendly SUVs and automobiles (reducing emissions in all sectors as well as our dependence on foreign oil is critical), but it does illustrate a huge blind spot in America's energy consciousness. Those who develop and promote the framework for environmental initiatives have boxed us into a narrow view of the problem, thereby limiting the scope of potential solutions.

They've overlooked the biggest source of emissions and energy consumption in this country.

It's architecture.

The Big Picture

Addressing global warming is like solving a Rubik's Cube puzzle. It takes the right combination of elements to complete a picture of a plausible emissions reversal program that won't overburden the U.S. economy.

In the process of divining a solution, data has traditionally been divided into four sectors—industry, with the highest energy consumption and greenhouse gas emissions, followed by the transportation, residential and commercial sectors (Figure 1).

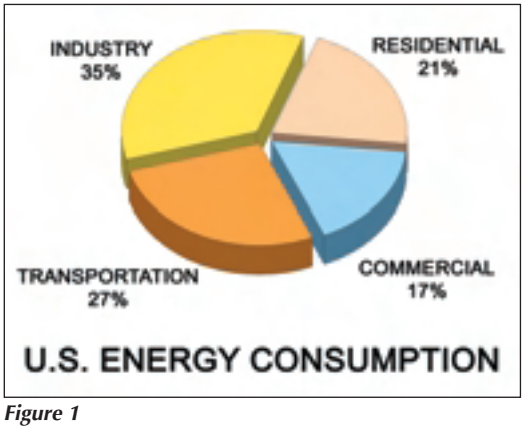


Figure 1

The loudest voices call for major reforms in the transportation sector beginning with greater fuel efficiency and pushing the auto industry to develop new fuel sources and vehicles, such as fuel-cell cars and light trucks.

The industrial agenda focuses on more efficient technologies for production, coupled with the use of less-polluting natural gas (to replace coal) and non-polluting renewable resources (wind, biomass, geothermal and solar) for electric power generation.

In the residential and commercial sectors, the emphasis has been on enacting standards and providing incentives to increase the energy efficiency of building shells, appliances, lighting fixtures and mechanical and electrical systems.

Taken together, these strategies are all worthwhile and necessary, but only address a portion of the U.S. contribution to global warming. For example, it would take increasing gas mileage of every passenger and light-duty vehicle on the road to an average of 40 mph over the next ten years just to stabilize the projected increase in their gas consumption at today's levels.

The environmental lobby, the electric utility industry and the current administration are miles apart when it comes to the use of renewable energy technologies for generating electricity. The environmental community would like to see about 8.6 percent of the total U.S. demand for electricity in 2020 generated by renewables (wind, solar, biomass and geothermal), while industry and the Energy Information Administration (EIA) project only 2.3 percent. However, 8.6 percent of electricity produced by renewables in 2020 would only supply about 30 percent of the EIA projected increase in electric demand. Meanwhile, in the residential and commercial sectors, stringent prescriptive building codes have already been adopted by many states, so substantial code-driven energy and emissions reductions in these sectors are unlikely.

None of these strategies reverses our emissions, though they mitigate the impact of emissions as our future need for energy spirals upward. Think of it as deficit spending. As our national debt mushrooms, we're making payments on the interest without touching the principal.

We need to turn down the global thermostat, but it's locked. Who holds the key?

It's the architects.

The Case for Architecture

By graphically rearranging the traditional way of reporting energy use and gas emissions, the key to visualizing the issues and the actions necessary to address the situation becomes clear. Creating a new sector termed "Architecture," which combines the residential and commercial sectors and that part of the industrial sector containing industrial buildings and building materials, a new and very different picture emerges. This picture clearly illustrates the problem and the sectors that must be carefully investigated in order to effect a change (Figure 2).

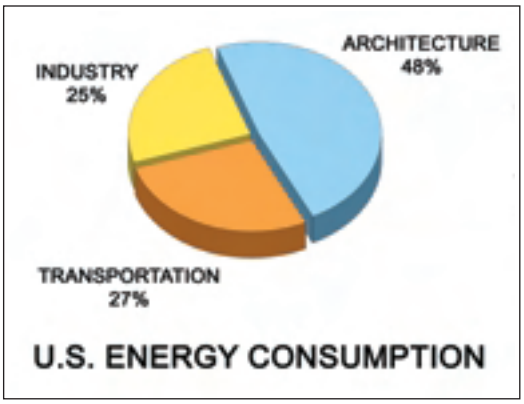


Figure 2

In this new picture, Architecture consumes approximately 48 percent of all the U.S. energy produced and is responsible for 46 percent of all U.S. CO_2 emissions annually, almost double any other sector. It's also the fastest growing energy-consuming and emissions sector (Figure 3).

Buildings are among the most long-lived physical artifacts society produces. They are typically used for 50-100 years, so their inertia has a major impact on future energy use and emissions patterns. Today's architecture will be with us for a long time.

Architects design most buildings and specify all the materials used in their construction. The design of a building—its form, fenestration, construction materials and finishes—largely determines the building's lifetime energy consumption and gas emission patterns.

The mechanical and electrical systems incorporated into a building design will convert today's fossil fuel energy to make that design habitable—to heat, cool, light and ventilate spaces as well as power equipment. Buildings can be designed to use large or small amounts of imported energy and in some cases no imported energy at all.

Today, architecture has become estranged and totally divorced from nature. Most structures are designed to be isolated from their surrounding environment. They require an uninterrupted supply of fossil fuel energy in order to operate. Otherwise, if their energy supply is discontinued, they become uninhabitable—too hot, too cold, no light, etc. They insulate themselves against the environment for as long as possible in an effort to preserve their internal conditions. The construction standards and building codes in force today fully support this design strategy.

Currently, most building energy codes require ample insulation values for walls, roofs, foundations and glass areas in support of this design strategy. These codes are at the point where more stringent requirements yield very small returns. In many cases the energy it takes to produce the additional material is greater than any potential savings. In fact, U.S. energy consumption per square foot of building has been increasing slightly since 1990, a testament to the fact that building codes have not been effective in stimulating further reductions in the Architecture sector.

We know that buildings can be designed today to operate with less than half the energy of the average U.S. building at no additional cost. The design information needed to accomplish this is freely available. It was developed in the 1970s and 1980s along with demonstration projects that were built and monitored at that time. The Mt. Airy, North Carolina, library is an example of one of these demonstration projects (see photo, page 49). Since then, many buildings of all types have been designed and constructed with annual energy consumption and CO_2 emissions of 50 percent to 75 percent below the U.S. average, further illustrating that this magnitude of reductions is readily attainable.

Blueprint for a Revolution

Achieving these reductions in the Architecture sector will require nothing short of a revolution in the architectural design community. The challenge is that the architecture inherited from our predecessors is no longer valid today. The global problems we now face provide the basis for a new architecture and a dialogue with nature that will give this new architecture its uniqueness.

This revolution, if it is to succeed, begins with design education and the understanding that each work of architecture has global implications. There are currently 124 accredited schools of architecture in the U.S. with an enrollment of more than 30,000 students. Fewer than half the schools have faculty with a deep understanding of the design principles necessary to transform architecture from its mindless and passive reliance on fossil fuels to an architecture intimately linked to the natural world in which we live. And, of the schools that do have faculty with experience designing low-energy buildings, many have only one faculty member with the necessary expertise.

There is precious little time to educate thousands of faculty in the design principles necessary to effect a dramatic change in the Architecture sector's emissions output and operational and embodied energy consumption patterns. However, because of the nature of architectural programs and their system of design studios, the education of students and faculty can take place almost overnight.

What is needed in each and every "studio," included as a requirement in the problems issued to students, is that architecture be designed to engage the environment in a way that significantly reduces or eliminates the need for fossil fuels. Due to the investigative nature of the design studio, students educate themselves through the research necessary to address the design problem, and—through studio critiques—they will educate their instructors as well.

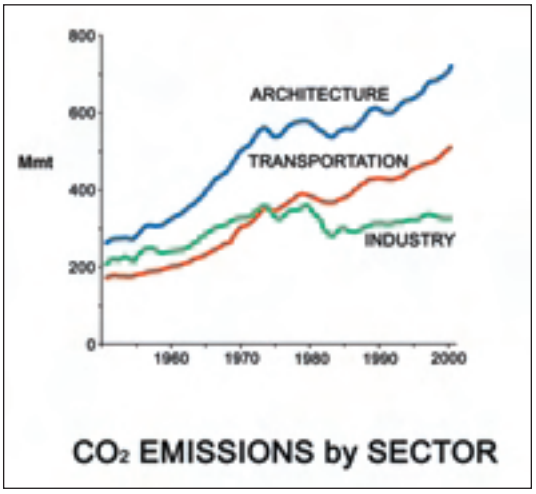


Figure 3

Schools must also offer computer simulation and living systems courses to augment the design studio and provide students with a deep understanding of the principles involved in natural processes. The schools, then, have the potential to institute changes in the profession so profound that we can begin to speak about a new direction in architecture. It thrusts architecture into a pivotal role in solving a critical global dilemma, and in doing so it serves the highest creative purpose.

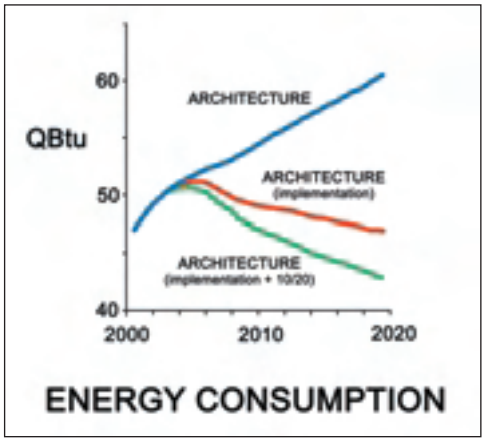


Figure 4

Figure 4
(Architecture sector in quadrillion Btus)
The Architecture (+program) scenario assumes the programs outlined in this article are fully implemented as follows: (1) energy consumption reductions for government owned buildings are implemented in 2004, (2) energy consumption reductions for all buildings are implemented in 2007 and (3) the 15 percent embodied energy reduction for all buildings is implemented over a 5 year period, beginning in 2005. The Architecture (+program, +10/20) scenario assumes the programs outlined in this paper are fully implemented, as well as the States implementing a renewable energy portfolio standard (10 percent of electricity supplied by renewables by 2015 and 20 percent by 2025, as outlined in the Union of Concerned Scientists Clean Energy Blueprint, October 2001).

To ensure that all this takes place quickly, the National Architectural Accrediting Board should make the accreditation of architecture programs contingent upon fulfilling the above requirements, and State Licensing Boards must include in their professional architecture licensing exam a segment requiring an understanding of these principles.

There are other beneficial impacts to implementing this educational strategy. Roughly 15 percent of architecture students come from abroad and many of these international students are in graduate programs. The U.S. will be training these students, many of whom will return to their native countries, in the design principles necessary to affect significant worldwide reductions in greenhouse gas emissions. This is especially important in developing nations as they strive to increase their standard of living with major investments in infrastructure and building projects.

And schools with studio-based industrial design and interior design curriculums can incorporate the same strategies to effect a major change in their programs as well.

Meeting the Challenge

Coupled with this transition in design education, there must be a process in place to support a similar movement in the professional architecture community. To set the wheels in motion, federal and state governments should require that all government renovation and new building projects be designed to meet an energy consumption performance standard of one half the U.S. regional average for that building type. Once this standard is established, most city and county governments, school boards, housing authorities and educational institutions will follow suit with similar standards.

The adoption of these performance standards should be linked to an intensive federal program to refine and transform complex and cumbersome building performance simulation programs so they are user-friendly, graphic in format and seamlessly integrated with the Computer Aided Design and Drafting (CADD) programs currently used by architecture firms. This will ensure that architecture firms will have the appropriate tools necessary to comply with the new standards.

When these simulation programs are in widespread use, building codes for all housing developments and commercial, institutional and multi-family buildings can be changed from their current prescriptive requirements to the newer performance standards that will be in place for all government buildings.

The American Institute of Architects (AIA) has produced a wealth of information regarding the embodied energy in building materials. To further reduce energy consumption and emissions in the Architecture sector, this material should be incorporated into a federally sponsored, nationwide, AIA continuing education program with the specific goal of reducing the embodied energy of building designs by a modest 15 percent by the year 2008.

With about 1.75 billion square feet of building demolition, 5 billion square feet of new construction and 5 billion square feet of renovation taking place in the U.S. each year, the potential for annual energy consumption and CO_2 emissions reductions are enormous. If the above programs were fully implemented, energy consumption and emissions in the entire Architecture sector would stabilize and begin to decline (Figure 4). This would put the U.S. well on its way toward meeting its international obligations.

Because 76 percent of all the electricity produced in the U.S. is used just to operate buildings, these programs would also replace the need to construct most of 1300 new power plants over the next 20 years projected by the Administration's National Energy Policy. It would reduce the need to mine, transport and burn 750 million tons of coal and build thousands of miles of new gas pipelines and power lines during that same period.

Robert Reck

The Natatorium of the 170,000 square foot Genoveva Chavez Community Center in Santa Fe, New Mexico, is a current example of a building that incorporates south-facing clerestories for daylighting and heating, as well as to take advantage of the special quality and intensity of light in Santa Fe.

The Key

The American architectural community has the unique opportunity to lead the way in reversing the destructive trend of human-induced climate change. They hold the key to the lock on the global thermostat. If they open the lock, and if the automobile industry likewise accepts its responsibility to increase the gas mileage of its fleet—and if more States require that a percentage of their energy come from non-polluting renewable resources—then the U.S. will have a viable strategy in place to combat global warming and restore its international good will and credibility. ✪

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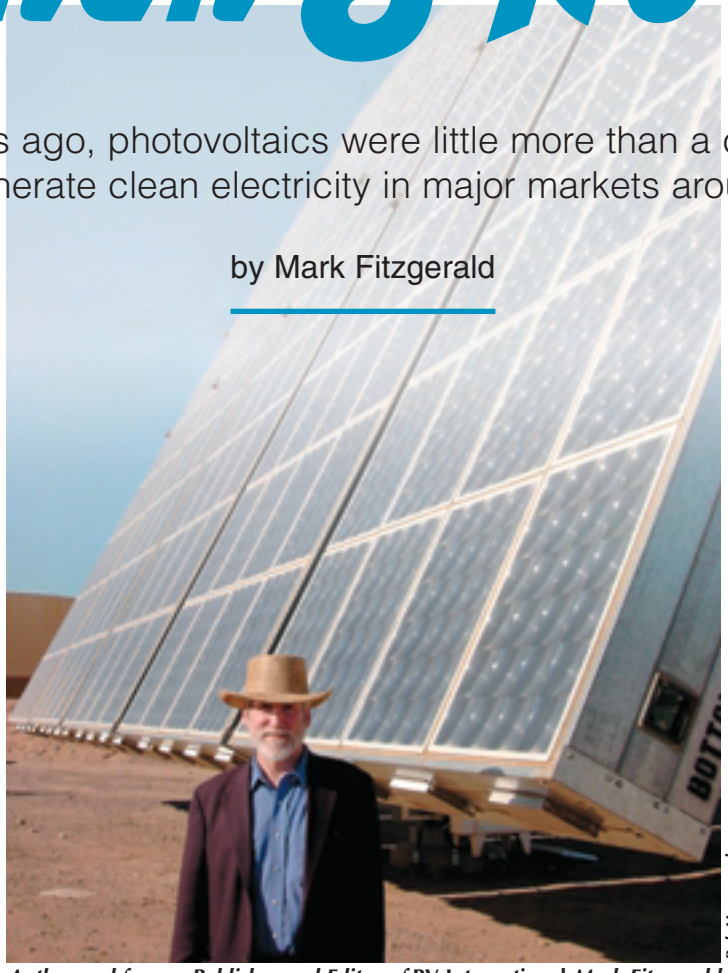
The PV World: Then & Now

Twenty years ago, photovoltaics were little more than a curiosity, but today they generate clean electricity in major markets around the world.

by Mark Fitzgerald



Bob Hammond

Author and former Publisher and Editor of **PV International** *Mark Fitzgerald stands in front of a high-performance "concentrating" photovoltaic power generator that uses plastic lenses to focus light onto small, efficient photovoltaic cells at the Arizona Public Service Company's Solar Test and Research (STAR) Center in Tempe.*

Sometimes it is useful to look back at how things were, as a way to gain perspective on where we are now.

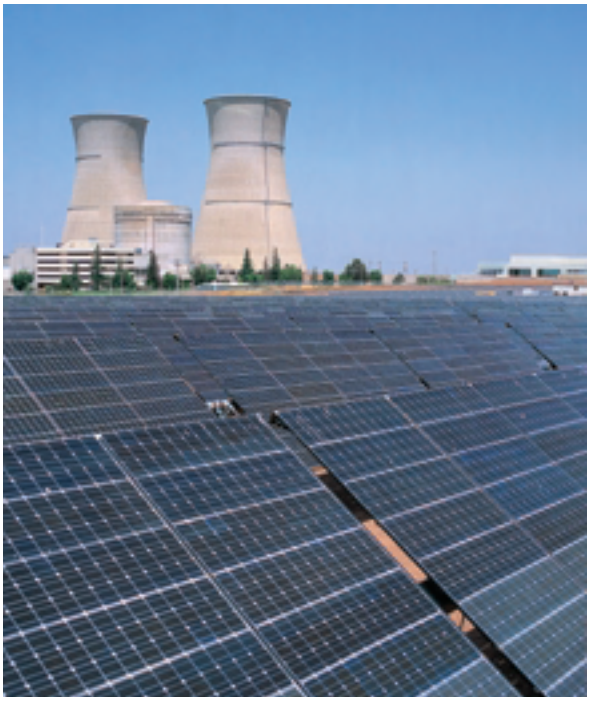
The world was a different place 20 years ago. In 1983, there was a Bush in the White House (as vice president), President Reagan dubbed the Soviet Union the "Evil Empire" (possibly the predecessor to the "Axis of Evil") and proposed the "Star Wars" anti-missile defense system, and the U.S embassy in Beirut was bombed, killing 87 people. Well, maybe things don't change so much.

But some things have changed. The price of oil in 1983 averaged $29.00 per barrel ($51.00 adjusted to 2003 dollars), while it bounces around $30 per barrel today. Solar, which showed such great promise in the late 1970s under President Carter—with the support of U.S. tax credits—had begun to fade without much government support. Solar thermal applications dominated the market, while photovoltaics (PV) was an interesting curiosity in most markets. Today, solar thermal still makes tremendous sense, but currently more support and resources are directed to PV.

For the PV industry, the changes have been dramatic. In 1983, the world shipments of PV totaled 16.8 megawatts (MW) (a 100 percent increase over 1982), with a cumulative installed total of 36.7 MW. In 2003, it is likely we will see in excess of 600 MW of PV shipped, with a cumulative installed capacity of more than 2500 MW. In 1983, PV was still little more than a curiosity (except in rural and remote regions and in space), while in 2003, we see broad international support and major markets for urban grid-tied systems. The 1983 price per watt for modules averaged about $8.00 ($14.25 in 2003 dollars), while today it averages about $3.00 for larger purchases. The U.S. Department of Energy target price was less than $1.00 per peak watt (Wp), which, adjusted for inflation, is equal to $1.80/Wp in today's dollars. Not too far off.

But, in the early 1980s, because PV was not of significant interest to the broad market, it was difficult to find general information on the technology and its applications. There were highly technical materials, like the proceedings of the IEEE PV Specialists Conferences, and marketing materials from manufacturers if you knew where to look. Publications like *Popular Mechanics* and *Popular Science* would run articles from time to time, typically discussing the future of the technology, but there was no publication providing an accessible resource on the state of the market to industry or the public. The dominant solar publications at the time, *Solar Age* magazine and *Solar Engineering and Contracting*, were the default resources for information on solar applications and developments (*Home Power* and SOLAR TODAY were still a few years off), but they spoke almost exclusively to the solar thermal and passive solar markets.

Photovoltaics deserved a dedicated publication, so in April 1983, ten years after the Cherry Hill Conference (the first conference dedicated to terrestrial PV), the first issue of *Photovoltaics International* (*PV International*) was mailed out. The timing was hardly ideal (see the paragraph above on the world energy markets in the 1980s), but it was a useful idea. So why is this relevant enough to cover in SOLAR TODAY? Because, in 1988, ASES purchased *PV International* and folded it into SOLAR TODAY as a means to grow beyond ASES' core market of passive solar and solar thermal into the growing market for PV.

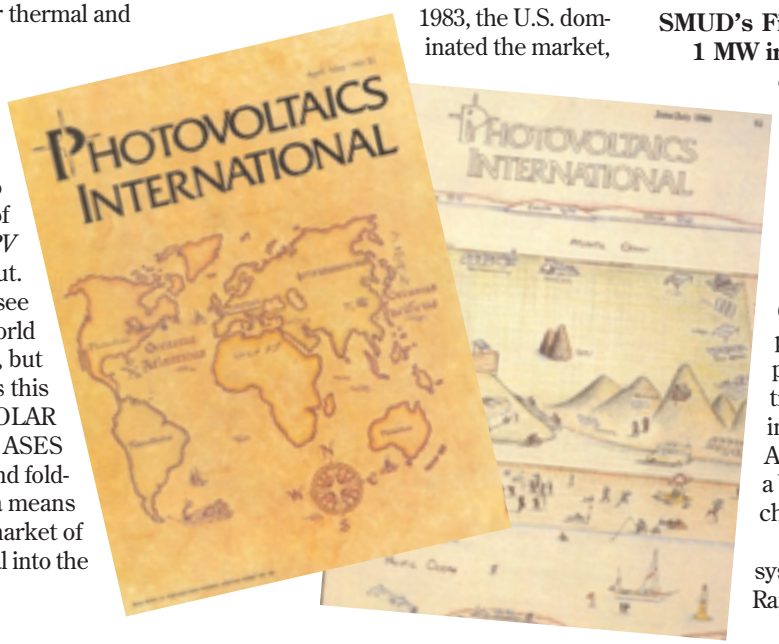


SMUD

The Sacramento Municipal Utility District (SMUD) held the ceremonial groundbreaking for the photovoltaic system on the grounds of the Rancho Seco nuclear power station site in October 1982. The site now features more than 3.9 MW of photovoltaics.

As one way of considering the changes over the last 20 years, it is interesting to look at the changes in the installed projects. The first issue of PV International was a summary of 10 of the largest PV projects in the world at the time. These 10 installations ranged from 70 kilowatts (kW) at EPCOT to two 1-MW projects in California. Today, the ten largest projects are all larger than 1 MW, with the largest being a 4-MW system in Germany (with a 10-MW system under construction).

It is also interesting to look at the market players then and now, to see how things have evolved. In 1983, the U.S. dominated the market, both in manufacture and in large systems. Today, Europe and Japan hold the market. In 1983, Solar Power Corp. (an Exxon subsidiary), ARCO Solar and Solarex dominated manufacturing, and companies like Stone & Webster and BDM Corporation were installing systems. Today Sharp, BP Solar, Kyocera and Shell are the four largest manufacturers, and the 10th largest, Photowatt, produces the equivalent of the total world production of all manufacturers in 1983.



Then

In 1983, PV International highlighted 10 of the largest PV systems in the world at the time. Here are summaries (and, in several cases, information on the current status) of those 10 systems.

The ARCO Solar Lugo Megawatt

1 MW in California. In December 1982, the BDM Corporation completed construction on the ARCO Solar/Southern California Edison 1-MW Lugo PV system, in San Bernardino County, California—the first megawatt PV system in the world. The system, consisting of 27,648 modules set on 108 2-axis trackers in the high desert of southern California, was constructed over 38 weeks. The modules were ARCO Solar, the inverters were manufactured by Helionetics and Garrett AiResearch. BDM was the prime contractor and its principal subcontractor was Townsend and Bottum, Inc. ARCO Solar and Southern California Edison dismantled the system and sold off the modules to a third party in 1990.

SMUD's First Megawatt

1 MW in California. As the first phase of a planned 10-year, 100-MW PV installation, the Sacramento Municipal Utility District (SMUD) held the ceremonial groundbreaking for the initial megawatt on the grounds of the Rancho Seco nuclear power station site in October 1982. This ambitious plan envisioned fields of flat-plate collectors on single-axis trackers. The first megawatt, installed under a contract with Acurex Solar Corporation, used a Windworks Gemini 1-MW synchronous inverter.

While the planned 100-MW system has not come to pass, the Rancho Seco site now hosts more

than 3.9 MW. SMUD has also installed more than 10 MW of PV throughout its service territory, with more than 6 MW installed on homes, parking canopies, churches and other distributed generation sites.

Martin-Marietta Concentrators

In 1983, there were two large-scale concentrator PV systems in operation—one stand-alone, one grid-tied and both manufactured and installed by Martin Marietta Corporation. The technology used 33X, point-focus Fresnel lenses, with 68 modules (each with four lenses and cells) mounted on each 2-axis tracker system.

350 kW in Saudi Arabia. In 1981, under a U.S.-Saudi Arabia cooperation program called SOLERAS, Martin Marietta Corporation commissioned the largest concentrator PV system and largest stand-alone system in the world. At 350 kW, with a C&D battery system and backup diesel generators, the system provided power for the villages of Al Jabaylah, Al Uyaynah and Al-Hejrah, 40 km outside of the Saudi capital city of Riyadh. The Midwest Research Institute managed the program.

225 kW in Arizona. In 1982, Arizona Public Service and Martin Marietta Corporation inaugurated the 225-kW concentrator PV system at Sky Harbor Airport, in Phoenix, Arizona. At the time, it was the largest grid-tied concentrating system in the world.

Solarex Breeder

200 kW in Maryland. In 1992, Solarex Corp. dedicated its 200-kW roof-integrated PV array in Frederick, Maryland. While initially called the Solarex "Breeder" facility, from the intention to use the array's power to manufacture 2 MW of PV annually, Solarex soon dropped the designation. The system also included a 2.5 megawatt-hour (MWh) battery storage system.

Oklahoma Science Center

105 kW in Oklahoma. Science Applications International Corp. (SAIC) was the prime contractor for the 105 kW array of Solarex modules installed on the roof of the Oklahoma Center for Science and the Arts. The system provided power to the Oklahoma Gas and Electric grid through a Windworks inverter. The system design was altered to include mirror reflectors to boost the rating to 135 kW. Unfortunately, the increased temperatures offset the planned gain, causing the array to operate below its original design output.

The Twins

In 1983, Beverly, Massachusetts, and Lovington, New Mexico, were each home to a 100-kWp PV system. The intent of the systems was to provide experimental and practical data on intermediate-sized installations and a comparison of the performance of similar systems in dissimilar environments—the northeastern and southwestern U.S. Both systems use modules from Solar Power Corporation (an Exxon subsidiary), with the installation managed by Stone and Webster.

Shell International Renewables Ltd.

Today, Shell is one of the four largest photovoltaic manufacturers in the world. This is the Shell Solar factory at Gelsenkirchen, Germany.

100 kW in Massachusetts. Dedicated on April 14, 1981, the 100-kW PV system at the Beverly High School provided approximately 10 percent of the annual electrical requirements of the 2000-student school. The array was connected to the New England Power Service Company through a Helionetics inverter. In 1997, Ascension Technology worked with the City of Beverly and New England Electric to rehabilitate and upgrade the PV system, which remains a significant educational resource.

100 kW in New Mexico. The 100-kW flat-plate system in Lovington, New Mexico, was dedicated on March 17, 1981, and exceeded its design expectations in terms of array output, though the data acquisition systems proved unreliable. Most of the system's output went to the Lovington Square Shopping Center, with a small portion going to the on-site visitors center. The array was connected to the Lea County Electric Cooperative using a Helionetics inverter.

Natural Bridges

100 kW in Utah. On June 7, 1980, the National Park Service, with program partners from the Massachusetts Institute of Technology, the U.S. Department of the Interior and the U.S. Department of Energy, dedicated the 100-kW Natural Bridges PV system at Natural Bridges National Monument in southeastern Utah near Moab. The stand-alone, PV-diesel-battery hybrid system, comprising modules from Motorola, ARCO Solar and Spectrolab, provides power for the site's six residence units, a well pump, outside lights, a water system, a maintenance shop and the visitors center.

Over time, the system's battery and power electronics components degraded, causing the diesel generators to operate more than the Park Service would like. In January 2003, the Park Service selected RWE Schott Solar Corporation to renovate the Natural Bridges PV system, and they installed a new array, battery system and power electronics. In the renovation design, the new array takes up only one-third of the original array area, and produces slightly more power.

EPCOT Universe of Energy

70 kW in Florida. As a key component of EPCOT's Universe of Energy pavilion in Orlando, Florida, the designers included a 70-kW PV array, manufactured by Solar Power Corp., connected to the Reedy Creek Utility through a Helionetics inverter. The power output of the array was designed primarily to offset the power requirements of the pavilion's theater cars that transport visitors through the exhibit.

In 1997, Ascension Technology worked with Walt Disney World, EPCOT and Reedy Creek Electric to rehabilitate and restore the system on the roof of the Universe of Energy, redesigning it as a 60-kW array, made up of 12 5-kW subsystems, each with its own inverter.

Now

Today, there is a plethora of large systems, in addition to the thousands of residential systems and mid-sized commercial systems installed under support programs in Germany, Japan, Switzerland, The Netherlands and several states in the U.S.

4 MW in Germany. Voltwerk AG, part of the Conergy Group, has completed installation of the world's largest solar park. The installation comprises 32,740 BP Solar PV modules and is located in Hemau, near

PowerLight Corporation, www.powerlight.com

The 1.18-MW PowerLight PV system on the roof of the Santa Rita Jail in Dublin, California, covers about 3 acres of the jail's roof.

Regensburg (Bavaria), Germany, at a former ammunition depot. The system includes 40 Siemens Sinvert inverters. The forty individual plants combine to give a total of 4 MW of solar generating capacity. Voltwerk used SunTechnics Solar Technology GmbH as the main contractor for the installation.

3.9 MW in California. Begun in 1983, and installed in a number of stages over the last 20 years, the Sacramento (California) Municipal Utility District (SMUD) now has a 3.9-MW PV array facility at the site of the closed Rancho Seco nuclear plant. In addition, SMUD has installed more than 6 MW of PV in distributed residential, commercial and other systems throughout its service territory, for a total of more than 10 MW.

2.4 MW in Arizona. Tucson Electric Power Company (TEP) has, through a number of phases, installed a 2.4-MW array near Springerville, Arizona. The Springerville Generating Station Solar System includes 22,276 PV modules spread out over 28 acres.

2.1 MW in Germany. Building on the first megawatt of PV installed on the Munich Trade Fair Center in Germany in 1997, an additional megawatt of Shell Solar modules was added at the end of 2002, bringing the total installed capacity to 2.1 MW.

2 MW in Arizona. Arizona Public Service has installed approximately 2 MW of PV as part of a planned 5-MW system at its PV Power Plant site northeast of the Prescott (Arizona) Airport. This is in addition to a significant base of installations throughout its service territory, including the APS STAR Facility.

1.6 MW in Germany. In November 2001, Renewable Energy AG commissioned a PV system, located near Markstetten, in Bavaria, Germany, with a total output capacity of approximately 1.6 MW.

1.2 MW in Spain. The Photovoltaic Solar Energy Plant near Tudela, a facility promoted by EHN, is the largest solar power station in Spain in terms of installed capacity (1.2 MWp). The plant has two separate components—the central area (for the highest electricity production) and the 'distributed' area, designed for experiments and research in this field.

1.18 MW in California. In early 2002, Alameda County completed a 1.18-MW PowerLight PV system on the roof of the Santa Rita Jail in Dublin, California. The array, completed in three phases, consists of three acres of PV modules. This system helped Alameda County weather the California State energy crisis in 2002 by reducing the jail's monthly electric bill.

1.1 MW in California. In February 2003, Johnson Controls Government Systems LLC was awarded a contract that includes installing a 1.1-MW PV system at the Marine Air Ground Task Force Training Command, at Twentynine Palms, California. Johnson Controls says that the 1.1-MW PV system, using BP Solar modules, will be one of the highest capacity non-utility PV systems in the world. The array will be used to supplement electric capacity during peak load periods and can supply approximately one-fifteenth of the base's annual electricity requirements.

1.01 MW in Long Island, New York. The first phase of the largest commercial solar project in the U.S. was completed in early 2003. A joint effort between the Fala DM Group, a Suffolk County mail order company, and the Long Island Power Authority has resulted in a system that will cover the mail order company's three rooftops with 1.01 MW of PV, using a PowerLight system.

As a note on another significant system that is committed but not yet completed, S.A.G. Solarstrom AG, of Germany, has announced that it is moving ahead with plans to build a 10-MW PV system. This installation will be made up of seven projects of 1.5 MW each, located in a group of villages in the Neumarkt region of northern Bavaria. Work began on the first installation in March 2003. Rather than being roof-mounted, these will be ground-mounted systems.

Next?

Wouldn't it be nice to have a clear image of the PV industry 20 years from now (or the stock market or the lottery numbers)? What will the markets look like? What technologies will dominate? What will the costs be? There are too many variables to know, but the last 20 years have seen significant growth under sub-optimal conditions. As the energy market evolves, and research continues, we can reasonably expect PV to continue to grow and prosper. ✪

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Bill Timmerman, NREL PIX 08993

Arizona Public Service Company operates the Solar Test and Research (STAR) Center in Tempe.

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For more information on the different levels of support, contact

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e-mail: ases@ases.org,
web site: www.ases.org

Installer Training

The Solar Living Institute was recently awarded an $85,000 Renewable Energy Consumer Education grant from the California Energy Commission to hold a series of 22 solar installation training classes throughout California. Classes began in March and are held through August 2003 in locations around the state.

The day-long classes are geared towards people with previous electrical experience who need the code and installation information specifically related to photovoltaic (PV) installations. The goal of the program is to increase the pool of qualified installers available to serve the public throughout the state. The recommended prerequisite for attending this class is apprentice or journeyman level electrician status or equivalent experience.

The course covers basic PV concepts, site analysis, performance calculations, PV array and balance of system installation issues, special wiring considerations, wiring methods and issues relating to the NEC code and utility interconnection. PV system equipment will be available to demonstrate the principles shared in class.

Classes are taught by a pool of experienced instructors who have years of hands-on solar electric experience. Students are provided with a thorough 200-page course manual and a 600-page *Solar Living Sourcebook*, the definitive work on renewable energy and other resource materials.

For more information and to register, contact the Solar Living Institute, P.O. Box 836, 13771 S. Highway 101, Hopland, California 95449, (707) 744-2017, FAX (707) 744-1682, e-mail: sli@solarliving.org, web site: www.solarliving.org.

Solar Living Institute

The Solar Living Institute provides hands-on training.

Texas Solar Schools

The "Texas Solar for Schools" program, implemented by the Advanced Energy Division of CSGServices, Inc. (CSGS), was recently recognized for its educational achievement and innovative approach. CSGS and its partners, the Texas State Energy Conservation Office (SECO) and the Children's Museum of New Braunfels, were awarded the Texas Alliance Exemplary Partnership award from the Texas Alliance for Science, Technology and Mathematics Education.

"Texas Solar for Schools" is a statewide effort that links renewable energy education to the installation of highly visible solar

electric or photovoltaic (PV) systems at 11 public schools across the state. Each PV system provides enough energy to power approximately one classroom, reducing electricity costs at participating schools, while providing a unique educational opportunity for Texas children and communities.

CSGS designed and installed the solar energy and data acquisition systems at the schools. They also provided computer programs that enable students to monitor how much energy is produced and provided hands-on training to school staff. SECO developed, funded and provided oversight for the program, while the Children's Museum of New Braunfels delivered ongoing educational training and surveys to students and teachers. As a result of the project's success, SECO and CSGS have agreed to extend the program to 10 additional schools in 2003.

For more information, contact CSGServices, Inc., 40 Washington Street, Westborough, Massachusetts 01581, (508) 836-9500, FAX (508) 836-3138, web site: www.csgrp.com.

Sustainable Design Course

The Institute for Social Ecology (ISE), in Plainfield, Vermont, is offering several summer courses including Sustainable Design, Building and Land Use, May 30-June 20, 2003. The 6-credit course includes instruction in permaculture, organic agriculture, community design, ecological building and forest ecology.

Students will be involved in the development of the ISE's campus while deepening their knowledge of how to create and live in a community. The program's format will be a mixture of lecture and discussion with readings, hands-on projects and a design studio. Using the ISE's 50-acre site as a laboratory, the design portion of the program will be devoted to the study of fundamental principles and skills that can be applied to any design task such as a building, an orchard, a garden or a campus.

There will be demonstrations and lectures/discussions on topics including the history of agriculture, organic agriculture, drawing and drafting, appropriate technology, estimating environmental costs, alternative building, permaculture and forest ecology.

For more information and to register, contact the Institute for Social Ecology, 1118 Maple Hill Road, Plainfield, Vermont 05667, (802) 454-8493, web site: www.social-ecology.org.

SolarFest News

SolarFest: Energy Education through the Arts recently announced the new location of *SolarFest 2003, the New England Renewable Energy Festival*. The Festival will be held at Green Mountain College in Poultney, Vermont, July 12-13, 2003.

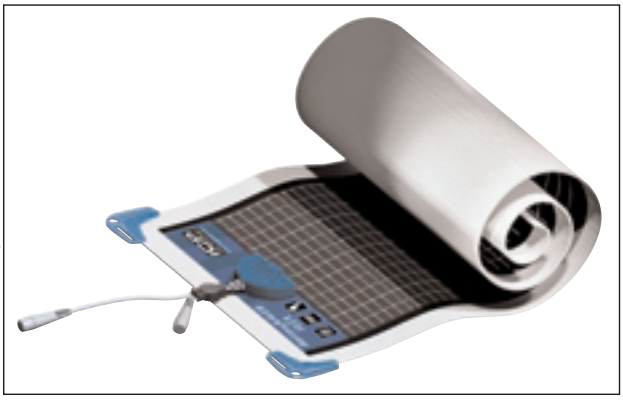
Events at SolarFest will include renewable energy and sustainable living workshops, on-site solar, wind and biodiesel demonstrations, renewable energy providers, hybrid car manufacturers, storytellers, nationally known musicians, a children's stage and activities and craft and food vendors.

SolarFest recently received a generous grant of $5000 from the U.S. Department of Energy through its Million Solar Roofs Program and the Vermont Department of Public Service. The grant is in support of the renewable energy outreach and education that happens at the festival.

For more information, contact SolarFest, P.O. Box 1052, Middletown Springs, Vermont 05757-1052, (802) 235-2866, e-mail: info@solarfest.org, web site: www.solarfest.org.

Flexible Solar Charger

ICP Global Technologies (ICP), a manufacturer of solar solutions, recently introduced the BatterySAVER FLEX™, available in 5, 10 and 20-watt outputs.



ICP Global Technologies

BatterySAVER FLEX™

The BatterySAVER FLEX™ consists of non-breakable solar cells that create a lightweight, flexible and durable solar panel that can be installed anywhere. Its malleable construction and choice of mounting options are ideal for all types of boats and other marine applications, as well as for RVs, automobiles and camping.

BatterySAVER FLEX™ panels are made of extremely flexible and durable Copper Indium Gallium Diselenide (CIGS) solar cells. Thin and flexible as 10 sheets of paper, the BatterySAVER FLEX™ rolls up neatly into its handy storage/carrying container when not in use.

The BatterySAVER FLEX™ can not only be used as a solar battery charger, but also as a direct power source for portable electrics such as GPSs, cellular phones and laptop computers using the optional 12-volt power socket.

For more information, contact Charles Gelinas, ICP Global Technologies, 6995 Jeanne-Mance, Montreal, Quebec, Canada H3N 1W5, (514) 270-5770, ext. 117, FAX (514) 270-3677, e-mail: cgelinas@icpglobal.com, web site: www.icpglobal.com.

Solar Design Tool

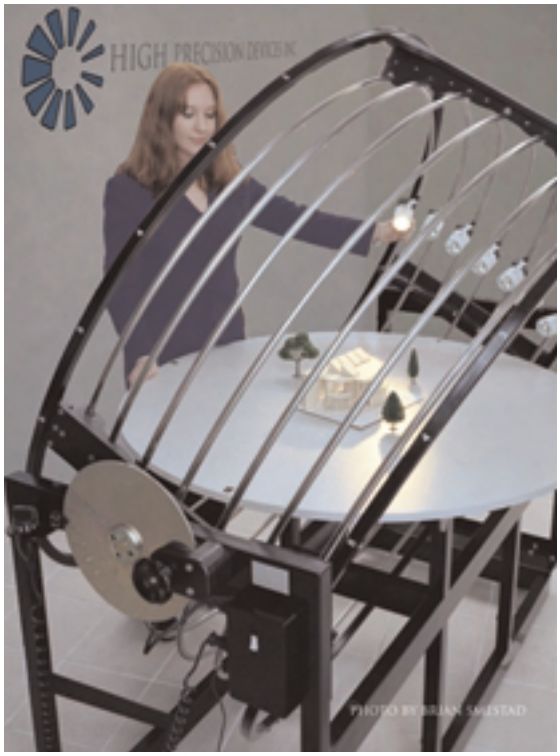
High Precision Devices, Inc., (HDP) in collaboration with Norbert Lechner, professor of architecture at Auburn University, has developed and built the HPD Model 126 Heliodon.

The Model 126 Heliodon accurately demonstrates the motion of the sun relative to a building for the purpose of designing solar responsive architecture. It is an engaging tool for architects and teachers to use to educate clients and students who have an interest in solar responsive design.

It is useful to anyone interested in learning the principles required for achieving solar access and shading. The Model 126 Heliodon can be used as a demonstration device, an interactive hands-on teaching tool, an architectural design tool, for testing and comparing alternative designs and a presentation tool to explain the virtues of a specific design.

It is also helpful to architects for designing building forms, orientation, shading systems, passive, active and photovoltaic solar collecting systems, daylighting and landscape design that welcomes the winter sun and rejects the summer sun.

For more information, contact Naomi Tepper, High Precision Devices, Inc., 1668 Valtec Lane, Boulder, Colorado 80301, (303) 447-2558, FAX (303) 447-2548, e-mail: ntepper@hpd-online.com, web site: www.hpd-online.com/heliodon.htm.



High Precision Devices, Inc.

The Model 126 Heliodon is an excellent hands-on teaching tool.

Junghans

Junghans SolarTEC watch

Solar Watches

Junghans is now selling solar wristwatches, known for their solar technology, long service life and wear comfort.

The watches are environment-friendly, with no battery. The high-performance energy accumulator built into the watch preserves the energy and functions as its source of power. Light, solar or artificial, penetrates the solar dial or the dial with translucent print, the light-sensitive solar cell converts the luminous energy into electric power and this energy directly drives and controls the watch movement. Just a bit of light suffices to keep Junghans solar watches in operation.

The watches have an energy reserve of two months in the dark, which ensures that they do not stop working, even in absolute darkness. An early warning system indicates when the energy level is low.

For more information, contact Junghans Uhren GmbH, Geißhaldenstrasse 49, 78713 Schramberg, +49 (0)7422/18-360, FAX: +49 (0)7422/18-403, e-mail: information@junghans.de, web site: www.junghanwatches.com or in the U.S., (800) 853-5486, (201) 891-9466, web site: www.junghanusa.com.

StressPly® Technology

The Garland Company, Inc., manufacturer and distributor of high-performance commercial and industrial roofing systems, has developed several waterproof roofing solutions including

StressPly® EUV waterproofing technology. This underlying system protects buildings from water penetration.

StressPly® EUV incorporates post-consumer recycled tires in its construction and is integrated with Garland's Starburst™ Mineral surfacing and a bright white Pyramic coating. As an Energy Star® approved solution, it offers exceptional reflectivity and energy savings.

For more information, contact The Garland Company, Inc., 3800 East 91st Street, Cleveland, Ohio 44105-2197, (800) 321-9336, (216) 641-7500, FAX (216) 641-0633, web site: www.garlandco.com. ✪

The Garland Company, Inc.

StressPly® EUV was recently installed on the roof of the Cleveland Environmental Center in Cleveland, Ohio, along with Garland's GreenShield™ green roof, SolarGrid™ photovoltaic rooftop panels and White Knight™ urethane coating.

Backup Power System

Xantrex Technology Inc. recently introduced the Xantrex Hybrid Backup Power System (HBPS). It is a sophisticated power system that automatically provides backup power during power outages. The Xantrex HBPS is a self-contained system that combines a Xantrex sine wave inverter/charger with a Kohler DC generator, batteries and optional renewable energy capabilities. These components are integrated into an outdoor enclosure designed for fast installation.

During extended blackouts, the system will automatically start its DC generator when the battery bank is depleted to a level pre-programmed by the user. Once the batteries are recharged, the system will automatically shut the generator off. When utility power is once again available, the batteries are kept in a charged and ready position using utility power, which minimizes generator runtime and fuel consumption. The generator is fueled by natural gas or propane.

Xantrex also has a smaller scale backup power system designed for indoor installations, the Xantrex Backup Power System (BPS). It is a compact, affordable solution that instantly provides up to four hours of backup power when utility power fails, enough power to get through most blackouts in North America.

The Xantrex BPS is designed to be easily installed by a qualified electrician and is available in 2000 to 5500-watt models with a high surge capacity up to 9000 watts to start motor loads, such as in a fridge, furnace or water/sump pump. A standard 2000-watt system is typically configured to provide the average home with backup power for critical loads for 2 to 4 hours. The system's modular approach makes the addition of components easy—extra batteries and cabinets can be added at a later date to extend run time, and more than one

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Xantrex Technology Inc.

Xantrex Hybrid Backup Power System

power module can be installed to increase the amount of power available.

For more information, contact Xantrex Technology Inc., 8999 Nelson Way, Burnaby, British Columbia, Canada V5A 4B5, (604) 422-8595, toll-free (800) 670-0707 or (800) 446-6180, FAX (604) 420-1591, web site: www.xantrex.com.

Solar Fast Pump

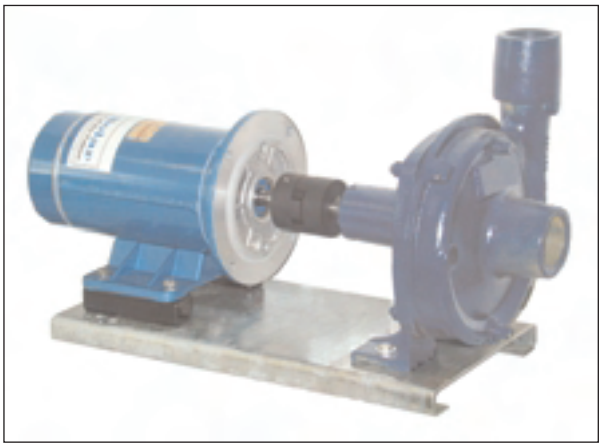
Kelln Solar recently introduced a high efficiency, large volume centrifugal pump, the Kelln Solar Fast Pump.

The Fast Pump is a continuous duty centrifugal pump that operates at 24-volts and is ideally suited for watering livestock from sand point wells, dugouts and rivers. It has been evaluated and tested by Alberta Agriculture, the Manitoba Water Services Board, Ducks Unlimited Canada and Agriculture Canada.

Battery operated at 15 feet of lift, the Fast Pump will water 180 cow/calf pairs with two 64-watt solar panels operating from two deep cycle RV/Marine batteries. With 256 watts of solar panels, 4 batteries, at 15 feet of lift, the Fast Pump will water 350 cow/calf pairs. At 15 feet of lift, the Fast Pump pumps 45 gallons a minute, at 21 feet of lift it will pump 20 gallons a minute.

The Fast Pump is a cast iron, ball bearing pump coupled to a continuous duty ball bearing, permanent magnet, DC motor mounted on a heavy duty galvanized stand.

For more information, contact Kelln Solar, Box 94, 55 James Street, Lumsden, Saskatchewan, Canada S0G 3C0, (306) 731-2224, toll-free (888) 731-8882, FAX (306) 731-2774, web site: www.kellnsolar.com.



Kelln Solar

Kelln Solar Fast Pump

U.S. Wind Update

by Christine Real de Azua

The U.S. wind energy industry turned in a year of solid growth in 2002 and is poised to deliver a near-record year in 2003. Wind turbines are now quietly lighting up more homes and offices than ever before and bringing a bright note to an energy sector battered by the worst crisis it has seen in years.

Total installed wind generating capacity expanded by nearly 10 percent during 2002 to 4685 megawatts (MW), with 410 MW of new equipment going into service. By the end of this year, wind plants across the U.S. are expected to top 6000 MW in capacity and produce 15 to 17 billion kilowatt-hours (kWh) annually—enough to power 1.5 million American households.

Less than one percent of U.S. electricity comes from wind today. However, the American Wind Energy Association (AWEA) estimates that, with steady, supportive policies including proactive regional transmission planning, wind can provide at least six percent of the nation's electricity by 2020.

Worldwide, wind reached 30,000 MW of installed capacity, generating enough to power the equivalent of 7.5 million average American households. Wind installations grew by 33 percent in 2002 in Europe, the global leader in wind energy capacity.

Hopeful Trends

U.S. wind energy installations have grown at an average 24.5 percent over the past five years. This expansion is both fueled by solid fundamentals and constrained by a variety of challenges.

The reliable and affordable cost of wind energy is one of the main factors underpinning the technology's growth. The cost of electricity from a wind plant is stable over time because its fuel—the wind—is free. This price stability allows utilities and merchant power companies to "hedge their bets" against volatility in natural gas prices by installing some predictably-priced wind—a so-called "hedge value" that one recent study finds is worth $0.005 cents per kilowatt-hour.

Also, a growing number of utilities are including wind power in their portfolio because of its attractive cost. Basin Electric Power Cooperative, a regional power cooperative that serves 124 rural electric systems in the central U.S., recently became the first rural electric coop to include wind power in its energy portfolio, largely on the basis of economics. Basin will buy power from two 40-MW wind farms, the first large wind projects to be built in the Dakotas.

The U.S. wind energy market is attracting new companies, large and small, American and international. The American Wind Association, the trade association of the industry, has seen its business membership increase dramatically over the past few years.

General Electric subsidiary GE Power Systems has entered the wind turbine manufacturing market, and now runs opera-

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tions in the U.S., Germany and Spain. GE Wind has begun testing a prototype 3.6-MW turbine, one of the largest wind turbines ever erected, designed for offshore applications.

Gamesa, a Spanish company that is one of the world's largest wind turbine manufacturers, has partnered with Navitas, of Minneapolis, to develop projects in the U.S. Gamesa is planning to open a blade and turbine manufacturing facility in the Midwest if the federal government extends a key incentive, the wind energy production tax credit.

Uncertainty Clouds Planning

Wind energy in the U.S. is hobbled by some major constraints, however. One of the most important is the absence of a stable, supportive national policy. The wind energy production tax credit (PTC), a key federal incentive, has been allowed to expire twice over the past five years, and is scheduled to expire again December 31, 2003. The PTC, a 1.5 cent-per-kilowatt-hour tax credit (adjusted for inflation) for wind-generated electricity, helps level the playing field in a sector where mature competitors like oil and natural gas enjoy long-established subsidies.

PTC expiration-and-extension cycles damage the industry, as investments come to a halt, contracts are put on hold and workers are laid off pending a decision by Congress. When the PTC expired most recently, in December, 2001, about $3 billion worth of proposed projects were stalled and hundreds of workers furloughed.

Because of manufacturing lead times, and because the industry is now larger than ever before, a failure to extend the credit by the middle of this year would result in the loss of thousands of jobs and billions in economic activity. By contrast, a multi-year extension of the PTC would provide a much-needed stable market signal. A national renewable energy goal or "renewables portfolio standard" (RPS) would also ensure long-term stability.

Also on the industry's wish list:

- More state RPS laws or regulations. At this writing, 14 states have adopted some type of RPS, with the most notable being New York, where Gov. George Pataki has pledged to boost renewable energy from a current 17 percent of electricity supply to 25 percent over the next 10 years.
- Nondiscriminatory transmission rules, to let wind plant owners access the "interstate highway" of power lines they need to get their product to market. More power lines from windy areas to centers with growing electricity demand wouldn't hurt either.
- A 30 percent investment tax credit for homeowners or small businesses buying small wind turbines.

Green Power Gathers Steam

The year just past also saw some major successes in the "green power" market, the generic name for a variety of programs that allow utility customers and consumers to buy electricity from clean energy sources at a premium price. After several years of languishing, the green market has stimulated a modest but steady pickup of wind development in the northeastern U.S.

Green power will encourage more than 75 MW of wind development in Pennsylvania alone over the next two years, as universities, residential customers and state agencies choose electricity from greener sources. Nationwide, Catholic University of America in Washington, D.C., is the academic community's leader, agreeing to buy wind power for 12 percent of its electricity needs.

On Other Fronts

Offshore wind energy took the media by storm in 2002, as newspapers and TV stations reported on highly-visible and publicized bids to develop wind farms on the East Coast. Two major projects, one off Cape Cod in Massachusetts and another off Long Island in New York, are in the works at this writing.

Small wind system purchases continued to grow steadily, despite a series of market barriers including outdated zoning laws and interconnection requirements. Incentives like the proposed small turbine investment credit mentioned above are needed to help this industry segment reach its potential.

Overall, wind continues to show enormous promise, and remains on track to take its place beside hydropower as a major source of clean electric power. ✪

Christine Real de Azua is Assistant Director of Communications and an International Policy Analyst with the American Wind Energy Association, 122 C Street NW, Washington D.C. 20001, main (202) 383-2500, direct (202) 383-2508, FAX (202) 383-2505, e-mail: christine@awea.org, web site: www.awea.org.

NEG Micon, Warren Gretz

Wind turbines of the Southwest Mesa project, in McCamey, Texas, were manufactured by NEG Micon of Denmark. There are a total of 107 units producing 74.9 megawatts at this installation.

Colorado's Wind Energy

The Colorado Public Interest Research Group (CoPIRG) recently released a new report titled *Wind Energy: Powering Economic Development for Colorado*. The report shows that wind energy can help Colorado meet a growing demand for electricity while providing significant economic development for rural parts of the state.

"Our research demonstrates wind energy is economical and good for our economy," stated co-author of the report, CoPIRG energy associate Stephanie Bonin. "If we increase our wind production at a modest rate, rural Colorado can reap over 1 billion dollars in rural economic benefits in the next 18 years."

The report looks at the benefits of meeting half of Colorado's new demand with wind energy through the next ten years and then three-quarters of new demand in the following decade. An investment in wind power of this scale would create $383 million in rural economic benefits through the year 2012 and $1.2 billion in rural economic benefits through 2020, including $230 million in additional property tax payments to rural counties over the next 18 years and $76 million in royalties paid to farmers, ranchers and landowners.

"Net income to agricultural producers continues to decline each year. The creation of wind energy sources on their property allows farmers and ranchers to diversify their income streams," said John Stencel, president of the Rocky Mountain Farmers Union. "By diversifying their sources of income, producers are better able to weather difficult conditions, both economic and environmental. The development of wind energy provides additional jobs and other forms of economic stimulus to rural communities that are otherwise struggling."

NEG Micon

The Ponnequin facility in Weld County (shown here) and the Peetz facility in Logan County currently supply all of the wind-generated electricity for Colorado.

The CoPIRG report also found wind farms increase the property tax base and create a new revenue source for education and other local government services. For example, the 162-megawatt wind farm in Lamar will increase the tax base in Prowers County by 29 percent. In Logan County a

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similar wind farm would increase the tax base by about 20 percent, Phillips 63 percent, and Sedgwick 85 percent.

Wind farms also create skilled temporary and long-term jobs. The report found that modest increases in wind production would yield 5700 new jobs through 2012 and almost 17,000 permanent and temporary jobs in rural counties through 2020.

"Wind power is a new kind of crop Colorado's farming and ranching communities can look to for income," said Bonin. "More wind energy means more jobs, more money for rural schools and a greener future for many farmers and ranchers in Colorado."

For more information, contact Environment Colorado, the new home for CoPIRG's environmental work, 1530 Blake Street, Suite 220, Denver, Colorado 80202, (303) 573-3871, FAX (303) 573-3780, e-mail: info@environmentcolorado.org, web site: www.environmentcolorado.org or www.copirg.org. The full report can be downloaded at www.environmentcolorado.org/reports/windenergy11_02.pdf.

Energy on Public Lands

The U.S. Department of the Interior's Bureau of Land Management (BLM) and the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) recently announced the availability of a new report that identifies and evaluates renewable energy resources on public lands. The report, titled "Assessing the Potential for Renewable Energy on Public Lands," will help federal land managers make decisions on prioritizing land-use activities that will increase development of renewable energy resources on public lands in the West (except Alaska). The report studied resources on BLM, Tribal and Forest Service lands.

The assessment was undertaken in response to a task developed from the President's National Energy Policy. BLM and NREL formed a partnership in June 2001 to conduct an assessment of access to renewable energy resources on BLM-managed federal lands in the western U.S.

The sources of renewable energy addressed in the report include wind, photovoltaic (PV) and concentrating solar, biomass and geothermal energy. Federal land managers will use the report's findings in land-use planning activities to prioritize land-use plans and to increase the development and use of renewable energy resources on public lands. Public land managers can use this report in tandem with the recently released Energy Policy and Conservation Act (EPCA) report that was requested by Congress.

The EPCA report assesses access to nonrenewable energy (oil and gas) on public lands. The two reports identify areas of high potential for energy and land use planners can use these two reports to locate transmission corridors where they are most needed.

The new study shows that there are some areas of overlap between renewable and nonrenewable energy resources. For example, southwest and south-central Wyoming and a portion of the Powder River Basin in Montana have high potential for wind energy development. Overlaps for concentrating solar power exist in northwest New Mexico and southwest Wyoming. Biomass energy potential exists in west-central Montana.

The BLM and NREL used Geographic Information System data to assess renewable energy resources on BLM lands in the West. The assessment identifies the BLM's planning units with the highest potential for developing renewable resources, which

include concentrating solar power, PV solar, geothermal, wind and biomass resources and technologies.

"Increasing our domestic development of renewable energy sources will help to reduce our dependency on foreign sources of energy," said Rebecca Watson, Assistant Secretary of the Interior for Land and Minerals Management. "Currently, renewable energy, including hydropower, accounts for only 9 percent of our nation's energy, but is the fastest growing segment of our energy supply. As the report demonstrates, public lands have abundant opportunities for renewable energy development."

The assessment found that 63 BLM planning units in 11 western states have high potential for power production from one or more renewable energy sources and 20 BLM planning units in seven western states have high potential for power production from three or more renewable energy sources.

Additionally, the BLM/NREL team identified high-potential geothermal energy sites during visits to BLM state offices. This study, which focused on the BLM's geothermal resources in seven western states, found that 35 sites have high potential for near-term development.

For more information, contact NREL Public Affairs, 1617 Cole Boulevard, Golden, Colorado 80401-3393, (303) 275-4090, e-mail: public_affairs@nrel.gov, web site: www.nrel.gov. The report can be downloaded at www.nrel.gov/docs/fy03osti/33530.pdf or can be obtained by writing to the Bureau of Land Management, Denver Federal Center, P.O. Box 25047, Denver, Colorado 80225-0047.

Green Building Guidelines

The Sustainable Buildings Industry Council (SBIC) recently announced the release of *Green Building Guidelines: Meeting the demand for low-energy, resource-efficient homes.* The book is the second generation of sustainable residential design guidelines created in cooperation with the National Association of Home Builders. Written in plain language with illustrations, case studies and checklists, the Guidelines is targeted for homebuilders just starting to learn about the elements of high-performance home design.

Sustainable Buildings Industry Council

Green Building Guidelines

Each of the six chapters of the *Guidelines* reviews specific design strategies as well as offers construction and marketing tips, checklists and references to many additional resources. Most importantly, the *Guidelines* encourage builders to think about these issues in an integrated and holistic way.

SBIC also offers a *Guidelines* workshop that addresses site-specific, climatic conditions and typically includes local case studies.

For more information and to order, contact the Sustainable Buildings Industry Council, 1331 H Street, N.W., Suite 1000, Washington, DC 20005, (202) 628-7400, FAX (202) 393-5043, e-mail: sbic@sbicouncil.org, web site: www.sbicouncil.org. The cost is $40 for SBIC members or $50 for non-members.

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Resources

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"ReThinking Development"

Portland, Oregon's Office of Sustainable Development's (OSD's) Green Building Division recently submitted a report, "ReThinking Development: Portland's Strategic Investment in Green Building," for adoption by the Portland City Council. The report details the programs implemented over the past 24 months that have accelerated interest and activity in Portland's emerging green building industry.

At the beginning of 2001, Portland's Green Building Program's (G/Rated's) two-year goal (based on the Green Building Initiative adopted by City Council, December 1999) was to adopt green building and site design systems in at least 600 units of housing and three million square feet of commercial and mixed-use development throughout the City.

As highlighted in the report, G/Rated has exceeded that goal. As of February 2003, forty-one commercial and mixed-use buildings, totaling 3.1 million square feet, have incorporated green building design and construction practices. Portland's Green Investment Fund and the Portland Development Commission's green affordable housing requirements add another 1314 units of efficient, durable and healthy housing to the mix. In addition, more than thirty affordable and market-rate housing projects with almost 2000 units are in financing and pre-design phase.

The 32-page report reflects a growing commitment to green building, both within the City and the surrounding metropolitan area. Portland is home to numerous Leadership in Energy and Environmental Design (LEED) registered buildings, dozens of green design and construction firms and a robust cluster of green building-related manufacturers and vendors.

The report also outlines a number of strategies to encourage green building practices, stimulate Portland's "green" economy and solidify the City's reputation as a "green" incubator. The priorities over the next five years include extending G/Rated programs, to the greater Portland-Metropolitan area.

These initiatives, coupled with ongoing technical training, community partnerships and new research on the specific costs and benefits of green development, local demand and business capacity, form the core of the G/Rated mission.

For more information, contact Stephanie Swanson, City of Portland Office of Sustainable Development Green Building Division, (503) 823-7109, e-mail: sswanson@ci.portland.or.us. "ReThinking Development: Portland's Strategic Investment in Green Building" can be downloaded at www.green-rated.org.

Green Cars & Trucks

Amidst growing public interest in fuel efficiency and increasing concern about gas-guzzling SUVs, the American Council for an Energy-Efficient Economy (ACEEE) recently released the new *ACEEE's Green Book®: The Environmental Guide to Cars & Trucks - Model Year 2003*.

The ACEEE's *Green Book®* is a buyer's guide for environmentally friendly passenger cars, trucks and SUVs. It helps consumers compare vehicles on the basis of a "Green Score," a measure that incorporates fuel consumption and air pollution, including both unhealthy tailpipe emissions and the emissions of gases that cause global warming.

Using its "Green Score" ranking system, *ACEEE's Green Book®* reveals the year's "greenest" and "meanest," the 12 least polluting and most efficient vehicles as well as the least efficient vehicles. In addition, it identifies the top-ranking models in each vehicle class.

Taylor Jones, Austin, Texas

Honda Insight

Topping the 2003 "greenest" list is Honda's hybrid gasoline-electric Insight, followed by Honda's natural gas-powered Civic GX and Toyota's electric RAV4 EV sport utility. Two mass-market-oriented hybrid gasoline-electric sedans, the Toyota Prius and Honda Civic Hybrid, are next in line among the greenest vehicles of 2003. The *Green Book* notes that gasoline-powered vehicles have been steadily improving in terms of environmental performance, a fact reflected in this year's list—ten of the twelve greenest vehicles of the year can be fueled at the gas pump.

Although the list of "meanest" vehicles is topped by a pair of sports cars, it is the remainder of the list that illustrates a problem with this year's new vehicle fleet. "From an environmental standpoint, the Ferraris and other exotics aren't a big deal, as their sales are very limited," stated co-author John DeCicco, a Senior Fellow at Environmental Defense. "Of greater concern are the massive SUVs and pickup trucks, which not only have high emissions and consume a lot of fuel, but also are sold in large numbers."

ACEEE's Green Book® identifies greener choices in a wide range of vehicle types. The "best-in-class" list includes larger vehicles, such as the more efficient versions of the Chrysler Voyager minivan, Ford F-150 pickup and Toyota Highlander SUV. Sedans like the Chevrolet Impala and Honda Accord also score well in their classes.

"America's car buying decisions have significant energy, economic and environmental impacts," noted Bill Prindle, Deputy Director of ACEEE. "If new car and light truck buyers chose the most efficient vehicles in each size class, we would slash the 2003 fleet's gasoline use by 20 percent, reducing gasoline costs by $3.7 billion and saving the average buyer $220 a year. And, of course, we would also cut greenhouse gas emissions and reduce our dependence on imported oil."

Along with its summary "Green Scores," *ACEEE's Green Book®* details each model's fuel economy, health-related pollution impacts, global warming emissions and estimated fuel expenses. Additional highlights of the new edition include: advice on how to buy green when shopping for a new car or truck; details about today's gasoline-electric hybrid vehicles and a preview of hybrids coming to the market in the near future; information on how advanced technologies are providing today's cars and trucks with improved environmental performance; and a summary of tomorrow's environmental designs, including advanced engine technologies, high-strength lightweight materials and hydrogen fuel cells.

ACEEE has also updated www.GreenerCars.com, the companion web site to *ACEEE's Green Book®*. The site contains the year's "greenest," "meanest" and "best-in-class" lists, as well as consumer information on vehicles and the environment. Subscribers can search the web site's interactive database (updated with new model releases throughout the year) and build

custom lists for comparing vehicles. Monthly and annual subscriptions to the web site are available at www.GreenerCars.com.

For more information and to order, contact ACEEE Publications, 1001 Connecticut Avenue, NW Suite 801, Washington, DC 20036-5525, (202) 429-0063, FAX (202) 429-0193, e-mail: aceee_publications@aceee.org, web site: www.aceee.org and request *ACEEE's Green Book®: The Environmental Guide to Cars & Trucks - Model Year 2003.*

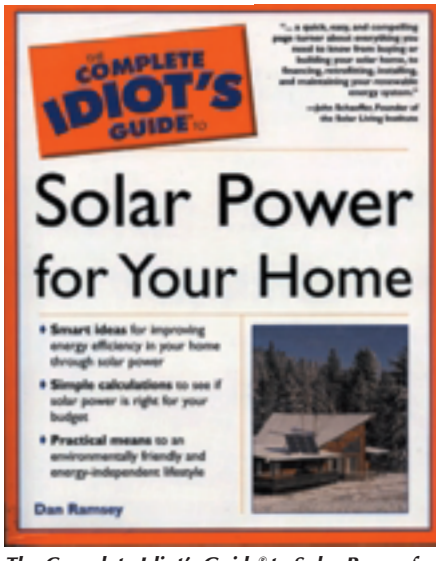
Idiot's Guide to Solar Power

Alpha Books, publisher of *The Complete Idiot's Guides®* series, recently released a new book, *The Complete Idiot's Guide® to Solar Power for Your Home.*

This practical guide shows how individuals can generate their own electricity using solar panels, and outlines the advantages and disadvantages and costs and benefits of solar power. It gives advice on financing and building a solar home, picking a professional to install a solar power system and buying or selling a solar home.

Through this *Complete Idiot's Guide®*, individuals can learn to: estimate energy needs; sell excess solar power to a local utility; design, install and maintain a solar energy system; use supplemental, portable and emergency power systems; and be more energy efficient.

For more information and to order, contact Alpha Books, Pearson Education, 201 West 103rd Street, Indianapolis, Indiana 46290, (317) 581-3500, web site: www.idiotsguides.com and request *The Complete Idiot's Guide® to Solar Power for Your Home*, ISBN 0028643933. The cost is $19.95. ✪



The Complete Idiot's Guide® to Solar Power for Your Home

OK Produce Solar System

Fresno, California, Mayor Alan Autry and other officials recently joined with OK Produce of Fresno in dedicating a large rooftop solar electric system in the California Central Valley. PowerLight Corporation designed and installed the 231-kilowatt (kW) PowerGuard® solar system mounted on the roof of OK Produce's distribution facilities.

PowerLight Corporation

This 231-kilowatt solar system sits on the roof of OK Produce, in Fresno, California.

"You couldn't ask for a better area than the Central Valley for solar power," noted Mayor Autry. "We've got plenty of sun. It's a vital key to our agricultural success. And there's no reason why we shouldn't also use it to create energy."

Integrating solar power into OK Produce's energy mix will help them lower costs, reduce pollution and conserve natural resources. The solar system covers 35,000 square feet of the roof at the company's facilities. In addition, the solar powered installation spares the environment thousands of tons of harmful emissions, such as nitrogen oxides, sulfur dioxide and carbon dioxide, which are major contributors to smog, acid rain and global warming. It is estimated that the solar-generated electricity will reduce emissions of carbon dioxide by 1800 tons over the next 25 years. These emissions reductions are equivalent to planting approximately 500,000 acres of trees, removing 365 cars from the roadways or not driving 4.5 million miles.

PowerLight's PowerGuard system was selected as the solar electric technology application for OK Produce's expansive flat roof space. PowerGuard is a patented, lightweight photovoltaic roofing assembly that delivers clean solar electricity to the building while protecting the roof from damaging effects of weather and UV radiation. Additionally, the solar panels provide added insulation benefits to the building. The PowerGuard system incorporates AstroPower Inc.'s APex solar modules, manufactured using AstroPower's proprietary high-speed, continuous-sheet Silicon-Film process.

For more information, contact PowerLight Corporation, 2954 San Pablo Avenue, Berkeley, California 94702, (510) 540-0550, FAX (510) 540-0552, web site: www.powerlight.com.

Drive to Survive

This spring, the Institute of Ecolonomics (IOE) will embark on the Drive to Survive, an ambitious cross-country journey from Los Angeles to Washington DC to demonstrate the viability and availability of hybrid and alternative-fuel vehicles and to "Drive Hydrogen Home."

With actor and ecolonomist Dennis Weaver at the helm, the drive team will travel May 1-14, 2003, through major cities across the country including: Los Angeles and San Francisco, California; Salt Lake City, Utah; Denver, Colorado; Kansas City and St. Louis, Missouri; Chicago, Illinois; Detroit, Michigan; Cleveland, Ohio; Philadelphia, Pennsylvania; and Washington DC. "Pit Stops" will be held in several cities including: Bakersfield, Fresno and Sacramento, California; Reno, Nevada; Grand Junction, Colorado; Russell, Kansas; Columbia, Missouri; and Ann Arbor, Michigan.

The drive team will emphasize energy independence and educate the public about developing a hydrogen economy. During the two-week educational and media tour, the team will demonstrate new technologies and exchange ideas with students and educators, corporations and consumers, constituents and politicians.

The drive will showcase cutting-edge vehicles, such as those powered by hydrogen, electricity, compressed natural gas, biodiesel, methanol and ethanol.

When the caravan crosses its finish line in Washington, DC, Weaver will deliver a petition with thousands of signatures to Congress demanding that lawmakers make a declaration of energy independence by increasing fuel efficiency, promoting alternative fuels and decreasing our dependence on foreign oil.

The Drive to Survive builds on the momentum of IOE's Drive for Life 2001, a 1000-mile course from Los Angeles, California, to Denver, Colorado, along segments of historic Route 66.

For more information, contact Sarah Owens, executive producer, Drive to Survive 2003, (415) 357-2929, e-mail: sarah@ecolonomics.org, web site: www.drivetosurvive.info/index.php.

Institute of Ecolonomics

Ecolonomist Dennis Weaver stands beside his Toyota Prius Hybrid.

PV Installer Certification

The North American Board of Certified Energy Practitioners (NABCEP) recently approved the prerequisites and process whereby photovoltaic (PV) installers will be able to become certified to NABCEP quality standards of practice.

The certification process requires candidates to meet prerequisites of education, experience or training—providing a variety of paths for PV installers to enter the certification process. These requirements were developed by the NABCEP PV Technical Committee and by the Board based on input from stakeholders, extensive deliberation among committee and board members, research of skill requirements for existing trades and examination of certification and licensure pathways for similar trades. Information on this background research is

available at www.irecusa.org/articles/static/1/binaries/ReferencesforRequirements.doc.

In addition, the prerequisites and certification process were subject to two public comment periods, garnering over 400 comments, which were used by subject matter experts to further refine the certification requirements. Installer prerequisites are intended to ensure that candidates for certification have the skills and experience they will need not only to pass the certification exam, but also to perform reliably and safely on the job.

"Establishing these prerequisites was a careful balancing act," said Ezra Auerbach, president of the NABCEP board of directors. "We sought a level of experience and/or training that would indicate the skill and quality of installers without unnecessarily limiting access to the certification exam. The number of different ways a candidate can meet the prerequisites reflects the Board's desire to be as inclusive as possible."

For more information, contact Wendy Parker, NABCEP Project Coordinator, (720) 344-0341, e-mail: wparker@nabcep.org. To see a full version of the certification process for PV installers, including the prerequisites for certification as well as the requirements for maintaining certification, visit http://irecusa.org/articles/static/1/1045900530_987094287.html.

Xantrex Technology Inc.

The solar electric system on this home was made possible through Xantrex' Renewable Energy Financing Program.

Xantrex Financing Program

Xantrex Technology Inc. recently completed its first financing deal in collaboration with Vermont Solar Engineering, a charter member in Xantrex' Certified Dealer network. Xantrex' Renewable Energy Financing Program made it possible for Vermont Solar Engineering's customers to purchase a solar electric system for their new rural home.

Through this program, Certified Dealers like Vermont Solar Engineering can offer customers financing, which makes a renewable system affordable for most buyers.

The Xantrex Certified Dealer Renewable Energy Financing Program is administered through Thalman Financial. Thalman was able to develop a customized payment schedule of monthly installments for Vermont Solar Engineering's customers at very competitive rates.

The application process is straightforward. When residential, municipal or commercial customers contract with a Certified Dealer for renewable energy system design and installation, they can also apply for the financing program. The dealer will initiate the application and a Thalman consultant will follow up with a suitable payment schedule within 48 hours.

For more information, contact Xantrex Technology Inc., 8999 Nelson Way, Burnaby, British Columbia, Canada V5A 4B5, (800) 670-0707 or (800) 446-6180, (604) 422-8595, FAX (604) 420-1591, web site: www.xantrex.com. To find a Xantrex Certified Dealer in your area, visit www.xantrexREdealer.com.

Retail Stores Feature PV

Four BJ's Wholesale Clubs in New York are now producing electricity, thanks to a

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partnership between the Conservation Services Group (CSG), Evergreen Solar, Inc., BJ's and the Long Island Power Authority (LIPA) solar rebate program.

The four BJ's Clubs, in Farmingdale, Islandia, Riverhead and Westbury, feature 96 Evergreen Solar photovoltaic (PV) panels at each location. CSG designed and installed the systems, which cover an area of about 1000 square feet on each store's roof. The PV solar electric panels are solid-state devices, made from silicon that convert sunlight to electricity, without fuel, noise or pollution.

Each BJ's solar power plant produces 10 kilowatts (kW) of "green" electricity for the store, helping to reduce the peak demand on LIPA, the local electric utility. All LIPA customers benefit when electrical consumption is reduced during the peak demand periods, which usually occur on hot sunny days in the summer. BJ's and its members benefit by helping to promote the development of power sources such as solar electricity that rely on clean, renewable resources like the sun. Combined, the four BJ's solar power plants on Long Island will generate between 40,000 and 50,000 kilowatt-hours (kWh) of electricity yearly, and over their lifespan will avoid production of 720 tons of carbon dioxide.

Richard M. Kessel, LIPA Chairman and CEO, joined company officials from BJ's, CSG and Evergreen Solar in a ceremony marking the installations, recently held at the Islandia store. Students from the Pines Elementary School in Hauppauge, New York, also attended, singing "You Are My Sunshine" while wearing colorful solar masks, to open the ceremonies. The Pines School has partnered with the Islandia store through BJ's Adopt-A-School program.

BJ's has installed solar panels on the roofs of its clubs in Middletown, Rhode Island; Plymouth Meeting, Pennsylvania; North Dartmouth, Massachusetts; and Deptford, New Jersey.

The Club is a participant of LIPA's Solar Pioneer Program, which encourages the use of clean solar energy among Long Island homeowners. The Program helps make PV installations more affordable.

For more information, contact Evergreen Solar, Inc., 259 Cedar Hill Street, Marlboro, Massachusetts 01752, (508) 357-2221, FAX (508) 357-2279, web site: www.evergreensolar.com or BJ's Wholesale Club, (800) BJS-CLUB, web site: www.bjs.com.

Green Pricing Program

North Carolina recently instituted a statewide utility green pricing program with the approval of the North Carolina Utilities Commission (NCUC). NC GreenPower (NCGP), a nonprofit entity of Advanced Energy (AE), will run the program.

This voluntary green pricing program brought utilities together with environmentalists, renewable energy advocates and any person interested in green pricing in North Carolina, to create additional renewable energy options for the state. Funds raised through this program will go to building more applications of solar, wind and other renewable energy.

The program, with an anticipated start date sometime this fall, will offer two products, including a mass-market and a large-volume product.

The mass-market product, $4 per block of 100 kilowatt-hours (kWh), will be available for purchase by any North Carolina electrical energy consumer. This block of new renewable energy will have a resource mix of solar, wind and methane from biomass delivering power to the North Carolina electric grid. This resource mix has higher costs of production, which will result in a higher cost product than the large volume product. The product will be accredited by the Center for Resource Solutions (CRS), which will provide assurance to the consumer that the power that is purchased is new, green and composed of these resources.

The large volume product offers a lower cost alternative for large volume consumers who purchase at least 10,000 kWh of the product per month. To assist a broader base of renewable energy providers and to allow high volume electricity purchasers to maximize their support of green power, the large volume product includes a resource mix of solar, wind, small hydro and all types of biomass, with certain limitations. Both existing and new renewable energy generation will be included in this product in order to reach a target price of $2.50 per block of 100 kWh and to assist existing green power producers who have experienced significant reductions in their "avoided cost" payments from the utilities. NCGP will seek certification for the large volume product from Environmental Resources Trust (ERT) to ensure consumer confidence in the product's green status. A large volume customer would have to agree to a one-year contract minimum to qualify to purchase the large volume product.

For more information, contact Advanced Energy, 909 Capability Drive, Suite 2100, Raleigh, North Carolina 27606, (919) 857-9000, FAX (919) 832-2696, e-mail: moreinfo@advancedenergy.org, web site: www.advancedenergy.org/greenpower.

Carson City Partnership

Nevada's Capital, Carson City, is seeking to convert its access to world-class renewable resources into an economic development engine for the region. The City hopes that participants in the renewable energy industry will respond to the City's request for qualifications (RFQ) as a first step in creating a partnership to develop renewable energy projects.

"The City wants to see what private renewable energy developers can offer," said Andy Burnham, City Manager of Carson City. "By serving as a purchaser of renewable energy, the City and its potential partners want to encourage development of renewable energy in this region."

Potential partners in the projects include the Carson-Tahoe Hospital, State of Nevada, Western Nevada Community College Churchill County, Washoe County and Washoe Regional Transportation Commission and Carson City School District. The total energy load could be as high as 12 megawatts (MW).

The City is asking developers to respond with their qualifications and their proposed approach to configuring projects. The City intends to enter development contracts with the selected responders that protect their rights to develop the projects they configure.

Some of the projects mentioned as possible candidate projects in the RFQ include: purchase of renewable energy power by the City's water and sewer utilities; pooled purchase programs of renewable energy generated power by public agencies in the region; development of hydro power from the water transmission pipeline conveying water from the City's water supply at Marlette Lake; development of power generation capacity at the City's landfill; development of conservation and demand reduction programs; and work with the School District on creating an alternative energy demonstration project as part of the construction of a new school.

The RFQ encourages responders to put together multi-disciplinary teams to explore diverse generation sources. The City anticipates selection of one or more developers based on qualifications and the suggested approach to project configuration. After selection, developers will negotiate a disposition contract with the City that would give the developer an exclusive right to configure the proposed project and protect investments by the developer as propri-

etary. Execution of the contracts with selected developers is anticipated to occur in June 2003.

For more information, contact Tom Hoffert, Carson City Utility Operations Manager, City of Carson City, Nevada 89701, (775) 887-2355, ext. 1003.

Rosebud Wind Turbine Installed

The first utility-scale Native American 750-kilowatt (kW) NEG Micon wind turbine was recently installed on the Rosebud Sioux Indian Reservation in South Dakota. Its installation marks the end of an eight-year preparation that begun in 1995 when the Rosebud Tribe, the Tribal Utility Commission and the Rosebud Casino began measuring the wind resources. The resource proved to be a Class 5/Class 6 resource. Class 5 wind speeds are 16.8 to 17.9 mph at 50 meters (m). Class 6 wind speeds are 17.9 to 19.7 mph at 50 m. The average wind speed at the site is estimated to be 17.9 mph at 155 feet (47 m) above ground.

In 1998, the Tribe applied to the U.S. Department of Energy (DOE) for a cooperative grant to build a commercial utility turbine. Part of the Tribe's success in obtaining the grant can be attributed to having 18 months of wind data. Working closely with the Intertribal Council On Utility Policy (ICOUP) and Distributed Generation, Inc., the Rosebud Tribe negotiated the first U.S. Department of Agriculture (USDA) Rural Utilities Service loan to a tribe for a commercial wind energy project.

Bob Gough, Intertribal Council on Utility Policy

Crews install this 750-kilowatt NEG Micon wind turbine on the Rosebud Sioux Indian Reservation in South Dakota.

Electricity generated by the turbine will help provide power to the Rosebud Casino and motel. The turbine is expected to supply an annual average of 80 percent of the electrical needs of the casino/motel. Realizing that the turbine will at times generate more energy than can be used by the casino/motel, the Tribe is anticipating a sale of the excess clean renewable energy that it generates to Basin Electric for local use, with a multi-year sale of "green power" to Ellsworth Air Force Base, near Rapid City, South Dakota, to be delivered through a cooperative effort with Basin, Nebraska Public Power and the Western Area Power Administration.

The Tribe has also negotiated the first tribal sale of the bulk of the "green tags" generated by this turbine to NativeEnergy of Vermont, which has marketed the tags to thousands of individual green power supporters, including Ben & Jerry's Ice Cream, the Dave Mathews Band, the Natural Resources Defense Council for their Rolling

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Stones' climate change awareness benefit concert and other parties interested in the development of renewable energy on Indian lands.

The Rosebud turbine installation is the first phase of a long-term plan for multi-megawatt wind development on Indian reservations across the Great Plains. This 190-foot 750-kW NEG Micon turbine can produce enough electricity to serve about 300 to 350 houses and is expected to produce more than two million kilowatt-hours (kWh) per year. One kWh is the amount of power needed to light ten 100-watt light bulbs for one hour.

The two-dozen reservations in the northern Great Plains have a combined wind power potential that exceeds 300 gigawatts (the capacity to generate 300,000,000,000 watts at full wind).

For more information, contact NativeEnergy, LLC, P.O. Box 22, North Ferrisburgh, Vermont 05473, (800) 924-6826, e-mail: info@nativeenergy.com or Tony Rogers, Rosebud Tribal Utility Commission, (605) 747-4097.

Sustainable Resources 2003

Sustainable Resources 2003—An International Forum Connecting People with Practical Sustainable Solutions to World Poverty will be held October 1-4, 2003, in Boulder, Colorado.

Co-organized by the University of Colorado at Boulder's School of Engineering, Service Learning Program and Environmental Center, the Sustainable Village and the Marpa Center for Business and Economics at Naropa University, Sustainable Resources 2003 will provide a new platform of exchange where poverty issues faced by the developing world can be addressed globally and solved locally.

Sustainable Resources 2003 will provide unique opportunities for nonprofit organizations, NGOs, donors, funding agencies, humanitarian organizations, educators, engineers, business people, volunteers and representatives of developing communities to meet, learn from each other, network, discuss new approaches for outreach and create new partnerships. The forum will provide a "meeting of the mind" and a platform for multidisciplinary exchange. It will also help develop recommendations toward a cooperative action plan in areas of concern to the developing world.

The conference will consist of a combination of keynote lectures, technical and non-technical presentations, case studies, cooperative problem solving, workshops and short courses on the major issues facing developing communities. These issues include: water, sanitation, infrastructure, energy, shelter, health and hygiene, economic development, security, strategy, whole systems design, food and nutrition, social and cultural concerns, communications and the environment.

Workshops and short courses will focus on generating cooperative partnerships that can more effectively accomplish each organization's goals. Exhibition space will be available for participants to showcase their projects, services or products. One of the goals of the forum is to establish a collaborative marketplace where participants can match their skills and needs to work more effectively for sustainable development.

For more information, contact Bernard Amadei, University of Colorado, Department of Civil Engineering, 428 UCB, Boulder, Colorado 80309-0428, (303) 492-7734, FAX (303) 492-7317, e-mail: amadei@spot.colorado.edu, web site: www.edc-cu.org/SR2003.htm.

"F-Cell" Tests in Japan

A Japanese testing facility for fuel cell vehicles was recently opened at a ceremony in Tokyo, Japan. The facility is made possible through the "Japan Hydrogen & Fuel Cell Demonstration Project" (JHFC). The project, subsidized by the Japanese government and co-initiated by DaimlerChrysler, involves five automotive manufactures and companies from the energy supply sector that have joined forces to test fuel cell vehicles along with the necessary fuel infrastructure under everyday operating conditions.

DaimlerChrysler will be involved in the test program with its Mercedes-Benz "F-Cell" A-Class, which was first presented in October 2002. The necessary road operation approval for this car has already been granted by the Japanese Ministry for Land Infrastructure and Transport.

The JHFC facilities provide excellent conditions for the tests, because they include both workshops and an information center. Five hydrogen filling stations have already been established in the greater Tokyo area.

Dr. Andreas Truckenbrodt, responsible for alternative powertrains at DaimlerChrysler, said, "The Japanese demonstration project represents a significant milestone along the road towards market maturity for fuel cell vehicles and towards the use of hydrogen as an energy medium for the future. We welcome this initiative of the Japanese government, since we are convinced that this future-oriented technology can only be effectively promoted through close cooperation between the automotive manufacturers and the energy supply sector."

For more information, contact the DaimlerChrysler Corporation, Auburn Hills, Michigan 48326-2766, (248) 576-5741, FAX (248) 576-4742, web site: www.daimlerchrysler.com.

Vallejo Solar Systems

The City of Vallejo recently dedicated its latest renewable energy project, solar electric generation systems on the rooftops of Vallejo City Hall and the John F. Kennedy (JFK) Public Library.

PowerLight Corporation designed and installed Vallejo's newest solar systems. The solar arrays use sunlight to produce electricity, and during the daytime generate enough energy to power over 330 homes. In addition, in the lobby of City Hall, there is a solar system information kiosk that allows visitors to see real-time system performance as well as learn about the benefits of solar energy and other information related to the operation of the panels.

The solar system at Vallejo City Hall is a 108-kilowatt (kW) installation, and the solar system installed at the JFK Public Library is 224 kW. In August 2002, a 31-kW solar array was installed at Vallejo's police station.

"The installation of photovoltaic (PV) systems is a key step in our drive to reduce energy costs and consumption, while achieving greater self-sufficiency and sustainability," said Vallejo Mayor Anthony Intintoli, Jr. "We're delighted to be doing our part to enhance the environmental quality of the region and confront challenging budget issues."

The City also has plans for a solar array in the northeast quadrant of the City, where the system will be used to power water pumping stations located in the area. The installation consists of PowerLight's PowerGuard lightweight PV roofing assembly that generates clean solar electricity, while protecting the roof from the damaging effects of weather and UV radiation. Additionally, the solar panels deliver thermal insulation benefits that reduce heating and air conditioning costs. In furnishing

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Vallejo's solar electric systems, PowerLight incorporated highly efficient solar cells from Sanyo. These on-site generation systems not only meet 20 percent of the facilities energy needs, but they will spare the environment from thousands of tons of harmful emissions such as CO_2, NO_x and SO_x, which are major contributors to smog, acid rain and global warming.

Any excess power that's generated will be sent back to the grid, especially on sunny summer days during times of peak demand.

In addition to providing the solar electric system, PowerLight is partnering with Viron to provide an energy management system and solar load controller at both City Hall and the Library. These energy conservation measures will lower the facilities operation and energy costs by 33 percent while providing a comfortable environment for both the staff and the general public. It is estimated that over the 25-year operating life of the system, the City of Vallejo will save $4.4 million in combined energy reduction costs.

PowerLight Corporation

The Honorable Anthony Intintoli, Vallejo Mayor, Dan Shugar, President of PowerLight Corporation, Gary Cloutier, Vallejo Vice-Mayor, Joe Bates, Assistant Maintenance Superintendent and Council Member Joanne Schivley join in dedicating the photovoltaic systems on the rooftops of Vallejo City Hall and the John F. Kennedy Library in Vallejo, California.

For more information, contact the City of Vallejo, 555 Santa Clara Street, Vallejo, California 94590, web site: www.ci.vallejo.ca.us or PowerLight Corporation, 2954 San Pablo Avenue, Berkeley, California 94702, (510) 540-0550, FAX (510) 540-0552, web site: www.powerlight.com.

Iowa Wind Farm

The American Wind Energy Association (AWEA) recently praised MidAmerican Energy, a utility in Iowa, for its announcement to build a 310-megawatt (MW) wind facility in the state. The project would become the world's largest land-based wind plant, if completed before a proposed expansion of the 300-MW Stateline facility currently in operation in the Pacific Northwest.

The new wind farm will consist of 180 to 200 turbines, with a rated generating capacity of 1.5 to 1.65 MW each. Each turbine is about 400 feet tall, and generates enough electricity to power 400 to 500 average American households. The location of the project has not yet been decided. The wind farm is part of a plan to add a total of 1640 MW to MidAmerican's generation capability including a 540-MW natural gas plant and a 790-MW coal plant, and freeze elec-

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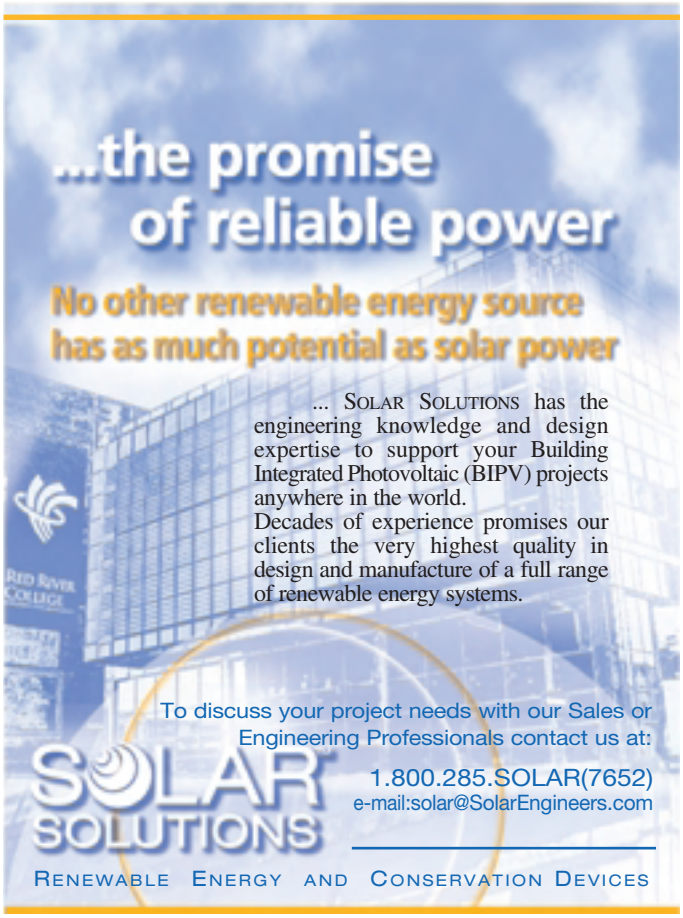

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tricity rates until 2010. To generate the same amount of electricity as the wind plant using coal would require a train of coal cars 34 miles long each year.

Iowa has a vast wind energy potential, nine times larger than that of California, the state with the most wind power installed to date (1700 MW), and five times that of Germany, the world leader in installed wind power capacity (Germany now has 12,000 MW of wind power generation, and the country's wind industry employs 45,000 people). Currently, Iowa hosts 423 MW of wind power generating capacity, the third largest amount of installed capacity in the U.S. after California and Texas.

Iowa gets 85 percent of its power from coal, 9 percent from nuclear and the rest from other sources. The cost of generating electricity from the wind has decreased to a level where, in states with a large potential like Iowa, it is in a competitive range with power from other new sources. That cost is also stable throughout the life of the project. The wind power in MidAmerican's mix should therefore help the utility keep its electricity rates down as pledged.

The total installed capacity of wind energy in the U.S. at the end of 2002 was more than 4600 MW, or enough to serve more than 1.2 million households. AWEA estimates that wind energy can provide 6 percent of the nation's electricity by 2020.

For more information, contact the American Wind Energy Association, 122 C Street, NW, Suite 380, Washington, DC 20001, (202) 383-2500, FAX (202) 383-2505, e-mail: windmail@awea.org, web site: www.awea.org.

New York Standby Rates

The New York State Public Service Commission is developing new standby rates for customers using distributed generation (DG). The standby rates apply only to delivery service and do not affect commodity charges.

Despite strong concerns expressed by environmental groups and the small DG industry, the Commission decided that standby rates should apply to non-demand-metered (residential and small commercial) customers. In practice, this means that when these customers install DG units, they will pay an increased monthly customer charge, and a lower kilowatt-hour charge. A customer whose DG unit satisfies a large percentage of his/her own power needs will pay more under the standby rate than it would under the standard rate. Some customers whose DG units serve only a small portion of the electric load may pay less under the standby rate.

In New York, residential solar installations of less than 10 kilowatts are statutorily exempt from standby rates, but commercial customers are not statutorily exempt. The Commission has shown a willingness to create limited exemptions for customers using renewable sources including solar, wind, biogas and fuel cells. These exemptions are being negotiated on a utility-by-utility basis. The Commission has also been willing to accept exemptions for units that serve less than 15 percent of the customer's peak load.

For more information contact Mike Rieder, New York Public Service Commission, (518) 474-6149, web site: www.dps.state.ny.us.

Solar Cell Efficiency

BP Solar recently announced it has achieved a solar cell efficiency of 18.3 percent for a 125-milimeter (mm) size cell. The Fraunhofer Institut Solare Energiesysteme in Germany verified the cell efficiency.

The 18.3 percent efficiency represents an 11 percent improvement over the 16.5 percent efficiency currently available with BP's Saturn solar cells. Researchers at BP Solar's Technology Center in Sunbury, United Kingdom, developed the 18.3 percent efficiency cell.

Improved efficiency remains the underlying foundation for future BP Solar production of premium solar cells. This new technology will form the basis for the new BP Solar Tres Cantos manufacturing facility in Madrid, Spain, as well as underpinning efficiency improvements at the existing Alcobendas facility near Madrid.

For more information, contact BP Solar, 989 Corporate Boulevard, Linthicum, Maryland 21090, (410) 981-0240, FAX (410) 981-0278, web site: www.bpsolar.com.

EPA Honors Coating Technology

U.S. Environmental Protection Agency (EPA) administrator Christie Whitman recently honored DuPont and DaimlerChrysler with the EPA Clean Air Excellence Award for the development and introduction of DuPont "SuperSolids" ultra-low emissions coatings technology at a ceremony in Washington DC. The new technology was first used at the

DaimlerChrysler assembly plant in Newark, Delaware.

The clearcoat technology lowers paint line volatile organic compound (VOC) emissions by 29 percent and hazardous air pollutants by 84 percent. It also increases the scratch and mar resistance of the vehicle finish by more than 60 percent.

Ed Donnelly, group vice-president of DuPont Coatings & Color Technologies, accepted the award on behalf of his team. "The success of SuperSolids™ is the result of close cooperation between DuPont coatings experts and DaimlerChrysler's engineers to ensure this technology delivers excellent results in actual production," he said.

"SuperSolids" was launched in the spring of 2002 and immediately lowered VOC emissions on the clearcoat production line by more than one quarter, in addition to eliminating more than 80 percent of the Hazardous Air Pollutant emissions from the complete topcoat process. The technology also reduced odors from the painting process by 50 percent.

For more information, contact DuPont Corporate Information Center, Chestnut Run Plaza 705/GS38, Wilmington, Delaware 19880-0705, (800) 441-7515, (302) 774-1000, e-mail: info@dupont.com, web site: www.dupont.com.

Solar Energy Rights

The Arizona Court of Appeals recently issued a published opinion in a case that will lead to greater use of solar energy in Arizona. In Garden Lakes Community Association v. Madigan/Speak, the homeowners association (HOA) was seeking to force the homeowners to take down solar panels installed on their roof. The Appeals Court found that the HOA's deed restriction and architectural guidelines, combined with the HOA's conduct, violated the public policy of Arizona as expressed in Arizona Revised Statute Section 33-439.

Garden Lakes Community Association is a 2000-home community located in Avondale, Arizona. Madigans and Speaks, retirees living in the community, installed solar swimming pool heaters for environmental and economic reasons. The homeowners wanted to use Arizona's abundant sunshine to heat their swimming pools so they could exercise without pain in winter months.

The HOA filed a lawsuit against the two, seeking an injunction requiring removal of the solar panels and approximately $100,000 in fines. Relying on the deed restriction and Architectural Review Guidelines, the HOA argued that the homeowners should have built a patio or screen to hide the solar panels. Madigans and Speaks argued that both options are prohibitively expensive and significantly reduce the efficiency of the systems. Madigans and Speaks won in the trial court but the HOA continued its litigation and appealed.

The Appeals Court upheld the lower court's decision in favor of the homeowners. The opinion can be reviewed at www.cofad1.state.az.us/opinionfiles/cvidx.htm.

Many HOAs place restrictions on the installation of solar devices that add significantly to their cost or prevent them from receiving sunlight, which would render them useless. This practice is a significant barrier to widespread use of solar energy by Arizona homeowners.

"Hopefully, this ruling will end attempts by HOAs to prevent Arizonans from using solar energy," said Kent Pulido, President of the Arizona Solar Energy Industries Association (AriSEIA). "With incentives such as the Arizona residential tax credit, the new utility rebate programs and the pending federal tax credit, Arizonans can now take advantage of the sun to reduce their monthly utility bills and allow our state to take advantage of the economic development and air quality benefits that solar can provide."

According to information provided by Arizona utilities, in the Phoenix area, the installation of a solar domestic water heating system will annually displace 2600 pounds of pollutants, when replacing an electric water heater and 1200 pounds when replacing a natural gas water heater. Swimming pool heating systems can prevent the emissions of 10,000 pounds of carbon dioxide and other pollutants annually when replacing natural gas for pool heating. Money saved by Arizona consumers remains in the local economy, benefiting Arizona cities and towns.

The Arizona Solar Energy Industries Association has been conducting an outreach program to HOAs, promoting standards for the aesthetic installation of solar energy devices. The program, funded by the U.S. Department of Energy through a grant to the Arizona Department of Commerce Energy Office, has resulted in presentations to many homeowner associations and management companies throughout the state. The goal of the program is to demonstrate the increased property values of energy savings and the benefits of solar energy to the state of Arizona.

For more information, contact Michael Neary, Executive Director, Arizona Solar Energy Industries Association, (623) 587-8180, web site: www.azsolarindustry.org.

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Regulatory Watch

Environmental Advocates of New York (EANY) recently launched a new program, the Regulatory Watch Project, designed to increase the environmental movement's scrutiny of key state agencies.

The program will begin by concentrating on three areas—agency budgets, field staff and enforcement. EANY's new program will work to develop a clearer picture of how environmental programs are being staffed, what essential services are being outsourced and whether or not the purposes set out in specific legislation are being carried out.

For more information, contact Karen De Vito, Director of the Regulatory Watch Project, Environmental Advocates of New York, 353 Hamilton Street, Albany, New York 12210, (518) 462-5526, ext. 235, FAX (518) 427-0381, e-mail: kdevito@eany.org, web site: www.eany.org.

Wildlife Refuge Goes Solar

The Imperial National Wildlife Refuge, located north of Yuma, Arizona, along the Colorado River, recently unveiled a new 10-kilowatt (kW) solar installation on the roof of its visitors' center. American Solar Electric, Inc. designed and installed the system, which incorporates 64 Kyocera Solar, Inc. KC-158G solar modules. The rooftop solar array will offset a high percentage of the grid-supplied power used by the visitors' center and office complex, saving taxpayer money.

The Imperial National Wildlife Refuge plans to help educate the public about the benefits of solar energy. This new solar array will become the focus of an educational tool to teach visitors how photovoltaic modules convert the sun's rays into clean, renewable energy. The Imperial National Wildlife Refuge visitors' center receives over 6000 visitors per year, and over 2600 children and adults participate in educational tours on the Refuge's 26,768 acres.

For more information, contact American Solar Electric, Inc., 5056 South 40th Street, Suite C, Phoenix, Arizona 85040, (602)431-0016, FAX (602) 431-0026, e-mail: info@americanpv.com, web site: www.americanpv.com or Kyocera Solar, Inc., 7812 East Acoma, Scottsdale, Arizona 85260, (800) 223-9580, (480) 948-8003, FAX (480) 483-6431, web site: www.kyocerasolar.com.

Future Canadian Wind Farm

Clean Energy, Inc., a development stage company, recently secured a 2.5-mile ridge in Pincher Creek, Alberta, Canada, to build a 10-50 megawatt (MW) wind farm under long-term option and lease agreements.

The Canadian site was selected for its exceptional annual wind capacity and existing multi-year comprehensive hourly wind data. The company is evaluating 750 kilowatt to 2 MW Proven gearless wind turbine designs from European suppliers, and is proceeding with the required wind farm permitting process.

The majority of the clean electricity generated from the proposed wind farm will be sold to the Alberta Power Pool independent spot market on an hourly basis. Average historic pricing for the past 30 days from the Alberta Power Pool is US$0.07 per kilowatt-hour. A portion of power sales will be made available under long-term power purchase agreements with industrial and commercial customers within the region.

Additional corporate benefits for the project include: Canada's commitment to the Kyoto International Accord; a federal Canadian wind power production incentive for additional revenues; and the developing marketplace for verifiable emission credits.

Clean Energy is currently examining several potential funding sources to ensure that the best competitive long-term financing arrangements are attained for this specific project.

For more information, contact Clean Energy, Inc., 4520 30 Avenue, Edmonton, Alberta, Canada T6L 5G7, 001-780-463-5484, web site: www.cleanenergyforlife.com.

ICP & Global Solar Sign Pact

ICP Global Technologies, manufacturer of solar products for consumers, recently signed an exclusive licensing agreement with Global Solar, developer of next-generation flexible copper indium gallium diselenide (CIGS) solar cells. The licensing agreement includes international rights for the exclusive use of Global Solar's technology for varied solar products.

The companies previously worked together to produce the BatterySAVER FLEX™, designed to charge 12-volt batteries for markets including marine and boating.

Through the deal, ICP Global Technologies has the exclusive right to fully commercialize Global Solar Energy's advanced CIGS solar technologies in jointly developed products. The company anticipates using Global Solar's thin-film solar cells in a variety of innovative applications, encouraging the widespread use of solar power solutions.

For more information, contact Charles Gelinas, ICP Global Technologies, 6995 Jeanne-Mance, Montreal, Quebec, Canada H3N 1W5, (514) 270-5770, ext. 117, FAX (514) 270-3677, e-mail: cgelinas@icpglobal.com, web site: www.icpglobal.com or Global Solar Energy, 5575 S. Houghton Road, Tucson, Arizona 85747, (520) 884-3625, web site: www.globalsolar.com.

PV in Connecticut

The Connecticut Clean Energy Fund (CCEF) recently announced the selection of its Photovoltaic (PV) Program Request for Proposal (RFP) finalists. The CCEF received initial interest from 19 proposals comprising 24 projects under its Solar PV Program. These projects represented total investments of $3.6 million and requested $2.3 million in funding support. Eleven of the 19 proposals were selected for participation in the program.

The finalists include the Town of Fairfield, Vestar, City of Stamford, Granby Education Foundation and Select Energy Services. The new solar electric projects will result in additional solar PV capacity of approximately 100 kilowatts.

Five of the projects are in towns listed as electric transmission constrained areas. These projects will also demonstrate how renewable energy can assist in relieving electrical load congestion in critical areas of the state and provide back up power. The completion of all projects is expected by the end of this year.

The Connecticut Clean Energy Fund also selected projects that provide high value, support a highly visible application, reduce barriers to installation, demonstrate innovative approaches to design, application or financing and promote solar PV as a clean, practical and environmentally friendly technology. The projects demonstrate effective distributed power generation and a capability to reduce the power grid load during the high peak summer months in Connecticut.

The Connecticut Clean Energy Fund, administered by Connecticut Innovations, invests in enterprises and other initiatives that promote and develop sustainable markets for energy from renewables and fuel cells that will benefit the ratepayers of Connecticut.

For more information, Contact Lisa Varvelli, Connecticut Clean Energy Fund, (860) 563-0015 or visit www.ctcleanenergy.com. ✪

Letters to the Editor

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asthma and newborn developmental problems. I hope the "Breathe Easier" campaign becomes a continuous series of successes.

I direct our company's renewable energy practice, and have consulted on air pollution control issues for electric utilities since 1989. I have a few thoughts I'd like to share with SOLAR TODAY readers related to Nicklas' discussion:

First, with the current control of transmission in the hands of Independent System Operators (ISOs) who remain loyal to big utilities, some old coal units with heat rates in the range of 12,000 Btu per kilowatt-hour (kWh) are being preferably dispatched over very efficient and clean natural gas-fired combined cycle combustion turbines with heat rates in the range of 7000 Btu/kWh. Until and unless the current transmission system is altered by the Federal Energy Regulatory Commission (FERC), our nation's citizens will continue to suffer from the disconnected interests between the parties consuming energy, those generating energy and those delivering energy.

Second, there are at least 1400 fossil-fueled power units across the U.S. that are more than 30 years old. These are the culprits operating in excess of 10,000 Btu/kWh. For an example, in January, a large independent power producer announced its decision to keep a 56-year old 350 megawatt (MW) plant online and just add more pollution control to the back to meet air pollution control requirements. That is insane—there must be a stronger tie between pollution control and energy efficiency.

Third, if one 300 MW plant is replaced with a wind farm, the wind farm needs to be more than 600 MW, must have a storage scheme (such as pumped storage, for example) and will require about 25,000 acres of open space. While I am in favor of renewable energy solutions as part of our generating mix, I believe it is highly unlikely that the general public will continue to support and favor expansive installation of such wind farms and other low-density generating alternatives across the landscape over more centralized, high-density alternatives such as coal, gas or nuclear. Bear in mind that the Energy Information Administration is predicting we'll need more than 1000 units 300 MW in size over the next 20 years.

As a nation, it will take leadership on many fronts to address our energy equation, both on the demand side (efficiency) and the supply side (generation AND transmission). But I believe the "Breather Easier" message will have a much greater impact in the near term if it can be applied in the local communities where the 1400 old fossil units currently operate. And I suggest that it must include the message of energy efficiency.

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FAX (303) 788-9725
e-mail: edward.settle@e3co.com
web site: www.e3co.com

Support Solar In Ukraine

Editor:

The Ukrainian Section of the International Solar Energy Society needs support from SOLAR TODAY readers who may have back issues that they would be willing to send to Ukraine.

There is a bill pending in the national legislature of Ukraine that will prohibit

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Letters to the Editor

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"associations of citizens" such as the Section to publish their materials. This means that the Section will not be permitted to continue to publish its solar newsletter—a very troubling development. However, publications produced by "professional publishers" may continue to be printed and circulated.

Not to be dismayed, Dr. Viktor P. Vasylyev, the Chairman of the Ukraine Section since its founding in 1998, has an idea to keep information on solar energy and other renewables flowing in his country. He would like to receive back issues of periodicals and journals on these subjects to distribute to Ukrainian schools and universities. Because these publications are "professionally" published, they may legally circulate in Ukraine.

I ask that readers consider mailing back issues of SOLAR TODAY and other such publications to Dr. Vasylyev in Ukraine and he will give, not sell, those publications to interested institutions in Ukraine. Unfortunately, the Section will not be able to pay for the publications nor for the cost of mailing the publications to him. I hope generous contributors will consider their publications and the mailing costs as donations for the sharing of valuable knowledge to an information-deprived nation. Please send the publications to:

Dr. Viktor P. Vasylyev
PO BOX 30
Kharkiv 61052
Ukraine

There many well-educated and highly motivated persons in Ukraine—the nation of the Chernobyl disaster—who want to use Ukraine's abundant supply of clean energy sources to make their nation a healthier place in which to live. I hope that by sponsoring the Section with its 30 members in ISES I can help in achieving this admirable goal. Please help our Section help their nation have a better future by contributing some of your solar publications.

Thank you.

George Finley
151 Tremont Street, 12P
Boston Massachusetts 02111
e-mail: georgefinley@prodigy.net

Efficiency First

Editor:

I appreciated Blair Swezey's thoughtful and eloquent response to my letter in the March/April 2003 issue of SOLAR TODAY ("Back to Basics"). His restatement of the fact we should all use less first helps clarify the steps people should take, rather than just buying green power to make themselves feel good. ASES should always try to use these issues to present all the actions a concerned person should take in the proper order, so they don't just skip to some part and miss the big picture.

As for transportation, this is a good time to restate the obvious on that issue as well. Honda has been 5 years ahead of most car makers since 1975, when they made the CVCC the cleanest auto. The CVCC got great mileage compared to the cars with catalytic converters, which got poor mileage. Other auto companies insisted that what they were doing was impossible. Honda has maintained its lead, and now make SULEV vehicles and hybrids.

If these issues are clearly stated each in every issue of SOLAR TODAY, they will become standard thinking for all ASES members. In fact, if we organized a huge purchase of green power at the same time by using all members, the utilities would get a very clear and loud order to make the requested renewable power faster that they are now doing.

Jim Stack
e-mail: jstack@cricketcommunications.com

Simple Solar

Editor:

Regarding Alfred Eggen's letter in the March/April 2003 issue of SOLAR TODAY ("Trickle Down Solar"), the second paragraph describes eloquently, almost as compactly as a poem, the benefits of Harry Thomason's trickle down collectors and other simple, workable solar ideas. On the other hand, the last sentence, "However, unless something new happens, this very significant potential is going to be ignored and forgotten, just as before," distresses me.

At Habitat for Humanity of the Gila Valley we have been working for some years at building simple, inexpensive solar-heated and nocturnally-cooled homes. We have found that to have a 100 percent solar-heated house requires several things, including lots of thermal mass, a very energy-efficient building envelope, large solar collectors, a pump to transfer heated water, a thermostat to control the pump, a three-way valve to direct water flow seasonally, large hot water storage, south-facing windows and owners willing to learn how to operate the system.

We like to think of our efforts as collaborative rather than competitive, and hope that we can work with like-minded individuals to make these simple, great ideas achieve recognition and acceptance. Eggen asks, "How can the use of this technology be advanced?" By all of us working together.

Donald A. Wright
243 West Saddle Drive
Safford, Arizona 85546
(928) 428-1025

New Awards

Editor:

The light at the end of our tunnel? Almost simultaneously, I received the January/February issue of SOLAR TODAY and a circular from the Executive Director. The former listed the past Awards categories, the latter contained eleven new ones. Bravo! Congratulations! A great advancement over "Fellows."

For review, the new awards are Government Leadership; Public Service; Business Leadership; Media; Educator; Developer; Designer; Chapter Recognition; Non-government Recognition; Philanthropic Leadership; and Woman in Solar Energy. This group fills the gap between current technical and minor bureaucratic service or accomplishment and our historic appeal to the public.

At last there is recognition that even non-members may contribute greatly to solar use and to our society. There is now a greater responsibility for the Awards Committee to select broadly. This should recognize individuals or groups, not "personalities" within other organizations. Perhaps they won't have the time to become members or even have known about us. A write-up about them in SOLAR TODAY will draw new interest and almost assuredly a larger readership.

Were it not for the necessarily large number, I would recommend that each recipient of the new awards should automatically become an ex-officio member of the ASES Board for a one-year period. They should be invited to submit views to the Board as well as make a presentation to the annual meeting. The former may permit candid criticism of the Society, the latter should be a tremendous drawing card for public attendance and membership.

Many thanks to those who formulated this new Awards schedule.

Harold R. Hay
ASES Pioneer and Member
e-mail: HaroldRHay@aol.com

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- Air Wind 24 and 48V, $350 Each

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Calendar

May 2003

1, Milwaukee, Wisconsin
Using RETScreen. Contact the Midwest Renewable Energy Association, 7558 Deer Road, Custer, Wisconsin 54423, (715) 592-6595, e-mail: info@the-mrea.org, web site: www.the-mrea.org.

The Midwest Renewable Energy Association offers a wide variety of renewable energy courses and workshops. For a complete schedule, call (715) 592-6595 or go to www.the-mrea.org.

1-3, Raleigh, North Carolina
Solar Hot Water Heating Workshop. Contact the North Carolina Solar Center, Campus Box 7401, North Carolina State University, Raleigh, North Carolina 27695-7401, (919) 515-3480, e-mail: ncsun@ncsu.edu, web site: www.ncsc.ncsu.edu.

The North Carolina Solar Center offers a wide variety of renewable energy courses and workshops. For a complete schedule, call (919) 515-3480 or go to www.ncsc.ncsu.edu.

2, Santa Monica, California
Solar Installer Training. Contact the Solar Living Institute, P.O. Box 836, Hopland, California 95449, (707) 744-2017, e-mail: sli@solarliving.org, web site: www.solarliving.org.

The Solar Living Institute offers a wide variety of renewable energy courses and workshops. For a complete schedule, call (707) 744-2017 or go to www.solarliving.org.

5-10, Oaxaca, Mexico
PV Design & Installation for Rural and Remote Applications. Contact SoL Energy, P.O. Box 217, Carbondale, Colorado 81623, (720) 489-3798, e-mail: info@solenergy.org, web site: www.solenergy.org.

5-16, Carbondale, Colorado
PV Design & Installation. Contact Solar Energy International, P.O. Box 715, Carbondale, Colorado 81623, (970) 963-8855, FAX (970) 963-8866, e-mail: sei@solarenergy.org, web site: www.solarenergy.org.

Solar Energy International offers a wide variety of renewable energy courses and workshops. For a complete schedule, call (970) 963-8855 or go to www.solarenergy.org.

10-14, Trenton, New Jersey, Philadelphia, Pennsylvania, Washington, DC
2003 Tour de Sol. Contact the Northeast Sustainable Energy Association, 50 Miles Street, Suite 3, Greenfield, Massachusetts 01301-3212, (413) 774-6051, FAX (413) 774-6053, e-mail: nesea@nesea.org, web site: www.nesea.org.

12-16, Oaxaca, Mexico
Solar Energy for Food & Water. Contact SoL Energy, P.O. Box 217, Carbondale, Colorado 81623, (720) 489-3798, e-mail: info@solenergy.org, web site: www.solenergy.org.

13-15, Newport Beach, California
Distributed Generation and Combined Heat and Power Workshop. Contact Energetics Conference Services, 7164 Gateway Drive, Columbia, Maryland 21046, (410) 290-0370, web site: www.energetics.com/femp/la.html.

13-16, Houston, Texas
25th Industrial Energy Technology Conference. Contact the Industrial Energy Technology Conference, Texas A&M University, Energy Systems Lab, 3581 TAMU, College Station, Texas 77843-3581, (979) 845-1508, web site: www-esl.tamu.edu/ietc.

15-16, Washington, DC
Public Relations for the Energy Industry. Contact the American Conference Institute, 41 West 25th Street, 9th Floor, New York, New York 10010, (888) ACI-2480, web site: www.americanconference.com.

17, Shoreview, Minnesota
Solar Boat Regatta and Energy Fair. Contact Al Meyer, MRES chairperson, 25921 Dodd Blvd., Lakeville, Minnesota 55044, (952) 461-2787, e-mail: myrwood@unique-software.com, or visit www.mres-solar.org.

18-21, Austin, Texas
WINDPOWER 2003. Contact the American Wind Energy Association, 122 C Street NW, Suite 380, Washington D.C. 20001, (202) 383-2500, FAX (202) 383-2505, e-mail: conference@awea.org, web site: www.awea.org/conference.

27-29, Boston, Massachusetts
XIVth Global Warming International Conference & Expo. Contact Global Warming International, 22 W. 381 75th Street, Naperville, Illinois 60565-9245, (630) 910-1551, FAX (630) 910-1561, web site: www.GlobalWarming.net.

June 2003

4-7, Trenton, New Jersey
Mid-Atlantic Sustainability Conference 2003. Contact the Northeast Sustainable Energy Association, 50 Miles Street, Greenfield, Massachusetts 01301-3212, (413) 774-6051, e-mail: nesea@ nesea.org, web site: www.nesea.org.

8-11, Vancouver, British Columbia, Canada
Hydrogen and Fuel Cells 2003. Contact Advance Group Conference Management Inc., 1444 Alberni Street, Suite 101, Vancouver, British Columbia, Canada V6G 2Z4, (800) 555-1099, (604) 688-9655, FAX (604) 685-3521, e-mail: hfc2003@advance-group.com, web site: www.hydrogenfuelcells2003.com.

21-26, Austin, Texas
SOLAR 2003—America's Secure Energy. Contact the American Solar Energy Society, 2400 Central Avenue, Unit G-1, Boulder, Colorado 80301, (303) 443-3130, FAX (303) 443-3212, e-mail: conference@ases.org, web site: www. ases.org.

27-29, Montrose, Colorado
Colorado Renewable Energy Conference 2003. Contact the Colorado Renewable Energy Society, (303) 806-5317, e-mail: info@cres-energy.org, web site: www.cres-energy.org.

July 2003

12-13, Poultney, Vermont
SolarFest 2003. Contact SolarFest, P.O. Box 1052, Middletown Springs, Vermont 05757-1052, (802) 235-2866, e-mail: info@solarfest.org, web site: www.solarfest.org.

25-27, John Day, Oregon
SolWest Renewable Energy Fair. Contact Jennifer Barker, SolWest, P.O. Box 485, Canyon City, Oregon 97820, (541) 575-3633, e-mail: info@solwest.org, web site: www.solwest.org.

29-August 1, Rye Brook, New York
Energy Efficiency in Industry. Contact the American Council for an Energy-Efficient Economy, 1001 Connecticut Avenue, NW Suite 801, Washington, D.C. 20036, (202) 429-8873, FAX (202) 429-2248, e-mail: info@aceee.org, web site: www. aceee.org.

Upcoming ASES Conferences

SOLAR 2003
"America's Secure Energy"
June 21-26, Austin, Texas

SOLAR 2004
July 11-14, Portland, Oregon

ASES/ISES
Solar World Congress 2005
"Bringing Water to the World"
August 8-12, Orlando, Florida

Contact the American Solar Energy Society, 2400 Central Avenue, Unit G-1, Boulder, Colorado 80301, (303) 443-3130, FAX (303) 443-3212, e-mail: ases@ases.org, web site: www.ases.org.

Boycott a Bad Energy Bill

by Howard Geller

As I write this piece in late March, the U.S. has attacked Iraq. President Bush claims it is due to Iraq's alleged stock of weapons of mass destruction and links to terrorist organizations. Others believe it is due in part to gain control of Iraq's critical oil resources. After Saudi Arabia, Iraq has more known oil reserves than any other nation.

Future Iraqi leaders are likely to increase oil production in response to pressure from the U.S.—that is after Iraq's oil industry is rebuilt. Rebuilding Iraq's oil production capacity (and other infrastructure) will no doubt cost billions of dollars…dollars that are likely to go to companies like Halliburton, with close ties to the Bush Administration. Watching which companies get these contracts, and how much they contribute to President Bush's re-election campaign, will no doubt be interesting.

With war underway in Iraq and gasoline prices approaching $2 per gallon, there is renewed interest in national energy legislation. In an important victory for environmentalists and a blow to the Administration's energy strategy, the U.S. Senate has once again rejected opening the Arctic National Wildlife Refuge to oil production. But a comprehensive energy bill drafted by Rep. Barton (R-Texas) has begun to move forward in the House of Representatives.

The Barton energy bill, along with energy policies proposed by President Bush and Vice President Cheney, can be characterized as "old energy thinking." Old energy thinking focuses on greater production of conventional energy sources. It pays lip service but provides minimal real support to improving energy efficiency or implementing new renewable energy sources. It downplays environmental concerns by advocating more fossil fuel production on sensitive public lands. And it calls for weaker emissions standards and more subsidies to fossil fuels and nuclear energy.

By virtually ignoring energy efficiency and renewable energy sources, old energy thinking does relatively little to reduce America's oil addiction and oil import dependence. It encourages highly polluting energy sources such as coalbed methane development on western lands. It ignores the serious threat of global warming, instead maintaining rising carbon dioxide emissions and America's disproportionate contribution to global warming. And by repealing some federal regulations and "streamlining" the approval process for energy supply facilities, old energy thinking is an assault on consumers and public participation in the decision making process.

America needs and deserves better. Sensible energy legislation would concentrate on improving energy efficiency in our homes, workplaces and vehicles as well implementing renewable energy sources. It would keep sensitive public lands off-limits to fossil fuel production while reducing our oil dependence through greater efficiency and production of alternative, renewable fuels. It would reduce absolute levels of carbon dioxide emissions starting now, enabling the U.S. to join other industrialized nations that are seriously confronting the threat of global warming. It would expand consumer protection and enhance public participation in energy-related decisions, not reduce them. And it would cut subsidies for polluting fossil fuel technologies or nuclear energy, not increase them.

Given that proponents of "old energy thinking" are running the show in Washington, DC these days, what should renewable energy and energy efficiency advocates do? One school of thought says that bad energy legislation is inevitable, and that efficiency and renewable energy advocates should try to get whatever "crumbs" they can into this legislation. Another school of thought says that the overall energy package will be so rotten that it is not worth trying to "green up," and that energy efficiency and renewable energy advocates should stand firm with environmental and consumer advocates who strongly oppose a bad energy bill.

I favor and recommend the latter approach. First, Congressional leaders do not appear willing to include measures that will significantly improve energy efficiency or renewable energy. We know that a Bush-Cheney-Barton-Domenici energy bill will do far more harm than good in terms of moving our nation away from polluting fossil fuels and nuclear energy to renewable energy sources. Whether the bill is 98 percent bad, 95 percent bad, or 92 percent bad hardly matters. Second, including weak energy efficiency and renewable energy provisions in the bill, such as a weak national Renewable Portfolio Standard, could undermine efforts to adopt strong efficiency and renewable energy provisions at the state and local levels.

Last but not least, I do not believe that adoption of bad national energy legislation is inevitable. There are many complex issues in the bill that split votes along non-partisan lines (e.g., those in favor of increasing federal authority vs. those in favor of greater state authority, farm states vs. non-farm states, etc.). It is possible that comprehensive energy legislation could go down to defeat yet again, due to the controversial provisions likely to be included in the bill as well as vigorous opposition from consumer and environmental defenders. Energy efficiency and renewable energy advocates can contribute to the defeat of bad energy legislation by acknowledging that the energy efficiency and renewable energy provisions will in all likelihood be very weak and by saying that "on balance, this bill stinks."

At the same time that energy efficiency and renewable energy advocates boycott a bad energy bill, they can still articulate and advocate broad energy legislation that would truly benefit consumers, national security and the environment, even if it stands little chance of enactment today. They can work on the adoption of important policies such as tax incentives for innovative renewable energy and energy efficiency technologies, separate from a bad energy bill. And energy efficiency and renewable energy advocates can continue to advocate and help enact strong energy efficiency and renewable energy incentives and requirements, along with tougher consumer protections and emissions standards, at the state and local levels.

Given the cast of characters now running the show in Washington, states and localities are where the real action is for advancing energy efficiency and renewable energy supply. Boycotting a bad national energy bill can be done in combination with advancing the clean energy revolution. ✪

Howard Geller is the Executive Director of the Southwest Energy Efficiency Project based in Boulder, Colorado, and the author of Energy Revolution: Policies for a Sustainable Future *published recently by Island Press. He can be reached at hgeller@swenergy.org.*

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