SOLARTODAY

the magazine of the American Solar Energy Society

LEADING THE RENEWABLE ENERGY REVOLUTION

Summer 2016
solartoday.org

Solar on Native Lands

AMERICAN **SOLAR** ENERGY SOCIETY

JULY 10 - 13
SAN FRANCISCO

SOLAR 2016

Progress Toward 100% Renewables

solar2016.org

Created for solar enthusiasts and professionals, SOLAR 2016 will present:

- **Plenary sessions on the state of progress in the US and what is happening worldwide as a result of the COP in December 2015**
- **Sessions for discussing pre-publication research at the forefront of your field**
- **Panel discussions by experts addressing key relevant topics**
- **12 AIA CES Learning Units offered**
- **Great opportunities to network with your peers**

SOLAR 2016, the 45th ASES National Solar Conference, is co-located with Intersolar North America, at the Intercontinental Hotel, San Francisco, California, July 10-13, 2016

SOLAR 2016 registration includes admission to all SOLAR 2016, Intersolar North America, and ees sessions, and to the Intersolar Exhibition!

Register today! solar2016.org

inter solar connecting solar business | NORTH AMERICA

CONTINUING EDUCATION AIA

AMERICAN SOLAR ENERGY SOCIETY

SOLAR TODAY is published by the American Solar Energy Society, ases.org, the U.S. Section of the International Solar Energy Society

SOLAR TODAY
SOLARTODAY.ORG
SUMMER 2016
VOLUME 30, NO. 3

PHOTO BY: JESSICA NELSON, GRID ALTERNATIVES

Bringing solar energy to tribal lands with team work and education.

In every issue

The Heat is ON

Summer solstice marks the sun's northernmost journey in the sky, providing us "northerners" with the longest day of the year. This is good because there is plenty of work to be done here to promote solar energy, and we see the light! We are turning a corner and turning over a new leaf at ASES, as we set ambitious goal for our 2020 vision (page 62). The future is sunny and clear for ASES, and we have no time to be "out of focus".

Get out your gas mask, we passed a dark milestone in May when carbon dioxide (CO_2) levels surpassed 400 parts per million (ppm) at the South Pole for the first time in 4 million years.

NOAA reports that 2016 will almost certainly be the warmest on record, and probably by the largest margin to date. Remember that every year this century has broken the previous year's record for highest average temperature. Lake Mead, the nation's largest reservoir, has broken a record (previously set last June), declining to the lowest level since it was filled in the 1930s. Similarly, Arctic sea ice has already hit a record low, and it is still early summer.

Things aren't all that bad though! Renewable energy generation capacity increased by 8.3 percent last year to 1,985 gigawatts globally, the fastest annual rate on record, according to data from the International Renewable Energy Agency (IRENA).

Many old and dirty coal plants are closing down and essentially no new coal plants are being built in the U.S., "driving the largest transformation of the U.S. electricity system in half a century," according to the Union of Concerned Scientists.

Don't call me Warren Buffet but it's time to divest from fossil fuels and invest in renewables. Investments in renewables last year were more than double the amount spent on new coal and gas-fired power plants, according to the Renewables Global Status Report.

We live in interesting times. Tesla Motors recently announced their intent to buy SolarCity, the largest residential solar installer in the US. The ambitious move would turn the electric car company into a vertically integrated clean energy company. With the new battery packs coming out, the whole industry is rapidly changing. As Bob Dylan says, "Times they are a changing."

Nearly 100 years after the first airplane flew across the Atlantic Ocean, the first fully solar powered aircraft, Solar Impulse 2, has successfully made its way across the pond, landing in Spain June 23rd after completing a 71-hour flight from New York. The sky is literally the limit, as noted in NREL's Clean Energy Development on Tribal Lands article on page 10.

We are one nation, one human race, and one with the planet. Please join us as we embark on a new era at ASES. This is an era of 100% renewable energy.

Across the globe cities, states, countries, and other entities are making a strong commitment to a renewable energy future. California has set a goal of sourcing 50% of its electricity from renewables by 2030. The state's 3 largest utilities face a legal mandate to add 1.3 gigawatt-hours of storage capacity by 2020. California, Arizona, and New Jersey have the highest solar panel capacities. But it's not just the sunny areas that can make big impacts. Texas- the most oil-rich state in the US- has the second highest incentive rates for installing solar panels.

Carly Rixham
(crixham@ases.org) is the ExecutiveDirector at the American Solar Energy Society.

Sub-Saharan Africa stretches to reach a renewable energy goal of 330 gigawatts, on target to be deployed by 2030. Check out more useful info in Momentum's article on page 43.

If talk of anthropogenic global warming is getting you hot, you might enjoy a cold one as you enjoy our compilation of several solar powered wineries and breweries on page 18. Or better yet, join us at SOLAR 2016, our 45th annual National Solar Conference, held in conjunction with Intersolar North America in San Francisco, July 10-13th. Our theme this year is Progress Toward 100% Renewables, and we are looking forward to rolling up our sleeves and discussing how we can make this global transition.

ASES' uniqueness is the integration of professionals and advocates, and the goals of producing conference outcomes can be used immediately by policy makers and general public, as well as businesses, and you!

Carly Rixham

SOLAR TODAY
environmental statement

SOLAR TODAY is printed with vegetable ink on paper containing 100 percent post-consumer waste. The paper is produced at a biomass-powered mill. **This issue saves:**

Trees 182
Energy 121 million Btu
Water 27,574 gallons
Greenhouse Gases 8.9 tons
Solid Waste 7.2 tons

SOLAR TODAY
LEADING THE RENEWABLE ENERGY REVOLUTION
SOLARTODAY.ORG

Editorial
Carly Rixham Editor, Publisher and Art Director
Paulette Middleton, Elaine Hebert Assistant Editors

Contributors
Rona Fried, Mick Sagrillo, Rebecca Langton, Scott Sklar, Amanda Bybee, Mark Dudzinski, Karen Peterson, Brooke Nally, Paulette Middleton, Elaine Hebert, Ken Bossong, Leaf Running-rabbit, Jerry King, John Burke

Advertising
Jeff Bradley
jbradley@ases.org (303) 947-6585
Development/Partnerships
Spring Hericks
shericks@ases.org (720) 878-1352

SOLAR TODAY (ISSN: 1042-0630) is published six times per year (4 regular issues + 2 special editions) by the American Solar Energy Society, 2525 Arapahoe Ave., Suite E4-253, Boulder, Colorado 80302, 303.443.3130, info@ases.org, ases.org.
Editorial Comments
Send questions or comments to editor@solartoday.org.
Member Services
To renew your subscription or change your address, log-in to your account at ases.org/renew or call email membership@ases.org.

intersolar

connecting solar business | NORTH AMERICA

25 1991–2016 YEARS OF INTERSOLAR

North America's Most-Attended Solar Event
Moscone Center, San Francisco

- Hear it here first! Be part of the first major U.S. solar event in 2016
- Join 18,000 peers, visit 550 exhibitors, attend 60 sessions & workshops
- Gain insight: PV, energy storage, smart renewable energy & solar heating/cooling

JULY 12–14 2016

www.intersolar.us

co-located with

ees NORTH AMERICA

SEMICON WEST

Register now!

YOUR AD HERE!

SOLAR TODAY

WE ENERGIZE YOUR CUSTOMERS

AMERICAN SOLAR ENERGY SOCIETY

Reserve advertising space in **SOLAR** TODAY for 2016.

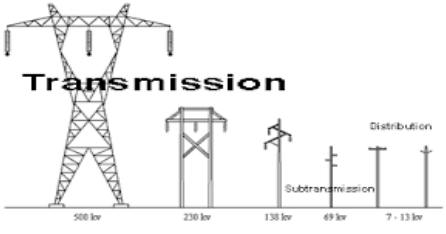
Six great issues per year including the ASES National Solar Tour Guide, read in print and digital formats by more than 50,000 renewable energy professionals, advocates, and end users. Advertisers also receive increased visibility on our website: solartoday.org. Design services available. Classified section coming soon!

For editorial calendar, rates, and more information, check out solartoday.org/advertise or contact Jeff Bradley today: jbradley@ases.org

Innovative Solar Systems

Looking for a Career with a Leading Solar Company?

ISS is Hiring!



ISS Offers the Best Pay, Bonus, and Profit Sharing in the Industry

ISS is Hiring for The Following Positions

Utility Scale Project Sales People

Legal Staff

Electrical Design Engineers (PV Systems + Transmisson/Sub Station Design)

PPA Negotiators

EPC Construction Managers

CALL (828)-215-9064

Email Resumes to - JohnGreen@InnovativeSolarSystemsLLC.com

Visit our website at www.InnovativeSolarSystemsLLC.com

Exciting Developments in Solar

by **RONA FRIED, Ph.D.**

Rona Fried, Ph.D., is president of Sustainable Business.com, a thought leader on green business known for its daily news and Green Dream Jobs service since 1996.

Over the past few months we've seen a rush of exciting developments in solar, some giving us insight into how distributed energy will work in the future.

Thanks to tax credits (ITC) being renewed, 2016 will be a breakthrough year for US PV installation, rising a stunning 119%. Sixteen gigawatts (GW) are expected to be installed, shattering last year's record 7.3 GW, according to the Solar Energy Industries Association (SEIA) and GTM Research. In February, we passed a wonderful milestone as the millionth home was outfitted with a solar system. About 300,000 Americans will install solar this year.

Sixty of the world's largest corporations have joined the Renewable Energy Buyers Alliance (REBA), to make it easier for companies to buy renewable energy directly from utilities. Right now, it's complicated – they either have to negotiate separately with utilities to get the amount of energy they need or sign long-term power purchase agreements with developers. Smaller companies don't use enough electricity to participate. The Alliance is challenging utilities to add 60 GW by 2025.

> You have too much shade on your roof for solar panels, but your neighbors have plenty of sun, producing more than they need. Why not buy electricity from their solar arrays instead of from the grid? That's what is happening in Brooklyn, New York and soon, in Boston, Massachusetts.

In more great news, 17 states joined the "Governors' Accord for a New Energy Future" to make a clean energy future a reality. Governors say they will establish goals and benchmarks to accelerate energy efficiency and renewables, modernize the grid, and incentivize clean transportation.

Signatories represent 40% of US population: Hawaii, California, Oregon, Washington, Nevada, Iowa, Minnesota, Michigan, Pennsylvania, Virginia, Delaware, New York, Connecticut, Massachusetts, Rhode Island, New Hampshire, and Vermont.

And the International Solar Alliance held its first meeting. The goal is to mobilize $1 trillion for "massive deployment of affordable solar energy by 2030." One hundred twenty countries have signed up!

Community solar is expected to take off in 2016, and a trade association has formed to push this wildly popular option, the Coalition for Community Solar Access. These shared arrays always quickly sell out because half of Americans either rent or don't have enough sun on their roof for solar.

One of the innovative uses of community solar is in Minnesota, where the Rural Renewable Energy Alliance (RREAL) is providing solar electricity in lieu of cash for energy assistance. Utility Xcel Energy plans to double the amount of solar on its Minnesota grid by giving customers the option of participating in community solar projects.

Innovative New Models Appear

You have too much shade on your roof for solar panels, but your neighbors have plenty of sun, producing more than they need. Why not buy electricity from their solar arrays instead of from the grid? That's what is happening in Brooklyn, New York and soon, in Boston, Massachusetts. It runs on Ethereum, a technology created for secure Bitcoin transactions – it monitors energy flows through the system and allows residents to buy and sell energy through the peer-to-peer network.

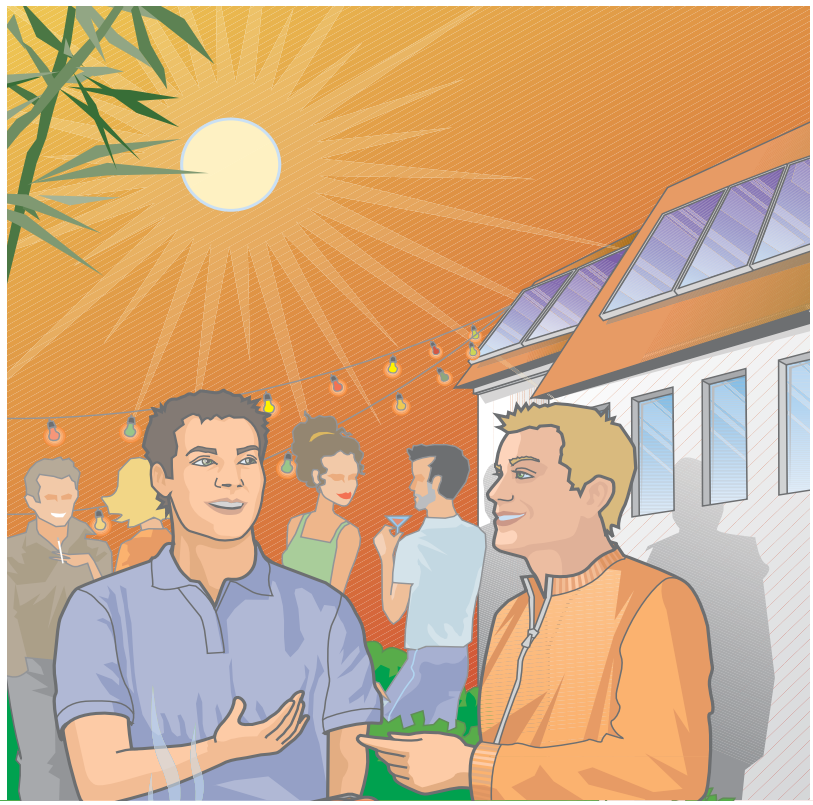
Arizona's largest utility, Arizona Public Service, is testing advanced solar inverters to operate rooftop solar systems remotely, turning them into "power plants." It allows APS to either ramp up or curtail electricity flows into the grid based on customers' real-time energy needs.

"Energy used to flow in one direction, from our power plants to a customer's home or business. That is no longer true today," says Scott Bordenkircher, Director of Technology Innovation at APS.

More Solar News:

- Oregon joined California, New York and Hawaii in shooting for 50% renewable energy. In California, the largest utility PG&E is now using 30% solar energy.
- San Francisco unanimously approved changes to its building code, requiring all new buildings to have solar systems starting next year. The first large city to do this, it builds on California's building energy codes that require new and renovated buildings to be "solar-ready" - oriented toward the south, roofs clear and unshaded. The city's goal is to reach 100% renewable electricity by 2025.
- Approximately 2.5 million people in the US work in renewable energy, energy efficiency, clean vehicles and fuels, more than coal mining, petroleum extraction, pipeline and railroad industries combined. And more people work in clean energy than in real estate or agriculture, says the report, Clean Jobs America. Energy efficiency is by far the biggest job-creator, employing nearly 1.9 million Americans.
- In the US, solar jobs grew 22% and wind jobs grew 21% over the past year.
- Worldwide, 8.1 people work in renewable energy. Top countries are China, US, Japan, Brazil, India and Germany. Solar PV is the biggest employer at 2.8 million people, according to the International Renewable Energy Agency (IRENA). **ST**

For more great news, read our articles, 70% Renewable Energy Possible By 2030, says World Survey *(http://bit.ly/291RdvL) and* Renewable Energy Revolution is Within Sight in US (http://bit.ly/22PnVF9).



A NEW PATH TO PROSPERITY IN INDIAN COUNTRY:

Exploring Opportunities for Clean Energy Development on Tribal Lands

By Karen Petersen, National Renewable Energy Laboratory

PHOTO BY: DENNIS SCHROEDER, NREL

The new energy economy is young and thriving, with plenty of room for expansion—and with the sky as the limit, it's making inroads in some unexpected places.

From the redwood forests of northern California to the green lowlands of upstate New York, from the high desert of southern Nevada to the frozen tundra of northern Alaska, visionary Native American leaders are forging a new path to economic vitality and community resiliency. It's a new path that honors traditional ways, while addressing longstanding challenges and barriers.

There's no denying the persistent gaps between American Indian and Alaska Native (AIAN) populations and the rest of the country in areas such as housing, healthcare, education, and employment. For generations, tribal leaders have worked to close those gaps and provide for their communities, and for some, gaming has provided one avenue for doing so. But forward-looking tribal governments are continually seeking new and innovative approaches to economic development. And increasingly, they are focusing on energy.

Within the broad swaths of mostly rural, often remote land Native Americans call "Indian Country" exist considerable untapped resources.

Despite representing less than 2% of the total U.S. land base, Indian lands contain an estimated 5% of all U.S. renewable energy generation potential, according to the U.S. Department of Energy's (DOE's) National Renewable Energy Laboratory (NREL).

When considered in light of the rapid decline in costs for clean energy technologies, the proliferation of policies that incentivize clean energy, and the increasingly urgent need for energy transformation, this disproportionate wealth in renewable resources represents a nascent opportunity—one not reserved for tribes alone.

"Indian Country is ripe with opportunity for profitable, mutually beneficial business engagements with tribes," said DOE Office of Indian Energy Director Chris Deschene.

Positioning Tribes to Thrive

Deschene's characterization of the opportunity for energy development on tribal lands is grounded in data-driven analysis and empirical evidence. In addition to funding technical resource and market analyses and contributing to intergovernmental energy and climate initiatives, the DOE Office of Indian Energy Policy and Programs has an established track record of cultivating propitious—and practicable—tribal energy visions. Since 2002, DOE has invested more than $50 million in nearly 200 tribal energy efficiency and renewable energy projects. Signaling its confidence in tribes' ongoing success, DOE recently announced more than $9 million in funding for 16 clean energy projects in 24 tribal communities.

"In addition to supplementing the substantial economic investments tribes have made in energy projects through grants, the Office of Indian Energy has committed significant intellectual capital to growing the human capacity needed to deploy, maintain, and operate energy projects on tribal lands," said Deschene. "Now we are at a critical moment—a turning point on the path to tribal energy and economic security where we have an opportunity to build on past investments and maximize the returns."

Guided by energy visions and strategic plans ranging in scope from boldly enterprising to cautiously optimistic, AIAN communities are making headway.

In April Menominee Tribal Enterprises broke ground on a $2 million biomass energy plant in Wisconsin, and the Seneca Nation of Indians broke ground on a $6 million 1.5-megawatt (MW) wind project in New York. These projects, co-funded by DOE, are just two recent examples of tribal energy visions coming to fruition.

Workers installing the racking for the Blue Lake Rancheria's solar system.

Leveraging federal and state government grants, incentives, and technical assistance, many other AIAN communities have amassed the resources, knowledge, and skills needed to harness their renewable resources and deploy holistic technology solutions designed to reduce their energy costs, create jobs, and build resilience.

"Clean energy is emerging as a new economic engine in tribal communities, and tribes are in the driver's seat," said Deschene. "By developing their indigenous energy resources, tribes are positioning themselves to not simply survive but thrive—and that goal is best realized through economic sovereignty."

And yet the road to energy and economic sovereignty is not a solo journey. Tribal leaders recognize that there is a compelling business case for bringing a wide array of partners from government, academia, and industry on board. In many cases these partnerships, varying in scope and structure, are critical to making energy projects technically and economically viable for tribes.

And they have the potential to be win-win deals.

"Building strong government and industry partnerships at the local, regional, and national level has been key to our steady progress toward our renewable energy and carbon reduction goals," said Jana Ganion, energy director of the Blue Lake Rancheria (BLR).

Blue Lake Rancheria

Blue Lake Rancheria (BLR) is one of a growing number of tribes pursuing progressive clean energy goals by investing in energy projects that incorporate a variety of renewable energy and energy efficiency technologies.

The small northern California tribe established its holistic climate action plan in 2008, and in December 2014 it was one of 16 U.S. communities designated by the White House as Climate Action Champions for extraordinary leadership on the climate front. "Tribal governments are choosing to lead with fast transitions to clean energy, and we are seeing stunningly successful examples of this across the United States," said Ganion.

This spring BLR began construction of its 500-kilowatt (kW) solar array. The solar system is a cornerstone of the tribe's low-carbon community microgrid project, scheduled to be online by year-end. When complete, the project will incorporate more than 950 kilowatt-hours of battery storage with the tribe's solar energy system and back-up generators.

In addition to being selected for the Office of Indian Energy's Strategic Technical Assistance Response Team (START) Program in 2015 and securing funding through the California Energy Commission's Electric Program Investment Charge (EPIC) in February 2016, the tribe has cultivated healthy partnerships with a broad array of other stakeholders. They include DOE, NREL, the Schatz Energy Research Center at Humboldt State University, Redwood Coast Energy Authority, Tesla, Siemens, and REC Solar, among others.

Although BLR has run up against obstacles, the tribe has established separate business entities that have enabled it to work seamlessly with its private sector partners to circumvent perceived barriers.

"Initially, there was some apprehension about entering into a contract with a tribal nation, in part because sovereign immunity is seen as a potential financial risk," said Chris Fennimore, director of business development for REC Solar, the local firm that contracted for the design, engineering, and construction of BLR's solar array. The assumption of risk proved unfounded, Fennimore said, crediting Serraga Energy, LLC with assuaging their concerns and streamlining the process.

A tribally organized limited liability company, Serraga was formed to "develop and manage energy-related projects at the rancheria, enable nimble day-to-day

decision making and, as the contracting entity, facilitate specific agreement terms, including limited waivers of sovereign immunity," explained Ganion.

"Through the business entity [Serraga], they waived their sovereign immunity directly related to us. And they had already secured the [EPIC] grant. That increased our comfort level," said Fennimore. "We contracted with Serraga in December and started construction in May, and I can honestly say it's been a smoother process than we've encountered with some of our commercial solar projects."

Fennimore said REC Solar's experience with BLR has opened up the possibility of future work with tribal nations. "Now that we have a better understanding of how to navigate these projects and realize the obstacles are surmountable, we see an untapped market."

Saint Regis Mohawk Tribe

Across the country, in another state where favorable renewable energy programs, policies, and incentives are fueling a burgeoning solar industry, the Saint Regis Mohawk Tribe is embarking on a similar path.

The tribe, located in northeastern New York along the U.S.-Canadian border, faces some of the highest energy costs in the state. Inspired by a sustainable energy vision and a plan that emphasizes energy efficiency and solar energy to reduce costs and improve the lives of community members, the tribe and the Akwesasne Housing Authority (AHA) are leveraging a variety of partnerships to achieve their clean energy goals.

In addition to receiving strategic energy planning technical assistance from the Office of Indian Energy in 2015, AHA has aligned itself with AMERIND Risk, the National American Indian Housing Corporation, New York State Energy Research and Development Authority, the U.S. Department of Agriculture, and the U.S. Department of Housing and Urban Development (HUD).

In 2013 AHA completed an expansion of its Sunrise Acres low-income tribal housing complex with funding from HUD and the American Reinvestment and Recovery Act of 2009. The 20 units and a training center are equipped with PV arrays, geothermal heat pumps, and other energy-efficient features that have helped offset nearly 50% of their energy costs.

The success of the Sunrise Acres project was an impetus for AHA to explore options for financing additional solar projects. "AHA has worked with us to identify opportunities to combine federal grants and state incentives with the significant tax credits available for solar PV," said John Clancy, attorney and renewable energy consultant for AHA. "Since AHA is a nontaxable entity, this is accomplished by partnering with a taxable entity that can utilize and provide AHA with credit for the valuable 30% federal investment tax credit [ITC] for solar projects."

A number of other tribes, including the Oneida Tribe of Indians of Wisconsin and Picuris Pueblo in New Mexico, are structuring deals based on the "partnership flip" model, which allows investors to take advantage of the ITC and lets tribes avoid the up-front capital costs while retaining the option to take ownership of the project once a target return on investment is realized.

While tribes like BLR and Saint Regis Mohawk pursue smaller community-scale renewable energy projects to reduce costs and achieve energy and climate-resiliency goals, others are leveraging various partnership and ownership structures to develop much larger projects.

Moapa Band of Paiute Indians

For tribes that have ample resource potential for utility-scale solar generation but elect not to develop, own, and operate such a project independently, one option is a land-lease agreement. Such is the basis of a successful deal between the Moapa Band of Paiute Indians and Arizona-based developer First Solar. This summer, the Moapa Paiutes will complete construction of a 250-MW solar project on their reservation in southern Nevada. The first utility-scale solar project on tribal land, the Moapa Southern Paiute Solar Project will deliver enough clean, renewable energy to serve the needs of nearly 100,000 California homes through a 25-year power purchase agreement with the City of Los Angeles. In the process, it will displace an estimated 178,000 metric tons of carbon dioxide emissions each year—the equivalent of taking 34,000 cars off the road.

In addition to benefiting the environment, the project has provided revenue, jobs, and long-term economic development opportunities for the tribe, which is

The first utility-scale solar project on tribal land, the Moapa Southern Paiute Solar Project will be complete this summer

leasing the land for the solar array to First Solar. As the project owner, technology provider, and construction contractor, First Solar is in turn procuring services from the tribe during construction, including gravel, recycling, and food services. A tribal hiring preference the tribe negotiated ensured that Native Americans made up 25% of the construction labor force, and nearly 40 of those employees were tribal members. "Every Moapa who wants a job on the site has one," said Greg Anderson, vice chairman of the Moapa Paiutes. In addition, seven long-term operations and maintenance jobs will be filled by Native workers, and First Solar has already trained two Moapa Paiutes who are slated for those positions.

As First Solar's initial foray into tribal project development, the Moapa project is a win-win on a variety of levels, according to Laura Abram, director of public affairs for First Solar. "The success of the Moapa Southern Paiute Project demonstrates the value of … bringing diverse economic and job opportunities to Native American tribes while providing the land and services solar developers need to meet their customers' growing demand for clean, affordable solar energy," she said.

With 780 MW of tribal projects in various stages of development, First Solar is actively pursuing opportunities to collaborate with tribes to develop other utility-scale projects on tribal lands, Abram said.

Soboba Band of Luiseño Indians

For tribes with robust resource potential that desire a greater ownership role in their projects, another option is to contract with an experienced consulting firm to represent the tribe's interests on all phases of energy project development, from feasibility and planning through financing and construction.

That was the route the Southern California-based Soboba Band of Luiseño Indians took when it hired Optimum Group to assist with land use master

planning in 2013. "As an owner representative, we bring our expertise to assess a particular technology or project, make the recommendation we feel is best for the client based on our experience and track record of successful projects, and then represent the tribe's interests in going to the marketplace," said Ali Sahabi, president of Optimum Group. As part of that effort, Optimum Group helped identify sites suitable for community-scale solar projects and demonstrate the technical and economic viability of the project, all of which supported the tribe in writing a successful grant application.

In January the tribe broke ground on a 1-MW solar array that will occupy a small parcel of land on its 7,000-acre reservation. The tribe invested more than $1 million in the $2.1 million PV project, which was co-funded by a $1 million DOE grant awarded in 2015.

The PV plant will help power the tribal administrative center, schools, and other community facilities, meeting 80% of the buildings' annual energy needs and saving the tribe an estimated $6.4 million in electricity costs over the next 20 years. As the sole owner of the project, the tribe will receive credit for generation fed back to the grid through a net-metering agreement negotiated with Southern California Edison with assistance from Optimum Group.

In addition to freeing up discretionary funds to address vital community needs, the project will provide jobs for tribal members and advance the tribe's long-term energy vision. After completing the first phase of the project this summer, the tribe plans to move forward with a two-phased expansion that will bring the total generation to 3 MW—nearly 35% of the Soboba community's total energy needs.

"Native people have long been 'Keepers of the Earth,' and with that, the tribe takes tremendous pride in this new environmentally safe development that is taking Soboba one step closer to becoming a self-sustaining tribe," said Tribal Council Chairwoman Rosemary Morillo.

Solar Energy in Rural Alaska

While the excellent solar generation potential in the Southwest has created one of the more palpable market opportunities for tribal energy development, other, less conspicuous opportunities are arising much farther north. Although it may seem counterintuitive, there are significant solar energy investment opportunities in Alaska Native villages. Rural Alaska's geographic isolation, heavy dependence on fossil fuels for electricity generation and heating, vulnerability to the impacts of climate change, and disproportionately high energy costs often make developing and deploying various combinations of clean and renewable energy technologies economically attractive.

According to a new report from the Office of Indian Energy entitled "Solar Energy Prospecting in Remote Alaska: An Economic Analysis of Solar Photovoltaics in the Last Frontier State," Alaska's solar resource is comparable to that of Germany, which leads the world in solar installations with roughly two average-sized 250-Watt solar PV panels per capita. The analysis, conducted by NREL, finds that solar can be an affordable option to reduce diesel fuel usage in certain locations throughout Alaska.

Last October, DOE convened solar industry leaders in Anchorage to kick off a collaborative effort to advance innovative financing and technical solutions for integrating solar energy generation onto islanded microgrids serving villages in Alaska. DOE is also working with a variety of Alaskan stakeholders to examine how public-private partnerships can be used to facilitate and attract increased financing for solar and other energy technology development statewide as part of the National Strategy for the Arctic Region.

Office of Indian Energy Senior Policy Advisor Doug MacCourt worked with Energy Secretary Ernest Moniz to present the Solar Prospecting report's findings at a field hearing of the U.S. Senate Energy and Natural Resources Committee in Bethel in February. "Our research shows a clear path for integrating solar PV systems at a feasible price point to reduce high diesel fuel costs and create cleaner, more resilient energy systems in remote Native villages," he said.

NREL Senior Finance Analyst Paul Schwabe, who authored the report, sees a unique opportunity for industry to partner with Alaska Native Corporations (ANCs), which are for-profit corporations involved in myriad business operations for the primary benefit of their tribal members. "The business expertise, combined with the local knowledge and influence of ANCs, could open up a variety of business structures for rural Alaska, from direct ownership to third-party financing," said Schwabe.

Driving Innovation, Creating Prosperity

These collaborative efforts to amplify solar energy opportunities in Alaska reflect DOE's broader, mission-driven efforts to advance national and global energy and climate goals by increasing clean energy investment and building a clean energy economy.

"By facilitating mutually beneficial energy development opportunities between tribes and industry, the Office of Indian Energy can help bridge the gap between the demand for electrification, energy infrastructure, and energy service reliability and the application of innovative technologies on tribal lands," Deschene said.

A key strategy for this is developing an industry-tribal network to address barriers to tribal energy innovation. To initiate this dialogue, the Office of Indian Energy is planning to host business round tables with tribal, energy industry, and financial sector representatives to identify opportunities as well as barriers and make recommendations.

The ultimate goal, according to MacCourt, is the creation of an independent organization dedicated to process improvements and partnerships that facilitate and accelerate clean energy development on tribal lands.

"The challenges hindering energy development on tribal lands are largely access to capital, distribution, and human capacity," said MacCourt. "Working closely with industry and tribal leaders, we can and must meet these challenges through public-private partnerships. The Department of Energy leads some of the world's most successful industry partnerships to commercialize clean energy technology. Applying that success to AIAN communities means bringing new business models and innovations in finance, and opening a new dialogue between business and tribal leaders who see the value of a clean energy future."

For more information on energy development and investment opportunities on tribal lands, visit energy.gov/indianenergy. **ST**

PHOTO CREDIT: TONTO APACHE TRIBE

A 75-Kw solar PV array installed on the Tonto Apache Tribe's Tribal Administration Building as part of a 2014 project co-funded by DOE. The tribe anticipates saving an estimated $1.8 million in energy costs over the project's projected 30-year lifespan.

What Drives the Growth of Community Solar Market

by Rebecca Langton,
Clean Energy Collective

The use of solar energy in the U.S. is still relatively small, accounting for just 1% of electricity generation. Within that figure exists the power generated from Community Solar programs, which, by the end of 2015 consisted of 181 MW representing less than 1% cumulative installed solar PV capacity. However, the market growth potential for community solar is huge. According to The National Renewable Energy Laboratory (NREL), that amount could reach 5.5 – 11 GW of shared solar by 2020.

Why such an extreme forecast of community solar market growth?

Consumers and utilities, who in the past have been on the fence about community solar, are now starting to take notice of these programs. They are sprouting up across the nation, allowing more people to tap into this source of clean energy while feeding solar powered electricity back into the grid, and as a result the future looks bright for utilities and their customers. Community Solar, also referred to as shared solar, is expected to see exponential growth and adoption in the coming years, resulting in utilities of every size offering renewable energy choice to their customers and members. As a result of this expected growth, there will be greater accessibility to solar energy, and a laundry list of benefits to both consumers and utilities.

If everyone could access solar energy in an affordable way, most households and businesses would probably choose solar energy over traditional fossil fuel sources. But unfortunately, not everyone has access to this clean source of power. Making solar energy accessible to more people is a driving goal of community solar programs (#Solar4All). Anyone with an electric utility bill can participate in a utility offered community solar program. It no longer matters if a rooftop is properly sited for optimum sun exposure. Renters and condominium owners can participate in community solar; not to mention non-profits, businesses of any size, and low or moderate income households.

Because of community solar, there is the opportunity for the 50% of U.S. households and businesses who cannot access rooftop solar to participate in solar. As stated by NREL in a study published in 2014, "by opening the market to these customers, shared solar could represent 32%-49% of the distributed PV market in 2020, thereby leading to growing cumulative PV deployment growth in 2015 – 2020 of 5.5 – 11.0 GW, and representing $8.2-$16.3 billion of cumulative investment." Rocky Mountain Institute's projections are even higher, anticipating 15 GW of community solar by 2020.

The cost of solar equipment and development soft costs are continuing to fall and economies of scale are making the development costs of a project more palatable. According to GTM Research, overall system pricing fell 17% over the course of 2015 in the utility-scale market. Programs will soon be offered at a cost equal to or less than the cost of traditional fuel sources. This levelized cost of energy (LCOE) is what makes solar energy accessible to more people like low-income households, fueling the growth in community solar programs.

Lower development costs due to reduced equipment prices are improving a project's bottom line, which has captured consumer's attention. Consumer demand can be credited for community solar growth, rightfully so because they stand to benefit economically, environmentally, and socially. Through subscription, or pay-as-you-go programs, customers can start saving on their electricity bills from day one. Hedging against rising rates, savings on monthly bills, and in some cases, receiving tax credits and renewable energy credit (REC) payments are all examples of economic benefits attractive to participants. Environmental and social benefits come in the form of reduced dependence on fossil fuel energy sources and a reduction of carbon emissions.

Utilities recognize the benefits of community solar solutions because they provide the ability to offer a renewables program in a way that allows them to meet their RPS requirements, protect against retail rate erosion, and maintain a grid-tied connection with their customers. For utilities who spend a fair amount of time and resources combating self-generation and net-metering laws, community solar offers a solution to that challenge. Community solar is a way for utilities to retain their customers by meeting their demands for solar energy choices.

As utilities of every size recognize the benefits of and embrace community solar programs, the pace of adoption will accelerate, meeting and exceeding the growth expectations of industry experts. Consumers will continue to be the driving factor of renewable energy programs, and utilities will continue to respond to the solutions that help them retain and engage their customers. If you're unfamiliar with community solar and your local utility has yet to offer a program, just wait. With upwards of 11 GW expected to be installed across the U.S. over the next four years, this market segment is poised for a bright future. ST

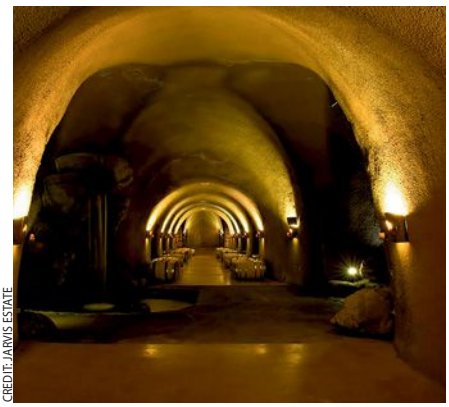
Stay tuned for regular updates from the Community Solar Hub in SOLAR TODAY. For more information, visit www.communitysolarhub.com.

For Your Drinking Pleasure: Wineries and Breweries Powered by the

1. Jarvis Estate

Jarvis Winery, a totally underground winery in Napa Valley,California, received a Regional Wine Tourism Award of Merit for Best Sustainable Wine Tourism Practices.

Operated entirely by solar power, Jarvis' vineyards are green-certified by the California Land Stewardship Institute and its 45,000 square feet of wine caves remain 61 degrees year round requiring no heat or cooling.



CREDIT: JARVIS ESTATE

Jarvis Estate, underground fermenting

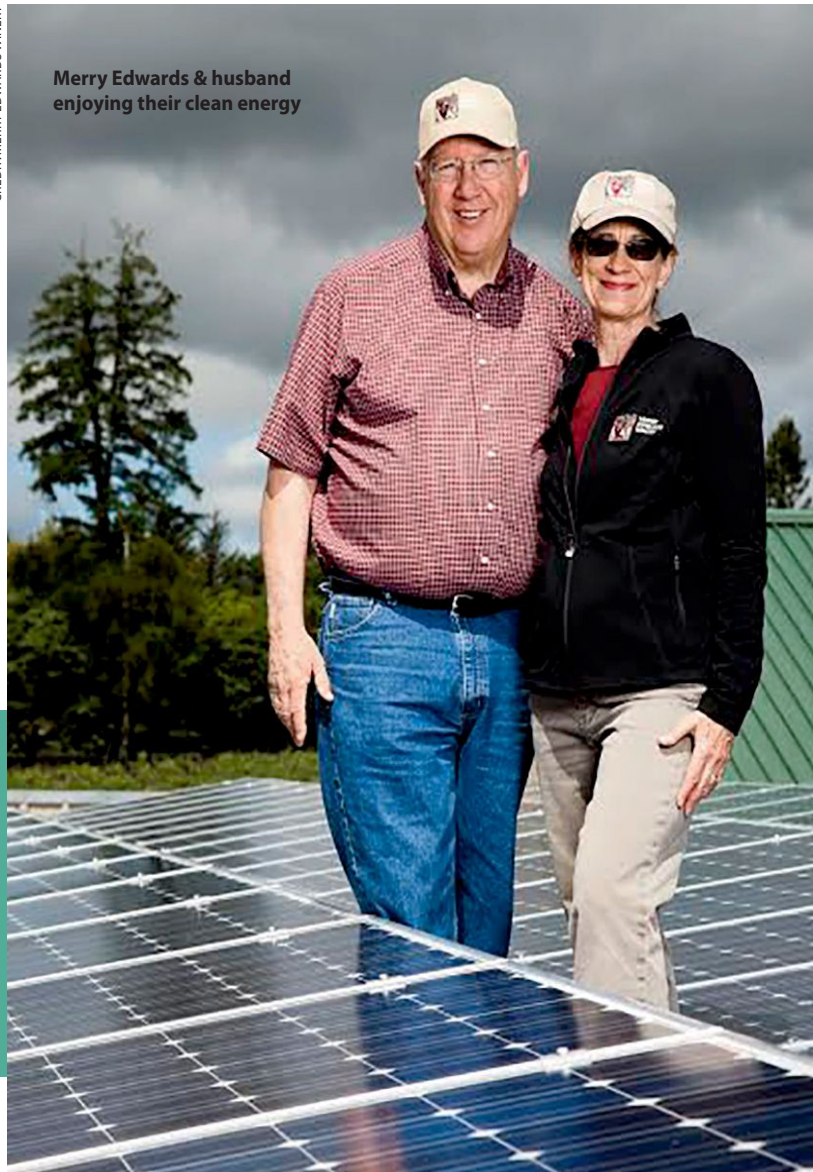
"It is a great pleasure for me to receive this award on behalf of everyone at Jarvis Winery. We appreciate the recognition of our green practices that include our vineyards, which are Napa Green certified, as well as our underground winery facility that does not require heating or cooling and is completely powered by solar array on the estate."
-- Will Jarvis

2. Merry Edwards Winery

One of California's first woman winemakers, Merry Edwards began her career at Mount Eden Vineyards in the Santa Cruz Mountains in 1974. She went on to become the founding winemaker at Matanzas Creek in 1977 and remained there until 1984. For the next decade, Merry consulted for numerous wineries, large and small, in Oregon and for many diverse appellations of California.

In 1997, family and friends joined Merry to found Merry Edwards Winery, with a focus on producing Pinot Noirs with a sense of place from Russian River Valley and Sonoma Coast. In 2008, she and her husband, Ken Coopersmith, completed their winery on the site of Coopersmith Vineyard. Mary says,

"At our winery, we find that green practices are sound business as well as being good for the environment. An example of this is our solar system installed in 2010. Our south-facing roof now boasts nearly 600 photovoltaic modules generating 150 kW. Even though the upfront investment was large, federal and state incentive programs in place when we began the project helped ameliorate the costs. The massive decrease in electrical bills has been a boon for our business as well as helping to reduce our environmental footprint. Also, our new guest house and home are both solar with integrated, individual pan monitoring for top performance."



CREDIT: MERRY EDWARDS WINERY

Merry Edwards & husband enjoying their clean energy

3. Jordan's Vineyard & Winery

After six years of reducing their carbon footprint, they are thrilled to announce that Jordan Vineyard & Winery is now powered by the sun. Stellar Energy installed a 454-Kilowatt solar-photovoltaic array on a steep hillside behind the winery. It consists of 1,932 modules composed of 100% American made equipment—quite uncommon in this country due to the higher cost of U.S.-manufactured products. The solar power is expected to offset their utility bill by 99% and save the winery nearly $4.9 million in electricity costs over the next 30 years. A web-based monitoring system allows us–and wine markers and customers–to see, in real time, Jordan's environmental impact and solar energy produced/used.

Jordan Winery is now enrolled in the Sonoma Clean Power program, which provides businesses access to environmentally friendly power, generated by local renewable resources, such as solar, wind and geothermal. Roughly 90% of their electricity comes from their hillside solar arrays and the balance from renewable energy. Using 10% renewable energy means that Jordan's electrical use is now carbon neutral.

4. Peju Province Winery

The love of farming and a passion for wine brought Tony Peju to the Napa Valley. A series of ideas - starting in his birthplace on the Caspian Sea, then France, England and eventually, Los Angeles -- created the Peju's Napa Valley winery. In 1982, Tony and his wife Herta purchased 30 acres of land in the Napa Valley with the magic ingredient - location.

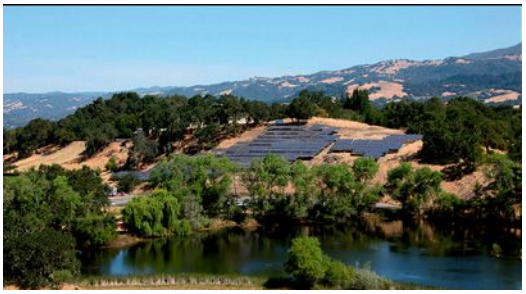
Neighboring vineyards in Rutherford included Robert Mondavi, Inglenook and Beaulieu. Situated between Highway 29 and the Napa River, the acreage included a 1900-era house and rambling vineyards, some 60 or more years old. Looking to the future, Tony and Herta have introduced their two daughters, Lisa and Ariana, to the workings of the wine business. Both of the young women are immersing themselves in all aspects of Peju Winery.

With the sun as a plentiful partner in the Napa Valley, curren Peju owner Ariana Peju launched the "Harvesting of the Sun" project by taking Peju solar in 2006. To date, 720 panels have been installed over 10,000 square feet of the winery's roof, and the panels generate 40% of the winery's annual energy.

Peju's solar power system is currently sized ar 126 kW AC it sit on top of their crush pad, barrel room, tank area and administrative offices. Peju is planning to add more modules.

CREDIT: JORDAN'S VINEYARDS & WINERIES

A view of Jordan's vines and PV System



CREDIT: JORDAN'S VINEYARDS & WINERIES

Jordan's Waterfront View

CREDIT: PEJU PROVINCE WINERY

Peju's PV System

5. J. Lohr Vineyards & Wineries

According to a press release fromFebruary 18, 2009, J. Lohr Vineyards & Wines unveiled the largest solar tracking array in the wine industry, a 3-acre, state-of-the-art, 756 kilowatt solar photovoltaic (PV) single-axis tracking system designed to offset 75% of the winery's energy usage at its Paso Robles operations. This ground-mounted installation is comprised of 4,320 PV modules that track the sun from east to west on a daily basis to optimize production of solar-generated electricity. The landmark system was designed and installed by Conergy.

"J. Lohr has an impressive track record of environmental responsibility, and by both adopting sustainable practices and being willing to share its experience with others, is helping to expand the California wine industry's widespread sustainability movement," said Allison Jordan, executive director for CSWA, the California Sustainable Winegrowing Alliance.

"With a strong, credible voice among industry professionals and a powerful commitment to environmental stewardship, J. Lohr recognized the importance of setting an example for the wine industry, for other energy-intensive businesses, and the public at large," said Conergy Product Developer Michael DeSousa. "By investing in this bellwether system, J. Lohr becomes more energy independent and will enjoy more predictable energy costs for decades to come," DeSousa added.

Founded more than three decades ago by Jerry Lohr, J. Lohr Vineyards & Wines crafts a full line of internationally-recognized wines from its 3,000 acres of estate vineyards in Paso Robles, Monterey County, and the Napa Valley.

6. Frey Organic Wine

Frey is a third-generation family-owned and operated winery located at the pristine headwaters of the Russian River in Redwood Valley, Mendocino County, California. Frey Vineyards combines the best of modern and traditional winemaking methods to showcase distinctive varietal flavors. Through minimal manipulation in the cellar, they allow the wines to express the authentic character of the soils and climate. For over three decades Frey has a vanguard in crafting wine without added sulfites, a synthetic preservative added to most other wines (even wines made with or ganically grown grapes!) that can cause adverse allergic reactions in some people.

Frey's Organic Winery's first solar array

Frey's organic and Biodynamic farming methods encourage care for the soil, groundwater, and wildlife, promoting rich biodiversity in the vineyard. Ninety percent of their land is held as unspoiled natural habitat with a diverse mix of native plants and animals. As stewards of the land, they emphasize producing organic and Biodynamic wine of the highest quality while caring for planet and palate alike.

As part of this program, and with the help of an energy audit, Frey installed efficient lighting and motors. A 17 kilowatt solar array is used to power aforklift, lights, bottling equipment, and pumps. A solar water heating system is in the works.

Other everyday significant, carbon-reducing practices are the use of recycled office and label paper; and tree planting and forest protection in surrounding wilderness. All of these actions either directly or indirectly keep carbon dioxide out of the air.

In the future, electric tractors will be used in their vineyards. They are also looking into the use of high carbon composts, called biochar.

J.Lohr Vineyards 756 KW PV System

CREDIT: J. LOHR VINEYARDS

Frey Organic Wine:
"America's first organic and Biodynamic winery. Producing award-winning vegan, gluten free wines with no added sulfites since 1980"

CREDIT: FREY ORGANIC WINE

CREDIT: FREY ORGANIC WINE

7. Wine Tree Farm & Golden Creek Vineyards

Wine Tree Farm and Gold Creek Vineyards share a unique off-grid solar powered winery in California's beautiful Sierra foothills. While many California wineries use solar power to help reduce electrical consumption and its associated carbon footprint, Wine Tree Farm and Gold Creek Vineyards are the state's first entirely solar powered off grid wineries. The wineries share a production facility that uses solar panels to produce all power needed for wine production, winery business operations, and a popular customer tasting room. To ensure power at nighttime, high efficiently lighting and a battery array allow 24 hour operation.

The winery's focus on solar power began in 1998 when Wine Tree Farm founder Corinne Moore purchased the 105 acre ranch property which included remnants of Gold Rush era mining operations and an old 1902 farmhouse that had no public utilities. Since the house was originally used only as a weekend getaway, originally one solar panel and a couple of batteries provided all the power that was needed to illuminate a few DC lights and a small pump for the house's water well.

Almost immediately Corinne planted a small vineyard behind the house to experiment with different wine varietals to learn what would grow best. The vineyard, however, needed additional water for irrigation and that meant the winery needed more power in order to run irrigation pumps. Since no utility ran to the property, Corinne jumped into solar with both feet.

In 1999, Corinne's teenage son Nic met a local man who installed solar-powered systems. Nic was so interested that he decided to work with him in the solar business, ultimately earning his solar electrician accreditation. "We installed a small electrical solar system here at the house that generated AC, with the capability of running lights, fans, computers – virtually everything needed for day-to-day living," explains Corinne.

In 2000, Corinne and her son moved into the farmhouse full time. Over the years the solar system has been expanded and now provides all the comforts necessary for a full time residence and winery office. Two years later Corinne and her son planted a larger commercial vineyard on the far end of the ranch property.

CREDIT: WINE TREE FARM

Grape selection process -- Wine Tree Farm

CREDIT: WINE TREE FARMS

CREDIT: WINE TREE FARMS

8. Medlock Ames Winery

Commitment to the environment runs deep at Medlock Ames. Not only do they farm organically but they strive be as sustainable as possible, which is why they invested heavily in using renewable energy to power their winery. Solar power is a fabulous example of longer term sustainable thinking. The initial investment is large but makes enormous sense when looked at in connection with a 'hundred year plan'. They predict that the panels will have paid for themselves in eight years or less – and with approx. thirty years of useful service the winery can look forward to twenty years of massively reduced (or eliminated!) electricity bills.

Benefits that don't show up on a balance sheet are just as important. They eliminate many pounds of CO_2 each year with their system as well as contribute power to their local power grid at peak times when it is needed most. They know that clean energy is good for everyone and in many respects they can now add 'energy' to the growing list of things their farm at Medlock Ames provides. In addition, they welcome visitors to the ranch to take a walk over to one of their many hi-tech solar arrays that seem (strangely enough) to sit happily next to vines, geese, sheep, olive trees, vegetable gardens and all the various wildlife. Hawks and owls have been seen resting on the solar panels!

9.Patz & Hall

Patz & Hall was founded in 1988 by four talented individuals: Donald Patz, James Hall, Anne Moses and Heather Patz. Together, they have turned Patz & Hall into one of California's most highly regarded wineries with a celebrated portfolio of single-vineyard wines. Though Patz & Hall was not the first California winery to make vineyard-designate Chardonnays and Pinot Noirs, it was one of the first to introduce these wines to a wider audience outside of wine clubs and tasting rooms.

In addition to having high quality wines Patz and Hall also strive to have exceptional sustainability practices. They have become the cornerstones of the winery's success, allowing Patz & Hall to realize

Medlock Ames Winery's PV system

the highest levels of quality and consistency.

They designed and installed a roof-mounted solar array at the winery comprised of 512 solar photovoltaic panels. The array is able to produce 128,000-kilowatt hours per year, making their winery 100 percent energy self-sufficient. Additionally, the array's design shields the barrel room from the sun decreasing the building's overall temperature. This solar array spares the environment over 128,000 pounds of CO2 emissions annually (over 30 years, this is the equivalent of not driving 3.8 million miles).

Their winery was designed to have a separate barrel room cooling system from the tank cooling system. This allows for complete shutoff of each system when not in use. Making it an extremely efficient design. The winery was also designed to be able to pre-treat all of our wastewater. This environmentally friendly treatment process removes solids and puts them through a biofermentor, lowering biological oxygen demand (BOD) levels and essentially making our wastewater similar to storm water.

In addition all of the left over organic matter from their winemaking (skins, seeds, etc.) is composted. This totals approximately 200 tons annually. The compost is used by vineyards and organic farms across Sonoma County.

Because their bottles used to have to be trucked over 1,900 miles, theychanged out their bottle manufacturer, thereby reducing the carbon footprint of their bottle transportation by 60%.

• In addition, they use a zero emissions electric forklift for winery material and barrel movements; converted all case box packaging to craft (standard cardboard) eliminating all dyes and converting inks to soy based material on 35,000 boxes; switched to lighter wine bottles, which reduces overall fuel usage during shipping (shipping is a significant part of a winery's carbon footprint); completed a comprehensive energy audit of the offices in order to ascertain and eliminate energy waste; upgraded to the most energy-efficient lighting; recycle all paper through a shredding service; use recyclable tin capsules (as opposed to plastic) on top of our bottles; and recycle 100 percent of the used bottles, capsules and corks.

10. Starmont Winery & Vineyards

Starmont's goal is to capture the essence of the Napa Valley's premier vineyards in rich, complex, supple wines that pair well with food and are accessibly priced.

Starmont is also committed to protecting and preserving the environment. and have taken the following steps to follow through with their commitment:

- Each barrel room has independent climate controls to more efficiently manage fermentations and barrel aging.
- Automated systems manage temperatures by bringing in cooler nighttime air and venting out warmer air, using low energy fans, when conditions permit.
- State of the art 277 kW Solarcraft Solar Energy System generates enough electricity each day to power over 250 average homes.
- 100% of winery process water recycled as vineyard & landscaping irrigation.
- 98.6% of waste is diverted away from landfill, per a Napa Recycling assessment
- Energy efficiency is moved through lighting, motors, compressors, double paned windows and a fully insulated building (roof and walls).
- Starmont is a certified Napa Green Farm and Napa Green Winery, and is a member of the Napa Sustainable Winegrowing Group.

CREDIT: PATZ & HALL

Patz and Hall's hand made wine barrels.

11. Trefethen Family Vineyards

Hailey Trefethen, who along with her brother Loren is the third generation of Trefethens to passionately embrace the winegrowing life (her grandparents founded Trefethen Vineyards in 1968 and her parents, John and Janet, released the first Trefethen wines in 1973). Hailey says that "becoming 100% solar-powered fits perfectly into our philosophy of sustainability and our continual efforts to reduce our footprint. It enables us to close the loop further and become even more self-sustaining."

Trefethen has been at the forefront of the sustainable farming movement since Eugene and Catherine Trefethen began growing grapes on a cluster of farms surrounding their historic, 19th-century winery in the southern Napa Valley. Gene, instrumental in establishing an agricultural preserve in

CREDIT: PATZ & HALL

Patz and Hall's wine vats

Napa County by encouraging local residents to vote for its passage, was an early pioneer of sustainable practices, including his development of a rain water collection and recycling system that replenished Trefethen's reservoirs. Over the past 45 years, the Trefethen family has quietly and without fanfare created a model program of sustainable winegrowing designed to minimize the use of chemical agents, conserve natural resources, and provide job security, living wages and benefits to its workers.

"When we started in the wine business all those years ago, no one in the wine business was talking about sustainability," says Trefethen Family Vineyards CEO Janet Trefethen. "But I was raised on a rice farm and knew that if you wanted to live off the land, you had to respect and care for it and its resources. We've been doing that since 1968."

In addition to solar powering its vineyard and winery operations, Trefethen religiously adheres to a host of other sustainability practices, including recycling wastewater for irrigation; using deficit irrigation to reduce water usage; transforming winery waste (grape seeds, skins and stems) into compost; restoring riparian areas and streams; employing natural methods of weed, mildew and pest control (bats, hawks and barn owls diminish pest populations); planting cover crops to enhance soil health; harvesting at night rather than mechanically cooling the grapes; maintaining a fleet of electric and soy-based biodiesel fueled vehicles to reduce fossil fuel emissions; opting for soy inks on bottle labels; and providing year-round jobs and full benefits for agricultural workers, along with extensive employee health and education programs.

CREDIT: TREFETHEN FAMILY VINEYARD

Trefethen Family Vineyard's solar array

> "But I was raised on a rice farm and knew that if you wanted to live off the land, you had to respect and care for it and its resources. We've been doing that since 1968." -Janet Trefethen

12. Stone Brewery

Founded by Greg Koch and Steve Wagner in 1996, San Diego-based Stone Brewing is the 10th largest craft brewer in the United States. With Steve's knowledge of brewing and Greg's past successes in business, these two beer fanatics managed to cobble together the funds needed (withno small help from Greg's father, Terry Koch) for some shiny new stainless steel brewing vessels. After a nine-month search, the newly formed team found the perfect

CREDIT: STONE BREWERY

The Stone Brewery Restaurant

Trefethen Family Energy, emissions, and environmental savings

CREDIT: TREFETHEN FAMILY VINEYARD

The Stone Brewery Restaurant

CREDITS: STONE BREWERY

location in San Marcos for Stone Brewing and cation in San Marcos for Stone Brewing and moved in on February 1, 1996. On July 26, the ribbon was cut and the first beer was tapped in the brewery's tasting room
Their rooftop solar panels on the Escondido brewery produce more than 20% of the power for the brewery and restaurant.

13. Two Goats Brewery

In July of 2015, Two Goats Brewing in Hector, NY made the switch to solar. From the start, their business model has been one of sustainability: their building is a refurbished barn from the 1800's; their spent grain goes to local farm stock; they use local hops and food products; they have in-house practices of reusing; recycling and composting; and they are major supporters of regional causes. Going solar was just another step in that direction. As owner and brewer Jon Rodgers says, "The projected payback period for Two Goat's solar system is 7.5 years, and in the last 6 months alone they've saved two-thirds in energy costs. With the tax incentives and rebates, it makes the switch to solar feasible and a smart investment."

From start to finish, the process of going solar was seamless because of the streamlined efforts of local company Renovus Solar. Renovus has designed and installed thousands of renewable energy projects throughout New York State and was professional, efficient and extremely accessible. Their aim is to demystify and simplify the transition to solar by clarifying options, filling out forms for the customer (such as rebates, interconnection contracts and building permit applications) and talking one through the tax deduction details.

In collaboration with Renovus, Two Goats continues to support growth in the solar industry by hosting educational meetings for the public.

CREDIT: TWO GOATS BREWERY

Two Goats Brewery's classic brew

14. Sierra Nevada Brewing Co.

In 1980, Sierra Nevada set out with a simple goal: brew the beers they wanted to drink. They started small with homebrew shop experience, a love of American hops, and plenty of passion. Decades later, they are still at it and the passion burns brighter than ever.

Focusing on the environmental lens of sustainable development, the Sustainability Department provides guidance on reducing the overall environmental impacts of their processes brings awareness of environmental issues to their roles at the brewery and to their personal lives.

Their sustainability program extends to every facet of the company from barley to bottle and into customer's refrigerator. Sierra Nevada's fundamental approach is to "close the loop" wherever and whenever possible. They look for opportunities to bring materials leaving their facility—such as heat, water, and packaging—back into our production process.

Introduced to employees in 2011, their zero waste goal emulates sustainable natural cycles in which discarded materials are resources, not wastes, and products and processes are designed and managed to reduce the volume and hazards of waste. The drivers behind our zero waste goal are:

CREDIT: TWO GOATS BREWERY

Patrons and panels soak up some rays outside of Two Goats Brewery.

CREDIT: SIERRA NEVADA

Sierra Nevada Brewing Companies solar panels

- To improve environmental health by reducing landfill contribution, reducing greenhouse gas emissions, sustaining natural resources and preventing the release of harmful chemicals into land, water and air systems. Doing so also improves everyone's personal health and the health of the communities by ensuring that we have clean air and water.

- To save money by reducing the cost of utilities and resources. Saving money allows Sierra Nevada to offer employees amazing benefits and provide job security.

They work hard to divert solid waste from the landfill, recovering 99.8% of their total solid waste through reuse, recycling or composting (also known as reEarthing). The same resolve is applied to all of the resources they use throughout the brewery, including energy, water, packaging materials, compressed air, food, employee time, parts, services, money and, most importantly, beer.

They have metrics in place to help identify and reduce waste in brewery operations. Tracking mechanisms depend on the type of waste, and metrics are reported brewery-wide through our Key Performance Indicator (KPI) program which is illustrated in the following sections. Audits are regularly conducted throughout the brewery to provide detailed information about specific processes that need improvement.

15. Domaine Carneros Vineyards

Since the beginning, Domaine Carneros has pushed the sustainability envelope to ensure they live as lightly on the land as possible while producing great grapes and wine. These efforts include owl boxes providing natural solution for rodent management, in addition to using grape pomace from harvest to feed local cattle.

In 2003, they installed the largest solar collection system of any winery in the world. To help minimize the use of electric lights. By having built into the earth and using night cooling systems, they maintain cellar temperatures naturally. In addition, the compost, and recycle bottles, corks, foils, cardboard, paper, plastic wrap and more throughout the entire winery.

16. Spottswoode Estate Vineyards

For more than 30 years, Spottswoode Estate Vineyard & Winery has farmed its legendary Napa Valley estate vineyard 100% organically. In 1985, decades before most winegrowers were thinking about sustainability, or chemical-free farming, Spottswoode's owner, Mary Novak, and her renowned founding winemaker, Tony Soter, transitioned their historic estate vineyard to organic farming. In 1992,

Front gardens of Domaine Carneros Vineyards.

CREDIT: DOMAINE CARNEROS VINEYARDS

this decision culminated in Spottswoode becoming only the second estate vineyard in Napa Valley to earn CCOF organic certification. More than just establishing Spottswoode as one of Napa Valley's most environmentally conscious wineries, this decision has had an industry-wide impact. Because Spottswoode's Cabernet Sauvignons are recognized as among the finest in the world, with renowned wine writers comparing them to the great First Growths of Bordeaux, this decision has shaped the thinking of generations of California vintners—proving that being green is in no way incompatible with greatness.

CREDIT: SPOTTSWOOD WINERY

Spottswood Winery gate entrance.

Farming organically is just one aspect of Spottswoode's commitment to the environment—a commitment that has been continued, and greatly expanded, by a passionate second generation of the Novak family. In 2007, under the leadership of winery President Beth Novak Milliken, Spottswoode joined 1% for the Planet, the pioneering organization founded in 2001 by environmental activist Yvon Chouinard. As one of only 1,200 member companies around the world, Spottswoode has made the huge commitment to contribute 1% of its gross revenue on an annual basis to organizations that share its environmental values.

Beth also developed partnerships within the community, and with various governmental agencies, to restore Napa Valley's Spring Creek, which defines the southern border of the Spottswoode Estate Vineyard. In 2007, Spottswoode began installing several solar arrays to offset the winery's energy needs. Today, this system has grown to include 90 kW of arrays that offset 100% of the winery's annual production and office-related energy needs, and a 30 kW system that generates roughly 75% of Spottswoode's agricultural energy needs. Additionally, Spottswoode has established a 7 kW system on the estate's historic home, with the goal of offsetting 100% of Spottswoode's residential energy needs. Most recently, Spottswoode became an early adopter Tesla Driving Destination Partner when it installed a complimentary electric vehicle charging station.

In addition to being organic, Spottswoode also cultivates its vineyard biodynamically. Beth says "When you have the privilege of farming a vineyard like Spottswoode, that's over 130 years old, it comes with an appropriate sense of responsibility. As stewards of our land, we think about how our decisions will affect the vineyard for decades, even generations, to come." Spottswoode's holistic approach also embraces biodiversity as a method of ensuring the energetic health of the vineyard. To promote this biodiversity, the vineyard is farmed using cover crops and the estate includes owl boxes, bluebird boxes, green-winged swallow boxes, bee boxes, a raptor box, restored riparian areas and numerous year-round insectaries. The property is also home to chickens and goats, which further contribute to the vitality of the estate.

In recognition of its remarkable commitment to the environment, Spottswoode has earned several important certifications over the years. In 2004, the California Land Stewardship Institute awarded Spottswoode its Fish Friendly Farming certification. The following year, the Spottswoode Estate Vineyard became one of the first vineyards to earn certification through Napa Green Certified Land, and in 2010, Spottswoode became a Certified Green Winery through Napa Green. As a result of Spottswoode's decades-long commitment to sustainability and the environment, Spottswoode was honored by the Great Wine Capitals Global Network with the "2016 Sustainable Wine Tourism Practices Award of Excellence." ST

Spottswood Estate Vineyard's rooftop PV panels

CREDIT: SPOTTSWOODE ESTATE VINEYARDS

70x More New Capacity from Renewables than Gas in 1st Quarter 2016

By **Ken Bossong**

Ken Bossong
(*sun-day-campaign@hotmail.com)* is Executive Director of the SUN DAY Campaign, a non-profit research and information organization working on renewable energy and energy efficiency issues. He is a consultant to American Councils and IREX on the selection and placement of scholars from the United States, the former Soviet Union, and Africa working on environmental and other policy issues.

Setting a new lopsided quarterly record, renewable sources (i.e., wind, solar, biomass, and hydropower) outpaced -- in fact, swamped -- natural gas by a factor of more than 70:1 for new electrical generating capacity placed in-service during the first three months of calendar year 2016.

According to the latest just-released monthly "Energy Infrastructure Update" report from the Federal Energy Regulatory Commission's (FERC) Office of Energy Projects, nine new "units" of wind provided 707 megawatts (MW), followed by 44 units of solar (522 MW), 9 units of biomass (33 MW), and one unit of hydropower (29 MW). By comparison, only two new units of natural gas (18 MW) came on line. There was no new capacity reported for the quarter from coal, oil, nuclear power, or geothermal steam.

Further, solar (75 MW), wind (72 MW), and biomass (33 MW) accounted for 100% of new generating capacity reported by FERC for just the month of March. Solar and wind were the only sources of new capacity in January as well.

Renewable energy sources now account for 18.11% of total available installed generating capacity in the U.S.: water - 8.58%, wind - 6.39%, biomass - 1.43%, solar - 1.38%, and geothermal steam - 0.33%. For perspective, when FERC issued its very first "Energy Infrastructure Update" in December 2010, renewable sources accounted for just 13.71%.

Moreover, the share of total available installed generating capacity now provided by non-hydro renewables (9.53%) not only exceeds that of conventional hydropower (8.58%) but is also greater than that from either nuclear power (9.17%) or oil (3.83 %). *

"While often touted as being a 'bridge fuel,' natural gas is increasingly becoming an unnecessary bridge to nowhere," noted Ken Bossong, Executive Director of the SUN DAY Campaign. "As renewables continue to rapidly expand their share of the nation's electrical generation, it's becoming clear that natural gas will eventually join coal, oil, and nuclear power as fuels of the past."

The Federal Energy Regulatory Commission released its most recent 6-page "Energy Infrastructure Update," with data through March 31, 2016, on April 27, 2016. See the tables titled "New Generation In-Service (New Build and Expansion)" and "Total Available Installed Generating Capacity" at: http://www.ferc.gov/legal/staff-reports/2016/mar-infrastructure.pdf.

*** Note that generating capacity is not the same as actual generation. Electrical production per MW of available capacity (i.e., capacity factor) for renewables is often lower than that for fossil fuels and nuclear power. According to the most recent data provided by the U.S. Energy Information Administration, actual net electrical generation from utility-scale renewable energy sources totaled about 14.3% of total U.S. electrical production as of January 31, 2016 (see: http://www.eia.gov/electricity/monthly). However, this figure understates renewables' actual contribution because neither EIA nor FERC fully accounts for all electricity generated by distributed, smaller-scale renewable energy sources such as rooftop solar (e.g., FERC acknowledges that its data just reflect "plants with nameplate capacity of 1 MW or greater").**

Off-Grid Living

by Leaf Running-rabbit

Dear Fellow Solar and Earth Enthusiasts!

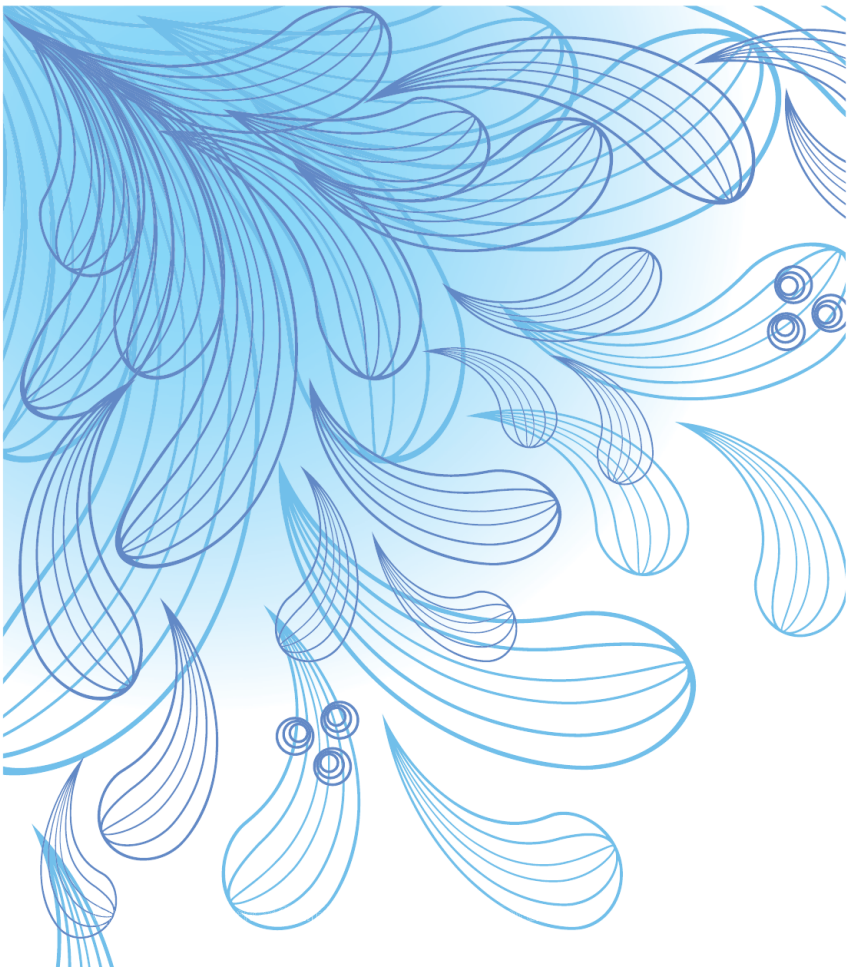
This is the time of year again when we have to decide whether to leave our solar panels upright in the winter sun position for yet one more week in fear of another heavy snow, or do we take the plunge and lay them down further in hopeful anticipation of a long lasting and committed summer sun?

For me, living at 9,200 feet elevation high in the Rocky Mountains, this can seem like a major and monumental decision. If I lay the solar panels down too early, then yes, I may be able to draw in more power since the sun is higher in the sky, but I may be finding myself having to trek my way up there in order to clean off the freshly fallen spring snow. Oppositely, if I go ahead and leave them in their winter, more upright, position, then no, I will not have to trek up there to clean snow off of them, but I will be gaining less solar input based on a less-than-ideal angular orientation toward the sun.

Solar input, or in other words, the absorption of solar sun power into my battery bank which I can then use as normal ol' everyday electricity, hinges specifically on the angle of your solar array toward the sun, the array's orientation to the Four Directions (mainly toward the South in this hemisphere), temperatures and length of day, and your personal ability to maintain your solar panels, in my case, free and clear of snow and other deterrents that block sun rays.

Here are some basic solar facts: the more directly your solar panels are angled to the specific slant of sunrays hitting your array, the more solar input you will receive; the absolute colder the temperatures are outside, such as winter temperatures, the more solar input you will receive; the closer you have your solar array pointing due south, give or take a few degrees, the more solar input you will receive during a day; and finally, the cleaner you keep your panels, whether free from dust, pollen, snow, or shade, the more solar input you will receive.

This is one of the things I absolutely LOVE about living off the grid and living with solar: I am intentionally living in direct relationship with the Four Elements of the Earth! It is one way of being even more Earth-centered in my lifestyle and lifeways! I am becoming ONE with Nature! And I am all the more aware of my dependence on Her, the Earth, and on my own need and desire to protect and serve Her better, as She is serving me.



How, you may ask, is living off the grid with solar energy, living in direct relationship with the Four Elements of the Earth? Good question!

EARTH, as always, is our starting point. Our Earth sits in a direct angular relationship with the Sun, and it changes not only seasonally, but morning, noon, and night. Before I had this larger and more permanently-mounted solar array, in the little squatter's cabin I lived in for 17 years that you may have read about in the Winter edition of *SOLAR TODAY* Magazine, I had only a two-panel solar array simply held together in a 2x4 wooden picture frame that I kept leaned up against a tree. My daily routine was to go out there in the morning and turn the panels to point toward the morning sun, toward the East. At midday, if I happened to be home, I would go back out there and point the panels toward the midday sun, toward the South. And then in the late afternoon, I would go out there one last time, and point the panels toward the evening sun, toward the West. But never not one time did I ever point the panels toward the North. Ever.

AIR, as always, is our continuing line. Our atmosphere is what helps to reflect and bring the sun rays to our solar panels. I believe it is the refraction of light through our airy atmosphere that makes solar input even possible. Additionally, and I am not sure of the specific how's and why's of this, but the colder the air temperatures outside, the stronger the solar input inside. Like us, our Earth is breathing, and like the Earth, our solar panels are breathing in the Sun! Inhaling into our battery banks, exhaling through our lights. Whoa. Very yogic, you might say. Bottom line is, without the air and atmosphere that we specifically have, I may not be writing about solar living at all.

FIRE, as expected, is the next of our continuing lines. The Sun *is* fire. Without fire, there would be no sun. And without sun, there would be no solar power. Period. This, obviously, is the easiest of the Four Elements to figure out and understand in relation to solar living. The Sun is resonant of our own hearts beating within our bodies. The Sun can be looked at as the Earth's heart beating within the "body" of our Universe. Just like our own hearts, it is what keeps us alive, it is what keeps us living, it keeps the flow flowing, and the love loving. Passion is one of the forces of Nature that keeps us striving toward our potentials, acting out upon our capacities, and revitalizing our vitalities. Living with the power of the sun is no different. There has not been one single time that after having turned on a simple light, that I did not feel one hundred percent and completely amazed that I was turning on the sun in my own home, and in my heart.

PHOTO BY LEAF RUNNING-RABBIT

PHOTO BY LEAF RUNNING-RABBIT

WATER, as expected, is the ending point of our use of the Four Directions. Water flows through all of us like rivers. Water flows through our atmosphere like clouds. Water, as far as solar input and solar living goes, is largely related to the AIR and the way sun rays pass through our atmosphere, into our panels, and into our homes. Water is a major part of the refraction of light, at least I think. I am not a scientist by any means, but I believe that without water in our atmosphere, we would not be receiving nearly as much solar input as we do by having water in our atmosphere. All I know, is that sometimes I feel tears of happiness well up in my eyes just knowing and realizing that I am in direct communication with the Sun and with the Four Elements of the Earth, and friends, those watery tears are a direct result of living my life as earth-centered as possible, and having a sincere and loving relationship with those four elements.

Ok, so getting back to the question of tilting my panels for summer sun right now, or leaving them more upright in their winter sun position for another couple of weeks so that snow falls off of them more easily… Well, after going through all of the Four Elements and all of the beautiful ways that I am in a love affair with Nature, now makes this question seem not so important.

Now I've decided it doesn't really matter. One more week this way, one less week that way…I think I'll just go out there and sit with them and revel in my passion. **ST**

Please see and read more by following my Instagram feed @wildbe. And thank you for reading!

Blessings Always! **ST**

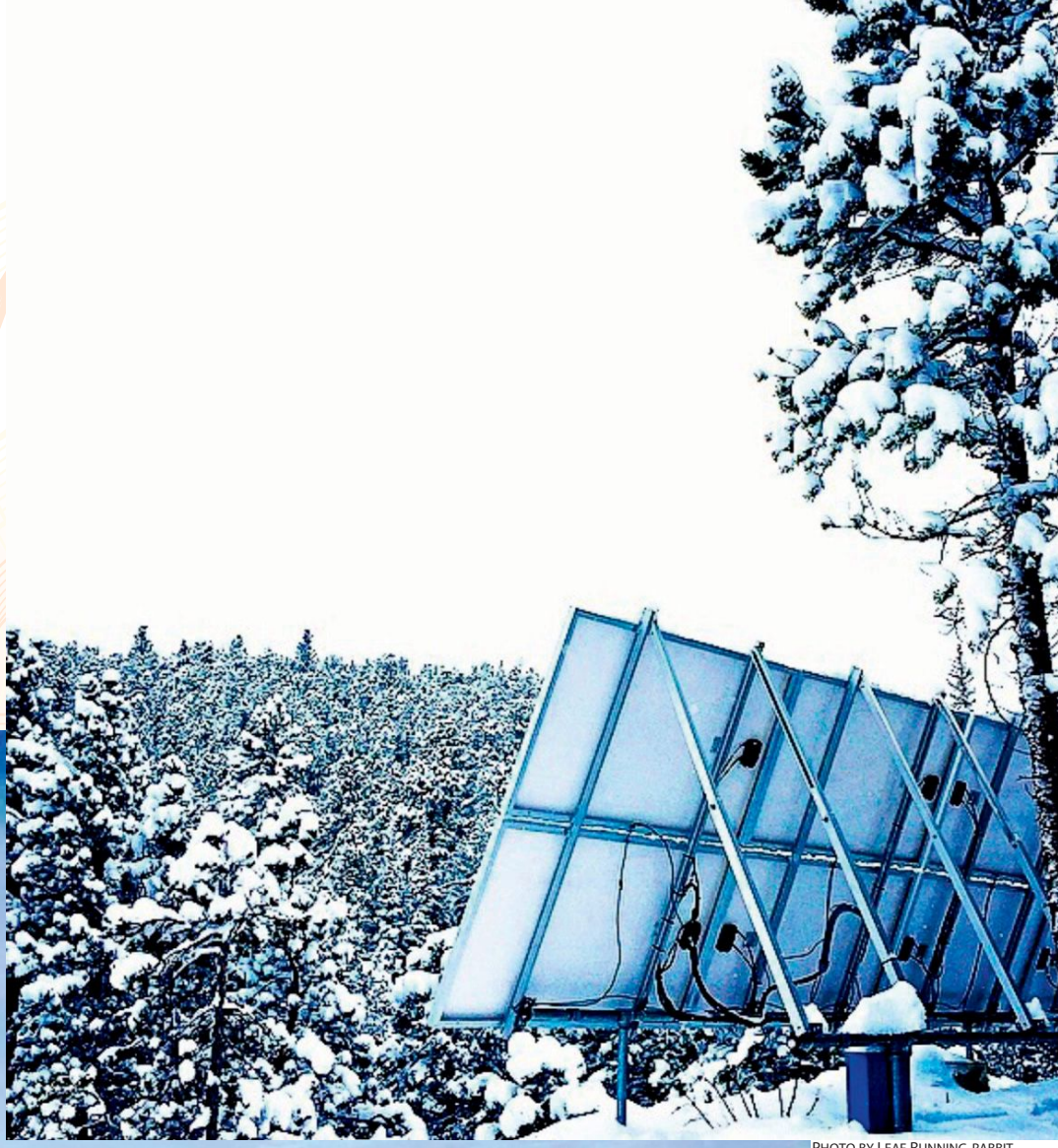


PHOTO BY LEAF RUNNING-RABBIT

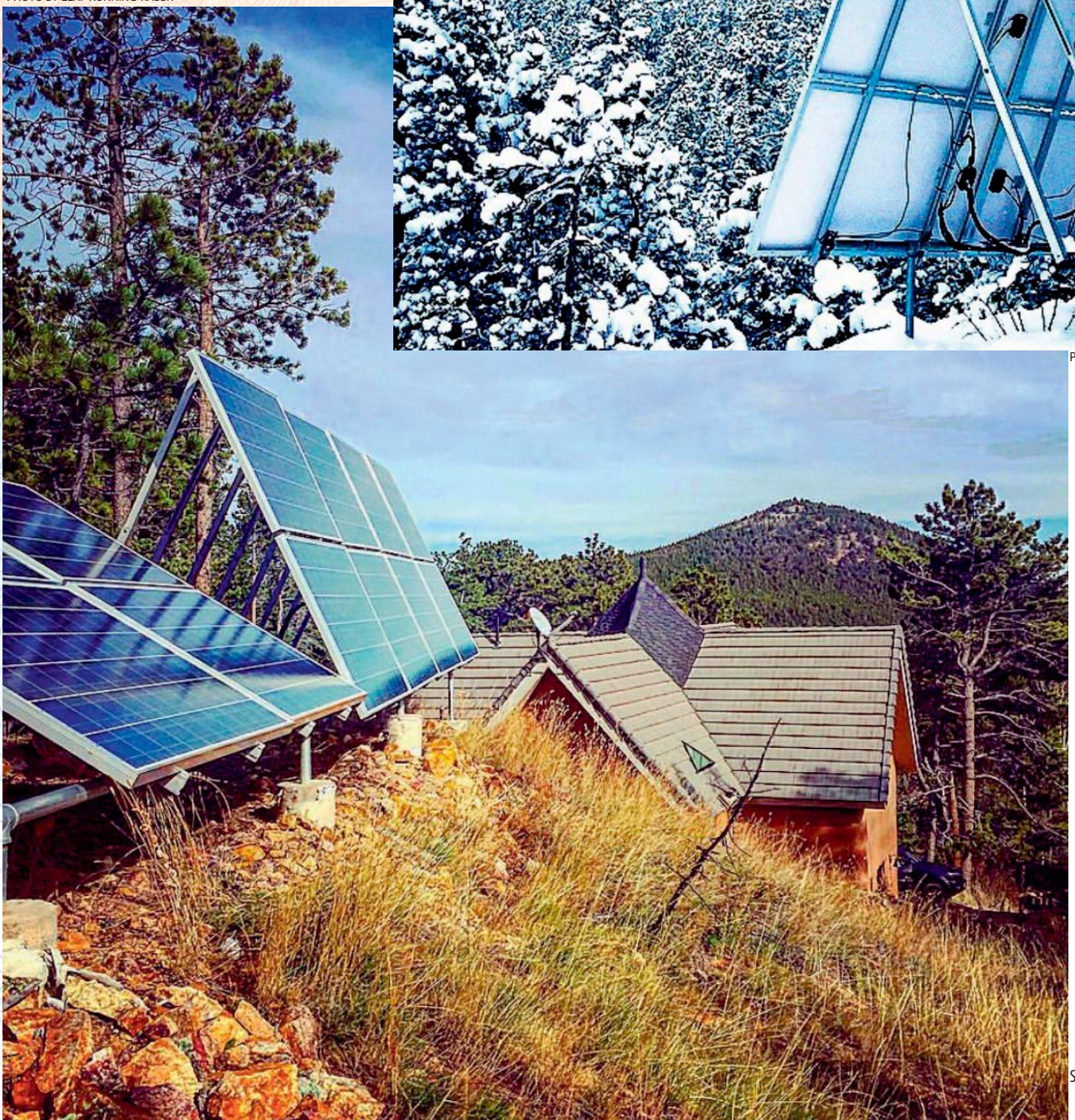


PHOTO BY LEAF RUNNING-RABBIT

All Points North Foundation and GRID Alternatives Go the Distance to Bring

SOLAR AND SUSTAINABLITY TO TRIBAL LANDS

by Mark Dudzinski

Rose All Runner was born on the Picuris Pueblo, high in the Sangre de Cristo Mountains of northern New Mexico. Once the largest of the northern Pueblos, the community today has 328 enrolled members and just 86 living on the Pueblo. As a tribal elder, All Runner has seen a great deal of change in her lifetime. She can distinctly remember a water pump in the village that froze during the winter, prompting the family to laboriously haul water from the river. They had none of the conveniences typically considered core home life essentials – light, electricity, indoor plumbing. And even now, during chilly Rocky Mountain winters, a constant fire in her wood stove heats the home she shares with her son Ed, whose collection of track and field trophies gives testament to the family name.

The Picuris of today have more modern amenities than in times past, but in some ways, life here

DISCUSSING ELECTRONICS.PHOTO: JESSICA NELSON, GRID ALTERNATIVES

Picuris Pueblo is not alone in its limited economic opportunities. Of the 2.9 million Native Americans in the United States, approximately 638,000 people live on 325 reservations across the country. In 2013, almost one-third (29.2%) of Native Americans lived in poverty, by far the highest rate of any ethnic group and nearly double the national average.

Many of the tribes with the greatest needs are located on remote, rural reservations that are well beyond a reasonable driving distance from metropolitan areas. Some tribes have large populations that are living without basic resources; on the Navajo Nation, for example, an estimated 16,000 families do not have access to electricity.2

Tribal populations face some of the highest unemployment rates in the United States. The national Native American unemployment rate of 11 percent in late 2014 was almost double the national rate of 6.2 percent, according to the U.S. Department of Labor, and in some reservations the rates are much higher.

As tribes like the Picuris look for ways to address their economic challenges and create meaningful employment opportunities for their members, solar power has been gaining traction. A clean, cost efficient alternative energy source, solar can not only significantly reduce the energy cost burden for tribal members, but it can also provide jobs both on and off the reservation.

is as challenging as it has always been. Located in a remote area far from urban centers, Picuris Pueblo is a resilient community with a diverse economy, and families here have been able to preserve their culture and lifestyle. Modern Picuris is home to a high-quality charcoal briquettes manufacturing plant, a thriving herd of bison, and is the majority owner of the Hotel Santa Fe. Yet, even with these businesses, the tribe struggles to find economic opportunity for its residents. Most tribe members must travel off the reservation for work, and many are unemployed.

Rose All Runner was skeptical at first when she was selected to receive solar panels on her roof as part of a demonstration project with nonprofit GRID Alternatives and the Northern Pueblo, but today, the 12-panel, grid-tied system she received has significantly reduced her monthly energy costs. Its installation also provided hands-on training for community members, and is helping educate the community about solar technology and its benefits.

The project was funded by a grant from All Points North Foundation (APNF), a small, private foundation based in Boston, MA, dedicated to driving awareness, education, training, and hands-on application of solar as a practical and cost-efficient energy source. The purpose of the project, which includes three installations for Northern Pueblo families, is to model sustainable energy development in Native American communities.

GRID Alternatives, a national organization that makes solar power and job training accessible to underserved communities, has partnered with over 30 tribes across the country to install solar for more than 330 tribal members since 2010, and works with tribal colleges to provide students with hands-on training to supplement their solar curriculum.

These partnerships have generated savings of up to 90 percent on electricity costs for families, while preserving cultural traditions with clean, renewable energy whose source is non-imposing on the land. Partnerships and participation are built with local community organizations, job training groups, energy efficiency providers, and solar subcontractors for employment opportunities. And the cost to the communities has been minimal, with funding provided by corporate, foundation, and government grants and incentives.

When done right, solar development in these communities can have a domino effect of providing training, creating job opportunities, promoting partnerships and volunteerism, and ultimately becoming a local and regional economic "engine that can" while fighting climate change that burdens the nation.

"GRID looks out for those who can most benefit from solar power and solar jobs and APNF is proud to support their important work with Native American communities," said Laura Staich, executive director of APNF. "This pilot is powerful and serves as an affirmation of how tribal nations are successfully adopting and adapting to solar, finding a foothold in green training through "classroom rooftops" for tribal members and their inspiring communities."

Intent on bringing solar to benefit "all of us," GRID Alternatives was honored for its work with tribal communities in 2013 by the U.S. EPA Region

PHOTO: JESSICA NELSON, GRID ALTERNATIVES

PHOTOS: JESSICA NELSON, TEAM GRID ALTERNATIVES

9, and expects to continue to expand its partnerships with tribal communities across the U.S. GRID formally launched its national tribal program in 2014, building on work begun in 2010 in California, and opened its first tribal satellite office to serve families in the North Coast region of California. The nonprofit also partnered with like-minded Henry Red Cloud's Lakota Solar Enterprises and Trees, Water & People in an inter-tribal demonstration project on the Pine Ridge Reservation in South Dakota in July of 2014. Project leaders point to these initiatives as affirming the belief that reducing dependence on expensive and polluting fossil fuels is critically important. And, they add, on tribal lands, it is imperative. In 2014, GRID Alternatives was recognized as a Champion of Change by the White House.

Demonstration projects like GRID's are helping build momentum among tribes around bold renewable energy visions. The Picuris Pueblo, along with its supportive housing authority -- the Northern Pueblo Housing Authority (NPHA) -- has ambitious goals to extend solar photovoltaic (PV) in its community. The tribe had already installed a solar electric system on its 2,640-square-foot firehouse, New Mexico's first net zero energy building in Penasco, about 50 miles north of Santa Fe.

"NPHA is thrilled to be partnering with GRID Alternatives and All Points North Foundation to provide a home solar powered system to a low-income homeowner at each of the three New Mexico Pueblos we serve," said Scott Beckman, executive director, NPHA, noting that Ms. All Runner was already saving $80 a month. "That's a life-changing lot of money for someone living on a fixed income so she is very happy with her new system. We're hopeful that positive results like these will be part of building the awareness and support partnerships like ours need to bring the benefits of renewable energy to homes around the country."

For Forestry and Fire Director Luther Martinez, Ms. All Runner's installation was not only a logical next step for the community, but also a great opportunity to provide a real-time platform for education about solar technology, and to help them better maintain the fire station's system. "Picuris Pueblo is an isolated community, so we have to just use what we have got," he said. "If anything breaks we will now have some knowledge on how to fix it."

And they will need that knowledge. In March, Picuris Pueblo was awarded funding by the Department of Energy via the Northern Pueblos Housing Authority to install a one megawatt solar array to offset the electricity of all 50 homes and 12 tribal buildings. (See: http://energy.gov/articles/energy-department-announces-over-9-million-funding-16-indian-and-alaska-native-community.)

"Solar power is a great tool for tribes that are looking to develop economically in ways that resonate with our cultural values," said Tim Willink, Director of Tribal Programs for GRID Alternatives, who is himself a Navajo. "It can reduce energy costs for families and communities, bring power to remote regions for the first time, and provide new employment opportunities in places where they are scarce. And best of all, it's clean, with very low impact on the land."

With support from organizations like APNF, GRID is moving full throttle on new strategic partnerships with tribal job training organizations, community-based partnerships, technical assistance linkages with tribal entities in remote rural regions, and the completion of over 100 additional solar installations with at least 12 different tribes across Arizona, California, Colorado, Montana, New Mexico, New York South Dakota, Utah, and Washington in 2016.

Each project is unique, developed in close collaboration with the local community to align with their development goals, cultural and ancestral heritage, and sovereignty. And the projects are designed to not only last but become springboards for future projects, with built-in skill building and community education opportunities that ensure the expertise to maintain the systems and build new ones remains with the tribe.

Recent projects include four grid-tied residential photovoltaic (PV) systems in a housing development built for low-income Spokane Indian families in eastern Washington; a solar array installed by tribal volunteers and university students on the home of Karen Spotted Tail in South Dakota, a Rosebud Sioux whose community faces unemployment rates as high

as 83 percent; and an off-grid solar electric system for a Navajo elder and Vietnam Veteran in Arizona who had never had electric power before. In early 2016, GRID will install solar systems for two more Northern Pueblo families as part of the demonstration project that included All Runner's installation.

GRID also provides one-year service learning fellowships for tribal members through its SolarCorps program, including Cheyenne Poorbear, a Lakota Sioux Tribal Member from Pine Ridge, who volunteered with GRID Alternatives while living in Denver and was hired to work with tribal communities in California's North Coast.

Both APNF and GRID Alternatives leadership recognize the importance of driving demonstration projects forward, not as fleeting, one-time efforts but as a solutions-oriented springboard for both scalability and sustainability. Partnering closely with tribal communities and rooting projects in their broader development goals promotes continued opportunities for economic growth, providing the tribal residents not only with connectivity of solar "power" but "power" of another sort – important work experience, professional and practical working partnerships, and a growing economy in an area where the benefits have a very high impact.

But helping tribes scale solar will require sustained, long-term investment not just from nonprofits and local foundations but also from the government and business sectors, as well as policies that support solar development. In places where net metering is not supported, for example, the economics of grid-tied solar PV are challenging at best.

"The opportunity here is tremendous," said GRID Alternatives CEO and co-founder Erica Mackie. "By working in partnership with tribes and investing in their vision for renewable energy development and sustainable economic growth, we can help bring cleaner air, lower energy costs, and good job opportunities in places that need them most."

The hurdles to creating true scale make this work that much more of a priority for APNF. From the start,

PHOTOS: JESSICA NELSON, TEAM GRID ALTERNATIVES

APNF has been intentional about supporting communities that have been overlooked or underserved. As the All Points North Foundation's own logo, a compass, symbolizes, all people and communities should have the opportunity to overcome adversity and APNF is dedicated to navigating communities upward.

The funding of the three Pueblo demonstration projects is the latest in a string of APNF solar energy grant making. APNF grants to date across the country have empowered students to lead a cultural shift in their schools, brought solar to a theatre stage, and helped a wildlife sanctuary cut electricity costs. Through the Center for ReSource Conservation ReNew Our Schools grant, schools compete to see who can lower their energy footprint by the biggest percentage using their eGauge energy monitors to analyze their electricity use. Those that reduce electricity use by the greatest percentage walk away with photovoltaic systems on their school roof. For Dell'Arte International, APNF's grant enables the critically acclaimed theatrical organization to increase the theatre's energy efficiency and utilize the region's available solar power. A 17kW solar generator will offset up to 70 percent of its electricity use. APNF also helped Everybody Solar harness the power of the sun for Wildlife Associates, a 120-acre wildlife sanctuary in San Francisco's Half Moon Bay.

APNF invites other like-minded corporations inside and outside the renewable energy circle to collaborate on future projects. "There is undoubtedly strength in numbers when collaborating partners – tribal communities, housing authorities, nonprofit organizations, private foundations and solar installers – can come together to provide financial support, job training, and in-kind resources," noted Staich who saw first-hand the need of tribal communities during a site visit to New Mexico. "We invite other organizations to partner with these resilient tribal families and communities to continue to enhance their quality of life while paying homage to their Native cultures and environment." ST

About the Author

Mark Dudzinski

Mark Dudzinski is a board member of All Points North Foundation, a small, private foundation based in Boston, MA. He also serves as the volunteer chairman of its Solar Subcommittee. After "retiring" from a 27-year high profile career as Chief Marketing Officer with GE Energy, he took the diverse skills he honed in the business world and now applies it to helping others through philanthropy work at APNF nationally. Internationally, he is founder of Light the World, a non-profit organization dedicated to bringing cost effective lighting to the 1.2 billion people who live by firelight when the sun sets. He is intent on changing the electricity delivery model globally.

All Points North FOUNDATION

For more information on these and other similar kinds of solar energy projects that APNF supports, go to: http://www.allpointsnorthfoundation.org/in-the-news.

For more information on the many solar initiatives that GRID Alternatives champions, go to: http://gridalternatives.org/headquarters/news/solar-helps-bring-sustainability-northern-pueblo#sthash.dSoEF85h.dpuf.

1 US Census Bureau data, http://www.infoplease.com/spot/aihmcensus1.html
2 Navajo Tribal Utility Authority, http://www.ntua.com/
3 American Fact Finder, US Census Bureau, http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml
4 Northern Pueblos Housing Authority, http://www.nphousing.com/communities/#_ftn1
5 U.S. Department of Energy, "Energy Department Announces Over $9 Million in Funding for 16 Indian and Alaska Native Community Clean Energy and Energy Efficiency Projects", http://energy.gov/articles/energy-department-announces-over-9-million-funding-16-indian-and-alaska-native-community

The Tiny House Competition

Photo courtesy of Tumbleweed Tiny House Company.

Saturday, October 15, 2016 | 9 a.m. - 4 p.m.
Cosumnes River College, Parking Lot E

– Come see California college teams compete.
– Tour 10 tiny houses.
– See how you can live big and spend small.

Learn more at smud.org/tinyhouse.

- Music
- Prizes
- Food Trucks
- Vendor Fair

SMUD®
Sacramento Municipal Utility District

Powering forward. Together.

0347-16

Solar Wearables

by Brooke Nally

sustainable energy specialist with solarpowerauthority.com

Today, a lot of excitement surrounds wearable tech, Internet-connected fashion accessories and clothing that represent the ultimate in mobile technology. Did you know that soon solar power will also become a buzz word among many trendy fashion designers? Innovative dress designers such as the Netherland's Pauline Van Dongen have recently begun incorporating miniaturized solar power panels into some wearable items, enabling customers to use their attire to re-charge their cell phones. This trend promises to transform the fashion world within this decade.

Last January, Aaron Tilley presented a technology article on the Forbes website welcoming the arrival of Swarovski Shine, the first fashion line of jewelry dedicated to generating solar power to recharge wearable tech. The product of a venture undertaken by the eminent Swarovski jewelry design house and a startup company, Misfit Wearables, this new product does not even require extensive exposure to sunlight to begin generating small amounts of power. A mere ten to 15 minutes of outdoor activity can supply an associated fitness and sleep tracking device with sufficient energy to function for several days, a significant energy savings for consumers.

What benefits will users of the system derive? The solar tech jewelry reportedly retails for a price between $170 and $250. This system works with the approximately $80 Shine computer-connected fitness tracker to generate real time information. People maintaining exercise programs and diet regimens can use the innovative wearable tech to:

Soon, instead of a daily test of meal time and workout willpower and motivation, weight control will become more a matter of plugging into effective emerging technologies, such as Shine, and monitoring one's fitness readings at regular intervals.

Devising Energy-Efficient Wearables

Experts point to two essential challenges still facing companies as they enter the haute couture realm of stylish sunshine-empowered clothing and accessories. Harvesting energy and storing it both remain important research issues.

Several options exist for implementing the former process; design innovators have begun exploring everything from wearable solar cells, like ones used by Pauline Van Dongen, to imaginative thermoelectric and piezoelectric systems. As this decade progresses, the public will probably see some very creative new solar fashion items reach the market.

Wearable Power

Now consumers and high-tech fashion houses seem poised to reap some of the rewards of all this intense scientific inquiry. Innovators such as Pauline Van Dongen have already started searching for ways to incorporate sunshine power into daily wear. Expect some stunning new products to catch your eye in the near future!

- **Keep a running tally of daily calories utilized;**
- **Monitor the number of foot steps undertaken each day;**
- **Assess the quality of sleep at night, and more.**

IMAGE CREDIT: MISFIT WEARABLES

modernize®
HOME EMPOWERMENT®

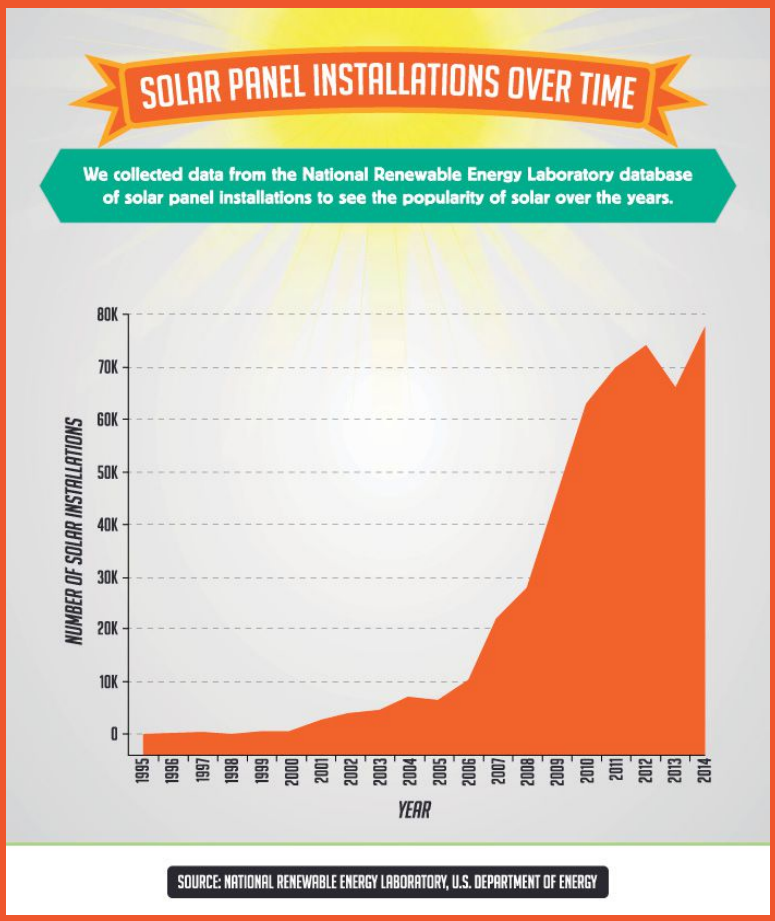
Across demographics, the appeal of solar energy is strong. Even as the nation debates the necessity of renewable energy sources, the appeal of harnessing the sun's rays holds sway. Whether you're interested in doing your environmental part, or simply saving money on your electric bill each month, the benefits of solar speak for themselves. No wonder a recent nationwide Gallup poll showed 79% of those surveyed support an increased emphasis on solar in the years to come.

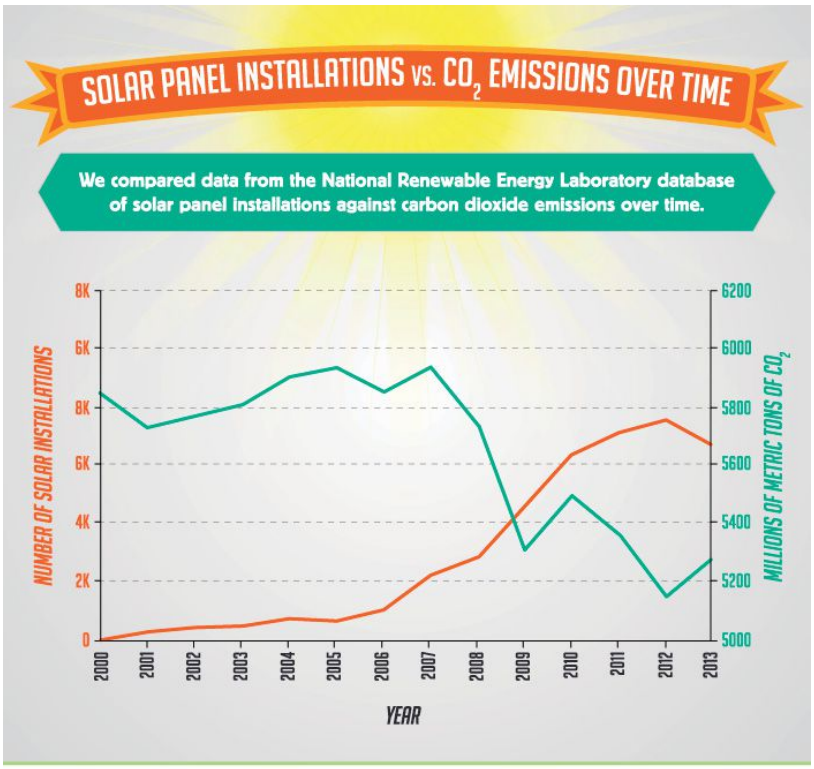
But if solar is as close as we come to uncontroversial energy, where does public opinion produce action? If we want to delve deeper than widespread idealism, there's one concrete measure of where Americans are getting serious about solar: actual installations. We tracked down the data to show which parts of the American landscape are moving beyond just talking the talk and actually adopting solar panels.

Solar Sunrise: The Increase in Installs

Here's the big – and bright – picture: In recent years, solar has enjoyed an exponential surge in popularity. While the solar market has seen slight dips or moments of stasis in some years, the broader trend is encouraging to those who wish the technology were applied more broadly. If the yearly count of installs can go from mere hundreds to nearly 80,000 in just two decades, just how much can the industry expand in coming years?

Another interesting note: The deepest years of the recession seem to have left solar relatively unscathed. That's a striking fact, at a time when many homeowners and businesses chose to





SOURCES: NATIONAL RENEWABLE ENERGY LABORATORY, U.S. DEPARTMENT OF ENERGY

delay other structural improvements, citing cost concerns. The relative resistance of solar to economic upheaval may indicate an interesting dynamic. During the downturn, it's possible that families and businesses chose to invest in a technology with a proven track record of sustainable return on investment. After all, how many other upgrades offered the same guarantee of financial benefits?

Solar vs. CO2

Another encouraging reflection: Solar panel installations seem to have an inverse relationship with CO2 emissions. Except a period of mutual rise from 2009 to 2010, when one indicator goes up, the other falls. Of course, there are dozens of other variables at work, and solar can't claim full credit for the correlation. Plus, the trend includes a 2013 uptick in emissions and a downturn in installs. Despite those conditions, there's good reason to believe that America's carbon footprint shrinks when solar surges.

Solar Installations by State

Now it's time to see which states lead the charge. Ok, we hear you – no big surprise that California is king when it comes to solar panel installs. The state has a legacy of environmentalist culture, and a record of hard facts to match. In fact, its total number of installs dwarfs those of even their closest peers, like No. 2 Arizona, which boasts its fair share of sun.

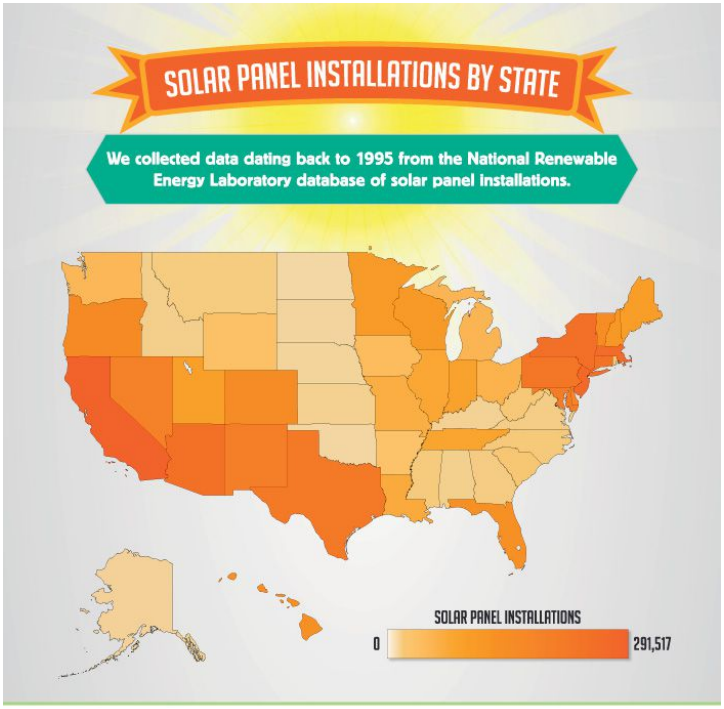
There's an interesting trend of Northeastern states ranking high in solar panels installs, with spots 3 through 7 occupied by New Jersey, Massachusetts, New York, Connecticut, and Pennsylvania. It just goes to show: You don't need to bask in consistent sunshine to feel the solar appeal.

Considering Capacity

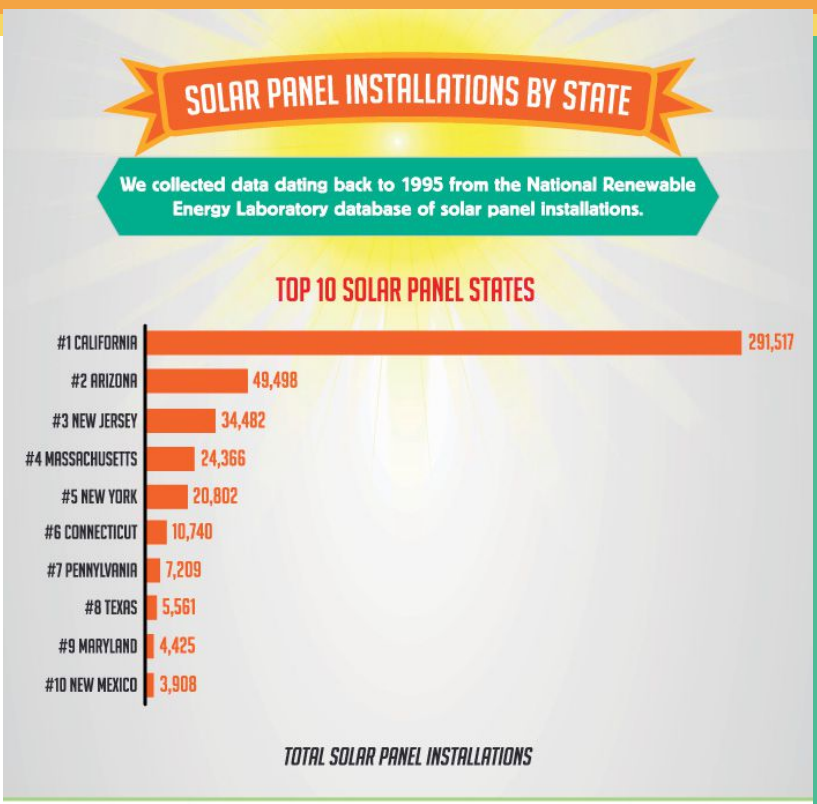
While install totals are a good measure of the technology's popularity, they don't necessarily tell the whole solar story. Not all installs are created equal – each set of panels varies in size and efficiency. To see where the most solar energy is being created, we measured the total production capacity of the solar installs by state.

> Solar panel installations seem to have an inverse relationship with CO_2

California still sits atop the rankings, but other states shuffle relative to the install count graphics farther above. Nevada, Colorado, and Minnesota make this top 10, and New Jersey ascends to the second spot. That's partially due to strong solar programs in the Garden State, like a $500 million program regultors approved in mid-2013. That point brings us to our next subject …



SOURCE: NATIONAL RENEWABLE ENERGY LABORATORY, U.S. DEPARTMENT OF ENERGY



SOURCE: NATIONAL RENEWABLE ENERGY LABORATORY, U.S. DEPARTMENT OF ENERGY

Installations vs. Incentives

Lots of states have moved to make solar particularly attractive, through incentives such as tax breaks or spending initiatives for which solar companies eagerly bid. It's not just politicians playing to the tide of popular opinion swelling around social: There's a genuine desire to position their states at the forefront of an energy revolution long in the making.

You'll notice that many of the top capacity states make this list as well. While some incentives function at the level of consumer kickbacks for implementing solar in their homes, most are targeted at the commercial or government level. Maybe that's why Colorado and Minnesota are close to the top in megawatts but not in total installs. Where incentives are at play, installs are fewer in number but greater in individual capacity.

Incentives by Affect

With so many states making concerted efforts to bolster solar panel installations in size and number, it's worth exploring where incentives seem to be working best. Policy outcomes are complicated to evaluate, especially when so many incentives are relatively new, with an aim of encouraging gradual results over time. Still, here's a basic indication of where incentive policies have caused solar to take off.

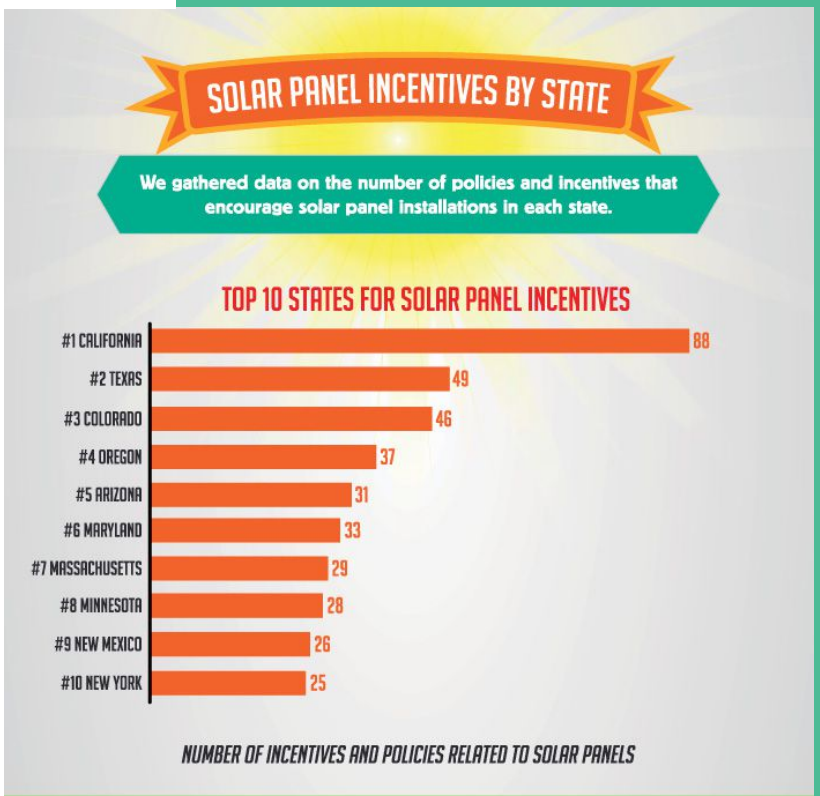
In this list, we see Delaware and D.C. emerge among the top-ranked states. While they boast relatively small populations, their efforts seem to be registering as effective compared with their peers.

Conclusion

From the Pacific to the Jersey Turnpike, solar panels are making their presence felt across the nation. After years without broad commercial adoption, solar panels are showing up in spots we might not have expected, and it's safe to say that more are on their way. We hope this look at the data behind solar installs across America sheds light on a phenomenon that many support generally but few understand in much detail. As successful solar installs are better understood and encouraged, there's no reason to think it can't change the face of our nation's energy – and soon!

Our Methodology

When it comes to solar installations, there's no source more authoritative than the National Renewable Energy Laboratory, an official laboratory of the U.S. Department of Energy. The folks at the NREL have developed a database of solar installations dating back decades by soliciting data from government agencies, industry leaders, and the public. It's called the Open



SOURCE: DSIRE, NC CLEAN ENERGY TECHNOLOGY CENTE

PV Project (PV standing for photovoltaic, a technical term for solar's energy conversion process), and it's arguably the most comprehensive documentation of American solar energy out there. That's why we studied its data for this project, compiling its records to track installations across the nation over time.

That being said, a few notes should be made clear in the interest of accuracy. All the data presented here are voluntarily submitted – the data we illustrate have been offered willingly by the individuals connected to each install. Here's how the NREL describes their own data collection methods, and how they hope the public will engage the info they offer:

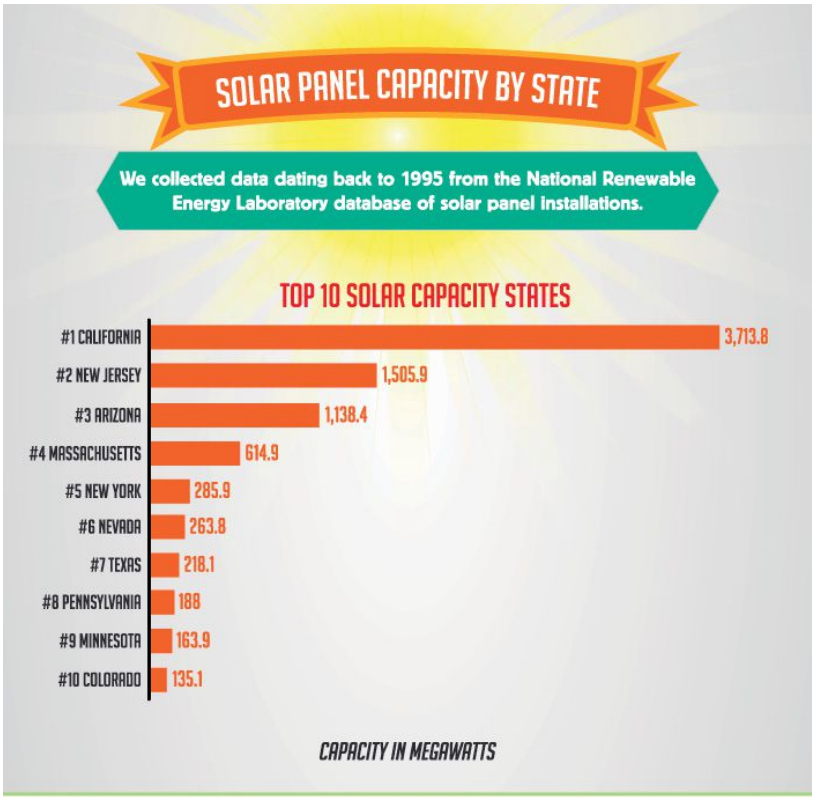
Data for the project are voluntarily contributed from a variety of sources including solar incentive programs, utilities, installers, and the general public. This database serves as a web-based resource for users to easily explore and understand the current and past trends of the US PV industry. The data collected is actively maintained by the contributors and are always changing to provide an evolving, up-to-date snapshot of the US solar power market.

That means that while our project offers the latest information from America's foremost government authority on solar, it doesn't account for all installs, everywhere. Rather, it presents facts and figures we can interpret as representative of the solar industry's wider dynamics and trends. This also means that the data included in the database are in a state of gradual change, as submissions roll in. Our project's data reflects the database at the time of publication, but it won't perfectly match the database as it's updated continually.

We also thank the NC Clean Energy Center for its Database of State Incentives for Renewables & Efficiency and the U.S. Department of Energy for its carbon emissions data.

Sources:

- https://openpv.nrel.gov/search
- http://www.dsireusa.org/
- http://www.eia.gov/environment/



SOURCE: NATIONAL RENEWABLE ENERGY LABORATORY, U.S. DEPARTMENT OF ENERGY

New "Be Solar Smart" Consumer Tools Promote Safe Installation and Fair Deal

Along with the growing number of Americans exploring powering their homes from the sun, comes the need to help consumers through the complex process of going solar.

Residential rooftop solar grew 66 percent in the U.S. last year. That means more consumer marketers and salespeople in the marketplace. More meetings with contractors and solar salespeople. More information to understand and more confusion.

Because there are many parts and intricacies of the transactions involved – some not so obvious and some difficult to grasp – the Interstate Renewable Energy Council (IREC) created a "Be Solar Smart Checklist," which offers a step-by-step guide to simplify the complicated. It is part of a consumer tool trio including IREC's Clean Energy Consumer Bill of Rights, the Solar Smart Consumer Checklist, and a Consumer Resources link list.

The three consumer tools were released recently by IREC, an independent, not-for-profit organization that has been increasing consumer access to safe, affordable renewable clean energy for nearly 35 years.

"We want consumers to be sold on solar but not left in the dark," says Jane Weissman, IREC's President/CEO. "The Checklist is an easy and clear way to getting solar panels on roofs and protecting the investments that put them there."

"These three practical guidance documents are equally important for consumers, government agencies, the industry, retailers, and others in the market," says Larry Shirley, chair of IREC's Board of Directors. "The consumer trio is a natural progression for IREC, which has always promoted consumer access and quality assurances by initiating standards, best practices, credentialing schemes, and model rules and procedures," says Shirley.

After a home, a solar system could be one of the biggest investments a consumer makes.

"After a home, a solar system could be one of the biggest investments a consumer makes," says Consumer Reports Policy Counsel for Energy and Environment Shannon Baker-Branstetter. "It's important for consumers to have independent information to guide them through the process to make sure reality meets their expectations and benefits of installing solar are realized."

IREC's Be Solar Smart Checklist provides questions for consumers to ask and ways to assure they are securing a safe installation and a fair deal. It walks through the issues that help consumers make informed decisions to meet their expectations and get the most from their investments.

IREC's Clean Energy Consumer Bill of Rights is a unique, unbiased tool intended to ensure that consumers have a positive experience with clean energy products, technologies, service providers, marketers, sellers and other market players including utilities. It also serves as a guide for government agencies and consumer groups to reference for practices and protocols they should expect and require of clean energy service providers.

"IREC doesn't have any financial gain in solar transactions," says Weissman. "The protective

CREDIT: IRECUSA

Larry Shirley, chairman of the IREC Board of Directors

"It's important for consumers to have independent information to guide them through the process, to make sure reality meets their expectations and the benefits of installing solar are realized."

—Consumer Reports

1. Preliminary Questions and Tips

Getting the most from your investment.

- Is your site suitable for solar energy? Is your roof shaded by trees or will trees grow to shade your roof later? Understand the orientation of your roof for maximum solar benefits.
- What is the age of the roof? If it needs replacing soon, this would mean removing and re-installing solar pan els.
- Start with an energy audit to improve the efficiency of your home or building.
- Compare solar installer offers.
- Should you lease or buy?

2. Access

Find out your local utility's policies on integrating and connecting solar.

- What utility fees are involved to connect to the elec tric grid, and to put power back on the grid?
- How long will it take to get approval from your utility company to hook up your solar installation to the grid?
- How much and how often will your utility company credit or pay you for net excess power you put on the grid? (i.e. What happens when the meter "runs backwards?")
- How will the utility measure your contributions to the grid and how will you access this information?
- Who will have access to data on your power usage and generation? Can you control or opt out of sharing it with third parties?

3. Safety

Ensuring safe installation.

Ask your contractor for documentation showing the following:

- Safety practices and procedures and how they will be followed.
- Licensing, permitting, bonding, and insurance require ments of your local and/or state governments.
- Worker training that adheres to industry standards.
- Industry-recognized credentials in good standing,
- such as those awarded by the North American Board
- of Certified Energy Practitioners.

4. Contracts

Securing a fair deal.

- If part of the contract does not make sense, ask for changes to the contract and/or seek legal assistance.
- Look carefully at all costs and financing terms, including those that may be variable or depend on the utility company or other factors outside of the contractor's control.

The following terms should be clearly defined:

- Ownership terms.
- Potential impacts on selling, modifying or refinancing the property, including liens, filings, etc.
- Termination and removal terms in cases of third-party ownership.
- Designation of responsible party for the proper disposal of the product at the end of its life.
- Performance calculations that specify and include all relevant factors. If installation and/or equipment will be monitored, find out what kind of data is being collected, who has ownership and access to the data, and if the data will be available and/or sold to others.

Contracts should include:

- A reasonable period for rescinding the contract.
- Remediation terms regarding any damage to the property from work.
- Warranties for equipment and workmanship.
- Verifiable minimum performance.
- Remedies if performance projections are not met.
- Start and end dates, if applicable.
- Contact information for duration of installation process.
- Contact information for follow-up, including a contingent contact if the company or product manufacturer ceases operations.
- Long-term maintenance plan and designated responsible party.
- Ask for documentation on who will receive credit for the Renewable Energy Certificates/Credits (RECs) that your system will generate.

measures listed in the Bill of Rights strike a fair balance for the consumer and the companies that sell products and services."

IREC's Clean Energy Consumer Bill of Rights addresses important consumer issues, including safety, contractual transparency, warranties, advertising, privacy and other protective measures.

Other organizations and associations in the solar and clean energy field offer valuable information and explanations. A list of current publications are referenced in the online Consumer Resources link.

The IREC Consumer Protection Trio can be accessed at www.irecusa.org.

IREC thanks Consumer Reports for their professional expertise and assistance in the development of the Be Solar Smart Consumer Checklist and Clean Energy Consumer Bill of Rights.

CREDIT: IRECUSA

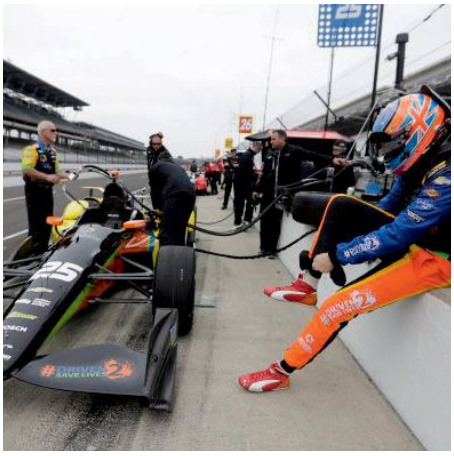
Neighbors come together to build a green community.

Celebrating 22 years of recognizing exemplary people, projects and programs, this year's winners in each competitive category were selected by more than 1,500 online voters. IREC 3*i*Award recipients were recognized during an awards ceremony at Solar Power International.

CREDIT: IRECUSA

IREC is a nationally recognized thought leader, stakeholder coordinator, expert resource and facilitator of regulatory reform. Our work expands consumer access to clean energy; generates information and objective analysis grounded in best practices and standards; and leads national efforts to build a quality- trained clean energy workforce, including a unique credentialing program for training programs and instructors. IREC's programs and policies benefit consumers, policymakers, utilities and the clean energy industry.

IREC is an independent, not-for-profit 501(c)(3) organization that relies on the generosity of donors, sponsors and program funder support.



PHOTOS COURTESY OF CSTEFAN WILSON

SOLAR TODAY interviews Indianapolis 500 Race Car Driver Stefan Wilson about his #ThinkSolar Campaign

by Carly Rixham, ASES Executive Director, SOLAR TODAY publisher

CR: How did you become an Indy race car driver?

SW: I started racing when I was nine all over United Kingdom. My brother, my my dad, and I spent most of our weekends going to the go-kart tracks in all corners in the country. It was a family hobby and it turned into my profession. Moved to Indianapolis when I was 20, (6 years ago) from Sheffield, UK.

CR: That's convenient for your Indy 500 training.

SW: Actually a lot the drivers live here, it becomes a hub.

CR: What was is it like racing in the 100th running of the Indy 500?
SW: It was incredible. There were 400,000 people at the track. At the drop of the green flag, the motor speedway became the 57th largest city in the U.S. As a fan you get to witness the crowd, but in the car you don't really get really to experience that. Only 33 qualify to make the race. At the start of Indy, there were 11 rows, 3 cars in each row.

CR: Why 33?

SW: I don't know why that is.

CR: What was going through your mind?

SW: How do i pass the car in front of us?

CR: Who is us?

SW: The team.

CR: I'd love to hear about #ThinkSolar

SW: #ThinkSolar is something i envisioned to help steer the sport I'm in into a greener future. Make it more eco friendly.

CR: It's kind of strange for race car drivers to think of eco friendly.
SW: I have a strong appreciation for the environment and the impact that we are having on it. I want to influence fans on what they can do to utilize solar in the their lives.

CR: Good

SW:The goal to is utilize solar more in the 101th running of the Indianapolis 500- now it's the start of the new century for the race, and put solar on the race car. We can totally solar power all the electronic needs on the piston.
If we can power some of the electronics on the race car- how cool would it be to say that we were the first to introduce solar in the way that we are doing? The Indy has historically actually been the proving grounds for new technology, the center of innovation for the automotive industry. Things like rear view mirrors were born in the Indianapolis speedway. In 1911-1920 a lot of the teams had a passenger would tell them where other cars. That was a lot of extra weight in the car. Now the rear view mirror has gone away but we still use side mirrors.

We can also implement solar on the pit stand, where the rest of team can see what's going on in the telemetry.
CR: It's exciting to think about solar on the pit stand. What great visibility for the fans to see solar at work.

SW: Yes, The average estimated usage on that stand is going to be about 1.8 to 2 kW in next year's race. The pit stands already have pop up roofs, so it's really just replacing the roof with a panel or putting the panel right on top of it. We can probably get enough solar panels for 13 kW system on there. People can relate that to their own homes. The pit stand is owned by the team so its totally fine for us to do it. Right now the teams are using gas powered generators.

Also we can track the production and use of solar at the pit stand and stream it on the internet for science classes to watch and see how well the solar unit is working to make the car quicker. They can compare how much energy is being produced by the solar cells and how much energy is left in the battery storage. Education for any car fan of any age!

CR: That's awesome. What kind of work are you doing with youth?

SW: The vision is to increase the STEM education involvement. I have worked with Junior Solar Spring, a group of 60 teams in Indiana, building solar racecars. I'd like try to replicate the Junior Spring group, and introduce it to other areas of the country. It is neat to see young people utilizing solar and getting hands on with solar at such a young age and its the next generation and the kids really utilizing solar. It's something I never had a chance to do and to see. A solar powered race car is incredible, and inspires them to see what else solar can do. They are going to grow up to be politicians and hold homes of thier own and want to utilize solar in their lives. Seeing that energy convert to movement is huge. Their understanding of energy transfer is going to be so much more than what mine was at that age. They were all super fired up and cheering on the teams. As part of the build up for the race, we'd like to get a final race at the Indianapolis Track.

CR: What kind of international work are you doing?

SW: We have a partnership with Solar Aide, non-profit in the UK that helps to grow a network in Africa, donating solar lights in regions of Africa. You can actually track the impact of light that gets donated. Using their platform we were able to offset my teams entire involvement in the Indy 500. Even though I had carbon emissions, it was entirely offset by donations to Solar Aide, 32 lights were donated to regions, eradicating the emissions of 48,000 lbs kerosene.

CR: Why are you doing this, Stefan?
SW: It's a passion for me. I really see the future of where we are headed but I want solar to be a part of that. When I imagine the future, I feel like solar is a big part of how we produce energy. I can't see any other way of energy that is as eco-friendly and scalable like solar. It presents a really viable solution. I'm pretty passionate about it and I want to bring it in to the sport I'm passionate about.

Excited to be join everyone at SOLAR 2016.

CR: Don't forget we are offering a free carbon offset for travel!ST

Election Season: many questions, many omissions

by **SCOTT SKLAR**

Scott Sklar is President of The Stella Group, Ltd., is an Adjunct Professor at The George Washington University teaching two courses on sustainable energy, and Chairs the Sustainable Energy Coalition in Washington, DC, and can be reached at solarsklar@aol.com.

Question. What clean energy qualities should we look for in the presidency?

Aanwer. I have gotten many queries during the Presidential primary season on who wears the clean energy mantle. I don't want to get into supporting or opposing candidates here, particularly since the Presidential nominees have not been selected as I write this column. But I do believe we need to be armed with the right knowledge and questions, and understand the indicators to make decisions in the Presidential elections, in the Congressional races for representatives in the US Senate and House of Representatives, as well as in our choices for Governor, county executive, mayor along with other elected officials. My top seven points are below.

Don't fall for the "subsidies" jive.

The Union of Concerned Scientists February 2011 report about the subsidies for nuclear power, "Nuclear Power: Still Not Viable Without Subsidies," found that more than 30 subsidies have supported every stage of the nuclear fuel cycle, from uranium mining to long-term waste storage. Added together, these subsidies cover from 70 – 120% of the investment, and often have exceeded the average market price of the power produced. According to the report -- compiled by Oil Change International and U.K.-based think tank Overseas Development Institute -- national subsidies to oil, gas and coal producers amount to $20.5 billion annually in the U.S., with almost all of those being received in the form of tax or royalty breaks. Federal subsidies amount to $17.2 billion annually, while subsidies in a number of oil-, gas- and coal-producing states average $3.3 billion annually. While Congress passed extensions of the solar and wind tax credits in December 2015, they are being scale-down and out over time, while the fossil subsidies have no such scale-downs over their 70+ years to taxpayer support.

Demystify what they mean by de-regulation.

Look beneath what they sponsored in initiatives or legislation. Politicians obfuscate their records by co-sponsoring legislation that doesn't go anywhere or even worse, doesn't actually mean or do anything. Many politicians have it out for EPA, upholding the laws passed by Congress. But in fact, the attack is much more Machiavellian – that they do not want environmental degradation, loss of land, water, wildlife, and health impacts to have a monetary benefit. They want all of that to be someone else's problem.

There's more than just climate change.

EPA added mercury to the pollutants covered by the Clean Air Act to join sulfur and nitrogen oxides, and particulates. EPA created new rules on mountain top removal practices regarding coal, and recently is moving on fracking practices regarding shale oil and shale gas extraction. Capital E's Greg Kats postulates that there is substantial underinvestment in energy efficiency, adding that the US could save US$2 trillion through more efficient energy use over the next 15 years.

Is the "all of the above" energy strategy mean anything?

Usually this is a code by those supporting fossil and nuclear but don't want to say they dismiss energy efficiency and renewable energy. But they usually don't support quantifying environment protection, conserving our nation's water, and considering the human health impacts of water contamination, increase in earth tremors and earthquakes, and carcinogenic emissions including hormone disruptors and immune disruptors. Basically, it's a "look the other way" strategy, and lumping every energy choice along with liking puppies and bunnies. But there are consequences.

And what about coal, pipeline, and fracking jobs?

In April 2015, a Washington post story concluded the US coal industry lost 50,000 jobs, and as of June 2015, there were approximately 174,000 blue-collar, full-time, permanent jobs related to coal in the U.S.of which mining had 83,000 jobs and coal transportation provided 31,000 jobs. As for job growth, the EIA indicates that 161,600 of these jobs were added between 2007 and 2012. Drilling jobs specifically increased by only 6,600.

The Solar Foundation's 6th National Solar Jobs Census covering 2015 counted 209,000 solar workers in all 50 states. The solar industry is creating jobs at a rate 12 times higher than the overall economy. Since 2010, Census series has found that solar employment has grown by 123%, representing an increase of 115,000 well-paying solar jobs. According to the American Wind Energy Asso-

ciation 2012 report, there were 80,700 wind-related jobs in the U.S. across fields such as development, siting, construction, transportation, manufacturing, and operations, services. The biomass, geothermal, and marine energy industries also hosted about 80,000 jobs each.

What about climate, water, and our ecosystems ….the big picture ?

175 countries signed the Agreement in New York City in May 2016.

The Paris Agreement was adopted by all 196 Parties to the United Nations Framework Convention on Climate Change at COP21 in Paris on 12 December 2015. In the agreement, all countries agreed to work to limit global temperature rise to well below 2 degrees Celsius, and given the grave risks, to strive for 1.5 degrees Celsius. Thermoelectric plants, according to the University of Michigan (http://css.snre.umich.edu/css_doc/CSS05-17.pdf) accounts for over 44% of our water compared to 31% for irrigation. Scientific American in July 2015 stated, "Oil and natural gas fracking, on average, uses more than 28 times the water it did 15 years ago, gulping up to 9.6 million gallons of water per well and putting farming and drinking sources at risk in arid states, especially during drought." (http://www.scientificamerican.com/article/water-use-rises-as-fracking-expands/) The National Wildlife Federation Report issued an ocean study in 2015 which concluded, " an updated study of marine mammals, birds, reptiles and fish - shows that marine populations have declined by 49% between 1970 and 2012." Climate change, including ocean acidification, along with overfishing directly impacted this rapid decline. Nearly three billion people rely on fish as major source of protein. Fish and aquaculture assure the livelihoods of 12% of the world's population, creating economic benefits of US$ 2.9 trillion per year.

Over $50 billion of private sector money has been invested in renewable energy in the USA in 2015. Forbes notes, "According to the International Energy Agency (IEA), energy consumption in developed countries would have been 58 percent higher in 2005 had it not been for energy-efficiency interventions arising from the oil price shocks of 1973".

Don't let those wily politicians swan song you. And make sure you vote in November, it is a powerful tool. **ST**

What matters when installing a small wind turbine?

by **MICK SAGRILLO**

Mick Sagrillo (msagrillo@wizunwired.net) teaches and consults about wind power, and has powered his home with wind since 1982.

You've done your homework, investigated what's needed for a good wind installation, how to improve your site and wind resource, and what to look for in a wind turbine and manufacturer. The last bit of your research involves the wind installer you choose, one of the most critical small wind decisions you will ever make.

Why is the wind installer so important?

You are installing a wind system to generate renewable electricity for decades. And while the wind turbine might appear to be a fairly complicated piece of equipment, it's nothing compared to navigating the permitting and inspection process, coordinating the excavation, concrete, crane, and electrical contractors, and erecting a 100-plus foot structure which, in all likelihood, you will never climb. And then there will be ongoing inspections followed by operation and maintenance to attend to.

Penny pinch on the installer, and you will be on your own when you most need help.

So, what's needed for a successful small wind installation that will not be abandoned by the owner the first time it needs maintenance or repair? A good relationship with a competent, reliable, experienced wind installer that can be counted on when needed. You're going to be married to this person or company for decades, so approach the search similar to the way you would a life partner.

By this point, you've screened wind turbine manufacturers, and they are an excellent first resource for identifying competent wind turbine installers. Ask the manufacturer for referrals, and especially who to steer away from. The manufacturer will know which companies are easy to work with and who is basically flying by the seat of their pants. You don't want the latter regardless of what a good deal they offer. Start your interview process with the highest recommended installers, not necessarily the closest to you. Cost may be an issue, but there are more important considerations than what you consider the bottom line. All too often, we consumers blur the concepts of cost and value, especially when we have no idea what we are talking about.

Listen to the advice of the installer. They have the experience, you don't. They should be advising you based on what will work well and for the long haul. You are likely making decisions based on aesthetics, cost, and emotion. However, you need to assure yourself that this indeed is the case, one of the points of the screening process. Likewise, don't chew the installer down on cost at every expense. They have to make a living just like you, and you want them to come back when you need them. Abuse them and you'll never see them again--guaranteed.

One easy way to screen for installers is to get referrals of customers of a given installer from the manufacturer. Call as many of these customers as you possibly can. Interview the customers with a list of questions you've developed: what worked well; what needs work? Would you hire this person or company again? Would you recommend this installer to your boss? Why or why not?

Negative answers need not eliminate that particular installer from consideration, but should at the very least raise flags for discussion with the installer.

Ben Polito, Pika Energy

Quiz time

Now it's time to call and quiz your prospective installers. Questions to use in your screening process might include:

- How long have you been in business?
- How many wind systems have you installed?
- What wind turbine sizes and for which manufacturers have you installed?
- What tower types and tower heights have you installed?
- Who do you typically subcontract work out to?
- In what geographic area are your installations located?
- Do you offer follow up service and O&M, or only do installations?

Roy Rakobitsch, Windsine Inc

One red flag you might look for in the interview process is an installer that brags about their work or downplays their competition. All of the outstanding small wind installers that I know are very humble women and men who are rather hesitant to boast about their accomplishments yet are quick to recognize the work of fellow installers. It's a small world out there, and most small wind installers rely on each other for technical advice, specialty tools that they might not have, or additional hands when their crew needs help. They don't see other small wind installers as competition but as resources—a very interesting business outlook.

You might also ask about credentials. These could include tower climbing and rescue training and certification, CPR and first aid, and manufacture training on specific turbines, towers, or power conditioning equipment. Unfortunately, NABCEP no longer certifies small wind installers, but many of the outstanding installers who worked on that certification are still in the industry. It's worth inquiring about.

Finally, ask your prospective installer for client references and call all of these people as well. Find out what worked and what they would do differently.

Keep in mind that you may be calling installers a state or two away simply because it is a small industry. This is not the best of situations because distance plays a big role in response time to when, and if, the installer ever returns to attend to small problems that could contribute to turbine down time. You want an installer as close as possible for obvious reasons. Response time is one, but travel cost is another big consideration. But a good installer is worth the travel expense. Remember: it's about value, not cost.

A small wind system, like any renewable energy system, is an investment and needs to be looked at from a holistic perspective: the site, the wind resource, the tower height, the wind turbine, the manufacturer, and the installer. A $20,000 wind turbine and installation that only lasts for two years is an extremely poor investment compared to an $80,000 wind turbine that lasts 20 years. Owners take care of and invest maintenance and repair dollars in things that work, like a properly sized and sited wind turbine. At the 2014 Small Wind Conference, Jim Jarvis of APRS World stated "Higher purchase price is always going to be cheaper than service costs, downtime, or early retirement due to failure."

Buy a quality wind turbine from a quality manufacture and have it installed by a quality small wind installer. Penny pinch on the installer, and you will be on your own when you most need help. **ST**

Our mission is to enable a 100% renewable energy society.

AMERICAN SOLAR ENERGY SOCIETY

Established in 1954, the nonprofit American Solar Energy Society (ASES) is the nation's leading association of solar professionals & advocates. ASES is the US Section of the International Solar Energy Society.

- Emerging Professionals Network
- 52 LOCAL CHAPTERS
- Technical Divisions
- STUDENT SCHOLARSHIPS
- ONLINE TRAINING
- Annual Awards

- SOLAR TODAY magazine
- 45 years of Proceedings from the ASES National Solar Conferences
- SOLAR@WORK E-NEWSLETTER
- Facebook
  Twitter
  Instagram
  LinkedIn
- Periodic Ground Breaking Reports

- July 10-13, 2016: SOLAR 2016: 45th Annual National Solar Conference San Francisco, CA
- OCT 2016: 21ST NATIONAL SOLAR TOUR
- Fall 2017: US DOE Solar Decathlon and SOLAR 2017 Denver, CO

Join Now ases.org

AMERICAN **SOLAR** ENERGY SOCIETY

JULY 10 - 13
SAN FRANCISCO

SOLAR 2016

ISNA, EES, and SOLAR 2016 attendees are invited to join the American Solar Energy Society at all of our events.

HIGHLIGHTS

Monday July 11th 11:00am, 5th Floor, Ballroom C

Progress to 100% Global Renewable Energy

- Professor Eicke Weber, Director of Fraunhofer Institute of Solar Energy, Freiburg, Germany—German examples and what is needed worldwide to reach 100% renewables.
- Michael Eckhart, Global Head of Environmental Finance, Citibank Capital Markets, Inc.—Role of financing and innovations that are making a real difference in accelerating progress to 100%.
- Diane Moss, Founder of Renewables 100 Policy Institute— Policy tools and actions that are working worldwide and in the U.S.
- John Smirnow, Secretary of General Global Solar Council— Report on solar industry and growth worldwide.

Tuesday July 12th 11:15am, Fifth Floor, Ballroom C

Progress to 100% Local to National to Global Renewable Cities

- Debbie Raphael, Director of San Francisco Department of the Environment – Efforts in San Francisco
- Jodie Van Horn, Director of Strategic Relations at Sierra Club, Readyfor100 campaign—Grassroots renewable progress primarily at the cities level in the U.S.
- Betsy Agar, Research Manager and Founding Member of Renewable Cities, a Simon Fraser University Centre for Dialogue program, Vancouver, BC—How cities are leading the way to 100% with a global focus
- Angelina Galiteva, Founder and Board Chair of Renewables 100 Policy Institute, California ISO Board of Governors– Addressing concerns of utilities

Wednesday July 13th 11:15am, Fifth Floor, Ballroom C

Accelerating Progress to 100% Renewable Energy

- Mark Davis, CEO of WDC Solar, Washington, DC—Creating jobs in the installation sector in the U.S.
- Chris Deschene, Director, U.S. Department of Energy, Office of Indian Energy Policy and Programs – Renewable energy on tribal lands
- Reverend Canon Sally Grover Bingham, Episcopal priest and Canon for the Environment in the Diocese of California -- The Regeneration Project and its Interfaith Power & Light campaign

Prof. Eicke Weber

Michael Eckhart

Diane Moss

John Smirnow

Debbie Raphael

Betsy Agar

Angelina Galiteva

Mark Davis

Reverend Canon Sally Grover Bingham

AMERICAN SOLAR ENERGY SOCIETY

Leading the renewable energy revolution

ases.org

Thank you for joining us at SOLAR 2016, the 45th Annual ASES National Solar Conference

SPECIAL INVITATION

American Solar Energy Society's

ANNUAL AWARDS BANQUET

& Fellows Reception

TUESDAY
July 12, 2016

7 - 9 30PM

The City Club
of San Francisco

155 Sansome Street
Library Room

AMERICAN SOLAR ENERGY SOCIETY

SHINE ON

PURCHASE TICKETS AT SOLAR2016.ORG

ASES Emerging Professionals Networking Event

networking | games | entertainment | food | cash bar

Monday July 11, 2016 | 7:30-9:30pm | San Francisco
Following Intersolar North America Opening Reception

SOLAR 2016

Special presentaion by Indy racecar driver, Stefan Wilson, #ThinkSolar

AMERICAN SOLAR ENERGY SOCIETY

ENERGEIAWORKS

Executive Recruitment for Clean Energy Markets

solar2016.org

Burke's Work *in the burning sun*

ASES Chapter Maine Solar Energy Association's John Burke travels to Guinea to install and educate

By John Burke
Maine Solar Energy Association, SEADS of Truth, Inc. Do-Yourself-Solar, Downeast Alternative Design Solar, Inc. (DADS, Inc.)

This is a very short excerpt of the full 30 day Guinea, W. Africa, solar development project. The international work of Dr Komp, Preasident of MESEA (see the Int'l. Work page on the mainesolar.org site), with the non-profit Skyheat Associates, was cut short, at the last minute, due to hospitalization. In three days, John Burke was on a plane to Guinea for five weeks! An effort for solar education, was undertaken, with 40+ young folks, in Conakry, Guinea! This was supported by Washington, DC based Binta Terrier, of PLAD, Inc. (Partnership League for Africa's Development). Can't we all just 'GO Solar', and get along?

The effort was accomplished from late April through early June, with an energetic group of 50 young folks, which ended up as about 36 with great interest in a future effort. The 'solar oven' assembly was a first for all involved, including John Burke. The oven transformed the solar thermal energy into an encapsulation / lamination process, to allow the EVA sheets to melt and sandwich the 36 cell PV module for installation on the workshop building. The full cells (80 x 150 mm), were cut in half (80 x 75 mm), for each 32W module, producing a 'rated' 1.7 A. The details of the PV assembly and solar oven encapsulation are cherished by the group as well as the leaders.

The 'Energie Solaire' workshop building now has four 32 W (rated) PV modules connected in parallel, to generate approximately 7 A, at the 12 V output. We did wind up with a 12 V 'Solar Gel' battery (100 Ah), and we used a 20 A max charge controller to safely re-charge the battery. More PV modules and batteries may be added in the near future! We're still discussing a possible return trip in the fall. The country has many PV modules in disrepair, around the capital city, set up for street lights by EU NGOs, but lack of maintenance leaves a small percentage that continue to shed light at night. We hope to get more interest in furthering our effort!

Can't we all just 'GO Solar' ! ... and get along ?"

PHOTO BY JOHN BURKE

Neighbors inquire about solar oven and PV roof work.

Mardi, May 31, 2016 the sun cooperates and by noon we have the three PV modules ready for the oven! By 1:00 pm the temp is 150 F, and we're ready for the EVA cooking. The PV modules are in the oven for EVA encapsulation! The crew is on the roof securing the boards for the PV installation. We spend some time with the install details and the why and what for, series, parallel, as well as the wiring for the PV switch, charge controller, and battery bank. At this point we may just use the two 12V (7 Ah), batteries we have on hand. Binta described an attention getting sign use, for our PV solar power, on the front of the workshop. We discuss the possible description and wording to attract attention, 'Energie Solaire', or Solar Powered Guinea, or some such. We take the pictures of the Premier PV Module, encapsulated with a solar oven in Guinea, with the signatures and the Group. The three PV modules have not fully encapsulated, the EVA needs higher temperature. After the end of class, two visitors are interested in a solar Food Dryer and we share the Maine Solar Primer drawings. The third friend, from across the busy street, stops by to inquire of just what we are doing, we share the story.

"...The third friend, from across the busy street, stops by to inquire of just what we are doing...

we share the story."

PHOTO BY JOHN BURKE

Energie Solaire celebrates PV encapsulation.

Mercredi, June 1, 2016 the group brings the oven with the three PV modules back outside, and hopes for more sun! The frames are being cut for the PV finish, and all who want to, get a chance to cut the pieces. We focus is again on the wiring for the modules and down to the room closest to the street where we hope to house the battery bank and bring the power to the proposed 'sign' in front. 'Energie Solaire' has the group excited, a group logo will be developed later. We all hope for the time and energy to accomplish the task of a sign! The oven reaches 150 F, but not enough time to insure a successful EVA encapsulation. We will check again tomorrow. We also hope to get to the market in the morning for more tools and supplies.

ASES 2020: Five-Year Vision

Who We Are
The American Solar Energy Society (ASES) is a nonprofit organization providing valuable resources to connect consumers with the solar and renewable energy industries. Our community of solar professionals and advocates is dedicated to achieving a 100% renewable energy society.

We were established in 1954 at a very different time in history—before photovoltaics became the large and evolving international industry it is today. We cheered and championed much of this growth, and witnessed hosts of new players emerge onto the scene.

ASES leadership recognizes the challenges of maintaining and growing a 62-year-old organization in a manner that is necessary and relevant. Despite the changes of the past six decades, today's world continues to need an ever-more rapid transformation to renewable energy. Likewise, ASES is also transforming to better address this need.

What We Do
- Deliver resources connecting consumers with the solar and renewable energy industries
- Create community, events and media focused on acceleration of renewable energy utilization
- Provide unbiased technical, non-technical, and policy information
- Publish the award-winning magazine Solar Today
- Produce the National Solar Tour, the largest grassroots solar event in the country
- Organize the longest-running annual solar national solar conference in the US covering issues related to technology, financing, policy and sustainability
- Connect via online assets such as ases.org, solartoday.org, Solar@Work, and social media spaces
- Lead regional chapters, topical technical divisions, university student chapters
- Serve as the U.S. section of the International Solar Energy Society

Where We're Going
- Expanding outreach and membership
- Increasing Solar Today subscribers and advertisers
- Driving participation in national dialogues to increase the use of renewable energy
- Shaping our annual conference as a welcoming, informative, community environment for all forms of renewable energy; for art, culture, technology, and business; and for a non-competitive, no "hard sell" experience
- Digitizing and archiving our 60+ years of renewable energy information
- Partnering with the Clean Energy Federal Credit Union
- Partnering with the U.S. DOE on the Solar Decathlon
- Partnering with other nonprofit and advocacy organizations on a long-term basis
- Identifying opportunities to support other industries and organizations in the utilization of solar and renewable energy and other sustainable technologies

What You Can Do
- Become an ASES individual, professional, business or lifetime member
- Subscribe to or advertise in Solar Today Magazine
- Sponsor the National Solar Conference or National Solar Tour
- Be a speaker at one of our events
- Contact us to potentially feature your industry or company news and developments
- Connect with us on Twitter, Facebook and Instagram
- Partner your organization or non-profit with us
- Submit your ideas for ways we can deliver greater value and impact
- Engage with an ASES regional chapter in your state(s)
- Join, create or advise a student chapter

Please join our mission of enabling a 100% renewable energy society and our goal of expanding ASES' outreach, membership and support.

AMERICAN SOLAR ENERGY SOCIETY

AMERICAN SOLAR ENERGY SOCIETY

To join a local chapter visit **ases.org/chapters**.
To join a division visit **ases.org/divisions**.
To share chapter or division news, please email **editor@solartoday.org**.

CHAPTERS

Chapters Chair
Elaine Hebert
elaine@norcalsolar.org

DIVISIONS

Divisions Chair
David Comis
dcomis@ases.org

Energy Economics
Chair: Bill Ellard
bill@energysolutionpartner.com

Sustainable Transportation
Chair: Lucas Dixon
lucas.dixon@plugsmart.com

Resource Applications
Chair: Jan Kleissl
jkleissl@ucsd.edu

Wind
Chair: Trudy Forsyth
trudyforsyth2@gmail.com

Solar Buildings
Chair: Pablo La Roche
pmlaroche@cpp.edu

Solar Electric
Chair: Marlene Brown
mbwildwoman@gmail.com

Solar Thermal
Chair: Ron Gehl
rgehl@eosresearch.com

Sustainability
Chair: David Comis
dcomis@ases.org

Clean Energy Federal Credit Union Update

by Amanda Bybee
Organizer of the proposed
Clean Energy Federal Credit Union

CLEAN ENERGY FEDERAL CREDIT UNION PROPOSED

The process of chartering the proposed Clean Energy Federal Credit Union (PCEFCU) advances on several fronts:

We met with our National Credit Union Administration (NCUA) analyst in early April while he was traveling in Denver, and it was a very productive meeting. We were able to talk through his questions about the business plan in depth, and the list of outstanding issues is steadily shrinking. Additionally, it was lovely to meet him in person after so many months of phone meetings. We are preparing the next iteration of the business plan to address the most recent round of feedback, and will submit that as soon as it is complete.

In the last issue of Solar Today magazine, we reported that we had brought Sonya Jarvis on board as part of the team, with the intention of her becoming the CEO of the new credit union when it received its charter. Unfortunately, due to shifting circumstances, it turns out that Sonya will not be able to serve the PCEFCU in that way. She and her family will be staying in Louisiana, and Sonya will become the new CEO of the ASI Federal Credit Union, a longstanding credit union in New Orleans. She will, however, be involved as an official of the PCEFCU, for which we are grateful. We wish her the best with the new opportunity, and look forward to working with her in a different capacity. As a result of this news, we re-launched the search for our CEO in May. If you know a credit union or banking professional who would be interested in a startup opportunity, who has the capacity to be hands-on, and who is passionate about clean energy, please make an introduction! We can be reached at info@cleaneenergyfcu.org.

The next big lift will be to raise the initial capital to seed the credit union. These funds need to be offered in the form of donations or grants (not investments). At minimum, we will need $1.25M in order to obtain our federal charter and open for business. Any leads or suggestions of potential foundations, family offices, or like-minded individuals are appreciated. We are also planning a crowdfunding campaign for later this year and we are hoping to garner everyone's support in spreading the word and encouraging donations – big or small – from as many people throughout the country as possible. Please be on the lookout for communications about our crowdfunding campaign in the future. NOTE: donations to the credit union can be made via a "fiscal sponsor" 501c3 organization, thereby qualifying them as tax-deductible charitable donations.

We are gathering letters of support from future CEFCU members and fellow credit unions to demonstrate the viability of our business plan. These letters indicate their willingness to open savings accounts and/or buy Clean Energy CD's. To date, we have received 16 letters for just over $2.2M from individuals and supportive credit unions. If you are interested in supporting the effort with a commitment letter to open a savings account, please email me at info@cleanenergyfcu.org. All deposits are insured up to $250k. We appreciate your willingness to transfer savings accounts over to the PCEFCU, where you know your money will have a positive impact and help others to afford clean energy products and services.

Lastly, we will again attend the ASES annual conference this summer. By then, we should have a firm grasp of the final timeline for receiving the charter, and we will be looking to sign up future members of the credit union! See you there.

get involved: locate an ASES chapter in your community

Alabama
Alabama Solar Assoc.
P: 256.658.5189
morton@al-solar.org
al-solar.org
Contact: A. Morton
Archibald Jr.

Arizona
Arizona Solar Energy Assoc.
P: 602.952.8192
j2envarch@aol.com
arizonasolarenergy.org
Contact: Daniel Aiello

Arkansas
Arkansas Renewable Energy Assoc.
P: 877.575.0379
info@arkansasrenewable
energyassoc.org
arkansasrenewableenergyassoc.org
Contact: Frank Kelly

California
NorCal Solar Energy Assoc.
P: 510.545.4925
info@norcalsolar.org
norcalsolar.org
Contact: Eric Larson

Orange County Renewable Energy Society
P: 714.794.7795
plesniak@gmail.com
ocrenewables.org
Contact: Adam Plesniak

Solar Living Assoc.
P: 707.472.2456
karen.kallen@solarliving.org
solarliving.org
Contact: Karen Kallen

San Diego Renewable Energy Society
chair@sdres.org
sdres.org
Contact: Stephen Johnston

Colorado
Colorado Renewable Energy Society
P: 720.231.5317
info@cres-energy.org
cres-energy.org
Contact: Alex Blackmer

Connecticut
Northeast Sustainable Energy Assoc.
P: 413.774.6051
nesea@nesea.org
nesea.org
Contact: Jennifer Marrapese

Delaware
Mid Atlantic Solar Energy Society
P: 301.880.7045
john.essig@mases.org
mases.org
Contact: John Essig

Northeast Sustainable Energy Assoc.
P: 413.774.6051
nesea@nesea.org
nesea.org
Contact: Jennifer Marrapese

Florida
Florida Renewable Energy Assoc.
P: 407.710.8705
info@cleanenergyflorida.org
cleanenergyflorida.org
Contact: Bill Young

Georgia
Georgia Solar Energy Assoc.
P: 404.522.4775
norene.quinn@gasolar.org
gasolar.org
Contact: Norene Quinn

Idaho
Idaho Renewable Energy Assoc.
P: 208.629.6858
mikecmedberry@msn.com
Contact: Mike Medberry

Illinois
Illinois Solar Energy Assoc.
P: 312. 376.8245
lesley.mccain@illinoissolar.org
illinoissolar.org
Contact: Lesley McCain

Midwest Renewable Energy Assoc.
P: 715.592.6595
dougs@midwestrenew.org
midwestrenew.org
Contact: Doug Stingle

Indiana
Indiana Renewable Energy Assoc.
317.635.1701
info@indianarenew.org
indianarenew.org
Contact: Laura Arnold

Iowa
Midwest Renewable Energy Assoc.
P: 715.592.6595
dougs@midwestrenew.org
midwestrenew.org
Contact: Doug Stingle

Kansas
Heartland Renewable Energy Society
P: 913.299.4474
info@heartland
renewable.org
heartlandrenewable.org
Contact: Craig Wolfe

Kentucky
Kentucky Solar Energy Society
P: 606.618.0300
theresa@littlewolf.org
kyses.org
Contact: Teresa Martin

Louisiana
Louisiana Solar Energy Society
membership@lses.org
lses.org
Contact: Jeff Shaw

Maine
Maine Solar Energy Assoc.
P: 207.497.2204
sunwatt@juno.com
mainesolar.org
Contact: Richard Komp

Maryland
Mid Atlantic Solar Energy Society
john.essig@mases.org
mases.org
Contact: John Essig

Massachusetts
Northeast Sustainable Energy Assoc.
P: 413.774.6051
nesea@nesea.org
nesea.org
Contact: Jennifer Marrapese

Michigan
Great Lakes Renewable Energy Assoc.
P: 616.364.8448
glrea.info@gmail.com
glrea.org
Contact: Jim Carter

Midwest Renewable Energy Assoc.
P: 715.592.6595
dougs@midwestrenew.org
midwestrenew.org
Contact: Doug Stingle

Minnesota
Minnesota Renewable Energy Society
P: 612.963.4757
info@mnrenewables.org
mnrenewables.org

Mississippi
Mississippi Solar Energy Society
sdlewis@megagate.com
Contact: Steve Lewis

Missouri
Heartland Renewable Energy Society
P: 913.299.4474
info@heartland
renewable.org
heartlandrenewable.org
Contact: Craig Wolfe

Nevada
Solar NV
P: 702.507.0093
vegassolarguy@gmail.com
solarnv.org
Contact: Guy Snow

New Hampshire
Northeast Sustainable Energy Assoc.
P: 413.774.6051
nesea@nesea.org
nesea.org
Contact: Jennifer Marrapese

New Jersey
Northeast Sustainable Energy Assoc.
P: 413.774.6051
nesea@nesea.org
nesea.org
Contact: Jennifer Marrapese

Mid Atlantic Solar Energy Society
P: 301.880.7045
john.essig@mases.org
mases.org
Contact: John Essig

New Mexico
New Mexico Solar Energy Assoc.
info@nmsea.org
nmsea.org
Contact: Gary Vaughn

New York
New York Solar Energy Society
P: 917.974.4606
wyldon1@gmail.com
nyses.org
Contact: Wyldon Fishman

Northeast Sustainable Energy Assoc.
P: 413.774.6051
nesea@nesea.org
nesea.org
Contact: Jennifer Marrapese

North Carolina
North Carolina Sustainable Energy Assoc.
P: 919.832.7601
ivan@energync.org
energync.org
Contact:Ivan Urlaub

Ohio
Green Energy Ohio
P: 614.985.6131
bill@greenenergyohio.org
greenenergyohio.org
Contact: William A. Spratley

Oregon
Solar Oregon
P: 503.231.5662
lisa@solaroregon.org
solaroregon.org
Contact: Lisa Logie

Pennsylvania
Northeast Sustainable Energy Assoc.
P: 413.774.6051
nesea@nesea.org
nesea.org
Contact: Jennifer Marrapese

Mid Atlantic Solar Energy Society
P: 301.880.7045
john.essig@mases.org
mases.org
Contact: John Essig

Rhode Island
Northeast Sustainable Energy Assoc.
P: 413.774.6051
nesea@nesea.org
nesea.org
Contact: Jennifer Marrapese

South Carolina
South Carolina Solar Council
info@scsolarcouncil.org
scsolarcouncil.org
Contact: Bruce Wood

Tennessee
Tenneessee Solar Energy Assoc.
P: 865.974.9218
steve@tnsolarenergy.org
tnsolarenergy.org
Contact: Steven Levy

Texas
Texas Solar Energy Society
P: 512.751.1873
800.465.5049
info@txses.org
txses.org
Contact: Lucy Stolzenburg

Utah
Utah Solar Energy Assoc.
P: 832-SUN-UTAH
info@utsolar.org
utsolar.org

Vermont
Northeast Sustainable Energy Assoc.
P: 413.774.6051
nesea@nesea.org
nesea.org
Contact: Jennifer Marrapese

Virginia
Mid Atlantic Solar Energy Society
P: 301.880.7045
john.essig@mases.org
mases.org
Contact: John Essig

Washington
Solar Washington
P: 425.270.5612
patrick@solarwa.org, dnicol@solarwa.org
solarwa.org
Contact: Patrick Nugent, Dave Nicol

Washington, D.C.
Mid Atlantic Solar Energy Society
P: 301.880.7045
john.essig@mases.org
mases.org
Contact: John Essig

West Virginia
Mid Atlantic Solar Energy Society
P: 301.880.7045
john.essig@mases.org
mases.org
Contact: John Essig

Wisconsin
Midwest Renewable Energy Assoc.
P: 715.592.6595
dougs@midwestrenew.org
midwestrenew.org
Contact: Doug Stingle

STUDENT CHAPTERS

Appalachian State University
Sustainable Energy Society
asuses@gmail.com
asuses.appstate.edu
Contact: Tess Scanlon

ASES Colorado State University Chapter
marclively34@gmail.com
Contact: Marcus Lively

Austin Community College
Renewable Energy Student Assoc.
scott.moser@g.austincc.edu
austincc.edu/resa
Contact: Scott Moser

NCSU Renewable Energy Society
P: 919.515.9782
ccmaurer@unity.ncsu.edu
Contact: C.C. Maurer

Penn State Student Chapter of ASES
clubs.psu/up/ases
Contact: Jeffrey Brownson

Shoreline Community College
Student Chapter of ASES
thecommunitysolarproject.org

Solar Education & Outreach,
The Ohio State University
P: 614.595.3847
searles.31@buckeyemail.osu.edu
seo.org.ohio-state.edu
Contact: Trace Searles

University of Florida
P: 954.673.8797
ases.uf@gmail.com
ufases.org
Contact: Jason Rosen

University of Vermont Renewable Energy Network
P: 802-656-9775
richard.watts@uvm.edu
Contact: Richard Watts

Key
Green = This chapter has sub-chapters. Visit online to find the sub-chapter nearest you.

ASES Intern Spotlight: Riley Shea: Hello! My name is Riley Shea and I am a senior at Appalachian State University in Boone, North Carolina. I am currently studying Appropriate Technology, a major focused on the science and implementation of renewable energy resources. Prior to my stint here at Appalachian I played football my freshmen year at Lenoir-Rhyne University. I am extremely interested in green building and solar photovoltaic, and plan to build a career where I can implement both. I love the outdoors, sports (but mostly football), and hanging out with my family and friends. My ultimate dream in life would be to live somewhere on a river, but close to a mountain, so I can snowboard and fish, so I guess you can say I'm a fan of the simple life.

Visit ASES, ISES, and NorCal Solar at booth 9015 (3rd floor) of the Intersolar Exhibition, July 12-14

ISES
International Solar Energy Society

NorCal Solar
Northern California Solar Energy Association
Promoting solar energy solutions since 1975

AMERICAN SOLAR ENERGY SOCIETY

A community of solar professionals and enthusiasts dedicated to enabling a 100% renewable energy society

NorCal Solar — ASES Northern CA Chapter — Established 1974
ASES — Largest ISES Section — Established 1954
ISES — Membership Worldwide — Established 1954

We work together at global-national-regional levels to help individuals & groups make a difference * keep informed * stay connected

through publications, on-line presence, social media, professional growth & networking events, participation in renewable energy policy making dialogues, and partnerships with like-minded groups.

JOIN TODAY - Special Intersolar Rates
10% discount for joining 1 organization at any level
20% discount for joining 2 organizations at any level
25% discount for joining 3 organizations at any level

"I invented ways to use solar energy. Now I just have to wait a million years for fossil fuels to run out."

CARTOON FOR SOLAR TODAY BY JERRY KING

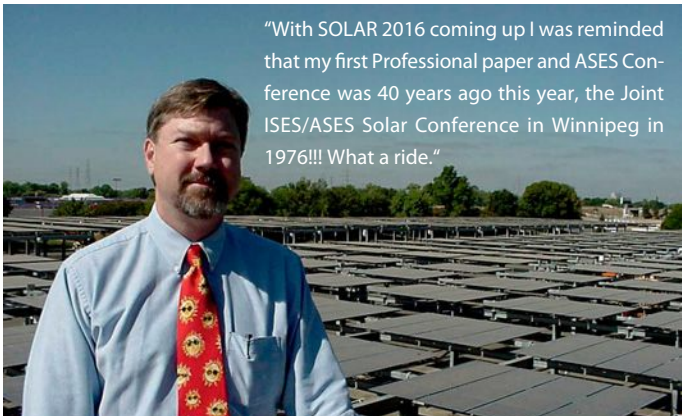
ad index

Member Spotlight: Donald Osborn

Donald E. Osborn is President of Spectrum Development Energy Inc., a leading PV engineering, procurement and construction (EPC) company and is one of the most respected professionals in the PV industry. Osborn founded and led the solar programs of the Sacramento Municipal Utility District (SMUD) from 1991 - 2002. The SMUD Solar Program was responsible for the first broad commercialization of grid-connected PV in the US and led to the California Solar Initiative and the growth of today's PV market for which Osborn is known as the "Father of US Grid-connected PV Commercialization". Prior to joining SMUD, he was the Director, U of AZ Solar & Energy Research Facility; Associate Director, Arizona Solar Energy Commission; Director, Arizona WSUN; and Research Engineer, Helio Associates. A member of ASES for over 40 years, he is the former Policy Chairman, former Board member, and Fellow of ASES. He is the recipient of the 2000 ASES Abbot Award for "significant and sustained contributions to the field of solar energy" and of the 2001 International Energy Globe Award. Osborn is also the former Chair of the Solar Electric Power Association, and former Board member of the Solar Energy Industries Association (SEIA). He was featured in *Switching To Solar*, By Bob Johnstone (Chapter 9 "Glorious SMUD", 2011, Prometheus Books). He is living in his third solarized home. www.SpectrumEnergyDev.com

Osborn presented his first professional paper 40 years ago this summer at the 1976 joint ASES (then AS/ISES) and ISES Conference in Winnipeg and was Co-Chairman of the 1980 ASES Annual Conference in Phoenix. He says, "ASES has been a welcoming and pivotal home for my development in the solar field. As a young engineer it gave me first hand exposure to the diverse RD&D activities in solar and direct interaction with such a broad range of solar professionals. I owe much to ASES for helping to give me such a solid start in the solar field and to the friends and colleagues in ASES who helped and mentored that young engineer." According to Osborn, "ASES stills fulfills that critical role of the meeting ground for researchers, students, solar professionals and advocates to share the broad range of solar development, performance, and new frontiers in a non-commercial, free exchange of ideas and results not found elsewhere. ASES has enabled solar's development through the decades ushering in the Solar Century."

Come hear Don as our keynote speaker at our SOLAR 2016 Awards Banquet July 12 in San Francisco.




ARIZ REPUBLIC
PHOENIX
JUN 2 1980
MAR JON

Secretary of State Rose Mofford and Greg Stutzman (right) of the Solar Jubilee planning committe use a Fresnal lens to concentrate the sun's rays and cut the Jubilee's opening-day ribbon. Helping to steady the ribbon is Don Osborn, co-chairman of the event, which is at the Civic Plaza through Thursday.

San Francisco,CA
Intercontinental Hotel
Co-located with Intersolar North America

July 10-14, 2016

SOLAR 2016 **PROGRESS TOWARD 100% RENEWABLES**

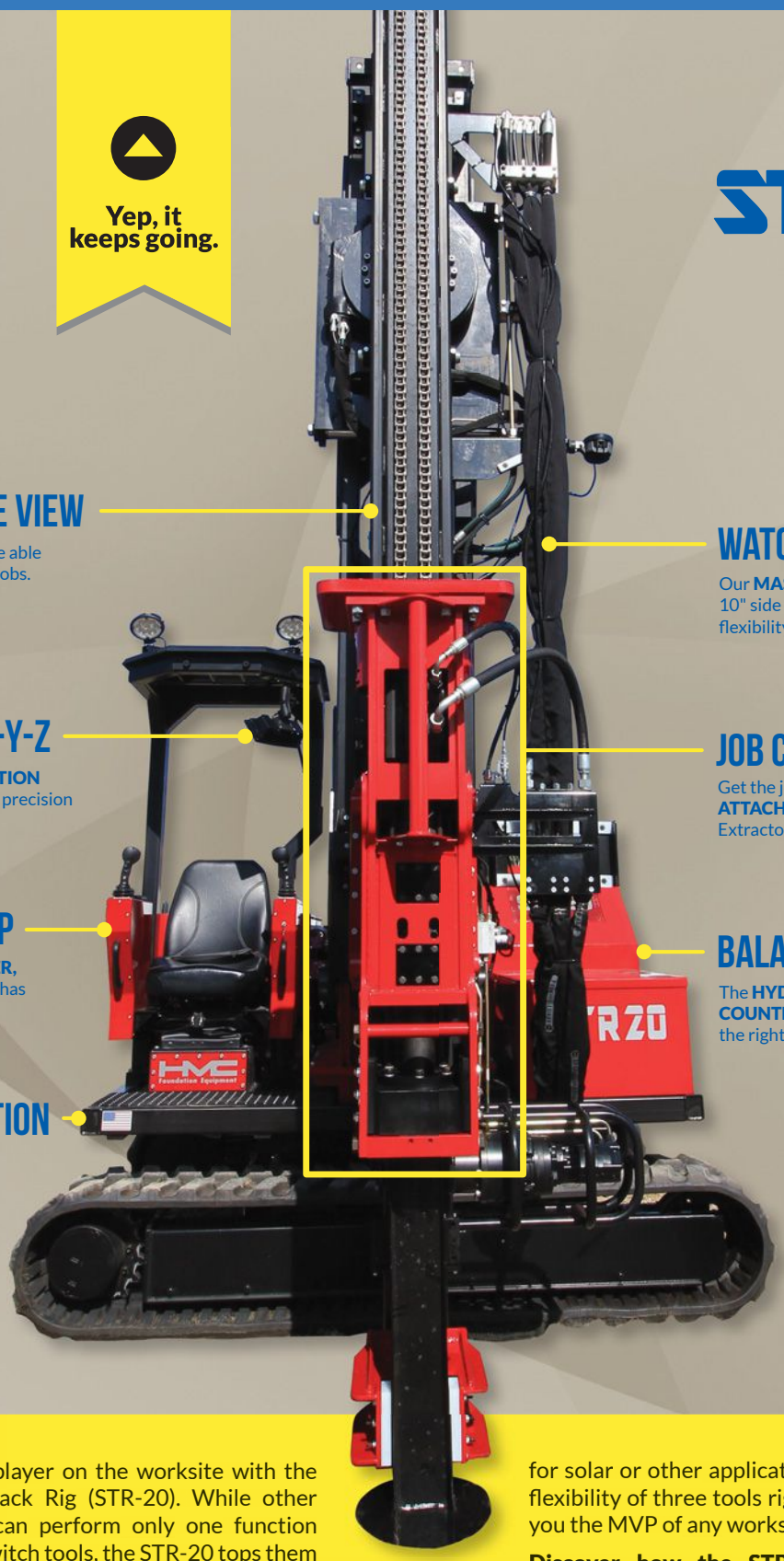
		Intercontinental Ballroom C	Howard Room	Fremont Room	Jackson Room
SUNDAY	9:00 -12:00	**Chapters Caucus** *(9-5)* (Pacific Energy Center)			
	12:00 - 1:30	Lunch Break			
	1:30 - 5:00	**Chapters Caucus (cont.)** (Pacific Energy Center)		**Divisions Caucus** (Pacific Energy Center)	
	6:30 - 9:30	SOLAR 2016 Opening Reception (Thirsty Bear)			
MONDAY	7:30 - 8:30	ASES Speaker Check-in			
	8:30 - 9:00	Coffee & Tea			
	9:00 -10:30	**Forum: Spirit & Sustainability**	*** Technical Session: Solar Buildings & Architecture I**	**Technical Session: Solar Electricity: Economics & Policy I**	**Forum: Case Studies on Resilient PV Systems**
	10:30 -11:00	30 Minute Break			
	11:00 -12:30	*** Plenary Panel: Progress Toward 100% Renewable Energy - Global Actions** (Ballroom C)			
	12:30 -1:30	Lunch & ASES Division Meetings			
	1:30 - 3:00	**Forum: Community Solar I: Solar Powering America**	**Technical Session: Implementing 100% Renewable Electricity**	**Technical Session: Solar Electricity: Economics & Policy II**	*** Technical Session: High Efficiency ZEB & Control Systems**
	3:00 - 3:30	30 Minute Break			
	3:30 - 5:00	**Forum: How the Convergence of Energy, Data Analytics, and IoT will Change the Solar Market**	**Technical Session: Resource Assessment: Models and Data**	**Technical Session: Renewable Energy Grid Integration**	**Technical Session: Solar Electricity: Simulations, Hybrid & Specialty Applications**
	5:30 - 7:00	Intersolar Official Opening Ceremony *(Followed by the ISNA Opening Reception)*			
	7:30 - 9:30	ASES Emerging Professionals Reception (Ballroom C)			
TUESDAY	7:30 - 8:30	ASES Speaker Check-in			
	8:30 - 9:00	Coffee & Tea			
	9:00 -10:45	**Forum: Tapping Solar Potential in Higher Education**	**Technical Session: Resource Assessment: Forecasting & Remote Sensing**	**Forum: Solar for All: Expanding Solar Markets**	*** Technical Session: Solar Thermal Technology Advances I**
	10:45 -11:15	30 Minute Break			
	11:15 - 1:00	*** Plenary Panel: Progress Toward 100% Renewable Energy - Actions In The U.S.** (Ballroom C)			
	1:00 - 2:00	Lunch & ASES Division Meetings			
	2:00 - 3:45	**Forum: SANE (Solar Automated Nonstop Elevated) Transportation**	**Technical Session: Forecasting Applications for Large-Scale PV Operations**	*** Technical Session: Solar Buildings & Architecture II**	*** Technical Session: Solar Thermal Technology Advances II**
	3:45 - 4:15	30 Minute Break			
	4:15 - 6:00	**Forum: Community Solar II: Solar Market Pathways**	**Technical Session: Transportation, Sustainability, & Resiliency**	**Technical Session: Technological Advances in Solar Electricity**	**Forum: Applicaton of PV-Thermal Systems**
	7:00 - 9:30	ASES Fellow's Reception & Gala Awards Banquet (City Club of San Francisco)			
WEDNESDAY	7:30 - 8:30	ASES Speaker Check-in			
	8:30 - 9:00	Coffee & Tea			
	9:00 -10:45	**Forum: The Great Solar Thermal Debate**	**Technical Session: The Value of Distributed Solar Resources**	**Technical Session: Socio-Economics of PV Resiliency**	**Forum: Community Solar III: Financing**
	10:45 -11:15	30 Minute Break			
	11:15 -12:15	*** Plenary Panel: Accelerating Progress Toward 100% Renewable Energy** (Ballroom C)			
	12:30 -1:45	ASES Annual Membership Meeting (Ballroom C)			
	2:00 - 6:00	ASES Board of Directors Meeting			
THURSDAY		**Intersolar North America Exhibition**			

* ***AIA Approved Sessions*** *- Selected sessions presented at Solar 2016 have been approved for AIA Continuing Education System (CES) Learning Units. A total of 12.5 LUs can be earned by attending all eight of the approved sessions.*

SELF-CONTAINED TRACK RIG

Yep, it keeps going.

STR20



BIRD'S EYE VIEW

With a **29' MAST** you'll be able to accomplish the tallest jobs.

EASY AS X-Y-Z

The STR's **GPS AUTOMATION** controls provide you with precision pile placement.

REVVED UP

With **83.5 HORSE POWER, TIER 4i ENGINE**, the STR has superb power.

360º ROTATION

WATCH IT MOVE

Our **MAST MOVES 24"** in and out 10" side to side, for unparalleled flexibility.

JOB CUSTOMIZATION

Get the job doe with **3 AVAILABLE ATTACHMENTS**; Vibratory Driver/ Extractor, Impact Hammer, and the Auger.

BALANCING ACT

The **HYDRAULICALLY ADJUSTED COUNTERWEIGHT** allows you to achieve the right balance for the day's work.

Be the most versatile player on the worksite with the new Self-Contained Track Rig (STR-20). While other machines in its class can perform only one function without the ability to switch tools, the STR-20 tops them all by easily converting from the Impact driver to the Vibro driver to the drill tool when installing small piles for solar or other applications. One machine with the flexibility of three tools right at your fingertips makes you the MVP of any worksite.

Discover how the STR-20 can transform your business. Call us today to find out how you can pre-order an STR.

HMC

Hercules Machinery Corporation

Manufacturer and Supplier of Foundation Equipment

MADE IN THE USA

800.348.1890

HMC-US.COM