

SOLAR TODAY

An American Solar Energy Society Magazine
Expert Perspectives on Achieving a 100%-Renewable Energy Society

Spring 2024
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Looking at Jobs Can Change Our Minds About Energy

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A Coordinated Approach to Clean Energy: A Recipe for Success
Jobs on the Chopping Block as Utilities Lobby Against Local Solar
It's Time to Stand up for Solar





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Cover image: Dominic Paul-Baha, a GRID Alternatives worker, finishes the installation of rooftop solar panels on a home in Washington, DC. © Kristelle Batucal, U.S. Department of Energy, Flickr. This page: The E2 Solar Crew installs SunPower panels in the cold New England winter on Cape Cod. @ Chris Wingard, U.S. Department of Energy, Flickr.

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The Future of Solar Workforce Growth Is Bright

Clean energy is an engine of job growth that can transform economies in the United States and worldwide. This issue of Solar Today explores national workforce trends.

Solar employment grew around five times more rapidly than job growth in the United States overall between 2014 and 2019, according to the guidebook "Dynamic Careers in the Solar Industry: A Guide for Career Counselors and Job Seekers." This book was produced by Interstate Renewable Energy Council and Solar Energy Industries Association in February 2022.

The guidebook says this industry employs over 230,000 people nationally, counting Puerto Rico. It will need to grow to 900,000 employees by 2035 to meet the clean energy goals of the Biden Administration.

According to the U.S. Bureau of Labor Statistics, our industry is highly technical and requires a broad diversity of skills. Solar workers may have experience in manufacturing, construction, plumbing, soldering, brazing, pipefitting, assembly, welding, engineering, programming, metalworking, chemistry, sales and/or physics. Many have backgrounds in materials, chemical, civil, electrical, industrial, software or mechanical engineering. The building trades, including electricians, roofers and plumbers, all play important roles.

Some solar employees have operated machines and foundries; worked with glass or coatings; welded, soldered and brazed metal; installed and repaired electrical and/or electronics equipment; studied environmental or

atmospheric science; operated power plants; worked with semiconductors or been employed in sales or real estate.

According to Ellen Barlas, associate director of the Midwest Renewable Energy Association, the Wisconsin Focus on Energy program administrator surveyed installers in Spring 2021 and found 91% were currently looking for staff. 77% were having difficulty finding them.

IREC's National Solar Jobs Census found in 2021 that 89% of employers in this industry said it was "very difficult" or "somewhat difficult" to fill open positions.

"Lack of awareness about opportunities for family-supporting, innovative careers in solar and other clean energy fields is a top barrier to market expansion," wrote Laure-Jeanne Davignon and Gwen Brown, vice president of workforce and communications director at IREC, in the Winter 2022 issue of Solar Today. "Pathways into the solar industry are not clearly defined or widely promoted. Solar is impacted by the persistent and pernicious stigmatization of career pathways in the trades."

This issue of Solar Today explores the statistics behind job creation in the United States, as well as the benefits of local employment.

Kat Friedrich
Editor in chief of Solar Today and professional member of the American Solar Energy Society



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See page 42 for more details.

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Looking at Jobs Can Change Our Minds About Energy



By John A. "Skip" Laitner

Energy jobs? U.S. citizens usually don't give energy much thought... except as we might worry about the price of gasoline or the monthly electricity bill. Yes, we might also fret a little as we think about how fossil fuels contribute to the growing burden of climate change.

A Shift in Perspective

There is so much more to the energy-jobs story than is generally understood. This is especially true as engineers, materials scientists, and even energy and resource economists are coming up with new critical insights on how energy shapes our larger social and economic wellbeing, as well as the climate and growing environmental burdens.

I have great hope that "rethinking the energy narrative" might positively enhance a more robust and sustainable economy. In the brief account that follows, I'll lay out working examples of how a deeper understanding of jobs might change our minds about the nation's energy consumption as it enables the greater good.

Looking at jobs figures can give us reasons for both caution and optimism.

Energy Enables Work

On any given day, someone may be welding together critical parts of an infrastructure that will generate a useful amount of solar-powered electricity. At the same time, a plant foreman may power up equipment to meet the day's production schedule. A truck driver may be on her way to

An engineer at SunEdison oversees SunEdison's testing facility at SolarTAC in Aurora, Colorado.

Since 1950, Energy Productivity Met 68% of Total U.S. Demand for Energy Services While Energy Supply Only Met 32%

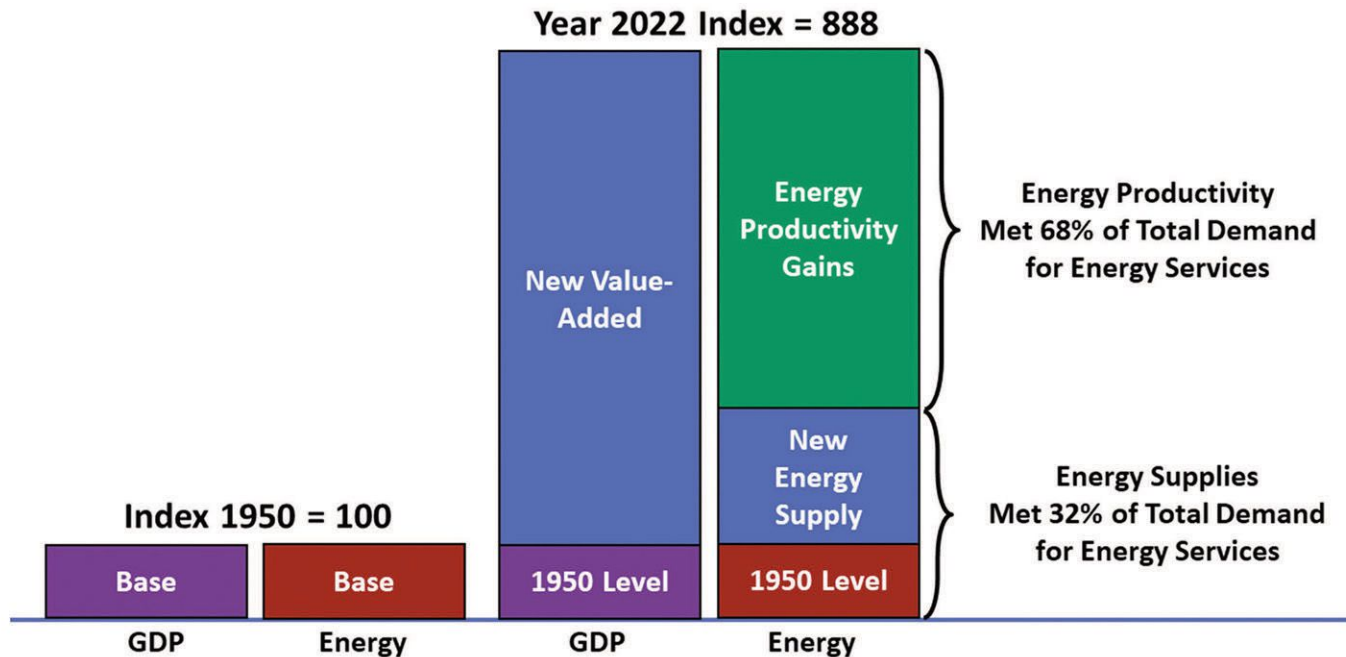


Figure 1. Author calculations are based on U.S. Energy Information Administration data (completed in February 2024).

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deliver a replacement part that allows a manufacturer to resume production.

These separate work events all share three critical ingredients. The first is someone who performs work or who directs an activity that gets the job done (labor). The second is the use of machinery or equipment that enables the production of goods and services (capital). The last is a flow of energy so that the desired work can be carried out (useful energy as work).

In effect, both labor and capital absolutely require energy in order to function at all. But it is not purely the availability of energy that matters, but how productively we put that energy to work.

In fact, as Figure 1 suggests, since 1950, the U.S. economy has grown by a factor

of almost nine. Compared to a real Gross Domestic Product (GDP) 1950 index of 100, GDP has grown to an index of 888 (rounded almost nine times) in 2022.

Yet greater energy productivity — in effect, getting more work or output from energy supply — met 68% of total U.S. demand for energy services through 2022. Energy services are those functions that enable labor and capital to facilitate or obtain desired end-use services or outcomes. Conventional energy supply, on the other hand, provided only 32% of that demand.

While the United States has shown significant gains in energy productivity over the years, it remains surprisingly less productive than many other developed nations.

Based on 2021 data, the Energy Information Administration (EIA) suggests that we generate about \$210 of GDP (measured in 2015 constant dollars to eliminate the effects of inflation) for every one million Btus of total energy consumed. Yet, the global average is slightly higher with a world energy productivity of \$218 per million Btus.

One million British Thermal Units of energy (Btus) is approximately eight gallons of gasoline, or 293 kWh of electricity.

While we outperform national economies like Belgium, Norway, Canada and China, other countries like Ireland, Switzerland, Denmark and the United Kingdom have much higher rates of energy productivity, tracking at

\$819, \$554, \$504 and \$403 per million Btus, respectively.

In fact, out of the 192 countries for which the EIA tracks such data, the United States appears to be only the 142nd-most energy-productive economy.¹

At the same time, there is good news in this story. Investments in solar photovoltaics and wind energy can also provide a stimulus that can increase the number of jobs even as greenhouse gas emissions are significantly reduced. Before we dig into that possibility, however, let's first step back and explore current climate damages as a function of jobs and economic damage.

Imagine Climate Change as a Cause of Job Loss and Economic Damage

The Earth energy system is out of balance. This refers to the buildup of excessive heat within the biosphere because of the accumulation of greenhouse gases that prompt human-induced climate change. The accumulated heat in the system over the past 60 years or so is now on the order of 576 times global energy use — warming the land, the atmosphere and especially the oceans.²

With that scale of energy absorbed within the Earth's ecosystems, it is not hard to imagine that the global heat engine, especially since the 1980s, has been driving a growing number of hurricanes, droughts, wildfires, floods and storms that create billion-dollar disasters and impact the nation's infrastructure and communities — as reported by the National Centers for Environmental Information (NCEI).³

In short, according to Figure 2, the tracking of billion-dollar climate disasters within the United States suggests that the economic burden has grown from roughly \$21 billion per year

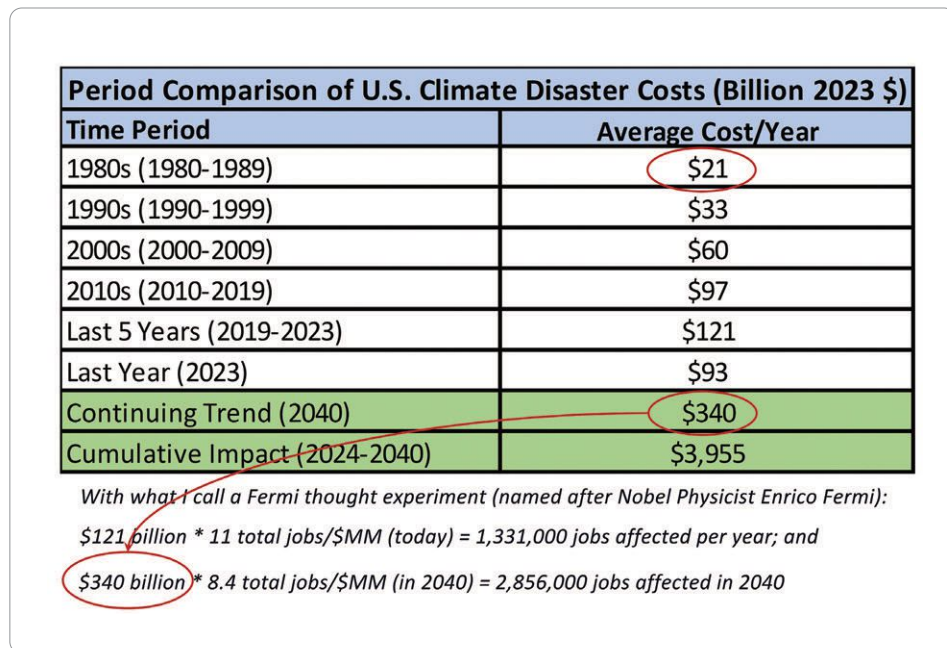


Figure 2. Author calculations are based on NCEI data (completed in February 2024).

in the decade of the 1980s to an average annual impact of \$121 billion over the last five years (2019 through 2023).

If we do nothing to slow the growth of greenhouse gas emissions and if we then extrapolate that trend through the year 2040, the scale of economic damage might grow to \$340 billion in 2040.

The cumulative impact over the 17-year period 2024 through 2040 might be on the order of \$4 trillion, with all NCEI values again reported in Consumer Price Index-adjusted 2023 dollars (to eliminate the effects of inflation). Yet, these values reflect only the direct impacts — that is, only the first cost of structural damages, including lost homes, other shattered buildings and smashed vehicles.

In the spirit of a Fermi thought experiment to give us a better sense of scale, we might find jobs effects by multiplying these first dollar impacts by what we call the total employment multipliers that measure the direct, the

indirect and the induced effects of a positive dollar change in overall spending or a negative cost in climate damages.

The direct impacts refer to the immediate disruption or the first costs. The indirect effects refer to the disruption in the supply chains that deliver or consume the likely array of goods and services that might be normally provided to households and businesses.

Finally, the induced effects are the lost spending of incomes or wages that might otherwise be made possible by the provision of direct and indirect goods and services.

As shown just under Figure 2, annual climate damages of ~\$121 billion, when multiplied by an estimated economy-wide average of 11 total jobs per million dollars in that year, suggests that about 1.3 million jobs per year were impacted in each of the last five years.

And assuming we take little action to

United States Key Sector Job Coefficients in 2022

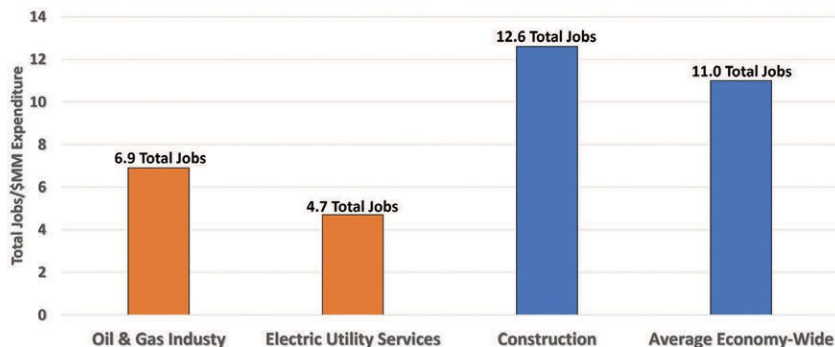


Figure 3. Author calculations are based on IMPLAN data (completed in February 2024).

slow the growing climate burden, our simple extrapolation to 2040 suggests the various climate damages might be on the order of ~\$340 billion in that year.

Accounting for changes in labor productivity, we might perhaps find a smaller economy-wide jobs multiplier in 2040 of about 8.4 total jobs per million dollars. Despite a smaller multiplier, the larger economic damages might create a larger total impact that grows to roughly 2.9 million jobs in that year alone.

My calculations are derived from the current 2022 IMPLAN data set for the United States.⁴

Imagine Climate-Productive Investments with Real Job Benefits

Rather than worry about the growing economic burden of climate change, might we imagine a set of productive investments that can both reduce greenhouse gas emissions and also drive new employment opportunities even as we also increase the nation's overall energy productivity?

In fact, spending less money on oil and gas can drive economic growth and produce proportionally more jobs in

construction and other sectors, as shown by the job-coefficient contrast in Figure 3.

In short, for every \$1 million of avoided oil and gas industry costs, which drives a total of 6.9 jobs, the energy-bill savings spent throughout the economy might drive 11 total jobs. The net gain is 4.1 jobs.

And if we encourage an investment stimulus of \$1 million to construct new solar-power and wind-energy systems, together with associated grid-enhancement assets (such as storage), that might drive a total of 12.6 jobs within the U.S. economy. There is a huge opportunity to do so with an investment in our nation's overall energy productivity.

A MacArthur Fellow, my colleague Saul Griffith, lays out this potential in his 2021 book, "Electrify: An Optimist's Playbook for our Clean Energy Future." As he suggests in Figure 6.1 on page 54 of his book, by encouraging a productive investment that electrifies the U.S. economy, we could reduce total energy needs by more than half.

Equally critical, at its peak, Griffith said the "rewiring of America will create more than 25 million new jobs." While there will be jobs displaced within the conventional energy sector, by the year 2040 there will be "a sustained 5-6 million job increase over what it is today."⁵

Other studies suggest similar magnitudes. In another 2021 study undertaken for Senate Majority Leader Charles Schumer (D-NY), my economist colleague Jeremy Rifkin, the World Resources Institute, Black & Veatch, and I documented the possibility of 15 to 22 million new jobs being created if the nation transitions to a higher level of energy productivity.⁶

Long story short? Rather than view the transition to a more energy-productive economy as a cost burden, we can retire our old arguments and thinking. Instead, we can imagine the evolution of a more energy-productive economy and increase the job-creation potential even as we reduce our global climate and environmental burdens.

There is an economic imperative and a very real opportunity to do so, if we choose to make it happen. ■

About the Author

John A. "Skip" Laitner is a long-time international resource economist. He is the principal and founder of Economic and Human Dimensions Research Associates, based in Tucson, Arizona. He is a professional member of ASES.

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Using a smartphone allows two solar technicians to examine a diagram.

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A Coordinated Approach to Clean Energy: A Recipe for Success

By Cynthia Finley

Several factors contribute to the increased demand for careers in clean energy. A complex combination of encouraging federal policies, funding support for employers and consumers, increased awareness

and interest in energy efficiency, and advances in clean energy technologies create the ideal combination for an immediate need for workforce-development initiatives to help advance career pathways into clean energy.

Imagine a perfect pie crust without filling; that sounds like it is less appealing. Imagine pie filling with no crust; that's certainly not going to hold up. Imagine a delicious pie with a perfect crust and filling, with your

favorite ice cream melting on the dish, but no utensil with which to eat; everything you want but no way to access it.

Building a sustainable workforce pipeline into clean energy that is diverse, is equitable and meets the market demands requires the right partners, tools and aligned collaboration. Absent any of these ingredients, it is like a dessert that no one can eat or wants to eat.

Building a workforce strategy in clean energy is like constructing any recipe; start with the ingredients (data). What do stakeholders need to know? How many employees does the industry need? What does the current labor market look like? And where do employers find the millions more dollars needed to transition to a future of 100% clean energy? What is the first step?

According to the U.S. Economic Development Administration, workforce development strategies are crucial to economic development and should include many elements. Employers and community partners should be included for a more coordinated approach.¹ That is a tall order even for the most well-coordinated programs.

Coordinating efforts is one of the essential takeaways from this list. Ensuring that players are aligned in their approaches can prove to be complicated. How can stakeholders implement successful workforce strategies that make a difference?

A successful strategic framework must include the following:

- **Understand the Clean Energy Landscape:** Determining the trends in clean energy and the potential growth of new technologies will be important to establish a successful

strategic workforce framework.

- **Assess Workforce Needs:** Determining what occupations and skills will be required to fulfill those workforce demands will be key to developing a sustainable pipeline routing workers into growing job opportunities.
- **Educate and Train:** Knowing where the training providers are in a state will help to provide a streamlined approach for job seekers to gain the skills they need that align with employer demands.
- **Build awareness:** The clean energy sector is fragmented across multiple industries. Creating public-awareness campaigns, spotlighting career pathways and providing resources to help job seekers begin their journeys is essential.

A multifaceted approach that involves collaboration among various stakeholders will be necessary to develop robust sector strategies for the clean energy workforce. Where do industry stakeholders start to create this sustainable approach in their communities? It's often not at the beginning. While the oven may be the last tool to finish a delicious recipe, it's the first thing one preheats before beginning.

Understanding the Landscape: What Do We Need to Pay Attention to?

According to the U.S. Bureau of Labor Statistics, "employment of solar photovoltaic installers is projected to grow 22% from 2022 to 2032."² Keeping tabs on the federal landscape also provides clues that help predict solar-industry growth. The Inflation Reduction Act "will lead to transformative growth for solar and other clean energy industries."³

According to Interstate Renewable

Energy Council's (IREC) 13th annual Solar Jobs Census, "For the first time, solar companies will have the option to use the Production Tax Credit, and new provisions allow new entities to take advantage, including churches, government entities, educational institutions, tribal nations and other nonprofits."⁴

What Might Stand in Our Way?

Will recent changes to net metering in California or a rise in interest rates across the United States impact the projected growth? According to Michelle Davis, head of solar research at Wood Mackenzie, "The [United States] solar industry is on a strong growth trajectory, with expectations of 55% growth (2023) and 10% growth in 2024."⁵

Wood Mackenzie noted that over the long term, "interconnection bottlenecks and transmission capacity may impact sustained growth."⁶ This is something to keep an eye on. The data and statistics on workforce development are evolving. Knowing which data trends to focus on can be perplexing.

Assessing Workforce Needs: A Mixed Bag of Data

One minute, eggs are good for you, and the next, they aren't. What do you do with conflicting labor-market data? Labor-market projections can help lay the foundation for your workforce needs. However, it's time to roll up our sleeves and dig deeper. Developing relationships with employers adds the depth and breadth of information you need to prepare for workforce demands.

With labor projects determined, workforce stakeholders and employers can move on to conducting a gap analysis to determine what may be missing to meet industry needs.

Education and Training

Thanks to employer partners, the



Credentialing initiatives provide a vital layer of quality assurance in rapidly evolving clean energy sectors to ensure that workers are trained to the highest standards and that their skills and competencies are adequately validated.

— Anna Sullivan, previous IREC director of credentialing

occupations are defined, the skills are assessed, the credentials are determined, and the timing of the workforce landscape has been studied; now, let's get to the rest of our recipe needs.

The levels of experience for occupations can vary from employer to employer. IREC's data on new hires in 2022⁷ shows stark differences in the amount of training or credentials required across industry occupations.

It's important to know what is expected to determine where our strategy may fall short. A gap analysis determines what training exists in our communities and what stakeholders and workforce partners may need to develop to fill the gaps. It is a critical next step in our recipe.

Ensuring There Is a Pathway

44% of solar industry employers said it

was "very difficult" to find qualified applicants — the highest such percentage ever recorded in the Solar Jobs Census.⁸

How do employers and workforce stakeholders close this gap? Mapping out which occupations are in immediate demand and the required credentials or skill sets is an excellent place to start to give the job seeker a solid idea of their career path.

IREC's solar career map⁹ illustrates the expansive options for career growth in the industry and the pathways to get there.

Are We Using the Freshest Ingredients? The Importance of Quality

So far, this strategy has identified the jobs and the skills required and has identified the training to meet those demands and established career pathways. But what about quality assurance? With a rapidly changing clean energy landscape, it will be vital for job seekers to receive training that is assured to meet industry standards and that prepares them for sustainability in the workforce.

Where do you begin to determine if training providers align with industry demands and provide quality training? Start by exploring who is accredited in the field.

We may be at the part of our recipe where we have an ingredient we aren't sure we really need. Will it really make

a difference to leave out this ingredient, which is sometimes hard to find? While I don't think our recipe will be a complete failure without an accredited training provider, I definitely don't think it will be winning any ribbons at the county fair.

Accreditation ensures that trainers are trained for specific job tasks. Conformity assessment tasks may include testing, inspection or certification.¹⁰ According to the IREC standard 14732:2014 Job Task Analysis Guidance Document, accreditation ensures training organizations are developing "job task analysis (JTA) from which to form the basis of their curriculum or syllabus,"¹¹ but it's also how employers know they are getting the freshest ingredients.

The New Face of the Workforce

Today's workforce is multifaceted; the current generational span includes the Boomer generation (60-78) through Generation Z (7-22).¹² With a large population beginning to age out of the industry or job seekers making career switches later in life, there is a learning curve for employers to properly support these changing dynamics and ensure company sustainability and growth.

Building Awareness

When our recipe is complete, workforce stakeholders started with a clean slate; brought in the experts (employers, educators, training professionals and community-based



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organizations); figured out what was needed to get cooking; used all of our best tools and ingredients; and followed each step through the very end. Now, how does the message get out to job seekers about this wonderful creation?

The clean energy-workforce space is energized (no pun intended), so many people are interested in and supporting the shift to clean energy. Here are a few resources to help you get started and build these integrated connections to organized labor, federal resources, employers, training providers and community-based organizations:

- **The National Clean Energy Workforce Alliance:**¹³ a cross-sector effort to improve clean energy education, training and job-placement outcomes — and ensure that expanding clean energy job opportunities are inclusive of diverse candidates and underserved communities
- **Green Workforce Connect:**¹⁴ a new workforce strategy from IREC working to create a central hub of clean energy jobs (<https://greenworkforceconnect.org>), a new platform that connects job seekers and contractors to employers
- **Apprenticeships in Clean Energy (ACE Network):**¹⁵ a network that leads a national coalition of industry, training and workforce development leaders to expand and diversify Registered Apprenticeship opportunities in the rapidly evolving clean energy sector
- **Association for Career and Technical Education (ACTE):**¹⁶ an association that provides educational leadership in developing a competitive workforce and strives to empower educators to deliver high-quality CTE programs that ensure all students are positioned for career success

Regardless of one's seat at the table,

whether as an employer, contractor, training provider or workforce stakeholder, communication is key to advancing the solar industry.

Employers are crucial, but quality education and training should be non-negotiable. Sustainability is linked to resources and career pathways. The plan isn't just to get people jobs; the goal is to get people long-term careers that impact our growth opportunities.

Let's get cooking! ■

About the Author

Cynthia Finley is the vice president of workforce and strategic innovation at IREC (Interstate Renewable Energy Council), where she leads the team in developing strategic initiatives to expand workforce development in the

clean energy industry. She is committed to creating equitable career opportunities for underrepresented populations. She holds a doctoral degree in higher education.

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Jobs on the Chopping Block as Utilities Lobby Against Local Solar

By Katie Kienbaum

Across the country, investor-owned utility monopolies are spending big to stop a major clean energy job creator: local solar.

As one example from California, the three main investor-owned utilities contributed at least \$1.7 million to a group pushing to limit the amount that solar owners are paid for energy shared with the grid.¹ Last year, the state — which is the largest rooftop-solar market in the nation — implemented new net metering rules that dramatically reduced compensation for new rooftop solar.

The Golden State, once seen as a climate leader, isn't the only place where local solar is under attack. With utility support, states have rolled back net metering for rooftop solar, and utilities have opposed community solar programs or pushed to limit the financial benefits for participants.^{2,3}

Local solar refers to the smaller-scale installations built on rooftops, over old landfills, and in other available spaces near the communities they power. Compared to the far-flung, utility-scale solar farms that sprawl out over hundreds of acres, these compact

local solar projects actually create more jobs per watt of energy capacity.

Even the utilities' own figures show that local solar is the superior job generator. In a regulatory filing in Minnesota, investor-owned utility Xcel Energy estimated that for every \$1 million it spent on rooftop solar, it would create 30 times more jobs than if it had spent the money on utility-scale solar.⁴

Local solar projects create greater jobs because they lend themselves to a more human touch. Workers are needed to clamber around on the rooftops of households and community centers, to connect with potential solar owners and community solar subscribers, and to design projects that fit the unique needs of rural farms or dense urban neighborhoods.

Naturally, local solar development means jobs in installation, project management, and other services directly related to building community solar gardens and mounting panels on roofs.

But the paychecks for local workers and other economic activity can also lead to growth in 'induced' jobs at businesses that aren't obviously related to solar, such as restaurants,

bookstores and doctors' offices. Solar gardens and other clean energy projects that are not just locally sited but also locally owned can create even more jobs for communities. In a recent report called "Advantage Local: Why Local Energy Ownership Matters," I and my co-authors laid out the many ways that local ownership of clean energy — distinct from its location or scale — can maximize community benefits, including jobs.⁵

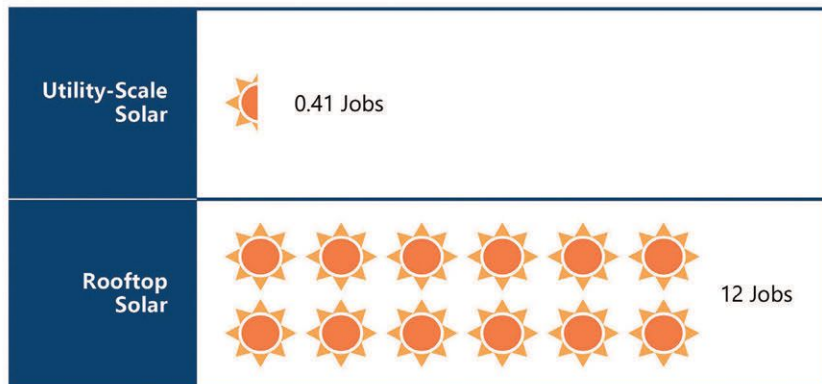
For instance, research into community wind projects has found that local ownership was associated with more impact on local employment levels than absentee ownership.⁶ (This included jobs working directly for wind projects and related suppliers, as well as at other businesses in the region.)

One possible explanation for this increased employment effect is that local owners might be more likely to hire local workers and frequent local suppliers than corporate owners from outside of the community.

Furthermore, local ownership of clean energy gives communities the power to prioritize employing workers from groups that are underrepresented in the solar industry, including women, veterans, and Indigenous and Black workers.

Solar panel installers climb on the roof of a home in Minneapolis.

Jobs per \$1 Million Invested, According to Xcel 2020



Source: "30 Times More Jobs from Rooftop Solar, Utility Filing Says" by John Farrell



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© Katie Kienbaum

Comparison of jobs associated with \$1 million in capital expenditure for both utility-scale and rooftop solar; from a regulatory filing Xcel Energy made in 2020 at the Minnesota Public Utilities Commission.

In addition to jobs, local solar projects generate local economic returns through energy-bill savings and land-lease payments. Paired with batteries, they increase community resilience to extreme weather. Nurturing a local solar industry can also enable the growth of new small businesses, since the smaller scale is more accessible to entrepreneurs just getting started.

Locally owned solar, in particular, can increase popular support for clean energy deployment. In our report, we identified several studies that suggest that local residents favor community-owned clean energy projects and that these projects are associated with more positive attitudes toward clean energy development.^{7, 8, 9, 10, 11}

Plus, local ownership of solar puts power back in the hands of everyday people — not profit-maximizing utility executives — to make decisions about our own energy futures.

Perhaps because of these benefits, utilities push back against the growing popularity of local and community-owned solar in a variety of ways. In state after state, investor-owned utilities have lobbied against rooftop and community solar programs — sometimes with disheartening success, as in California.¹²

We also suspect that some utilities may delay connecting projects to the grid (or at least not properly prioritize and fund this part of their work) to slow the growth of local solar.¹³

On the more nefarious deep end of the lobbying pool, utility monopolies have even supported deceptive 'ghost candidates' in order to unseat unfavorable legislators and leveraged charitable donations for the public support of community groups, all in an effort to manipulate policymaking and advance their own interests.^{14, 15, 16}

With the efforts that investor-owned utilities make to just to stop their customers from installing rooftop solar, it's not too surprising that two separate blockbuster corruption scandals in recent years have involved utilities: FirstEnergy Corp. in Ohio and ComEd in Illinois.^{17, 18}

Investor-owned utility monopolies spend big on all of this dirty work because local solar, by offering an alternative to their 100-year-old business model of centralized control, threatens their shareholder profits and political power.

An expert witness for the investor-owned utility Arizona Public Service has admitted as much in front of the state's utilities commission. During a hearing, he agreed with an attorney for the solar industry that the "growing number of [rooftop-solar owners] is a business risk to utility's shareholders and company profits" and that this is why utilities often oppose these local projects.¹⁹

The utility monopoly threat to local solar has a real impact on clean energy jobs. According to an analysis late last year by the California Solar & Storage Association, California would have lost 17,000 solar jobs — a fifth of the industry's employment in the state — by the end of 2023 because of the state's changes to net metering rules.²⁰

"We are shedding jobs at a level that is reminiscent of the Great Depression," even eclipsing losses related to the COVID-19 pandemic, the group's executive director, Bernadette Del Chiaro, said.²¹

Of course, there's still a need to make sure that local solar is equally available to all communities and that local solar jobs are good jobs.



© John Farrell

Cooperative Energy Futures' Co-Founder and General Manager Timothy DenHerder-Thomas stands at the site of the cooperative's community solar installation on Shiloh Temple International Ministries in Minneapolis.

Though the gap has been shrinking over recent years, rooftop-solar adopters still skew toward higher incomes, even when accounting for homeownership.²² And as for any clean energy job, labor policies, practices and protections must ensure that local solar jobs allow workers to thrive.

Investor-owned utilities exist to make profits for investors, not to create local jobs or community benefits. Policymakers need to step in if we want to achieve those goals.

A key first step is for state legislators to prevent utilities from charging their customers for astronomical executive compensation, lobbying expenses, and other self-serving political-influence activities that hurt local solar and go against ratepayers' best interests. Colorado, Connecticut and Maine have already passed utility-accountability

laws and additional states are considering their own bills.^{23, 24}

If regulators and legislators really want to maximize the job-creation and economic-development benefits of the clean energy transition, they need to stand up to the big utility companies, support the growth of rooftop and community solar, and make sure that local solar jobs are high-quality and easy to access for all kinds of workers.

That way, monopoly utilities won't be able to dim solar's shine. ■

About the Author

Katie Kienbaum is a senior researcher for the Energy Democracy Initiative at the Institute for Local Self-Reliance (ILSR), which works to build strong local economies by challenging concentrated corporate power. Before joining the Energy Democracy

Initiative, she was a research associate with ILSR's Community Broadband Networks Initiative.

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Solar Jobs Illuminate Opportunities on Pine Ridge Indian Reservation

By Alicia Kelton

Against the backdrop of the vast Pine Ridge Indian Reservation in South Dakota, where the winds whisper stories of resilience and the land echoes the trials and triumphs of a community, a beacon of hope emerges in the form of the Red Cloud Renewable energy center.

Nestled within this expansive landscape, this center stands not merely as a collection of solar panels and structures, but as a testament to the unwavering determination of the Oglala Lakota people toward self-sufficiency and progress.

In the shadow of historical challenges, the presence of Red Cloud Renewable on Pine Ridge Indian Reservation marks a pivotal chapter — an assurance that energy independence is not just a dream but an imminent reality.

Through innovation, empowerment and a deep reverence for heritage, this center is spearheading a transformative journey towards a future where renewable energy powers not only homes but also the resurgence of hope and pride within the community.

For generations, the Oglala Lakota people have navigated a complex history marked by struggles for self-governance and the preservation of their rich heritage.

In the midst of socioeconomic hardships — where unemployment rates soar and access to basic necessities remains a challenge — this community has fiercely safeguarded its cultural identity.

However, amidst these trials, one formidable challenge looms large: the unyielding grip of energy dependency.

With utility costs burdening households already grappling with economic constraints, the quest for energy independence emerges as an indispensable aspiration.

Beyond mere access to power, it represents a beacon of self-reliance — a pivotal stride toward liberating the community from enduring cycles of hardship and a testament to their unwavering determination to shape their own destiny.

At the heart of Pine Ridge Indian Reservation's transformative journey towards energy sovereignty stands the visionary figure of Henry Red Cloud.

In 2002, fueled by a passion for change and a dedication to his community, Red Cloud embarked on a pioneering endeavor. By crafting and distributing solar furnaces, he not only provided immediate relief from the pressing

utility costs but kindled a spark of hope for a sustainable future.

This act of empowerment laid the groundwork for what would later flourish into the Red Cloud Renewable energy center. Established in 2008, this center became a beacon of change, offering crucial solar education classes.

These classes, more than mere lessons on photovoltaics and renewable energy, serve as the cornerstone of progress for Native Americans. They don't just impart technical knowledge; they embody a promise of opportunity, a pathway toward a future where renewable energy isn't just a concept but a tangible resource within the grasp of the community.

Marie Kills Warrior, an Oglala Lakota native who is a senior project support at Renewable Energy Partners, Inc., stands as a shining example of hope and progress for the future of Pine Ridge Indian Reservation. Her remarkable journey in the world of solar energy mirrors the radiant progress that is illuminating opportunities for the community.

I asked her what it was like growing up on Pine Ridge Indian Reservation. She said, "Well, like most rez kids at that time, we played and ran around in the

creeks out at North Route where we lived and in Kyle. Swam and fished at Kyle Dam, Yellow Bear and the river. Played basketball at the courts and on Sesame Street.

"We spent a lot of time outside during the spring, summer and fall months. My cousins would take us to pick buffalo berries, chokecherries and plums. They would also take us out to timsila [wild turnip] hunting behind the hills by our house. You can say we made the best out of what we had."

Her solar odyssey began in 2017 during an Earth Day event, where the potential of solar energy ignited a spark within her. This initial curiosity transformed into a passionate pursuit of knowledge, leading her to Denver, Colorado, to join the Grid Alternatives SolarCorps program.

Her journey is not just about personal growth; it's about lighting the way for others. She actively participated in the Tribal Train The Trainer (T4) program, preparing to teach and share the power of PV 101 with others.

"I want to give back the same opportunity that was presented to me to other individuals in their homelands," she told me.

Her dedication to education and her vision for a future where Indigenous communities have greater access to renewables radiate hope. Her aspirations extend beyond her own backyard, envisioning a South Dakota that embraces renewable energy as a net metering state or as part of a coalition that changes the Public Utility Regulatory Policies Act rates.

Her mission is clear: to empower her community and others to harness the limitless potential of solar energy. Through her unwavering dedication, the future shines brighter on Pine Ridge

Indian Reservation, where solar jobs are indeed illuminating opportunities and inspiring a sustainable path forward.

In the heart of Pine Ridge Indian Reservation, where resilience has been tested by enduring challenges, a compelling narrative of hope, innovation and empowerment unfolds.

Marie Kills Warrior's journey, intertwined with the Red Cloud Renewable energy center and the burgeoning solar job opportunities on the reservation, epitomizes the essence of this transformative path.

She embodies the hope and promise of Pine Ridge, while Henry Red Cloud stands as the bedrock upon which this visionary future is built.

The radiant progress propelled by the Red Cloud Renewable energy center and the visionary leadership of figures like Marie Kills Warrior and Henry Red Cloud serves as a beacon of hope.

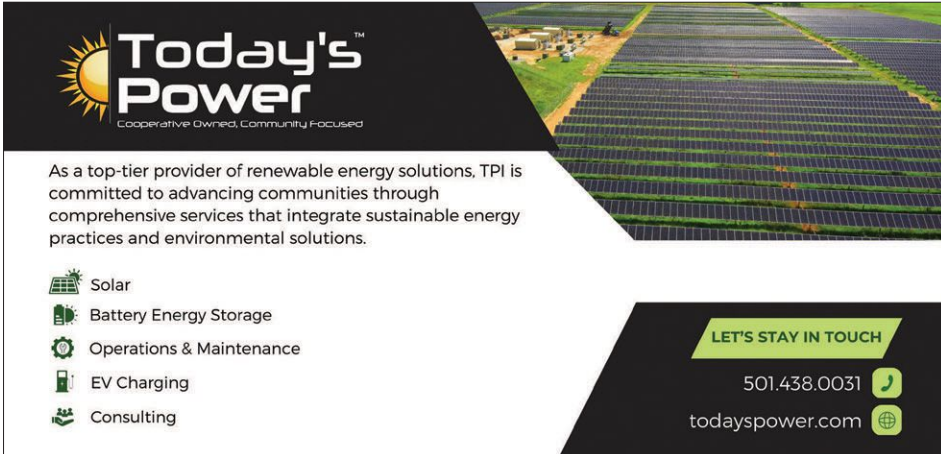
This narrative not only signifies their unwavering spirit in the quest for energy independence but also emphasizes that renewable energy is a catalyst for positive change, illuminating opportunities and forging a sustainable path forward. In Pine Ridge Indian

The American Solar Energy Society has been grant-writing to augment the fantastic work of Red Cloud Renewable in Pine Ridge, South Dakota, which is training Native American solar professionals and deploying solar to tribal people.

Reservation's heart, the future gleams with solar-powered promise, guided by the determination of its people. ■






About the Author

Alicia Kelton is the head of the Communications Department at Red Cloud Renewable, collaborating closely with Henry Red Cloud. Her role has been immersed in championing the cause of solar energy. She received an associate's degree in psychology from Ivy Tech Community College in Bloomington, Indiana.





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It's Time to Stand up for Solar



A large solar farm in Texas stretches toward the horizon.

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By Jill K. Cliburn

Last fall, Solar Today readers learned about rising opposition to large-scale renewable energy development in communities nationwide. Author Joel Stronberg mentioned groups like the Alliance for Wise Energy Decisions and Citizens for Clear Skies, whose names belie campaigns

that promote misinformation and dismiss urgent clean energy goals.¹

Stronberg cited a 2023 study from the Sabin Center for Climate Change Law that cataloged nearly 300 renewable energy projects across 45 states that experienced serious organized

opposition between March of 2022 and May of 2023 — a 40% increase in such projects compared to the year before.²

New research confirms the causes of this rising crisis. A survey of solar and wind developers released by Berkeley Lab in January 2024 found that



permitting challenges and community opposition closely followed grid-interconnection constraints as the top three reasons for large-scale solar-project cancellations.³ Problems with financing, supply chains and power sales pale by comparison.

The threat that a vocal minority of citizens can pose to solar project approvals and ultimately to U.S. climate goals is real. But efforts to improve permitting processes and to see solar opposition in perspective are also gaining strength, thanks largely to formerly silent citizens who are standing up for solar.

Joanne Scanlon, executive director of the New York-based United Solar Energy Supporters (USES), is one of those formerly silent citizens. Scanlon retired from a career in healthcare and looked forward to spending time with her family before she realized that concern for her grandkids' future would require her to become a clean energy activist.

She watched opposition building against a proposed 180-MW solar development nearby called the Horseshoe Solar project. She started a Facebook page and then a Nextdoor networking group to offer a different, pro-solar perspective. She started to speak up at public meetings, collaborated with a Sierra Club group, and eventually "plugged into" USES.⁴

The Horseshoe project was delayed by about five years, but it was finally approved to break ground this year.⁵

Along the way, Scanlon said, "I learned to ignore personal attacks." She said it's important that debate and negotiations take place. That requires bringing well-researched facts to the table.

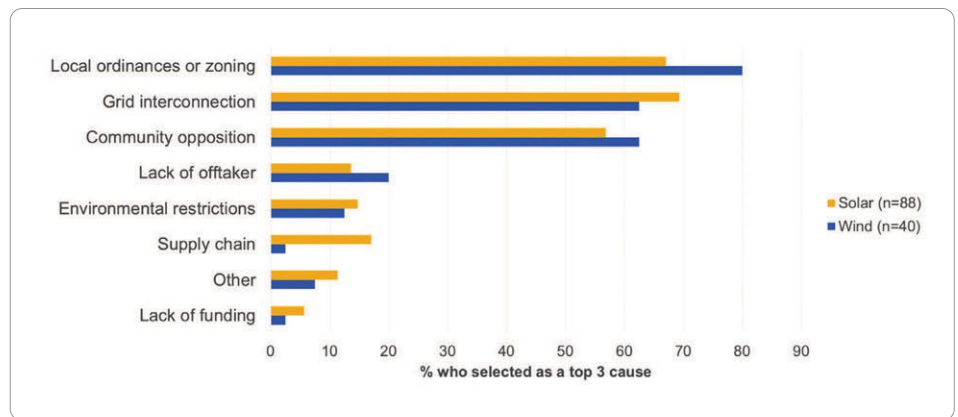


Fig. 1. Developers of large-scale solar and wind identify community opposition as a top reason for project cancellations. Over the past five years, about one-third of large-scale solar projects have been canceled and about half have experienced delays of six months or more.

© Berkeley Lab, 2024

In this case, landowners' rights were at stake, but so were the rights and concerns of indigenous people who have long called the region their home. A state review board recommended that a portion of the Horseshoe site be withdrawn from the development plan to protect Native American cultural sites. The developer complied.

On this project and at least a half-dozen more, USES has worked through the permitting process to bring lasting economic and environmental benefits to communities by "harvesting the sun," according to Scanlon.

She said that USES accepts donations from developers, but that the group's efforts are not contingent on developers' support. Pro-solar campaigns do better when relying on volunteers who are known in their communities but not directly associated with the landowners, solar developers or utilities. USES board members and advisors assist frontline volunteers, preparing a trove of informative webinars, referrals and FAQ answers.

That backup crew includes an engineer; a behavioral scientist; a code officer; an

energy business consultant and Richard Perez, a solar technology and policy innovator who served multiple terms as a board member of the American Solar Energy Society (ASES).

Perez leads solar research at the State University of New York in Albany. He has been working with his son, Marc Perez, a group manager at Clean Power Research, on ways to meet grid requirements with less battery storage.

The plan hinges on overbuilding and strategically dispatching PV.⁶ Perez said technical solutions and planning tools for a massive, yet careful PV buildout are at hand. "But the greater challenge today lies in public education," he said, adding that an educated response to solar disinformation is urgently needed.

In contrast to most local pro-solar groups, those that oppose solar developments are well organized and nationally networked and supported.

At the 2023 ASES national solar conference, I shared my firm's research on public engagement in a rising controversy around a proposed



When you hear “solar,” you think “great,” but there is a dark side. There’s more to the story. Learn how solar contributes to climate change, produces toxic waste, as well as the real economic drivers of the industry.

— Citizens for Responsible Solar Website (2024)

100-MW solar-plus-storage project near Santa Fe, New Mexico.⁷

Using a variety of analytic tools, we reviewed comments that were submitted to county permitting officials during early phases of what turned into a costly and ongoing permitting process. One simple and glaring finding was that just 13% of comments submitted during the first six months favored the project.

Those who opposed the project had quickly organized a mailing list, circulated instructions for writing public comments and op-eds, reached out to newspapers and radio, and launched a website.

Initially, the site was built directly on the website of a solar opposition group in Kansas. Later, the Santa Fe, New Mexico opposition group launched its own website under the name New Mexicans

for Responsible Renewable Energy.⁸

The name echoed that of a national opposition group, Citizens for Responsible Energy, which has been the subject of investigative reporting by National Public Radio (NPR) and others due to its ties to oil and gas interests.⁹ According to NPR, Citizens for Responsible Energy has ties to similar opposition groups in at least a dozen states.

It would be fair to accept the critique that people of one opinion are simply organizing to counter people of another opinion and that is how democracy works. Yet it is hard to disentangle the subtle disinformation and fears that solar opposition groups have raised.

One vexing finding from our analysis of comments on the proposed project near Santa Fe, New Mexico was that 52% of those opposed to the project identified themselves as “pro-solar.” According to their websites and comments, project opponents support solar, but only on industrial-zoned land, on brownfields, along highways and on rooftops.

They use specific language to describe how they oppose misplaced “industrial solar” from “corporate solar developers” who make big profits selling to utilities that often intend to “send it” from their backyards to markets far away. Opposition outreach materials often blame “big tech” green tag buyers and server farms for driving solar demand on power markets. This promotes a distorted picture of the nation’s overall clean energy transition.

The potential risks of large-scale solar to wildlife, agriculture and soil health are highlighted in opposition outreach, too, without reference to the perils that

wildlife, agriculture and soils already face from climate change and alternative land developments.

In the hands of opposition leaders, the advantages of solar generation — in terms of displacing coal-fired electricity, increasing grid reliability, supporting tax-funded services, leveraging incentives, providing stable income for landowners and jump-starting a solar workforce that also would serve distributed solar — are often cast as unnecessary or uncertain promises.

Despite rapid progress across every aspect of the solar and storage industry, the careful scientists and policymakers that have led our field too often find that fear builds much faster than trust.

For example, the willingness of storage battery partners to share lessons learned about fire safety has become a figurative flashpoint wherever battery storage is part of the plan. The public often misses the fine print about new battery designs, fire prevention standards and emergency response protocols while being drawn to the jaw-dropping visuals from an earlier generation of battery fires.

Social science research has begun to catalog the sources of opposition to large-scale solar and to suggest and test more representative and evidence-based permitting processes. Gilbert Michaud, assistant professor at the School of Environmental Sustainability at Loyola University Chicago and chair of the ASES Policy Division, has been involved in some of that work.

For one recent study, Michaud collected data on proposed projects across six states and oversaw 45 interviews with stakeholders. The study shed light on who was communicating



with whom, as well as when and how they were communicating during early development and permitting processes.¹⁰

He identified problems and likely ways to fix the system. For example, different media, including social media, should be used to attract a more representative cross-section of participants to both in-person and online meetings.

Outreach and education should begin early. Publicly funded liaison offices in each state could help facilitate local processes. Michaud said he also recommends having technical experts present at all public meetings.

A few of Michaud's recommendations aligned with process improvements and public education that are already being tested.

For example, Minnesota's Clean Energy Resource Teams (CERTs) program was already taking this approach. CERTs is a collaboration involving the Minnesota Department of Commerce (the state energy office), the Southwest Regional Development Commission (a representative statewide agency), the nonprofit Great Plains Institute and the University of Minnesota Extension.

CERTs' mission is to provide education and tools to local communities to support making a rapid and just transition to clean energy. According to Melissa Birch, a CERTs co-director, the program supports large-scale siting processes in three major ways: It provides tools and web-based information tailored to different stakeholders' needs; it sponsors events, from Farmers Union forums on solar leasing pros and cons to workshops for local government; and it works directly in communities, providing customized

research and facilitation.

Predating Michaud's recommendation, the CERTs team has run local liaison offices throughout the state.

CERTs is focused on building trust, because trust from all parties is key to short- and long-term success. According to Birch, trusted partnerships differ from one rural community to another, but one consistent partner is the cooperative extension service.

"It has been there for over a century and it earned its place as a reliable source of information," Birch said. "We like to say we are doing clean energy with people, not to people."

Another resource that CERTs plans to use more is an "energy ambassadors" program. CERTs recognized the trust factor in neighbor-to-neighbor communications, so a year ago, it recruited local energy ambassadors to spread the word about the incentives in the Inflation Reduction Act (IRA).

Where siting controversies are brewing, these ambassadors — largely volunteers and often retired professionals — can bring unbiased information about energy technology and the permitting process. They also may act as a conduit if more specialized help is needed. According to Birch, CERTs has more than 800 energy ambassadors signed up.

Getting down to the details of large-scale solar planning is still a challenge, Birch said. In Minnesota, local planning boards generally have authority to rule on conditional-use permits for solar projects under 50 MW.

But the Minnesota Public Utilities Commission now has permitting



We like to say we are doing clean energy with people, not to people.

— Melissa Birch, co-director of Clean Energy Resource Teams

authority for projects 50 MW and over. Minnesota recently updated its siting guidelines, adding considerations to protect the local environment and culture, but also limiting some demands on developers.

State authority over large-scale solar siting is becoming popular in states that have clean energy and decarbonization goals. State-run processes may address local planning boards' lack of expertise and time. In some cases, they can resolve issues in the face of conflicting interests.¹¹ As of early 2024, 13 states have exerted some degree of authority over solar permitting.

The response from stakeholders and developers to statewide permitting authorities has been mixed. Some planning boards and local participants resent the takeover of local authority. Developers find that siting criteria increase and permitting costs rise when state authorities get involved, but the faster approvals are welcomed. It is too soon to tell if local tensions and threats of legal action will abate.

In preparing this article, I talked to Dahvi Wilson, who leads a consultancy called Siting Clean.¹² Wilson draws on direct experience leading community outreach for a developer, Apex Clean

Energy. She shares best practices, while warning that outcomes for any one project remain unpredictable.

For instance, diverse and representative participation is central to democratic processes, but sometimes more vocal solar supporters bring out more intense opponents, and the result is gridlock. A strategy that involves negotiating a benefits agreement for extra monetary compensation or nonmonetary accommodations may help.¹³

Wilson said she supports using professional facilitators. She also said she favors education and technical assistance for local decision-makers.

We agreed that anyone with experience across the solar field or educational background in energy systems could assist. That assistance might be a formal engagement or work behind the scenes or simply sharing personal stories about projects that have worked.

Wilson said, "When you get past all the noise, what you hear is a community asking, 'What do we really want for our future?'" ■

About the Author

ASES Fellow Jill K. Cliburn has stood up for solar plus storage in her own community. Her website, the Solar

Value Project, features work on integrated energy strategies and market analysis for a prompt and equitable energy transition.

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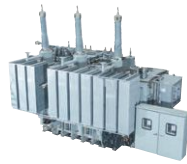
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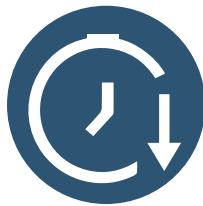


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Solar installers work long hours on rooftops preparing supporting hardware and other components of renewable energy systems.

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Protecting Yourself from the 'Other Guys'

By Roger Horowitz, Patrice "Pete" Parsons and Rich Strömberg

There are a lot of great solar installers in the industry who provide reliable products to build affordable arrays with quality and

skill. However, from time to time, we hear reports of the 'other guys' – the companies that are in it to make a quick buck and move on to the next sale.

Warranty service or Operations and Maintenance? These may be lacking or nonexistent.



Solar arrays that miss the energy production estimates by a significant margin? These can leave well-intentioned array owners with a bad experience.

While this is not the norm, we want to caution would-be solar-array owners and provide pathways to prevent poor customer satisfaction.

Some recent anecdotes about poorly installed solar that we are personally aware of include the following:

- A woman purchased a home with a preexisting leased solar array that was installed on an older roof. The original installer should have advised the prior homeowner to get a new roof before installing an array that would undoubtedly require removal and reinstallation before the end of the 25-year PV-module warranty period.

That installer went out of business, but a new company bought the lease and now wanted to charge the woman a lot of money to remove the array for the roofers to do their work and then reinstall the system. They quoted her a price for the work equal to buying a brand-new solar array.

Since the lease company owned the array, they wouldn't let another installer do the work at a lower cost. The homeowner was also offered a buyout of her remaining lease at a price much higher than the current value of her PV system.

- A company installed solar panels on any available roof space instead of focusing on unshaded roof space that would have a good power-production factor.
- A commercial solar array was mounted horizontally (instead of at an angle) on a flat roof in Florida where rainwater was allowed to pool on the modules and seep behind the

front-side glass, causing rippling of the ethylene vinyl acetate encapsulant film and allowing algae to grow between the glass and the silicon cells.

Further, the inverters were mounted outside, which resulted in the ventilation fans pulling in corrosive, salty sea air into the sensitive internal electronics. This system stopped working and the customers did not have a good solar experience.

- A commercial array in Colorado had a building owner who had a third-party power purchase agreement and was billed regularly for the supposed solar production despite the system not producing.

The installer had not worked to repair the offline inverters for more than a year, but was providing a fraudulent bill to the building owner, who was double-paying for electricity.

- A large, extremely reputable national solar company worked with a company that was providing it sales leads in the Houston area. After the large company had installed a system based on one of these leads, the customer didn't understand why her bill was not zero.

She had been promised by the salesperson that her solar array would cover her entire electric bill. She didn't have a clear understanding of the contract and certainly didn't understand the credit that would be paid to her.

When the solar company heard about all the promises that had been made on their behalf, they went back and repaid her the entire amount of the system, which was fortunate for her in this case, but there are plenty of examples of these poor practices happening across Texas.

While several of these anecdotes relate

to leased arrays, this is not to say that all leased arrays should be avoided. In many larger commercial arrays, any system larger than what is allowed for net metering (typically larger than 25 kW) is frequently owned by a solar company that operates and maintains the system and sells the power produced to the building owner at a rate less than the utility retail rate.

Residential lease arrays might be an attractive option for homeowners who don't want to buy or finance their own systems. The primary considerations for leased arrays are 1) to be cognizant that the lease is an encumbrance should the homeowner wish to sell their home before the end of the lease period and 2) to seek transparency about the energy produced and system health/performance.

What are the costs to buy out the lease early? Are there penalties to an installer if the system underperforms? What are the costs and logistics if the array needs to be removed for roof repairs? These factors might cause a prospective solar array owner to revisit a home equity loan or even forego a solar array until a later date.

Inspired by the Inflation Reduction Act of 2022, lots of folks are interested in installing solar all over the country. Along with reputable solar companies, there are plenty of solar scams and misleading solar advertisements out there, particularly on social media. Here are several pathways a prospective solar-array owner can follow to protect their interests and ensure the best possible option based on their particular needs.

- You should beware of ads and salespeople claiming free systems or a time-limited program that you need

to sign up for immediately.

- Some companies are counting on you not doing your research and selling expensive systems or systems without warranties. Do you really need an array this large? Is a battery/energy storage system actually needed if the local utility doesn't have time-of-use rate structures?

Time-of-use rates are used when an electric utility charges a higher per-kWh rate at times each week when energy demand is high and lower rates when demand is low.

A battery energy storage system can help the array owner draw excess power from the battery rather than from the grid during high-usage-rate periods. The system can also push excess power back onto the grid during high-usage-rate periods and use nighttime power from the grid to recharge the battery when usage rates are low.

- Solar United Neighbors (SUN) has a National Solar Help Desk (<https://www.solarunitedneighbors.org/helpdesk>), which provides free support for people looking to go solar. SUN is a 501(c)(3) nonprofit that can help you find local installers and can review solar proposals and contracts free of charge. We and SUN always recommend getting three solar proposals and making sure to check the warranties on the systems to make sure that the installer and manufacturers have a long-term plan to help you if your system isn't working.
- In general, we recommend using the monitoring app that comes with your solar systems to track performance. We also advise having a solar professional take a look at your system in person every five years.
- When it comes to choosing an installer, make sure to read every

online review that you can find and call or meet multiple local references from the solar installer. A lack of local references and lack of online reviews is generally a red flag when it comes to solar companies. Scrutinize these online reviews to confirm their legitimacy.

- Talk with your neighbors who have solar arrays.
- Lastly, join your local chapter of the American Solar Energy Society (www.ases.org) to network with system owners who can provide advice and share their knowledge.

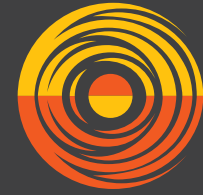
Best of luck in finding the right solar array for your needs. We love our systems and want the same for you. ■

About the Authors

Roger Horowitz is the director of Go Solar Programs at Solar United Neighbors, where he combines his passion for community organizing with his love of solar energy. He loves supporting families as they go solar and is especially interested in equitable financing.

Patrice "Pete" Parsons is a seasoned strategist with more than two decades of experience. She is the executive director of the Texas Solar Energy Society, where she creates programs to educate and inspire every Texan to adopt solar energy as part of an equitable 100%-clean energy future. She is a member of the American Solar Energy Society (ASES).

Rich Strömberg is the vice chair of the ASES Photovoltaics Division. He is a doctoral student focusing on the reuse of solar photovoltaic systems for social and ecological benefit. He is a co-founder and the director of Equitable Solar Solutions.™



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naacp.org
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Facilitating Renewable Energy Job Transitions

By Gilbert Michaud

As part of the transition to lower-carbon forms of electricity generation, policymakers and economic developers must understand the skills and education levels of those looking for employment in the clean energy economy. Using the State of Ohio as a case study, my paper outlined a workforce transition tool to inform both political decision-making and a displaced worker's career choices.

This research illustrates the level of difficulty in transitioning between jobs and the wage differentials involved in declining energy occupations (e.g., coal) compared to those of high-growth energy occupations (e.g., solar).

Traditional energy assets in the United States, such as coal-fired power plants, achieve inexpensive and relatively reliable power for consumers. However, a decline in these sectors due to environmental regulations and price competitiveness of renewable energy sources has resulted in job losses in certain communities.

At the same time, investments in large-scale renewable energy developments, supported by state policy and corporate sustainability, have helped create job opportunities, tax revenues and other positive economic impacts in communities. These communities include ones adversely affected by the hardships of declining coal economies.

In mapping coal-fired power plant occupations' transition to the solar energy industry, this research reveals a larger commentary on the skills gap inherent to many workforce transitions. The results suggest that it is important to upskill workers to provide job opportunities at similar wage rates.

This research assists decision-making for workers, agencies, developers and politicians who are pursuing or supporting enduring and well-paying careers in the new energy economy.

The analysis proposes four specific policy recommendations to incentivize program strategies and energy workforce training:

- Provide state-funded workforce training and/or extension of unemployment benefits for fossil fuel workers to support their transitions to high-growth energy industries, particularly as renewable energy projects achieve a higher penetration across the country.
- Establish sales-tax exemptions for renewable energy firms that offer workforce-training programs at summer camps, high schools, etc., to prepare a stable supply of labor in renewable energy jobs (e.g., wind and solar).
- Implement an advanced energy workforce tax credit to incentivize the hiring and training of marginalized populations (e.g., veterans and

individuals with criminal records) by clean energy and technology firms.

- Legislate state K-12 school curricula that provide advanced energy courses (i.e., science, engineering and mathematics fields) and/or learning labs (e.g., onsite photovoltaic arrays) that establish resources for professional development in clean energy.

Moving forward, as renewable energy projects experience even more growth, these actions offer long-term policy solutions to aid energy career transitions. ■

This article is a summarized version of the policy brief "Examining Renewable Energy Transitions: A Tool to Enhance Workforce Development" (<http://tinyurl.com/2kz mh5fr>). It was written by the author.

About the Author

Gilbert Michaud is an assistant professor of environmental policy at the School of Environmental Sustainability at Loyola University Chicago. His research focuses on renewable energy policy, electricity markets, and sustainable economic development. Michaud currently serves as the Policy Division chair for ASES.



Rooftops covered with solar panels are becoming more common as renewable energy is adopted in the United States.

© Bilanol

Demand and Opportunity Today for Residential Energy Storage

By George Kuo

In the first three quarters of 2023, the installation of residential solar power saw another surge, with growth of 24% year-over-year, according to Wood Mackenzie. Total expected growth for the year was 13%.¹

This is on top of 2022 results in which 700,000 United States homeowners

embraced the technology.² Growth is expected to slow in 2024 to 12%, with recovery expected in 2025.

The residential storage market is now experiencing significant expansion, driven by a confluence of factors making battery storage increasingly appealing to homeowners incorporating PV systems.

Residential Energy Storage: An Increasingly Attractive Proposition

The growing frequency of public-safety power shut-offs, exacerbated by severe weather events and grid constraints, has heightened homeowners' awareness of the vulnerabilities associated with sole reliance on the utility network.³

Concurrently, regressive changes to net metering policies in California have diminished financial incentives for solar energy fed back into the grid. These factors are reshaping the economics of solar power, reinforcing the case for energy storage systems. With utilities offering reduced returns for surplus solar power, storing excess energy allows homeowners to fully capitalize on their solar production financially.⁴

The Storage Industry Must Address Consumer Requirements

Innovation within the solar industry has yielded compelling solutions that provide homeowners with greater flexibility of and control over their energy usage.

Canadian Solar, where I work, addresses consumer needs with its EP Cube and EP Cube Lite residential battery storage systems. These systems are scalable for indoor or outdoor installation, are user-friendly, and prioritize safety and sustainability.⁵

These solutions include technologies from enhanced battery chemistry to intelligent power management, interoperability with existing systems, whole-home backup and grid-tied options.

Technological advancements, coupled with government incentives, empower homeowners to maximize the financial benefits of solar energy without incurring substantial costs. Solutions offering seamless integration, advanced intelligence and heightened grid resilience are now accessible to the average homeowner.

The Challenge: Educating the Customer

However, despite steady growth in the residential solar sector, there remains a significant gap in consumer awareness, particularly around solar + storage solutions.

It's important for homeowners to understand the benefits and long-term prospects of residential energy storage systems.

As homeowners look to industry experts for advice on the best products for their needs, the responsibility of educating them falls primarily on distributors and installers who interact directly with customers. They must become industry experts and trusted advisors.

Sharing the Benefits of Home Energy Storage

Topics to emphasize when explaining the benefits of residential storage options to homeowners include understanding available options, cost-effectiveness, space, aesthetics, expandability, safety and performance.

Here are some key points for solar pros to consider when explaining these advantages:

- **Understanding the options available:** Homeowners can choose between full home vs. partial home backup vs. off-grid solutions.
- **Cost:** With modular residential energy storage, homeowners can add incremental battery modules to accommodate more loads and maximize capacity.
- **Space and aesthetics:** Today's energy storage units are sleek and compact and can be installed indoors or outdoors.
- **Expandability:** Economical self-consumption systems can be installed now and later expanded to include more capacity or backup power.
- **Safety:** The most prominent global energy providers develop solutions with safety as the top priority.
- **Performance:** Manufacturers ensure that the systems offer overall

performance, chemical stability, increased capacity and longer service life.

Safety and Battery Chemistry

Residential battery types and their chemistries have been key discussion points due to their direct impact on homeowners.

Recent incidents in the United States where residential batteries caught fire have raised consumer concerns about battery chemistry.

Presently, residential battery storage systems primarily utilize nickel manganese cobalt (NMC), lithium-ion (LION) and lithium iron phosphate (LFP) chemistries. NMC batteries are a subcategory of LION batteries.

It is important to understand some key differences in battery chemistry. The most significant difference between NMC and LFP is that NMC has a higher likelihood of thermal runaway when compared to LFP.⁶ Also, NMC technology is more susceptible to catastrophic failure like catching fire. LFP battery chemistry is considered the safer option for residential battery storage systems.⁷

LFP is a more stable battery chemistry than NMC.⁸ LFP batteries offer a superior balance of energy density and efficiency, optimized for residential use. Their greater depth of discharge promotes a longer battery lifespan and stable operation.

Compared to NMC batteries, LFP batteries boast a longer lifespan and superior safety due to their stable lithium chemistry, even at higher temperatures.

Environmentally, LFP batteries outperform NMCs, as they contain less toxic materials, minimizing their environmental impact.

Additionally, LFP batteries offer a higher number of warranty cycles and can handle a wider range of temperatures, making them safer for residential applications.

Compared to other LION batteries, LFP is considered safer because of its capability to handle a wider range of temperatures. The operating temperature range for typical LION batteries is 32°F to 113°F, while the

operating temperature range for LFP batteries is -4°F to 140°F. On average, LION batteries have a higher probability of catching fire at higher temperatures.

Despite the other LION chemistries having a higher energy density than LFP, it is better to use LFP batteries because of their safety.

Canadian Solar's EP Cube system utilizes LFP battery chemistry, ensuring minimal risk of thermal runaway and enhancing overall safety.

With homeowners seeking to save money and reduce dependence on utilities, the future of the residential solar market is set for major growth. Continued consumer education is vital to drive market expansion globally in the coming years.

With further consumer education, we should see vast market growth on a global scale in the years ahead. The dawn of a new era in the solar industry is upon us, and it's brighter than ever. ■

About the Author

George Kuo works at Canadian Solar Inc. as senior director of product & solutions, product management. He has a master's degree in computer engineering from the University of Southern California, a bachelor's degree in electrical engineering from the University of California, Irvine and an executive master's degree in business administration from the Stanford Graduate School of Business.

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In Memoriam: Paul Dean Maycock, Visionary

By Roma Maycock and Jennifer Macotto

Paul Maycock, a visionary of the early United States solar program, passed away at Hospice House of Williamsburg on Sept. 26, 2023 at the age of 88.

He was born on Sept. 2, 1935 to Wilfred and Vivian Beauchene Maycock in Sioux City, Iowa, and graduated valedictorian from East High School. A recipient of a full U.S. Navy scholarship, he attended Iowa State University (ISU) and graduated with a bachelor's degree in physics in 1957. Upon receiving his commission as an officer in the U.S. Navy, he was assigned to the Office of Naval Research in Washington, DC.

After fulfilling his three-year commitment to the Navy in 1960, he returned to ISU, where he earned a master's degree in Physics. He then accepted an offer from Texas Instruments (TI) in Dallas, where he served in a variety of positions and was directly involved in developing over 40 consumer products that TI ultimately produced or licensed. It was during this time in Dallas that he began his service in the United States Navy Reserve.

Returning to Washington, DC in 1975, Maycock joined the Energy Research and Development Administration that later became the U.S. Department of Energy (DOE). At DOE, he was director of photovoltaics and developed his passion for renewable energy. He grew his starting budget

of \$7 million to an all-time high of \$152 million in 1981.

With the change of administration, however, the budget was reduced to less than \$53 million and he resigned to form his own company, Photovoltaic Energy Systems Inc., a consulting and information firm. It counseled clients throughout the world in the field of photovoltaic energy.

He went on to author over 100 professional publications and two books, the most important of which was "A Guide to the Photovoltaic Revolution: Sunlight to Electricity in One Step." He frequently lectured internationally to developed as well as developing nations and reached out to countries around the world with his newsletter, PV News. He enjoyed serving on the boards of the Solar Electric Light Fund and Solar Light for Africa.

In retirement, he and his wife, Roma Maycock, lived at Patriots Colony in Williamsburg, Virginia and enjoyed traveling to visit family and friends around the globe, especially to England, where they had lived in 1962 and 1963.

He was a 35-year member of the service club Ruritan National and loved to play poker. He also liked to fish in the Chesapeake Bay.



In America, the government's late-1970s solar program grew chiefly out of the vision of one man — Paul Maycock.

— The Silent War: Inside the Global Business Battles Shaping America's Future, Ira Magaziner and Mark Patinkin, p. 218

In addition to his parents, he was preceded in death by his daughter, Andrea Turner, and his brother, Lanny Maycock. He is survived by his wife of 65 years, the Rev. Roma Maycock; his children, Robin Maycock, Joel Maycock, Jennifer Macotto and Seth Maycock; and his brother, Jerry Maycock. ■

Memorial contributions in Paul Dean Maycock's name may be made to Solar Light for Africa (<https://solarlightforAfrica.org/donate-now>).

A version of this obituary was previously published by Bucktrout Funeral Home.

About the Authors

Roma Maycock is a retired Episcopal priest. She is a professional member of the American Solar Energy Society.

Jennifer Macotto is Paul Maycock's daughter. She works at VPM, Virginia's home for public media, as a donor relations officer.

A Tribute to Frank Vignola, Solar Advocate, 1945–2023

By Dave Renné, Chris Gueymard and Tom Stoffel

ASES and the solar resource community have lost a dear friend and outstanding researcher. Frank Vignola passed away peacefully at his home in Eugene, Oregon on Sept. 26, 2023.

As a physicist with a passion for solar energy, he was convinced early on of the need for a database that would provide a reliable, accurate estimate of the local and regional solar resource. By 1975, he was already measuring solar radiation at the University of Oregon (UO). By engaging local, state and federal stakeholders, he was able to establish the UO Solar Radiation Monitoring Laboratory (SRML).

He created a network of high-quality radiometric stations in the Pacific Northwest. Today, the SRML continues to serve the solar industry with accurate, up-to-date solar-resource information for the region. The network he established is now the longest-running observational solar-radiation database in the United States.

He has a long history of key publications advancing our knowledge of the global solar resource. His numerous publications include contributions to the two latest editions of the National Renewable Energy Laboratory (NREL) publication "Best Practices Handbook for the Collection and Use of Solar Resource Data for Solar Energy Applications" (2017¹ and 2021²).

He was the driving force behind two editions of the book "Solar and Infrared Radiation Measurements" (2012 and 2020³), coauthored by Joseph Michalsky and Thomas Stoffel. He published numerous articles in the International Solar Energy Society's journal *Solar Energy*, as well as in other journals.

From 1995–2020, he also served as an associate editor of *Solar Energy*.

Recently, he helped establish the SuNRISE PV Facility at UO. His contributions to the annual American Solar Energy Society (ASES) national solar conferences are legendary. He was a regular technical contributor, a member of the scientific committees, and a key organizer of Solar 2004 in Portland, Oregon.

His special service to ASES led him to become the first recipient of the respected Rebecca Vories Award in 1996.

In 2020, he was honored by his peers with the much-deserved ASES Charles Greeley Abbot Award in recognition of his groundbreaking technical contributions in advancing solar-energy applications.

He is survived by his wife, Mary Lou Vignola, who often accompanied him to the ASES solar conferences.

Here are some brief testimonials from a few of his many colleagues and friends:

Tom Stoffel said, "Frank was known for his thoughtfulness, humility, creativity and gentle persistence as he diligently worked to advance solar-energy-conversion applications around the world. He will be sorely missed by those of us fortunate to have worked with him."

Dave Renné reminisced, "I have known Frank as a friend as well as a professional colleague and mentor for over 30 years. Through the years, I enjoyed his many visits to NREL as well as my occasional visits to SRML in Eugene."

Laura Riihimaki, one of his students, said, "Frank was my [doctoral] advisor during 2004–2008 at UO. As I spoke with various physics professors there to find the right advisor, Frank stood out because his commitment to research in solar-radiation monitoring was motivated by his firm conviction that solar energy was a technology that needed to be adopted for the good of society."

Aron Habte, Frank's most recent technical monitor at NREL, said that "Frank was one of the few icons in this small community. I am sure Frank will be remembered from his many contributions to the field of solar energy. I would also like to remember

Frank for his deep knowledge, hard work, perseverance and humility."

Chris Gueymard said he was "touched by [Frank's] indefatigable elegance at overcoming his professional or personal challenges." He also shares how he was deeply moved by his character: "For as long as I live, I will always be uplifted by the immense courage of this smiling person carrying a heavy bag and painfully limping through the long corridors to reach a remote session room, always ready to provide suggestions around or motivate anybody intercepting him along the way."

Some of the material and quotes included in this article were derived

from a tribute the authors published in Solar Energy.⁴ ■

About the Authors

Dave Renné was a principal scientist at the National Renewable Energy Laboratory (NREL) from 1991-2012, where he managed the solar-resource-assessment activities and worked in international programs. He served as president of the International Solar Energy Society (ISES) from 2010 to 2019. He is a life member of the American Solar Energy Society (ASES).

Chris Gueymard was a research scientist at the Florida Solar Energy Center. He then founded Solar Consulting Services and continued his research activities. He has been a

long-time member of ASES and ISES. He served as associate editor of Solar Energy during 2007–2020. He continues to author many scientific publications.

Tom Stoffel progressed from a research scientist to principal group manager during his career at NREL from 1978–2013, focusing on solar and infrared irradiance measurements and modeling. He then co-founded Solar Resource Solutions to support research in renewable energy. He is an ASES fellow and life member.

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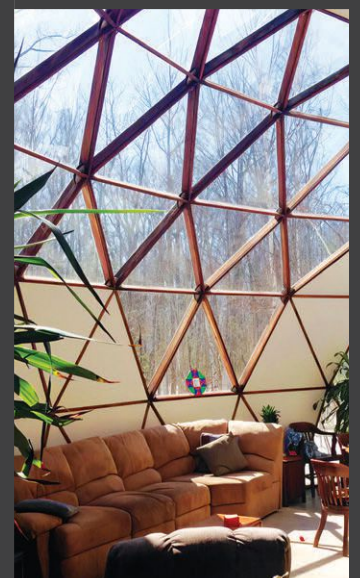
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In Memory of David Johnston

By Paul Kando

David Johnston, builder, designer, researcher, entrepreneur, author and educator, died on Aug. 29 in Boulder, Colorado at the age of 71. He was mentored by legendary architect, inventor and system theorist Buckminster Fuller at Southern Illinois University, graduating with a degree in Environmental Systems Design.

In the late 1970s and early 1980s, during the Carter Administration, he was a valued member of a team of professionals focusing on solar energy research and development under the auspices of the U.S. Department of Energy. He became a key contributor to the development of passive solar energy in buildings. In turn, that work inspired the development of the worldwide Passivhaus design-build system by the International Passive House Institute in Darmstadt, Germany.

Dedicated to preserving a clean environment and stable global climate, he advised the International Energy Agency, as well as private architects, builders and homeowners, on energy-efficient and environmentally sustainable housing. He also helped establish the Passive Solar Industries Council in Washington, DC and co-founded the California Build It Green program.

In 1983, he founded Lightworks Construction in Bethesda, Maryland, specializing in solar installations and gradually expanding into general remodeling and new home and commercial construction. A decade later, he sold Lightworks and moved

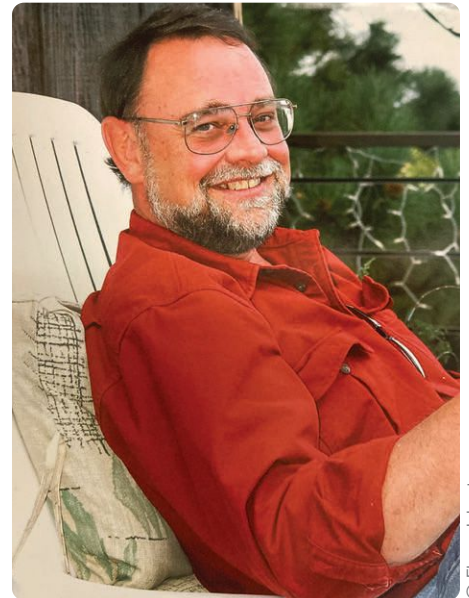
to Boulder, Colorado, drawn, as he said, by the culture of sustainable living.

In Colorado, he founded What's Working, a design and consulting firm focusing on green construction practices, which encouraged builders to pay more attention to sustainability and efficient energy use. Through trade-organization activities, he was largely responsible for the commercialization of passive solar technology and its integration into residential construction.

A past director of the Boulder Home Builders' Association and co-author of the Green Builder Certification Program, he worked as a columnist for the Boulder Daily Camera newspaper and worked for Cahners' Construct magazine as a senior editor. He co-founded the Boulder Green Building Guild and authored five books about green building, remodeling and energy self-sufficiency. He was a regular contributor to major building publications and newspapers.

In 2007, he was awarded the SAM/SPG Sustainability Leadership Award in Switzerland as well as other numerous awards and citations for his contributions to a clean energy and healthy climate future and sustainable design and building practices. He also worked for the U.S. Department of State in a program to 'green' U.S. embassies around the world.

He was also a warm and friendly person who enjoyed the outdoors and traveling overseas. He was generous of



David Johnston

© Elena Johnston

spirit, was a great friend, and was happiest when he was in nature or playing with his four-legged friends. He is survived by his wife Elena Johnston and his brother Jim Johnston, who, along with his many friends and work associates, will miss him deeply.

In his memory, the Colorado Green Building Guild created a new annual award, the David Johnston Lifetime Achievement Award, in 2024. ■

This obituary was previously published in Boulder Daily Camera. It was edited and reprinted with permission from the author.



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United States Solar Data Tables

Emmanuel Iddio,
National Solar Tour intern at the
American Solar Energy Society

FEDERAL ENERGY REGULATORY COMMISSION: Energy Infrastructure Update, November 2023		
% of total available solar-generating capacity	7.50%	November 2023
% of total capacity installed provided by renewable energy	36.81%	November 2023
Estimated future % of new capacity provided by solar energy	72.05%	December 2023 – November 2026
Estimated future % of new capacity provided by renewable energy	88.86%	December 2023 – November 2026
% of new generation in service	73.71%	November 2023
Cumulative % of new generation in service in 2023	46.53%	January – November 2023

<http://tinyurl.com/57yrpedb>

ENERGY INFORMATION ADMINISTRATION: % Change in Electric Power Monthly from November 2022 – November 2023		
% growth in total solar power net generation	22.3%	November 2022 – November 2023
% growth in residential solar generation	28.78%	November 2022 – November 2023
% growth in nuclear power generation	0.3%	November 2022 – November 2023
% growth in coal power generation	-9.1%	November 2022 – November 2023

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Shining Bright in the Capital: ASES SOLAR 2024 Conference

By Ella Nielsen



The federal capitol building lights up the skyline of Washington, DC.

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On May 20-23, the American Solar Energy Society (ASES) will be hosting its 53rd annual national solar conference, "SOLAR 2024: Connecting Technology & Policy," marking a significant milestone as it returns to Washington, DC, after more than two decades.

With the presidential election this year, SOLAR 2024 conference attendees are engaging DC policymakers, emphasizing the urgency for collective action to drive sustainable energy change, and highlighting technology and policy prescriptions demonstrated to work.

Hosting this net zero-emissions hybrid conference in the nation's capital

amplifies the message that the clean energy revolution is not just a regional pursuit, but a national imperative that demands attention and collaboration.

Headlined by a powerful, diverse lineup of leaders from government and industry at the front lines of driving change, SOLAR 2024 will have over 120 speakers, 30 sessions, three North American Board of Certified Energy Practitioners workshops, an annual awards banquet, a climate ride, a solar-advocacy day on Capitol Hill, a solar tour, dozens of posters displayed and more.

SOLAR 2024 will act as a powerful call to action, gathering technical experts, policymakers, industry leaders,

students and solar enthusiasts to converge and collaborate and to explore innovative solutions that will shape the future of renewable energy.

ASES, the leading educational nonprofit for solar energy, will celebrate its 70th anniversary. It will also celebrate the 30th anniversary of the Mid-Atlantic Solar Energy Society, one of its regional chapters.

SOLAR 2024 has a commitment to celebrating diversity. The lineup of speakers reflects a variety of perspectives, experiences and expertise, showcasing the richness that a diverse community brings to the solar industry.

From policy influencers to technology innovators and entrepreneurs to renewable energy activists, the speakers at SOLAR 2024 represent a diverse set of voices united by a common goal — a sustainable, secure and equitable future powered by clean energy.

Plenary Speaker Spotlights

- **Rana Adib**, executive director of REN21
- **Paul Pinsky**, director of the Maryland Energy Administration
- **Becca Jones-Albertus**, director of the DOE Solar Energy Technologies Office
- **Mark Christie**, commissioner at the Federal Energy Regulatory Commission
- **Sandra Begay**, principal member of the technical staff at Sandia National Laboratories
- **Maria Curry-Nkansah**, senior research advisor and lead for circular economy for energy materials and technology at the National Renewable Energy Laboratory
- **Ramez Naam**, climate tech and clean tech investor, speaker, and author
- **Sonia Dunlop**, CEO of the Global Solar Council
- **Jamie Lyons**, technical director of the U.S. Department of Energy Zero Energy Ready Home program and vice president at Newport Partners LLC

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Attendees of all ages and stages in their careers can expect a dynamic exchange of ideas, insights and solutions. Workshops, panel discussions and poster presentations will delve into the intersection between technology and policy, exploring how advancements in renewable energy technology can be seamlessly integrated into a policy landscape that fosters sustainability and resilience.

In conclusion, SOLAR 2024 is not just a conference; it's a celebration of

progress, a call to action on a renewable energy future and a commitment to diversity and inclusion. This conference is creating a catalyst for change, lighting the way towards a sustainable, solar-powered future.

Join the conversation and register for this conference! You can attend in person or sign up for the hybrid event. The full conference schedule, visitor's guide, net zero-emissions information and more can be found online at ases.org/conference. ■



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Want to learn more about ASES Divisions and how you can get involved? Visit community.ases.org. Updates from some of our divisions are below.

Solar Buildings Division

Chair: Julian Wang, jqw5965@psu.edu

The Solar Buildings Division will have a record presence at "SOLAR 2024: Connecting Technology & Policy" in Washington, DC on May 20-23 with three sessions:

- 1) Energy Competitions
 - 2) Solar Energy Efficiency and Performance Enhancement
 - 3) Advancements Beyond Net Zero
- In addition, there will be a panel discussion day on efficiency-first

strategies focusing on policies that help reduce the overall energy demand of buildings.

Finally, the Solar Buildings Division meeting will now be more integrated into the conference, so be sure to reach out to us there (or online through the American Solar Energy Society Community Forum ahead of time) to share your thoughts on how you

can help increase awareness of solar buildings.

This spring, the 2024 National Solar Tour (www.nationalsolartour.org) will open for registration for individual and group tours for both the in-person and virtual tours held in the fall. Sign up soon to have more time to market your tour and gain free exposure for your building and the many professionals involved in creating it.

Energy Economics

Chair: Wyldon Fishman, wyldon1@gmail.com

Financing remains at the heart of the energy transition. Photovoltaics and those panels on the roof are the cherry on top. Exploring how to finance the repair of a building before weatherization or the roller coaster of silicon-manufacturing supply all comes back to each of us being aware of the ups and downs of

supply and demand.

Does that old building have a landlord looking to save money long-term? How fast can manufacturers ramp up to meet the demand for newer and better solar panels? Will new affordable housing be built using all the new construction

techniques that cost less and do more? Join us at the American Solar Energy Society conference "SOLAR 2024: Connecting Technology & Policy" to discuss questions about solar implementation. It's all about the economics.

Grid Modernization & Storage Division

Vice Chair: Emily Moog, ermoog@sandia.gov

The Grid Modernization & Storage Track is hosting one session and several posters at "SOLAR 2024: Connecting Technology & Policy," covering a variety of topics and focus areas. The organizing committee also anticipates that panels during the conference will approach their guiding questions from a

multidisciplinary set of perspectives. Dedicated enthusiasts of this track should be able to find something in every panel.

More broadly, innovation, particularly regarding regulatory or community-engagement hurdles in home,

community and large-scale solar, is a topic of active research in the field. It is of critical importance not only to consumers and community members, but is also starting to receive attention from policymakers.

Policy Division

Chair: Gilbert Michaud, gmichaud@luc.edu

The American Solar Energy Society's Policy Division is looking forward to the 2024 annual conference, especially given its location in Washington, DC. The conference theme, "Connecting

Technology & Policy," fits the interests and activities of the Policy Division well. At the event, the Policy Division will be involved with engagement efforts with elected officials in Congress. Attendees

are encouraged to sign up for the "Solar Advocacy in Action" add-on for the conference!

Sustainability Division

Chair: Paulette Middleton, paulette@panoramapathways.net

The Sustainability Division is pleased to welcome Numair Latif as vice chair. For more information, visit <https://ases.org/about/about-us/divisions/bios-of-chairs/>. The division leaders are

developing new strategies for advancing sustainable policies and practices. Please contact Chair Paulette Middleton at paulette@panoramapathways.net with your suggestions and express interest in

being part of the strategy team. Also, please register for "SOLAR 2024: Connecting Technology & Policy," as it promises to be a critically important conference in this election year.

ASES Life Members

This list does not include deceased members.

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Mentor Match Program

Join the program at community.ases.org/participate/mentoring.

Ella Nielsen, programs director at the American Solar Energy Society (ASES): "What are some of the benefits of participating in the ASES Mentor Match Program?"

Adam Rossi, sustainability coordinator at Jerusalem Farm and ASES member: "As someone just entering the field of solar energy, I know that there is a lot I don't know. It is a wonderful thing to be able to talk to an experienced expert in the field and be able to ask questions and work through problems without feeling embarrassed or self-conscious. The ASES Mentor Match program provides just that. I am able to meet one-on-one with an individual who has a wealth of knowledge about everything solar. It has helped me feel so much more confident and better equipped to be a young person in the solar industry."

EVENTS CALENDAR

RE+ Southeast	Apr. 17-18	Atlanta, GA	https://re-plus.events/southeast
CLEANPOWER 2024	May 6-8	Minneapolis, MN	https://tinyurl.com/2p836cu5
RE+ Texas	May 14-15	Houston, TX	https://re-plus.events/texas
SOLAR 2024: Connecting Technology & Policy	May 20-23	Washington, DC	https://ases.org/conference
AgriVoltaics Conference 2024	June 11-13	Denver, CO	https://www.agrivoltaics-conference.org
RE+ Mid-Atlantic	July 18-19	Philadelphia, PA	https://re-plus.events/midatlantic
RE+ 24	Sept. 9-12	Anaheim, CA	https://www.re-plus.com

Member Spotlight

Numair Latif

Vice Chair of the American Solar Energy Society (ASES) Sustainability Division and ASES Member since 2015

Latif is the founder and principal of RESco Engineers LLC, a company focused on engineering the renewable economy using the 2030 Palette (<http://2030palette.org>) to achieve carbon-neutrality in the building and transportation sectors.

He is the co-founder and former executive director of the Southwest Rural and Indigenous Renewable Energy Resource Center, located in New Mexico. The nonprofit provides education, support services and training for small and emerging businesses in rural and indigenous communities of the Southwest for realization of renewable energy and efficiency project ideas.

Living in the high desert, he is inspired by the regional passive solar building design pioneered by the Native Americans and later adopted by the Spanish and Mexican settlers of this arid region.

He is also an educator who has taught courses in environmental policy,

planning and science at the college level. He is currently teaching high school students science, technology, engineering, and math (STEM) subjects utilizing hands-on renewable energy projects to demonstrate the power of solar energy.

He has graduate degrees in architecture, environmental science and engineering.

Ella Nielsen, programs director at ASES: What has been your involvement with ASES?

NL: I have been an ASES member since 2015. I became interested in studying the accelerating impacts of climate change after Hurricane Katrina hit my beloved city of New Orleans in 2005 and caused unimaginable damage. I soon discovered that one of the key strategies in addressing climate change is the rapid adoption of renewable energy sources such as solar.

When I moved to New Mexico, I decided to join ASES to learn more about the best available technologies for small-scale applications in the Southwest, a region with one of the most abundant rates of solar insolation in the world.



EN: What personal or professional accomplishments are you most proud of?

NL: Winning the New Mexico Governor's STEM Challenge in 2020 with a group of high school students who designed a water filtration and recycling system for household use in rural communities with limited water availability. I launched and sponsored several student clubs, honor society chapters and podcasts. I also launched 1to3tutors.com in 2023 to offer individualized instruction in math and science through video conferencing. ■

ASES Legacy Fund

Learn more at ases.org/legacyfund

Create a lasting impact on a sustainable and renewable energy future after you have passed away! Support the American Solar Energy Society's Legacy Fund. Financial backing is imperative, given the escalating urgency of addressing global climate challenges. With your support, you'll help ensure that our work continues.



Intern Spotlight

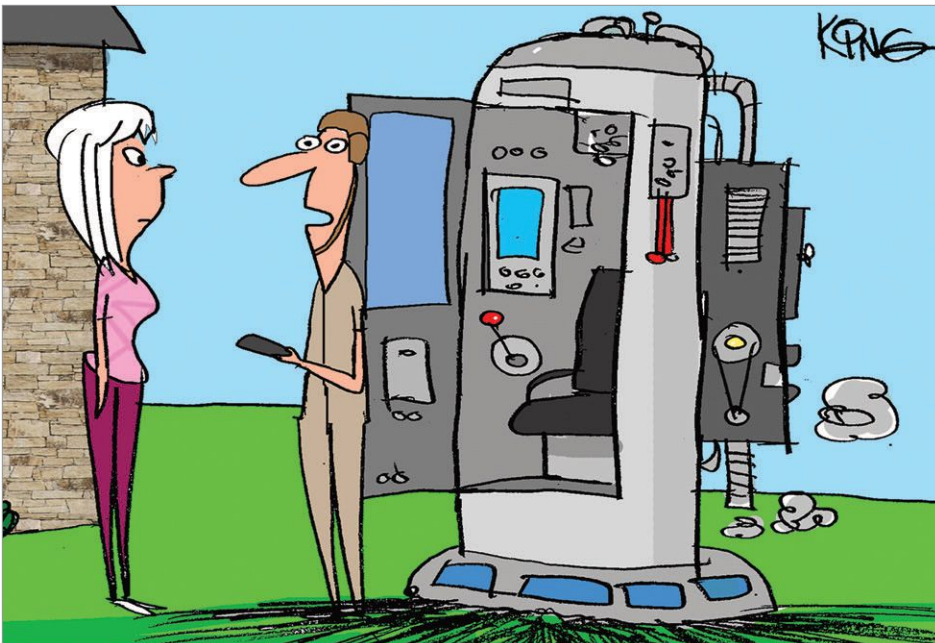
Emmanuel Iddio is a doctoral student at the Department of Civil and Architectural Engineering at the University of Wyoming. He is interested in building energy simulation, net zero home designs, and rooftop solar for residential and commercial buildings. Originally from Ibadan, Nigeria, he appreciates the experience of all four seasons and especially likes the cold and windy winters that Wyoming is known for. He enjoys watching soccer, reading novels, biking, and experiencing other cultures through food and documentaries.



AMERICAN SOLAR ENERGY SOCIETY

Tiny Watts aims to engage thousands of people – kids and adults across every spectrum – to fall in love with the many uses of solar and become solar citizens.

LEARN MORE
ases.org/tinywatts



“I built this time machine so I can go back in time and advise them to start working on solar energy. Would the 1800s be far back enough?”

© Jerry King

CORRECTION

In the Winter 2023 edition of Solar Today, in the last paragraph of the article on page 35 by Dara Bortman, one of the sentences says, “We must electrify everything...” Stu Besnoff, owner of Alpine Solar Heat and Hot Water, LLC, wrote to Solar Today to remind us of the importance of solar thermal, which does not require electrification.

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