

SOLAR TODAY

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

Winter 2022
solartoday.org

Clean Energy Workforce Alliance Targets Ambitious Goals



The Federal Green Revolution and You
Growing the Number of Female Installers
Native-Led Educational Spaces Are Rising like the Sun



The logo features a stylized sun with a yellow center and orange and red concentric circles.

ASES SOLAR 2023

SAVE THE DATE

August 8-11, 2023 | University of Colorado Boulder

ases.org/conference

See Call for Participation on page 55





AMERICAN
SOLAR
ENERGY SOCIETY

Solar Today magazine is published by the American Solar Energy Society (ases.org), the U.S. section of the International Solar Energy Society, providing publications on progress to a 100%-renewable energy society.



IN EVERY ISSUE

- 4** From the Editor
- 12** View from Washington
The Federal Green Revolution and You
By Joel Stronberg
- 42** Student Perspective
Meet Cliff Brutus:
Mechanical Engineer,
Project Manager and
Lifelong Learner
By Ian Guan
- 54** Division Updates
- 55** Inside ASES
- 59** ASES Chapters

Cover and this page: Riley Neugebauer, solar installer and apprentice at Namaste Solar, works on a residential solar project. © Juan Blohm

OUR ENVIRONMENTAL STATEMENT

Solar Today is printed with vegetable ink on paper containing 100% post-consumer waste. The paper is produced at a biomass-powered mill. The average issue saves:

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

6 Clean Energy Workforce Alliance Targets Ambitious Goals

By Laure-Jeanne Davignon and Gwen Brown

18 The Club of Rome's Plan for Systems Change and a Just Solar Revolution

By Sandrine Dixson-Declève

22 Growing the Number of Female Installers

By Riley Neugebauer

26 Native-Led Educational Spaces Are Rising like the Sun

By jacklyn janeksela

30 Midwest Renewable Energy Association Trains Forest County Potawatomi

By Ellen Barlas

32 Pandemic Causes Online Solar and Storage Training to Go Viral

By Sean White

34 How RE-volv's Solar Ambassador Fellowship Kickstarts Student Careers

By Sydney Muñoz

40 Two Major Impacts the Inflation Reduction Act Will Have on Solar

By Scott Childers

46 Solar Certification Programs: NABCEP and ETA International

By Jay Warmke

50 Diversifying the Solar Workforce Through Inclusive Apprenticeships

By Alexander Winn, Devin Boyle and Josh Christianson

Solar Educators Share Teaching Tools to Build the Workforce

Today's solar employers are on the lookout for skilled potential hires but often have difficulty finding them, according to multiple articles in this magazine. With \$369 billion streaming into energy security and climate resilience due to the Inflation Reduction Act, according to the Democratic Party website, this shortfall will increase steeply.

This month, Solar Today is responding to this challenge by targeting innovation in education and providing political insights about the IRA. These forces are poised to change the industry, bringing in catalytic ideas.

"There is no silver bullet for employers seeking new talent," Laure-Jeanne Davignon and Gwen Brown, who are the vice president of workforce and the communications director of the Interstate Renewable Energy Council, wrote in this issue. "Effective workforce development is an intentional process involving strategic partnerships in communities across the country."

Over 500 organizations are participating in the National Clean Energy Workforce Alliance, which is building collaborative approaches and bridging silos. As solar educators connect with ideas from other industries, they discover applied techniques of multimedia training and online engagement that benefit students, workers and employers.

Becoming a skilled solar professional often requires a combination of academic training and professional certifications and/or apprenticeships from organizations such as Solar Energy International and the North American Board of Certified Energy Practitioners.

According to the U.S. Bureau of Labor Statistics, our industry is highly technical. Solar workers may have experience in manufacturing, construction, plumbing, soldering, brazing, pipefitting, assembly, welding, engineering, programming, metalworking, chemistry and/or physics. Many have backgrounds in materials, chemical, civil, electrical, industrial or mechanical engineering. Graduate degrees and management experience are valued highly.

Some solar employees have operated machines, worked with structural iron and steel, installed and repaired electrical and/or electronics equipment, studied environmental or atmospheric science, worked with semiconductors or been employed in sales or real estate.

With such a broad range of career tracks and subspecialties within the solar industry, it is wise to offer a flexible variety of training options the way NABCEP is doing. This makes it easier for job seekers to develop their futures.

At Solar Today, we are inviting younger generations to write for and participate in our association. We encourage you to visit our online community and be matched with a mentor or mentee. Career advice from experienced society members can open doors and empower the next generation.

Kat Friedrich
Editor in Chief



SOLARTODAY
the power of community

PUBLISHER
Carly Rixham

EDITORIAL
Kat Friedrich, Editor in Chief
Lucy Cooley, Editor
Margaret Tanner, Editor

Contributors: Ellen Barlas, Devin Boyle, Gwen Brown, Scott Childers, Josh Christianson, Laure-Jeanne Davignon, Sandrine Dixon-Declève, Ian Guan, Jacklyn Janeksela, Sydney Muñoz, Riley Neugebauer, Joe Ranalli, Joel Stronberg, Jay Warmke, Sean White, Alexander Winn, Will Yourey

Division Contributors: John Burke, Debbie Rucker Coleman, Gilbert Michaud, Paulette Middleton, Henry K. Vandermark, Julian Wang

EDITORIAL BOARD
Wyldon Fishman, David Ginley, Paulette Middleton, Marc Perez, Jane Pulaski, Carly Rixham, Karen Soares, Andrew Stone

ASES OPERATIONS
Carly Rixham, Executive Director
Ella Nielsen, Membership and Engagement Mgr
Lauren Reddington, National Solar Tour Director
Sarah Townes, Chief Finance Officer

ASES BOARD OF DIRECTORS
Robert Foster, Chair
Abraham Ellis, Vice Chair
Dara Bortman, Secretary
Joshua Peterson, Treasurer
Debbie Rucker Coleman, Wyldon Fishman, David Ginley, Sydney Muñoz, Marc Perez, Mudassir Siddiqi, Karen Soares, Andrew Stone

SOLAR TODAY (ISSN: 1042-0630) is published four times per year by the American Solar Energy Society, 2525 Arapahoe Ave., Suite E4-253, Boulder, CO 80302, (303) 443-3130. Our email is info@ases.org. Our website is ases.org. Copyright 2022 by the American Solar Energy Society Inc. ASES owns the right to publish and syndicate these articles. Authors may republish and/or sell their work.

To pitch op-ed explainers to Solar Today, email two paragraphs about each story and one paragraph about each author's relevant background to kfriedrich@ases.org. To propose peer-reviewed pieces, please email your abstracts and CVs or resumes.

We also welcome ideas for themed issues.

ADVERTISING AND EDITORIAL
For advertising inquiries, contact Phil Arndt, Business Development, parndt@ases.org. Send editorial questions or comments to Kat Friedrich, kfriedrich@ases.org.

MEMBER SERVICES
To renew your subscription or change your address, log into your account at ases.org/renew or email membership@ases.org.



JUSTICE, EQUITY, DIVERSITY AND INCLUSION (JEDI)

ASES acknowledges the systemic injustice that impacts Black and indigenous people and other people of color as we work together to ensure that our transition to a 100%-renewable energy future is equitable, inclusive and just.

BlackLivesMatter.com
naacp.org
ases.org/jedi

Join our non-profit team



NEW APPROACH

Board Members
Industry Sponsors
Solar Leaders
Energy Activists

3 Educational Pillars
Transparent Sales
K-12 Education
Streamline Permitting



info@USSolarCoalition.org 816-207-9899

OUR VISION

A world equitably transformed to 100% renewable energy.

Support our cause. Donate today!
ases.org/donate



AMERICAN
SOLAR
ENERGY SOCIETY



Clean Energy Workforce Alliance Targets Ambitious Goals



By Laure-Jeanne Davignon and Gwen Brown

Hiring challenges for the clean energy industry have been recurring themes over the last decade. In 2021, the National Solar Jobs Census¹ published by our organization, the Interstate Renewable Energy Council, found that 89% of solar employers reported that it was “somewhat” or “very” difficult to fill their job openings, with 49% citing the small applicant pool as the most significant reason. Additional barriers must be overcome to include populations currently underrepresented in the solar industry.

There are a number of reasons that the hiring pool has not kept pace with available jobs. Lack of awareness about opportunities for family-supporting, innovative careers in solar and other clean energy fields is a top barrier to market expansion. Even where awareness or interest exist, pathways into the solar industry are not clearly defined or widely promoted and potential workers cannot consistently identify credible information about training and jobs.

We stand on the cusp of what is likely to be the most significant growth the solar industry has seen. Hundreds of billions of dollars worth of investment are poised to flow into solar and other

© Juan Blohm

Riley Neugebauer, solar installer and apprentice at Namaste Solar, works on a residential solar project in Denver, Colorado.

clean energy industries following the passage of the Inflation Reduction Act. Addressing our hiring challenges and building a robust pipeline of well-trained workers will be essential.

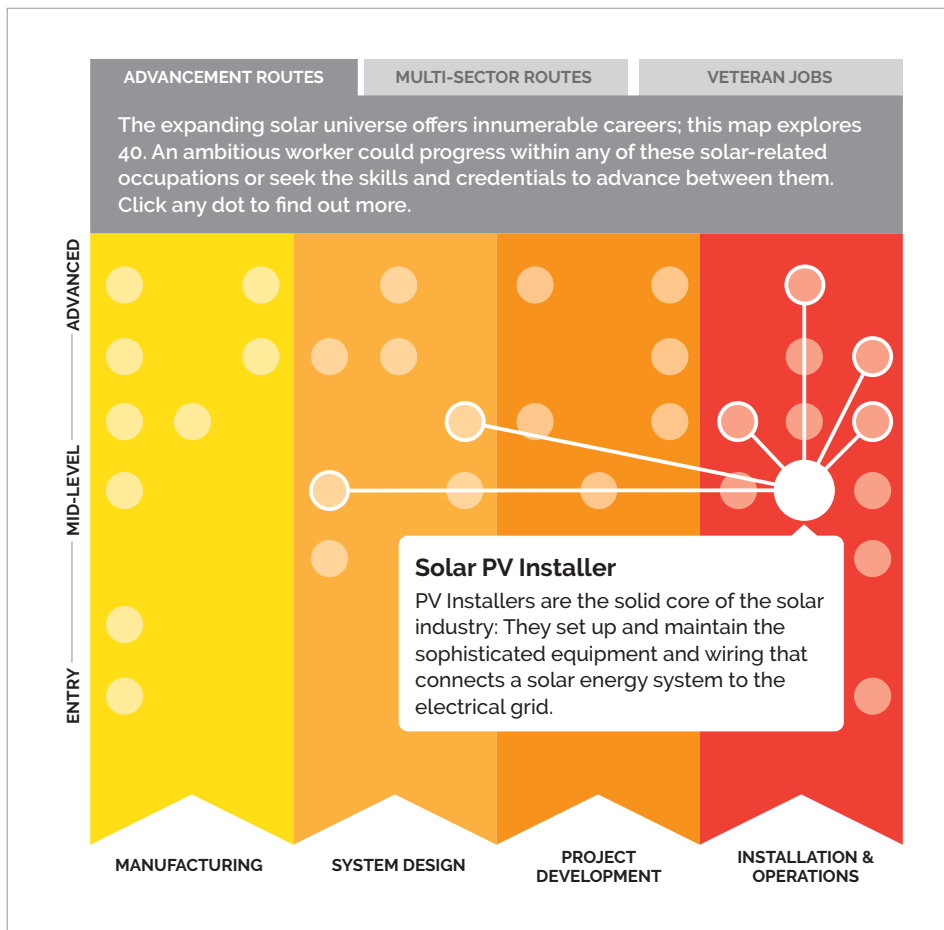
Luckily, a new initiative, the National Clean Energy Workforce Alliance,² is bringing together stakeholders across the value chain to create and share a holistic strategy for improving workforce outcomes.

Crowdsourcing Workforce-Development Best Practices

The IREC Workforce Program works to support the growth of a highly trained and inclusive clean energy workforce that empowers individuals and communities, so we are regularly in touch with solar employers. Starting in 2021, the calls and requests from employers looking for new, skilled talent became more frequent and a bit panicked. Solar employers saw enormous opportunity heading their way, with no clear pathway to grow their workforce. Fast-forward about a year to the passage of the historic IRA — and this low buzz of concern has become a cacophony.

There is no single silver bullet for employers seeking new talent. Effective workforce development is an intentional process involving strategic partnerships in communities across the country. This is especially true when it comes to building a workforce that includes workers who have previously been underrepresented.

Recognizing this need, IREC and the National Council for Workforce Education formed the National Clean Energy Workforce Alliance in late 2021. The 500+-member alliance unites stakeholders across the clean energy value chain to improve recruitment, education and placement outcomes. The idea is that we are stronger



Career maps like the Solar Career Map shown here can help prospective job seekers understand available options.

© Interstate Renewable Energy Council

together and can learn from each other — as well as from industries that have faced similar challenges.

You can see some of the initial outcomes of the alliance’s work on our website.³ A more comprehensive report detailing solutions and information about specific projects and programs that can be scaled to address our workforce needs will be published in late 2022. Keep your eyes peeled for that resource. But your ‘sneak peek’ is here.

Raise Awareness with Recruitment Tools

Career maps such as IREC’s Solar Career Map⁴ are interactive tools that make it easy to explore potential roles, including what the work involves and

what credentials or training are needed, as well as the salary ranges and advancement potential.

By making accessible key information about the range of careers in clean energy, these maps can make a significant difference in helping potential workers and those supporting them understand the opportunities and career pathways. They can also help highlight the value of jobs in the skilled trades.

Similar to other sectors relying heavily on the skilled trades, solar is impacted by the persistent and pernicious stigmatization of career pathways in the trades. Our academic frameworks frequently emphasize attainment of academic degrees while overlooking

great opportunities for family-sustaining careers in the trades.

IREC's solar and other career maps feature many "new-collar" jobs that may not require a traditional four-year college degree — instead, they rely on certifications, training at workplaces, education and other paths, making them a fit for students who will not and/or cannot attend college.

Job-training organizations have used career maps with great success to showcase the merits of different clean energy career paths. In the energy efficiency sector, John Pady, chief expansion officer of the Green Generation Workforce Development Initiative, which provides job training to high school students, said that IREC's career map for the energy efficiency sector played an important role in his approach to engaging students and parents.

"[We] pulled up the Green Buildings Career Map and used it to really visualize [the options] to the students so that they could understand — and so that their parents could understand — that what they were going to embark on over the next four years is something that can lead to sustainable, meaningful and gainful employment," Pady said.⁵

IREC's career maps and other career-exploration resources are already available and have been accessed by over 135,000 users over the last three years — but IREC and our partners have identified a need to centrally locate resources for potential job seekers. We are working on solutions that are easy to locate for audiences not yet familiar with our industry and that provide a means to directly connect to training opportunities and jobs. We are also continuing to develop new resources to support training providers.⁶

industry employers and community organizations serving potential workers to encourage a more robust pipeline.

Invest in Community Partnerships

One significant marker of every successful workforce program is that it includes multiple (often numerous) partners, including trainers, educators, employers and organizations working in communities to remove barriers to workforce entry.

Solar One is a nonprofit organization whose mission is to design and deliver innovative education, training and technical assistance that fosters sustainability and resiliency in diverse urban environments. It serves a variety of audiences including at-risk youth and individuals with prior justice involvement. Its Solar Career and Technical Education Program in New York City is grounded in the community, leveraging local partners to help remove barriers for underserved populations.

"We employ great intentionality with our partners in the community and work with organizations that have already earned the trust of those they serve. Your heart needs to be in the right place when working with vulnerable populations," said Geovani Caldero, environmental and solar workforce instructor at Solar One.

"Representation plays an important role in the success of our programs — our participants feel more confident when they see an instructor that comes from the same community that they belong to," he said.

This meaningful connection to the community is the key to Solar One's successful model of integrating solar education tied to emerging clean energy careers into CTE programs across NYC. Its team has served 2,700 students in 15 schools since 2016.

Solar companies that have a presence in multiple states and communities and are concerned about the resources needed to support this type of high-touch outreach, consider this: If you can afford to conduct business in a community, how can you afford not to develop meaningful relationships on the ground in those same places?

Innovative Training

To develop and scale the highly skilled workforce needed to meet our country's clean energy and social equity goals, the solar industry is evolving and innovating our training practices. One of the challenges during previous rounds of investment in solar training was a disconnect between the skills taught in classrooms and those needed by employers on the job.

To correct this misalignment, successful training providers are increasingly including employers in all phases of workforce training and leveraging tried-and-true methods to ensure knowledge and skills transfer seamlessly to the job.

"IREC's approach to training is somewhat innovative for clean energy, but is really just solid, research-supported practice with a focus on the needs of adult learners," said Kristen Hagerty, senior director of workforce development at IREC. "Effective job-focused training involves use of multimedia formats and realistic scenarios to simulate conditions in the workplace. Participants practice skills and have the ability to make and correct mistakes in a low-stakes environment."

Online instruction will also support workforce growth and equitable access by providing high-quality training at scale, including to participants from rural and other hard-to-reach demographics.

"There is always a way to convey knowledge and skills to learners that



© Kate Costa, U.S. Department of Energy/ Wikimedia Commons

A GRID Alternatives volunteer helps install solar on a roof in Loleta, California.

they can bring to the workplace," said Michelle Pletch, an instructional designer with ELB Learning, a national leader in the training and e-learning industry. "That way, employees have a head start when they enter your workforce."

For instance, a code official can learn to utilize a checklist to inspect a virtual PV system using video before ever needing to be out in the field for a live inspection.

As we look to the future, we will benefit from opportunities to embed clean energy skills into existing training and educational pathways rather than creating standalone programs.

For example, we can include solar training in more electrical training programs and add training on technologies such as air source heat pumps in more high school and community college trades programs.

Our clean energy future will also require a broader array of professionals to have a clean energy aspect to their jobs. More than 20,000 safety officials, including code officials and firefighters, have benefited from national solar training⁷ deployed by IREC and our partners. Real estate agents, financiers, and so many more audiences will need solar knowledge under their belts to participate in the new clean energy economy.

Build Apprenticeship Opportunities

Now required to access the maximum tax incentives for solar, registered apprenticeship programs are the Cadillac of clean energy training programs, rich with benefits for both workers and employers.

Apprenticeship is an industry-driven, high-quality career pathway where employers actively participate in developing and preparing their future workforce. Individuals can obtain paid work experience, classroom instruction, and a portable, nationally-recognized credential.

Although there are currently very few solar-specific programs, this pathway is well developed for construction, electrical and adjacent trades.

IREC and our partners in organized labor and the trades are working to promote these opportunities to more workers and employers and ensuring that more union and non-union workers can participate in the clean energy transition.

More and more employers will be able to grow their talent like the ReVision Energy Electrical Apprenticeship Program,⁸ which is the first employer-based apprenticeship program in the nation to provide the academic training required for renewable energy professionals to earn electrical licensure.

Focus on Job Quality

A critical element of the just transition is ensuring that the jobs we are recruiting workers into are of high quality and offer family-sustaining salaries and benefits. The clean energy transition will not be just if we try to recruit workers into jobs where quality does not already exist. Beyond salary and benefits, we will want to ensure that

workplace culture can support new and diverse workers.

Let's work together to deliver on a promise of worker safety, not just in the usual physical sense, but also the security of a long-term career pathway. Investing in company culture through programs like SEIA's diversity, equity, inclusion and justice certification⁹ and other resources can help foster an environment where employees thrive and stay.

Consider making professional advancement pathways more defined and transparent so your company will benefit from decreased talent-acquisition costs by retaining employees who become more highly skilled as they move up through the ranks.

Creating this type of dynamic not only supports equity but is the best way to position our industries as preferred employers positioned to tackle the climate emergency.

No Need to Reinvent the Basics

We have our work cut out for us in the solar industry and other clean energy sectors to overcome current recruiting challenges and build an inclusive and vastly larger pipeline of highly trained workers prepared to deliver on the promise of a just transition to a low-carbon economy.

Fortunately, many effective workforce-development strategies already exist, vetted by the experiences of employers in our industry and beyond. As we enter a bold new era of climate action, the key will be for employers to plug into shared resources, best practices and collaborative networks of professionals facing similar challenges. The Clean Energy Workforce Alliance is building a community for this purpose. We invite you to join us.¹⁰ ■

About the Authors

Laure-Jeanne Davignon, vice president of workforce at the Interstate Renewable Energy Council, oversees the strategic direction of a program that develops robust training-to-job pipelines to meet bold clean energy goals. She has served as principal investigator for federally-funded efforts to foster the diverse workforce of the future and is a national thought leader on clean energy workforce issues. Her experience spans education and nonprofit management, first in higher education and then as an association executive for the residential building supply industry. She resides in upstate New York.

Gwen Brown, communications director at IREC, oversees efforts to increase awareness of IREC's programs and resources to build the foundation for a 100% clean energy future. Prior to joining IREC, she led content marketing at Aurora Solar, a software firm working to reduce the cost of residential and commercial solar. In this role, she led the creation of educational content including blog articles and webinars. Gwen has published dozens of articles in industry publications. Earlier in her career, she was a senior research associate at the Environmental Law Institute and a fellow with the Clean Energy Leadership Institute.

Sources

1. <https://tinyurl.com/solar-jobs-census>
2. <https://tinyurl.com/clean-energy-WF-alliance>
3. Ibid.
4. <https://tinyurl.com/solar-career-map>
5. <https://tinyurl.com/career-map-success-story>
6. <https://tinyurl.com/online-training-development>
7. <https://tinyurl.com/clean-energy-training>
8. <https://tinyurl.com/revision-energy>
9. <https://tinyurl.com/DEIJ-certification>
10. <https://tinyurl.com/alliance-signup>

The Federal Green Revolution and You

By Joel Stronberg

Adapting a quote from the United Kingdom Prime Minister Winston Churchill — national climate politics can be a riddle, wrapped in a mystery, inside an enigma. I was very surprised that a hyperpartisan Congress — and an administration too confident in its own abilities and plagued by world events and an overheated economy — have managed to pass a series of historic climate-responsive policies and programs.

Much of the credit for the bipartisan Infrastructure Investment and Jobs Act,¹ the Inflation Reduction Act,² and the CHIPS and Science Act³ goes to one of the more puzzling political personalities on Capitol Hill — Sen. Joe Manchin (D-WV). Yes, the same coal-state senator largely responsible for tossing President Joe Biden's Build Back Better Act in the congressional dustbin.

Through the first half of this year, it looked as if the IIJA and a series of presidential orders to federal agencies would constitute the entirety of the federal response to the climate crisis. It's not that these things are unimportant — quite the contrary. However, they're hardly what's needed to respond in a just, timely, consistent manner to the climate crisis and its consequences.

Moreover, executive orders can be as easily erased by the next president as

they were issued by the current one. President Donald Trump promised to reverse all of President Barack Obama's climate-related directives, including his signature Clean Power Plan, early in his administration. Biden promised that on Day 1 in office,⁴ he would reverse most of Trump's climate-related orders. They were promises both men were easily able to keep.

Of the \$550 billion in new spending, the IIJA provides tens of billions of dollars for environmental and climate-related investments, including:

- \$65 billion for clean energy and electric-grid investments
- \$7.5 billion to build a national network of charging stations for electric vehicles
- \$55 billion to expand access to clean drinking water
- \$21 billion to clean up Superfund and brownfield sites and cap orphaned oil and gas wells
- \$6 billion in funding to prevent retirement of aging nuclear plants
- \$700 million for legacy hydropower
- \$2.5 billion for advanced nuclear power generation
- \$50 billion for climate resilience and weatherization
- \$21.5 billion for clean energy research and demonstration projects, split between clean hydrogen and carbon capture and sequestration

The bill provides states with funds for everything from the development of training programs for contractors who install home energy-related retrofits and resources for writing the rules for building codes to rebate programs that encourage building energy efficiency into environmental and climate justice block grants.

Democratic Party leaders initially thought that the infrastructure bill and Biden's Build Back Better Act would be joined as part of a budget-reconciliation process that wouldn't require any Republican support. The reconciliation process is not subject to the Senate filibuster rule that takes a supermajority of 60 votes to close the debate down so that the subject legislation can proceed to a vote.

A filibuster is a very long debate that blocks or delays consideration of a piece of legislation. It takes advantage of a Senate rule that says a senator can address the body for as long as they wish.

Although the reconciliation process would have avoided the need for any Republican votes, it demanded that all 48 Senate Democrats and the two independents who caucus with them vote as one. With the Senate split 50/50, the Democrats' majority status is contingent on tie votes, allowing Vice President Kamala Harris to cast the tie-breaking vote.



© The White House/Wikimedia Commons

U.S. President Joe Biden said at COP26 in 2021, “There’s no substitute for face-to-face diplomacy. I’m here at COP26 to make sure that we meet the moment on climate and kick off a decade of ambition, action and innovation to preserve our shared future.”

Infrastructure was something that Republicans and Democrats could agree on. It was a standing joke in the capital that every week of the Trump administration was infrastructure week — with never any action.

The BBBA was another matter. The politics around it meant it would never pass as a multi-trillion-dollar standalone piece of legislation. Manchin said he believed the President’s plan was inflationary and refused to provide the 50th vote.

The White House and a core group of ten bipartisan senators that included Mark Warner (D-VA), Susan Collins (R-ME), Manchin, Rob Portman (R-OH)

and Jon Tester (D-MT) thought it was essential to the nation to show that members of Congress were capable of putting aside partisanship long enough to get something done.

Progressive Democrats in the House of Representatives said they believed that splitting the infrastructure bill and the BBBA meant “the ambitious social safety net and climate package”⁵ was doomed.

At the time, the HuffPost said, “Progressives want some kind of commitment that, if Congress passes the narrower bipartisan deal, it will also pass a broader package that includes progressive priorities like child care,

elder care, affordable housing, and investments aimed at boosting electric vehicles.”

The concern that the BBBA was doomed was spot on, but no Democrat was in a position to vote against the IJJA, so the bill passed.

When the BBBA went down, it took most of Biden’s climate plans with it. However, the thinking was that Manchin would support clean energy tax credits as he had in the past.

Those thoughts appeared to be wrong over the eight months between the passage of the IJJA and the announcement that Senate Majority



There's no question that the triptych of the nation's new climate legislation is good for its economy and environment. Assuming that everything goes according to the rules in the implementation phase of the IRA alone, it would mean a 40% reduction in greenhouse gas levels from 2005.

Leader Chuck Schumer (D-NY) and Manchin came to an understanding on the oddly named IRA.

Manchin expected something in return from Schumer and House Speaker Nancy Pelosi (D-CA) for his support of the IRA. He wanted a guarantee⁶ that language speeding up the permitting process for fossil fuel projects, including pipelines, would be inserted in a must-pass budget bill.

The language was inserted as promised. However, it was payback time for the progressives. The Manchin provisions were stripped out of the continuing resolution keeping the government open. The significance of this contentious history will become apparent in a moment.

The IRA is U.S. history's most comprehensive climate-related legislation. The bill rises to the challenge of climate change by encouraging the adoption of clean energy alternatives through positive reinforcement of climate-wise choices such as tax credits, investment

incentives and consumer rebates.

Its provisions include:

- A \$369-billion investment in climate and clean energy measures
- Billions of dollars to expand low-income healthcare subsidies and limit drug costs for seniors
- \$270 billion in tax credits (out of the total of nearly \$370 billion)
- Incentives for the commercial development of carbon sequestration technologies, including subsidies for the building of new pipelines, provision of new oil- and gas-leasing opportunities, and incentives for carbon capture technologies and methane reduction

The IRA is remarkable for its breadth. It addresses issues of parity for programs and policies thought long ignored — environmental justice for communities of color and measures for low-income and rural populations.

The act provides \$47 to \$60 billion for environmental justice initiatives.⁷ According to PPI,⁸ a progressive Washington, DC think tank, "Rural energy systems will receive significant upgrades, with \$10 billion appropriated for rural electric cooperatives and \$2 billion for clean energy adoption through the Rural Energy for America Program. Conservation, agriculture and forests receive \$20 billion all together, as well."

The legislation reduces federal deficit spending through corporate tax hikes. It allows the bill to lay claim to what its title suggests — inflation reduction. The bill goes about it by sparing the government the cost of the programs. The CHIPS and Science Act is the third piece of the climate-related investment portfolio enacted by the 117th Congress and signed into law by Biden. RMI estimated that \$54 billion of the total

\$280 billion authorized by the act will go toward energy innovation.⁹

The bill looks to free the nation from dependence on China for the semiconductor chips needed by clean energy technologies like solar and wind, the auto industry for electric vehicles, and the defense industry. However, the CHIPS and Science Act is an authorizing bill while the IJJA and IRA are appropriating bills.

The distinction between authorizing and appropriating legislation is vital for advocates to understand. The monies needed to implement the IJJA and IRA are already being accounted for in the various federal agency budgets. If the funds aren't already in program accounts, the checks are in the mail.

The same cannot be said for the CHIPS and Science Act. An authorizing bill gives permission to spend federal funds for specific policies and programs. However, the bill doesn't provide the capital — that comes through an appropriations act.

Congress will return to Washington, DC after the elections, as it will once again be forced to pass more budget legislation, either as a series of individual bills or as part of one large budget package.

Funding for the CHIPS and Science Act may be part of the next budget action. Given the spate of supply chain problems plaguing anything requiring a computer chip, the bill has bipartisan appeal.

There's no question that the triptych of the nation's new climate legislation is good for its economy and environment. Assuming that everything goes according to the rules in the implementation phase of the IRA alone, it would mean a 40% reduction in greenhouse gas levels from 2005.^{10,11,12}

High precision. Four measurements in one.

Fluke IRR1 Solar Irradiance Meter

- ✓ Irradiance
- ✓ Temperature
- ✓ Compass
- ✓ Inclination



FLUKE®

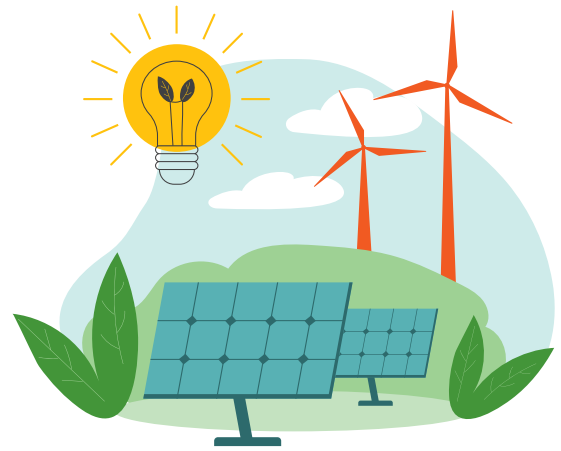


For more information go to: www.fluke.com

Inflation Reduction Act

Clean Energy Overview and Highlights

The Inflation Reduction Act (IRA) is the largest climate bill in U.S. history. A main policy focus of the IRA is supporting tax credits and rebates for **clean energy, electric vehicles and efficiency updates**. Below are some highlights of how this bill can benefit you and/or your business.



RESIDENTIAL CLEAN ENERGY CREDIT

30% Tax Credit

for residential installations of clean energy (including solar, storage, etc.), offered through the end of 2034

HOMES REBATE PROGRAM

Allocates **\$4.3B** for state-level rebates for energy-saving residential retrofits offered through the end of 2031

HIGH-EFFICIENCY ELECTRIC HOME REBATE PROGRAM

Allocates **\$4.5B** for state-level rebates for home electrification investments, specifically for low- and moderate-income households

ENERGY EFFICIENT HOME IMPROVEMENT CREDIT

30% Tax Credit

for residential efficiency investments (including home energy audits, windows, heating/cooling appliances, etc.) offered through the end of 2032

CLEAN-VEHICLE CREDIT

\$7,500 Tax Credit

for the purchase of new electric vehicles offered through the end of 2032

PREVIOUSLY-OWNED CLEAN-VEHICLE CREDIT

\$4,000 Tax Credit

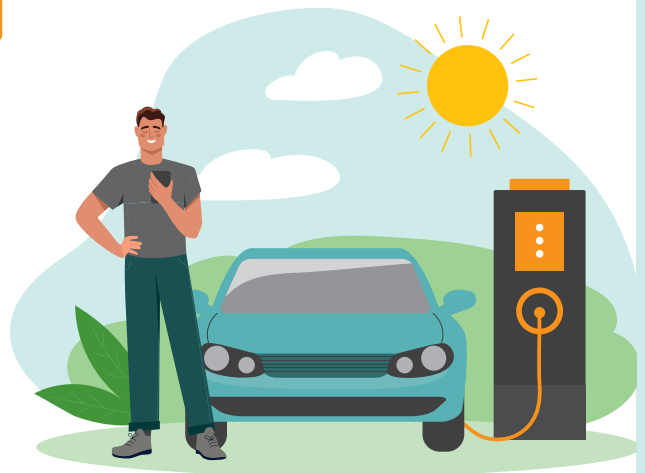
for the purchase of used electric vehicles

All of these policy incentives are projected to increase the deployment of clean energy, electric vehicles, and energy efficiency investments. This is an unprecedented level of policy support from the U.S. federal government.

Please note that not all households are eligible for all credits and rebates. Consult with state-specific program specialists, tax accountants and energy professionals about potential savings for your household.

For more information, please see the "By the Numbers: The Inflation Reduction Act" press release from the White House and the "What the Inflation Reduction Act Does for Green Energy" article by PBS.

For further questions, please post on the Ask a Renewable Energy Expert forum at community.ases.org.



AMERICAN
SOLAR
ENERGY SOCIETY



What's the likelihood that the rules will rule? When's the last time any government program was put into practice without a hitch?

What Can You Do?

It's at the implementation phase that the climate and clean energy communities need to double and triple efforts to engage government policymakers in a dialogue about how the programs will be implemented and even to partner in proposals for projects that could receive funding. From experience, I can say it's not a task for the faint of heart.

The bills are complicated. There are a lot of moving pieces to understand and dots to connect. As legislation goes, the IRA was brevity itself at 725 pages. That is not true of the infrastructure bill, which has 2,700 pages. The CHIPS and Science Act weighs in at 1,000 pages.

Fortunately, there are myriad resources available to advocates, starting with the White House. State energy offices, the National Caucus of Environmental Legislators, the National Governors Association, the National Conference of State Legislatures, the United States Conference of Mayors, environmental groups and industry associations, university departments, and community organizations like the National Association for the Advancement of Colored People are all actively engaged in the implementation of the IRA, the IIJA, and the CHIPS and Science Act.

Be warned — partisanship remains a problem and is likely to dog implementation efforts. Following the passage of the infrastructure bill, Insider reported that Trump called Sen. Mitch McConnell (R-KY) an Old Crow.¹³ He also used the "Republicans In Name

Only" label for the 13 Republican senators who voted in favor of the bill.

Climate change is part of the culture wars. In January, 16 Republican governors accused the U.S. Department of Transportation of overreach¹⁴ due to its encouraging states to fix old roads before building new ones and emphasizing community resilience to the consequences of climate change.

E&E Daily reported that "top Republican lawmakers are pushing back against the Biden administration's efforts to encourage states to prioritize climate resilience, public transit and bike paths over highway expansion projects when allocating new infrastructure funding."¹⁵

A future Republican Congress and White House would be likely to review the IRA and IIJA legislation with a possible eye toward reducing their scope or reprogramming funds for other purposes.

The politicization of climate, if it's not the greatest existential threat to the nation, is close to it. However, unlike climate change, something can be done about it quickly.

The passage of these bills is a watershed moment in the half-century of torturous efforts that have come to characterize the nation's transition to a low-carbon economy. None of these bills are perfect, but they are extraordinary for their breadth and the resources they make available at the state and local levels.

In the final analysis, the single best way to protect these programs is by implementing them — in a sensible, bipartisan manner. Much of the legislation's impact will be at the

state and local levels.

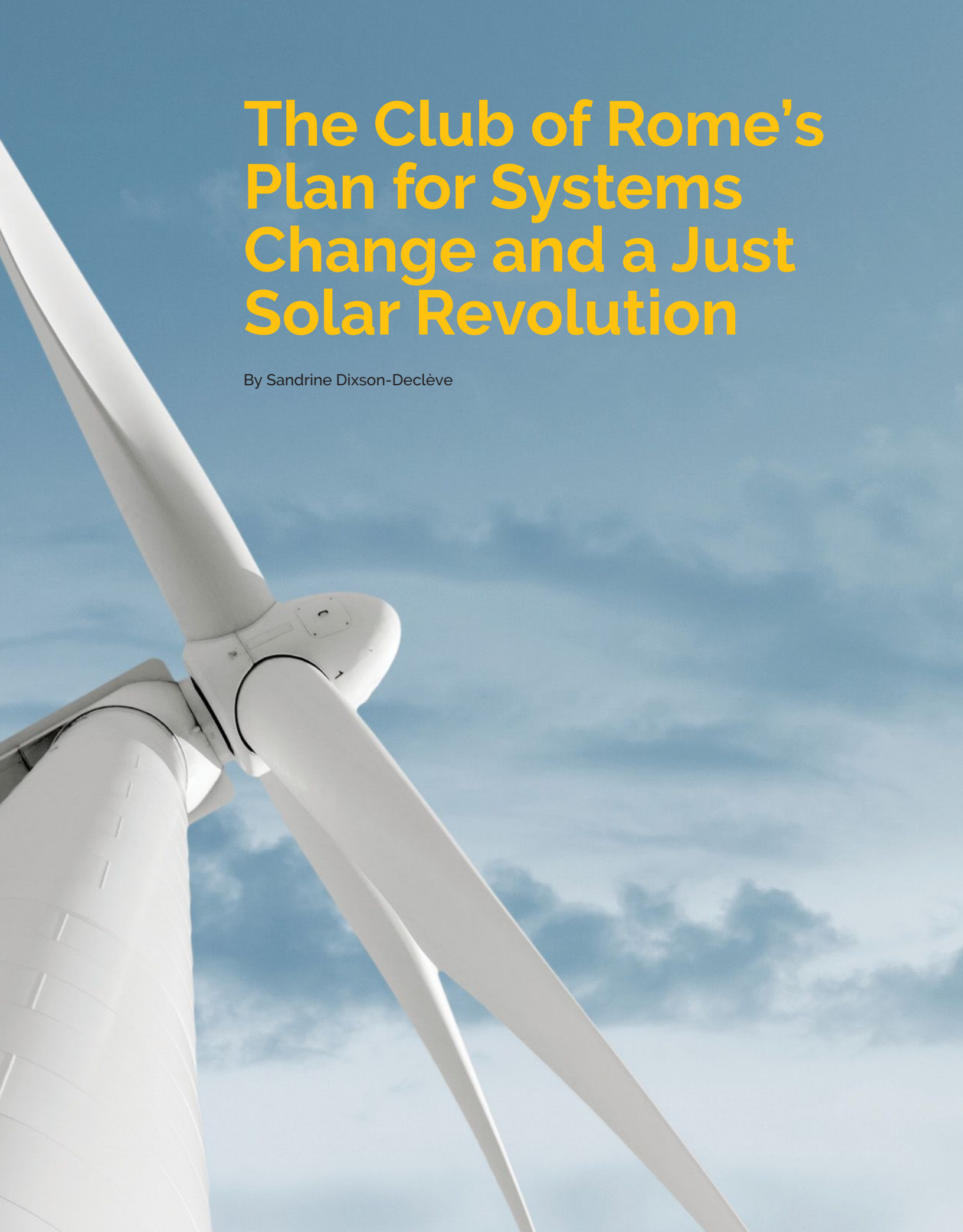
As projects are constructed and new factories manufacturing 21st-Century technologies start production, new jobs will spring up. Then the truth of the claim that a sustainable climate is good for both the environment and the economy will be evident. If ever there was time for advocates to become engaged in a bipartisan manner, it's now. ■

About the Author

Joel Stronberg, MA, JD is the president of The JBS Group/Civil Notion. He's been analyzing and advocating federal and state policies on behalf of clients for over 40 years. These days, his portfolio of activities also includes being a columnist at illuminem.com, a featured voice at Resilience.org and Energy Central, and a speaker at meetings and on podcasts.

Sources

1. <https://tinyurl.com/yd4dbz8y>
2. <https://tinyurl.com/5n8k2kz3>
3. <https://tinyurl.com/yeywevj6>
4. <https://tinyurl.com/bdfubpu2>
5. <https://tinyurl.com/2kypmvdvk>
6. <https://tinyurl.com/mt7mxb8f>
7. The White House lists the amount as \$60 billion, while Just Solutions Collective estimates the amount as closer to \$47 billion.
8. <https://tinyurl.com/4a2yjfa5>
9. <https://tinyurl.com/bdd2kdkv>
10. Rhodium Group, an economics and energy research firm, estimated that the bill would cut emissions by 31% to 44% by 2030. <https://tinyurl.com/mvpecyp5>
11. Energy Innovation, a climate think tank, predicted a reduction of 37% to 41%. <https://tinyurl.com/59p47rja>
12. A group of Princeton University researchers called the REPEAT Project calculated a carbon dioxide cut of around 42%. <https://tinyurl.com/2jkk8aev>
13. <https://tinyurl.com/2yxd7pwm>
14. <https://tinyurl.com/mwk39mva>
15. <https://tinyurl.com/gvr8bpvw>



The Club of Rome's Plan for Systems Change and a Just Solar Revolution

By Sandrine Dixson-Declève

The transition from a fossil fuel-based economy to a clean energy economy is underway. In 2021, wind and solar accounted for 10% of all electricity production in the world, compared to just 5% in 2016.¹ Doubling at this pace means wind and solar could account for half of all electricity supply in the early 2030s.²

The key issue is not whether the world's energy systems will transform, but whether the change will be rapid enough and whether it will be fair. If the energy transformation perpetuates historic injustices within countries or between different regions of the globe, it will have a destabilizing effect on societies and create deep resistance.

The renewables industry has a hugely important role to play in charting the road ahead. Solar and wind energy companies should be clear from the outset that they are not content to simply reap the financial rewards of replacing oil, coal and gas, but that they are ready and willing to lead a broader societal and economic transformation.

Moving away from fossil fuels is not just an opportunity for new industries to benefit or even simply a way to rise to the challenge of climate change. The transition is also an opportunity to reset the economy and society; to decrease inequalities; and to create a cleaner, better and fairer world for people everywhere.

50 years ago, the Club of Rome, the network of incredible thought leaders of which I am co-president, published the seminal "The Limits to Growth" report.³ For the first time, its authors used computer models to demonstrate that the earth's resources were finite and that continuing to push for ever more economic growth would be to the detriment of planetary and human health.

Humanity took little heed of this warning. Until very recently, the favored modus operandi of most heads of government and business was based on ever more economic growth powered by the burning of fossil fuels, the endless extraction of minerals, and the intensive use of land.

Today, change is starting to happen. The growth of the solar industry is a clear indicator that the old technologies and means of working are beginning to lose their mighty grip. If humanity is, however, to stop greenhouse gas emissions from rising and avoid the worst impacts of global heating, this change needs to urgently speed up.

Our latest book, "Earth for All: A Survival Guide for Humanity,"⁴ published by the Club of Rome this September, is a roadmap showing how we can move forward and meet the significant and multifaceted challenges facing the world today in a timely fashion.

Authored by a team of climate and economic experts, including myself, and stress-tested by thought leaders from around the globe, the book sets out two scenarios.

The first — the "too little too late" scenario — is where societies keep boasting and bumbling about sustainability while muddling through and refusing to change course.

The second scenario is the "giant leap." For this to happen, we describe five extraordinary turnarounds to reboot society. These include ending poverty, addressing inequality, empowering women, making food systems healthy and regenerative for people and ecosystems, and transitioning to clean energy.

None of these turnarounds can happen in isolation. For example, take the

combination of ending poverty and acting on the energy transition. With the right choices, a post-carbon system offers tremendous new ways of creating economic value for everyone without hurting the Earth.

Significantly lower emissions mean significantly less harm to the planet and people. Renewable technologies require, in the longer term, much fewer resources than the fossil fuel incumbents. Solar electricity requires 2,000 times less material by weight than coal generation, according to an analysis by Carbon Tracker, a United Kingdom-based nonprofit.⁵

It is true that the clean energy transition as a whole will require an increase in the production of certain minerals over the next two decades, but this demand will taper off dramatically after 2040. And if we optimize our use of materials, we can reduce potential negative impacts from extraction and use.

Once built, the components of the clean energy system will have a lifetime of at least 50–80 years. Indeed, a 2017 Nature Energy study found that the lifetime carbon footprints of solar and wind are about 1/20 of coal and gas, including manufacturing and construction.⁶

The study shows that the use of extraction machinery and fuel for the transport of oil and gas, in addition to methane leaks from pipelines, well heads or coal mines, contributes to lifecycle energy uses and emissions being higher for fossil fuels than for renewables. Solar and wind installations also produce 26 and 44 times more energy respectively than the energy used to build them.

And there are other benefits. Solar energy, in particular, will shift the ownership of energy assets from a

centralized to a decentralized system, allowing more people to produce their own energy, taking the profits out of the hands of the few and sharing the gains more fairly, helping to ensure energy access, end poverty and reduce inequality.

Any lingering suggestion that clean energy competes with food production must be also put to rest immediately. Research from 2021 shows that significant numbers of countries in Africa and Latin America could meet all their power needs by covering less than 0.1% of their land with photovoltaic panels.⁷ And smart solutions, such as regenerative agricultural practices using renewable energy sources, bring benefits for farmers, the clean energy industry, local citizens and the planet.

To bring about such systemic changes, however, we will need the support of everyone. If we get our policies wrong, “axe the tax” opposition will arise, as we have seen with the French Yellow Vests Protests and similar ones in Iran, Turkey, Nigeria, Mexico, Jordan and Kazakhstan.

In our new book, we advocate for a fee-and-dividend approach — charging a fee for carbon emissions and extraction and distributing the fees back to every citizen. Coupling carbon fees with progressive taxation and wealth redistribution, where the wealthiest 10% take no more than 40% of national incomes, would reduce inequality.

It would also benefit the clean energy transformation by shifting capital away from fossil fuels and guaranteeing capital flows to those suffering the most from a lack of energy access or from energy poverty.

We need to push governments in the United States and the European Union to at least triple annual domestic investments in renewable capacity

and energy efficiency at high speed and encourage change that will make it easier for finance to flow around the world.

The U.S. Inflation Reduction Act is a fantastic move in the right direction. But we also need to ensure that as the European Union and United States wean themselves off fossil energy, they do not push their neighbors in the South toward further dependency on stranded assets as a short-term transition guarantee for the North.

We also need stricter regulation on private financial markets to prevent any more carbon-intensive investments by private lenders and bond holders. We must likewise hold high-income countries accountable for green investment in their own countries and outside their borders.

We need to better share the knowledge and technology of Global North companies with those in the Global South and support a green technology revolution by ending the World Trade Organization’s system of intellectual property rights for critical green technologies. The system stymies invention and innovation. Low-income countries seeking to encourage renewables through subsidies to their own producers quickly face cases in the WTO. Preventing the dissemination of critical clean technologies is deeply dangerous for all.

Global energy costs do not necessarily need to be higher if we optimize current solutions and decouple the electricity market from gas prices to reap the full rewards of the lower prices of renewables.

We also need to ensure that we transfer current perverse subsidies from fossil energy to renewable and energy efficiency solutions.

Government subsidies will be important to bring down upfront investment costs, but these will be paltry in a long-term global perspective of delivering energy security and planetary stability.

If we don’t make the right choices now, our civilization could collapse like those before it amid a perfect storm of self-induced crises. The path ahead will not be simple or easy, but it is exciting.

Over the coming decades, we have the opportunity to design an economy that services people and the planet: an economy anchored in well-being economics, rather than GDP growth at all costs, and one that provides not just for high-income countries or households, but that enriches the lives of the majority and ensures a thriving Earth for all. ■

About the Author

Sandrine Dixson-Declève is an international and European climate, energy, sustainable development, sustainable finance and complex systems thought leader. She is currently the co-president of the Club of Rome together with Mamphela Ramphele. They are the first women to lead the organization in its history. Dixson-Declève divides her time between lecturing, facilitating difficult conversations and doing advisory work. She is a TED Countdown and TEDx speaker and author of numerous publications and book chapters, including the book “Earth for All: A Survival Guide for Humanity.”

Sources

1. <https://tinyurl.com/bdt3vruij>
2. <https://tinyurl.com/23kvhfcc>
3. <https://tinyurl.com/uavueyat>
4. <https://tinyurl.com/6gxd88hs>
5. <https://tinyurl.com/594ghej7>
6. <https://tinyurl.com/bdhk5yb7>
7. <https://tinyurl.com/azfw7wr7>

Pssst...

**Spreadsheets aren't a replacement for good,
solar-specific software.
Your team deserves better.**

**Get in touch to learn about the SolarAMPs platform built to
streamline your community solar business needs.**

www.solarinformatic.com | sales@solarinformatic.com



Growing the Number of Female Installers

By Riley Neugebauer

When I install solar power, I see there aren't many women doing what I'm doing. I think it could and should be different. My estimate is that 1-3% of field roles in the United States (solar installers, field technicians, etc.) are staffed by women. While 50% would be nice, I don't think it's realistic. So I want to suggest we should aim for 1 in 10 women in the next decade, instead of 1 in 100.

Clear data about the number of women in field-based roles in solar doesn't exist. We do know, according to the 2021 Solar Jobs Census, that 26-30% of the industry is made up of women, which includes office, manufacturing and field roles.

According to the National Center for Women's Equity in Apprenticeship and Employment, "In 2018, women's share of workers in construction occupations reached 3.4%." ¹ Female electricians were one of the slowest-growing groups.

U.S. Bureau of Labor Statistics data shows that women make up 11% of all the people employed in the construction industry, but also doesn't indicate any breakdown by role. ²

Globally, it seems that the numbers are better, given that the most recent 2022 global report on gender in the PV industry from the International Renewable Energy Agency found that



Riley Neugebauer, solar installer and apprentice at Namaste Solar, works on a residential solar project in Boulder, Colorado.

© Juan Blohm

women made up 12% of the total for solar-installer positions around the world. ³

I find that the often cited 26-30% number about women in solar can be misleading, given how many different roles are covered. My sense is that there are many women in marketing,

HR and sales; fewer women in project management and design; and almost no women in any field roles. Women comprise 4% of electricians nationally. ⁴

My experience on the residential side of solar in the United States tells me that there are almost no women installing it, given that I've typically

been the only one, or one of two, everywhere that I've worked. I was also the only woman in my one-year solar certificate at San Juan College many years ago.

So, if 30% is highlighted as a disappointing statistic and an area of opportunity, then I hope that 1-3% would also be considered disappointing... maybe even atrocious. I think we need to separate some of these roles more clearly in the data and know that recruiting more women into the solar trades is a different kind of effort and goal than recruiting more women into other solar jobs.

In addition, the number of women of color in the field is far lower. Jan Scott, a Native American woman who is a lead installer at Independent Power in Boulder, Colorado, said that she'd "like to see more women of color in the solar industry, mainly in the operational side. Sometimes, though, you gotta be the first to pave the way. And I'm here to break those glass ceilings."

"The time is ripe for women to finally gain footing in this profession," said Jenny Conrardy, apprentice electrician at Current Electric in Wisconsin. "It is amazing to watch the industry morph to try to increase inclusiveness for women. We need more females to be able to help set this new tone."

Why Care?

The solar PV industry is the fastest growing renewable energy sector worldwide, accounting for more than a third of the total workforce. IRENA estimates that globally, solar PV jobs could grow from 4 million now to 15 million by 2050, depending on what climate path we choose to follow.⁵

Policies around the world will play a big role. The recent passage of the Inflation Reduction Act in the United States,



© Jan Scott

Jan Scott, lead installer at Independent Power, works on the Trail Ridge Store within the Rocky Mountain National Park at an elevation of 12,000 feet.

securing 10 years of the solar ITC among other perks, further solidifies the expected growth in solar. A recent Solar Energy Industries Association and Wood Mackenzie report estimates that the industry will grow 40% by 2027 as a result of the passage of the new legislation.⁶

Most of the growth that has already happened in the industry is taking place within the solar-installation and project-development sectors. The largest percentage of all solar-industry jobs in 2021 (nearly 30%) was in installation and repair.

So we have a lot of growth predicted in the next decade and beyond. There is an extensive need for workers in the installation sector in particular. 89% of the firms surveyed for the 2021 Solar Jobs Census reported difficulty finding qualified applicants.⁷ Yet only a third of solar firms have developed a strategy to increase the diversity of their workforce.

If you can't find workers and your labor pool is homogeneous, then it seems clear to me that leaving women (over 50% of the population) out of your strategic recruitment and hiring efforts is not helpful.

What Do We Do?

Strengthening Metrics

Companies need to improve data collection, goal setting and information sharing. They should share their goals for hiring more women so that there can be some accountability. I think this needs to be part of a larger diversity, equity and inclusion effort that includes strategies for diversifying the workforce more broadly. Let's form a national coalition that focuses on training, recruiting and retaining women in the solar trades!

"We're at a critical point in clean energy where we are going to see exponential job growth and have an opportunity to ensure this growth is accessible to women and other historically underrepresented groups in the energy and construction trades," said Alyssa Thomas, workforce development and apprenticeships program manager at SunPower.

"Through SunPower's 25x25 initiative, we have pledged to reach 40% women in our workforce by 2025," Thomas said. "We're doing this through installer-training partnerships for women with Solar Energy International and Grid Alternatives; our women's employee resource group, EmpowHER; and



© Jenny Conrardy

Jenny Conrardy, apprentice electrician at Current Electric, installs a ground mount in Campbellsport, Wisconsin with the crew from her solar team.

trainings for employees in DEI and allyship.”⁸

Changing the Culture

If we want women to work in the trades, there needs to be more effort made to change the culture. Being one of the only women in a male-dominated role, learning a technical skill, and also having to deal with learning how to navigate a potentially challenging culture is a lot to handle. That is a big reason why many women don't choose to do it or don't stick around.

Company leadership needs to create expectations around a respectful workplace culture and the accountability to go with it. Ensure that promoting people into lead installer roles and beyond is related to more than just technical ability. It includes good leadership, awareness and communication that is important for the whole company, not just women.

Using a Cohort Approach

It can feel overwhelming to enter a male-dominated space in the trades or be the only woman on a job site, so having a group of women who can learn together and work together after being hired can make a big difference in recruiting and retaining them.

Carol Weis, co-founder of Remote Energy, said, “I have been actively teaching women's solar classes for over 20 years because as a solar electrician and trainer, I never saw many women in the room until I was teaching women-only classes.”

“Participants in women's-only classes state they are intimidated to be one of the only women in a male-dominated class and industry,” Weis said.

Recruiting and Retaining Women

Rather than focusing on recruitment as a first step, companies really have to take a step back, evaluate their retention plans, and see what they are doing to create environments for diverse workplaces.

Missy Mackin, program manager for trailblazers and gender equity at Vermont Works for Women, said in an email that companies should make sure they've built supportive workplaces before they hire women. “The old model of ‘sink or swim’ doesn't work anymore. Some basics to consider are:

- **Offer mentorship:** Having a female mentor is the single greatest predictor of retention for women in the trades.
- **[Manage well]:** Provide ongoing direct supervision of all new employees. Women often report being given tasks [that] are either too easy or far beyond their skill set and [comfort level], often because crews lack supervision and are unprepared (and not paid) to teach new hires.

- **Stop microaggressions:** Learn what microaggressions are and shut them down just as you would those more obvious instances of harassment. Make sure your subcontractors are on the same page.
- **Provide benefits:** Offer benefits attractive to women such as flexible scheduling. Think outside the box.”

Once you feel that your company is a good workplace for women, she said, attend recruitment events that will attract a diverse audience, post jobs in more than the typical places, and ensure that you are talking with potential candidates about what the job entails, because this certainly isn't the job for everyone. Also, be clear if candidates can apply without prior experience. Outline what your training program looks like.

Training

Training is a critical piece of increasing the number of women in the solar trades. You might consider forming pre-apprenticeship programs for women in solar, participating in registered apprenticeships, developing/updating in-house training programs, and/or partnering with other organizations who can offer paid training to your employees and then assisting with tuition and fees for these programs.

SEI is one of the key organizations offering training for women in the United States. Justine Sanchez, PV+storage curriculum developer and trainer for SEI, said: “When it comes to all solar employment sectors, installation and system design happen to be concretely in SEI's area of expertise. Thus, SEI is uniquely positioned to play a critical role to bridge the gender gap that exists as we build the nation's solar-installation and project-development workforce.”

“SEI, along with industry partners such as SOLV Energy, Nextracker, SunPower and hopefully many more, is now

focused on removing financial, situational and emotional barriers through scholarships, women's workshops and networking to increase the number of women that are trained for solar jobs," Sanchez said.

K-12 Education

We need to empower girls with solar STEM education and hands-on workshops to help inspire them to pursue technical careers in solar.

"We Share Solar believes strongly in promoting girls' education in STEM by providing meaningful hands-on opportunities and investing in training and job opportunities to increase participation of women in the solar sector," said Wendy Cross, program director at We Share Solar.

"Recruiting the new, more diverse workforce is a long game and employers need to be intentional about recruitment," Mackin said. "In order to find female-identifying workers, they'll want to make connections with schools and provide girls information about all of the careers available to them."

What's Next?

Solar is a rapidly growing industry, contributing to the efforts to address global climate change. It is further supported by recent national legislation. It's an industry in need of more workers quickly. And yet, like many construction industries, it faces challenges with finding workers due to fierce competition, outdated culture, low diversity and inadequate skilled labor.

We are at an important moment in the industry when we need to pursue a broader commitment to diversity, equity and inclusion.

Ultimately, hiring more women is going to be just as much about creating a safe



Students attend a workshop led by We Share Solar at Kennedy Middle School in Charlotte, North Carolina.

© We Share Solar; The Media Arts Collective



Students participate in a workshop facilitated by We Share Solar at an American Indian Science and Engineering Society event.

© We Share Solar; The Bokedh Effect

space and focusing on empowerment as it is about effectively delivering training on technical skills. Women will want to work for companies where they see other women who are happy with their jobs. Let's lay the groundwork to help make that happen. ■

About the Author

Riley Neugebauer is a North American Board of Certified Energy Practitioners-certified solar installer and electrical apprentice working in Boulder, Colorado for Namaste Solar. In addition to this role, she founded Solar for Women (solarforwomen.com) to create more networking for women in the solar trades and is working to develop

additional resources for women who want to become installers and technicians. Her past includes nonprofit project management, regional network-building, Maine farming, and sustainability management in higher education. She has attended trainings at Solar Energy International.

Sources

1. <https://tinyurl.com/5hy5nafv>
2. <https://tinyurl.com/yc3asfmz>
3. <https://tinyurl.com/2kbs498>
4. <https://tinyurl.com/5hy5nafv>
5. <https://tinyurl.com/msg9dncsr>
6. <https://tinyurl.com/4w328nfy>
7. <https://tinyurl.com/374cwmw6>
8. <https://tinyurl.com/4tf6yx53>

Native-Led Educational Spaces Are Rising like the Sun

By jacklyn janeksela

One way Native Americans are reclaiming their power is by exchanging information.

Indigenous community members are creating safe places, both on and off the reservations, where people are able to learn with and from each other and share wisdom in ways that feel appropriate to them.

It is a version of school that might not look like a traditional school setting, but it's a place where the traditional ways of Native Americans are maintained and new ways are considered. In these spaces there is choice, not forced ideas and identities, and indigenous students have indigenous teachers.

Another way Native Americans are reclaiming their power and their connection to the land is by transforming their land into demonstration sites. People get hands-on experience that is fuel for the solar soul, with less theory and more real-life applications. There are fewer extractive behaviors and there is more care, respect and compassion for Mother Earth.

Solar empowerment and education centers are leading the charge, ensuring that Native American nations continue to be sovereign in areas like education, energy and food. Tribe-led training centers build partnerships with each other, braided together like sacred sweetgrass. They are healing the damage that came from colonization

and racism, as well as the lack of opportunities, funding and dignity.

Chief Henry Red Cloud of the Oglala Lakota, now the executive director of Red Cloud Renewable,¹ noticed this need a decade and a half ago. He didn't see Native Americans teaching. He seemed to be the only one studying solar. He noticed that there weren't any opening prayers or closing ceremonies in the classroom.

Instead of confronting schools around curricula, championing policy changes or getting frustrated and doing nothing, Red Cloud took action. He started his own renewable energy-training facility. It didn't take long for people to show interest and students to register.

Soon, others followed by creating their own versions of RCR on their tribal lands. For example, JoAnn Armenta of Purpose Focused Alternative Learning realized the organization could be replicated within the Diné Nation.

Later, Armenta partnered with Don Yellowman's Forgotten People Community Development Corporation.² She used her educator background to advocate on behalf of the membership who wanted to be heard and recognized when developing community-based plans for rehabilitating their lives and lands. But they were not done.

To gain more knowledge on tribal rights

and energy sovereignty and to network with other like-hearted people, Yellowman made several trips from Navajo land. He studied at RCR to bring back knowledge to the Navajo Nation (Diné) people who have been negatively impacted over the centuries. He continues efforts to empower the Diné to become solar-trained technicians. To date, 12 Diné people have been trained at RCR and are currently applying their technical expertise installing solar systems for families with the highest need.

RCR has had over 100 Native American students attend its solar training. Clyde Brown, who later founded Sun Spirit Solar and is from the Chippewa Cree Tribe, is one of those graduates. He is now a full-fledged solar advocate on the Rocky Boy Reservation who knows renewable energy is one of the best and brightest ways to a more sustainable future.

Brown had the chance to study at Solar Energy International in Paonia, Colorado, but chose to study at RCR. He wanted to be in an environment that was familiar to him, with lots of humor and cultural practices.

For years, as a member of the Rocky Boy Energy Commission Board, Brown

Chief Henry Red Cloud, executive director of Red Cloud Renewable, stands next to John Red Cloud, its managing director, in front of a teepee.





© Adam Kurowski



© Adam Kurowski

Top: Remote Energy's Co-Founder Chris Brooks leads a solar training onsite at Red Cloud Renewable in Pine Ridge, South Dakota. Bottom: Two Diné students, Jake Toledo and Brandon Ami, connect a solar array to the OutBack Power Mojave inverter on Pine Ridge, South Dakota. These students also participated in the Solar Business Entrepreneur Workshop.

championed solar and renewable energy, but it was a hard sell to the community and to leadership. They wanted solar, but the investment aspect was a challenge.

Brown realized he could make bigger strides if he provided real-life examples of solar, so he started his own solar business, Sun Spirit Solar.³ He knew that showing over telling would be the key to buy-in.

Shortly after he returned home from studying at RCR, a local tribal college offered him a job constructing solar-powered sheds that carried wastewater away and detected pathogens.

Powered by solar ground-mount technology, those sheds test waters twice a day and provide an alert system that is a source of disease mitigation. This means that they save people's lives. Brown is an empowered solar warrior for his community because of this educational opportunity.

Schools and education are changing, but not quickly enough. For some, waiting for legislation or administration is no longer an option. Native American community leaders recognize that delaying any longer would be a mistake – their situations are too delicate and children too important. Instead, they are becoming the change they want to see in the world.

Phrases like decolonizing education are not just buzzwords. They are movements that highlight the importance of Native American presence and cultural preservation within an educational setting.

Conventional education has endorsed certain expectations, not all of which are culturally appropriate. The standard North American school training was created for and by non-Native Americans.

Therefore, cultural sensitivity training for both teachers and students has been omitted from most collegiate conversations. Non-Native Americans tend to dominate the educational landscape as the school staff and the narratives in textbooks.

What inspires someone to take measures into their own hands is the realization that educational institutions were created for some to be successful but not for all. Rather than working within a system predicated on little to no expectation of Native American success, let alone survival, people are reclaiming their power and their connection to the land. Information exchanges that align with their values and identities are a way to ensure Native American presence well into the future. One way to do that is by asking: Will this system help or harm people seven generations down the line?

Solar energy training sites are becoming the sunrays of the future – giving Native American communities the chance to build with the seventh generation in mind. Harnessing the power of the sun for energy sovereignty, right relationship with Mother Nature, and generational respect enlivens these educational spaces. Solar energy isn't just a way to power up; it highlights how all systems work in unison.

What we learn from these Native American-led educational operations is that with faith and perseverance, things of beauty triumph over habits of damage and destruction. Indigenous-led education advances social, racial and environmental justice.

These teachers and students are, piece by piece, building a better world, right now as you read this. They are meeting with other community members to share their solar training knowledge,



© Adam Kurovski

The Tribal Train-the-Trainer course has participants from many tribal nations who stay onsite at Red Cloud Renewable for four weeks. Here, participants study and build a solar water-pumping system that is helpful in gardens and for livestock.

putting solar on elders' homes, talking to schools about using solar water pumping for school gardens, meeting with ranchers about solar water pumping for livestock, talking with passion and from experience on the solar way of life, and speaking from their cultural traditions and from the heart.

Native American-led educational spaces are rising like the sun. Let's honor their leaders and encourage their students in solar.

Reach out to any of the organizations mentioned in this article to learn more about how you can get involved! ■

About the Author

jacklyn janeksela lives on the Lakota lands currently known as Pine Ridge Reservation in South Dakota. There, she works at Red Cloud Renewable, a tribal-led organization, in several capacities: outreach and communications, career services direction, and food sovereignty.

Sources

1. <https://tinyurl.com/22d9mjbf>
2. <https://tinyurl.com/y52ktpdh>
3. <https://tinyurl.com/mrygnnpa>

Midwest Renewable Energy Association Trains Forest County Potawatomi

By Ellen Barlas



Lake Lucerne is near the Forest County Potawatomi Community in Crandon, Wisconsin.

© Royalbroil/Wikimedia Commons

With the passage of the Inflation Reduction Act, the forecast for solar deployment is for tremendous growth. According to the Solar Energy Industries Association, over the next 10 years, the IRA will lead to 69% more solar deployment than would otherwise be expected in a no-IRA scenario.

By 2032, the United States will have installed 682 GW of total solar capacity, more than five times the amount installed today. By 2032, solar energy will produce more electricity each year than all U.S. coal-fired power plants in 2021.¹

Compared to surrounding states, Wisconsin's solar market has been slow to develop. The lack of a local workforce is a problem for solar developers of both large and distributed solar projects. Wisconsin has more than a dozen large-scale PV projects (2.5 GW) coming online in the coming year. The lack of skilled workers is already an issue on current projects.

In Spring 2021, the Wisconsin Focus on Energy program administrator conducted a survey of 24 Wisconsin trade allies offering solar-installation services. The survey found that 91% were currently trying to hire additional staff and that 77% experience difficulty

finding qualified candidates. 78% of respondents were looking to hire staff to work in long-term positions (five or more years).

When Jerry Hauber, energy manager at the Forest County Potawatomi Community in Crandon, Wisconsin, attended the Midwest Renewable Energy Association's Annual Energy Fair in June 2022, he was looking for information about solar training.

The tribe, which has installed more than 2 MW of solar at its location in Crandon, also has more than 3 MW of solar planned. Attending the fair was Hauber's opportunity to meet MREA's

staff; tour the MREA campus; and learn more about training in solar installation, solar plus storage, and other renewable energy subjects.

According to Hauber, his tribe wants to build a copy of the MREA's demonstration lab at its location in Crandon. "We want to build a hands-on learning lab so people from the tribe and surrounding Northwoods communities can come to see battery storage, different types of solar panels and even a small hydrogen station. We want to be a resource for high school students looking for a career and for community members who want to know more about solar and solar jobs."

Additionally, the demonstration lab will help people understand the economics of solar. "We want to help people understand how renewable energy technology can be used in homes and businesses and how much these technologies cost, what the payback periods are, and help them understand what applications make the most sense," Hauber said.

The tribal community has lived in Forest County, Wisconsin, since the late 1800s. The tribe originally settled near Blackwell and Wabeno and has lived in that area ever since, as well as in the Carter and Crandon (or Stone Lake) areas.

Life on the reservation is very different today than it was for the tribal settlers. Today, the community is the largest employer in Forest County and adheres to a diverse array of business models. The tribe's commitment to sustainability is evidenced through its ongoing commitment to renewable energy resources on and off the reservation.

Now, the community is providing training for 10 of its staff to better educate them about solar. Three staff members from the Energy Department

and seven maintenance-staff members are currently taking the MREA's in-person PV Associates courses. The courses, which lead to testing for an Associates credential through the North American Board of Certified Energy Practitioners, are being delivered on the reservation by MREA's Solar Project Manager, Nick Matthes.

The training will provide tribal staff members with a better understanding of the community's current solar systems, help prepare them for future solar systems, and provide each with an industry-recognized credential.

More training is slated for the near future too. According to Hauber, the tribe must outsource its operations and maintenance needs to solar contractors. This is expensive and often means the energy and maintenance staff must wait for a solar company to come from a distance to provide repairs and maintenance. Hauber is planning to provide O&M training through the MREA to his staff so they can service the solar systems onsite.

The MREA's solar training and the plans to build a hands-on demonstration lab on the reservation will benefit tribal members and the community at large. Hauber has plans to offer training to tribal youth and area high school students. And, in Spring 2023, Hauber is planning to bring solar to tribal homes.

"We'd like to bring Nick Matthes back and install solar on five tribal homes," Hauber said. "Because of supply chain issues, our plans to do this have been stalled. Now, with the training happening at our location, we'd like to have people see the product of the training."

The MREA has been training professionals in the solar PV industry for over 30 years. The MREA training program employs 11 instructors with

years of industry experience to serve more than 500 active and potential solar-industry professionals each year. MREA's training is accredited through the Interstate Renewable Energy Council and recognized by NABCEP and various state licensing agencies.

In addition to online, classroom and interactive training available to the general public, the MREA provides contracted training to distributors, utilities, inspectors, contractors, agencies and community groups.

According to Nick Hylla, executive director of the MREA, "The MREA recognizes that the employment needs of the solar industry in Midwest states are significantly larger and more diverse than existing programs can accommodate. This will include advancing new programs that satisfy industry needs and recruiting and training individuals from communities that have struggled with persistently high unemployment. The new reality is that full-capacity recruitment and training efforts are needed immediately and by all actors to meet workforce needs." ■

The MREA was founded in 1990 after a group of friends planned and hosted the first Annual Energy Fair. Now in its 32nd year, the fair brings between 11,500-18,000 attendees together at the MREA's campus in central Wisconsin.

About the Author

Ellen Barlas is the workforce director of the Midwest Renewable Energy Association and has a certification in construction project management. She has a bachelor's degree in English and literature/letters from the University of Illinois Chicago.

Source

1. <https://tinyurl.com/4s3kd7z3>

Pandemic Causes Online Solar and Storage Training to Go Viral

By Sean White

I have been teaching online on-demand solar PV and energy storage classes since 2014. It was a good gig, but not my main job. I was traveling the world teaching live classes for most of my work. And then along came COVID-19. Suddenly, my online classes took off like a rocket!

Many people discovered during this unfortunate event that there are a lot of ways that we can learn and get work done that are more efficient and more convenient. When I teach a week-long in-person class, it is difficult for students to remember everything; there is no rewind button; and if someone is tired or has something important come up, they cannot take a break.

Live classes do have their benefits, but now online classes are more mainstream and acceptable. For example, many people will spend hundreds of hours taking a 40-hour online class to prepare for a North American Board of Certified Energy Practitioners certification exam and spend hundreds of hours in the class over the course of a year, while some people will finish the 40 hours in a week. It is a flexible platform for flexible schedules.

Solar and storage training is not just for people on the roof. It is important for C-level executives to know the basics of the technologies. It is surprising how often they do not have a clue about anything technical. With an online option, they can fit it in whenever they want. Those who take my Solar PV Boot Camp + NABCEP PV Associate Exam Prep class have a 98% NABCEP Associate Exam

pass rate, which is better than the rate for my in-person classes.

A promise that I make to my online students is to answer every question every day on the discussion board, which sometimes takes two hours per day. I do this 365 days per year. I figure that some people spend more time on Facebook.

I make my classes fun. Almost every day, someone reminds me of some joke I made while recording one of my videos. I spend eight hours making every 15 minutes of video, so it is a lot better than live, since when I teach live, I only get to spend 15 minutes making 15 minutes of class.

Some people have said in the pre-2019 past that online learning can be boring. It definitely still can be, if the wrong arrangement for online training is set up. I have had organizations pay me by the hour to produce online training. I would stand in front of a green screen for two weeks, reciting slides according to their models, which is not as engaging as developing and updating my own material and engaging with students.

When the instructor has a vested interest in the outcome, then the material is better.

With HeatSpring, my favorite online platform, I get to split revenue from each student. By sharing the revenue, HeatSpring can get the best instructors to work the hardest at making the best material. I love the setup and so do my students. If there were a better instructor, then they would eventually

get all of my students, so it keeps me on my toes and working hard.

One more source of income for me is what they call the affiliate program. When someone signs up through me, I get an extra 20%. There are many other affiliates, such as the American Solar Energy Society, NorCal Solar and other HeatSpring instructors.

Many of my online students are from companies, colleges and other institutions that get group rates. Others are those who take my live classes and get the online class included as part of the arrangement, so they can keep on studying even after I go home. Most of my students sign up online themselves. I do get a lot of people taking my free classes, but my focus is on my classes that are more valuable.

One of the most valuable parts of my courses are my NABCEP practice exams. I have many practice questions with answers and detailed explanations. Since 2020, all of these exams can be taken online. A majority of my students take my classes to prepare for these exams. I have received recognition for my work with NABCEP and write books that are used by students studying for their tests. ■

About the Author

Sean White has taught North American Board of Certified Energy Practitioners preparation classes for 15 years. He has won many awards, has authored eight books, and has been teaching workshops at American Solar Energy Society conferences since 2010.



Upcoming Solar Trainings

ASES is proud to offer the following solar trainings in partnership with Heatspring.

Sign up today at ases.org/resources/solar-trainings

NABCEP PV Installation Professional Certification Exam Prep *(starts anytime)*

This course includes a 70-question practice exam and explanation video that will help participants pass the notoriously difficult NABCEP PV Installation Professional certification exam.

<http://bit.ly/2ci6DtA>

SHORT COURSES: *(all start anytime)*

NABCEP PV Installation Professional Certification Practice Exam (Free)

Access a 75-question practice exam to test your knowledge and identify areas you need to focus on when studying.

<http://bit.ly/2cjMHrn>

Mastering Commercial Solar Finance (Free)

Enroll to access advice from a \$20MM solar tax equity investor. Master nonprofit PPAs and how to find and manage investors.

<http://bit.ly/2cnZZE1>

Infrared Imaging as a PV Characterization Tool (\$25)

Involved in solar operations and maintenance? Enroll to learn about infrared imaging (IR) technology and how you can use it to greatly improve solar PV O+M.

<http://bit.ly/2cBmuUF>



Solar Ambassador Program university team leads meet during the 2019-2020 fall training retreat.

© RE-volv

How RE-volv's Solar Ambassador Fellowship Kickstarts Student Careers

By Sydney Muñoz

Since 2012, the solar industry has grown nearly 46%.¹ With the passage of the Inflation Reduction Act this summer, the solar industry is now expected to create 550,000 new jobs, which would more than double the current industry's workforce by 2030.²

With the rapid growth of the solar industry, there is now an even greater need for companies to hire talent with the right skills and experiences. That's where renewable energy training programs for young professionals come into play, like the one offered by

RE-volv, a Bay Area-based climate justice nonprofit.

RE-volv's Solar Ambassador Fellowship is an academic-year-long training program where college students learn about the solar industry while helping to

solarize local nonprofits. With a mission to accelerate the equitable adoption of solar energy, RE-volv provides financing via power purchase agreements and solar leases to community-serving nonprofits nationwide.

"To solve the climate crisis, people need to know that they can take action locally and that it will have a meaningful impact," said Andreas Karelis, executive director and founder of RE-volv. "We started the Solar Ambassador Fellowship to give college students an opportunity to accelerate solar adoption, create tangible benefits for their community, and develop the necessary skills to enter the clean energy workforce."

RE-volv started the Solar Ambassador Fellowship in 2014 with five universities and seven ambassadors. The program has continued to grow every year. RE-volv is currently training 100 college students at more than a dozen universities in nine states. Many ambassadors continue in the program for multiple years. More than a third of participating students rejoin the program for two or more years.

Since 2014, RE-volv has trained over 450 college students at more than 45 universities across the country, from South Carolina, Wisconsin and Ohio to Indiana, Maine and California. The Solar Ambassador fellowship has a more than 70% team retention rate, with university teams participating in the program for two or more academic years.

Alumni of the program have gone on to careers at national energy laboratories, electric utilities, government agencies, clean energy nonprofits, and industry leaders including Sunrun, Tesla, Mosaic, 3Degrees, Philadelphia Energy Authority, RMI and more.

Kickstarting Solar Careers

The fellowship runs from September



A solar ambassador assists in an installation for the nonprofit Harbor House Ministries in Oakland, California.

to May. At the start of the program, the RE-volv team speaks with each ambassador to learn about their motivation for joining. The majority of ambassadors major in engineering or sustainability, but there's a wide range of majors from communications to business to policy. All are looking for ways to gain hands-on experience in the solar industry while making a positive impact in their communities.

Within the solar industry, there's a plethora of job opportunities and roles to fill outside of technical positions; everything from communications, marketing and advocacy to community engagement, project management and solar sales. Many of these soft skills can only be gained through experience typically found outside the university classroom.

Many solar ambassadors join the fellowship because they want to pursue careers in climate solutions but are not

quite sure where their skills and interests align with professional opportunities.

Michelle Le, an alumna of the program, said, "Prior to the fellowship, I knew very little about the clean energy industry aside from what I could learn from my classes. I had the misconception that I couldn't pursue a career in clean energy because I didn't have a rigorous STEM background. This fellowship opened my eyes to so many other opportunities and gave me the space to see where I fit into all of this."

The Solar Ambassador Fellowship Curriculum

The fellowship includes a combination of industry-specific education and hands-on experience. Through the curriculum, RE-volv educates students about solar energy technology, policy and finance, along with communications, management and leadership skills. RE-volv provides an intensive Leadership Summit training at the start



© RE-volv

A Solar Ribbon Cutting Event for VFW Post 10804 is hosted by Coastal Carolina University solar ambassadors.

of the program along with monthly webinars with industry leaders.

The fellowship focuses on two main areas: helping a nonprofit go solar and educating the community about clean energy. Solar ambassadors gain project management experience and communication skills by leading nonprofits through the solar customer journey from initial outreach to proposal review to deal closure.

After the nonprofit's solar system is installed, the solar ambassador team works with the nonprofit to create and execute a campaign to educate the nonprofit's community about solar through events and engagement. The solar ambassador team hosts a ribbon-cutting ceremony for the nonprofit once the system is installed.

which typically attracts local news stations to highlight the story.

Solar-Education Events Nationwide

Each ambassador team also leads three or more events per year with the goal of educating the community about the importance of renewable energy. During the 2021-2022 academic year, solar ambassador teams hosted more than two dozen events, educating more than 450 students and community members about solar through educational panels, film screenings, tabling events and advocacy work.

Last year, solar ambassadors at the University of California San Diego participated in the L.A. solar rally to protect net metering in California. Ambassadors at the University of California, Berkeley brought a solar

panel on campus to educate students. The solar ambassadors at Gonzaga University in Washington ran a campaign to encourage students in the residence halls to reduce their electricity usage.

In the spring of 2022, the University of Dayton Solar Ambassador Team hosted a solar-education event as a part of a youth summer camp series led by the Mission of Mary Cooperative, a nonprofit focused on transforming vacant lots in Dayton into vegetable gardens. The Dayton solar ambassadors helped bring an 11-kW solar system to the cooperative in 2018 and have hosted many solar-education events.

Collaboration with Nonprofits

One of the key pillars of the program is the work that ambassador teams do to

help solarize a nonprofit. An ambassador team takes the lead on the project by finding a deserving community-serving nonprofit that could benefit from solar energy, walking staff through the process to go solar, co-presenting the solar proposal and organizing a campaign to educate the community.

Our solar ambassadors have brought solar to 22 nonprofits nationwide in eight states. Projects include Transitions in Washington State, River Revitalization Foundation in Milwaukee, and The Village of Arts and Humanities in Philadelphia.

Coastal Carolina University has been involved in the program since 2016 and has brought solar to two Veterans of Foreign Wars posts in South Carolina. The VFW Post 10804 in Little River was the first post in the state to go solar and one of the first in the nation.

After the success of the first VFW solar project, Danielle Kvadas, solar ambassador from 2018-2021, helped bring solar to VFW Post 10420, the second nonprofit Coastal Carolina Solar

Ambassadors solarized. Kvadas said, "The most memorable part of the project was the [Solar] Ribbon Cutting Event because the community was so involved and we had a great turnout. It was great to see everybody come together for solar."³

After graduating, Kvadas became the solar design and procurement manager for a solar company in Montana. "Being a RE-volv solar ambassador gives me a sense of leadership that is important when advancing my career," she said. "I have learned accountability, the push to complete a project from start to finish, and a better grasp on handling any challenges thrown my way."

Solar ambassadors at the University of Dayton have been involved since the program launched in 2014. The team has brought solar to three nonprofits, Mission of Mary Cooperative; East End Community Services; and Oak Tree Corner, a grief support center for children. The team celebrated the Oak Tree Corner project with a ribbon-cutting ceremony in 2021.

Patrick Hoody, a current University of Dayton solar ambassador who's been involved in the program since 2019, said, "Working with Oak Tree Corner has allowed me to see the impact of helping nonprofits go solar. It feels amazing to be able to work towards an awesome achievement of going solar with people who care so much about the community I live in."⁴

Career and Job Placement

During the 2021-2022 academic year, over 90% of RE-volv solar ambassadors reported that they are either considering or planning on pursuing a career in renewable energy following graduation. Among alumni survey respondents, over two-thirds of program graduates have found jobs in the clean energy sector. Many ambassadors receive job offers in the clean energy space as they graduate college.

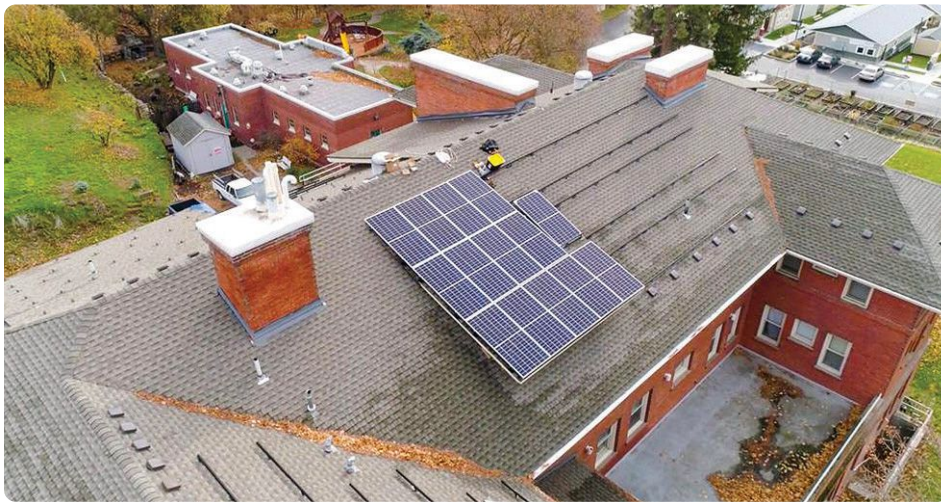
Anna Adamsson was a solar ambassador throughout her undergraduate years at Purdue University from 2017-2021, where

A Solar Ribbon Cutting Event is hosted by the University of Dayton solar ambassadors for Oak Tree Corner.



© Sydney Muñoz

© Photo Courtesy of Gonzaga University



Solar is installed on Transitions, a nonprofit that the Gonzaga University Solar Ambassadors are assisting.

she served as team lead during her senior year in 2021. Following graduation, Adamsson started her career as a project assistant at the Clean Energy States Alliance, where she works on the Solar with Justice project and the Energy Storage Technology Advancement Partnership.

"Coming to college, I knew I wanted to study the environment and find a career path where I could be fighting the climate crisis, but I never really connected renewable energy with that," Adamsson said. "[The Solar Ambassador Fellowship] was an invaluable experience and I learned many skills that I was able to work on and develop through the fellowship and that now I've been able to translate into my current role."⁵

With the program providing both solar education and project management experience, solar ambassadors are more competitive when applying for their first positions after college due to the hands-on experience they gained during the fellowship.

Cat Sweeney, a solar ambassador at Coastal Carolina University from 2016-2018 who helped bring solar to

VFW Post 10804, co-presented at the annual Association for the Advancement of Sustainability in Higher Education conference about the impact of the program.

"There are many opportunities and experiences that I would have never been able to experience without this program," Sweeney said. "It definitely helped me start being a leader in the field and more specifically with the company I found employment with after college in the energy field."⁶

Tyler Vallejos, solar ambassador alumni and team lead at the University of California Santa Cruz, also launched his career in the solar industry after graduation. He said, "I truly believe my experience as a solar ambassador is what landed me a job at one of the largest energy installers in the nation, Tesla Energy, and my current role supporting the leading global solar-design software built for solar installers, OpenSolar."

"I can't emphasize enough how beneficial the RE-volv network is for young professionals to launch their careers in sustainability," Vallejos said. "With the knowledge I gained, I was

able to leverage my experience and passion for working in clean energy to distinguish myself as a candidate who is highly knowledgeable in the industry."

Training the First High School Ambassadors

The ambassador program is constantly evolving and changing to meet the needs of student participants and the industry. Over the years, RE-volv has trained more than just college students; working professionals as well as altruistic retirees have gone through the program as well.

This past fall, RE-volv welcomed its first dozen high school solar ambassadors from Georgia, Wisconsin and California. These students are eager to learn more about solar energy — a topic typically not taught in high school — and are ready to make a positive impact in their communities. The team is hopeful their participation will make them top candidates for university admissions.

Continuous Improvement

Throughout the last nine years, the Solar Ambassador Fellowship has evolved and grown to fit the needs of students and the industry. Feedback from solar ambassadors has always been the most important tool to improve and grow the program.

Since the fellowship runs during the academic school year, the summer months are when staff focus on recruiting new teams and students and making updates to the program. Some of the largest changes over the years have included digitizing the training, creating a Certificate of Completion, and establishing an ongoing job pipeline to clean energy companies.

In the early years, the onboarding Leadership Summit was done in person and the fundamentals of the program were taught through webinar lectures

throughout the year. Now, through education software, staff have been able to develop a rigorous online course for fellows to complete at the onset that includes video presentations and digital readings exercises and quizzes.

In 2021, the team introduced the Certificate of Completion to highlight solar ambassadors who have successfully completed the requirements of the program. RE-volv has certain requirements for teams and individuals to guide the work of the solar ambassadors, including attending educational trainings, hosting solar-education events and collecting relevant information from nonprofits.

The Certificate of Completion allows the solar ambassadors to showcase their achievements in the program on their resumes and LinkedIn profiles, while demonstrating to potential employers their skills and real-world experience.

As the needs of the solar energy workforce continue to grow, RE-volv is excited to play its part in creating career pathways into the industry, training the next generation of clean energy leaders. ■

About the Author

Sydney Muñoz served as the Community Engagement Coordinator at RE-volv from 2020-2022, where she managed the Solar Ambassador

Program for two years. She is currently the Sustainability Specialist for Goodwill Industries International. She has more than four years of experience leading projects, programs and initiatives on sustainability, clean energy, waste reduction and alternative transportation within nonprofit, university and government spaces. Sydney also serves on the American Solar Energy Society Board of Directors.

Sources

1. <https://tinyurl.com/msk36k7s>
2. <https://tinyurl.com/yck2v3r3>
3. <https://tinyurl.com/mr45726e>
4. <https://tinyurl.com/2p8c5wcw>
5. <https://tinyurl.com/28uh4n2m>
6. <https://tinyurl.com/bddv5y6n>



SANDIA'S SOLAR ENERGY PROGRAMS

Accelerating innovation for national security and prosperity

Concentrating Solar Power | csp.sandia.gov
Grid Integration | rsdi.sandia.gov
Photovoltaics | pv.sandia.gov

Work with us: careers.sandia.gov
Licensable technologies and software: ip.sandia.gov

Exceptional service in the national interest



Sandia National Laboratories

SAND2022-5628 O

Two Major Impacts the Inflation Reduction Act Will Have on Solar

By Scott Childers

With the passage of the Inflation Reduction Act, the United States is set to make its largest investment in fighting climate change ever – \$369 billion set aside to help businesses and consumers transition to more sustainable energy sources and promote domestic manufacturing.

Much of the IRA's benefits will be accessible through tax credits offered throughout the supply chain, available to everyone from the manufacturers of the raw materials to the end buyers.

Consider the incentives for electric vehicles: Credits will be available to those who mine the minerals, those who process the minerals into battery components, those who manufacture the final batteries, those who put the batteries into electric vehicles, and those who buy the electric vehicles.

Similar credits are available for those who manufacture and purchase solar panels.

This wide range of incentives is likely to spur two trends: (1) a change in corporate operations to prioritize domestic manufacturing and purchasing of solar panels and batteries for energy independence, and (2) a greater need for energy storage solutions that can capture this influx of solar energy.

Let's take a deeper look at each trend.



An owl is perching on a solar panel.

© Erik Karits

The Operational Shift

It didn't take long for companies to capitalize on IRA incentives. Less than two weeks after President Biden signed the bill, First Solar, the largest solar panel manufacturer in the United States, said that it will build a new panel factory – its fourth fully integrated domestic facility.

It's likely that we'll see many more companies announce additional U.S. investment throughout their supply chains. Instead of mining materials such as cobalt, lithium and vanadium outside the United States and potentially facing supply chain disruptions while trying to transport them stateside, companies will have the incentives

to build out manufacturing infrastructure domestically.

The IRA is opening avenues for material mining and energy capture technologies that once seemed like roadblocks – so much so, there wasn't much of a business case for keeping these operations at home.

This new dialogue between different industries to increase local manufacturing could have a circular effect. The lower cost to manufacture clean energy solutions at home leads to lower costs for consumers, which increases demand and incentivizes businesses to increase production.

The Storage Shift

With the increased emphasis on energy independence through solar power and the domestic production of tools to capture this energy, there will also need to be an emphasis on creating tools that store more of this energy for long durations.

Think about your neighborhood – what happens if there's a storm that knocks out the local power station? It's not good enough for a backup generator to keep an individual home or business functioning for a few hours. Communities as a whole need to be able to run for days or even weeks.

The IRA's tax credits will also help the energy industry build more of these storage systems. Currently, lead and lithium-ion batteries are used in backup-power storage systems. While both are commercially mature technologies, they are better suited for short-to-medium-duration energy storage – from a few minutes to four hours of operating time. Lithium-ion batteries have greater power density than lead batteries, allowing for a smaller footprint.

But to increase duration, it is necessary to add cells to these types of battery systems, which adds to the footprint and cost of the systems. For lead systems, added cells also increase the weight of the battery systems. Added spacing is needed for lithium-ion battery systems as a safety precaution in case of a fire.

Lead batteries have the benefit of a strong domestic supply chain with readily available materials, an established recycling system and a useful life up to 30 years, depending on design. Lithium-ion batteries have a useful life of about 10 to 15 years, rely heavily on offshore supply chains, and do not yet have end-of-life recycling established. There is a significant amount of government funding aimed at solving these challenges for lithium-ion batteries in the United States. However, at this time, most of the money is focused on electric vehicle batteries rather than stationary power storage systems.

Vanadium redox flow batteries are well-suited to store energy for durations longer than six hours. VRFB allows for independent design of the power and energy ratings, which gives it stability and flexibility in its applications. Longer operating times are achieved simply with larger tanks that hold more electrolyte. The energy is delivered at full power and without having to make any changes to the power conversion stacks. The aqueous nature of the electrolyte also makes these systems safe from thermal runaway situations, enabling them to safely scale up to achieve larger energy storage capacities.

Vanadium's benefits go far beyond its longer durations. VRFB systems are manufactured primarily using domestic materials and offer a near-infinite cycle life, capable of functioning 40 years or

longer before the battery system reaches the end of its life and when solar panels or other supporting infrastructure are no longer functioning. At that time, vanadium can be extracted from the electrolyte in the battery, purified and used to create electrolyte for new batteries.

Like lithium, though, the process and commercial infrastructure for recycling vanadium are not currently well-established. However, because of vanadium's similar component profile to lead batteries, the timeline may be shortened by using the recycling process blueprint established by the lead battery industry. Recycling is not an immediate concern for vanadium due to its long battery life.

A Brighter Tomorrow

The IRA is the catalyst we need to kickstart efforts for energy independence and security – but reaching the final goal will require collaboration. A wide variety of battery chemistries will be necessary to meet the increasing demands for energy storage. It will be up to the solar energy and energy storage industries to develop and refine the materials that make this clean future possible. We have the incentives. Let's get to work. ■

About the Author

Scott Childers is vice president, Essential Power division of Stryten Energy. In this role, he is responsible for growing the company's energy solutions and new technology offerings. He champions clean, renewable energy opportunities for Stryten and actively works with utilities and original equipment manufacturers to deploy long-duration, sustainable energy storage solutions.

Meet Cliff Brutus: Mechanical Engineer, Project Manager and Lifelong Learner

By Ian Guan

Jean Clifford (Cliff) Brutus, an engineer at the U.S. Department of Energy's Brookhaven National Laboratory, has a cool job — literally. He's developing components to keep particle beams circulating in the lab's Relativistic Heavy Ion Collider cool.¹

As particles called ions circulate around the 2.4-mile-circumference collider, they have a tendency to heat up and spread out. That spreading can be a problem for scientists trying to steer the ions into head-on collisions for nuclear physics experiments at this DOE Office of Science user facility.

"Keeping the beams cool and tightly bunched maximizes the rate of collisions and therefore the amount of data scientists can use to make discoveries," Brutus said.

Some of the cooling strategies being implemented at RHIC can also be adapted for the construction of the future Electron-Ion Collider — a facility that will collide electrons with ions to reveal the particles within these building blocks of matter.² When completed early in the next decade, the EIC will be the only particle collider of its kind in the world.

"Research and development had always piqued my interest," Brutus said. "But helping design components for



Jean Clifford Brutus stands at the Relativistic Heavy Ion Collider at Brookhaven National Laboratory.

this unique facility — where scientists from around the world will make discoveries for decades to come — is exceptional and tops the list of ideal career paths I could take as a mechanical engineer."

Early Engineering Interest

Brutus took an interest in engineering from a young age. After growing up in

Haiti, he recalls how he and his brother shared a passion for motorsport.

"My brother Christian wanted to buy an all-terrain vehicle, but my parents were against it," Brutus said. "So he decided to build one on his own. As a supportive brother, I helped him with the fabrication process."



Once he inherited the go-kart a few years later, Brutus dove deeper into learning how it worked and how to fix it — gaining hands-on design, construction and maintenance experience that he still uses on the job today.

After moving to Long Island in 2006 to finish high school, Brutus drew on these experiences to pursue a degree in mechanical engineering. He had aimed to study at Stony Brook University but was rejected when he first applied to their highly competitive mechanical engineering program.

"I was devastated and I started to become doubtful about my future," he said.

Instead, Brutus attended Suffolk County Community College. At Suffolk, he became heavily involved in the school's science, technology, engineering and mathematics program. After one year, he earned a STEM scholarship and transferred to his program of choice at SBU.

The community college detour turned out to be "one of the best paths I could take at the time," Brutus said. "The STEM program at SCCC gave me an edge with a scholarship and a large network that I still keep in touch with."

Internship to Full-Time Job

That same network led to an internship at BNL in 2009. As an intern of the Science Undergraduate Laboratory Internships program,³ Brutus learned all about particle collider and accelerator technologies while working under Joseph Tuozzolo, now the technical systems division director for the EIC.

"Cliff was a can-do type of intern," said Tuozzolo. "He was always on time and



© Courtesy of Jean Clifford Brutus

As a teenager, Brutus helps his brother build an all-terrain-vehicle-turned-go-kart.

attentive and willing to consider alternatives to improve his projects."

Brutus went on to intern for General Electric Transportation in 2010. Despite being offered a full-time job at GE, Brutus felt a strong desire to complete a master's degree at SBU in 2012 and return to BNL.

"I reached back out to Joseph, saying that I was interested in coming back because it was the most impactful internship I had," said Brutus. He returned to BNL, first under a co-op position in 2011, and transitioned to a full-time engineer position in 2012.

"I was very happy that he considered BNL after finishing his master's," said Tuozzolo. "He hit the ground running when he came on board and has always strived to go faster."

At BNL, Brutus has been designing, fabricating, testing and commissioning accelerator components for the Coherent Electron Cooling and Low Energy RHIC Electron Cooling experiments, which aim to improve

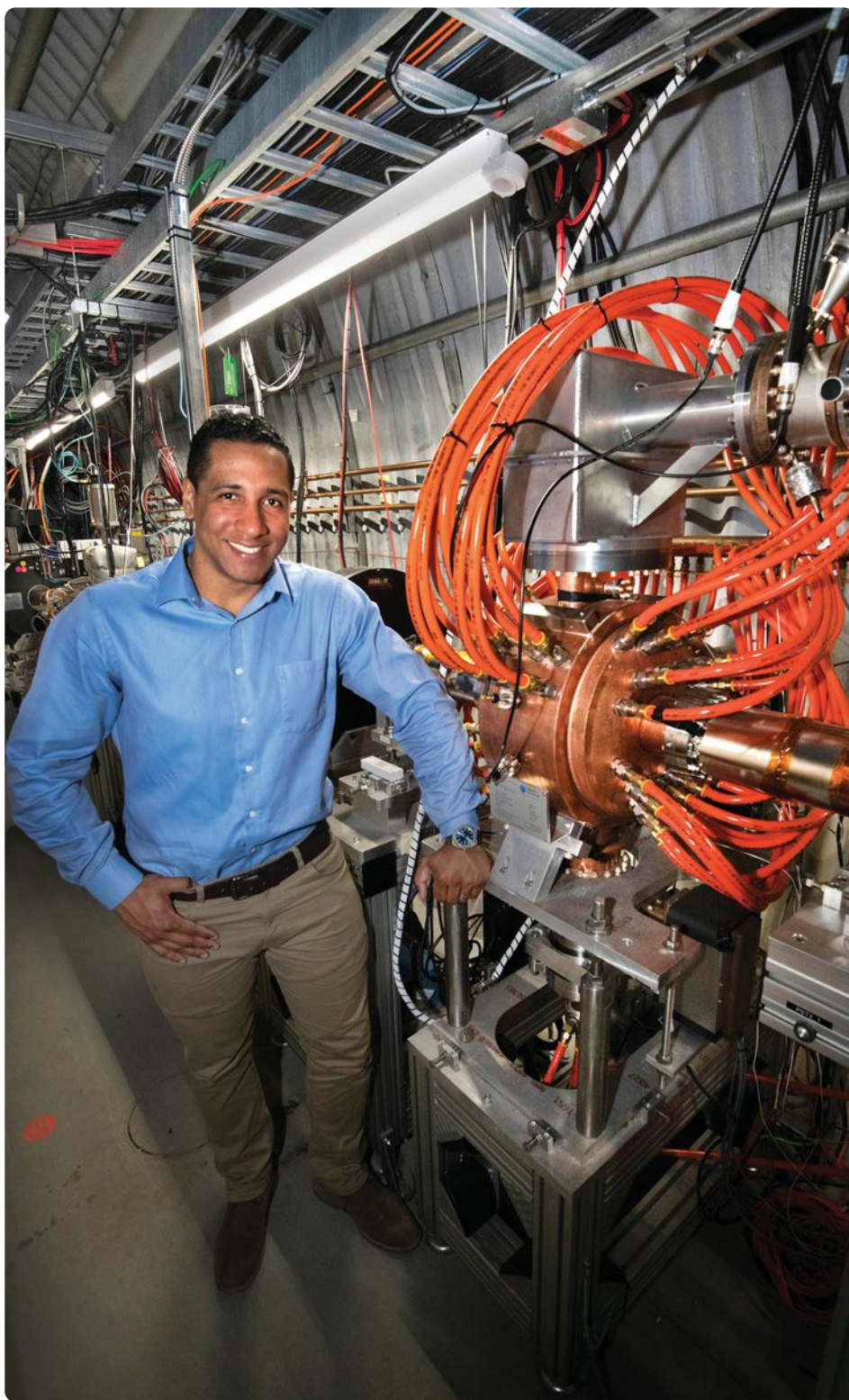
the performance of RHIC and the EIC.

"The types of equipment used in a particle accelerator are complex," said Brutus. "As a mechanical engineer working in such a facility, you get involved in all aspects. We help design electron sources, radiofrequency cavities, magnets, diagnostics devices, cryogenic systems, control systems and more."

Brutus uses an array of tools, including computer software that models accelerator components in three dimensions and performs engineering design analyses through electromagnetic, thermal and structural simulations.

"There are many technical challenges when working with superconducting materials operating at a temperature of 2 Kelvin (-456 degrees Fahrenheit)," he said.

Brutus is also responsible for the overall planning, scheduling and operational support for the experiments he leads as a project engineer, keeping



© BNL

Jean Clifford Brutus stands at the Relativistic Heavy Ion Collider at Brookhaven National Laboratory.

his projects within budget and on schedule and meeting physicists' expectations.

"You could spend several months having meetings and designing a project on a computer," he said. "Many

times, we have several design iterations going back and forth between what the physicists want and what can actually be manufactured."

"But when we finally build, install and commission projects, it is very rewarding and exciting to see your design being used for scientific research," he said.

Paying It Forward and Reaping Rewards

Brutus also enjoys opportunities to pay his experiences forward. He mentors SULI students and serves on the Diversity, Equity and Inclusion Council for the Nuclear and Particle Physics Directorate at BNL, where he helps develop initiatives to improve the culture of NPP.

In 2016, Brutus earned his Project Management Professional certification. And in 2018, he achieved his life-long goal of becoming a licensed New York State Professional Engineer.

He was featured on the cover of *Minority Engineer* in 2019 and is a two-time recipient of the BNL Lab Spotlight Award.

In 2021, Brutus was honored as one of Stony Brook University's 40 Under Forty Award⁴ — a recognition of alumni who have distinguished themselves as leaders in their communities.

"It is a great honor to represent SBU, Brookhaven Science Associates, and my family," said Brutus. "This is a reflection of my passion to support science and discovery, to help others and the values I believe in."

Appreciative of the opportunities given to him as a student and as an engineer, he offers this to those just starting out:



"I advise them to always better themselves — as a person, as a leader and as a collaborator," he said. "Always challenge yourself and be willing to learn from your mistakes as well as from others of different backgrounds and cultures in order to grow professionally."

The SULI program and projects at RHIC and the EIC are funded by the DOE Office of Science. ■

This article on particle physics was reprinted with permission from Brookhaven National Laboratory. It was included in Solar Today because this technology can be used to improve electricity transmission and also because we are highlighting students' work.

Brookhaven National Laboratory is supported by the Office of Science of the U.S. Department of Energy. The Office of Science is the single largest supporter of basic research in the physical sciences in the United States and is working to address some of the most pressing challenges of our time. For more information, visit science.energy.gov.

About the Author

Ian Guan was a media and communications intern at Brookhaven National Laboratory. He created multimodal content on nuclear and particle physics, medical physics, accelerator and collider technology, career development and science diversity. He is now a student at the University of Washington.

Sources

1. <https://tinyurl.com/56hjarbf>
2. <https://tinyurl.com/jkw3mknx>
3. <https://tinyurl.com/mr2jy7c8>
4. <https://tinyurl.com/598uasjs>



© BNL



© Courtesy of Jean Clifford Brutus

Top: Brutus sits alongside members of the first Early Career Resource Group leadership team at BNL (left to right): Megan Quarant, Danielle Pontieri, Erica Lamar, Charles Baldassarre, Kayla Hernandez and Alyssa Petrone. Bottom: Brutus (left) stands alongside George Mahler at a SULI recruitment event at Stony Brook University's Engineering Job Fair in 2016.

Solar Certification Programs: NABCEP and ETA International

By Jay Warmke

Abstract

Most people who have made solar PV their career are familiar with the North American Board of Certified Energy Practitioners¹ and the certifications it offers to the industry. But most members of the general public have no idea such a program exists.

Those who teach technical skills in community colleges and universities across the United States are aware of the Electronics Technicians Association International and the certifications it offers.² But many within the PV industry have never heard of ETA-I.

Founded in 1978, ETA is a not-for-profit trade association that serves technology-related industries by providing accredited individual certifications. ETA has issued over 180,000 technical certifications covering more than 90 certification programs in a variety of technology fields.

Since 2010, ETA has offered certification to those designing and installing solar PV systems. Over the years hundreds of students have become certified through this program, largely through community colleges.

NABCEP was established in 2002 with the mission “to support and work with the renewable energy and energy efficiency industries, professionals



© Lou Hernandez / Wikimedia Commons

Contractors install solar panels at the Los Angeles Air Force Base Space and Missile Systems Center.

and stakeholders to develop and implement quality credentialing and certification programs for practitioners.”

While the missions of these two 501(c)(6) organizations are similar, their approaches to the certification of individuals working in the solar industry are slightly different.

So what are the similarities and differences between the two programs?

What is the difference between a certification program and a credential and why does it matter?

And where are these certifications required to install solar?

1. PV Industry Certification Programs

The prime mission of both organizations is to develop and promote individual certifications within their respective industries.

Individual (or personal) certifications are designed to provide an independent third-party attestation that an individual has demonstrated a minimum level of competence, education and/or experience in a given field, as determined by a committee of selected industry experts (usually).

2. NABCEP Programs

The first NABCEP certification examination was offered in 2003, designed to test and certify solar PV

installers. Since that time, NABCEP has added seven more specialized certifications (all within the solar PV and solar thermal industries). In addition, NABCEP also offers three entry-level "credentials" targeted at the solar PV, solar thermal and small wind industries.

These certifications are focused on and marketed to the North American marketplace.

Certifications offered by NABCEP include:

- PV Installation Professional
- PV Design Specialist
- PV Installer Specialist
- PV Commissioning & Maintenance Specialist
- PV Technical Sales
- PV System Inspector
- Solar Heating Installer
- Solar Heating System Inspector

The eligibility requirements of each program vary slightly. For the purpose of this paper, we will focus only on the PVIP credential.

In order to be eligible to sit for the design and installation examinations, the applicant must provide extensive documentation that they have "performed in a decision-making role" in at least three solar PV installations larger than 1 kW (generally) within the two years prior to application.

In addition, the applicant must also provide proof of completion of 58 hours of solar PV-specific training as well as 10 hours of Occupational Safety and Health Administration safety training.

Once approved, the applicant must obtain a 70% or better score on the written examination. The certification is then valid for three years and can be

renewed for additional three-year periods by providing proof of continuing education.

The associate-level programs offered by NABCEP are designed as a "credential" rather than a certification. These are targeted toward individuals who have no experience in the industry but would like to demonstrate a minimum level of competence in the field.

These associate-level programs offered by NABCEP include:

- Photovoltaics
- Solar Heating
- Small Wind

No experience or hands-on skills demonstration is required for these credentials.

The applicant must document a minimum of 40 hours of approved training in the specialty and obtain at least a 65% score on a written exam.

The credential is then valid for three years and can be renewed for additional three-year periods by providing proof of continuing education.

3. ETA-I Programs

Founded in 1978, ETA-I first developed industry certification programs targeted to the electronics industries (primarily radio and television repair and maintenance). Over the years, ETA-I has issued over 180,000 technical certifications that include not only electronics but fiber optics, electrical cabling, biomedical technologies and renewable energy.

In this paper, the focus will solely be on the solar photovoltaic certifications offered by ETA-I. These include:

- Photovoltaic Installer-Level 1 (PV1)
- Photovoltaics Installer/Designer (PV2)

The PV1 certification is designed for individuals who are new to the industry. To be eligible to sit for the examination, the applicant must have completed 40 hours of approved training and have demonstrated a set of installation skills (such as connecting and testing solar panels, connecting disconnects and inverters, etc.) to the satisfaction of an ETA-I-approved certification administrator.

The applicant must then obtain a 70% or better passing score on a written examination.

The credential is then valid for four years and can be renewed for additional four-year periods by providing proof of continuing education.

The PV2 program is designed for experienced solar PV installers/designers.

The applicant must demonstrate experience based not on the number of systems installed but on having completed a number of specific tasks. The applicant must also document 60 hours of approved industry-specific training as well as completion of 10 hours of OSHA safety training. In addition, the applicant must obtain the ETA Customer Service Certification.

The credential is then valid for four years and can be renewed for additional four-year periods by providing proof of continuing education.

4. Accreditation

In the United States, there is no governmental oversight of the certification process (as is the case in many other nations). The process is largely voluntary and self-policing.

In an effort to help define what constitutes a quality certification program, the International Organization for Standardization has published the ISO/IEC 17024:2012, Conformity



Despite years of growth, the solar PV industry is still in its infancy. As with any new enterprise, the rules of the road have yet to be firmly established.

Assessment - General Requirements for Bodies Operating Certification of Persons.

This standard outlines the steps and processes a certification body should perform when developing and administering a certification program (including initial selection of the development team, psychometric processes for developing the question database, security issues, renewal criteria, etc.).³

A number of accreditation bodies exist that evaluate if the certification-credentiating body has met the criteria as outlined in the ISO 17024 document.

Two such organizations active within the United States are the American National Standards Institute and the International Certification Accreditation Council. These accreditation bodies must in turn adhere to performance standards as outlined in ISO/IEC 17011 – Conformity Assessment: General Requirements for Accreditation Bodies Accrediting Conformity Assessment Bodies.

ETA-I is accredited by ICAC. NABCEP is not accredited.

5. License and Certification Requirements

While certification is largely a voluntary

process designed to demonstrate excellence within a specific industry, a state license is a government-issued document that provides proof that the business is legally allowed to operate in a specific state.

Many states require that solar PV installation be performed by a licensed electrical contractor. Some states require a general contractor's license. A number of states have developed industry-specific solar PV licenses that are required to install systems. Still other states require no license at all.⁴

While no state currently mandates that any individual or company hold a solar-industry certification to perform work, at the local level, cities and counties may require such documentation. There is, however, no national database that tracks such narrow and specific requirements.

Some statewide solar incentive programs, such as the Illinois Shines Program, do, however, require that installers be industry-certified in order to be eligible to participate.

Where required, these incentive programs will accept either the NABCEP PV Installation Professional certification or the ETA-I PVI1 or PV2 certifications.

The NABCEP associate-level credentials are generally not accepted, as they are not considered certification programs.

Conclusion

Despite years of growth, the solar PV industry is still in its infancy. As with any new enterprise, the rules of the road have yet to be firmly established.

Many states have chosen to simply incorporate the licensing of this emerging industry into existing structures

(such as electrical- or general-contractor licenses). Some states have developed targeted licensing geared toward the solar industry, while still others have ignored it altogether.

But state licensing addresses only part of the problem. As the industry grows and matures, customers will increasingly seek some third-party credential when selecting a PV installer/designer to help in assessing the quality of the firm or individual. Solar PV certification programs will in large measure fill this role.

The PV industry currently has two well established and quality credentials from which to choose. While they approach the task in slightly different ways, they both have demonstrated a commitment to providing affordable and relevant certification to the industry as it grows and changes over the coming years. ■

This article is a modified version of a peer-reviewed one published in the book "Proceedings of the American Solar Energy Society National Conference: ASES SOLAR 2022." Solar Today obtained permission to republish and edit it from Springer Nature.

About the Author

Jay Warmke is the co-owner of Blue Rock Station, a sustainable-living center that features the first Earthship (a 2,200-square-foot passive solar home constructed out of garbage) built east of the Mississippi.

Sources

1. <https://tinyurl.com/2bv5wdxj>
2. <https://tinyurl.com/yc6y32b6>
3. <https://tinyurl.com/mua464c2>
4. <https://tinyurl.com/2p94xc22>



Live Broadcasting



Video Production



Impactful Media

Hybrid & Virtual
Conferences & Events

**BOOK A FREE
CONSULTATION TODAY**
720-515-7215

Diversifying the Solar Workforce Through Inclusive Apprenticeships

By Alexander Winn, Devin Boyle and Josh Christianson

Abstract

A recent study from the U.S. Department of Energy showed the national solar industry workforce will need to triple by 2035 to meet deployment goals. Apprenticeship programs that are designed to be inclusive of underserved populations, including those with disabilities, can help create skilled workers that can help the industry meet this demand. The solar industry has made progress in recent years toward building a more diverse workforce, but more can be done to reach untapped talent pools to support future growth.

Approximately 26% of adults in the United States have a disability, but only 29.1% of them are employed. In fact, 10.7 million more employable citizens could enter the job market if companies focus on disability inclusion. Apprenticeship programs provide participants with paid “earn-while-you-learn” training through in-classroom instruction and structured on-the-job training with experienced mentors.

Apprenticeship programs designed to be inclusive of people with disabilities and underrepresented groups more broadly can be a low-cost way to help companies of all sizes to diversify their



A trade professional reads a technical diagram.

© Halfpoint

workforces, boost productivity, reduce turnover, decrease absenteeism, expand their customer base, and more — all factors that can increase a company's bottom line.

The Partnership on Inclusive Apprenticeship, an initiative funded

by the U.S. Department of Labor's Office of Disability Employment Policy, can support solar employers to advance and enhance inclusive apprenticeship programs.

Introduction

According to the 2021 United States

Energy and Employment Report,¹ much of the clean energy sector experienced job losses during the COVID-19 pandemic and the solar industry saw an 8% decline in jobs. In 2020, the industry began rebounding, bringing an influx of 560,000 jobs into the energy sector and a continued need for solar workers.²

As the nation moves past COVID-19-pandemic business hurdles, experts anticipate continued growth in solar jobs.^{3,4} A recent study from the DOE projects that the solar industry will employ between 500,000 and 1.5 million United States workers by 2035.⁵

Though increasingly optimistic about the future outlook, many industry leaders face major hurdles to recruit and hire experienced candidates to fill the growing number of clean energy jobs.

As outlined in the USEER 2021 report, 88% of companies in the electric power-generation sector reported: "It was either somewhat difficult (69%) or very difficult (20%) to find new employees."⁶

At the same time, the report said the energy sector is "less diverse than the nation as a whole" and employers are seeking ways to build diverse, equitable, inclusive and accessible workplaces.⁷

Apprenticeship programs that are designed to be inclusive of people with disabilities — and underrepresented groups more broadly — can play a vital role in building out the solar industry's future workforce while also helping employers meet diversity, equity, inclusion and accessibility goals. This talent pipeline offers a cadre of trained and experienced job candidates with diverse skills, knowledge and abilities.⁸

1. Bringing in Diverse Talent Through Apprenticeship

About 26% of adults in the United States have disabilities,⁹ but only 29.1% of people with disabilities aged 16–64 are employed.¹⁰

People with disabilities can bring a wealth of untapped talent and diverse perspectives into the clean energy sector, filling jobs ranging from solar power installers to systems engineers and market analysts. In fact, 10.7 million more U.S. citizens could enter the job market if companies would expand their focus on full inclusion of workers with disabilities.¹¹

An apprenticeship program that is designed to be inclusive of people with disabilities can create a diverse talent pipeline of valued workers and help build a more inclusive solar industry.

These programs are specifically designed to be accessible to and inclusive of all trainee workers, including people with cognitive, neurological, physical, mental health and sensory disabilities. In turn, recruiting and hiring these career seekers can help to foster more diverse, equitable, inclusive and accessible workplaces that also attract talent from other underserved groups, broadening the talent pool even further.

Launching an inclusive apprenticeship program can offer a way to help companies of all sizes diversify their workforces, boost productivity, reduce turnover and absenteeism, enhance their brand images and more. All of these factors can drive a company's mission and yield key advantages for its bottom line.

2. The Value of Inclusive Apprenticeship

Creating an inclusive apprenticeship program can be a cost-effective way to build a diverse pipeline of solar workers. "The Value of Inclusive Apprenticeships," a resource from the

PIA, summarizes the many advantages that these programs can bring to companies,¹² including:

Significant return on investment: In 2020, the average Registered Apprenticeship program yielded a 170% return on investment for North Carolina employers.¹³

Companies that embraced best practices for employing and supporting more workers with disabilities in their workforce achieved 28% higher revenue, doubled their net income, and attained 30% higher profit margins on average.¹⁴

Lower turnover and reduced training costs: The vast majority of apprentices (89%) maintained their positions, helping their businesses achieve a strong three-year retention rate.¹⁵ At four Walgreens locations, the three-year average turnover rate was 48% higher for team members without a disability as compared to team members with a disability, saving on recruiting and training costs.¹⁶

A wider talent pool: As noted earlier, only 29.1% of working-age adults with a disability are employed, compared with 70% of working-age adults without a disability. Nearly 11 million citizens could enter the labor force and pursue jobs, including through apprenticeships, if companies embraced full inclusion of workers with disabilities.

3. A Path Forward: Steps to Creating an Inclusive Apprenticeship Program

For those companies with an interest in creating inclusive apprenticeship programs, these five steps can help organizations kickstart the process and meet their goals to become more diverse, inclusive, equitable and accessible businesses:

Step 1: Explore

Interested companies can explore how apprenticeship programs can help prepare and train the future workforce by learning more about the value of inclusive apprenticeship programs and how the PIA is advancing career paths in the clean energy sector.¹⁷

Step 2: Build

Employers can learn how to create an apprenticeship program or partner with an existing program.¹⁸ Additionally, many states offer funding sources that can aid businesses in developing programs, providing financial support for solar-workforce expansion, apprenticeship training and work access for job seekers with disabilities. Employers can pursue several tax incentives and grant programs.¹⁹

Step 3: Partner

Companies can consider developing new partnerships to create inclusive programs, which may include collaborating with industry partners such as apprenticeship intermediaries.²⁰

These intermediaries can connect apprentices and employers to help launch, grow and maintain apprenticeship programs. They are often run by industry associations, chambers of commerce, community and technical colleges, community organizations, labor and management partnerships and workforce development boards.

Step 4: Register

Businesses can find out how to register apprenticeship programs with the U.S. Department of Labor or state apprenticeship agencies.²¹

Step 5: Launch

Companies can begin apprenticeship programs by recruiting and hiring talented career seekers²² while ensuring programs meet their

accessibility goals by reading "Designing Inclusive Apprenticeships: A Guide for Recruiting & Training Apprentices with Disabilities."²³

4. Research Questions Lie Ahead

As PIA continues to make progress on advancing inclusive apprenticeships among solar energy stakeholders, the team will look to highlight lessons learned. Visit PIA's Clean Energy Spotlight for more information.²⁴

PIA will continue to engage with the growing community of workforce-development professionals focused on diversity, equity, inclusion and accessibility for further insights on how to apply best practices for inclusion of underrepresented groups in the solar workforce. ■

This article is a modified version of a peer-reviewed one published in the book "Proceedings of the American Solar Energy Society National Conference: ASES SOLAR 2022." Solar Today obtained permission to republish and edit it from Springer Nature.

About the Authors

Josh Christianson is a passionate advocate for workplace diversity, equity, inclusion and accessibility. Josh has a 20+-year track record leading successful public programs by building partnerships, teams and momentum to support big goals. Josh is the director of the Partnership on Inclusive Apprenticeship and was previously director for the Partnership on Employment & Accessible Technology, both funded by the U.S. Department of Labor's Office of Disability Employment Policy.

Devin Boyle serves as the director of communications for the Partnership on Inclusive Apprenticeship. At PIA, she leads strategic communications activities including the development

of resources for employers, apprenticeship organizations, and people with disabilities. Prior to joining PIA, Devin worked as communications lead for the Partnership on Employment & Accessible Technology.

Alexander Winn is an experienced solar developer and policy expert who has delivered dozens of presentations and educational workshops on local solar regulatory policy, solar finance, and solar market trends. Having worked in solar since 2008, Alexander has been at the forefront of solar-labor analysis and federally-funded soft cost-reduction strategies. Alexander serves as the clean energy lead for the Partnership on Inclusive Apprenticeship.

Sources

1. <https://tinyurl.com/2p93447r>
2. Ibid.
3. Ibid.
4. These estimates preceded the anti-dumping and countervailing-duties-circumvention trade case. <https://tinyurl.com/2e6y86c2>
5. <https://tinyurl.com/34wnn93e>
6. Ibid.
7. Ibid.
8. <https://tinyurl.com/4tc842m6>
9. <https://tinyurl.com/msunurjk>
10. <https://tinyurl.com/395cywa6>
11. <https://tinyurl.com/55ennsyp>
12. <https://tinyurl.com/3y2yu7t6>
13. <https://tinyurl.com/4jcusrt9>
14. <https://tinyurl.com/55ennsyp>
15. <https://tinyurl.com/24z8w8jd>
16. <https://tinyurl.com/yndx222w>
17. <https://tinyurl.com/3y2yu7t6>
18. <https://tinyurl.com/35n63akz>
19. <https://tinyurl.com/mpsuhkg8>
20. <https://tinyurl.com/35n63akz>
21. <https://tinyurl.com/3ff4t6py>
22. <https://tinyurl.com/muyuvkb3>
23. <https://tinyurl.com/3r2acypf>
24. <https://tinyurl.com/yatjcd5p>



RHI-1P(5-10)K-HVES-5G

Secure Your Energy Future

Solis Residential Storage Hybrid Inverter



Bankable. Reliable. Local **w:** solisinverters.com
e: ussales@solisinverters.com **t:** (+1) 866 438 8408

Want to learn more about ASES Divisions and how you can get involved? Visit community.ases.org.

Solar Buildings Division

Chair: Julian Wang, jqw5965@psu.edu

What Solar Sites near you could be a part of the 2023 National Solar Tour next October? Sites feature homes, businesses, community PV, electric vehicles, grid storage and various other sustainable strategies. In 2023, we plan to have a focus on educational projects and curricula. With thousands of visitors, it's also a super event to sponsor. The tour that kicked off on Oct. 1-2 included

all 50 states! That is a rare occurrence in the 25+-year history of the tour. The virtual sites can be viewed online through Jan. 15.

The call for papers for SOLAR 2023, the national ASES conference in Boulder, Colorado on Aug. 8-11, is open through early 2023. Track 1: Decarbonizing the Building Sector focuses on a variety of

building-related topics. See the announcement in this issue and on the ASES website for details.

In February, look for an ASES webinar on Passive Solar Design for Homes by architect Debbie Coleman of Sun Plans, author of "The Sun-Inspired House" and vice chair of this division.

Photovoltaics Division

Chair: John Burke, dadsolar@yahoo.com

At this year's National Solar Tour on Oct. 1, in Jonesport, Maine, in the Downeast Solar Center, we discussed thin-film PV and crystalline silicon PV differences and the advantages of each technology. We

also had a few moments to describe our upcoming October "Solar PV Hands-On Assembly" workshop series and say how anyone can get into the process at a level befitting their experience and

desire for learning. We continue promoting our off-grid DIY approach here at the solar home that Rich Komp built in the mid-1980s.

Policy Division

Chair: Gilbert Michaud, chaud@luc.edu

The American Solar Energy Society's Policy Division continues to promote and study the policies being used to encourage solar energy deployment. After a successful annual conference earlier this summer in Albuquerque, New Mexico, the division hosted an August webinar focused on solar-policy

updates in the Northeast. Soon, the division aims to roll out a series of webinars focused on solar-policy issues in different regions, so stay tuned. The division is also paying close attention to the recently passed Inflation Reduction Act, which contains updated and new federal tax credits and rebates for solar

energy, battery storage, electric vehicles and other technologies. We anticipate that this will be a topic of major discussion throughout the year as well as at the SOLAR 2023 Conference at University of Colorado Boulder.

Sustainability Division

Chair: Paulette Middleton, paulette@panoramapathways.net

As part of working with the American Solar Energy Society conference planning team for SOLAR 2023, the division is looking for contributions in these key areas related to sustainability:

Circular Economy, Mining Minerals, Land and Water Use Issues, and Sustainability as a Dynamic Organizational Capability. Check out the SOLAR 2023 Call for Participation to submit your abstracts.

The division also welcomes your ideas for ASES webinars on these topics. Please contact Paulette Middleton with ideas and questions.

Solar Thermal Division

Chair: Henry K. Vandermark, hkv@solarwave.com

The Solar Thermal Division welcomes a range of topics and interests as we invite proposals to present at the ASES SOLAR 2023 conference. The track "Applications of PV and Solar Thermal" will include subtopics such as Material Design for Energy Applications; DIY PV, Heating,

Water Distilling, Solar Cooking; Extended Applications of Thermal Heat; District Heating & Cooling; Concentrated Solar Power; Hybrid Systems and more. Please review the call for proposals and join us at the conference.

By the time this is published, I hope to welcome our new vice chair. Please take a look at the ASES community website's division forum and help with our part of the ASES mission.

52nd National Solar Conference Call for Participation Is Open

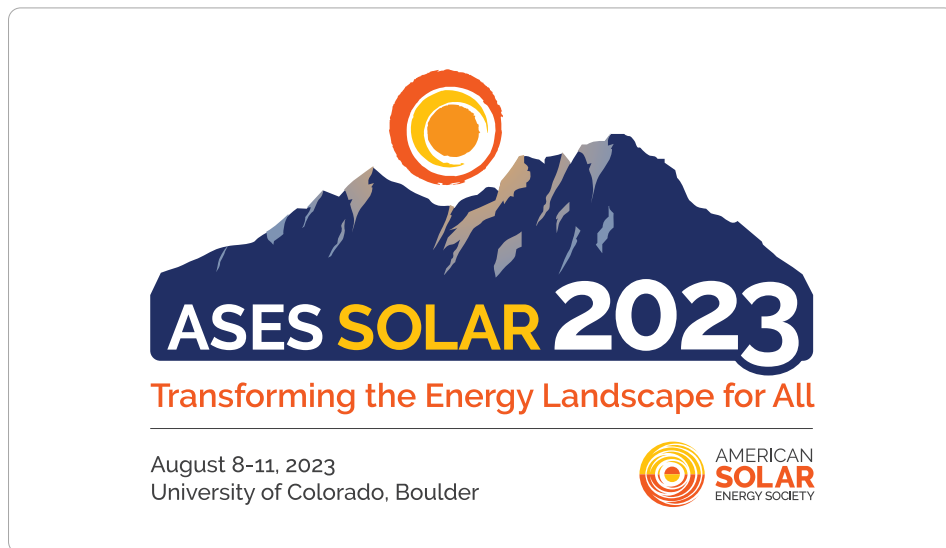
The American Solar Energy Society believes that a world equitably transitioned to 100% renewable energy is not only possible, but urgently necessary. Through the ASES National Solar Conference, SOLAR 2023, we will elevate public, institutional and governmental awareness of the large role solar energy is playing in the U.S. energy landscape. The conference will be on August 8-11, 2023 at the University of Colorado Boulder.

We must ensure that access to and the benefits from clean energy will be enjoyed by all communities, especially those that have been denied those benefits in the past.

ASES now invites you to submit a proposal at <https://tinyurl.com/3v2x2tec> to present at next year's conference around the theme "Transforming the Energy Landscape for All." View the website <http://ases.org/conference> for the upcoming deadline.

The conference theme will promote the ASES mission to "accelerate equitable solar adoption and universal sustainable living by educating and building community." The conference will focus on models and tools for negotiating the challenges to advancing renewables by following justice, equity, diversity and inclusion principles (<https://ases.org/jedi/>).

- **Track 1: Decarbonizing the Building Sector**
- **Track 2: Smart Grids from Nano to Micro**



- **Track 3: Applications of PV and Solar Thermal**
- **Track 4: Life Cycles and Impacts**
- **Track 5: Educating & Engaging Stakeholders**
- **Track 6: Equitable Energy Ownership and Access – Policy, Regulation, and Investment**

Submission Details

We offer a variety of presentation options (see below) for you to share your research, programs, projects, operations, actions, visions, etc. These include regular oral presentations (10-12 minutes), shorter sessions (5 minutes), poster sessions (2-3-minute oral presentations), or interactive hands-on workshops or outdoor displays. Your final presentations can be concise and scientific, lively and full of examples, or anywhere in between.

The track categories are the headings under which your abstracts will be

reviewed and accepted or rejected by the SOLAR 2023 Technical Review Committee.

Track 1: Decarbonizing the Building Sector

- Building New vs. Renovating
- Net Zero Buildings
- Passive Solar
- Electrification
- Buildings and Transportation
- Building-Envelope Efficiency
- Material Research
- Sector Examples (Residential Single & Multifamily, Commercial & Institutional Buildings)
- Passive Cooling
- Solar Decathlon Projects
- Energy Analysis and Design Tools
- Solutions for Urban Heat Islands

Track 2: Smart Grids from Nano to Micro

- Community Solar
- National Grid Expansion
- Municipal Grids
- Microgrids
- Energy Storage
- Distributed Generation
- Demand-Side Management
- Grid Infrastructure & Modernization
- Grid Operations
- Grid Resilience (Weather, War, etc.)
- Off-Grid Freedom, Energy Independence

Track 4: Life Cycles and Impacts

- Circular Economy
- Weather- and Energy-Related Research (Climate Scenarios, Extreme Weather Events, Trends, Socioeconomic Impacts of Energy Choices, Research Needs)
- Greenhouse Gas Mitigation
- Energy/Water/Food Nexus (Agrivoltaic Solutions, Land and Water Use Issues, etc.)
- Mining Minerals
- Economics of Climate Change and the Clean Energy Transformation (Lifetime Cost of Energy Comparisons from the International Renewable Energy Agency and Others)

Track 6: Equitable Energy Ownership and Access – Policy, Regulation and Investment

- Novel Financing for Solar Energy (On-Bill, Property-Assessed Clean Energy, PAC, Ratings, Utility Green Pricing...)
- Ownership and Energy Access of Traditionally Energy-Burdened Remote/Rural/Island/Tribal Communities: What Can They Teach Us?
- Solar on Native American Reservations
- Business Policies for Solar (Subsidies, Green Appraisal Act, etc.)
- Inflation Reduction Act – How it Helps Everyone

Track 3: Applications of PV and Solar Thermal

- Material Design for Energy Applications
- Emerging Cleantech Trends
- Power to X – Hard to Decarbonize Sectors (Transportation, Industry)
- Showcasing Projects – From Site Selection to Operation to Evaluation
- PV Innovations
- DIY PV, Heating, Water Distilling, Solar Cooking
- Solar Fuels and Artificial PV
- Hydrogen, Fuel Cells
- Extended Applications of Thermal Heat
- District Heating & Cooling
- Concentrated Solar Power
- Hybrid Systems

Track 5: Educating & Engaging Stakeholders

- Energy and the Media
- Anticipating and Addressing Opposition to a Decarbonized Energy System
- Sustainability as a Dynamic Organizational Capability
- Youth Climate Justice and Solar-Citizen Movements
- IREC Career Map Tool
- Workforce Development, Mentoring, Curriculums
- Equity and Justice
- Justice, Equity, Diversity and Inclusion in the Energy Industry and Energy Education and Workforce
- Solar Valuation in Real Estate Transactions
- Clean Energy-Jobs Update

Don't see your topic here?

Email conference@ases.org to propose a different track/session!

Be a Sponsor

Sponsorship opportunities are now available for SOLAR 2023. Make your mark and get in front of your audience early and often. Contact parndt@ases.org to sponsor this event.

Contact Us

For other questions, contact conference@ases.org.

Follow ASES on Facebook, Instagram, LinkedIn and Twitter for more updates! And join the discussion on the ASES Online Community (<http://community.ases.org/>). ■



ASES MEMBERSHIP FORM



CHOOSE YOUR MEMBERSHIP:

Basic \$45 **Digital Basic \$29**
Includes Solar Today magazine, a 15% conference discount, access to ASES Online Community, Credit Unions, Webinars and Tiny Watts

Professional \$99 **Professional Senior (65+) \$50**
Includes all the benefits of a Basic Membership, a 25% conference discount, plus access to ASES Divisions

Professional Supporting \$135
Includes all the benefits of Professional Membership plus annual recognition in Solar Today magazine

Student \$35 **Student Digital \$22**
Includes the benefits of Professional Membership plus an additional conference discount

Library \$59
Includes Solar Today magazine (duplicate copies available upon request), access to ASES Online Community and Webinars

Business **1-2 employees \$195** **3-9 employees \$290**
 10+ employees \$375 **Non-Profit \$109**
Includes all the benefits of Professional Supporting Membership plus special online recognition

Life Membership \$1,500 **Senior Life Membership (65+) \$1,200**
Includes all the benefits of Professional Supporting Membership (for life)

Add Local Chapter to any membership \$30
Colorado, Northern California, Oregon, Florida, Kentucky, Maine, Mid-Atlantic, Minnesota, New Mexico, New York, Texas, Heartland, and Tennessee

Full Name _____ Company Name (optional) _____

Email Address _____ Phone Number (optional) _____

Mailing Address _____

→ Sign up for one of our membership options and select auto-renew for an extra **\$10 off!** Yes No

PAYMENT INFORMATION:

\$ _____
AMOUNT

\$ _____
DONATION

\$ _____
TOTAL

Check Enclosed Please make check out to "American Solar Energy Society"

Complete for ACH

Name on Account _____ Account No. _____ Routing No. _____

Account Type: Personal Business Checking Savings

Complete for Credit Card

Credit Card No. _____ Expiration Date _____ CVV Code _____

Billing Address _____

Name on Card _____ Signature _____

Please mail this form to: **American Solar Energy Society, 2525 Arapahoe Ave, Suite E4-253, Boulder, CO 80302.** Thank you for helping us grow our solar community. Memberships are tax-deductible (minus cost of *Solar Today* magazine in print: \$20/yr).

ASES Intern Spotlight

Vaishalee Dash is currently a Master's in Electrical Engineering student at Washington State University, Pullman, specializing in power systems. Her research work pertains to integration and impact of renewable energy on power-distribution grids. She completed projects exploring future control architectures for distribution-management systems and new technologies for active grid control. She holds an M.S. (Research) in electrical engineering from the Indian Institute of Technology Kharagpur after developing control strategies for hybrid renewable energy systems and has authored research papers, reports and proposals.

Prior to joining WSU, she was a senior research engineer at the Center for Study of Science, Technology and Policy, a leading think tank in India. She delivered projects on solar PV and battery storage sizing and techno-economic analysis for various applications, helping government, institutional and other stakeholders working on clean energy-transition pathways.

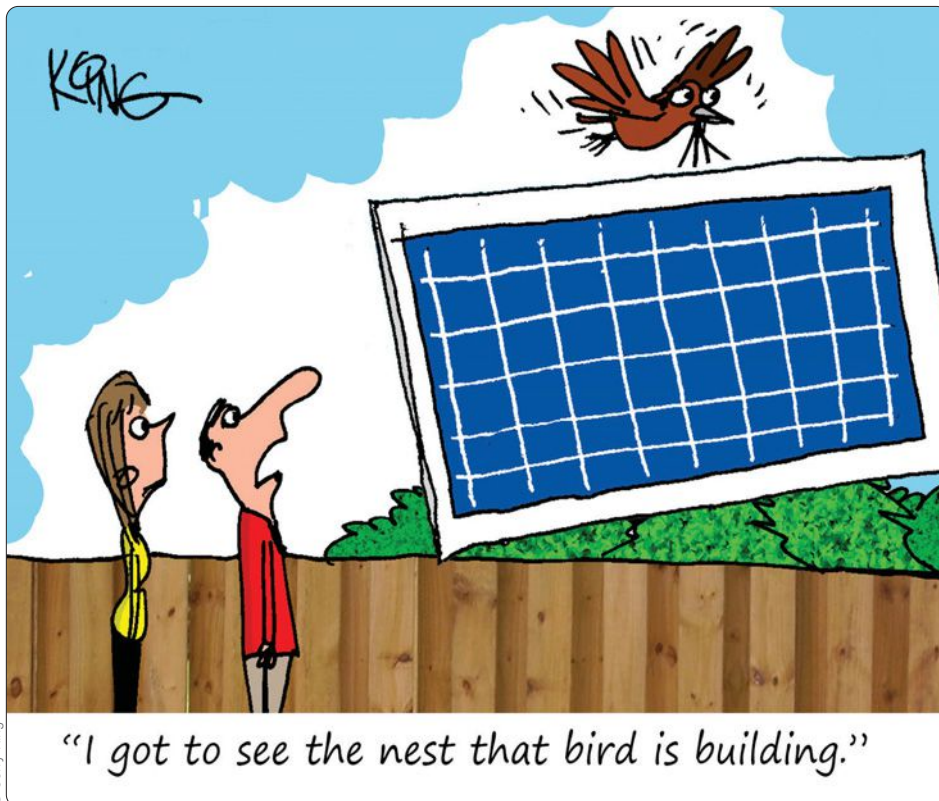



Visit smile.amazon.com

CHOOSE
American Solar Energy Society Inc.
AS YOUR CHARITY

Clarification

The article "Passive Solar Development in New Mexico: Celebrating the Pioneering Work of the 1970s and 80s" in our Spring 2022 issue omitted several earlier passive solar-development projects in Santa Fe, according to David Wright, a local architect. These included Peter Van Dresser's house off Canyon Road before 1970 and SUNSCOOP, David Wright's solar house on Camino Santander, which was designed and started in 1972.



Ad Index

US Solar Coalition5
Fluke15
Solar Informatics.21
Sandia National Laboratories39
Earth Coast.49
Solis.53
Amazon Smile.58
Block Energy60

Interested in placing an ad? Email Phil Arndt at parndt@ases.org to get started!

ARKANSAS

Arkansas Renewable Energy Assoc.
P: 501.225.8398
Contact: Frank Kelly
frank.kelly@arkansasrenewableenergy.org
arkansasrenewableenergyassoc.org

CALIFORNIA

NorCal Solar Energy Assoc.
P: 925.482.4176
Contact: Sean White
seanwhitesolar@gmail.com

ASES at University of California, Los Angeles†

Advisor: Richard E. Wirz, wirz@ucla.edu
Student Contact: Alexa Minervini
asesat UCLA@gmail.com

COLORADO

Western State University†
Contact: Matthew Harris
matthew.harris@western.edu
Faculty Advisor: Rich Stromberg
rstromberg@western.edu

CU Boulder Energy and Sustainability Society†
Student Contact: Sarah Gillerlain
sagi7053@colorado.edu
Faculty Advisor: Dale Miller
dale.miller@colorado.edu

CONNECTICUT
Northeast Sustainable Energy Assoc.**
P: 413.774.6051
Contact: Katie Schendel
kschendel@nesea.org, nesea.org

DELAWARE

Mid-Atlantic Solar Energy Society
P: 301.880.7045
Contact: John Essig
info@mases.com, mases.org

FLORIDA

Florida Renewable Energy Assoc.
P: 407.710.8705
Contact: Bill Young
byoung6360@gmail.com
cleanenergyflorida.org

Florida Atlantic University Solar Energy Society†
Student Contact: Ellie LoCascio
elocascio2019@fau.edu

GEORGIA
Georgia Solar Energy Assoc.
P: 404.522.4775
Contact: Jonelle Minefee
admin@gasolar.org, gasolar.org

ILLINOIS

Illinois Solar Education Assoc.
P: 312.376.8245
Contact: Lesley McCain
contactisea@illinoisolar.org
illinoisolar.org

Midwest Renewable Energy Assoc.
P: 715.592.6595
Contact: Nick Hylla
info@midwestrenew.org, midwestrenew.org

Illinois State University†
Contact: Matt Aldeman
maldema@ilstu.edu

IOWA

Midwest Renewable Energy Assoc.
P: 715.592.6595
Contact: Nick Hylla
info@midwestrenew.org
midwestrenew.org

KANSAS

Heartland Renewable Energy Society
P: 816.560.8321
Contact: Ken Riead
info@heartlandrenewable.org
heartlandrenewable.org

KENTUCKY

Kentucky Solar Energy Society
P: 502.271.7045
Contact: Chris Dolan
kysesinfo@gmail.com, KYSES.org

MAINE

Maine Solar Energy Assoc.
Contact: John Burke
dadsolar@yahoo.com, mainesolar.org

MARYLAND

Mid-Atlantic Solar Energy Society
Contact: John Essig
info@mases.com, mases.org

MASSACHUSETTS

Northeast Sustainable Energy Assoc.**
P: 413.774.6051
Contact: Katie Schendel
kschendel@nesea.org, nesea.org

Boston Area Solar Energy Assoc.**
Contact: Henry K. Vandermark
info@basea.org, basea.org

MICHIGAN

Great Lakes Renewable Energy Assoc.
P: 313.655.7945
Contact: John Freeman
JFreeman13@comcast.net, glrea.org

Midwest Renewable Energy Assoc.
P: 715.592.6595
Contact: Nick Hylla, midwestrenew.org

MINNESOTA

Minnesota Renewable Energy Society
P: 612.308.4757
Contact: Doug Shoemaker
hello@mnrenewables.org
mnrenewables.org

MISSISSIPPI

Mississippi Solar Energy Society
Contact: Caleb Dana, cdana@allenes.com

MISSOURI

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

MONTANA

Montana Renewable Energy Assoc.
P: 406.214.9405
Contact: Makenna Sellers
makenna@montanarenewables.org

NEW HAMPSHIRE

Northeast Sustainable Energy Assoc.**
P: 413.774.6051
Contact: Kaitie Schendel
nesea@nesea.org, nesea.org

NEW JERSEY

Northeast Sustainable Energy Assoc.**
P: 413.774.6051
Contact: Katie Schendel
kschendel@nesea.org, nesea.org

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

Mid-Atlantic Solar & Storage Industries Association**
P: 973.886.0526
Contact: Marianne Leone
coordinator@mssia.org, mssia.org

NEW MEXICO

New Mexico Solar Energy Assoc.*
P: 505.908.4234
President: Nicole Olonovich
nicolebeautyway@gmail.com, nmsolar.org

New Mexico Aggies Without Limits at New Mexico State University†
P: 575.646.3801
Contact: Hugo Alberto Sanchez Maqueda
smhugo@nmsu.edu

NEW YORK

New York Solar Energy Society
P: 917.974.4606
Contact: Wylidon Fishman
wylidon1@gmail.com, nyses.org

Northeast Sustainable Energy Assoc.**
P: 413.774.6051
Contact: Katie Schendel
kschendel@nesea.org, nesea.org

Alfred University†

Faculty Advisor: Xingwu Wang
fwangx@alfred.edu
Student Contact: Tessa Beaulieu
TGB3@alfred.edu

Solar and Sustainability Society at Syracuse University†
Student Contact: Mallory Stokker
mstokker@syr.edu

NORTH CAROLINA

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

Appalachian State University Sustainable Energy Society†

Sustainable Energy Society
P: 704.230.5783
Faculty Advisor: Brent Summerville
summervilleb@appstate.edu
Student Contact: Luis Aviles
ASUSES@gmail.com, asuses.appstate.edu

Barber-Scotia College†

Advisor: Dr. Gay Bullock
gbullock@b-sc.edu
Contact: Lee Barfield
lbarfield337@yahoo.com

OKLAHOMA

University of Oklahoma Sustainable Energy Society†
Sustainability Energy Society
Advisor: Mark Nanny, nanny@ou.edu
Contact: Anthony Garcia
Anthony.Gallegos.Garcia-1@ou.edu

OREGON

Solar Oregon
P: 918.853.2562
Contact: Zach Snyder
zachs@solaroregon.org, solaroregon.org

PENNSYLVANIA

Northeast Sustainable Energy Assoc.**
P: 413.774.6051
Contact: Katie Schendel
kschendel@nesea.org, nesea.org

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

Mid-Atlantic Solar & Storage Industries Association**
P: 973.886.0526
Contact: Marianne Leone
coordinator@mssia.org, mssia.org

Philadelphia Solar Energy Assoc.**
P: 215.285.2710
Contact: Liz Robinson
lizhrob2@gmail.com, phillysolar.org

Penn State Student Chapter of ASES†
Faculty Advisor: Julian Wang
asespennstate@gmail.com
Faculty Email: jqw5965@psu.edu

RHODE ISLAND

Brown University Renewable Energy and Sustainability Society (BURESS)†
President: Abayomi Lowe
Faculty Advisor: Jerome Robinson
jerome_robinson@brown.edu

Northeast Sustainable Energy Assoc.**
P: 413.774.6051
Contact: Katie Schendel
kschendel@nesea.org, nesea.org

TENNESSEE

Tennessee Solar Energy Assoc.
P: 615.837.1151
Contact: Jason Carney
info@tnsolarenergy.org, tnsolarenergy.org

TEXAS

Texas Solar Energy Society*
P: 210.722.7270
Contact: Pete Parsons
P.O. Box 1447, Austin, TX 78767
pparsons@txses.org, info@txses.org
txses.org

University of Texas at Austin†

Advisor: Matthew Hall
mjhall@mail.utexas.edu
Contact: Joshua Eudave
jeudave3@gmail.com

VERMONT

Northeast Sustainable Energy Assoc.**
P: 413.774.6051
Contact: Katie Schendel
kschendel@nesea.org, nesea.org

VIRGINIA

Mid-Atlantic Solar Energy Society
P: 301.880.7045
Contact: John Essig, info@mases.com
mases.org

WASHINGTON

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

WASHINGTON, D.C.

Mid-Atlantic Solar Energy Society
P: 301.880.7045
Contact: John Essig, info@mases.com
mases.org

WEST VIRGINIA

Mid-Atlantic Solar Energy Society
P: 301.880.7045
Contact: John Essig, info@mases.com
mases.org

WISCONSIN

Midwest Renewable Energy Assoc.**
P: 715.592.6595
Contact: Nick Hylla
info@midwestrenew.org
midwestrenew.org

*This chapter has sub-chapters.

**Associate Chapter

†Student Chapter

Thank You to Our ASES Business Members!

A&R Solar
AES Solar
AgSun Corp
Alternative Power Solutions
Amicus Solar Cooperative
Appalachia-Science in the Public Interest
Appalachian Renewable Power
ARC Design & Consulting
Array Technologies, Inc.
AviSun Renewable Energy
Bill Hagy Consulting
Boviet Solar
Build San Antonio Green
Building Performance Association
Cascade Solar USA
Clean Power Research, LLC
CleanTech Energy Solutions Inc
CleanView Capital, LLC
Coastal Solar Power Company

Creative Energies
Creative Solar USA, Inc.
Destiny Marketing Solutions
Discovery Wind and Solar Energy
Ecohouse Solar
Elite Solar Advisors
Emerald Sun Energy
Empire Clean Energy Supply
Energreen Construction Company, Inc.
Energy Audit
Enertopia Corp
EOS Research, Ltd.
Flint Hills Renewable Energy & Efficiency Cooperative
GenPro Energy Solutions, LLC
GenRenew, LLC
GOGO Charters Houston
Good Sun
Grid Solar Co
HD Energy Solutions LLC

Hearne & Son Electrical Plumbing & Heating Service
Houston Charter Bus Company
ICAST
Integrated Environmental Data, LLC
Katz Water Technologies
Kelelo Engineering
Kilo Hollow Energy Inc.
KiloNewton LLC
Lakeland Electric
Legacy Solar, LLC
Leighty Foundation
Linear City Concepts
Longhorn Charter Bus Houston
Maine Solar Solutions
Makers for Good
National Charter Bus Dallas
National Charter Bus Houston
Nelson Electric, Inc.
New Earth Solar, LLC

Number 1 Plumbing, A/C, Solar & Electric
O3 Energy
Olsson
PCL Construction
Perennial Environmental Services, LLC
Public Service Solar
Puget Sound Solar
Purpose Focused Alternative Learning
RENEW Wisconsin
Process Outsourcing Services Pvt Ltd
Shofur Denver
ShopSolarKits.com
Skaia Energy
Sky NRG Solar Inc.
Solahart Industries Pty Ltd
Solar Cookers International
Solar Energy International (SEI)
Solar FlexRack
Solar Illuminations

Solar Made
Solar Power Lifestyle
Solar Rising LLC
Solar Wave Energy, Inc.
Solarflux Energy Technologies, Inc.
SolarSesame
SOLART
SolShine Energy Alternatives
Sonora Environmental Research Institute, Inc.
Southern Alliance for Clean Energy
Sun Plans
Sunbility
Sundance Solar Systems
The Shift To Solar
Trinity River Community Solar Systems

Get to know BlockEnergy®



The **future** of
reliable, renewable,
and resilient energy.