

North American **CleanEnergy**

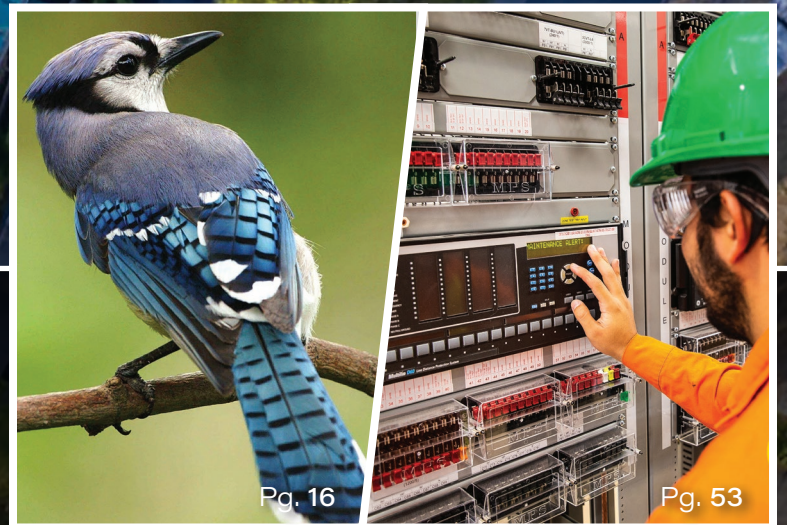
2020 **ENERGY EFFICIENCY** **BUYERS GUIDE** Pg. 55

Hidden Heat
The costly impact of
heat-related injuries Pg. 8

End of Life Options
Wind turbine blade recycling Pg. 38

**Safeguarding
Our Storage** Pg. 48

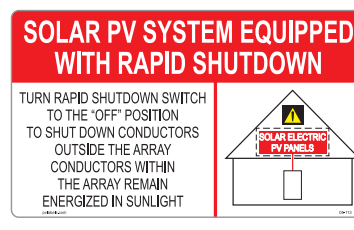
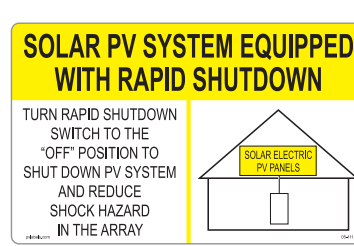
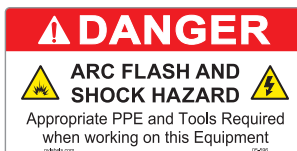
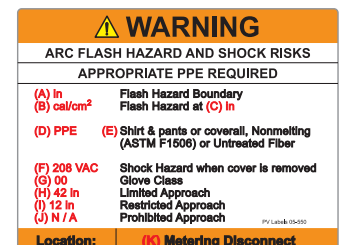
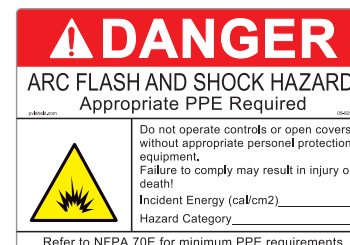
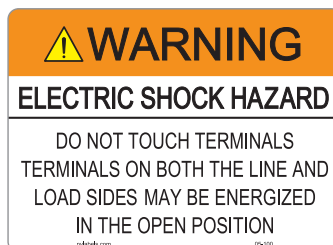
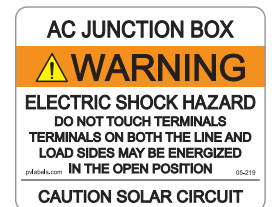
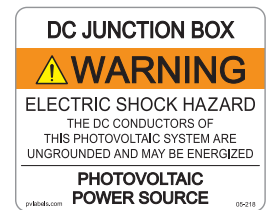
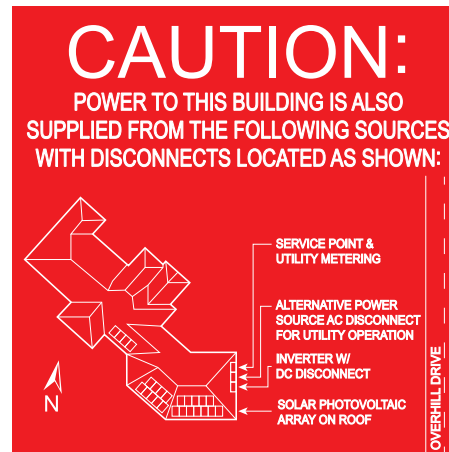
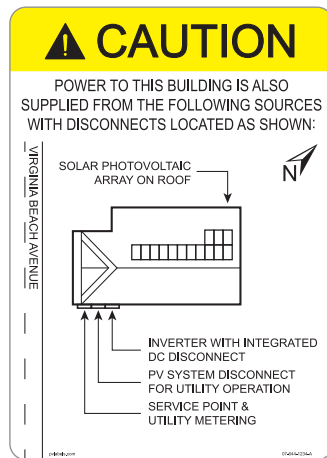
Bankrolling Change Pg. 65



PV LABELS

Solar Warning Labels, Placards, and Signs

- NEC 2011 PACKS
- NEC 2014 PACKS
- NEC 2017 PACKS
- RAPID SHUTDOWN
- IN STOCK - NOW
- Custom Items
- Plastic Placards
- Vinyl Labels
- Metal Signs
- Reflective
- UV Film Lamination
- Same Day Service
- Code Compliance
- Largest Selection
- MADE IN USA



ANSI Z535.4 Colors and Formats
- Available and in Stock

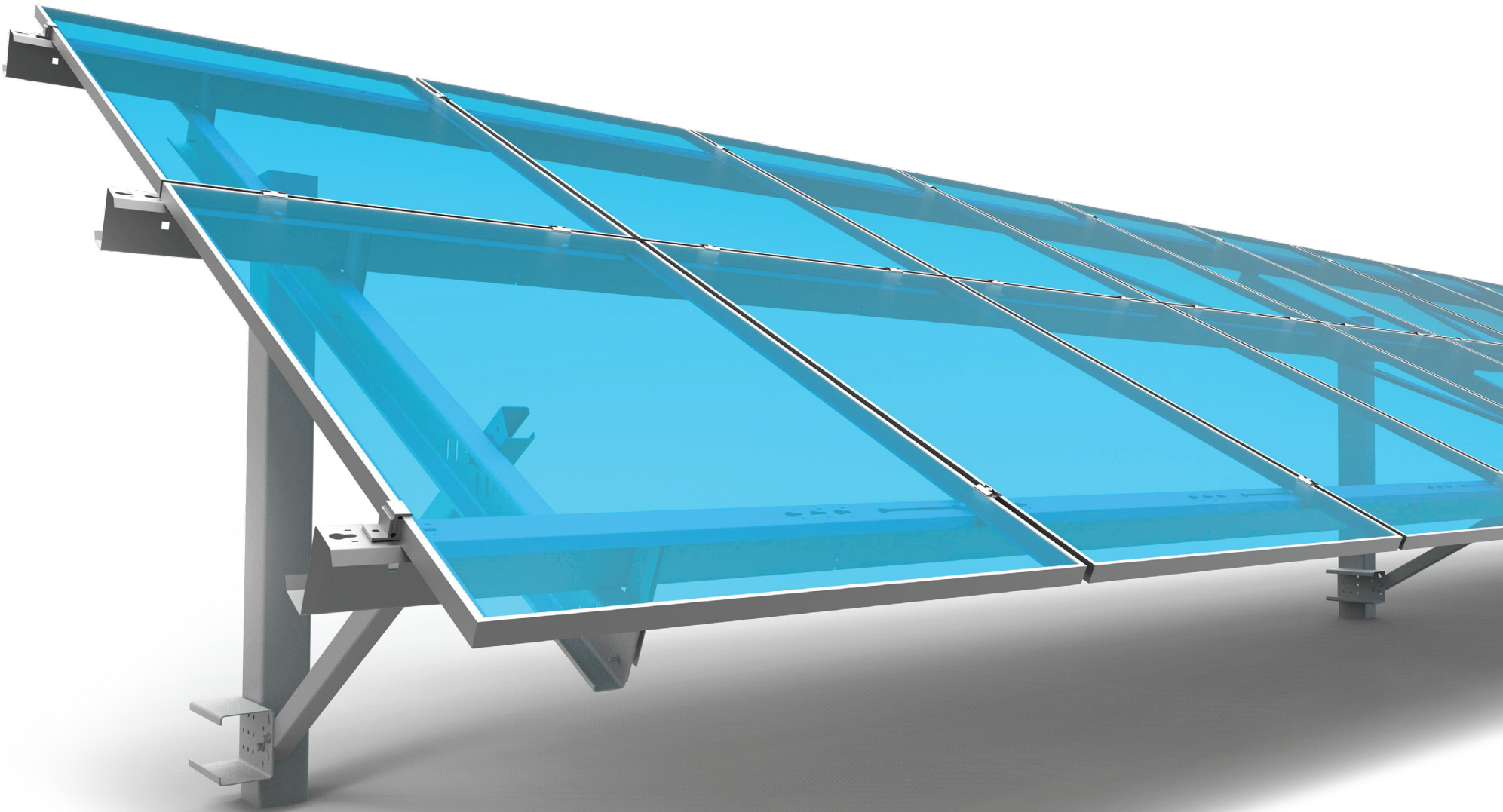
Also Available at:



***YES we can ship your Order Today!**



*Stock and Custom Orders will be shipped the same day if received and approved by 1:00 PM PST



TITAN

TITAN Racking Series

Designed by installers, for installers

- Standard with a C-pile or dual ground screw foundation
- Fastest module install with patent pending Gravity Clip
- Universal module compatibility with engineered purlin
- Lowest part count with unique asymmetrical design



On our cover...

Locally owned and operated in St. John, US Virgin Islands, Caribbean Solar Company is dedicated to providing clean, reliable solar energy for residential, commercial, and utility-scale installations. With a construction portfolio of more than 800KW of renewable energy, their innovative projects are designed to harness solar energy in the Caribbean.

Caribbean Solar Company

/// www.caribbeansolarcompany.com

departments

- 8 Top story
- 10 Solar energy
- 21 Solar & energy storage product spotlight: Inverters
- 31 Solar product spotlight: Rapid Shutdown Systems
- 32 Solar spotlight: Performance Monitoring
- 35 Solar spotlight: Performance Monitoring Software
- 36 Wind power
- 46 Wind product spotlight: Lubricants & Greases
- 47 Service spotlight: Drones
- 48 Energy storage
- 55 2020 Energy Efficiency Buyers Guide
- 65 Investing in clean energy
- 66 Events calendar & advertiser's list

20 Solar product: Antaira Technologies



33 Solar spotlight Performance Monitoring



41 How Tech is Driving Wind Success Post-Pandemic



47 Service spotlight Drones

54 Energy Storage product: OutBack Power Technologies, Inc.



64 2020 Energy Efficiency Buyers Guide

- | | | |
|---|---|--|
| 8 Hidden Heat
<i>The costly impact of heat-related injuries</i> | 31 Solar product spotlight:
<i>Rapid Shutdown Systems</i> | 46 Wind product spotlight
<i>Lubricants & Greases</i> |
| 10 How Silicon Carbide Enables Sustainable Solar | 32 Solar spotlight:
<i>Performance Monitoring</i> | 47 Service spotlight:
<i>Drones</i> |
| 12 Solar Project Bottlenecks Starting to Ease | 35 Solar spotlight:
<i>Performance Monitoring Software</i> | 48 Safeguarding Our Storage |
| 14 The Unknown Perils of Ballasted Solar Systems | 36 A Fresh Approach to Wind Training | 50 Everything You Need to Know About SGIP in 2020 |
| 16 How Does Solar Affect Birds?
<i>Deep learning system will monitor birds at solar facilities</i> | 38 End of Life Options
<i>Wind turbine blade recycling</i> | 52 How to Succeed in EPC Project Delivery |
| 21 Solar & energy storage product spotlight:
<i>Inverters</i> | 40 How Tech is Driving Wind Success Post-Pandemic | 55 2020 Energy Efficiency Buyers Guide |
| | 42 Is U.S. Offshore Wind Ready to Take Europe's Lead? | 65 Bankrolling Change |

JULY•AUGUST 2020
Volume 14, Issue 4

PUBLISHER

Ian Stuart
istuart@nacleanenergy.com

ASSOCIATE PUBLISHER

Quinn Stuart
quinn@nacleanenergy.com

EDITORS

Jill Walters
editor@nacleanenergy.com
Meg Lugaric
meg@nacleanenergy.com

ART DIRECTOR

Chris Van Boeyen
production@nacleanenergy.com

SALES

Ian Stuart
istuart@nacleanenergy.com
Quinn Stuart
quinn@nacleanenergy.com
Don McIntosh
dmcintosh@nacleanenergy.com
Keaton Spence
keaton@nacleanenergy.com

CIRCULATION MANAGER

James Vail
circulation@nacleanenergy.com

ACCOUNTING

Alison Bell
abell@nacleanenergy.com

255 NEWPORT DRIVE, SUITE 336
Port Moody, B.C. V3H 5H1
Phone: (604) 461-6223

North American Clean Energy (USPS 1370) is publishing bi-monthly and distributed free by Action Media Ltd. Periodicals postage paid at Henry, IL. POSTMASTER: Send address changes to North American Clean Energy at 515 University Ave. Suite 1, Henry, IL 61537. Subscription updates can be made at circulation@nacleanenergy.com.

North American Clean Energy accepts no responsibility or liability for reported claims made by manufacturers and/or distributors of products of services; the views and opinions expressed are those of the authors and not necessarily those of North American Clean Energy. No portion of this publication may be reproduced without the permission of the publishers.

Editorial, Advertising, Production, and Circulation are at 255 Newport Drive, Suite 336, Port Moody, B.C. V3H 5H1 (604) 461-6223. Subscriptions: \$89 per year outside North America. Email: circulation@nacleanenergy.com

SIGN UP FOR YOUR FREE SUBSCRIPTION

Visit our website for new subscriptions, renewals, or change of address.

NACLEANENERGY.COM

Information will remain strictly confidential.



Printed on paper with 90% recycled fiber.

NEW! QB2



Patent # 8448407

ERROR-PROOF COMPRESSION

The QB2 doesn't leave any room for user error when it comes to Microflashing® compression. Once the Dual Drive Shoulder Screw is secured, the Microflashing® is compressed!

ONLY 3 COMPONENTS

The QB2 is comprised of Microflashing®, an L-Foot, and a Dual Drive Shoulder Screw. No more Nuts needed to tighten and secure the L-Foot! Not only does this simplify the installation process, it also cuts down the installation time!

DUAL DRIVE

The new Dual Drive Shoulder Screw design can be driven using a standard ½" Hex Nut Setter or a 6mm Hex Driver. Installers can use the drive that works best with the rest of the components of their array.

**THE FASTEST,
SIMPLEST,
MOST EFFICIENT
QUICKBOLT DESIGN
YET!**



QUICKBOLT.COM
(844) 671-6045 • MON-FRI: 7AM-5PM PST

TO WHOMEVER RANG IN 2020

wishing for a year full of new and exciting changes: You may want to consider quarantining yourself over to Greenland until that big target on your back fades – possibly by next January. Yup, it's been a weird year so far. You may have seen social media memes abounding with outrageous scenarios for the next big surprise coming our way, everything from flying ants that breathe fire to black holes appearing on the shoreline. We all have been forced to cope with myriad changes thrown at us, sometimes daily, depending on the latest news/studies/developments. Yet for many people, change can be anathema. Take my son, for example - trying to get him to break his routine can be as much fun as bathing a cat. And, in light of the extended lockdowns, I would wager a good number of you working from home might not freely admit to "forgetting" to change your clothes every day.

While the pain of 9/11 is still relatively fresh in my mind, it's startling to meet adults today with no memory of that recent national horror. They have little awareness of how drastically that single event forever changed our lives. One particular account from a survivor illustrates the life-saving potential of embracing the discomfort of change. In his book, *The Examined Life: How We Lose and Find Ourselves*, psychoanalyst Stephen Grosz tells the story of Marissa Panigrosso, who worked on the 98th floor of the South Tower of the World Trade Center. She recalled that, when the first plane hit the North Tower on September 11, 2001, a wave of hot air came through her glass windows as intense as opening a pizza oven.

She did not hesitate. She didn't even pick up her purse, make a phone call or turn off her computer. She walked quickly to the nearest emergency exit, pushed through the door, and began the ninety-eight-stairway decent to the ground. What she found curious is that far more people chose to stay right where they were. They made outside calls, and an entire group of colleagues went into their previously scheduled meeting. Why would they choose to stay in such a vulnerable place in such an extreme circumstance? Because they were human beings, and human beings find change to be extremely difficult, practically impossible. To leave without being instructed to leave was a risk. What were the chances of another plane hitting their tower, really? And if they did leave, wouldn't their colleagues think that they were over-reacting, running in fear? They should stay calm and wait for help, maintain an even keel. And that's

what they did. I probably would have too.

Grosz suggests that the reason every single person in the South Tower didn't immediately leave the building is that they did not have a familiar story in their minds to guide them. We want to know what new story we're stepping into before we exit the old one. We don't want an exit if we don't know exactly where it is going to take us, even (or perhaps especially) in an emergency. Even among those people who chose to leave, there were some who went back to the floor to retrieve personal belongings they couldn't bear to part with. One woman was walking down alongside Marissa Panigrosso when she stopped herself and went back upstairs to get the baby pictures of her children left on her desk. To lose them was too much for her to accept. Her decision was fatal.

Our impulse is to stay safe by doing what we've always done. To change our course of action seems far riskier than to keep going. To change anything about our lives, even our choice of toothpaste, can cause great anxiety.¹

When it comes to clean energy, we're doing a pretty good job adapting and embracing the latest ideas and technologies. But, as with most things in our lives, we know there is room for improvement. Getting people to change their behavior is no easy task. You'll read a lot of numbers in this issue that attest to some of the changes our industry has accomplished so far, as well as our hopes and expectations that we can, in fact, encourage enough change worldwide to make the planet cleaner and safer for all.



"It is not the strongest of the species that survive, nor the most intelligent, but the one most responsive to change"
- Charles Darwin (1809 - 1882)

Meg

¹ <https://www.mybodytutor.com>



Green building for environmental stewardship

Terra View Homes have been named the recipient of the 2020 ENERGY STAR Canada Builder of the Year Award, in the small builder category, for new home construction. For almost two decades, Terra View Homes has been pioneering green home building practices in Canada. The green builder incorporates the key elements of ENERGY STAR technical specifications including ultra efficient heating systems, triple pane glass windows and doors, dual flush toilets and water saver taps, state-of-the-art mechanicals and superior insulation systems, low VOC wall paints and finishes, rough-in for future electric car chargers, and solar PV readiness with the option for future installation of a full solar photovoltaic system. All homes are built to a Net Zero standard and are crafted to exact industry environmental specifications to drastically reduce energy consumption.

Terra View Homes
/// www.terra-view.com



Contributing to a greener future

EVBox has been able to help replant trees all around the globe while looking to establish a more sustainable future by promoting eMobility. To celebrate their 2019 milestone of installing over 100,000 charging points across the world, they pledged to give back to the planet by planting one tree for every new EVBox charging point placed with their OneChargerOneTree initiative. To turn this promise into a reality, they teamed up with global reforestation charity, OneTreePlanted. Over the remainder of 2019, they planted over 6000 trees to help clean the air and absorb harmful carbon from the atmosphere. To account for the chargers they placed in 2018, they also planted 15,000 trees across California and Portugal, and even sent some passionate EVBoxers to Portugal to help reach this target.

EVBox /// www.evbox.com

SIBA

SIBA Fuses LLC
(973) 575-7422
info@sibafuse.com
www.siballc.net

SIBA Fuses ESS fuses are specifically designed and tested for the stringent requirements of (ESS) Energy Storage System applications and are utilized by large OEM's globally. When you need true solutions, SIBA Fuses is the one stop you need to make for your Energy Storage protection requirements.

Soltec's SF7 bifacial trackers obtain an additional bifacial gain of up to 2.1% thanks to their single-axis configuration



Coinciding with the 2nd anniversary of Soltec's bifacial research center (BiTEC), SF7 bifacial trackers show outstanding results: **15.7% more power generation than others.**

Bifacial technology, increasingly more used and valued by photovoltaic solar plants, has proven to significantly favor investment return for any project, regardless of its size. Soltec has actively developed bifacial technology since 2015, year when this leading solar tracker supplier manufactured its first solar tracker specifically designed for bifacial panels in a new power plant: The European Southern Observatory La Silla, in Chile. This 1.72-MWp experimental photovoltaic plant set the stage for the bifacial tracking technology, turning 'La Silla' into a unique project that allowed Soltec to further research bifacial tracking.

The company's current track record exceeds 10 GW, of which over 3 GW were generated using bifacial trackers, a technology with an increasing market presence. "Last year, bifacial technology became increasingly popular in large-scale photovoltaic projects. Nowadays, eight out of ten quotation requests are bifacial-related, thus reassuring Soltec's decision to further innovate and research in bifacial technology", says Eduardo de San Nicolás, Strategy Manager at Soltec.

Second year of bifacial research at BiTEC

With the aim to further develop bifacial trackers, Soltec inaugurated in 2018 the first Bifacial Tracking Evaluation Center in the world: BiTEC. This center, located in Livermore, California (USA) two years ago, focuses mainly on assessing how bifacial tracker performance is conditioned by installation parameters such as frame height, shading and albedo. Bifacial results are then compared to the parameters of fixed, monofacial structures.

Over the last two years, Soltec's testing confirmed that bifacial modules installed on SF7 Bifacial trackers yield up to 15.7% more Bifacial Gain under high albedo conditions (55.6%). Under values of medium albedo (29.5%) and low or seasonal albedo (19.9%), there is also a gain of 9.6% and 7.3%, respectively.

BiTEC also strives to study Bifacial Gain in photovoltaic modules installed according to the two most common solar tracker market configurations nowadays:

- ▶ 1-in-vertical: 1P
- ▶ 2-in-vertical: 2P

All analyses carried out at BiTEC over the last two years confirm that SF7 Bifacial Trackers in 2-in-vertical configuration obtain 2.1% more Bifacial Gain than trackers in 1P configuration. This data, gathered through com-

prehensive analysis and monitoring of bifacial trackers installed at BiTEC under all seasonal conditions, allowed Soltec to determine solar tracker performance for multiple atmospheric and terrain characteristics.

The University of Singapore confirms best lcoe in 1p

Researchers at Singapore's Solar Energy Research Institute recently concluded that large-scale photovoltaic projects equipped with single-axis bifacial trackers have an improved Levelized Cost Of Energy (LCOE) anywhere in the world. Through extensive research carried out by a group of university doctors (Carlos D. Rodríguez-Gallegos, Haohui Liu, Oktoviano Gandhi, Li Li, Thomas Reindl and Ian Marius Peters), it was determined that the combination of bifacial products with double-axis bifacial trackers remains too expensive, despite their higher yield. That means plants equipped with single-axis solar trackers are still the best in terms of LCOE optimization.

One of the theories always advocated by Soltec is that single-axis solar trackers are more profitable for plants, regardless of their characteristics. SF7 trackers and SF7 Bifacial trackers are both single-axis, thus favoring quicker installation on uneven terrains and under adverse weather conditions.

"All combinations of bifacial tracking systems improve performance under a 1P configuration, with improvements of over 50% in very high latitudes", concludes the study by the University of Singapore. "For an identical mounting structure, bifacial configuration is better than monofacial configuration. Tracking configurations perform significantly better than fixed structures. As for double-axis tracking installations, their performance is marginally higher than that of single-axis tracking installations", according to the study.

Soltec's single-axis SF7 and SF7 Bifacial trackers, models known for their high performance and terrain adaptability, have been sold all over the world. This Spanish company is currently developing bifacial projects accounting for 200 MW in the United States and 500 MW in Brazil.

Thanks to its state-of-the-art technology and qualified team of experts in key engineering areas, Soltec further consolidates its position in the photovoltaic solar energy market by seeking improved designs and enhanced product performance. The adaptability of SF7 Bifacial trackers to specific project needs is paramount to ensuring process excellence and customer satisfaction.

Hidden Heat

The costly impact of heat-related injuries

by Heidi E. Lehmann

HEAT-RELATED INJURIES ARE BOTH

underreported and totally preventable – a perfect storm in today’s intense workplace. Environmental factors, exertion levels, and poor acclimatization can exacerbate heat-related injuries, resulting in an invisible threat to both safety and productivity. Still, safety managers in the clean energy sector are not alone in the quest to reduce injury while improving production – new technological trends in heat safety provide continuous and private monitoring of individual workers, and can significantly mitigate heat risks while saving companies money. Although heat stress is a stealthy, unseen enemy with deadly potential, monitoring core body temperature to prevent heat injuries and illnesses can increase production, reduce costs, and save lives.

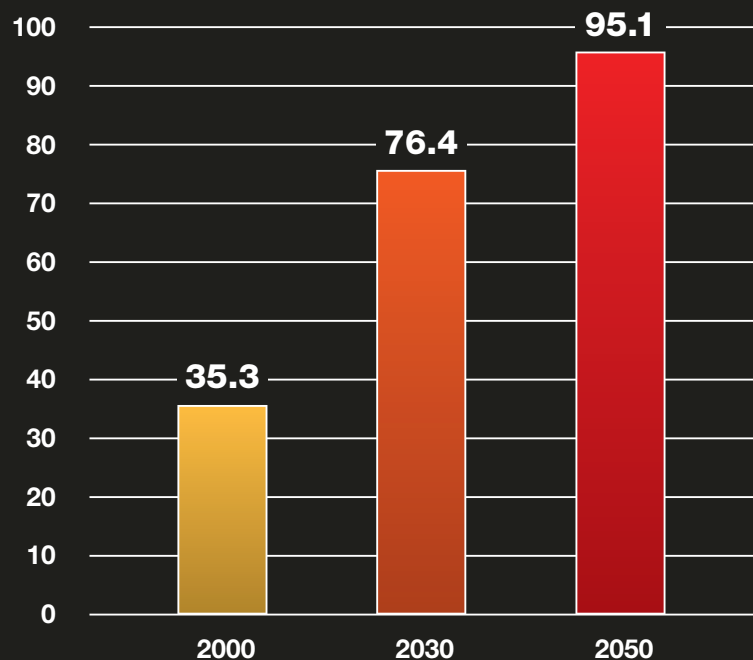
Heat-related injuries are increasing in the workplace, with both immediate impacts and invisible, long-term effects. There are hundreds of millions of at-risk workers across the globe. In the U.S. alone, between 1992 and 2016, heat stress killed 783 workers and critically injured 69,374 more. These stress injuries are on the rise, with the number of worker days spent in dangerous heat conditions estimated to almost triple by 2050, for construction workers alone.

For those working in the clean energy sector, heat stress is a particular concern. Turbine workers and solar panel installers experience high levels of sun exposure, which can result in heat-related illnesses. According to the CDC, the onset of heat stroke can increase a worker’s body temperature to 106 degrees Fahrenheit within just 10-15 minutes. In fact, the U.S. military recently identified heat exposure as a significant and growing threat – with an increase of almost 60 percent in exertional heat stroke and heat exhaustion cases since 2008. High heat can also increase the risk of occupational injuries by as much as nine percent, as shown by a recent ISGlobal study published in Environmental Health Perspectives. It’s clear that lives are at stake, both from immediate impacts such as loss of cognition, dexterity, and endurance, and long-term impacts such as chronic kidney disease and organ damage.

Workplace environment, exertion levels, and poor acclimatization can exacerbate heat-related injuries in all industries, resulting in an unseen threat to both safety and productivity. Many factors influence heat stress: type of work, environment, PPE, hydration, age, biological sex, and increasing weather extremes. In fact, 17 of the 18 hottest years on record have taken place since 2001, and an average of 2.2 million workers labor in extreme heat during the summer’s peak. And the National Weather Service reports that heat was by far the leading cause of weather fatalities over the past 30 years. Heat stress affects all workers, in particular those working in clean energy industries such as wind turbines and solar panel installation. Once heat injuries are detected by the naked eye, it’s already too late. Since most workers don’t want to raise any flags about their own health, they often wait to take a break – at that point, typical on-site treatments such as rehydrating and escaping the sun aren’t enough. And if a worker is on a roof or turbine, it will take time to reach safety. Often, by the time a worker takes him or herself out of the heat, the damage is done.

In addition to worker health and safety, productivity and operating costs are severely affected by heat-related injuries. Employers in the U.S. spend \$220 billion annually on injury and illness related to excessive heat, and another \$67 billion in Smart PPE and protective equipment. Only three states – California, Minnesota, and Washington – currently have OSHA heat standards in place. Surprisingly, these aren’t even the hottest states in the U.S. With the majority of states lacking OSHA heat stress standards, workers are laboring in sub-optimal conditions, with little protection or training. This exposure results in more injuries and hospitalizations, fewer worker days, and increased Worker Compensation costs. In fact, research shows that for every 10-degree Fahrenheit increase in temperature, there is a 393 percent increase in hospitalizations for heat exposure. One study calculated the healthcare costs of a single California heat

In the construction industry alone:



Total number of worker days in dangerous heat, construction workers, 133 U.S. cities (in millions of worker-days).



important that worker's heat risk be minimized with these new and innovative continuous physiological monitoring devices. And while heat stress is a stealthy and unseen enemy with deadly potential, monitoring and preventing heat related injuries and illnesses in the clean energy sector can increase production, reduce costs, and save lives.



Heidi E. Lehmann is Chief Commercial Officer at Kenzen, a smart PPE innovator focused on physiological monitoring and the prevention of heat injury and death among workers.

Kenzen /// www.kenzen.com

event at \$179 million. Moreover, these impacts are fully preventable, since the risk of heat injuries and illnesses can be easily monitored by measuring each individual's physiological responses.

New technological trends in heat safety that provide continuous, private monitoring of individual workers, can mitigate heat-related health risks and save companies money. The advent of technology that monitors key physiological indicators means that there is hope for new ways to prevent and predict individual worker heat stress in the clean energy sector. Before this type of Smart PPE, companies simply looked at accidents after the fact, with little ability to predict elevated risk for individual workers. Now, new technology enables safety managers to both predict and prevent near-misses. Devices are often smaller than a cell phone and easy to wear, with no discomfort to the user. Users can review individual worker-athlete leading indicators such as heart rate, core body temperature, and sweat loss. And dashboards for each worksite team keep management informed, while maintaining individual worker privacy.

Because individual monitoring is private (with data de-identified at the management level) workers have their own window into their personal health indicators, and can pull themselves away from heat risk as needed. This is especially important for those working in difficult-to-reach locations like turbines and rooftops. Better than temperature guns, which create an immediate lack of privacy when admitting workers to the site, continuous monitoring is covert and reduces worker check-in time. If an indicator warrants intervention, management can simply speak with the worker without alerting others to the concern. Additionally, rather than reviewing a heat stress injury after it occurs, continuous monitoring allows users to predict and prevent the incident – keeping workers safer and more fit for duty, while increasing output and lowering health care expenses.

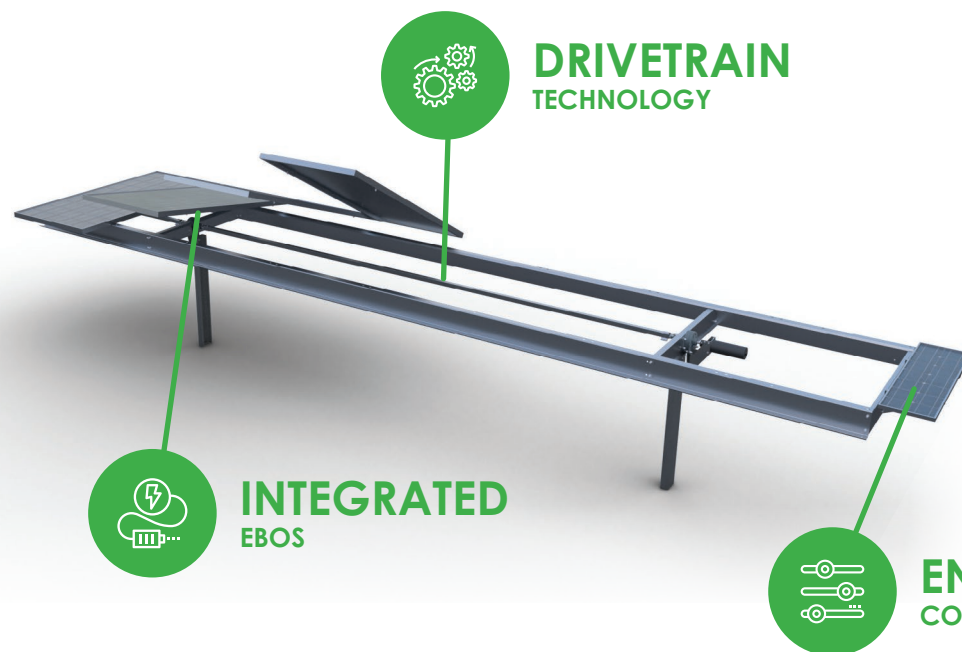
Reduced worker safety, lower productivity, and unnecessary costs are all easily preventable with improved individual monitoring of core body temperature. As increasing temperatures continue across the globe, it's even more



Inspired by nature

Sunflower® II

by RBI Solar



DRIVETRAIN TECHNOLOGY



CERTIFIED INSTALLATION



INTEGRATED EBOS



ENHANCED COMMUNICATIONS & CONTROLS

The breakthrough design of RBI's Sunflower® single-axis tracker has been equipped with enhanced capabilities, making it the most complete single-axis tracker system in the marketplace.

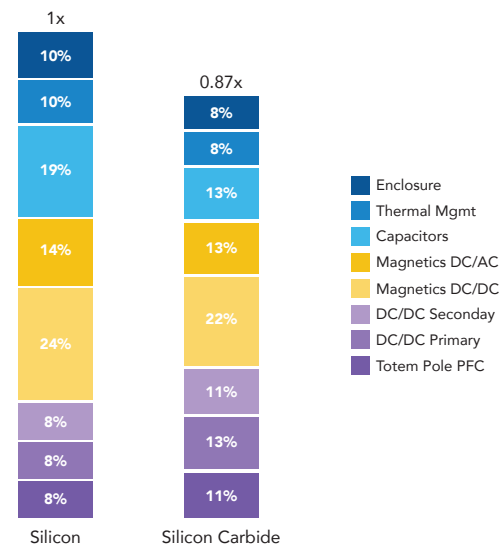
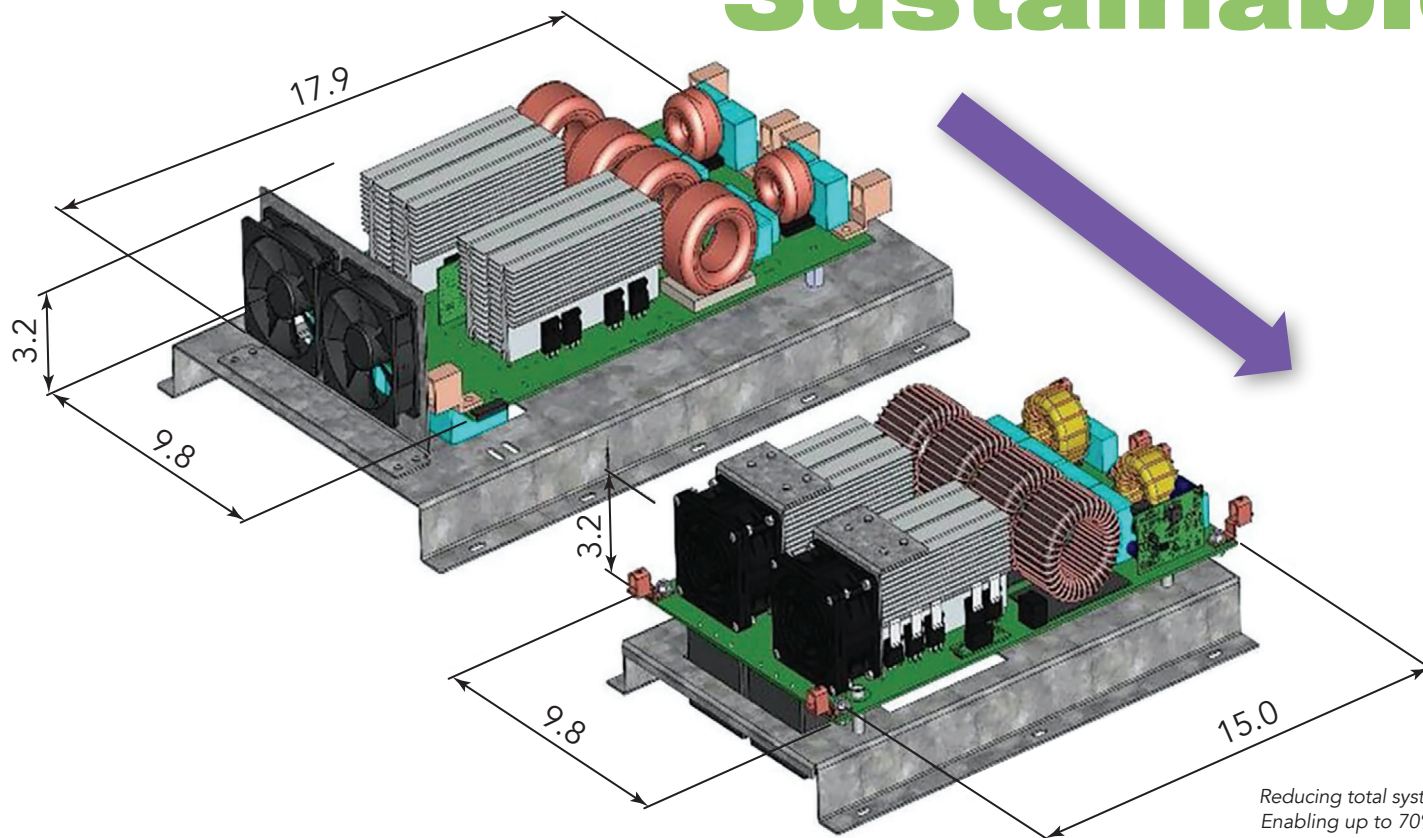


DESIGN | ENGINEERING | MANUFACTURING | INSTALLATION

rbisolar.com

How Silicon Carbide Enables Sustainable Solar

by John Palmour



Reducing total system cost in a 6.6kW bi-directional on-board charger design. Enabling up to 70% higher power density compared to silicon.

Solar power generation has experienced rapid growth over the past several years. Net solar power generation reached its highest levels in the U.S. - 66.6 gigawatt-hours in 2018, compared to just two gigawatt-hours in 2011. During this period of growth, a robust alternative has emerged that challenges the more traditional semiconductor material of silicon: silicon carbide. Silicon carbide significantly increases the sustainability of renewable energy, resulting in lighter, smaller, and more efficient solar inverters.

The Smarter Way to Manage Solar Projects.
atlas@ftcsolar.com

ATLAS Schedule a Demo Today
atlas.ftcsolar.com

As the demand for technology supports the increased use of sustainable resources, we need to be sustainable in the way we transmit and transform that power. Silicon carbide power components are well positioned to increase the sustainability of renewable power, as well as the technology that makes it possible.

Benefits of Silicon Carbide

The power semiconductor space is in the midst of a major transition, as it moves from silicon-based technologies to silicon carbide. This yields major benefits for a number of industries. From a scientific perspective, silicon and carbon create very strong covalent bonds, and this bond strength is key in allowing much higher breakdown to the electric field and higher thermal conductivity.

Silicon is the most common semiconductor used today. Silicon carbide, on the other hand, is considered a wide bandgap semiconductor. This distinction allows devices using silicon carbide to operate at much higher voltages, power densities, and temperatures, making silicon carbide ideal for the increased performance demands of next-generation applications. Silicon carbide also offers significantly lower switching losses than silicon, leading to much higher efficiency.

The proven performance of silicon carbide is powering new sectors and reviving established ones. For example, when looking at the impact on electric vehicles, using silicon carbide can increase the range of that vehicle by 5-10 percent, or enable manufacturers to use 5-10 percent fewer batteries for the same range. These numbers are significant to say the least. In industrial applications, silicon carbide power devices can increase efficiency, shrink system size, and reduce heat dissipation, helping businesses make the most out of every kilowatt hour of electricity and every square meter of floor space.



Implications for Sustainable Solar Power Design

A solar panel's semiconductors absorb sunlight and convert it to electricity; however, they are not particularly efficient in doing so. That makes every watt generated precious. In the process of converting that power into a usable form from the solar panel to the grid or load, you want to keep every bit of energy. Fortunately, the same benefits of silicon carbide highlighted above also apply to solar power systems, with the potential to enable 98 percent efficiency of that power to be converted - even with varying temperature, humidity, harsh, or remote environments.

The technology also positively impacts the sustainability of solar power generation design, specifically that of highly efficient solar inverters for residential use. These inverters can operate at much higher frequencies, resulting in a dramatic shrink in the size and cost of the magnetics required, along with an overall decrease in system cost. For example, using silicon carbide power components instead of silicon for solar inverters can save 10 megawatts for each gigawatt and 500 watts/sec in operations - significant energy savings.

Taking it a step further, 650V silicon carbide Metal Oxide Semiconductor Field Effect Transistors (MOSFETs) - which are commonly used for power conversion in electronic systems - can increase the efficiency of solar power systems. When compared to silicon, for instance, 650V silicon carbide MOSFETs require fewer components, have a smaller footprint, and a lighter weight. They lower switching losses by up to 75 percent, enabling higher efficiencies at higher frequencies, while allowing up to 70 percent greater power density and vastly improved thermal performance. Again, all at a lower system cost. 650V MOSFETs are also targeted to make highly compact and efficient switch-mode power supplies for servers, which will reduce the large amount of energy wasted in large data farms.

The benefits of silicon carbide can be used strategically for everything from utility-scale solar farms to solar panel chargers for electric vehicles in the home. Compared to silicon alternatives, silicon carbide enables smaller, faster, lighter, and more efficient systems across all applications. The technology has a positive impact on the sustainability of solar power generation design, paving the way for the next generation of renewable energy systems, and creating the road to a greener, more secure energy future.



John Palmour is CTO at Cree, a semiconductor company focused on silicon carbide and GaN technologies.

Cree /// www.cree.com

THINK RUGGED EXCEPTIONAL DEPENDABLE



Our distinctive red cases are well-recognized around the world and represent our longstanding commitment to deliver products with exceptional quality, reliability and support. Flooded models include Advanced NAM carbon additive for quicker, more efficient charging; improving performance and cycle life in traditional off-grid applications. Just one more reason to choose Roll's batteries.



Roll's
BATTERY ENGINEERING

THE LONGEST LASTING BATTERY
FOR YOUR OFF-GRID HOME.

ROLLSBATTERY.COM



Solar Project Bottlenecks Starting to Ease

by Adam Krop

IN THE MIDST OF WIDESPREAD UNCERTAINTY

across the globe from COVID-19, the solar supply chain is finding its way. During the shelter-in-place period, we struggled to set up our homes as an office space, virtual classroom, and perhaps an in-house gym. We held numerous conference calls with solar stakeholders sitting adjacent to middle schoolers in algebra class. Not necessarily ideal for productivity, but we were all in the same boat as we adapted to the temporary reality. Solar project developers faced some short-term bottlenecks, but are learning from their experiences.

Teams that have remained actively engaged throughout this period have done so, in part, by the inclusion of solar in the federal definition of a critical infrastructure business. Typically, long lead times are a curse for large-scale project development, creating some uncertainty in budgeting and forecasting. During this pandemic, however, this is a silver lining. Project developers are familiar with lumpy revenue projections, prudently building in buffers to forecasts to account for potential delays. Early stage project pipelines were most at risk for delays, due to the in-person nature of early stage development. However, projects farther along continued to check boxes through the development cycle. As sheltering restrictions ease, the industry is seeing several steps in the development process return to a healthy pace.

On the interconnection front, activity remained fairly consistent over the past three months. Utilities were deemed essential both on the federal level and in numerous states. Developers in New York received notices that some interconnection payments could be deferred by weeks to account for delays in moving to remote office operations. After a

brief slowdown in communications, the normal response rates resumed for projects that were already in queue. In general, utility contacts adapted well to the new working environment and were proactive in mitigating potential bottlenecks. For example, utilities began to offer virtual solutions, such as virtual site visits to keep projects moving through the queue. Today, interconnection deposits for late stage projects have resumed, allowing early stage due diligence (such as capacity screens) to continue at prospective sites.

Utilities and Financing remained active throughout, while Permitting most impacted by sheltering mandates.

Permitting offices experienced the same brief slowdown that many dealt with at the early stages of the pandemic. Slow responses and aversion to change stalled an efficient pivot to working from the home office. As a result, the shelter-in-place mandates had a greater long-term impact on permitting entities or Authorities Having Jurisdiction (AHJs), especially in areas that saw a higher rate of infection. Permitting was the main bottleneck throughout the three-month period, as public hearings were on hold. Eventually, some AHJs adopted technologies that aided working from home, helping to slowly regain contact with administrators in this process. Some AHJs in New York and Maine have recently re-opened, allowing developers to schedule

American Earth Anchors
The best screw you will have in the dirt™
46" Penetrator™
 Field-tested to 9,000 lbs downward pressure

REPLACES CONCRETE FOOTINGS

- No digging
- No pouring
- No forms
- No waiting

EASY LEVELING Screw down, screw up

2" Schedule 40 pipe fits over
 Custom brackets for any pipe size

americanearthanchors.com
 corinne@americanea.com 1-508-520-8511





Adam Krop is in Corporate Finance and M&A at ReneSola Power, which provides solar power project development, construction management, and project financing services worldwide.

ReneSola /// www.renesolapower.com



Solar's Best Kept Secret

Ten years ago our founders set out to create the world's most technologically advanced microinverter system... made right here in the USA. Mission Accomplished.

MAXIMIZE SYSTEM PRODUCTION
LOWER INSTALLER OPERATIONAL COST
PROMOTE END USER SATISFACTION



Single and Duo Microinverter

- CP720 supports two modules (60, 72 or 96 cell) at 240 or 208V - Up to 430W each.
- 7 kW system possible on one branch circuit - no subpanel required!
- Built-in protection circuitry mitigates grid instabilities
- Field or web adjustable firmware supports Rule21 or IEEE 1547-2018 requirements

Modular Trunk Cable

- Pre-terminated standardized lengths simplify installation
- TC-ER cable with 10 AWG wire supports 30A branch circuits

Versatile Gateway

- Auto detection of up to 255 attached micros
- Easily integrates into AC coupled battery or generator augmented systems
- Robust PLC: >500' connectivity
- Allows for production/consumption monitoring and zero net export

projects into monthly public hearings. The COVID 19 situation has provided learning opportunities that support the standardization and virtualization of the permitting process at AHJs, which could ultimately help lower soft costs.

The financing machinery for NTP projects offered a somewhat mixed outlook. Sales of portfolios have been completed, and development assets will come to market within the next 12 months. Potential equity owners of development assets are still looking to deploy capital into quality projects. Among tax equity investors, there remain a few holdouts pumping the brakes, presumably due to projections of lower income and lower appetite for tax credits. Projects needing leverage are being shelved until pricing settles in the market.

Like many industries, solar project development was not immune to the first wave of COVID-19 in the U.S. The brief setback in solar growth has provided time to develop more innovation in permitting and interconnection, allowing policy makers to take a long look at renewable incentives that would clearly benefit an economic recovery. Minor delays in new project development were largely due to the in-person nature of negotiations with landowners and permitting offices. However, projects with site control and preliminary interconnection and permitting work already underway have progressed through the pipeline with minimal delays. Thankfully, as many AHJs re-open for business, permitting activity is beginning to approach normal levels. Many financing partners remain interested and eager to deploy capital; as development assets come to auction, they will come to the table. As the first wave of COVID-19 winds down, the solar industry should be encouraged to see certain steps in the development cycle lurch back to life, and feel confident in the long-term trajectory of solar in the U.S.



All products are designed, manufactured, and supported in the USA.

(310) 800-1396
www.chiliconpower.com



The Unknown Perils of Ballasted Solar Systems

by Kevin Kervick

Most commercial solar rack systems are designed around ballast as the preferred method for securing a commercial rooftop solar array. While ballasted systems offer many benefits, solar installers and designers should carefully review all the variables before specifying the securement method. This includes knowing what type of commercial roof is installed, as well as how that system was installed.



Figure 1.

Most companies and installers will tell you that they prefer ballast over a mechanical anchor to preserve the roof warranty. However, many industry veterans do not realize that ballasted systems can easily void roof warranties, do not eliminate rooftop rack movement, and can create more problems than they solve.

Factory Mutual and Solar

Factory Mutual Approvals (FM Approvals) is closely involved with commercial construction techniques, methods, and testing to mitigate risk. "FM Approval" is often considered the gold standard for testing and approving building products and assemblies.

For rooftop solar, FM outlines (in its Loss Prevention Data Sheet 1-15) the installation best practices and requirements for installing a PV array.

FM on Ballast

According to the best practices referenced above, FM places clear limits on the acceptable slope for a ballasted PV array on a commercial facility. (Figure 1).

"2.1.1.5 Install ballasted rigid PV roof-mounted solar panels on roofs with a maximum roof slope of 1/2 in. per foot (2.4°). A higher slope is not recommended for ballasted PV panels as it will decrease frictional resistance to wind forces and increase sliding forces from gravity loads, weakening wind resistance."

While commercial roofs are frequently described as 'flat,' most are designed with some small degree of slope to ensure that the roof does not allow ponding water. Too often, ballasted solar systems are installed on commercial roofs with steeper slopes than FM outlines. This is dangerous and should be avoided - all PV systems are subject to thermal expansion

and contraction and will expand/contract with a downhill bias. As a result, it is not uncommon that ballasted systems "walk" downhill over time.

FM also outlines specific instructions based on whether the roof was fully adhered or mechanically attached. Knowing which method was used to install the roof is critical for the installer and specifier to understand.

"2.1.1.6 Install ballasted, rigid roof-mounted PV panels over fully adhered roof covers."

There is no consensus wind design method for installing ballasted PV arrays over mechanically fastened, single-ply roof covers. When a ballasted PV array is proposed over an existing mechanically fastened single-ply roof cover that is relatively new, do one of the following:

- a) Locate the array with a minimum setback distance equal to twice the roof height and fasten each module around each outside edge of each array.*
- b) Mechanically fasten PV panels throughout the entire array, such as by fastening each module around each outside edge of each array, and then intermittently fasten the remaining PV modules in the interior of the array at every second module in their long dimension and every third module in their short dimension."*

"Fully adhered" refers to a roof system where the waterproofing is adhered to the insulation or coverboard using adhesive or asphalt, which support a 100 percent ballasted PV system. Mechanically attached roof covers (i.e. membrane systems secured with screws and plates) are subject to 'billowing' or fluttering during windy

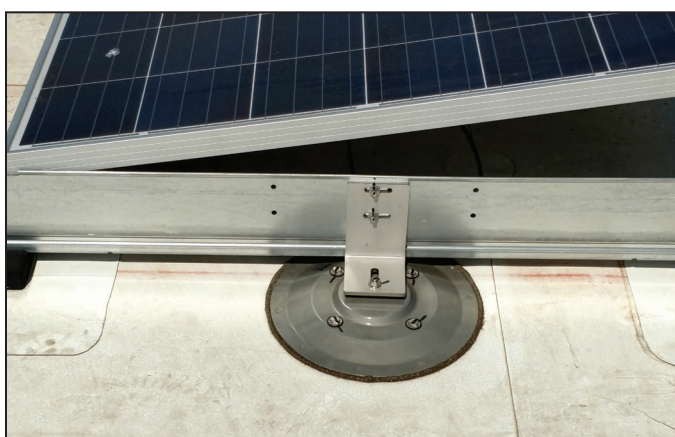


Figure 2.



Figure 3.

periods, which can result in the array being lifted off the roof and sent on an undulating ride. Solar arrays on these roofs should be at least partially anchored to the roof deck, and never exclusively ballasted. (Figure 2).

FM also mandates that related equipment be anchored to the structural deck or members. (Figure 3).

“2.1.1.9 Anchor all related equipment, such as combiner/junction boxes and conduits, to the roof deck or roof structural members (or inverters to concrete foundations) as required to provide proper anchorage against expected loads. Use mechanical anchors that can be connected to the equipment and to the roof deck or roof framing. The dead weight and resulting frictional resistance for most equipment is not sufficient to resist wind uplift and lateral wind loads.”

Translation: No how much ballast you use, solar arrays can still move around on the roof. This movement – particularly if there is any debris on the roof under the array – can damage roof covers over time, leading to leaks in the roofing assembly. To minimize movement, all commercial rooftop solar systems should include at least some roof-mount anchors that are secured to the structural deck or members, not merely to the roof cover. (Figure 4). Roof covers are meant to keep water out of the building envelope, not hold structural equipment in place against wind loads.

Roofing Warranties

Either system may violate the warranty. Fully 100 percent ballasted systems don't get an automatic pass in preserving warranty protection.

Always check the manufacturers website for a sample warranty. The language below is typical of the solar warranties in the industry.

Photovoltaic Overburden Additions on XYZ's Warranted Roof System.

This warranty expressly requires that any alterations to the roof during the warranty period must be approved by XYZ and performed by an approved/authorized roofing contractor. Therefore, the warranty will be suspended during the installation of any photovoltaic (“PV”) system. To reinstate the warranty coverage, the building owner must provide the following information and abide by the process outlined herein:

Additional Required Items to be submitted with this form:

- Detailed Roof Plan Indicating Scope of Work and PV Location on Roof
- Installation and/or Flashing Details
- Photovoltaic Overburden Waiver Signed by Building Owner

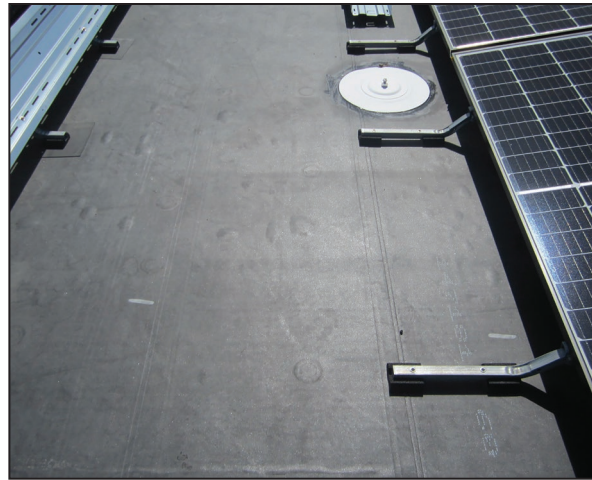


Figure 4.

On an existing XYZ warranted roof system, a post-inspection is required after the photovoltaic installation has been completed. The review and inspection are subject to fees for the project of \$XX/ft² with a minimum charge of \$XX per project.

The term ‘overburden’ pertains to any equipment (PV panels, HVAC, process piping, etc.) installed on a rooftop. Adding a ballasted or anchored PV system qualifies as ‘overburden’, which means the roof system manufacturer must be informed of the proposed installation. In the sample language above, the roof system manufacturer recognizes that solar installation will most likely not be performed by one of their authorized roofing contractors. As such, they suspend the warranty during installation. In this case, the warranty can only be restored after an inspection. In other words, if a PV system (ballasted or anchored) is installed without first notifying the roof manufacturer, they are no longer obligated to honor the warranty.

All commercial roofing system manufacturers require a post-installation inspection on warranted work. Some may also require a pre-installation inspection. Although layering additional costs on a solar installation makes it harder to attain an attractive ROI, solar installers should insist on a pre-installation roof inspection, even when not required. Any roof repairs should be completed before panels are installed; if a system is installed over existing roof damage, the installer may be blamed for causing the damage. A pre-installation inspection by the warranty issuer is good protection for both the building owner and the solar installer.

Double Check

If pre-installation notice is not filed with the roof manufacturer, even a 100 percent ballasted system will void the warranty. Many roof warranties have been endangered because the building owner was unaware of the warranty requirements, and the PV installer decided to not raise the issue. If a building owner is concerned about preserving the roof warranty, be sure to get a copy of it to review. Most roof system manufacturers offer several levels of warranty coverage, and the language varies from manufacturer-to-manufacturer. The only way to preserve a warranty is to review it carefully in advance and make sure to follow the steps outlined.

Using ballast to secure commercial solar systems can be beneficial, but it is critical for the specifier and installer to first understand the existing roof system and how it was installed. Choosing the correct attachment method based on this information can save considerable time, money, and potential headaches down the road.

Kevin Kervick is the solar products business manager for OMG Roofing Products of Agawam, Mass. He is responsible for strategic planning for the solar business, as well as for managing solar sales and product development.

OMG Roofing /// omgroofing.com

HEYCO® Wire Management Solutions for Solar Installers & Integrators...

Heyco® Solar Products Warranty

Visit www.heyco.com for information about Heyco's 20 Year Limited Warranty on our solar products.

Heyco Edge Clips

Heyco Edge Clips provide high panel retention forces while requiring low insertion forces. Ideal solution for applications where holes are not available or temperatures are too extreme for adhesive solutions.

Helios UVX Clip

The Helios UVX clip installs into a .260" (6,6 mm) mounting hole and holds up to 2 cables between .230-.315" (5,8-8,0 mm) each.

Heyco®-Tite Cordgrips for Enphase Q Cable

Heyco now offers 1/2" NPT and 3/4" NPT cordgrips compatible with the Enphase Q Cable. Use the 1/2" NPT for just 1 Enphase Q Cable or the 3/4" NPT for 2 Enphase Q Cables PLUS a #8 solid Grounding cable.

Heyco® HEYClip™ SunRunner® 4-2 & 4-2U

SunRunner 4-2 & 4-2U clips are the ideal wire management solution for top racking manufacturers such as Unirac, IronRidge, Everest, SnapNRack, and similar rack profiles.

Heyco® HEYClip™ SunRunner®

Double-compression design holds from (1) 12 gauge USE-2 to (2) 8 AWG cables up to 8,3 mm OD.

Heyco® SunBundler®

Stainless Steel Wire Cable Ties
Aircraft grade 302/304 stainless wire w/UV protected vinyl jacket and stainless steel crimp sleeve, 8" (203 mm) to 20" (508 mm) lengths.

For FREE samples or product literature, call toll free 1-800-526-4182, or visit heyco.com



SOLAR COMPONENTS
a PennEngineering® Company
www.heyco.com

“Stay Connected with Heyco” Power Components

Box 517 • Toms River, NJ 08754 • P: 732-286-4336 • F: 732-244-8843

How Does Solar Affect Birds?

Deep learning system will monitor birds at solar facilities

by Christina Nunez



WHEN MOST OF US THINK OF BIRDS

in relation to clean energy, we immediately picture spinning wind turbine blades. The wind industry invests a great deal of time and money to help mitigate threats to local wildlife, specifically of the avian variety. When it comes to solar panels' effect on birds, though, we're practically in the dark. The current data collection methods to quantify such effects are time consuming, but the U.S. Department of Energy's (DOE) Argonne National Laboratory has proposed a solution: using artificial intelligence and advanced cameras to help improve our understanding of how birds interact with photovoltaic arrays.

The lab has been awarded \$1.3 million from DOE's Solar Energy Technologies Office to develop technology that can cost-effectively monitor avian interactions with solar infrastructure. The three-year project will combine computer vision techniques with a form of artificial intelligence (AI) to monitor solar sites for birds, collecting data on what happens when they fly by, perch on, or collide with solar panels.

"There is speculation about how solar energy infrastructure affects bird populations, but we need more data to scientifically understand what is happening," said Yuki Hamada, a remote-sensing scientist at Argonne, who is leading the project.

Based on the limited data available, a 2016 Argonne study estimated that collisions with photovoltaic panels at U.S. utility-scale solar facilities kill 37,800–138,600 birds per year. While that number is low compared with building and vehicle strikes, which fell hundreds of millions of birds annually, learning more about how and when those deaths occur could help prevent them.

"The fieldwork necessary to collect all this information is very time- and labor-intensive, requiring people to walk the facilities and search for bird carcasses," said Leroy Walston, an Argonne ecologist, who led the 2016 study. "As a result, it's quite costly."

Such methods are also limited in frequency and span, and offer little insight about bird behaviors around solar panels.

The new project aims to reduce the frequency of human surveillance by using cameras and computer models that can collect more and better data at a lower cost. Achieving that involves three tasks: detecting moving objects near solar panels; identifying which of those objects are birds; and classifying events (such as perching, flying through, or colliding). Scientists will build models using deep learning, an

AI method that creates models inspired by a human brain's neural network, making it possible to "teach" computers how to do those three tasks by training them on similar examples.

In an earlier Argonne project, researchers trained computers to distinguish drones flying in the sky overhead. According to Adam Szymanski, an Argonne software engineer who developed the drone-detection model, the avian-solar interaction project will build on this capability, bringing in new complexities. The cameras at solar facilities will be angled toward panels rather than pointed upward, so there will be more complex backgrounds. For example, the system will need to tell the difference between birds and other moving objects in the field of view, such as clouds, insects, or people.

Initially, the researchers will set up cameras at one or two solar energy sites, recording and analyzing video. They will need to process and classify hours of video by hand to train the computer model.

Because collisions are relatively rare, they could be simulated using an object (e.g., a toy bird), providing the system with initial information to use as training examples.

Once the model is trained, it will run internally within the cameras on a live video feed, classifying interactions on the fly — another challenge that involves edge computing, where information is processed closer to where it is collected.

"We won't have the luxury of recording a lot of video, sending it back to the lab and analyzing it later," Szymanski added. "We have to design the model to be more efficient, so it can be executed in real time at the edge."

The technology to tackle this real-world challenge may be advanced in the future by leveraging the Sage Cyberinfrastructure initiative, led by Northwestern University, and Argonne's Waggle sensor system. This would provide a faster, more powerful edge computation platform and multidisciplinary software stack.

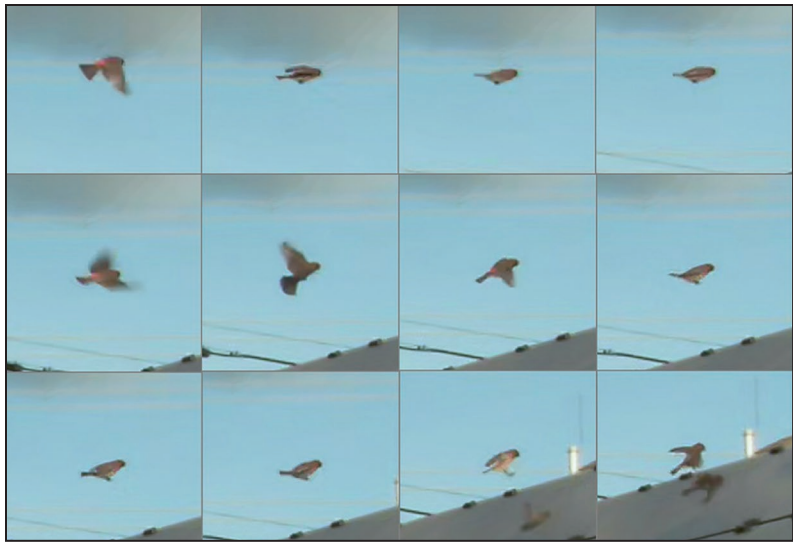
The Argonne project was selected for the Solar Energy Technologies Office Fiscal Year 2019 funding program, which includes funding to develop data collection methods to assess the impacts of solar infrastructure on birds. A better understanding of avian-solar interactions can potentially reduce the siting, permitting, and wildlife mitigation costs for solar energy facilities. Several solar energy facilities have granted permission to collect video and evaluate the technology onsite.

To assure sound technology development, the team will also have at its disposal a technical advisory committee, comprised of machine-learning experts

NEW!
Solar
 SNAP, SLIDE & SECURE™

Snap™
 patent pending

HVHZ compliant Solar Racking
 Works with ISR, SSMR, Single-Ply & Asphalt
 Learn more: www.aceclamp.com/solar-racking-systems



Bird movement captured in video. A series of small video frames will be used for a computer model to learn what a bird would look like. (Image by Argonne National Laboratory.)



Birds spotted at Argonne's solar facility (indicated with red boxes). Flight paths prior to perching are shown with red lines. (Image by Argonne National Laboratory.)

from Northwestern University and the University of Chicago, as well as solar technology and avian ecology experts from the Cornell Lab of Ornithology, conservation groups, the solar industry, and governmental agencies.

At the end of the project, Argonne will have developed a camera system that can detect, monitor, and report bird activities around solar facilities. The system will also notify solar facility staff when collisions happen. The technology will then be ready for large-scale field trials at many solar facilities, said Hamada.

The resulting data could be used to detect patterns and begin answering key questions: Are certain types of birds more prone to strikes? Do collisions increase at certain times of the day or year? Does geographic location of the solar panels play a role in the types of interactions? Do solar energy facilities provide viable habitat for birds?

The technological framework can also be used to monitor other wildlife by retraining AI with appropriate data. "Once we identify patterns, that knowledge can be used to design mitigation plans," Hamada said. "Down the road, once a mitigation strategy is in place, the same system can be used to evaluate the strategy's effectiveness."

Christina Nunez works in communications for Argonne National Laboratory, which seeks solutions to pressing national problems in science and technology. The nation's first national laboratory, Argonne conducts leading-edge basic and applied scientific research in virtually every scientific discipline. Argonne researchers work closely with researchers from hundreds of companies, universities, and federal, state, and municipal agencies to help them solve their specific problems, advance America's scientific leadership, and prepare the nation for a better future. With employees from more than 60 nations, Argonne is managed by UChicago Argonne, LLC for the U.S. Department of Energy's Office of Science.

Argonne National Laboratory
/// www.anl.gov

The U.S. Department of Energy Solar Energy Technologies Office (SETO) supports early-stage research and development to improve the affordability, performance, and value of solar technologies on the grid.

SETO /// energy.gov/solar-office

The U.S. Department of Energy's 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.

DOE Office of Science
/// energy.gov/science



Bulkhead connectors help save time and increase safety

WAGO's new 22mm bulkhead connectors add convenience in connecting to devices within an electrical closure without having to open the door. These connectors, used for industrial applications, can save time and increase safety where arch flash from open enclosures is a concern. These devices are cUL certified and rated NEMA type 2, 3R, 4, 4X, 12, and 13 or IP65 when the protective cap is closed. The PN 8000-099/000-1764 is a CAT 6A RJ45 Female/Female bulkhead connector rated up to 10 Gbits/s. The PN 8000-099/000-1765 is a USB 3.0 Female/Female bulkhead connector rated up to 5 Gbits/s.

WAGO /// www.wago.us

WHEN YOU RELY ON RENEWABLE ENERGY, THERE'S NO ALTERNATIVE TO

PROVEN ENERGY STORAGE



Those who count on wind or solar power systems to run their businesses, homes – and lifestyles – turn to Crown for renewable power storage solutions. We've been at the forefront of energy storage innovation since 1926 and offer tough, earth-friendly and budget-wise batteries to meet the needs of today's RE system owners.

On- or off-grid, start at the top and take a look at Crown to keep things bright and moving along.



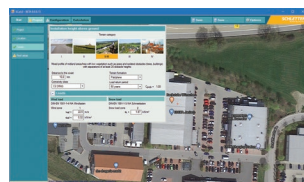
CONTACT US FOR DETAILS:
+1.419.334.7181
commercial@crownbattery.com
www.crownbattery.com



Portable solar-powered water purifier and sanitation system

GoSun has released a portable, solar-powered water purification and sanitation system. The GoSun Flow is small enough to fit into a backpack, uses solar energy to filter 99.99% of pathogens from water (including viruses such as COVID), and can function as a portable handwashing station, warm shower, source of clean drinking water, and much more. Through years of development, GoSun has designed the Flow to make everyone's outdoor water needs as easy as possible. It is unrivaled for both water purification and delivery in a mobile package. More than simply a water purifier, the GoSun Flow serves as an entire kitchen sink. With available upgrades, it can be converted into a full-on portable shower complete with clean, hot water. The all-in-one unit includes a faucet, pump, filter, powerbank, and solar panels. It can also be powered by a USB outlet.

GoSun /// www.gosun.co



Plan roof systems in Google Maps

The Schletter Configurator 3.0 allows users to plan roof systems in Google Maps. Roof surfaces can be marked out and planned directly in Google Maps via an interface. Once the roof inclination has been input, the system calculates the exact size of the roof surface to be configured and, if required, suggests the optimum configuration, depending on alignment. When the zip code or name of the town is entered, the system then takes over the regional standard loads for wind and snow automatically. Several roofs and roof systems can now be processed within one planning element. This makes handling easy, because the location parameters such as terrain category, relevant standard loads, etc. only need to be detected by the system or input once. It is thus possible to configure different roof types with different installation systems and alignments in one plan. Users can choose between fast configuration and professional mode. In fast configuration, the system suggests the configuration that is best, based on size, alignment and structural loading. In professional mode, users can select the individual parameters flexibly for themselves. The Configurator software is free of charge. As a memory-saving client application, it is also maintenance-free and always available in the latest version.

The Schletter Group
/// www.schletter-group.com



Simplify and optimize rooftop solar system design

Generac Power Systems' simplified PWRzone system solves several problems faced by solar installers using traditional equipment: high failure rates, low efficiency, and complex installations. PWRzone reduces the number of connections that must be made on the roof, which also reduces the chance for faulty connections. Because PWRzone uses fewer components and less energy, more solar energy is available to the system owner. A PWRzone is a customizable sub-array composed of standard solar modules, PV Links, which is Generac's 2500W optimizer, and SnapRS, a rapid shutdown switch, where required. The PWRzone architecture allows installers to quickly install by roof conditions and facets. PWRzone provides the efficiency of a string optimization approach and the ability to maximize production in all shading scenarios. Installers can put as many as nine PV modules on a single optimizer or as few as two. The simplicity of designing the PV system with PWRzone equates to fast install times and better margins for installers together with fewer points of failure and better power utilization for the homeowner. PWRzone adds an element of simplicity when designing solar for Generac PWRcell.

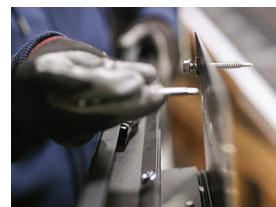
Generac Clean Energy
/// www.generac.com



Flexible single-axis tracker design

The Sunflower II, from RBI Solar, is the second iteration of RBI Solar's Sunflower single-axis tracker design, which utilizes a gearbox design at each pile to reduce stresses and provide tracking stability at each foundation. This engineering feature allows for lighter components to be used in the structure's design, making for a simplified installation in the field. The flexibility of the system's design also allows for complete layout optimization. Sunflower II can accommodate any grade changes up to 15%, which can significantly reduce the amount of civil scope and site preparation time prior to construction. The drivetrain system connects the gearboxes at the top of each foundation and carries the power from the motor to rotate PV modules throughout the day. The drivetrain has been engineered to operate on undulating topography. Each row of the Sunflower II system operates independently, so software upgrades to the communications and controls systems ensures every row is rotating in conjunction with one another. These enhancements increase the reliability of backtracking, operational uptime, and system performance. RBI Solar has dedicated project managers and certified installation teams that are capable of ensuring each Sunflower II system is properly installed and commissioned. Their installation crews are required to complete mandatory training and must follow QA/QC protocols in order to install the Sunflower II system. Along with the complete mounting system, the Sunflower II is equipped with an integrated electronic balance of systems (eBos) that ranges from wiring to combiner boxes.

RBI Solar, Inc.
/// www.rbisolar.com



Increased solar capacity, configurations, and solar roof value

GAF Energy announced the launch of their "Flex" option for use with the company's redesigned Decotech 2.0 roof-integrated solar product. Flex maintains the efficiency of standard system sizing, while also introducing new configuration choices for homeowners. Flex has a set number of system structure and wattage building-blocks that roofers can use to design optimal roof-integrated solar products for customers. Roofers have more options to draw from in incorporating solar into roofing solutions for homeowners, while still maintaining the simplicity of a kitted-system approach.

GAF Energy /// www.gaf.energy

CASH In Your Old Equipment

- Solar Modules
- Inverters
- Batteries
- ...and More



weryclesolar.com/nace



A versatile IoT solution for industry

Globalstar Canada Satellite Co. introduced the ST100, an innovative, embeddable, one-way Satellite Transmitter ready for rapid product development and manufacturing in the global marketplace. The ST100 is lightweight, low power, and small with embedded antennas, all on one commercial IoT board. The ST100 provides low cost, reliable connectivity that is powered by the Globalstar Satellite Network low earth orbit (LEO) constellation, providing SATCOM integration capability to any original equipment manufacturer (OEM) product. These embedded technologies are suitable for delivering remote sensing, tracking, and monitoring of field applications across industrial and remote operations. Globalstar Embedded Solutions don't require any additional ground infrastructure for data exchange, reducing costs typically associated with traditional connectivity while saving more than half the typical time to production. Because the ST100 operates on the Globalstar Satellite Network, one solution works everywhere without multiple country service contracts or roaming fees. The ST100 Satellite Transmitter offers a customizable approach to new commercial IoT product innovations and can be used by simply adding power, a mechanical enclosure and configuring the settings within the device firmware. For more advanced technical requirements, third parties can write their own firmware on the ST100 and utilize Globalstar APIs, Bluetooth wireless technology and the serial connector to expand the use of the board and integrate with other devices or hardware.

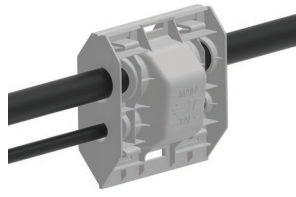
Globalstar, Inc.
/// www.globalstar.ca



PCB terminal blocks for power electronics expanding

WAGO is adding to its existing product line for their 2600 Series PCB Terminal Blocks for Power Electronics range featuring Push-In CAGE CLAMP connection technology. These new versions allow for increased pin spacing and double pinning to allow for expanded current capacities while maximizing voltage ratings. Options for these terminal blocks now include UL ratings as high as 85A and up to 1000V.

WAGO /// www.wago.com



DC grid architecture solution for utility-scale solar farms

A new Customizable Trunk Solution (CTS) for solar farms from TE Connectivity (TE) offers cost advantage and design flexibility in photovoltaic installations. The Customizable Trunk Solution is designed for DC grid systems to eliminate combiner boxes and provide plug-n-play flexibility from the string harness to the inverter. This hybrid solution is adaptable to site conditions, and can be installed underground or above ground. Customers benefit from reduced overall labor, operational, and maintenance costs. The CTS consists of three key products: Gel Solar Insulation Piercing Connectors (GS-IPC) which combines Insulation Piercing Technology, for easier and faster connection with no insulation cutback required and the Powergel formulation to seal, protect, and insulate providing an increased level of reliability. The GS-IPC provides protection, insulation, and high-quality sealing for fast, easy, and safe cable connections of PV cables ranging from #10 to 500 Kcmil. Size transitions or transitions from copper to aluminum are also possible. Suitable for direct buried and overhead applications. UL486AB+UL6703 listed part. The Solar Fuse Harnesses (SFH) is a robust fuse harness solution with a wide variety of configurations including in-line over-molded fuses, tapping, whips, and string jumpers. UL9703 compliant. Disconnect Boxes are Fiberglass or steel disconnect boxes up to 400 amps load break with surge and common ground capability integrated with shearbolt connectors for easier and simpler installation. UL1741 compliant.

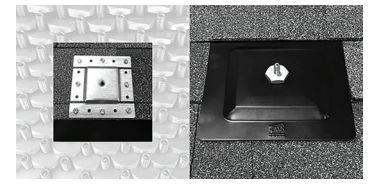
TE Connectivity /// www.te.com



Stationary solar and storage bi-directional inverter

The 50kW/100kW hybrid storage inverter provided by SINEXCEL has 2DC1AC connection with DC coupled solar built-in and can support up to two times PV input which enables larger solar generation. It is compliant with EU/UK/US/AU certification. Utility-interactive mode and stand-alone mode (off-grid mode) are both supported. There is built-in isolation transformer offers easy-to-use for off-grid use while power failure. And the optional 2DC2AC connection enables fast switch-over while blackout. 208Vac 3P4W and 480Vac 3P4W versions and outdoor NEMA3R version are available too.

Sinexcel, Inc. /// www.sinexcel.us



Sheathing attachment

Zilla's patented Double Stud XL Flashings attach directly to sheathing, eliminating the need to locate and fasten systems to rafters, and making them a fast and easy way to install solar PV systems on composite shingle roofs. Zilla Double Stud XL Flashings are conveniently packaged and sold in boxes that include everything needed to install 20 flashing assemblies quickly.

Zilla /// www.zillarac.com



SOLAR CONNECTIONS INTERNATIONAL
THE FUTURE OF SOLAR ATTACHMENTS™



POWERFOOT™
FOR ASPHALT SHINGLE ROOFS

WHAT'S INCLUDED

- 8" x 12" PowerPlate •
- L-Foot •
- 4" Lag Bolt •

PACKAGED IN 20 QTY KITS

- 3 Layers of WaterTight Protection
- 3 Piece Design for Quick Installation
- Available in Mill or Black Finish
- EPDM Sealing Washer on Lag Bolt



HOW IT'S SHIPPED



FINAL PRODUCT

SOLARCONNECTIONS.COM | 800.815.7652
INFO@SOLARCONNECTIONS.COM



Redesigned solar roof kit for fast, easy, durable solar
GAF Energy has launched an upgraded version of its solar roof product, DecoTech 2.0. The redesigned product will deliver the same homeowner value and give installers a fast, easy, durable solar solution for customers. DecoTech 2.0 will maintain the same aesthetic appeal of all GAF Energy's products, while simplifying the installation process for installers. The upgraded system features wiring improvements for durability and safety. It also boasts fewer points of attachment and new fastener hardware for quick and simple installation. GAF Energy empowers roofing contractors across the U.S. with a comprehensive and economical approach to solar installations. Designed to provide a low-profile alternative to typical rack-mounted solar panels, GAF Energy solar integrates directly with the roofing system and is part of the primary water-shedding layer. New high-efficiency solar panels optimize power output and maximize aesthetic appeal, combined with robust flashing and a sleek black perimeter shield to help reduce the risk of leaks and animal intrusion.

GAF Energy /// www.gaf.energy

OutBack
POWER[™]
an EnerSys[®] company

LET'S REIMAGINE RENEWABLES.

Like you, we are driven by the promise of a brighter tomorrow. Our solar + storage systems enable adaptive energy management and backup power capabilities for any residential or commercial user, on and off the grid.

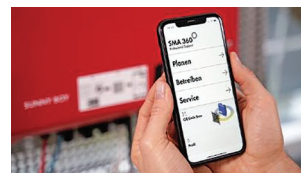
www.outbackpower.com



Low port count PoE connectivity

Southwest Microwave has expanded its suite of IP-based Power over Ethernet (POE) intelligent perimeter intrusion detection solutions with the INTREPID MicroPoint-POE-S Fence Detection System. Suitable for fence applications with cut-or-climb intrusion risks, MicroPoint-POE-S employs proprietary digital signal processing algorithms to precisely locate intrusion attempts to within 3.6 ft (1.1m) while ignoring harmless disturbances caused by wind, rain, or vehicle traffic. MicroPoint-POE-S couples two decades of MicroPoint fence sensor performance with simplified, secure TCP/IP network integration via a single Ethernet cable for power and data transmission, delivering system installation and maintenance convenience, design flexibility and lower infrastructure costs. MicroPoint-POE-S features Sensitivity Leveling, a unique calibration process that adjusts for variations in fence fabric or tension to deliver uniform detection along the protected fence line without the need for costly fence reconditioning. Detection zones are assigned via web browser anywhere along the cable, regardless of processor location, reducing hardware costs and offering the flexibility to tailor zoning to a site's unique requirements.

Southwest Microwave, Inc.
/// www.southwestmicrowave.com/ssd



All-round support for PV solar power professionals

SMA has developed the SMA 360 app for PV solar power professionals. It connects PV system simulation, planning, commissioning, and monitoring as well as automatic notification in case of service. SMA 360 makes life easier for installers and offers all-round support for their business. The app is available immediately in the app stores and is available free of charge for the first year. With SMA 360, solar professionals have all system data to hand at all times. All steps from PV system simulation and commissioning through to the mobile monitoring of all systems in the portfolio and on-site customer service can be performed directly on a cell phone or tablet. SMA 360 is regularly updated to incorporate new functions. In the future, these will include an automatic servicing notification.

SMA Solar Technology AG /// www.sma.de



IP-Based power over ethernet fence detection system

Antaira Technologies fulfills the need for low port count PoE gigabit connectivity solutions for industrial applications, with the new LNP-0500G-bt and LNP-0500G-bt-24 series. The LNP-0500G-bt Ethernet switch is rugged, reliable, and suited for applications that require up to 90 Watts of PoE power. When working in automation and transportation the LNP-0500G-bt-24 is an even better fit, providing the same high power PoE with a wider range of input voltage powering the switch. Both LNP-0500G-bt and LNP-0500G-bt-24 series are 5-port industrial 802.3bt PoE, gigabit unmanaged Ethernet switches, with 48 to 55Vdc high voltage power input (LNP-0500G-bt) and a 12 to 55Vdc wide voltage power input (LNP-0500G-bt-24). Each unit is designed with five gigabit Ethernet ports that are IEEE 802.3af/at/bt compliant on four of the ports (data and power output maximum 90W/port). The series supports MDI/MDI-X functions and 10Kbytes jumbo frames. This product series provides high EFT, surge (2000Vdc), and ESD (6000Vdc) protection to prevent any unregulated voltage and can support the power redundancy feature using a dual-power input design with reverse polarity protection. There is also a built-in relay warning function to alert maintainers when power failures occur.

Antaira Technologies
/// www.antaira.com

Inverters

An integral part of any energy system, inverters convert the power generated from the sun into functional energy for grid and off-grid use. With technology offering ever-more efficient and reliable power generation, herein we highlight the latest in utility-scale, commercial, industrial, and residential inverters...

SOLAR

SEE ADS ON PAGE 25 & 53



Ampner

Product: ACE 300 PV

Application: Utility-scale, industrial

Continuous Output Power: 261kW to 333kW

Weighted CEC Efficiency: 98.5%

Peak Efficiency: 99.0%

DC Voltage Operating Range: 850V to 1500V

Operating Temperature Range: -40°F to 140°F (-40°C to 60°C)

Dimensions: 43.3" x 37.4" x 15" (1100mm x 950mm x 380mm)

Certifications/Approvals: CE marking, IEC/EN/UL 62109-1, IEC/EN 62109-2, UL 1741, UL 1998, NEC 2017, CSA C22.2 No. 107.1, CSA C22.2 No. 62109 1:16, VDE-AR-N-4110, UL 1741 SA, IEEE 1547, IEEE 1547.1, IEC/EN 62920, FCC Part 15 Class A, IEC/EN 61683, EN 50530, CEC listing

Warranty: 5-year warranty

Key Features:

- Power ratings from 261kW to 333 kW;
- Operating ambient temperature range -40°F to 140°F (-40°C to 60°C);
- Flexible DC input arrangements for combiner inputs or direct string-input systems (MC4);
- Operating altitude to 13,000ft (4000m) above sea level;
- IP65 / NEMA 4 design.

www.ampner.com

SEE AD ON PAGE 29



TMEIC Corporation

Product: Solar Ware Ninja Series PV PCS

Application: Utility-scale

Continuous Output Power: 800kW - 920kW

Weighted CEC Efficiency: 98.5%

Peak Efficiency: 98.9%

DC Voltage Operating Range: 875V to 1300V

Operating Temperature Range: -4°F to 122°F (-25°C to 50°C)

Dimensions: 43.3" x 43.3" x 74.8" (1100mm x 1100mm x 1900mm)

Certifications/Approvals: UL1741, UL174SA, IEEE1547, NEC2017, IEC62109-1,2, IEC61000-6-2,4, IEC61727, IEC62116, IEC61400, BDEW, IEC61683, IEC60068

Warranty: 5-year warranty, extended warranty options available

Key Features:

- Up to 6 Solar Ware Ninja units on the same skid;
- PV and/or ESS combination available;
- Latest generation of Smart Inverter controls platform;
- Outdoor rated enclosure;
- UL or IEC certified global design.

www.tmeic.com



Ingeteam

Product: INGECON SUN Full Skid Power Station

Application: Utility-scale

Continuous Output Power: Up to 7.17MVA @30°C / 6.45MVA @50°C - 1500VDC

Weighted CEC Efficiency: 98.5%

Peak Efficiency: 98.9%

DC Voltage Operating Range: 655V-1300V through 996V-1300V

Operating Temperature Range: -40°F to 135°F (-40°C to 57°C)

Dimensions: 38ft x 7.4ft x 8.2ft (11.6m x 2.3m x 2.5m)

Certifications/Approvals: IEC 62116, UL1741SA, IEEE1547, IEEE1547.1, NEC CODE, Rule 21, Rule 14H, CSA22.2 No107

Warranty: 5-year standard warranty, with extended warranty options up to 25 years

www.ingeteam.com

Intertie Solution

For Distributed Energy Resource Interconnection

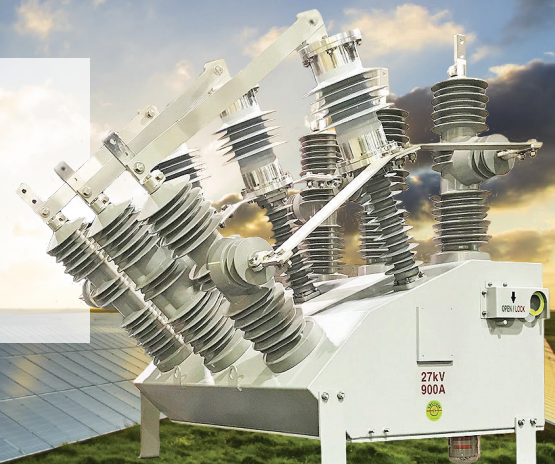
15.5 kV - 38 kV



770-946-4562
sales@southernstatesllc.com
www.southernstatesllc.com

Soft switching of intertie transformer to:

- Mitigate system voltage dips & inrush currents
- Protect transformer investment
- Reduce no-load losses



TranSwitcher®

SOLAR

SEE ADS ON PAGE 13



Chilicon Power

Product: CP-720

Application: Commercial, residential

Continuous Output Power: 720W

Weighted CEC Efficiency: 96.1%

Peak Efficiency: 96.7%

DC Voltage Operating Range: 47V to 82V

Operating Temperature Range: -40°F to 149°F (-40°C to 65°C)

Dimensions: 10" x 8" x 1.8" (254mm x 203mm x 46mm)

Certifications/Approvals: UL1741/SA, IEEE Std 1547-2018, IEEE std c62.41.2, CSA C22.2 NO. 107.1 CISPR 22 Class B; HECO Rule14H (Advanced Inverter), HECO Rule 22 (Self-Supply); NEC 690.12 Rapid Shutdown



Warranty: 25-year warranty

Key Features:

- Supports high wattage modules (430W);
- Single SKU for 60-, 72-, 96-, and 128-cell 240V or 208V;
- Robust PLC communication (range >500ft);
- Up to 20 modules per branch circuit;
- Reliable design with no electrolytic components.

www.chiliconpower.com

SEE AD ON PAGE 30



Ginlong Technologies

Product: Solis-125K-EHV-5G

Application: Commercial, utility-scale

Continuous Output Power: 125kW

Weighted CEC Efficiency: 98.6%

Peak Efficiency: 99.1%

DC Voltage Operating Range: 860V to 1450V

Operating Temperature Range: -13°F to 140°F (-25°C to 60°C)

Dimensions: 46.4" x 28.1" x 12.4" (117.9cm x 71.4cm x 31.5cm)

Certifications/Approvals: UL 1741, UL 1741 SA, Rule 21 Phase I and II compliant (ready for Phase III), Rule 21, UL 1998, UL 1699B, IEEE 1547, FCC Part 15 (Class A&B), CAN/CSA C22.2 107.1-1



Warranty: 10-year standard warranty, extendable to 20-years

Key Features:

- 3% higher DC string voltage than 1000V systems, resulting in higher energy density and lower installation costs;
- 99.1% maximum efficiency;
- 20 DC inputs results in DC to AC ratios up to 150% for greater energy generation during lower irradiance conditions;
- Optional AC combiner connects two-125kW units into a 250K system, substantially reducing AC cable costs.

www.ginlong.com



Yaskawa Solectria Solar

Product: SOLECTRIA XGI 1500

Application: Utility-scale

Continuous Output Power: 166kW

Weighted CEC Efficiency: 98.5%

Peak Efficiency: 99%

DC Voltage Operating Range: 860V to 1450V

Operating Temperature Range: -40°F to 140°F (-40°C to 60°C)

Dimensions: 29.5" x 39.4" x 15.1" (750mm x 1000mm x 380mm)

Certifications/Approvals: UL 1741SA, UL 1998, IEEE 1547

Warranty: 5-year standard warranty with 10 year options

www.solectria.com



Canadian Solar

Product: CSI-125KTL-GS-E

Application: Commercial, utility-scale, industrial

Continuous Output Power: 125kW

Weighted CEC Efficiency: 98.6%

Peak Efficiency: 99.1%

DC Voltage Operating Range: 860V to 1450V

Operating Temperature Range: -13°F to 140°F (-25°C to 60°C)

Dimensions: 46.3" x 28.1" x 12.4" (1176mm x 713.5mm x 315mm)

Certifications/Approvals: UL1741 SA, UL1998, CSA-C22.2 No. 107.1-01, IEEE1547, FCC PART 15, IEEE1547, Rule 21, ISO-NE

Warranty: 10-year warranty, available extension up to 20-years

www.canadiansolar.com



12K HYBRID

Easy Plug 'n Play Design

No-Glitch™ Technology

120/240/208V

STACKABLE

20kW Surge

Two 500V MPPTs BUILT-IN

Engineered, Assembled and Tested in USA

Phone: 972-575-8875 Email: Sales@sol-ark.com www.Sol-Ark.com





SolarEdge

Product: Energy Hub Inverter with Prism Technology

Application: Residential

Continuous Output Power: 3000 (for 3kW), 3800 (for 3.8kW), 6000 (for 6kW), 7600 (for 7.6kW)

Weighted CEC Efficiency: 99%

Peak Efficiency: 99/2%

DC Voltage Operating Range: 380V to 400V

Operating Temperature Range: -40°F to 140°F (-40°C to 60°C)

Dimensions: 17.7" x 14.6" x 6.8" (450mm x 370mm x 174mm)

Certifications/Approvals: UL9540, UL1998, UL1699B, UL1741 SA, UL1741, CSA 22.2, Rule 14H, Rule 21, IEEE1547

Warranty: 12-year warranty, extendable to 20-25 years

www.solaredge.com/us

SOLAR

SEE AD ON PAGE 26



Northern Electric and Power, Inc.

Product: Microinverter BDM-800

Application: Commercial, residential, industrial

Continuous Output Power: 0.8kW

Weighted CEC Efficiency: 96.5%

Peak Efficiency: 97.1%

DC Voltage Operating Range: 20V to 55V

Operating Temperature Range: -40°F to 149°F (-40°C to 65°C)

Dimensions: 10.5" x 7.8" x 1.6" (268mm x 200mm x 42mm)

Certifications/Approvals: UL1741

Warranty: 10- or 25-year warranty

Key Features:

- 800W continuous ac output power;
- Easy for installation;
- Good for 520W x 2 solar panels;
- Low cost per watt micro inverter;
- Integrated grounding.

www.northernep.com

SEE AD ON PAGE 24



AIMS Power

Product: AIMS 8000 Watt Pure Sine Inverter Charger 48Vdc to 120/240Vac

Application: Residential, commercial

Continuous Output Power: 8000W

Weighted CEC Efficiency: 88%

Peak Efficiency: 91%

DC Voltage Operating Range: 42V - 64V

Operating Temperature Range: Ambient temperature recommendation 14°F to 122°F (-10°C to 50°C)

Dimensions: 23.3" x 16.3" x 8" (592mm x 414mm x 203mm)

Certifications/Approvals: Listed to UL 1741, CSA 22.2

Warranty: 2-year warranty

Key Features:

- Powerful built in charger for lithium, GEL, AGM, and lead;
- 24,000W surge for 20 seconds;
- Split phase 120/240Vac;
- Automatic transfer switch;
- Hard wire and GFCI outlet.

www.aimscorp.net



SMA America

Product: Sunny Boy-US with ShadeFix Optimization

Application: Residential

Continuous Output Power: 3kW to 7.7kW

Weighted CEC Efficiency: 97%

Peak Efficiency: 97.9%

DC Voltage Operating Range: 100V to 550V

Operating Temperature Range: -13°F to 140°F (-25°C to 60°C)

Dimensions: 21.1" x 28.5" x 7.8" (536mm x 724mm x 198mm)

Certifications/Approvals: UL 1741, UL 1741 SA incl. CA Rule 21 RSD, UL 1998, UL 1699B Ed. 1, IEEE1547, FCC Part 15 (Class A & B), CAN/CSA V22.2 107.1-1, HECO Rule 14H, PV Rapid Shutdown System Equipment

Warranty: Up to 20-year warranty options

www.sma-america.com

COTEK SC Series Pure Sine Inverters Chargers



KEY FEATURES:

Available in 1200W and 2000W

Bi-directional with 5 in 1 operating modes

Built-in 3 stage battery charger and AC transfer switch

Temperature compensated charging option

-50~105oF full load operation with derating up to 140oF

UL458 and UL1741 certified for mobile and residential

Lightweight high frequency design

Adjustable power saving options

The new SC bi-directional inverter charger takes advantage of the most recent technology to provide features such as Power Sharing, Power Generation and Current Limiting. Unique multi input capability allows for seamless switching and control of both AC and DC. Multiple inputs can be combined to satisfy larger power requirements or limited to match your unique application. The SC provides an array of advanced features in a light weight and cost effective package.



COTEK The Americas - now serving Latin America!
For complete product specifications visit: www.cotek.ca

SOLAR

SEE AD ON PAGE 13



Chilicon Power

Product: CP-250E

Application: Commercial, residential

Continuous Output Power: 289W

Weighted CEC Efficiency: 96%

Peak Efficiency: 96.6%

DC Voltage Operating Range: 18V to 38.5V

Operating Temperature Range: -40°F to 149°F (-40°C to 65°C)

Dimensions: 10" x 8" x 1.8" (254mm x 203mm x 46mm)

Certifications/Approvals: UL1741/SA, IEEE Std 1547-2018, IEEE std c62.41.2, CSA C22.2 NO. 107.1 CISPR 22 Class B; HECO Rule14H (Advanced Inverter), HECO Rule 22 (Self-Supply); NEC 690.12 Rapid Shutdown

Warranty: 25-year warranty

Key Features:

- Supports high wattage modules (430W);
- Single SKU for 60- or 72-cell 240V or 208V;
- Robust PLC communication (range >500ft);
- Up to 20 modules per branch circuit;
- Reliable design with no electrolytic components.

www.chiliconpower.com

SEE AD ON PAGE 26



Northern Electric and Power, Inc.

Product: Microinverter

Application: Commercial, residential

Continuous Output Power: 550W

Weighted CEC Efficiency: 96.5%

Peak Efficiency: 97.3%

DC Voltage Operating Range: 22V to 60V

Operating Temperature Range: -40°F to 149°F (-40°C to 65°C)

Dimensions: 10.91" x 5.20" x 1.97" (277mm x 132mm x 50mm)

Certifications/Approvals: UL1741

Warranty: 10- or 25-year warranty

Key Features:

- Very rugged, and high reliability;
- Multiple models, such as BDM600, BDM800, BDM300;
- Daisy chain AC cables;
- Integrated grounding wire for safety;
- Compliant to NEC2017.

www.northernep.com



Schneider Electric

Product: Conext XW Pro

Application: Commercial, residential

Continuous Output Power: 6800W

Weighted CEC Efficiency: 93%

Peak Efficiency: 95%

DC Voltage Operating Range: 40V to 64V, 48V nominal

Operating Temperature Range: -13°F to 158°F (-25°C to 70°C)

Dimensions: 23" x 16" x 9" (58cm x 41cm x 23cm)

Certifications/Approvals: IEEE 1547, UL 1741 SA, Rule 21, Rule 14H, PREPA, and CSA 107.1

Warranty: Up to 10-year warranty

www.solar-schneider-electric.com



Morningstar Corporation

Product: SureSine Inverter

Application: Residential, industrial

Continuous Output Power: 300W @ 77°F (25°C)

Peak Efficiency: 600W @ 77°F (25°C)

DC Voltage Operating Range: 10V - 15.5V

Operating Temperature Range: -40°F to 113°F (-40°C to 45°C)

Dimensions: 8.4" x 6" x 4.1" (213mm x 152mm x 105mm)

Certifications/Approvals: CE and REACH Compliant • ETL Listed (UL 458) - 115V version ONLY • FCC Title 47 (CFR), Part 15 Subpart B for Class B Device Compliant • EN 60950-1+A11:2001, rev. 4/4/04 • Manufactured in a Certified ISO 9001 Facility

Warranty: 2-year warranty

www.morningstarcorp.com



CPS America

Product: CPS ES-62.5~375kW/268~1608kWh

Application: Commercial, utility-scale, industrial

Continuous Output Power: 62.5kW base, expandable to 375kW

Weighted CEC Efficiency: 97%

Peak Efficiency: 98%

DC Voltage Operating Range: 840Vdc to 1080Vdc

Operating Temperature Range: -13°F to 122°F, derating from 113°F (-25°C to 50°C, derating from 45°C)

Dimensions: PCS cabinet: 58.7" x 89.8" x 53.5" (1490mm x 2280mm x 1360mm) Battery cabinet: 52" x 89.8" x 58.3" (1320mm x 2280mm x 1482mm)

Certifications/Approvals: Enclosure PCS cabinet: NEMA 3R, Battery cabinet: NEMA 4, Inverter: UL 1741 SA, Batteries: UL 1973, UL 9540A, System: UL 9540

Warranty: 10-year warranty

www.chintpowersystems.com

NEED QUIET POWER?

Use an **AIMS Power** Inverter

Largest Selection
100W up to 200kW



AIMS Power offers everything you need for a back-up or off grid power system including CUSTOM solar kits



Trusted Brand for Over 20 Years!

SOLAR

SEE AD ON PAGE 23

COTEK



COTEK Electronic Industrial Co. Ltd.

Product: SD3500 12V/24V/48V

Application: Commercial, industrial

Continuous Output Power: 3.5kW

Weighted CEC Efficiency: 90%

Peak Efficiency: 91%

DC Voltage Operating Range: 10V-16V;
20V-32V; 40V-64V

Operating Temperature Range: -4°F to 140°F
(-20°C to 60°C)

Dimensions: 11.14" x 5.04" x 19.53" (283mm x
128mm x 496mm)

Certifications/Approvals: UL458, EN60950-1

Warranty: 2-year warranty

Key Features:

- Available in 1200W and 2000W;
- Bi-directional with 5 in 1 operating modes;
- Built-in 3 stage battery charger and AC transfer switch;
- Temperature compensated charging option.

www.cotek.com

SEE AD ON PAGE 30

solis



Ginlong Technologies

Product: Solis-66K-US-F-SW

Application: Commercial, industrial

Continuous Output Power: 66kW

Weighted CEC Efficiency: 98.4%

Peak Efficiency: 98.8%

DC Voltage Operating Range: 200V to 850V,
1000V maximum

Operating Temperature Range: -13°F to 140°F
(-25°C to 60°C)

Dimensions: 24.9" x 14.7" x 47.6" (63.3cm x
37.3cm x 120.9cm)

Certifications/Approvals: UL 1741, UL 1741 SA,
Rule 21 Phase I and II compliant (ready for Phase
III), Rule 21, UL 1998, UL 1699B, IEEE 1547, FCC
Part 15 (Class A&B), CAN/CSA C22.2 107.1-1

Warranty: 10-year standard warranty, extendable
to 20-years

Key Features:

- Compact and lightweight design inside a corrosion-resistant NEMA 4X enclosure;
- Transformer-less three phase design with 480Vac output;
- 98.8% efficient with ultra-low start up voltage;
- 4 MPPT designs with fast (<5 sec.) MPPT response times;
- Integrated AFCI option.

www.ginlong.com



Growatt New Energy

Product: Growatt 8-10kMTP-US

Application: Commercial, residential, industrial

Continuous Output Power: 8kW to 10kW

Weighted CEC Efficiency: 97.5%

Peak Efficiency: 98.1%

DC Voltage Operating Range: 140V to 600V

Operating Temperature Range: -13°F to
140°F (-25°C to 60°C)

Dimensions: 14" x 27.3" x 8.3" (355mm x
694mm x 210mm)

Certifications/Approvals: UL1741, UL1741
SA, CA Rule 21, UL1998, IEEE1547, FCC part
15(class B), CSA C22.2 No.107.1, UL1699B
(type 1)

Warranty: 5 or 10-year warranty, 15-year
warranty optional

www.growatt-america.com

ampner.com

The #1 in power rating
and power density

Ampner ACE™ 300 PV/ES



- 1500 Vdc inverters for photovoltaic and energy storage applications
- 333 kW at 690 Vac
- Ambient operation range from -40°F to +140°F
- Up to 13,000 ft above sea level
- UL/CSA certified
- SunSpec Alliance™ compliant
- Available from Q1/2021

Visit booth #3724 at SPI

INVERTERS | STATION SOLUTIONS
EXPERT SERVICES ON CONNECTING RENEWABLES TO THE GRID

SOLAR

SEE AD ON PAGE 23

COTEK



COTEK Electronic Industrial Co. Ltd.

Product: SC2000

Application: Commercial, residential, industrial

Continuous Output Power: 2kW

Weighted CEC Efficiency: 89%

Peak Efficiency: 90%

DC Voltage Operating Range: 10.5V-16.5V; 21V-33V

Operating Temperature Range: -4°F to 140°F (-20°C to 60°C)

Dimensions: 9.88" x 4.57" x 17.83" (251mm x 116mm x 453mm)

Certifications/Approvals: UL458, UL1741

Warranty: 2-year warranty

Key Features:

- Available in 1200W and 2000W;
- Bi-directional with 5 in 1 operating modes;
- Built-in 3 stage battery charger and AC transfer switch;
- Temperature compensated charging option.

www.cotek.com

SEE AD ON PAGE 22



Sol-Ark®

Energy Insurance for your family

Sol-Ark.com

Product: Sol-Ark 8K

Application: Residential

Continuous Output Power: 8kW/9kW

Weighted CEC Efficiency: 96.5%

Peak Efficiency: 97.5%

DC Voltage Operating Range: 150V-500V

Operating Temperature Range: 50°F to 113°F (-10°C to 45°C), Derates >113°F (45°C)

Dimensions: 25.6" x 18.8" x 7.1" (650mm x 477.5mm x 180mm)

Certifications/Approvals: Electronics certified by SGS labs, UL1741, UL1741SA, IEEE1547, FCC 15 class B, UL1699B, MIL-STD461G, MIL-STD-188-125-1 (Independently tested May 2018), Rule 21, HECO

Warranty: 5-year standard warranty, optional 10-year warranty available

Key Features:

- Grid-tied mode to sell power to the grid;
- Meter zero mode to zero whole home power;
- Programmable loads for high power off-grid items to save battery capacity;
- AC coupling adds up to 7kW backup power to existing grid-tie installs;
- Time of use/peak shaving allows use of batteries to avoid costly power and reduces peak demand charges.

www.sol-ark.com



Renogy

Product: Renogy 48V Solar Inverter Charger

Application: Off-grid, backup

Continuous Output Power: 3.5kW

Weighted CEC Efficiency: 93%

Peak Efficiency: 95%

DC Voltage Operating Range: Battery Input 40 to 60VDC, PV Input 40 to 145VDC

Operating Temperature Range: 5°F to 131°F (-15°C to 55°C)

Dimensions: 17" x 12.7" x 5" (43.18cm x 32.26cm x 12.7cm)

Certifications/Approvals: FCC, ROHS

Warranty: 1-year warranty

www.renogy.com



SPARQ Systems

Product: Q1200 1200W Solar Microinverter

Application: Commercial, residential

Continuous Output Power: 1.2kW

Weighted CEC Efficiency: 96.5%

Peak Efficiency: 97%

DC Voltage Operating Range: 22V to 40V per channel

Operating Temperature Range: -40°F to 149°F (-40°C to 65°C)

Dimensions: 1.25" x 7.3" x 11.2" (32mm x 185mm x 284mm)

Certifications/Approvals: UL1741, UL1741 SA/Rule 21/HECO/Rule 14H, IEEE1547, IEEE1547.1, CSA22.2 No. 107.1, FCC Part 15-Class B

Warranty: 25-year limited warranty

www.sparqsys.com



CyboEnergy

Product: Off-Grid CyboInverter

Application: Commercial, residential, industrial

Continuous Output Power: 1.25kW

Peak Efficiency: 96%

DC Voltage Operating Range: 15V to 58V

Operating Temperature Range: -40°F to 149°F (-40°C to 65°C)

Dimensions: 12.5" x 9.5" x 2.3" (32cm x 24cm x 5.8cm)

Certifications/Approvals: UL1741, IEEE1547, CSA107.1, FCC, NEMA2017 690.12

Warranty: 3-year warranty with extended warranty available

www.cyboenergy.com

MODULE LEVEL RAPID SHUTDOWN DEVICE

- Any panel over temperature warning
- Whole PV site auto shut-off before fire or smoke
- Panel level monitoring (optional)
- Compatible to SUNSPEC control signal
- Quad panel RSD makes lower \$/watt



NEP
NORTHERN ELECTRIC

(888) 598- 9901

info@northernep.com

www.northernep.com

ENERGY STORAGE

SEE AD ON PAGE 51



Rhombus Energy Solutions

Product: Rhombus 30/60 Site Inverter System

Application: Commercial, industrial

Continuous Output Power: 30kW continuous output per stage (two stage option)

Weighted CEC Efficiency: 94%

Peak Efficiency: 97%

DC Voltage Operating Range: 270V to 875V

Operating Temperature Range: -4°F to 122°F (-20°C to 40°C)

Dimensions: 31" x 23" x 70" (787mm x 584mm x 1178mm)

Certifications/Approvals: UL1741 SA, UL2202, UL2231 Certified, NEMA 3R and SunSpec compliant

Warranty: 2-year standard warranty with extended option available

Key Features:

- Maximum flexibility with two, 30kW independent, power stages that can be configured in multiple ways;
- Integrated VectorStat site controller that can be configured as a mesh or "hub and spoke" SCADA configuration;
- Multi-mode, multi-port, utility interactive bi-directional inverter for on and off-grid connections;
- Power converter for distributed energy resources in grid or island mode;
- Integrated isolation transformer.

www.rhombusenergy.com

SEE AD ON PAGE 29



TMEiC Corporation

Product: Solar Ware Ninja Series (ESS PCS)

Application: Utility-scale

Continuous Output Power: 640kW - 840kW

Weighted CEC Efficiency: 98.5%

Peak Efficiency: 98.8%

DC Voltage Operating Range: 710V to 1300V

Operating Temperature Range: -4°F to 122°F (-25°C to 50°C)

Dimensions: 43.3" x 43.3" x 74.8" (1100mm x 1100mm x 1900mm)

Certifications/Approvals: UL1741, UL174SA, IEEE1547, NEC2017, IEC62109-1,2, IEC61000-6-2,4, IEC61727, IEC62116, IEC61400, BDEW, IEC61683, IEC60068

Warranty: 5-year warranty, extended warranty options available

Key Features:

- Customizable block; up to 6 Solar Ware Ninja units on the same skid;
- DC Zone monitoring is standard;
- Latest generation of Smart Inverter controls platform;
- UL or IEC certified global design;
- Outdoor rated enclosure.

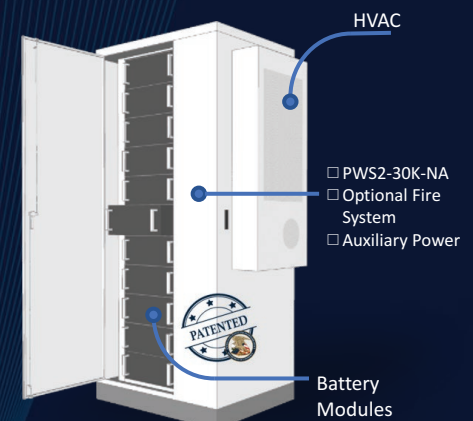
www.tmeic.com

Commercial & Industrial Energy Storage & Micro-grid Solutions

Driven By **Sinexcel**[®]

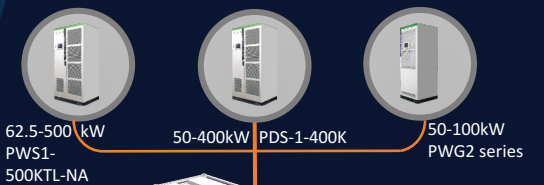
Pre-engineered all-in-one BESS

30 kW + Up to 100 kWh



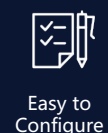
USA Patent No. 10511001

50~2000 kW + Up to 4MWh



10/20/40ft CSC certified Container

- Fire System
- Optional Transformer
- Auxiliary Power



Sinexcel Inc.

henry@sinexcel.us

www.sinexcel.us

ENERGY STORAGE

SEE AD ON PAGE 20

OutBack
POWER™
an EnerSys company



OutBack Power

Product: SkyBox True Hybrid Energy System

Application: Commercial, residential

Continuous Output Power: 5kW

Weighted CEC Efficiency: >94%

Peak Efficiency: >97%

DC Voltage Operating Range: 42V to 60V

Operating Temperature Range: -4°F to 140°F (-20°C to 60°C)

Dimensions: 47" x 21" x 9.4" (119.4cm x 53.3cm x 23.9cm)

Certifications/Approvals: UL 1741 SA, CSA 22.2 No. 107.1, UL 1778, HECO Rule 14H SRD, CA Rule 21 SRD, IEEE 1547-2003, IEEE 1547.1-2005

Warranty: 5-year standard warranty, 10-year extended warranty available

Key Features:

- Clean balance of systems - single box design;
- Works with wide variety of 48V battery chemistries;
- Backup power and support for time of use optimization;
- Dynamic power management;
- Fast and easy to install with or without batteries.

www.outbackpower.com

SEE AD ON PAGE 22

Sol-Ark
LIMITLESS POWER



Sol-Ark.com

Product: Sol-Ark 12K Hybrid Inverter/Charger

Application: Commercial, residential, DERS

Continuous Output Power: 12kW (9.0kWac + 3.0kWdc)

Weighted CEC Efficiency: 96.5%

Peak Efficiency: 97%

DC Voltage Operating Range: 150V-425V

Operating Temperature Range: -13°F to 133°F (-25°C to 55°C)

Dimensions: 30" x 16.75" x 9.37" (762mm x 425.45mm x 238mm)

Certifications/Approvals: UL1741, UL1741SA Rule 21, HECO 14H, PREPA, CEC, Canada, FCC Class B, IEEE1547a-2003/2014, UL1699B/NEC 690.5

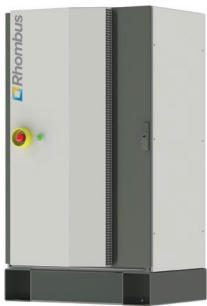
Warranty: 10-year warranty

Key Features:

- Texas based engineers available 7 days/week;
- Fast grid fail transfer;
- Affordable efficiency;
- Works with any generator;
- Easy AC coupling to almost any system.

www.sol-ark.com

SEE AD ON PAGE 51



Rhombus
Energy Solutions

Rhombus Energy Solutions

Product: Rhombus 50kW Inverter - RES-BESS 50kW-480

Application: Commercial, utility-scale, residential, industrial

Continuous Output Power: 50kW

Weighted CEC Efficiency: 94%

Peak Efficiency: 98%

DC Voltage Operating Range: 550V to 840V

Operating Temperature Range: -14°F to 122°F (-10°C to 40°C)

Dimensions: 31.5" x 47.2" x 20" (800mm x 1200mm x 500mm)

1200mm x 500mm)

Certifications/Approvals: Certified for UL1741SA, IEEE 1547, HECO, CEC, Rule 21

Warranty: 2-year warranty and 3-year extended warranty

Key Features:

- Island mode and grid mode capable;
- Power Factor Control Range: +/- .25;
- 60kVA Continuous Output power;
- 75kVA for 10 seconds for Overload.

www.rhombusenergy.com

SEE AD ON PAGE 27

Sinexcel



Sinexcel, Inc.

Product: Wall-mounted bi-directional storage inverter

Application: Commercial

Continuous Output Power: 30kW

Weighted CEC Efficiency: 96.5%

Peak Efficiency: 97.3%

DC Voltage Operating Range: 200V to 750V

Operating Temperature Range: -4°F to 140°F (-20°C to 60°C)

Dimensions: 6.95" x 18.5" x 26" (176mm x 470mm x 660mm)

Certifications/Approvals: ETL listed conforming to UL1741, UL1741SA, CPUC RULE 21, IEEE1547

Key Features:

- 30kVA high power density;
- Wall-mounted, making small footprint;
- Split-phase supported by different firmware;
- Utility-interactive mode (P-Q mode), and stand-alone mode (off-grid mode, or V-F mode supported).

www.sinexcel.us

ENERGY STORAGE

SEE ADS ON PAGE 25 & 53



Ampner

Product: ACE 300 ES

Application: Utility-scale, industrial

Continuous Output Power: 261kW to 333kW

Weighted CEC Efficiency: 98.5%

Peak Efficiency: 99.0%

DC Voltage Operating Range: 850V to 1500V

Operating Temperature Range: -40°F to 140°F
(-40°C to 60°C)

Dimensions: 43.3" x 37.4" x 15" (1100mm x 950mm x 380mm)

Certifications/Approvals: CE marking, IEC/EN 62477-1, UL 1741, UL 1998, NEC 2017, CSA C22.2 No. 107.1, VDE-AR-N-4110, UL 1741 SA, IEEE 1547, IEEE 1547.1, FCC Part 15 Class A, IEC/EN 61683, UL 9540

Warranty: 5-year warranty

Key Features:

- Maximum operational DC voltage 1500V;
- Power ratings from 261kW to 333kW;
- Full reactive power generation capability;
- IP65 / NEMA 4 design;
- Suitable for all common battery energy storage applications.

www.ampner.com

SEE AD ON PAGE 24



AIMS Power

Product: AIMS 4000 Watt Pure Sine Inverter Charger 24V DC to 120/240V AC

Application: Residential, commercial

Continuous Output Power: 4000W

Weighted CEC Efficiency: 88%

Peak Efficiency: 91%

DC Voltage Operating Range: 21V - 31.5V

Operating Temperature Range: Ambient temperature recommendation 14°F to 122°F
(-10°C to 50°C)

Dimensions: 19" x 16.5" x 8" (483mm x 419mm x 203mm)

Certifications/Approvals: Listed to UL 458, CSA 22.2

Warranty: 2-year warranty

Key Features:

- Powerful built in charger for lithium, GEL, AGM, and lead;
- 12,000W surge for 20 seconds;
- Split phase 120/240Vac;
- Automatic transfer switch;
- High/low voltage shutdown, short circuit / over temp protections.

www.aimscorp.net



The next generation in PV Inverters

TMEIC's modular Ninja solution is available for PV, PV+Storage, or Stand-Alone Storage.



Pictured here: Solar Ware Ninja™ – Ninja-5 Solution

WWW.TMEIC.COM
+1-540-283-2000

2060 Cook Drive
Salem, Virginia 24153 U.S.A.

JAPAN | NORTH AMERICA | SOUTH AMERICA |
EUROPE | SOUTHEAST ASIA | INDIA |
CHINA | MIDDLE EAST | AUSTRALIA

ENERGY STORAGE

SEE AD ON PAGE 27

Sinexcel



Sinexcel, Inc.

Product: Modular bi-directional storage inverter

Application: Commercial

Continuous Output Power: 62.5kW to 500kW

Weighted CEC Efficiency: 97.5%

Peak Efficiency: 98.2%

DC Voltage Operating Range: 600V to 900V

Operating Temperature Range: -4°F to 122°F (-20°C to 50°C)

Dimensions: 43" x 31.5" x 85" (1100mm x 800mm x 2160mm)

Certifications/Approvals: ETL listed conforming to UL1741, CSA22.2, IEEE1547, CPUC RULE 21 CE EMC: IEC61000, CE LVD: IEC62477, G59, AS4777

Key Features:

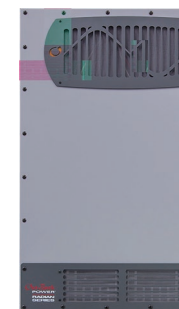
- The modular and ETL certified bi-directional inverter, with optional multi-strings-battery tech and same size of PCS cabinet;
- Utility-interactive mode (P-Q mode), and stand-alone mode (off-grid mode, or V-F mode);
- The external isolation transformer can offer 480Vac or 400Vac 3P4W connection to the distribution system or load for grid-forming operation;
- Optional NEMA3R enclosure.

www.sinexcel.us

SEE AD ON PAGE 20

OutBack POWER™

an EnerSys company



OutBack Power

Product: Radian Series Inverter Charger

Application: Commercial, residential

Continuous Output Power: 8kW or 4kW

Weighted CEC Efficiency: 92.5%

Peak Efficiency: 93%

DC Voltage Operating Range: 40V to 64V

Operating Temperature Range: -4°F to 122°F (-20°C to 50°C)

Dimensions: 28" x 16" x 8.7" (71.1cm x 40.6cm x 22.1cm)

Certifications/Approvals: ETL listed to UL 1741 SA, CE, CSA C22.2 No. 107.1, UL 778 Annex F, IEC 62109-1 ETL, RoHS compliant per directive 2011/65/EU, FCC Class B, IEEE 1574.1, EN61000-6-1, EN61000-6-3, EN61000-3-2, EN61000-3-3

Warranty: 5-year standard warranty, 10-year extended warranty available

Key Features:

- Supports frequency shifting, AC coupling, grid-interactive, and stand-alone capability in the same package;
- Unsurpassed surge capacity;
- Dual AC inputs;
- Field serviceable modular design.

www.outbackpower.com



Dynapower

Product: CPS-1500

Application: Utility-scale

Continuous Output Power: 1200kW (@480), 1500kW (@600)

Weighted CEC Efficiency: 98%

Peak Efficiency: 98.5%

DC Voltage Operating Range: 740V to 1500V

Operating Temperature Range: -13°F to 140°F (-25°C to 60°C) Derated above 113°F (45°C)

Dimensions: 81" x 55" x 33" (206cm x 140cm x 84cm) Indoor; 102" x 96" x 118" (259cm x 244cm x 300cm) Outdoor

Certifications/Approvals: IEEE 1547, UL 1741 SA

Warranty: 5-year standard warranty, 10-20-year extended warranty available

www.dynapower.com



Phocos Americas, Inc.

Product: Any-Grid Hybrid Inverter Charger (PSW-H-3kW-120/24 V)

Application: Commercial, residential, industrial

Continuous Output Power: 3kW

Peak Efficiency: 96%

DC Voltage Operating Range: 21-32Vdc Battery / up to 250Vdc PV

Operating Temperature Range: 14°F to 122°F (-10°C to 50°C)

Dimensions: 18.8" x 12.2" x 5.6" (478mm x 309mm x 143mm)

Certifications/Approvals: CE and RoHS Compliant

Warranty: 2-year warranty

www.phocos.com



Bankable. Reliable. Local

**MAXIMUM UPTIME.
MAXIMUM RETURNS.**

Utility Solar Solution

w: ginlong.com | t: 1-866-438-8408 | e: ussales@ginlong.com



Solis-125K-EHV-5G

Rapid Shutdown Systems

Rapid shutdown systems are necessary to provide an easy way to de-energize a solar array's DC conductors during emergency situations including fires. These systems help reduce fires and improve the safety of first responders on the roof during a fire. First included in the National Electric Code (NEC) in 2014, Rapid Shutdown Systems must be installed on buildings to reduce the shock hazard for emergency responders in accordance with 690.12(A) through (D). Here are some of the systems available on the market...



Darfon America Corp.

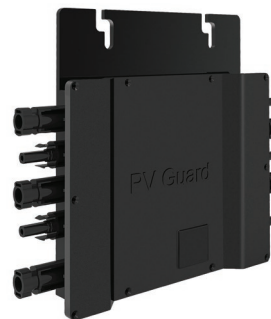
Product: Darfon H5001
Application: Residential
Continuous Output Power: 5.5kW
Weighted CEC Efficiency: 95.5%
Peak Efficiency: 96%
DC Voltage Operating Range: 120V to 500V
Operating Temperature Range: -4°F to 122°F (-20°C to 50°C)
Dimensions: 39" x 17.6" x 5.9" (990mm x 448mm x 150mm)
Certifications/Approvals: UL 1741 SA, CSA C22.2, IEEE 1547A, IEEE 1547.1, FCC Class B
Warranty: 5-year warranty
www.darfonsolar.com



Sensata Technologies

Product: MS4448PAE Inverter/Charger
Application: Residential
Continuous Output Power: 4.4kW
Weighted CEC Efficiency: 88%
Peak Efficiency: 94%
DC Voltage Operating Range: 36V to 64V
Operating Temperature Range: -4°F to 140°F (-20°C to 60°C)
Dimensions: 13.75" x 12.65" x 8.0" (34.9cm x 32.1cm x 20.3cm)
Certifications/Approvals: Listed to ANSI / UL1741, CSA STD C22.2 No.107.1-01
Warranty: 3-year parts and labor warranty, 5-years when installed on MMP or MP system
www.magnum-dimensions.com

SEE AD ON PAGE 26



Northern Electric and Power, Inc.

Product: Rapid Shutdown Device
Weight: 1lb (490g)
Output connector: MC4/Amphenol/MC4 compatible
Output wire length: 3.3ft, 6.6ft, 9.9ft, 13ft (1m, 2m, 3m, 4m)
Input connector: MC4/Amphenol/MC4 compatible
Operating temperature: -40°F to 185°F (-40°C to 85°C)
Storage temperature: 41°F to 112°F (5°C to 45°C)
Relative humidity: storage 20% to 70%, operating 0% to 100%

Max operating altitude: 9843ft (3000m)
Dimensions: 10.5" x 8.25" x 1.25" (266mm x 208mm x 30mm)
Protection rating: NEMA 6
Warranty: 25-year warranty
Input
 DC input power: 550W X 4
 Operation voltage range: 20V to 80V
 Input voltage range: 0V to 80V
 Max short circuit current: 20A X 4
 Max system voltage: 1500V
 Max efficiency: 99.5%
Output
 Output power range: 550W X 4
 Max output current: 14A
 Control signal method: PLC

Key Features:

- Different from regular one-way communication RSD, NEP RSD offers two-way communication function;
- NEP RSD offers over temperature, current, and voltage warning and automatic whole PV site shut-off function;
- NEP RSD offers optional panel level monitoring;
- Compatible with SunSpec signal;
- Quad panel RSD reduces equipment cost.

www.northernep.com



IMO Automation

Product: FireRaptor RSD
Weight: 0.88lbs (400g)
Output connector: Multicontact MC4
Output wire length: 5.8ft (1.78m) nominal
Input connector: Multicontact MC4
Operating temperature: -22°F to 203°F (-30°C to 95°C)
Storage temperature: -40°F to 203°F (-40°C to +95°C)
Relative humidity: 95%
Max operating altitude: 6562ft (2000m)
Dimensions: 5.82" x 3.93" x 1.22" (148mm x 100mm x 31mm) including mounting bracket, excluding cables
Protection rating: >IP68 / Nema 4X
Warranty: 20-year warranty
Input
 DC input power: 700W
 Input voltage range: 150VDC
 Max short circuit current: 12A
 Max system voltage: 150VDC
Output
 Output power range: 700W
 Max output current: 12A
www.imoautomation.com



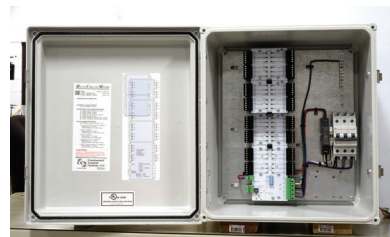
Tigo Energy, Inc. (Tigo)

Product: TS4-A-S (Safety)
Weight: 1lb (490g)
Output connector: MC4, EVO2, MC comparable
Output wire length: 3.9ft (1.2m)
Input connector: MC4
Operating temperature: -40°F to 185°F (-40°C to 85°C)
Storage temperature: -40°F to 185°F (-40°C to 85°C)
Relative humidity: RH < 85% (operating)
Max operating altitude: 6561ft (2000m)
Dimensions: 5.4" x 5.5" x 0.9" (138.4mm x 139.7mm x 22.9mm)
Protection rating: IP68, NEMA 3R
Warranty: 25-year warranty
Input
 DC input power: 500W
 Operation voltage range: 0 to 500V
 Input voltage range: 16V to 90V
 Max short circuit current: 15A
 Max system voltage: 1000V, 1500V
 Max efficiency: 99.60%
Output
 Output power range: 0 to 500W
 Max output current: 15A
 Output voltage range: 0 to 90V
 Control signal method: Wireless
www.tigoenergy.com

Performance Monitoring

Solar performance monitoring systems are necessary to verify the components within a solar system are performing and producing the energy they should. Here, we highlight some of the performance monitoring systems available on the market today.

SEE AD ON PAGE 34



Continental Control Systems

Product: Multi-Circuit Meter for Modbus

Voltage: 100-600Vac, wye and delta, single-phase, and three-phase

Current: 5 – 6000 Amps

Power: 2W

Frequency: 50/60Hz

Output: Requires 0.333Vac current transformers

Sensitivity: 0.5 % when used with 0.3% current transformers

Warranty: 5-year warranty

Certifications: ANSI C12.20, Sunspec

Key Features:

- Modular design up to 84 measurement points;
- Revenue-grade accuracy;
- ANSI C12.20 Modbus RTU or TCP/IP;
- Designed for all utility services;
- 100-600Vac NEMA 4 enclosure options.

www.ctlsys.com

SEE AD ON PAGE OBC



Shoals Technologies Group

Product: BLM

Voltage: Systems up to 1500V

Current: 12A Isc

Power: Parasitic

Logging Values: Voltage, Current Power, Temperature, and IV Curve

Warranty: 5-year warranty

Certifications: UL

Key Features:

- String Current, Panel Voltage, and I-V Performance monitoring;
- Continuously monitor for underperforming panels; with wireless communication and parasitic power;
- No need to run cables; easy installation via integrated connectors.

www.shoals.com



Hukseflux

Product: SR30 digital Pyranometer

Voltage: 5V – 30V

Current: 8.3 - 175 mA @ 12 VDC

Power: 0.1 - 2.3W

Logging values: W/m² (GHI, POA, DIFF)

Warranty: 5-year warranty

Certifications: ISO 9060 spectrally flat Class-A

www.hukseflux.com



Spectrafy

Product: SolarSIM-G spectral pyranometer

Voltage: 12Vdc

Power: <1W

Spectral Range: 280-4000nm

Measurement Range: 280-4000nm

Output: RS-485 ASCII

Sensitivity: <1%

Warranty: 5-year warranty Certifications: ISO 9080:2018 Class A

www.spectrafy.com



GroundWork Renewables

Product: MET System

Voltage: 100 to 240Vac @ 50/60Hz nominal current

Current: 2.1A @ 110Vac

Power: Autonomous, 5 days battery only

Sensitivity: Irradiance: Secondary Standard

Warranty: 5-year warranty

Certifications: UL 508A, IEC 61724 1: 2017, CAISO, SCE, PG&E

www.grndwork.com

RELIABLE INSIGHTS INTO PV PLANT PERFORMANCE

Read Now!

get.otthydrometinsights.com/epc-insights-compilation/

Meteorology Division of OTT HydroMet



Eppley Laboratory

Product: GPP Class A Pyranometer

Logging Values: .1 Wm-2

Spectral Range: 285-2800 nm

Measurement Range: 0-2800 Wm-2

Output: 0-10 mV Analog or Modbus Digital Output

Sensitivity: 8 μV / Wm-2

Warranty: 1-year warranty

Certifications: Calibrated to World Radiation Reference (WRR)

www.eppleylab.com



eGauge Systems

Product: eGauge Pro

Voltage: 1-, split-, or 3-phase 0-277Vac and +/-60Vdc

Current: 0-6900A (30 channels)

Power: Any current x voltage combination

Frequency: 50/60 Hz

Logging Values: VAC, VDC, A, W, Wh, Hz, VA, VAR, THD, deg

Warranty: 2-year, or 5-year warranty

Certifications: ANSI C12.2 - 0.5% Accuracy, UL (IEC/UL 61010-1 Ed. 3.0 B:2010)

www.egaugenet.com

SEE AD ON PAGE 13



Chilicon Power



Chilicon Power

Product: CP-100

Voltage: 120V-240V

Current: <60mA

Power: <7W

Frequency: 132kHz PLC plus WiFi and Z-Wave

Logging Values: Production plus 19 other micro status indicators

Measurement Range: Up to 255 microinverters

Output: 800x480 pixel touchscreen display

Sensitivity: +/- 2.5%

Warranty: 3-year warranty

Certifications: UL, FCC15 part B, CISPR 22 Class

Key Features:

- Auto detection of up to 255 attached micros - single or 3 phase systems;
- Enables onsite array configuration and mapping;
- Robust PLC: >500ft connectivity;
- Allows for production/consumption monitoring and zero export;
- Easily integrates into AC coupled battery or generator augmented systems;
- Connects to Z-Wave link compatible smart home devices.

www.chiliconpower.com

SEE AD ON PAGE 35



EKO

 Beyond Accuracy.

EKO Instruments USA

Product: MS-80S, Class A Spectrally Flat Fast Response Pyranometer

Voltage: 0-1 V output, 4-20mA, and Modbus over RS-485 (5-30 VDC)

Current: 17 mA @ 12VDC

Power: Sensor (<0.2 W), Heater (7W), Ventilator (2W)

Frequency: <0.5 Sec

Warranty: 5-Year Warranty

Logging Values: Solar Irradiance, inclination, sensor temperature, internal humidity, and calibration history.

Certifications: ISO 17025 Accredited Calibration, ISO9060:2018 Class A Spectrally Flat and Fast Response, IEC 61724-1 Class A Compliant

Key Features:

- Spectrally Flat and Fast Response Class A Sensor
- Integrated Sensor Diagnostics
- Lowest Cost of Ownership (5-year Warranty and Recalibration Period)
- Immune to Thermal Offsets and Lowest Measurement Uncertainty
- Multiple Signal Outputs and Sensor Position Information Allow for Faster Installations.

www.eko-usa.com



Electriq Power

Product: PowerPod Residential Energy Storage System

Voltage: 120/240

Current: 0-30A

Power: 5500W to 16,500W

Frequency: 50Hz and 60Hz

Logging Values: Dashboard (Electriq Power Software)

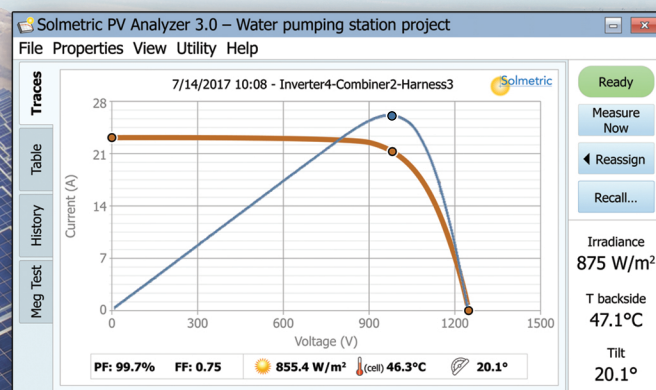
Output: 5500W to 16,500W

Warranty: 10-year warranty

Certifications: UL 1741SA, UL 1973, UL 1642, UL 9540, CSA C22.2, IEEE 1547A, IEEE 1547.1, FCC Class B, HECO

www.electriqpower.com

1500 Volt 30 Amp I-V Curves



Solmetric PV Analyzer

Now shipping V2!

- Highest accuracy and throughput
- Largest display with best array troubleshooting features
- Database of 50,000 PV modules
- Measures up to 1500V at 30A
- 300ft wireless sensor range

Solmetric
Expert tools
Better solar

www.solmetric.com

SEE AD ON PAGE 33



Solmetric

Product: PV Analyzer I-V Curve Tracer

Voltage: 1500V

Current: 30A

Power: 45kW

Warranty: 1-year warranty

Certifications: TUV

Key Features:

- Measure I-V curves up to 1500V at 30A;
- Wireless interface to irradiance sensor with 300ft range;
- Highest measurement throughput;
- Large, easy-to-use user interface.

www.solmetric.com

SEE AD ON PAGE 32



OTT HydroMet

Product: DustIQ Soiling Monitoring System

Voltage: 24Vdc

Current: 300mA maximum

Frequency: 0Hz

Logging Values: Soiling Ratio (%), transmission loss [%], Back of module temperature [°K]

Measurement Range: Soiling ratio 100% to 50%

Output: Modbus RTU over RS-485

Sensitivity: 0.1% soiling ratio

Warranty: 2-year warranty

Key Features:

- Know exactly when and where to clean;
- Optimize yield;
- Maintenance free;
- Integrated into leading plant management software.

www.otthydro.com



Apogee Instruments

Product: Silicon-cell Pyranometer SP-110

Voltage: 0 - 400mV

Warranty: 4-year warranty against defects in materials and workmanship

www.apogeeinstruments.com



Accuenergy (Canada) Inc.

Product: Acuvim II Series

Voltage: Voltage V1, V2, V3, Vlnavg, V12, V23, V31, Vllavg

Current: Current I1, I2, I3, In, Iavg

Power: P1, P2, P3, Psum

Logging Values: F, V1/2/3/lnavg, V12/23/13/lavg, I1/2/3/n/avg, P1/2/3/sum, Q1/2/3/sum, S1/2/3/sum, PF1/2/3, PF, U_unbl, I_unbl, Load Type, Ep_imp, Ep_exp, Ep_total, Ep_net, Eq_imp, Eq_exp, Eq_total, Eq_net, Es, Epa_imp, Epa_exp, Epb_imp, Epb_exp, Epc_imp, Epc_exp, Eqa_imp, Eqa_exp, Eqb_imp, Eqb_exp, Eqc_imp, Eqc_exp, Esa, Esb, Esc, THD_V1/2/3/avg, THD_I1/2/3/avg, Harmonics 2nd to 63rd, Crest Factor, THFF, K Factor, Sequence and Phase Angles, DI Counter, AI, AO, Dmd P/Q/S, Dmd I1/2/3

Warranty: 5-year warranty

Certifications: Revenue grade ANSI C12.20 class 0.2 & IEC 62053-22 class 0.2s

www.accuenergy.com/meter



Solar Data Systems

Product: Solar-Log 2050 Commercial Revenue Grade Meter

Voltage: 600V or 600/347V, 480V or 480/277V, 208V or 208/120V, 240V or 240/120V, Single (split) phase, Three Phase

Current: 200mA via mA CTs

Power: 120-277Vac

Frequency: 50Hz or 60Hz

Logging Values: Voltage [V] (A, B, C, Avg, AB, AC, BC, Avg); Current [A] (A, B, C, Avg); Active Power [W] (A, B, C, Total) – Bi-directional; Apparent Power [VA] (A, B, C, Total) Reactive Power [VAR] (A, B, C, Total) – Bi-directional; Power Factor (A, B, C, System) – Bi-directional; Active Quadrant (A, B, C, System); Voltage Phase Angle [°] (AB, AC, BC); Frequency [Hz]; Import/Export/Net Real Energy [Wh] (A, B, C, Total); Import/Export/Net Apparent Energy [VAh] (A, B, C, Total); Q1/Q2/Q3/Q4 Reactive Energy [VARh] (A, B, C, Total); Total Demand Power (Sliding Window) [W]

Measurement Range: 450VAC L-N, 780V L-L

Output: RS-485 + Pulse (Modbus/RTU)

Sensitivity: 0.2% max

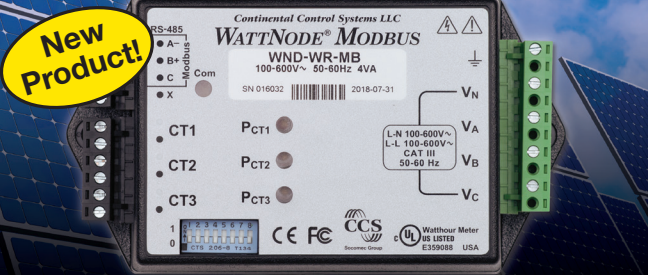
Warranty: 1-year warranty

Certifications: ANSI C12.20 Class 0.2 Accuracy Certified, Indoor/Outdoor IP-67

www.solar-log-america.com

WATTNODE[®]
WIDE-RANGE MODBUS ENERGY METER

NOW AVAILABLE with up to 84 SINGLE CIRCUITS
(or 28 three-phase circuits)



One Model for all Utility Services

- Supports 100 to 600 Vac

Corrects Wiring Errors Remotely

- Reconfigure the CTs Polarity

ANSI C12.20 Class 0.5 Accuracy

- Uses Safe Low-Voltage (0.333Vac) CTs

Modbus RTU, RS-485 Communication

Adjustable Baud Rates to 115K

Continental Control Systems, LLC

1-888-WattNode (928-8663) • ctlsys.com

Performance Monitoring Software

Solar performance monitoring systems are necessary to verify the components within a solar system are performing and producing the energy they should. Here, we highlight some of the performance monitoring systems available on the market today.



LevelTen

Product: LevelTen Performance Monitoring

Application: Commercial, industrial, utility-scale

Description: LevelTen Performance Monitoring includes a dashboard of comprehensive performance metrics including environmental data, economic data, and energy production data. In addition to providing a historical look at key performance metrics, Performance Monitoring is directly connected to the latest forward market curves, which means managers can see how a PPA is expected to perform for any given metric. This enables all internal stakeholders to take action (if needed) to reach their goals and manage their budgets. If a corporation has more than one PPA on the books, Performance Monitoring will compile data from all of the PPAs into a single portfolio view. This enables management to see how the corporation's overall portfolio of investments is performing, and how it could be improved with future investments.

www.leveltenenergy.com



naak, Inc.

Product: carbonTRACK cT200i Gateway

Application: Residential, commercial, industrial, grid services

Description: The cT200i Gateway is an energy management and IoT hub that enables residential and commercial energy users to monitor, control, automate, and transact energy. A differentiator for this product manufactured by carbonTRACK, is its ability to control behind the meter loads and integrate with SunSpec certified battery storage systems, delivering an end-to-end energy management system. Comes equipped with 3 built-in relays for hard wired circuit level control, and a ZigBee Home Automation chip for pairing with and controlling smart thermostats, smart plugs, and other smart appliances. Reliable cloud connectivity is established with onboard CAT M1 cellular and Wi-Fi.

www.naak.io



McHale & Associates, Inc.

Product: McHale Performance Suites

Application: Commercial

Description: McHale offers their proprietary Excel Add-In package to add functionality to Excel, specific to performance testing and thermodynamic calculations. McHale Performance Suites is a complete function package designed to provide the foundational engineering calculations and meet the American Society of Mechanical Engineers (ASME) requirements for performance testing, providing results that are accurate, defensible, and minimize the risk of computational blunders. The defensibility of the calculations and test results is a core competency involved in multiple party performance testing. The functions are time-tested and verified in every performance and acceptance test that McHale performs.

www.mchale.com



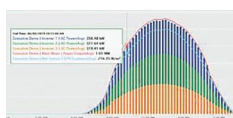
PVH - PV Hardware

Product: PV Performance Control SCADA

Application: Utility-scale

Description: PV Performance Control is PVH's advanced SCADA solution to monitor, control, analyze, and maintain solar PV plants. PVPC performs real-time data acquisition of plant field devices such as inverters, trackers, weather stations, strings or the substation, and stores the information either in a local central server or in the cloud. Likewise, it allows integration with third parties such as the country's electricity grid operator, the SCADA of the substation or the customer's remote-control center. It launches SCADA clients locally or remotely, from anywhere and at any time. Accredited to IEC 61724-1.

www.pvhardware.com



Trimark Associates, Inc.

Product: Vantage

Application: Utility-scale PV monitoring, C&I, DAS

Description: Trimark Vantage is a scalable, flexible visualization tool that helps users determine if their PV sites are performing as expected. Vantage provides real-time SCADA information from numerous devices, including inverters, weather stations, meters, and more. Intuitive, customizable dashboards can display the performance of a single device, or an entire site.

www.trimarkassoc.com



Solar Data Pros, Inc.

Product: Know True-Up

Application: Utility solar

Description: Know True-Up allows utility customers who also have solar to see how their energy usage habits and solar energy production combine to impact their utility charges. The software program also has a solar production monitoring component, which notifies the Know True-Up monitoring team when a solar system has not pushed any power to the grid within a 24-hour period. Utility customers are notified when a potential solar production problem is detected.

www.solarnegotiators.com



Cachelan

Product: SolarVu Monitoring Portal

Application: Commercial, utility, residential portfolios, energy storage, SCADA

Description: Cachelan is a solar monitoring solutions company that provides SCADA and DAS systems to help with O&M and Asset Management of solar and storage portfolios via their SolarVu platform. Manage portfolios of residential, commercial/industrial, and utility sized projects in one place. Receive high fidelity alerts of equipment issues and connect weather sensors, meters, site cameras. Easily compare inverter and string level performance. Cachelan interfaces with all major inverter and equipment manufacturers, and design to minimize their customer's cost.

www.cachelan.com

Accuracy, Under All Conditions.

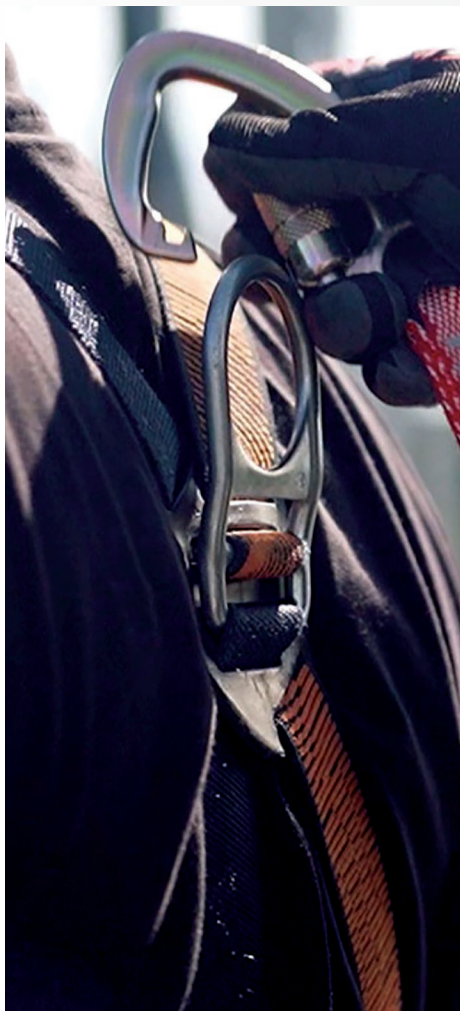
- Lowest Measurement Uncertainty
- Lowest Cost of Ownership
(Standard 5 Years Warranty and Recalibration Interval)
- ISO 9060:2018 Spectrally Flat & Fast Response Class A Pyranometer
- IEC 61724-1 Class A Compliant

www.eko-usa.com

A Fresh Approach to Wind Training

by Jakob Lau Holst

Training centers in the wind turbine industry began reopening in May. A survey commissioned by Global Wind Organisation (GWO) anticipates that course volumes will be at 90 percent in July across the United States, with Canada at 100 percent.



In spite of the crisis, hiring in the wind industry is continuing. In fact, large manufacturers and owner operators from GWO's membership in North America have taken on hundreds of new technicians since the turn of the year.

Given that all of these new hires, along with the existing workforce supporting North America's 115+GW of installed capacity, require regular safety training and refresher courses, the availability of training has never been more crucial.

To meet this challenge, training center leaders are focusing efforts on new ways to minimize risk of infection to their instructors and trainees, before they enter facilities as well as in the classrooms and throughout the hands-on safety training, which is so vital for wind turbine technicians.

GWO standard training includes basic safety, basic technical, enhanced first aid, advanced rescue, blade repair, and rigger signal person courses – all critical for technicians working in various roles across the industry.

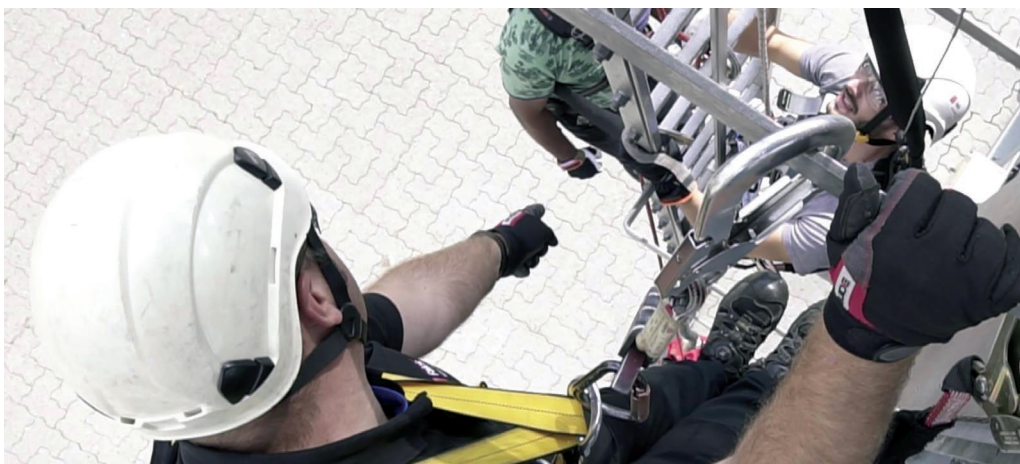
Some keys for minimizing the possibility of infections include:

- Monitoring the student's past two weeks travel activity, and symptoms prior to attending a course
- Impressing upon certain instructors that they are role models
- Maintaining an inventory of personal protective equipment (PPE)
- Sanitizing equipment before and after classes
- Keeping an overall healthy environment in facilities

Reopening requires a mindset that infection could occur throughout the training, so steps are taken to avoid that possibility by maintaining the safest possible environment. This includes monitoring trainees for 15 days before courses start to ensure they do not show symptoms of Covid-19; some centers are using a form that participants sign to confirm travel and contact history, along with a statement on what to expect upon arrival.

Trainees that need to travel to their assigned training center must follow specific instructions that can include pre-screening before departing, using airports with lowest levels of risk, or driving to the facility.

The facilities are sanitized daily, with common areas cleaned multiple times during the day. Also, sanitizing stations are present in all classrooms for trainees and instructors.



In advance of reopening, it is essential that instructors understand the roles they play in leading and demonstrating safe practices by being rigorous when it comes to basics of PPE, sanitizing, and distancing. This also is an opportunity to reinforce the messages of the World Health Organization and the Centers for Disease Control and Prevention for social distancing, washing hands, and monitoring health.

Trainees often have an assigned time for arrival to allow for necessary steps like registration, which is scheduled at 15-minute intervals. This can include logging in with personal information to obtain a quick response (QR) code, a forehead temperature check, and even a badge that shows the actual reading. Trainees then pick up their PPE (gloves, safety glasses, masks), which is worn from the moment they enter the reception area, throughout the hallways, and in all classrooms and common places. Therefore, a sufficient inventory of PPE is necessary to maintain operations of the center.

Distancing (at six feet or more) is practiced in classrooms and public areas, such as lunchrooms. Furthermore, trainees are asked to sit in the same location for each classroom training module.

To support distancing, class sizes are smaller than before. This comes with the added benefit of more time for instructors to direct safety training for participants. For example, one center now maintains a ratio of one instructor for three participants, versus the standard six.

During training, one interesting change is the use of mannequins for modules on first aid and working at heights. Trainees use a range of equipment for the safety modules. In working at heights, for example, trainees must be able to demonstrate the knowledge and skills to correctly inspect, service, store, and use relevant PPE; these include harnesses, lanyards, fall arresters, and work positioning equipment.

All this equipment requires special attention for sanitizing. Trainees assist in cleaning ladders before and after classes, while other equipment is sanitized, labelled with names of users, dated, and set aside for 72 hours before it can be used again.

Regarding the overall environment from a heating ventilation and air conditioning perspective, it is important to frequently

change filters on HVAC systems. Another key is doing whatever possible for air interchange in the facility, to avoid a stagnant environment. Therefore, the maintenance team must be engaged in delivering a healthy environment with proactive and predictive techniques.

In a business where safety is vital, and the protection of wind turbine technicians is essential, training to safeguard them every day requires a new way of preparing for - and conducting - the training they need on the job.

Jakob Lau Holst is CEO of Global Wind Organisation, a non-profit body founded by leading wind turbine manufacturers and operators.

GWO /// www.globalwindsafety.org

aggreko

Grid emulation experts

Ahead of the grid and before your deadlines, we enable you to commission renewable energy projects.

- Mitigate construction and contractual risk
- Commissioning services for wind and solar projects
- Cost saving fuel efficiency programs
- Simulating grid conditions
- Readiness testing
- Fluctuation testing in real-time
- Capitalize on tax incentives
- Custom engineered systems



aggreko

Visit aggreko.com to get in touch

End of Life Options

Wind turbine blade recycling

by Brandon Fitchett

FOR NEARLY FOUR DECADES, WIND POWER

has been increasingly adopted in the U.S., but it has accelerated rapidly in the last decade. Cumulative wind power generating capacity surpassed 100 gigawatts in 2019, representing almost 8 percent of total electricity generated. Moreover, wind now comprises about 30 percent of new capacity being added nationwide. The U.S. Department of Energy projects that, in an aggressive scenario, total wind generating capacity could reach more than 400 gigawatts by 2050.

Given that the service life of wind turbines ranges from 20 to 25 years, some of the earliest megawatt-scale wind turbines are just now being decommissioned. A wind turbine assembly includes the rotor (typically with three blades), nacelle (turbine generator and housing), tower, and foundation (Figure 1). A significant part of a turbine includes recyclable materials: the foundation is concrete; the tower is steel; and the nacelle components are primarily steel and copper. That is not the case for the blades, which are comprised primarily of glass fiber or carbon fiber reinforced polymer composites (GFRP or CFRP) - along with foam, balsa, metal, adhesive, paint, and other materials. At up to 100m in length, these blades are difficult and expensive to recycle due to both their size and the nature of the tough glass and carbon fibers. Since these materials also are non-hazardous, most decommissioned blades are currently sent to landfills for disposal.

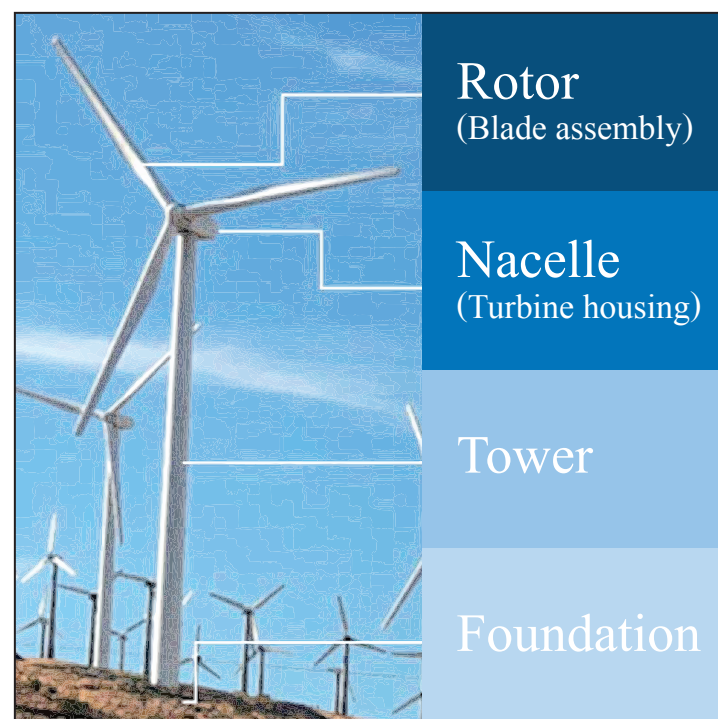
The volume of decommissioned blades is currently low, less than 25 thousand tons per year. However, due to expanding use of wind power and increasing numbers of turbines being decommissioned or re-powered each year, managing wind turbine blade end-of-life issues is a growing long-term concern. The annual amount of blade waste is expected to increase 10 times by 2050, ranging between 200,000 tons per year to almost 400,000 tons per year, depending on turbine service life and total capacity deployed.

Blade management technologies

There are many technologies being developed for managing wind turbine blades nearing the end of their useful life. These include:

- **Life Extension:** Exposure to sunlight, freezing temperatures, and precipitation can degrade or erode blade materials. Blade monitoring, coatings, and repair technology is improving rapidly for life extension beyond 20 years. This is an environmentally friendly means of reducing wind turbine blade waste, and often economically favorable.
- **Pyrolysis:** Pyrolysis is a process used to recover fibers, char, and/or gases for energy generation. Blades are reduced to small pieces and then decomposed using conventional heating (ovens), in an inert atmosphere to prevent combustion, at temperatures of 450-700°C. Although pyrolysis can be costly, the process may allow the glass and carbon fibers to be recovered and potentially reused. Pyrolysis has been used for other carbon fiber composite material, and glass fiber blades have been tested at a pilot facility in Germany.

- **Cement Kilns:** Cement kilns use a high temperature combustion process (>1000°C) to produce about 80 million tons of cement per year in the U.S. Size reduced glass fiber composite wind turbine blades can be mixed with the raw kiln feed. The glass fibers replace other raw materials needed for the cement, and the other blade components serve as fuel to offset coal or natural gas normally used in the process, thereby reducing the CO2 footprint of the kiln. Cement kilns, which can accommodate a large volume of composite waste materials, are being used commercially for blades in Germany, and are under consideration in the U.S.
- **Grinding and Re-use:** Blades can be processed to produce chunks, needles, or powders that can be used in a variety of products, such as decking, insulation, and building materials. The processed blade materials have a relatively low market value, and a significant portion of the material may require disposal due to paints and other contaminants. Grinding and re-use is being done commercially at pilot scale in the U.S.



Pyrolysis, cement kilns, and grinding/re-use all require significant size reduction of the blade, from tens of meters down to centimeters. Other re-use concepts in development take large sections of decommissioned blades and repurpose them for construction purposes, such as affordable housing, playgrounds, utility poles, or pedestrian bridges. Such concepts are attractive because they offer high materials recovery, low costs, and minimal environmental impacts. Structural considerations are being researched, but the market for these materials is not well defined. There are many other technologies currently in early development to meet the growing need for composites recycling.

Other considerations

Going beyond the technology options, the sustainability and economics of wind turbine blade recycling rests heavily on logistical considerations. Availability of a major transportation network is a critical cost variable. Also important is proximity to intermediate processing facilities for size reduction and aggregation of composites from different sources, as well as proximity to central recycling facilities. Although wind farms are concentrated largely in Texas and north through the Midwest, that distribution may change as more states adopt wind power, and wind farms move off-shore. Because the volume of decommissioned wind turbine blades is currently low and dispersed across the U.S., it is likely that the blades will have to be combined with other sources of composites (e.g., boat hulls) to achieve a sustainable recycling paradigm.

Where do we go from here?

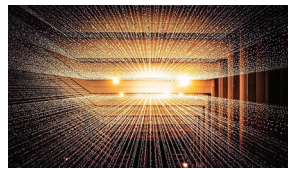
Given the explosive growth in renewable energy, it is important that we get out in front of the end-of-life issues. More research is needed for:

- o Continued development of promising and new technologies for end-of-life management of wind turbine blades
- o Rigorous techno-economic assessments to compare feasibility and economics of the various end-of-life management options
- o Collaborative development of a commercial-scale facility capable of front-end processing of composites scrap from multiple industries
- o Communications to inform policy development with sound technical information

As the power generation industry increasingly relies on renewable energy sources, the ultimate goal is to develop sustainable management practices that minimize environmental impacts once a blade has made its final rotation.

Brandon Fitchett is Senior Project Manager at Electric Power Research Institute. The information above is based on the EPRI report "Wind Turbine Blade Recycling: Preliminary Assessment" (Report 3002017711), which is available at no cost on the EPRI website. The report was authored for EPRI by the American Composite Manufacturers Association.

Electric Power Research Institute /// www.epri.com



Software solution leveraging lidar and turbine data for power performance testing

Leosphere, a Vaisala company, announced the launch of WindCube Insights, a proprietary data analytics software designed specifically for the WindCube Nacelle (previously called Wind Iris) nacelle-mounted lidar that simplifies the wind turbine power performance testing process. WindCube Insights enables true and fully transparent data analysis and reporting for WindCube Nacelle customers, within a web-based user interface. The software enables the upload of both WindCube Nacelle lidar and supervisory control and data acquisition (SCADA) turbine performance data with a simplified data synchronization process. The WindCube Nacelle lidar measures the wind conditions at hub height ahead of the turbine, enabling operators and wind turbine original equipment manufacturers (OEMs) to efficiently and accurately assess performance and optimize design and production efficiency. When fully integrated within the wind turbine, Windcube Nacelle enables load reduction, design costs reduction, and continuous production gains.

Leosphere, a Vaisala company /// www.leosphere.com

SAFE LIFTING & TRANSPORTING



Secure solutions for the wind power industry



Round Slings

Chains

Since 1935

Web Slings

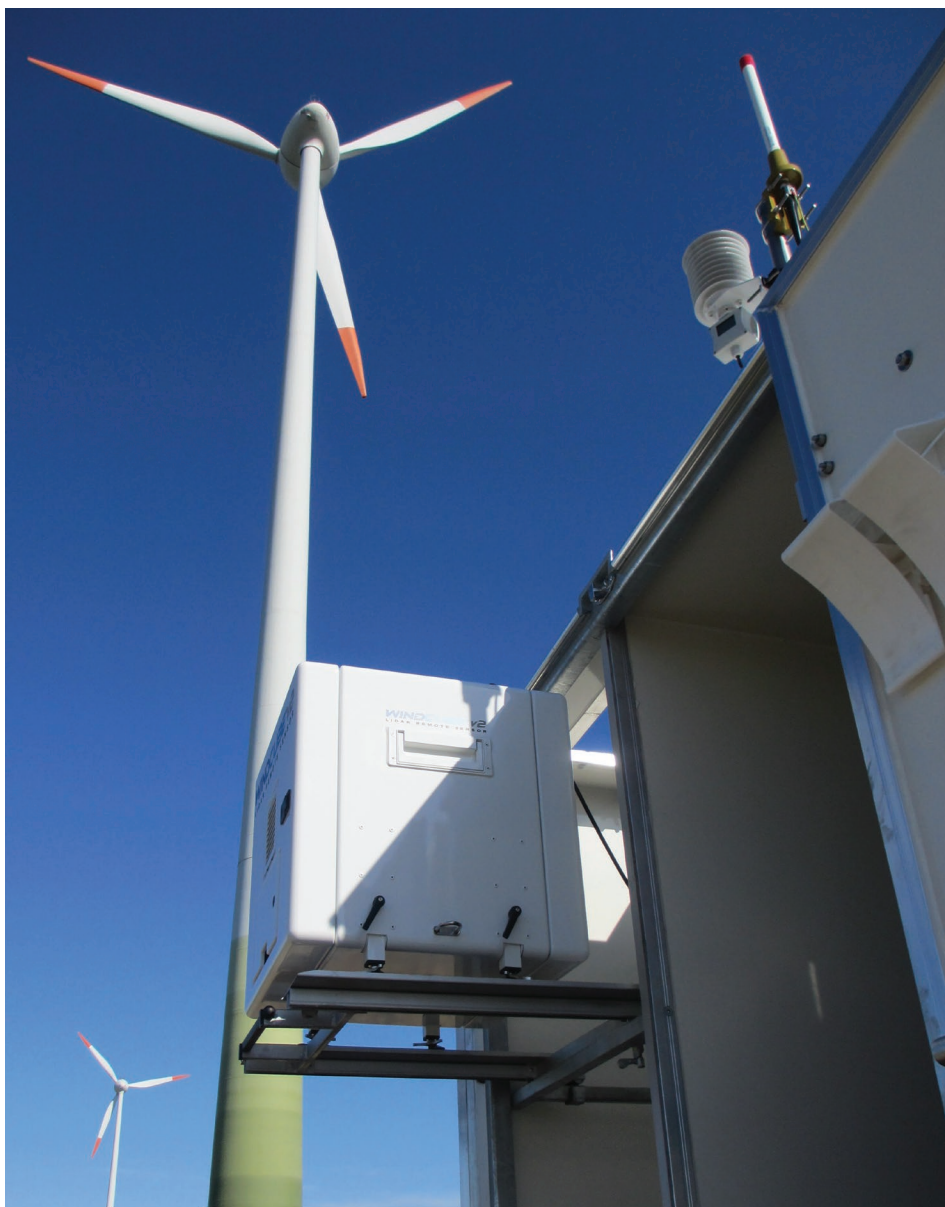
Steel Wire Ropes

Rigging Hardware

Doleco USA, Inc.
400 Oser Ave., Suite 1650
Hauppauge, NY 11788

T: 203-440-1940
sales@doleco-usa.com
www.doleco-usa.com





How Tech is Driving Wind Success Post-Pandemic

by Ameya Paseband

THE GLOBAL SPREAD OF COVID-19

is causing serious problems in many industries across the country. Millions of Americans have been infected with the novel virus, and countless businesses are feeling the negative impact. With authorities restricting large gatherings of people to prevent the virus' spread, companies across industries have been forced to find new ways of keeping their businesses moving forward while still adhering to social distancing restrictions.

Despite news that renewables are outpacing coal for the first time (in terms of electricity production), many renewable energy projects are being delayed. Effects of the pandemic have dried up capital and disrupted supply chains. In fact, some 40 percent of wind and solar capacity scheduled for the rest of 2020 has been held up.

The wind energy industry specifically has been experiencing supply shortages due to the uncertainty from COVID-19. Nonetheless, many companies continue to advance their wind measurement and wind farm prospecting efforts through the use of remote sensing technologies.


Light detection and ranging (lidar) sensors have been used in wind farm measurement for more than a decade, but the pandemic is only now underscoring the essential value these remote sensors provide wind prospecting projects.

Saving time through remote sensing

Before the first turbine even starts producing energy, a significant amount of time goes into the development process; energy yield assessments begin with at least one year of wind measurement to estimate production over the lifetime of the wind farm. Because precise knowledge of the windspeed is necessary - to know how much energy will be produced, and whether the turbines will survive on the selected site - accurate wind data is crucial in the development of wind farms.


Traditionally, companies employed standard meteorological masts (met masts) to accurately gather the critical wind information to achieve maximum value from their investment. Unfortunately, deploying a met mast requires time to obtain permits, and then more time for installation. In the unprecedented times that we're in, just securing a permit has been challenging for wind farm developers, delaying the onset of measurement by weeks or months.





TP&L
Management Solutions

THE POWER OF QUALITY


Your all-in-one resource for all transportation needs. We tediously manage logistics for all shipments, both domestic and foreign. Streamlining the entire supply chain process for your company so shipments arrive economically, safely, on time and to the quality standards set by the manufacturer.

<p>Services & Capabilities</p> <ul style="list-style-type: none"> • Distribution Services • Inventory Management • Rail & Trucking Logistics • Indoor/Outdoor Storage • Maintenance 	<p>North American Locations</p> <ul style="list-style-type: none"> <li style="width: 50%;">• Phenix City, AL <li style="width: 50%;">• Casper, WY <li style="width: 50%;">• Grand Forks, ND <li style="width: 50%;">• Enid, OK <li style="width: 50%;">• Ross, ND <li style="width: 50%;">• Levelland, TX <li style="width: 50%;">• O'Neill, NE <li style="width: 50%;">• Harlingen, TX <li style="width: 50%;">• Parsons, KS <li style="width: 50%;">• Pueblo, CO <li style="width: 50%;">• Garden City, KS
---	--

TPANDL.COM • (307) 337-2672



Plus, as turbines grow bigger and reach higher, companies are finding that building, permitting, and installing the correspondingly high met masts and instrumentation is becoming increasingly cumbersome, risky, time-intensive, and expensive. Additionally, wind and other renewable energy projects tend to require face-to-face meetings with communities, permitting authorities, and government bodies, all of which can be difficult to arrange in the age of social distancing.

Lidar sensors measure the full wind regime and characteristics of the wind flow, including windspeed, wind direction, and turbulence. Not only are they the best method of quickly obtaining measurements, but installation can be completed in just hours. Additionally, the sensor instantly tracks wind measurements at a distance of more than 200 meters — well beyond that of a traditional met mast. Even better, because lidars are mobile, compact, and deploy in a straightforward and easy manner, if developers need to move the sensor for extra measurements, they can do so quickly and easily without requiring a permit or building a tower.

Social distancing and smaller teams with lidar

From complex terrain to demanding offshore environments, lidar sensors are easy to maneuver and set up. With social distancing requirements complicating the installation of wind measurement technologies, it's important that organizations consider doing more with less staff. During our current health crisis, that means using fewer people on the job to increase safety and limit the spread of COVID-19.

While the installation of a traditional met mast uses upward of eight individuals (due to the more complicated assembly), installing lidar sensors for wind measurement can require as few as two trained installers. And, where met mast installation can take three days to complete, ground-based lidars for measurement of simple terrain install in just one day. Nonessential travel restrictions and the shuttering of hotels across the country have made the logistics of met mast and remote sensing installations especially challenging. However, with less staff involved in launching the lidar wind measurement tools, arranging shelter for those smaller teams becomes much easier.

At the end of the day, obtaining accurate wind information is vital in order to receive approval to finance a new development project. Utilizing remote sensing during this time enables the rapid and safe procurement of wind data needed to acquire funding and remain on schedule. Lidar's ease of installation not only makes the process faster, it also requires fewer people to get the job done. With lidar continuing to push the industry forward in the midst of a global pandemic, the wind industry is poised for success in this new normal, and should stay on track to emerge stronger than ever.



Ameya Paseband is a Renewable Energy Engineer for Leosphere, a Vaisala company. He works on lidar applications in aviation, wind energy, and meteorology. He is also an experienced trainer who has worked with many diverse customers in over 20 countries. As a field engineer for Leosphere, he has worked on various lidar applications during all stages of a wind project.

Leosphere /// www.leosphere.com

Vaisala /// www.vaisala.com



Managed rack mount ethernet switches

Antaira Technologies' LMP-2602G-SFP and LMX-2602G-SFP series are industrial-grade equipment that is Ethernet ready to fulfill various markets' networking applications in harsh industrial environments. These devices support high-density Ethernet port connectivity, wide bandwidth, long-distance data transmission, and have a superb reliability factor. Some applications require using a ring technology for complete redundant network designs. Antaira's LMP-2602G-SFP and LMX-2602G-SFP series uses ERPS or G.8032 which is an open ring architecture. This permits the use of various other Antaira switches as well as other manufactures like Cisco participating in the ring. Open standards give the network architect the flexibility to design an efficient network without being tied to one manufacturer. Fiber interfaces used in both ring and non-ring applications give the ability to extend a network out past traditional buildings, across campuses, and even towns. At the same time, it can be difficult to maintain the networking equipment when they are located a far distance away. Managed switches are critical in controlling and predicting failures on the network as well as determining when and where issues reside.

Antaira Technologies /// www.antaira.com



Flange fitting station for onshore and offshore wind towers

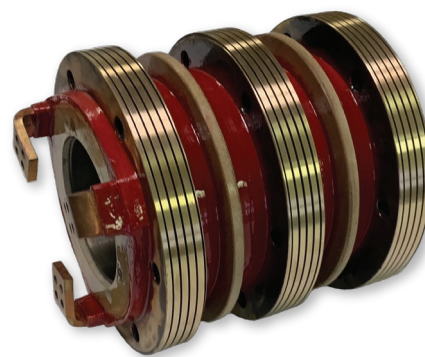
With PEMA FF station, flange fitting is possible without turning the shell, and thus cranes can be released to other tasks. Also, the amount of repairing is minimized as there is no need for lifting clamps. With PEMA FF station, the production time for flange fitting and welding is reduced while the quality of fit-up only increases. The station can be integrated with PEMA Column&Boom, which enables welding to be done in the same place. The integration significantly increases the easiness and efficiency of manufacturing, and it's been proven successful also in offshore wind tower foundation production.

Pemamek, Ltd /// www.pemamek.com



ELECTRIC MATERIALS COMPANY

Supplier to OEMs, aftermarket, and wind farm owners.



**In-house
engineering, quality,
and metallurgical support.**



- ◆ Reverse-engineering capabilities
- ◆ Slip Ring Assemblies (brass and steel rings)
- ◆ Copper busbar
- ◆ Copper earthing clamps/cable clamps
- ◆ Copper and copper-alloy extrusions, castings, and forgings
- ◆ AC rotors, DC commutators, and DC busbar systems
- ◆ CNC machining and plating to customers' specifications.
- ◆ ISO 9001:2015 certified

800-356-2211

www.elecmat.com

sales@elecmat.com

Is U.S. Offshore Wind Ready to Take Europe's Lead?

by Aneesh Prabhu

While Europe has seen profitability and investor interest increase significantly over recent years, its U.S. counterpart has yet to provide an economic case. With an ocean between them, yet similar goals, how exactly do their approaches differ?

To date, offshore wind has been a largely European endeavor, with the region accounting for roughly 80 percent of the world's offshore capacity at the end of 2018. Large European utilities dominate the offshore market, providing an important advantage with regard to project and supply chain management. In stark contrast, the U.S. currently has only one offshore wind farm in operation. Additionally, offshore has yet to demonstrate its profitability on this side of the Atlantic. This could be about to change, however, thanks to increasing investor interest that suggest sector growth is in the cards.

From strength to strength

While offshore wind still accounts for just 1 percent of the European energy mix – amounting to 20GW installed by the end of 2019 – the past decade has seen significant growth. Favorable pricing mechanisms, lower costs of capital, and excellent operator execution have kept costs markedly low, while significant increases in capacity are on the horizon. Recently updated national energy policies and government commitments, across several different countries, reveal a total of 90GW in planned offshore capacity in Europe – with the lion's share coming from the U.K and Germany.

Of course, European power prices have declined dramatically in 2020, as the coronavirus lockdown and a historically mild winter came together to reduce power demand. Though the pandemic has dampened demand as we head towards a global recession, offshore wind is, so far, proving resilient from a credit

perspective. The big European players have all seen their credit ratings affirmed, with extra support from the EU's commitment to a greener COVID-19 recovery (via the European Green Deal).

It's not all good news for offshore developers, though. Traditionally, projects have been supported by feed-in tariffs or other supporting pricing mechanisms, leading to enviable equity returns. Nevertheless, as the technology matures and costs fall, governments are adopting more advanced, market-based ways of supporting development. It has now become commonplace to award contracts for offshore-wind projects through reverse auctions in which bidders compete by accepting lower subsidies. So, while the evolving situation may ultimately lead to the end of double-digit returns in the sector, the development of cheaper and more efficient technology will see the sector continue to move forward.



Be a Good Neighbor.

Keep the Lights Off.



ON-DEMAND OBSTRUCTION LIGHTING FOR DARK SKIES COMPLIANCE

DeTect's HARRIER™ Aircraft Detection Lighting System (ADLS) is the most widely used with installations in the US, Canada & Europe.

- Meets all US FAA*, Canada NAVCAN & EU requirements
- Compatible with all turbines, SCADA networks & lighting systems

Find Out More at detect-inc.com

*US FAA TechNote DOT/FAA/TC-TN17/58



U.S. still catching up

On the other side of the pond, the economics are less favorable. The infrastructure-related risks of venturing into deeper waters are considerable. But they are not the only obstacles; levelized costs of energy (LCOE) remain significantly higher for offshore than for competing renewables technologies, and lack of a track-record means operations and maintenance (O&M) costs remain significantly higher than they do in Europe.

Yet investor interest in U.S. offshore has grown. Certainly, the aggregate pipeline of more than 26 GW in offshore wind capacity in federal lease areas has given impetus to investors, with a boost from the potential for further cost declines. According to the International Energy Agency (IEA), global average overnight capital costs (including transmission) are projected to decline to US\$2,500/kW by 2030, from US\$4,350/kW in 2018. Roughly half of the savings will come from efficiency gains achieved through fewer and larger turbines. Efficiency gains are contributing to offshore wind's claim to being more reliable than other renewable sources. Offshore wind already enjoys higher capacity factors than its onshore equivalent, and more stable hourly variability when compared to solar power.

There are overlaps, too, between existing onshore and offshore infrastructure that have the potential to drive costs down. As such, it's unsurprising that some oil majors are also offshore wind developers. The IEA estimates that about 40 percent of full lifetime costs of an offshore wind project have synergies with the oil and gas sector.

Offshore wind is making waves on both sides of the Atlantic. Although the U.S. is clearly lagging behind its European counterpart, the challenges facing global power markets – whether from the pandemic or from volatile prices – could very well give added impetus to the energy transition. While Europe looks to make offshore wind a key component of its energy mix, it's still unknown whether the U.S. can surmount the considerable challenges that currently render offshore uneconomical against alternative sources.



Aneesh Prabhu is Senior Director, Infrastructure North America for S&P Global Ratings, a credit rating agency that publishes financial research and analysis on stocks, bonds, and commodities.

S&P Global Ratings

/// www.spglobal.com



The wind energy industry has matured. So has its technology.

Leosphere's WindCube series is the most recognized and trusted suite of lidar technologies on the market. With several lidar types available, WindCube assists companies around the world in all phases and types of wind farm projects.

They are leading with lidar.

- Improve bankability and project success
- Streamline power performance testing and other crucial tasks
- Move offshore with confidence — and better data

vaisala.com/leadwithlidar

Photo: University of Oldenburg_For Wind_J_Schneemann



Secure large diameter bolted joints

Heico-Lock's Heico-Tec's internal design elements vastly improves the elasticity of a bolted joint, lowering impacts of dynamic stress and resulting in an application's longer life span. Designed to ISO 898-2 standards, the Heico-Tec tension nut replaces any comparably sized hex nut from the same strength class. Also, due to the attainment of highly accurate preloads, design engineers can use Heico-Tec tension nuts to reduce the size and number of bolted joints in an assembly, potentially lowering both cost and weight. Both on the factory floor and in field conditions, technicians only need a handheld torque wrench and standard sockets to safely and quickly achieve accurate bolted joint tightening. Users can avoid heavy, costly, and time-intensive measures found in traditional electric, hydraulic, or pneumatic tightening methods. Heico-Tec tension nuts are also suitable for areas where workspace is restricted. If a technician can get a handheld torque wrench into a tight space then they can correctly tighten the bolted joint.

Heico-Lock /// www.heico-lock.us



Updated harness line

The VOLT harness line is designed to provide fall protection and comfortable work positioning for those working on towers or inside wind turbines. Both models, the VOLT and VOLT WIND are easy to put on and take off with FAST LT automatic buckles on the waist belt and leg loops. The lightweight and breathable material on the wide, semi-rigid waist belt and leg loops maximizes air flow while also providing support. Storage systems on each shoulder strap for the fall arrest lanyards keeps the connectors stored away and, in the event of a fall, will release so the absorbers can deploy. The VOLT model, designed for work on towers and antennas, is constructed with equipment loops along the waist belt for easy tool organization. The VOLT WIND model, designed for work inside wind turbine towers, has a dorsal wear protector to reduce wear along the straps. In addition to the harnesses, the seat for VOLT harnesses was also updated to provide more comfort while working in suspension.

Petzl /// www.petzl.com



Fall protection harness focussed on comfort

Pure Safety Group (PSG) has introduced the new Checkmate Xplorer industrial full body harness for fall protection to the U.S. market. The harness, designed to be more comfortable during periods of suspension and frequent loading, features visual alert stitching, an intuitive way for the user to understand the correct way to wear the harness. Its limited slip dorsal D-ring has a precise amount of vertical adjustment built in and is designed to keep the D-ring in place after multiple loadings. Its large front ring allows for multiple attachments, and uses a lightweight aluminum quick-connect buckle to ensure a safe final connection. Hardware on the Xplorer is specifically designed to be ergonomically suited to the product's functions, reducing wear on the webbing, allowing easy connections, and providing critical pivot points for a greater range of motion. For maximum comfort, the harness features unique curved webbing that follows the contours of the body for a closer fit and an innovative sub-pelvic assembly for greater support and increased comfort during suspension. The Xplorer meets or exceeds the requirements of OSHA 1910.140, OSHA 1926.502, ANSI Z359.11-2014, EN 361:2002, EN12277:2007 Type A, and EN358:2000.

Pure Safety Group (PSG)

/// www.puresafetygroup.com



Fast cleaning of infectious PPE

SKYLOTEC's decontamination agent, Rescuclean S1, is virucidal with limited effect and also fights the corona virus SARS-CoV-2, the trigger of COVID-19 infections. SKYLOTEC's product range not only includes harnesses, ropes, and clothing, but also solutions for the correct treatment and cleaning of PPE, such as Rescuclean S1. The decontamination agent can be used immediately, dilution is not necessary in advance. Rescuclean S1 is suitable for hand washing of PPE which is not machine washable. It is either applied directly to the piece of equipment to be cleaned or the PPE is placed completely in the solution. The strength and service life of the cleaned PPE is not negatively affected. Rescuclean S1 is virucidal with limited effect, and kills all known corona viruses undiluted within one exposure time. This is the result of extensive laboratory tests carried out by the supplier of the decontamination agent. Thus, an effect against the novel SARS-CoV-2, which causes the COVID-19 disease, can be assumed. Rescuclean S1 is available in 5-litre containers. It is not classified as a hazardous material, so can be transported without safety restrictions. After the cleaning process the PPE should be rinsed with clear water and dried. This means it can be used again by persons comparatively quickly. This is an important factor in times like this current crisis, when PPE is quickly out of stock and can sometimes have long delivery times.

SKYLOTEC GmbH /// www.skylotec.com



Heavy-duty cutter line

Enerpac recently released a series of five cutters. EB-Series Bar Cutters consist of hydraulic and electric tools that quickly and easily cut through heavy-duty metal bars with durable, long-lasting blades. User safety is enhanced with the controlled cutting process that produces minimal spark and vibration risk. Typical bar cutting applications include round metal bar including up to number 14 rebar. EFB-Series Flat Bar Cutters are able to easily cut flat or rectangular metal bar within seconds. The durable, long-lasting blades offer longevity and less down time. The deep cutting head design accommodates metal bar up to 2 3/4" (70mm) high and over 1/2" (15mm) thick. ECC-Series Chain Cutters are a safe and simple solution for cutting industrial chains. The cutting process takes place behind a protective transparent shield, enhancing safety for users and bystanders. EWC-Series Wire and Cable Cutters offer a quick and clean way to cut cable and wire rope. The controlled cutting process enhances operator safety and produces minimal vibration to help prevent HAVS (Hand Arm Vibration Syndrome). EDC-Series Decommissioning cutters feature a set of large and powerful shear-style blades. These versatile tools are able to quickly cut through a large variety of materials including metal tubes, cables, profiles and similar materials. Complementing the new Enerpac Cutters is a specially adapted ZE6-Series pump. The ZE-6 Series pumps generate the precise flow needed to provide a combination of speed and power to those cutter models that require an external hydraulic pump. A 20ft. twin hose (sold separately) provides mobility, and easy access to applications. Cutter operations are controlled directly from the tools.

Enerpac /// www.enerpac.com

Composite Tooling for Windmill Blades

LARGE SCALE | HIGH QUALITY | PRICE COMPETITIVE | ON-TIME DELIVERY



- ▶ Patterns, Molds, Plugs
- ▶ Precision 5-axis machining
- ▶ Composite Fabrication
- ▶ Engineering Services

www.janicki.com
360.856.5143





Wind power converters for high power DFIG application

Ingeteam has launched its new-generation wind power converters developed for high power DFIG application. Ingeteam's DFIG converter series offer cost-optimized products for each market and application. The wind converters are grid-friendly, and include FRT, SCR, and SSR features, enabling them to be deployed anywhere in the world. The new DFIG converters can be modulated to bring customized solutions that will effectively minimize wind turbine LCoE. Ingeteam's design processes combine development and validation to ensure the supply of optimized DFIG Power Converters in the wind market for high power applications in the range of 6 to 8MW. The overall design ensures high-quality performance with regards to reliability, availability, and maintainability. They are versatile and interact with a wide range of grid connection situations, regardless of the particular local grid codes and conditions.

Ingeteam Group /// www.ingetteam.com



Optimized lifetime extension and early detection of damage

Wölfel Wind Systems has extended the existing SHM. Tower product with an inclination sensor in the foundation. SHM.Foundation provides the ability to detect tower and foundation damages at an early stage. Using methods of artificial intelligence (AI) and including EOC/SCADA data, a precise monitoring of the damage progress is possible. In addition, the system provides information on natural frequencies and the consumed lifetime. This allows a reduction of visual inspections and an optimized lifetime extension.

Wölfel Wind Systems

/// www.woelfel.de/en

CTC GLOBAL

How the use of ACCC[®] Conductor is Helping Combat Climate Change

Between 2005 and 2010, the newly introduced ACCC[®] Conductor was used to increase the capacity of 3,500 circuit kilometers of transmission lines in a handful of countries. Today, over 30,000 circuit kilometers of ACCC Conductor are in service in 52 countries. While the ACCC Conductor was initially deployed to increase the capacity of existing transmission lines to alleviate congestion, mitigate sag clearance violations, accommodate load growth and enable the integration of renewables, its improved conductivity is also reducing electrical line losses which serves to reduce fuel consumption and associated CO2 emissions—subsequently helping combat climate change.

Based on the International Energy Agency's "Global Energy & CO2 Status Report" of March, 2019 (using 2018 data), which reports that the average CO2 emissions created from all combined sources of generation is 475 grams (1.047 pounds) per kWh, the ACCC Conductor is currently reducing CO2 emissions by over 2.6 million metric tons per year. This is the equivalent of removing nearly 600,000 cars from the road. The cumulative CO2 reductions saved via the use of the ACCC Conductor exceeds 12 million metric tons.

To put this in perspective, consider the cost of purchasing 600,000 electric cars. Assuming they were powered by 100% renewable energy and the cost per vehicle was \$30,000 dollars, that would represent an \$18 billion dollar investment. Assuming the average cost of installing ACCC Conductor is \$100,000 per circuit kilometer, the all-in cost would be \$2.7 billion dollars – a fraction of the cost, with arguably far greater benefits.

While the efficiency of the grid previously had taken a back seat to the efficiency of generators, transformers and demand side appliances, entities such as the Asian Development Bank and World Bank are now funding transmission projects not only to support economic development, but also specifically to achieve emission reduction objectives.

This is a very good thing and CTC Global is ramping up its production to meet the challenge. Please give this some thought as you contemplate upgrading your transmission system. If you'd like more information please call us or email info@ctcglobal.com



CTC GLOBAL

CTC Global Corporation

2026 Mc Gaw Avenue
Irvine, CA 92614

+1.949.428.8500 | www.ctcglobal.com



Easily lift heavy loads

The new Enerpac SL400N Super Lift Hydraulic Gantry achieves high capacity and lifting height with an efficient footprint. The SL400N can lift up to 400 metric tons (first stage) with a 7.7m lifting capacity on a standard 2ft track. By being able to stick with this slender track gauge, the unit can easily be moved around existing obstacles. Operators can spend less time navigating impediments or moving them and use less resources to mobilize and demobilize the equipment. Other Enerpac innovations which make the gantry safe and easy to set up and operate come standard. Each gantry leg has a built-in hydraulic pump which eliminates trip hazards by eliminating the need to connect hoses and makes the equipment easier to set up. Powered by the Enerpac Drive System, the self-propelled rollers allow for synchronized travel, continuous movement, and require less space and track. Synchronized movement maintains safety because having significant difference in leg position can lead to load imbalance, damage to equipment, or accidents. With Enerpac Intellilift, users have a safe, easy, and reliable way to operate the gantry. With no cables, there are no tripping hazards or risk of incorrect connections. Wireless controls save time during set up as there are no cables to connect. Plus, it allows unrestricted operator roving position, synchronized movement, and has built in safety alarms.

Enerpac /// www.enerpac.com

Lubricants and Greases

An important part of the planned maintenance of a wind turbine, proper lubrication will help keep the machinery working well for years. Keeping a wind turbine's gearbox properly lubricated is essential to extending the life of the turbine. Herein we highlight some of the solutions available on the market today...

OILS



Hydrotex

Product: SYN-Nth Gear Oil

Application: SYN-Nth Gear Oil maximizes gearbox reliability. Its protection against gear scuffing and micropitting has been documented with FZG testing and field-proven in wind turbines. Its high oxidation stability extends drain intervals. Guaranteed ISO 4406 cleanliness: 16/14/11.

cSt @ 40°C: 390 cSt

cSt @ 100°C: 43.6 cSt

Viscosity Index: 167

www.hydrotexlube.com



AMSOIL, Inc.

Product: Synthetic Power Transmission EP Gear Lubricants

Application: AMSOIL PT Series Synthetic Power Transmission EP Gear Lubes are designed to provide protection for wind turbine and other industrial gearboxes requiring EP protection, such as those found in the textile, paper, steel, cement, plastic, and lumber industries. AMSOIL PT Series Gear Lubes are formulated to meet the listed standards and requirements.

cSt @ 40°C: 326.7 cSt

cSt @ 100°C: 34.8 cSt

Viscosity Index: 151

Pour Point: -36°F (-38°C)

Flash Point: 473°F (245°C)

www.amsoilwind.com

GREASES



Motion Industries

Product: CRC Sta-Plex Extreme Pressure Premium Red Grease, 14 Wt Oz

Application: A multi-purpose certified lithium complex grease recommended for many uses including bearings, and all moving and sliding surfaces to reduce friction in extreme environments.

Applies for use in industrial mining, metal production, machining, plastic molding, pumps, electric motors, ball and roller bearings, kilns, assembly plants, drying ovens, trucks, automobiles, buses, construction equipment, off-road operations, tractors mowers, reapers, and water pumps.

cSt @ 40°C: 200 cSt to 260 cSt

cSt @ 100°C: 16.5 cSt to 19.5 cSt

Viscosity Index: 85

Pour Point: 5°F (-15°C)

Flash Point: 475°F (246°C)

Dropping Point: 500°F

Soap Type: Lithium

PAO: Synthetic

NLGI Grade: 2

www.motionindustries.com

Take Your Career To New Heights

With Composite Windblade Repair Training



ABARIS
TRAINING

Advancing Composite Technology Since 1983

+1.775.827.6568
www.abaris.com

Drones

Ensuring the continual performance of renewable energy assets requires a systematic approach to maintenance, repair, and monitoring. In order to prepare a comprehensive maintenance plan, inspections must be performed to determine faults and failures, whether through sensing technology, photographic evidence, or human interface.

Advances in technology are rapidly changing the way the industry conducts this business. The evolution of drones and artificial intelligence technology have developed into increasingly accurate methods of inspecting equipment, analyzing, and reporting generated data to produce actionable planning for scheduled maintenance, effective budgeting, and reducing urgent repairs.



Nearthlab

Product: Autonomous drone for smart defect detection and analytics using AI

Description: Nearthlab's autonomous drone enables safe and hassle-free inspection for both onshore and offshore wind turbines. Nearthlab's all-in-one cloud platform allows efficient management of inspection data.

Industries: Wind

Services: Inspection, Drone-as-a-Service

Pilot: FAA Part 107 exam

Autonomous: Intelligent pathing, blade aware

Image capture: 46 mega pixel

Inspection time: 15 minutes

Flight features: Hover capability, autonomous detection

Safety features: Geofencing, GPS redundancy, collision-tolerant, emergency landing

Software: 3D mapping, LiDAR, interactive, deep learning

Data analysis: Consultants, analysts, AI (predictive analytics)

www.nearthlab.com



CLOBOTICS CORPORATION

Product: Clobotics Windspector - Autonomous Drone Inspection Solution

Description: Clobotics' Windspector is an end-to-end solution combining autonomous drones, artificial intelligence, cloud-based data analytics, and asset management for automated inspections of both onshore and offshore wind turbines.

Industries: Wind

Services: Inspection, Drone-as-a-Service

Pilot: FAA Part 107 exam

Autonomous: Intelligent pathing, blade aware, no predefined path

Inspection time: Under 25 minutes

Flight features: Hover capability

Safety features: Geofencing, GPS redundancy, emergency landing

Software: Modelling, LiDAR, interactive, AI algorithms

Data analysis: Analysts, AI (predictive analytics)

www.clobotics.com



Exo Group, LLC.

Product: Structural Engineering and Inspection Services

Description: Exo performs structural assessments on vertical infrastructure ranging from steel T&D assets to composite pole and blade components. They use the latest UAS technology to capture inspection data that their asset experts can turn into actionable insight.

Industries: Wind, solar, T&D

Services: Inspection, maintenance, Drone-as-a-Service, infrared, thermal imaging, beyond line of sight (BVOL)

Pilot: FAA Part 107 exam

Autonomous: Intelligent pathing

Flight features: Hover capability

Safety features: Geofencing, GPS redundancy, collision-tolerant, emergency landing

Software: Interactive, cloud-based asset GIS portal

Data analysis: Consultants, analysts

www.exoinc.com



Civdrone

Product: Autonomous construction layout and stakeout

Description: Autonomous marking drones and rover that can stakeout up 4000 coordinates a day using robotics and advanced RTK systems

Industries: Wind, solar

Services: Surveying, Drone-as-a-Service

Pilot: FAA Part 107 exam

Autonomous: Intelligent pathing

Flight features: Hover capability

Safety features: Geofencing, GPS redundancy

Software: (3D mapping, CivPlan mission planners)

www.civdrone.com



National Roofing Partners

Product: AI-Powered Roof Assessment

Description: NRP has reinvented commercial roof condition analysis with a smart, safe, and accurate way to analyze roofs. Available nationwide

Industries: Solar, commercial

Services: Inspection, surveying

www.nationalroofingpartners.com



Microdrones

Product: mdTector1000CH4 aaS

Description: mdTector1000CH4 aaS consists of a Pergam gas sensor, mounted and integrated with a Microdrones md4-1000 UAV. It has an onboard HD video link, so users can see in real time what the laser sensor is detecting.

Industries: Inspection, construction, engineering, surveying, emissions, safety

Services: Natural gas line surveys, tank inspections, gas well testing, landfill emission monitoring, plant safety

Pilot: FAA Part 107 exam in USA

Autonomous: Fully automated mission execution and realtime mission monitoring using mdCockpit

Length of operation/inspection time/downtime: Varies depending on project parameters

Flight features: md4-1000 robust, powerful, stable and dependable Tri-blade quadcopter airframe

Safety features: GPS, self-test, GPS homing (automatic return to base), automatic landing, virtual fence, real time error messages, automatic emergency landing in case of battery or control problems

Software: LiDAR, mdCockpit, mdInfinity

Data analysis: mdTector Viewer App: Visualize methane detection levels, post flight on a map, via an intuitive, easy to use Microdrones Android app

www.microdrones.com



DroneUp

Product: Equipment, financing, flight services, training & consulting, research & development

Description: Across the global landscape, DroneUp delivers innovative solutions that enable drone operations with value and effectiveness. At the core of their business is their pilot network hosted by their in-app Mission Match technology that allows them to connect business and government organizations to drone pilots. They connect clients to drone software and service solutions to meet their demands for intelligent data challenges with efficiency, reliability, and safety.

Industries: Commercial industry, public sector, public safety entities

Services: Construction, property, pavement, equipment inspections, progress monitoring, elevation and thermal, site data analysis, 3D modeling, marketing, individual and group training, waiver creation, program development, documentation and collaboration

Pilot: Pilots in the DroneUp network must be FAA Part 107 Certified to apply or claim missions in-app. Credentialing processes and verification of all pilots are mandatory for SOW and each is reviewed by the Flight Operations Team

Software: The DroneUp App can be found on both the Google Store & Apple's iTunes

www.droneup.com

Safeguarding Our Storage

by Michael Mo



It's happened to everyone – you order a new laptop computer, or maybe those remote power tools, and everything is fine. Then, at some point, it wears out or gets damaged or it's just time to replace it and you feel a little stuck on what to do with the old battery. So, what do we do? We keep them, simply because we don't know what else to do with old, used up lithium-ion batteries.

We know we're not supposed to just toss them in the garbage. If we do, they end up in landfills where they can leak toxic materials or trigger dangerous chemical fires. That's no good.

Some cities have battery and technology recycling programs and drop off centers. But those programs are largely inadequate and usually only in the cities and larger towns, (those that can afford to run them), leaving out massive chunks of the battery-consuming public.

Moreover, the battery reclamation programs and facilities that do exist put the burden on the consumer to find them and get their old battery packs to those locations. Even the cities with the best programs, the ones that will come and pick up batteries, make customers call for an appointment. And we all know consumers – every step you add makes the behavior you want less and less likely.

As a result, millions of old or used battery packs sit in bins in someone's garage, or bagged in their closet – just because every other option is nonexistent, dangerous, or burdensome. That's bad all the way around.

For starters, old batteries are dangerous. Age, along with vibration, damage and frequent cycling – the charging and draining of batteries – are among the biggest factors in the battery failures that can lead to fires and explosions. In other words, keeping piles of old batteries tucked behind your winter coats or oil-soaked rags is not a good long-term policy.

Lack of an easy disposal and recycling process for old lithium-ion batteries is also a problem because it makes batteries, and the things they power, more expensive.

That's essentially a market problem. Not enough old batteries going into a reuse system means that those systems are exceedingly difficult to scale and, therefore, unprofitable. Lack of profit opportunity means lack of investment to bring



the costs down. Which means, down the line, that every new device that uses lithium-ion battery is almost certain to be using a brand new one – new labor, new factories, new materials and so on. And many of the minerals and materials that go into a lithium-ion battery, like graphene and lithium, are neither cheap nor easy to get. Getting new product every time gets expensive.

It's not just a financial burden, but an environmental one, too. The continued mining of the materials used in a battery, with little or no recycling, is a bad policy.

With all that risk, cost, inconvenience, and environmental impact building up from not having a decent way to recycle and reuse lithium-ion batteries, the real stumbling block may be surprising: shipping.

Because batteries can be dangerous, no one wants to load them into trucks that rattle down highways or, perhaps deeply frightening, onto airplanes. This puts the burden back on consumers (to hand-deliver their old batteries to centers) and on cities (to transport them).



You see, new batteries, like the ones that come with your new laptop, are more stable on account of the fact that they are not old and are always shipped below 10 percent charge. That means they don't carry much energy. It's also why, when your new product arrives, you need to charge the battery. Old batteries, however, can be faulty or damaged. And there's no guarantee any one battery is not still 90 percent charged – packing a real punch should it fail by igniting its neighboring batteries into a fireball.

Therefore, if we can find a better way to ship old batteries - a safe way to pack them, so if they do fail, the danger is contained – we can unlock an entire supply and recycling business. If the big shipping corporations could find safe packing materials, then battery and device makers would be able to start including those materials as postage-paid mailing bags, returning old batteries directly to processing centers. Congress or other rule-makers may even insist on it.

The good news is that a battery-proof shipping package may be on the verge of reality. In fact, it's already here. The technology is sound, and the commercialization is in progress. In a recent joint venture, NASA sent storage bags to the International Space Station. These bags are designed to store laptop batteries, limiting any fires in case they fail. And in May, a licensing agreement was reached for a major shipping provider to use this NASA technology expressly for shipping old, damaged, or returned batteries. That's a first step in getting them in the approval process for major shipping companies.

Will safe shipping for old batteries trigger major investments in battery recapture and recycling? Maybe. Perhaps even probably. There are simply too many devices – medical equipment, electric cars, marine gear, cell phones – to think that we're going to rely only on new batteries and battery material forever. Getting our old batteries from one place to another – out of our homes and into major reuse pathways – is the biggest step to making that happen.

Michael Mo is the CEO of KULR Technology, (OTC: KULR) which is a development partner with NASA and other space and defense companies. KULR's proprietary, space-used carbon architecture is the core of their thermal management products for energy storage and high-value electronic components.

KULR Technology

/// kulrtechnology.com



Residential inverter improvements

SolarEdge is upgrading its StorEdge inverter by transitioning to HD-Wave technology and providing a new backup interface. The new StorEdge inverter is designed to support connection to backup generators or up to three StorEdge inverters with each DC coupled to two batteries. SolarEdge has also launched a new backup StorEdge interface that raises available backup power and eliminates pre-defining loads for simplified energy management.

SolarEdge /// www.solaredge.com

The Difference Is Like Night & Day



Deka
unigy II

When it comes to energy storage for renewable power applications, don't settle for just any battery and be left in the dark. Deka Unigy II batteries offer the most reliable and cost-effective solution for systems 1,000AH and above.

Technology & Benefits:

- 20 year design life for reduced maintenance costs and lowest cost per cycle
- MicroCat™ catalyst that lowers float current, decreases internal temperatures and reduces risk of dry-out
- Reduced parallel strings for smaller footprint, increased reliability and better charging efficiency
- A manufacturing process that includes over 250 quality checks for consistent, reliable performance

MADE IN USA with U.S. and Imported Materials

Buy USA For Highest Quality & Quickest Availability

FROM THE MAKERS OF ...

Deka
SOLAR
PHOTOVOLTAIC BATTERIES

800-372-9253 • MKBATTERY.COM
MK Battery – An East Penn Manufacturing Co. Subsidiary

Everything You Need to Know About SGIP in 2020

by Aric Saunders



IF YOU'RE A CALIFORNIA HOMEOWNER INTERESTED

in energy storage, chances are you've heard of the Self-Generation Incentive Program (SGIP). The SGIP rebate is a state incentive for homeowners looking to install a home battery system, either with or without solar. To help strengthen its ongoing efforts in wildfire resiliency, the California Public Utilities Commission (CPUC) has approved an extension of SGIP, which includes a new budget and modified incentive programs totaling over \$1.2 billion for those in the fire-zones of California.

SGIP offsets most, or in some cases all of the cost of energy storage projects in high fire threat areas that are sited at disadvantaged and low-income residences, as well as for medically vulnerable customers. This rebate allows these populations to utilize energy storage, and gain a reliable source of power when electricity is shut off during planned and unplanned outages.

Here's how to qualify:

1. Equity Budget - Incentive Amount: \$850/kWh - Low-Income Zones
 - a. Low-income or customers in a disadvantaged community, Qualified Census Tract, Empowerment Zone, or Enterprise Community.
 - b. Customer was previously designated eligible for CSI's Single-Family Affordable Solar Homes (SASH) Program.
2. Equity Resiliency Budget - Incentive Amount: \$1000/kWh - High-Risk Fire Zones
 - a. Residential customers in a Tier 2 or 3 high-risk fire zone or two or more PSPS events AND
 - b. Meet Equity Budget requirements;
 - c. All medical baseline customers in these areas, or
 - d. Customers that rely on electric pump wells.
3. Small Residential General Market - Incentive Amount: Step 6 - \$200/kWh, Step 7 - \$150/kWh - Qualified Census Tracts
 - a. All homeowners who are serviced by PG&E, SCE, or SDG&E electrical or gas service.

Some additional provisions include:

- More than \$1 billion to fund the SGIP for the next critical fire season and subsequent years (2020-2024).
- A higher chance of more money granted for customers with medical needs and impacted communities during PPS events.
- Targeting Tier 2 and Tier 3 high fire threat districts (where there is "extreme" and "elevated" risk of fire) and disadvantaged and low income customers, medically vulnerable households, critical services facilities, and low income solar program customers. CPUC's decision also extends eligibility to customers affected by at least two prior PPS events.
- Eligibility for customers who were affected by the last two PPS events.
- Eligibility for customers relying on wells with electric pumps.
- For those residents who do not meet the requirements above, the SGIP can still cover a percentage of the costs. For example, if you have a smart home battery backup system, SGIP states that you're eligible for an incentive rate of \$250/kWh incentive (\$2,625 in total).

The savings don't stop there. If you are planning to marry your energy storage system with a solar PV array, you can capitalize on a 26 percent federal investment tax credit (ITC). The SGIP gives all Californians the opportunity to conserve the environment while also conserving some of their hard-earned money.



Aric Saunders is the Executive Vice President of Sales and Marketing at Electriq Power, a Northern California-based supplier of a lithium-ion smart home energy storage solution.

Electriq Power /// electriqpower.com



Asset performance management solutions for power transformers

ABB's Power Grids business has launched its APM Edge solution for transformers to accommodate the growing complexity of grid operations to safeguard energy reliability and resilience, all whilst reducing capital investment and operational expense. The new software solution for asset owners, helps to enhance the operational performance of power transformers and lowers the total cost of ownership. The solution is part of ABB's Digital Enterprise and transformer service portfolio and has been created by merging its historic domain expertise in power transformer design and service with its Asset Performance Management (APM). APM Edge delivers real-time data to power producers and users on the current and future operational health of their transformer assets. This offers actionable intelligence to inform capital investment and maintenance strategies while reducing production downtime. These prognostic capabilities, for example, enabling customers to more accurately forecast when a critical asset like a transformer is likely to fail and model alternative planning pathways. Through a deeper knowledge and understanding of their assets, APM Edge allows asset owners to expand transformer availability with lower maintenance costs, transition to condition-based maintenance strategies and better prioritize their capital investments. APM Edge includes condition-based prognostic horizons and risk profiles alongside simulation tools that extend an operator's monitoring and diagnostic capabilities into the future, from the fleet level all the way to individual transformer assets.

ABB Power Grids /// www.abb.com



THE DAYS OF A SIMPLY NEEDING AN INVERTER **HAVE CHANGED**



RIS 30/60



RIS 50



RIS 125



RIS 250



RIS 500



RIS 1000



RIS 2000

Rhombus complete Site Inverter Systems Deliver:

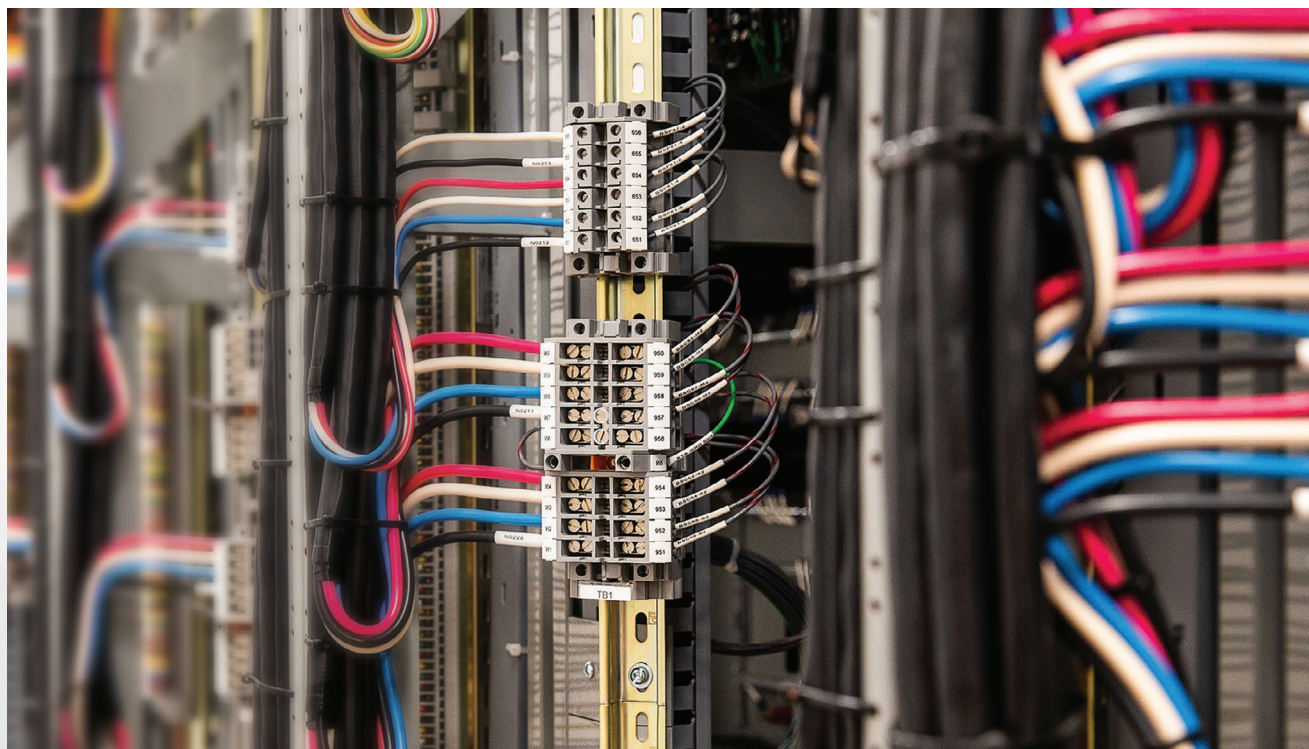
- Maximum flexibility with optional power stages that can be configured in multiple ways
- Integrated VectorStat® site controller that can be configured as a mesh or "hub and spoke" SCADA configuration
- Integrated utility grade meter system Multi-mode, multi-port, utility interactive bi-directional Inverter for on and off-grid connections
- Power converter for distributed energy resources in grid or island mode
- Resiliency designed multi-point communications to remote equipment
- Integrated isolation transformer
- Wide input voltage range
- Direct air-cooled

VectorStat® Integrated Site Controller Includes:

- Feature rich, distributed architecture with industrial grade encryption
- Software platform and databases with industry proven open-source modules
- Persistent key value and time based database which runs on VectorStation™ hardware or VectorCloud™
- Open to customer-designed "applets" for customized applications
- Includes MODBUS, CAN, USB, RS-485 interfaces
- VectorStat® nodes can be connected to disparate equipment and included in network
- UL 1741 SA Certified and SunSpec® compliant

How to Succeed in EPC Project Delivery

by Phillip O'Connor



If you're in the market for a comprehensive energy storage installation, it makes sense to seek out companies that offer a turnkey solution. If you're the one supplying the solution, guaranteeing a successfully completed project is far from simple.

Every business aims to ensure a favorable project outcome. Long before signing a contract with an end user, however, any full-service engineering, procurement, and construction (EPC) firm must consider their value proposition at the early stage of each proposal, so as to meet the objectives of the client requirements. Once an EPC firm decides to develop a response to a request for proposal (RFP), the primary objective is to establish a highly compliant proposal. Several factors have to be considered for a successful project outcome to include company resource availability:

- Company competitiveness
- Understanding the project risk profile
- Developing a risk mitigation plan
- Establishing a project team that is qualified to execute the contract

Lead EPC firms are typically confronted with challenges on how to best deliver the project within a tight timeline (on average, between 1 to 2 weeks). This process can require engagements that include the execution of various legal documents, including non-disclosure agreements (NDA's), exclusive teaming agreements, and single project and/or program joint venture agreements.

During a proposal phase, the EPC firm must be prepared to submit a number of deliverables at their own expense, such as engineering design work, project execution plans, project schedules, financial estimates, organizational charts, employee qualifications, red lined contracts, equipment specifications, etc. Top tier regulated electric utilities and well-established independent power producers tend to conduct proposal reviews using multiple criteria and the input of several stakeholders. Standard protocol dictates that review committees be formed by the end user. These generally consist of subject major experts in engineering, and often times will include third party consultancies that provide unbiased expert judgement and recommendations on technical robustness of the EPC firm's offer.

If there is no prior relationship with the end user, an EPC firm has limited time to establish credibility. This can often be addressed through the process of obtaining pre-qualification status outside of a project RFP. Commercial reviews are typically handled by separate teams, and require detailed review



NOW AVAILABLE

CE+T has partnered with e-On Batteries to release the industry's first dual DC Smart Grid interactive turn-key energy storage system.

With over 90 years combined Power Electronics experience CE+T and e-On installed the largest behind the meter Energy Storage System in the Oncor service territory in 2017. The companies have continued to build on their combined strengths to develop and deploy industry leading Energy Storage Systems.

- Scalable 30kW/64kWh system
- Integrated Grid Forming Control System
- Designed and Assembled in the U.S.
- Plug & Play functionality
- LiFePo4 Cell Level Monitoring through proprietary BMS System
- Built in energy arbitrage capabilities
- Energy peak shaving capabilities
- UL1973, UL1741SA listed
- UL9540 Compliant
- California Energy Commission Approved/SGIP Compliant



EV Charging



Datacenter



Telecommunications

www.cet-energysolutions.com



www.e-onbatteries.com



are also subject to auditing and monitoring, which requires additional project staffing to manage and supervise. Stiff penalties can accrue if an EPC firm falsely advertises these goals only to fall short during the project execution. Established EPC firms must be invested in these programs, with strategies in place to include identifying qualified disadvantaged business and the mentoring of these enterprises. In Canada, for example, it is not uncommon to have limited ownership in aboriginal business to ensure that project participation by remote aboriginal communities is maximized.

The EPC firm should also weigh the staffing of skilled trades and local labor market conditions. These decisions do not necessarily have to be solved at the time of the proposal. Once a contract has been signed, however, and the project team is planning to mobilize, the difference between a successful and unsuccessful project outcome will be largely based on the quality of the workforce. If this area of the project is mismanaged, an EPC will have a short stint in the energy storage business.

Lastly, EPC firms have had to quickly adapt to delivering battery energy storage projects during the middle of the latest major health crisis. The National Electrical Contractors Association (NECA), in partnership with Electri International, published research on “Pandemics and Construction Productivity: Quantifying the Impact”, which highlights these impacts from an electrical contractor’s perspective. From now on, it will fall on the EPC firm to accurately establish any impact that the COVID-19 crisis will have on labor productivity with the skilled trades, and to provision these impacts on new proposals from a cost perspective. Obviously, additional costs in PPE, lost time to review health and safety plans, and revising work plans will require extra time and money before any contracts can be executed. The legal challenges will be in distinguishing between force majeure delays and delays that may come with both schedule and financial recovery. The ability to procure building permits is another part of the risk management plan for any EPC firm. Carefully understanding the intricacies of all the risks involved is what will separate the successful EPC from one that ends up having to exit the industry.

of legal documents, exclusions, clarifications, payment terms, and penalty clauses. Project specific execution plans add value for the client, as their main purpose is to outline all facets of the project delivery; they help convey an EPC firm’s understanding of the main project objectives to reduce project risk for all parties.

Developing clear financial plans will align project funding requirements, ensuring that project stakeholders have funding at various stages, and that the owner or developer is capitalized (with their lender or their internal funds) to fund the EPC scope of work. It is highly recommended for clients to vet the financial strength of their EPC firm and key vendors - a project stress test prior to engagement can identify any financial risks before entering into a contract. Health and safety departments evaluate historical safety performance of their EPC partner using EMR, TRIR, and OSHA 300 logs. Demonstrated knowledge in quality control is also heavily weighted in proposal review. The end user should ensure that QA/QC systems deployed by the selected EPC firm are measurable, and include verification systems in the installation services being performed, as well as hold points and governing standards that ensure materials, equipment, and commissioning procedures are in place.

Clients are increasingly evaluating the EPC firm’s ability for local content participation, and for their project to include diverse businesses (such as aboriginal staffing, and enterprises owned by women, minorities, and disabled service veterans). In some cases, these requirements can represent a sizable portion of the overall offer, exceeding 30 percent of the contract value. These engagements



Phillip J. O’Connor is Department Manager, Northeast US Utilities at Black & McDonald, an integrated, multi-trade service provider that delivers high quality construction, facilities management, and technical solutions.

Black & McDonald

/// www.blackandmcdonald.com

ampner.com




**The #1 in
power rating
and power
density**

**Ampner
ACE™
300
PV/ES**

- 1500 Vdc inverters for photovoltaic and energy storage applications
- 333 kW at 690 Vac
- Ambient operation range from -40°F to +140°F
- Up to 13,000 ft above sea level
- UL/CSA certified
- SunSpec Alliance™ compliant
- Available from Q1/2021

Visit booth #3724 at SPI



INVERTERS | STATION SOLUTIONS
EXPERT SERVICES ON CONNECTING RENEWABLES TO THE GRID



Flexible AC coupling option with a simple firmware update

Recently, OutBack Power released an AC coupling firmware update to its SkyBox hybrid inverter. AC coupling is suitable when users have an existing solar PV system and want to add batteries for backup and time-of-use energy management. By adding a SkyBox hybrid inverter and energy storage to an existing grid-tied PV system, owners can keep their arrays and even enlarge them, meet new code requirements, and power their buildings with clean energy. Once the SkyBox hybrid inverter and batteries are installed, an icon appears on the SkyBox screen whenever a new firmware version is ready for installation. The user can simply press the icon and follow the on-screen instructions to install the firmware. A true hybrid energy system, SkyBox hybrid inverter provides both reliable energy back-up in the face of utility shutdowns and helps customers navigate new pricing structures and electrical codes with their existing arrays intact. Simply, SkyBox addresses a need in the market for energy flexibility. OutBack Power updates its SkyBox hybrid inverter firmware regularly to introduce new features. Past firmware upgrades include stacking, to allow two SkyBox hybrid inverters to be used in the same system, drop-down battery presets for streamlined installation, and external current measurement which enables energy management for the whole home. This last feature eliminates external charge controllers and communication boxes, significantly cutting solar and energy storage installation time and cost.

OutBack Power Technologies, Inc.

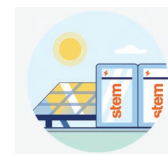
/// www.outbackpower.com



Premium grid-optional commercial energy solution

Peerless-AV announces a product partnership with Blue Planet Energy to develop the Blue Ion LXHV, a premium grid-optional energy solution that brings together a wide range of sustainable energy options to power critical infrastructure and businesses. Through a ruggedized, custom enclosure manufactured by Peerless-AV, Blue Planet Energy's non-toxic battery system and an integrated site controller, the product provides reliable energy for resilience projects that are built independent of, or in conjunction with, the utility grid. These include applications where energy is absolutely critical, like emergency services and healthcare facilities, or prohibitively high-cost, such as regions with expensive utility rate structures, or where business continuity during grid outages is imperative. The Blue Ion LXHV grid-optional energy solution enclosure is built to withstand and thrive in the tough situations. Features of the solution include a fire-safe battery chemistry and built-in battery management system; an integrated site controller accessible via a touchscreen on the enclosure or an app; a tunable cooling system and eco-friendly reusable and washable air filter; and easy installation and serviceability features like the zero displacement door hinge and removable top service entrance. The Blue Ion LXHV is a 125kW/128kWh system that is easily expandable in 32kWh increments to 2+MWh, with a 21-year life expectancy (8,000 cycles). The system also includes a pre-tested and pre-configured battery inverter and flexible microgrid control software allowing for optional integration with generators, renewables, or the grid. Blue Planet Energy solutions are available in various locations around the world, with installations in California, Hawaii, Puerto Rico, Mexico, and beyond.

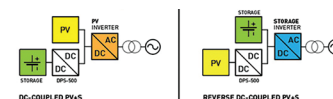
Blue Planet Energy /// www.blueplanetenergy.com



Energy storage online certification program

Stem, Inc., announced the debut of Stem University, an online certification program that provides required educational classes and tools for solar companies that are in the Stem Partner Program to gain expertise in storage. Stem's Premier and Certified Partners are required to complete Stem University coursework in three initial distinct certification tracks: sales, sales analytics, and deployment. Additional certifications in commercial operations, product, and back up power will be added to Stem University. Once a partner has one or more employees who have completed these tracks, they will become officially "Stem Certified." To continue in the Stem Partner Program, certifications must be renewed annually.

Stem, Inc. /// www.stem.com



Reverse DC-coupled PV + storage

Dynapower is currently delivering two DC-coupled PV+S configurations to help power the evolution in solar plus storage. In the standard DC-coupled PV+S, a grid-tied PV inverter with energy storage (BESS) is coupled to the PV array through a DC/DC converter (Dynapower's DPS-500) and is well suited for exporting power to the grid. Reverse DC-Coupled PV+S ties a grid-tied bi-directional energy storage inverter with energy storage directly to the DC bus. PV is coupled to the DC bus through a DC-DC converter (Dynapower's DPS-500). Reverse DC-coupled PV+S is most often well suited for microgrid application because of its inherent ability to efficiently provide safe and reliable power to an islanded microgrid. While the standard configuration is suitable for the majority of DC-Coupled solar plus storage installations, Reverse DC-Coupled PV+S has a number of benefits to consider.

Dynapower

/// www.dynapower.com

GROUND SCREWS? REFUSAL HOLES? HELICAL ANCHORS?

Rock Drilling Attachments Get the Job Done.

wordrockdrills.com | 1.336.584.6700

2020 ENERGY EFFICIENCY BUYERS GUIDE

Image provided by:
naak, Inc. // www.naak.io

DIRECTORY

ALBEDO GROUND COVERING

B2B EQUIPMENT EXCHANGE

BATTERY MANAGEMENT SYSTEMS

BIPV

CABLE PROTECTON

COMPONENTS

CONSULTING SERVICES

ELECTRICAL

ELECTRICAL WIRE, CABLE,
& CONNECTORS

ENCLOSURES

ENERGY MANAGEMENT

ENERGY MONITORING

ENERGY STORAGE

EV CHARGER

FANS & VENTILATORS

FLOATING SOLAR PLATFORM

GENERATORS | GENERATOR
COMPONENTS

HYBRID INVERTER

HYDROGEN GENERATORS | WATER
ELECTROLYSES

INTEGRATOR | EPC

INVERTERS

LIFTING SLINGS

LIGHTING

MANUFACTURE | INSTALLATION
EQUIPMENT

MICROGRIDS

MICROINVERTERS

MODULES

OFF-GRID SOLAR

PERFORMANCE MONITORING

PERFORMANCE TESTING

PERSONAL PROTECTIVE EQUIPMENT

RADIANT HEATING

SCREENING TECHNOLOGY

SITE ASSESSMENT & FORECASTING

SOFTWARE

SOLAR DISTRIBUTOR

SOLAR MOUNTING

SOLAR PLUS STORAGE

SOLAR THERMAL MANUFACTURING
& EQUIPMENT

TESTING EQUIPMENT


TOOLS

TRANSFORMERS

VALVES

WIND MEASUREMENT

Albedo Ground Covering



Beckett Solar Energy

Sprayed on the ground, Terra Pave Top-Seal Albedo products are 100% eco-friendly liquid soil stabilizers that permanently bind and transform the ground into a concrete-pavement-like-layer. Top Seal White Albedo achieves the albedo of snow (0.81), and delivers ~15% more from bifacial panels. Developed by University of Texas at Austin, the product has recently been named Finalist in NREL's American Made Solar Prize.

www.beckettsolar.com

B2B Equipment Exchange




EnergyBin

EnergyBin is an online business community of vetted PV professionals who buy and sell wholesale solar equipment on a secure and transparent platform. Over 90% of equipment for sale is new and under warranty. Buyers can send RFQs to members to receive multiple quotes. Sellers can position inventory in front of new buyers. Members can network with industry professionals for business opportunities. Solar companies from across the supply chain are members of EnergyBin.

www.energybin.com

SATICSHIELD | Filter Your Power

POWER PERFECT BOX



Reduces Electromagnetic Fields (EMF) & Dirty Electricity associated with solar inverters while lowering amp draw on energy hogs.

- EMF Reduction
- EMI filtration
- THD filtration
- Made in USA
- 10 Year Warranty

(406) 830-3226 www.saticshield.com

Battery Management Systems



Nuvation Energy

Nuvation Energy's Stack Switchgear (SSG) provides an integrated battery stack management solution that includes all the hardware and software required to integrate a battery stack into an energy storage system (ESS). Each SSG unit contains Nuvation Energy battery management system modules and is designed to be used with other products in the Nuvation Energy battery management system family.

www.nuvationenergy.com

BIPV



Ergosun Integrated Solar Roof Tiles

Available worldwide, Ergosun Integrated Solar Roof Tiles afford homeowners the look of a traditional roof with the benefit of low light solar power generation. The Ergosun Integrated Solar Roof is an easy installation concrete roofing product that can be installed simply by any traditional roofing contractor. Powering homes around the globe, Ergosun is committed to providing homeowners with reliable renewable energy without sacrificing a home's aesthetic.

www.ergosun.com

Cable Protection



AEROSUSA INC.

AerosUSA, Inc.

AerosUSA's high performance cable protection systems protect wiring in harsh environments such as solar and outdoor installations. New UL Listed / UL 1660 products complement a wide range of UL Recognized products. Offering maximum UV and IP protection, they are used where ANSI 356 / NFPA 70 and NEC codes apply and are highly flexible and lightweight. Patented one-piece, tool-less fittings provide improved productivity and reliability. These products have been used globally for over 60 years.

www.aerosusa.com

Components



Bal Seal Engineering, Inc.

Bal Seal Engineering, Inc. designs and produces sealing, connecting, conducting, and EMI shielding solutions that improve the performance and reliability of equipment used in wind, solar power, and other alternative energy production. Their solutions enable engineers to prolong service life, reduce maintenance, protect precision components, design more compact, efficient electrical connectors, and ensure consistent current/signal transmission. Their consultative engineering services streamline the design process, improving speed to market. Their products include the Bal Seal spring-energized seal, the Bal Spring canted coil spring, and the Bal Contact electrical contact.

www.balseal.com



EtherWAN Systems, Inc.

EtherWAN's C4G Series is a high performance, low power, ruggedized Dual-SIM 4G router, developed for demanding mission critical applications, connecting network assets and infrastructures in fixed, solar powered, and mobile (vehicle/train/subway/health) deployments.

www.etherwan.com/us



Fusetek

FUSETEK is an independently-owned supplier of CSA-approved circuit protection and control devices. They have been providing products to the Canadian electrical market for the last 35 years. Their solar line includes a wide range of products from trusted brands like SIBA and Littelfuse fuses, IMO drives and controls, and Vynckier fiberglass enclosures to name a few. They carry a substantial inventory to provide fast, reliable delivery for their solar customers.

www.fusetek.com



Schaltbau North America

Schaltbau develops and manufactures electro-mechanical components and driver's desks for railways and industry. Since 1929, they have been responsible for the safe operation of rail services, and today they protect systems in industrial applications for renewable energy, e-mobility, and automation. They follow strict safety standards for their customers, and create safe solutions for their applications.

www.schaltbau.com

SIBA FUSES



SIBA Fuses, LLC

SIBA Fuses ES fuses have been specifically designed and tested for the stringent requirements of energy storage applications and have been utilized by large OEM's globally. SIBA Fuses provides solutions which resolve energy storage protection requirements. SIBA Fuses US Headquarters is located in West Caldwell, NJ. They have a full-time sales and engineering staff, who can assist with time-critical requests.

www.siballc.net

wöhner®



Woehner LLC

QUADRON Panel for photovoltaics is a family of 1500Vdc fuse holders suitable for mounting NH1XL fuses from 50 to 250 amps and NH2XL or NH3L fuses up to 600 amps. Available in bolt-to-bolt configurations, for connecting lugged cables to M10 or M12 bolts on either side of the fuse; or bolt-to-busbar configurations, allowing current to be combined to a metric dimension busbar on the secondary of the fuse, in combiner box and inverter applications.

www.woehner.com

wöhner®



Woehner LLC

Woehner has received a UL listing of its 22x58 fuse holder to the UL4248-18 standard at 80A, 1500Vdc. This fuse holder satisfies the growing trend for parallel strings being fused at higher current ratings in 1500V systems. The AMBUS Panel is IP20 touch-safe and provides a safe, tool-free fuse insertion and extraction, for easy fuse installation and replacement. This fuse holder uses an advanced grade plastic material in the fuse carrier to satisfy the higher operating temperatures associated with PV fuses. Made in the USA.

www.woehner.com

wöhner®



Woehner LLC

SECUR Panel is for North American solar combiner box and inverter manufacturers who build to the UL1741 standard. The product offers a UL4248-18 listing at 1500 volts DC for 10x85 and 14x85 fuses as large as 30 amps. The 10/14x85 fuse holder is suitable for use with both 1500Vdc rated UL2579 listed PV fuses or IEC60269-2 certified gPV fuses. The SECUR Panel is IP20 touch-safe and provides a safe, tool-free fuse insertion and extraction, for easy fuse installation and replacement. This fuse holder uses an advanced grade plastic material in the fuse carrier to satisfy the higher operating temperatures associated with PV fuses.

www.woehner.com

Consulting Services



Electrical Consultants, Inc.

Electrical Consultants Inc. (ECI) is a power delivery engineering firm which brings power delivery services through 500kV to their clients. ECI provides services including: overhead and underground transmission engineering, substation and switchyard design, industrial power systems design, land survey and construction staking, right-of-way services, environmental planning, project management, construction management, and procurement services to utilities.

www.electricalconsultantsinc.com

Electrical Wire, Cable, & Connectors

CTC GLOBAL



CTC Global

CTC Global's ACCC Conductor improves the efficiency, capacity, reliability, and resilience of the world's electric power grid and has been used at over 800 projects in more than 50 countries. The ACCC Conductor offers line loss reductions of 25% to 40% or more. This translates into increased ROI and more.

www.ctcglobal.com



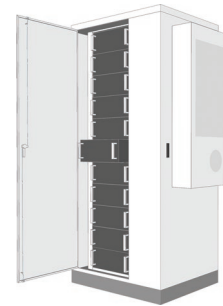
Priority Wire & Cable

Priority Wire & Cable stocks a large inventory of aluminum DC feeder cables PV 2KV, 4 awg thru 1000 MCM, plus 8 and 10 awg copper 2KV string wire in black, white, red, and green. They have supplied wire to over 5GW of projects and can assist in eliminating unexpected costs, and reducing lead time, waste, and labor.

www.prioritywire.com

Enclosures

Sinexcel



Sinexcel, Inc.

The patented outdoor cabinet with HVAC/aux power built-in and pre-wired is compatible with 19" rack lithium-ion battery modules. With or without the 30kW bi-directional storage inverter, it could be used alone or in parallel to enable flexible power or energy demand. Small footprint and double-sides doors allows easy-to-dispatch without limits of space for commercial and large residential applications. Plug-and-play design offers fast and convenient installation and commission for BESS.

www.sinexcel.us

Energy Management



FUERGY

FUERGY is tech company offering complex and tailor-made solutions for energy optimization. The company has developed its own, AI-powered software platform for energy management and modular energy storage system, that not only guarantees outstanding energy savings but also makes renewables an effective and affordable alternative for everyone. With its IoT functionality, built-in power back-up feature, and interconnectivity with EV battery, FUERGY is all-in-one solution for cheap and reliable energy.

www.fuergy.com



Satic Solar

Power Perfect Energy Management Systems are robust line conditioners that deliver real-time amp reduction on energy hogs with negative harmonics distortion (THD) interference (EMI) and electro-magnetic field (EMF) filtration. The robust circuit board integrated design allows it to be small, scalable, and affordable. Every Satic Power Perfect filter is manufactured in the U.S.A. with meticulous build quality, guaranteed performance, and long warranty.

www.saticusa.com

Energy Monitoring



Phoenix Contact USA

Facility managers and distributed energy resource installations now have real-time, remote access to energy data with Phoenix Contact EMpro. This energy meter offers simple configuration and operation, with no special skills needed to install or use. The EMpro tracks energy parameters such as voltage, current, and power at the device or system level. Data can be communicated locally or transmitted to cloud-based services, creating a streamlined IoT-based energy-monitoring solution.

www.phoenixcontact.com/us



Sense

The Sense home energy monitor works like a fitness tracker for the home, telling homeowners what's on, what's off, and how much energy it uses, so they can save money and make their homes more sustainable. The Sense Solar app tracks solar production and energy consumption simultaneously, showing the homeowner in real time how much energy is used in the home and returned to the grid.

www.sense.com

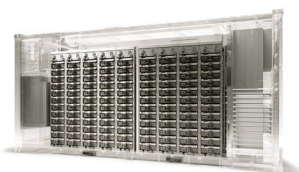
Energy Storage



Smappee

Smappee is an all-in-one energy management system for commercial, industrial, and residential use. Gather data on solar production and energy, gas, and water consumption. Consult the real-time and historical data in a user-friendly app or tailored dashboard. Add smart control and enable automated dynamic load balancing for self-sufficiency and smart EV charging with overload protection.

www.smappee.com



Aggreko

Aggreko's fully integrated, plug-and-play battery storage solutions ensure maximum system effectiveness and efficiency. They have been optimized across every component to deliver system performance, minimize operating costs, and shrink a carbon footprint. Aggreko offers solutions to power a microgrid, add reliability to a hybrid system, and to optimize business cases through smart energy management. The Y.Cube is a ready-to-install energy storage system.

www.aggreko.com



Battery Systems

Battery Systems provides their customers with battery products combined with efficient service, offered at competitive prices in ever expanding markets.

www.batterysystems.net



BlueSolutions

BlueSolutions' globally deployed solid-state Lithium Metal Polymer(LMP) energy storage technology is an advanced solid-state battery and energy storage design with important attributes of safety, high energy density, and high performance. Solid-state technology is insensitive to external temperatures, does not require cooling, and will not be subject to thermal runaway events. The LMP outdoor racks are suitable for hot, harsh environments, and remote locations. Its robust warranty is not subject to operating temperature or depth of discharge.

www.blue-storage.com



BMZ USA, Inc.

A modular, lithium-ion based Energy Storage System, the ESS 7.0, ESS 9.0, and ESS X batteries can store a surplus of collected solar energy for later use and be used for both on-grid and off-grid applications. Energy can either be directed into the storage system or be fed into the public grid via an inverter. The ESS batteries have a usable capacity range from 5.4kWh to 8.05kWh and up to 12 ESS can be connected in parallel. This means meeting the energy storage needs of small residential locations to larger commercial systems is no issue. The ESS are compatible with 48V systems which avoids hassles seen with high voltage. Simple to set up and use, BMZ ESS batteries make energy storage easy.

www.bmz-group.com



The Power Behind Performance



Crown Battery Manufacturing

CROWN1 batteries are engineered and optimized for deep-cycling in renewable energy applications. They are 98% recyclable. Crown's process incorporates recycled lead and plastic, along with green energy from solar panels, wind turbines, and geothermal cooling. To ensure quality, every CROWN1 battery is manufactured at the company's ISO 9001:2015-certified headquarters in Fremont, Ohio, USA. CROWN1 maintenance-free batteries are built using robotic assembly, the industry's heaviest plates, and more active material. This allows for more chemical reactions, enhancing performance and lifespan. Proprietary cast-on-strap systems deliver 100X the precision of manual welding, for improved longevity and reliability. CROWN1 offers 6-, 8-, and 12-volt models with 33-390Ah (20-hour rating) capacities.

www.crownbattery.com



Darfon America Corp.

The Darfon H5001 when paired with its B09ULF LFP battery creates an energy storage system that is efficient enough to qualify for California's SGIP rebate. The H5001 allows homeowners the flexibility of using utility, solar panels, batteries, or generators to match their power and energy needs. The flow of energy managed so that dependence on the utility is reduced or eliminated. The H5001 can also be used as backup power during a blackout or for off-grid living.

www.darfonsolar.com



Dürr Systems, Inc.

Dürr Megtec is a global turnkey supplier of custom single-side or simultaneous two-side coating lines, drying systems, and environmental solutions. Dürr Megtec has developed solutions for applications in lithium-ion battery electrodes, fuel cells, advanced composites, battery separators, solar films, membranes, clean room processes, and others. Its GigaCoater wide-web coating line for lithium-ion battery electrodes provides high-volume production of battery electrodes, with each GigaCoater capable of producing up to 3GWhr of electrode capacity per year on average. Dürr Megtec has also developed an easy-to-use laboratory coating line designed for short production runs. In addition, they offer a complete range of pollution control equipment consisting of oxidizers, solvent recovery systems, and distillation and purification systems.

www.durr-megtec.com



EnerSys

NorthStar BLUE+ Battery by EnerSys applies carbon technology for high cycle life and Partial State of Charge (PSOC) performance. Thin plate technology delivers long life and high power output. The NSB BLUE+ Battery is also UL1989-recognized and flame-retardant to meet UL94V0. It is built in the United States, has a two-year shelf life, offers fast, efficient recharge, and features special plastic components for operation in a wide temperature range. Its product range is 40-210 amp hours.

www.enersys.com



Leoch Battery Corp.

Leoch's 48-Volt Lithium Iron Phosphate (LiFePO4) batteries are equipped with a built-in Battery Management System (BMS) and optional LCD screen for hassle-free maintenance. Leoch high performance models offer 10,000 cycles @ 50% DOD, or 3500 cycles to 100% DOD at the system level. Can be put into parallel for 48VDC, 1600AH capacity.

www.leoch.us



naak, Inc.

Naak delivers optimized energy services for residential and commercial energy consumers, developers, and the grid. They leverage the benefits of behind the meter load control, ensuring energy service offerings are optimized and cost effective. The Digital Loads Panel offers market differentiation, increased customer savings, reduced installation costs, multiplies revenue streams, and ensures outcomes with less risk over the long term. naak provides plug and play battery storage kits with the common brands.

www.naak.io



Nilar, Inc.

The Nilar Home Box enables storage of excess solar energy to be utilized when demand is high or whenever it's needed. This allows homeowners to become energy independent, by increasing self-consumption, reducing peaks in power consumption and minimizing grid fee costs. With water based and non-flammable electrolyte, the Nilar Hydride battery cells offer unique safety benefits. The Home Box offers 6kWh of energy and is modest in size, with the dimensions of 305 x 900 x 945 mm.

www.nilar.com



e-On Batteries, Inc.

e-On Batteries, a Fort Worth, Texas area supplier with national scope, is developer of lithium iron phosphate (LiFePO4) based energy storage systems with a focus on product safety. The company's UL 1973 listed and CEC approved and listed modules are engineered as scalable building blocks to enable larger systems, and its 19" rack-mounted modular systems are easily configured from 12.8kWh residential systems to 4.8MWh container-based systems and more. With over 20 million deployed calls and zero catastrophic failures, combined with cell-level BMS monitoring and control systems, expert engineering liaison and certified installers, e-On Batteries provides full value to their customers.

www.e-onbatteries.com



Creating the Future of Energy



GS Yuasa Energy Solutions, Inc.

The SLR Series is designed for high cycle applications using GS Yuasa's advanced lead nanocarbon battery technology. A nanocarbon additive accelerates the reaction of active material to reduce sulfation. This leads to increased charging efficiency and higher capacity retention over the battery life. The product utilizes GS Yuasa's HT Element X for high heat, long life performance. The SLR product line provides 5000 cycles at 70% DOD and 19 years of cycle life when tested to IEC 61427.

www.gsyuasa-es.com



MK Battery

The Deka Unigy II 2-volt battery from MK Battery is available as either a single cell or system design, and features a wide range of capacities to fit the varied requirements of renewable energy applications. These modules are constructed using quality materials and current manufacturing techniques, enhancing their performance even in demanding applications. Exclusive IPF Technology optimizes power capacity, cell consistency, and long-term reliability. Advanced AGM technology eliminates periodic watering, corrosive acid fumes, and spills. Microcat Catalyst lowers float current, decreases internal temperatures, and the risk of dry-out to ensure long battery life.

www.mkbattery.com



Rhombus Energy Solutions

The Rhombus PCS 30/60 supports dual ± 30 kW DC connections to single 60kW grid AC connection. Integrated isolation transformer simplifies site preparation and deployment. The 30/60 comes with Rhombus' VectorStat energy management system software, giving operators the information required to manage power and energy. Multi-mode, multi-port utility interactive inverter, Bi-directional power converter for distributed energy resources in grid or isolation mode, and integrated isolation transformer.

www.rhombusenergy.com

Rolls

BATTERY ENGINEERING



Rolls Battery Engineering

Rolls flooded 6-volt S6 L16-HC model, and the full Series 4000 Renewable Energy product line, now include the proprietary Advanced NAM carbon additive, delivering increased charge acceptance and efficiency of 10-15%, requiring shorter charge times and improved performance in conditions of partial state of charge (PSOC) commonly experienced in off-grid solar applications.

www.rollsbattery.com

TMEiC

We drive industry



TMEiC Corporation

The TMEiC Solar Ware Ninja inverter system meets market needs for PV-alone, stand-alone storage, or TMEiC's hybrid PV+ESS solution. The inverter's modular and stackable system, along with its multi-block configurations, offers clients high-level PV plant optimization. Offering reliability, bankability, grid-functionality, and efficiency, the Solar Ware Ninja is a solution for PV and storage plants today and the future.

www.tmeic.com

EV Charger



FreeWire Technologies, Inc.

FreeWire's Boost Charger is a powerful battery-integrated electric vehicle charger. Easy to connect with existing infrastructure, it can be set up without costly construction or permitting. With 160kWh of battery capacity and 120kW output, Boost Charger is ready for current and next generation EVs. Boost Charger enables ultrafast charging using the same infrastructure as L2 chargers with a low cost of installation.

www.freewiretech.com

Fans & Ventilators



Continental Fan Manufacturing, Inc.

Continental Fan is a supplier of fans for nacelle ventilation, GCU (generator control unit) cooling, and tower ventilation. Whether axial fans for high air volumes and low pressures, centrifugal blowers for higher-pressure applications or motorized impellers for ventilating electrical cabinets, Continental Fan has the solution.

www.continentalfan.com

Floating Solar Platform



Ciel & Terre USA, Inc.

The floating solar platform, Hydrelio, enables PV panels to be installed on large water bodies such as drinking water reservoirs, quarry lakes, irrigation ponds, or even tailing ponds. It is an efficient, smart, simple, and affordable alternative to ground-mounted solar systems. Hydrelio is particularly suitable for energy and water-intensive industries which can't afford to lose either land or water. Wineries, dairy or fish farms, mining companies, wastewater treatment plants, irrigation districts, and water agencies are examples of organizations benefiting from the synergy this technology creates between sun and water.

www.cieletterre.us

Generators | Generator Components



Electric Materials Company

Electric Materials works with OEM, service centers, and wind farm owners. Customized solutions, engineering, reverse-engineering and metallurgical support offered to supply generator slip ring assemblies (brass and steel rings) and components, generator AC rotors and components, earthing cable clamps, copper extrusions, copper busbars, and cast or forged circuit breaker components (machined and plated). EM is a producer of custom copper alloys required to meet industry specification requirements.

www.elecmat.com

Hybrid Inverter



Ginlong Technologies

The Solis-HVES (High Voltage Energy Storage) maximizes solar-plus-storage benefits with its intelligent, reliable, and secure Smart Home Solution. With a high conversion efficiency (98.4%), the hybrid inverter boosts self-consumption, with flexible operating modes (time-of-use and off-grid backup), enabling time shifting and optimized energy use. It is compatible with LG Home RESU and other 120V-500V lithium batteries to help households lock in energy savings.

www.ginlong.com

ROSENDIN



Rosendin Electric

Battery Energy Storage Systems (BESS) are fast becoming a key component of existing and future renewable energy strategies implemented by utility, municipal, developer and commercial clients throughout the U.S. Rosendin supplies technology agnostic BESS solutions for most all frequency control and regulation, demand response, load shifting, peak shaving, microgrid, and backup power applications.

www.rosendin.com



U.S. Battery Manufacturing

U.S. Battery Manufacturing has been building flooded lead acid batteries since 1926 and manufactures deep cycle batteries specifically for many industries, worldwide. The company's RE Series batteries are designed to provide high peak capacity, long cycle life, and reliability for use in industrial or residential renewable energy applications. RE Series batteries utilize the company's XC2 formulation and Diamond Plate Technology to create an efficient battery plate, delivering high watt-hours per liter and watt-hours per kilogram.

www.usbattery.com



UL LLC

UL's energy storage services help reduce the complexities associated with creating energy storage products and support manufacturers and integrators to deliver safer technologies to market. Their component testing, certification, and surveillance services help verify the integrity of the entire supply chain and help facilitate seamless introduction of products into the global marketplace.

www.ul.com/batteries



Sol-Ark

Sol-Ark 12K is an affordable and powerful energy storage solution with 20kW surge. Two 500V MPPTs built-in for up to 16.5kW PV. Stack up to (9) inverters in parallel and add any generator. DC coupled easy AC couple retrofit to any grid-tie system. 120/240V and 208V 3-phase. Modes include peak shaving, TOU, zero-export, NEM, and smart-load shedding. Modbus, CANbus communications are certified HECO 14H, PREPA, UL1741/SA, CEC, and NEC690.11/UL1699B. This solution was the NREL semi-finalist for the American Made Solar Prize.

www.sol-ark.com

Hydrogen Generators | Water Electrolyses



Nel Hydrogen

Nel Hydrogen manufactures Alkaline and Proton Exchange Membrane (PEM) water electrolyzers, producing 0.27 to 5,000Nm³ of H₂ per hour. Units can be grouped together for larger production rates. Electrolyzers are used to store excess electricity in the H₂ bond. The H₂ can be sold to industry, or run through a turbine or fuel cell to put the stored energy onto the grid during periods of low generation or peak demand. PEM electrolyzers are also used to balance renewable power put onto the grid.

www.nelhydrogen.com

Integrator | EPC



New Dawn Energy Solutions

New Dawn Energy Solutions is an energy technology company that provides solar, storage, EV charging, and energy efficiency optimization solutions to residential, industrial, and institutional customers. They engage in all aspects of energy systems infrastructure, including assessment, design, development, installation, monitoring, and maintenance. Their energy solutions range from off-grid urban homes to turnkey microgrids that are sited on urban rooftops to the remote regions. They are vendor-neutral and take a holistic approach in formulating energy solutions that are best suited for their customers' needs. Their energy solutions include grid-tied, hybrid, off-grid, solar water pumping, and microgrid. Their service solutions include renewable energy system design and integration, project management, energy audits and site assessments, and plant commissioning.

www.newdawn-es.com

Inverters



Ampner, Ltd.

The Ampner ACE 300 PV is a 333kW string inverter rated for 1500Vdc systems. It provides high power density and power rating, withstanding extreme ambient conditions from -40°F to 140°F and installation altitudes up to 13,000ft. Moreover, the ACE 300 PV comes with wide range of options and configurations to suit all customer needs. The ACE 300 PV is certified according to UL/CSA standards and will be available from Q1/2021 onwards.

www.ampner.com



COTEK

COTEK offers five series of pure, sine-wave inverter and inverter chargers for off-grid and backup applications designed to meet the needs of the solar industry. COTEK inverter models range from 200W-4000W with a DC input of 12V, 24V, or 48V. The new SC and SL series of bi-directional inverter chargers come equipped with 5 operating modes and advanced features such as power sharing and current limiting. COTEK also offers standalone inverter and battery charger options through the SP, SD and CX series.

www.cotek.ca

Ingeteam



Ingeteam

Ingeteam's turnkey storage inverter station is a UL 9540 and UL 1741 SA compliant MV solution. Comprising one, two, or three bidirectional battery central inverters for both grid-connected and stand-alone systems, it combines Ingeteam's overall expertise in the power conversion field (+65GW supplied worldwide), plant control technology, and monitoring solutions. With a flexible design, Ingeteam's storage inverter offers a high-power density in a single power block, providing different configurable operating modes. It is available in two different series, 1000Vdc and 1500Vdc (610kVA to 1,640kVA), and features advanced battery control technology which extends the maximum life of the storage system. Ingeteam also supplies the Power Plant Controller and SCADA systems, as well as commissioning and O&M services.

www.ingeteam.com



SolarEdge Technologies

The Energy Hub Inverter with Prism Technology combines the performance of HD-Wave technology and functionality of StorEdge inverter for improved flexibility in home backup while simplifying installation. The solution supports whole home or partial backup with a battery and backup interface (up to 200A), 200% DC oversizing, seamless integration with the Smart EV Charger and future smart energy devices, and provides built-in production/consumption metering.

www.solaredge.com/us

Lifting Slings



Doleco, USA, Inc.

Doleco offers a full line of lifting slings, including web slings, round slings, high performance slings, and a complete line of load securement products including tie downs, mechanical load securement devices, and DoNova textile chain. These lifting slings are lightweight and easy to use, providing an efficient use of manpower and resources.

www.doleco-usa.com

Lighting



Flash Technology

An OEM since 1970, Flash Technology designs and manufactures innovative hardwired and solar obstruction lighting solutions. Their family of wind farm obstruction lights are ETL-certified for FAA, ICAO, CAR 621, and DGAC applications, ensuring compliance and long-term reliability at cost-effective prices. With more than 17,000 wind farm light installations globally, their systems offer permanent and temporary wind turbine lights, MET mast tower lighting, solar obstruction solutions, mounting brackets and surge protection systems. Flash's support services include component-level training, installation, troubleshooting, and maintenance.

www.flashtechnology.com

Microgrids



Sustainable Power Systems, Inc.

Sustainable Power Systems' Universal Microgrid Controller (UMC) is a drop-in control system designed to reduce the cost and complexity of microgrid deployment. It is engineered to meet the needs of a wide spectrum of microgrid configurations, grid-tied or off-grid, eliminating the need for solar project developers to do controls integration and custom programming. The UMC incorporates a real time optimization engine, including load and renewable forecasting, to ensure the lowest cost of energy. In Simulation Mode, the UMC monitors and controls a virtual version of each microgrid component, allowing for system validation and training prior to deployment.

www.sustainablepowersystems.com

Microinverters

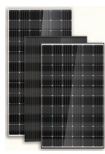


SPARQ Systems

A high-reliability and high performance 1200W Quad microinverter offers microinverter advantages at string inverter costs. SPARQ's Quad has four individual DC input channels that enable independent peak power tracking. Based on a per-watt rating, SPARQ's Quad provides low microinverter cost, high power output, high power density, and low weight.

www.sparqsys.com

Modules



Kosol Energie PVT, Ltd.

Kosol Energie is a manufacturer and wholesale distributor for solar PV systems including mono-crystalline and poly-crystalline PV modules, integrated PV racking systems, solar water pumping systems, and so on. They also offer cost-effective design and engineering services. Additional products include, bi-facial, split cell, flexible, intelligent smart sensor remote control solar LED street light, solar PV thermal collector, etc.

www.kosol.solar



Q CELLS

The Q.PEAK DUO BLK-G6+ is manufactured with larger cells for 6% more power, equivalent to up to 345Wp. It is assembled at Q CELLS' Georgia facility, and offers long-term reliability with a 25-year product warranty and a low degradation rate, guaranteeing 85% initial performance in the 25th year.

www.q-cells.us



Yingli Green Energy Americas

The Yingli solar panel family features differentiated product lines ideal for residential, commercial, and utility-scale projects. They offer in all formats the monocrystalline YLM Series, multicrystalline YGE Series, and both p- and n-type PANDA Bi-facial modules to meet project needs. The cell efficiency on the premium modules reaches up to 22.7%. Service on products is provided by a US based team, who assist in technical advice, project planning, and guarantee to maximize ROI.

www.yinglisolar.com/us

Off-grid Solar



AIMS Power

AIMS Power has created a powerful solar kit for large off-grid or back-up power applications. Includes a 30kW or 50kW pure sine inverter charger, 4950W of solar and deep cycle batteries. Suitable for hospitals, farms, commercial buildings and large homes. Split phase and three phase models in stock. Inverter charger, solar charge controller, batteries, cables, and fuses all included. CE, CED, CSA, UL, and ERAC certified.

www.aimscorp.net



Renogy

The Renogy 48V Inverter Charger + Lithium Iron Phosphate Battery Combo provides users with an off-grid solution. The dynamic inverter charger supports dual charging (AC + solar) and has a built-in MPPT charger, capable of handling PV input up to 4400W. The 48V smart battery is the perfect pair for off-grid energy storage, featuring comprehensive protections, self-heating, and over 4500 cycles. This powerful duo makes for a reliable energy system, suitable for backup or off-grid use.

www.renogy.com

Performance Monitoring



Accuenergy

AcuDC is a specialty energy meter suitable for distribution systems that involve DC power generation. It is used for monitoring solar PV energy generation, wind turbine power generation, power distribution, and other direct current applications.

www.accuenergy.com



Apogee Instruments

Silicon-cell pyranometers from Apogee Instruments are Class C rated and a reliable choice for applications that do not require the higher cost of a thermopile pyranometer. With several outputs available, 20+ years of continuous refinement, and thousands of sensors installed all over world, Apogee sensors are accurate, durable, and cost-effective.

www.apogeeinstruments.com



Cachelan

Cachelan is a solar monitoring solutions company that provides SCADA and DAS systems to help with O&M and Asset Management of solar and storage portfolios via their SolarVu platform. Manage portfolios of residential, commercial/ industrial, and utility sized projects in one place. Receive high fidelity alerts of equipment issues and connect weather sensors, meters, site cameras. Easily compare inverter and string level performance. Cachelan interfaces with all major inverter and equipment manufacturers, and design to minimize their customer's cost.

www.cachelan.com



Continental Control Systems

The CCS Multi-Circuit Meter (MCM) for Modbus measures bi-directional energy, power, voltage, current, etc. for up to 84 single-phase or 28 three-phase circuits. It communicates using either Modbus RTU over RS-485 or Modbus TCP/IP over Ethernet. The MCM provides revenue-grade system accuracy when used with the CCS Accu-CT family of revenue-grade current transformers. Line powered from 100-600 Vac, the MCM provides all the standard features of the WattNode Modbus meter, and is available as a NEMA 4.

www.ctlsys.com



eGauge Systems

The eGauge combines an energy meter, data logger, and a web server. This powerful combination lets users measure, store, and retrieve data directly from the device or from a remote location. Not only does it calculate power (V, A, VAR, kWh, etc), but also data from optional sensors that assess flow rate, temperature, wind speed, and more. Users can view historical and live data for up to 30 years with the unit's convenient user interface (UI). The UI can be accessed on a local network or via the internet from a computer, tablet, or smartphone. Once connected, users have access to real-time values, long-term reports, an interactive graphical interface, and many other tools.

www.egaugenet



EKO Instruments USA

ISO 17025 accredited solar radiometer manufacturer. ISO 9060:2018 Class A Spectrally Flat and Fast Response pyranometers yielding low measurement uncertainties and meeting class A monitoring requirements of IEC 61724-1. All sensors and instrumentation provide onboard diagnostics and data quality assurance features. 5-year warranty and recalibration interval yields low cost of ownership sensors with high performance.

www.eko-usa.com



OTT HydroMet

Kipp and Zonen's DustIQ can be easily added to new or existing solar arrays and integrated into plant management systems. The unit is mounted to the frame of a PV panel and does not need sunlight to operate. It continuously measures the transmission loss through glass caused by soiling, so that the reduction in light reaching the solar cells can be calculated.

www.otthydromet.com



Solmetric

The Solmetric PV Analyzer I-V Curve Tracer measures the performance of modules and strings up to 1500V and 30A. The wireless irradiance and temperature sensor captures environmental conditions at the time of the I-V sweep. Sophisticated software instantly determines the performance factor, fill factor, Isc, Voc, Imp, Vmp, Pmax, current ratio, and voltage ratio. Careful thermal management inside the tool ensures high measurement throughput enabling large systems to be commissioned quickly.

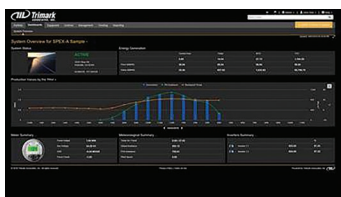
www.solmetric.com



Spectrafy Solar Sensors

Spectrafy Solar Sensors supplies spectrally enhanced ISO9080:2018 Class A rated irradiance sensors. Remove spectral noise from plant metrics, reduce performance uncertainty, track degradation, and quantify benefits of competing technologies.

www.spectrafy.com



Trimark Associates, Inc.

Trimark offers products and solutions that ensure the continuous, efficient operation of utility-scale power sites. These systems, including Trimark's robust Vantage SCADA interface, enable site owners to monitor, manage, and control all aspects of energy production. The visibility and alarms offered by Vantage immediately alert users to any issues arising at their site, saving them time and money. Vantage interacts with numerous systems and devices, including revenue meters, MET stations, battery energy storage systems, and more, to give users a complete picture of their site's operations.

www.trimarkassoc.com

Performance Testing



McHale & Associates, Inc.

McHale & Associates, Inc. is a specialized engineering group providing plant performance improvement services. They deliver solutions to increase productivity, quality of operation, and profitability by providing quality services in the areas of risk mitigation, performance optimization, and project/technology validations through analysis and testing.

www.mchale.com

Personal Protective Equipment



Kenzen

Kenzen has launched a real-time Cloud-based worker heat monitoring system that includes a wearable device worn by workers that alerts both the worker and their supervisor when core body temperature is too high. Alerts allow for immediate intervention to keep workers safe from heat injuries. The wearable monitors heart rate, activity, skin, and ambient temperatures. Data allows for real-time prediction of core body temperature.

www.kenzen.com

Radiant Heating



Electro Plastics, Inc. / STEP Warmfloor

STEP Warmfloor are flexible and durable heating elements made of PTC self-regulating, Nano Poly Carbon material. This heating system is very energy efficient and safe, operates on low-voltage, AC or DC, and can be used for floor warming, total heating, snowmelt, and roof deicing.

www.warmfloor.com

Screening Technology

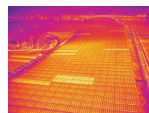


SPALECK USA, LLC

SPALECK USA was founded in 1869 and now offers screening machines, flip-flow-screens, 3D-combi-flip-flow-screens, mobile screens, dewatering screens, vibrating conveyors, infeed units, stainless steel screening machines for chemical and food applications, and customized solutions.

www.spaleck-us.com

Site Assessment & Forecasting



Raptor Maps, Inc.

Aerial thermography and Raptor Maps' AI-enabled data post-processing platform offers valuable insights into a system's performance. They accurately and efficiently identify, localize, and prioritize site anomalies. Their technology enables O&Ms, EPCs, and engineering firms to reduce risk, improve resource allocation, and decrease costs. Raptor Maps has analyzed over 20GW of solar PV through turnkey inspections and in-house drone support.

www.raptormaps.com

Software



Burnham Nationwide, Inc.

The BurnhamEYE is an inspection and documentation app that covers all aspects of a solar installation. The app directs the installer to gather information through a series of geo-tagged and time-stamped questions and photos. This information can be used to make an accurate assessment without having a 3rd party inspector physically at the site. As an additional service, their qualified team of inspectors will review the data and provide an unbiased and comprehensive report. These structured and consistent reports can be used as proof of workmanship for potential new clients or retained as record should future issues arise. The BurnhamEYE documentation can be done as soon as the installation is complete and before the installer leaves the site thus eliminating unnecessary and costly truck rolls.

www.burnhameye.com



energyOrbit

energyOrbit provides an easy-to-use solution for DSM and electrification management, tracking, reporting, and customer experience. Utility and third-party implementer DSM managers can quickly set up, modify, and execute energy efficiency, demand response, electrification, and water conservation programs, partnering on climate change. They offer an easily configurable database, robust framework for extensive DSM measures and equipment libraries, and customizable workflows and validation rules.

www.energy-orbit.com



HOMER Energy by UL

HOMER provides Economic Optimization Software for hybrid onsite generation. HOMER simplifies the process of understanding the lowest cost solution when considering the use of multiple energy generation and storage technologies. The software allows the user to consider the use of solar, wind, grid, generators, fuel cells, and any type of storage.

www.homerenergy.com



RatedPower

pvDesign is a cloud-based software to carry out the design and engineering of utility-scale (>1MW) solar PV plants, reducing the process from weeks to seconds. With pvDesign, users can perform different simulations, optimize the layout of projects, carry out feasibility studies, and generate all the relevant engineering documentation for EPC/permitting processes. The platform enhances designing in a fast and accurate way, allowing users to easily compare and manage all their projects.

www.ratedpower.com



Terabase Energy

The Terabase Platform is a powerful web-based tool to accelerate large scale solar project development decision-making from siting through to design optimization. Find a suitable site, then design and optimize the project, all via a simple and intuitive GIS-based interface. The Terabase Platform is powered by a predictive engine for energy output, including bifacial performance. The platform is free to use and Terabase also offers engineering services for a fee to platform users.

www.terabase.energy



Valentin Software

PV*SQL premium is a global simulation program, which puts the design of solar electric systems on a secure basis and reliably calculates system profitability. 3D models can be imported via an interface, enabling floor plans, cadastral maps, and screenshots from web-based satellite maps to be imported into the 3D visualization. PV*SQL also calculates how much PV energy can be used to charge an electric vehicle. A trial version, tutorials and webinars are available on the Valentin Software website.

www.valentin-software.com

Solar Distributor



Kinect Solar

Kinect Solar is an independent solar equipment distributor founded in 2015 to address inventory challenges throughout the industry. Their products include solar modules, inverters, and BOS components featuring high efficiency Tesla modules with heterojunction technology and Trina high yield bifacial modules. Their services include procurement as a service, system design, and technical support. In partnership with sister company SunLogix Global they are able to reduce costs, improve efficiencies, and reduce their energy consumption throughout the supply chain.

www.kinectsolar.com

Solar-Plus-Storage

Panasonic

EverVolt™

HIT.
Photovoltaic Module



Panasonic

Panasonic HIT offers efficient solar modules, providing homeowners with decades of reliable sustainable power. Add EverVolt, their intelligent battery storage solution and deliver a complete solar + storage system. Help homeowners improve grid independence and save money with a fully integrated energy ecosystem that keeps their family powered up during outages and peak rate periods.

na.panasonic.com/us/solar

Solar Thermal Manufacturing & Equipment



Aquatherm Industries, Inc.

Aquatherm Industries offers unglazed polymer solar thermal collectors, primarily used in residential and commercial pool heating applications, solar heat for industrial processes (SHIP), and low-cost thermosiphon systems. Their products are manufactured in the USA to ISO 9001 quality standards, NSF-50 listed, and IAPMO performance certified.

www.aquathermsolar.com



Baknor Thermal Management

Baknor provides solutions for heat dissipation with liquid cold plates, heat sinks, heat pipes, fans, and more. Their extensive knowledge of cooling weighs various tradeoffs and factors such as functionality, manufacturability, volume, mass, cost, packaging, efficiency, and the reliability and safety of heat dissipation components. Baknor's thermal designs ensures the optimum temperature to keep a device running efficiently while improving performance essential for today's electronic designs.

www.baknor.com



Digital Solar Corp

DSH provides heating and/or cooling (2021) for most thermally efficient buildings. It uses a patented, interseasonal, mass storage system to save summer heat for later or dark times. The solar collectors operate well even below -22°F (-30°C). The DSH custom digital controller is Wi-Fi compliant. DSH also provides optional heat for snow melt on PV panels, up-ramps and driveways, spa and pools, and integrated backup heat where required by code. Some retrofit available, new construction preferred.

www.digitalsolarheat.com



Sunda Solar Energy Technology Co., Ltd.

SUNDA has solar thermal experience for over 30 years. With Germany technology and standard, SUNDA patent products are Metal Absorber Evacuated Tube Solar Collector series: SEIDO1 series heat pipe vacuum tube and collector, SEIDO2 series direct flow vacuum tube and collector, SEIDO3 storage type vacuum tube and solar shower, SEIDO8 horizontal heat pipe vacuum tube and collector, SEIDO6 receiver tube and parabolic trough concentrating collector, which are extensively applied on domestic hot water, industry process, pools and spas, space heating and solar air-conditioning, sea water desalination, CSP etc. fields. SUNDA owns over 10 international certificates, Solar Keymark, SRCC, etc. With their sales network all over the world, their products have been exported to more than 80 countries and regions.

www.sundasolar.com



SunEarth

SunEarth Inc. makes ten primary products. These are the Empire, ThermoRay, and SunBelt medium temperature liquid flat plate collectors, the CopperHeart integral collector storage system, the SunSiphon packaged thermosiphon system, the Oasis low temperature pool and spa collector, standard SunBurst, and custom all copper roll-formed absorber plates, "Solar Strut", RexRack, and CompRail integrated mounting systems and hardware.

www.sunearthinc.com



Viessmann Manufacturing

Viessmann Manufacturing provides solar thermal systems for DHW heating and central heating backup. All components of their solar systems have been carefully design-matched to ensure reliable performance and efficiency every step of the way.

www.viessmann-us.com

Testing Equipment



Q-Lab Corporation

Q-Lab Corporation is a global provider of material durability testing products since 1956. They design and manufacture standard test substrates as well as weathering, light stability, and corrosion testers. In addition, contract test services which include accelerated laboratory testing are available at Q-Lab Florida, Q-Lab Arizona, Q-Lab Deutschland, and Q-Lab China. Outdoor exposure testing for weathering, lightfastness, and corrosion are available at Q-Lab Florida and Q-Lab Arizona.

www.q-lab.com

Tools



STAHLWILLE TOOLS, LLC

Stahlwille Tools offers torque wrenches with no coil-spring design, no need to return to zero after use. These tools can be adjusted without disassembly during calibration. The QuickRelease safety lock secures the insert tools while, at the same time enabling them to be changed quickly and easily and inadvertent release is no longer a risk. Available with multiple choices of inserts, ratchet, crow foot, ring, and specialty options.

www.stahlwille-americas.com

Transformers



Niagara Transformer Corp.

Since 1933 Niagara Transformer Corporation has been designing and manufacturing transformers in Buffalo, New York. Their products comply with IEEE Standards and government standards practiced throughout the world. Their customers include OEM and engineering, procuring and construction (EPC) firms, as well as end-users in private industry, government, utilities, universities, and others. Their diverse product line includes inverter duty transformers, substation collector transformers, step-up collector transformers, grounding transformers, and load tap changing transformers. Base ratings up to 50MVA, 138kV, and 650kV BIL.

www.niagaratransformer.com

Valves



GEMU Valves

In order to prevent crystallization and gas diffusion of lithium salts, sodium bromide, or lithium polymers, the use of automation-capable components which have repeatable, calculable reaction times for opening and closing with high cycle duties is required. GEMU multi-port valve blocks from the iComLine product range monitors and controls these process parameters.

www.gemu.com

Wind Measurement



Leosphere, a Vaisala Company

Leosphere's suite of WindCube lidars are solutions for the onshore and offshore wind markets which provide the bankable data and business outcomes that companies need to thrive. WindCube lidars are operating at thousands of sites across the globe, providing outstanding data accuracy and efficiency across all phases of a wind project.

www.leosphere.com

Bankrolling Change

by Stephan Ouaknine

In a time when we are watching society shift at a jarring pace, it is important for the world to understand there is another, more dangerous shift around the corner: Climate change has the potential to wreak even greater havoc on human health, economies, industries, and life as we have known it.

If COVID-19 has taught us one thing, it's that there is potential for massive economic damage. To stem the impact of a crisis, it's vital that we invest a lot - and early. Yet, fewer than two in five Americans (38 percent) believe climate change will damage the U.S. economy if it is not addressed. Only about a third (35 percent) believe there is not enough money being invested in technology that could help prevent or fix climate change, according to a recent online survey* of more than 2,000 U.S. adults.

As we think through rebuilding our post-COVID world, let's think about how we invest today to avert the crises of tomorrow.

History is marked by cautious change and capital-intensive innovations like wind turbines and solar panels. While those innovations have created affordable, grid-scale renewable energy to the developed world, challenges abound. Remaining obstacles include lowering the price of clean energy so dramatically as to shut down fossil-fuel generation entirely, as well as solving the long-duration energy storage hurdle to address energy reliability. Food, transportation, and other sectors have only just started being addressed. What we really need is the catalyst of a second-wave disruption.

The disruption of the automotive industry by electric vehicles accelerated the growth of the EV market share. EV adoption is growing swiftly, with global EV penetration estimated to go from 2.7 to 58 percent in the next twenty years. While that is great progress, the initial disruption is not enough to create seismic change. To greater incentivize EV adoption, consumers need better and more charging stations - and the apps to find them. The industry also needs to develop more robust batteries and solutions for the commercial real estate developers facing growing demand for such technologies.



The roadblock to these second-wave innovations? Investment. Many people oppose investing in newer promising renewable energy technologies because they cannot see the viability of technologies already supported by government subsidies. They forget that massive industries such as telecommunications, aerospace, semiconductors, pharmaceuticals, and even the internet as a whole, were sparked by initial government involvement. In the natural evolution of transformative discoveries, it falls to the private sector to keep these industries maturing and innovating until government assistance is no longer needed. Cleantech—or Climate Tech as it's now often called—is past the tipping point where government subsidies have created a crutch. We must walk on our own.

While many Americans believe climate change poses an imminent threat, this recent survey confirmed that Americans underestimate both the coming economic damage from climate change, and the role that entrepreneurs and investors can play in rectifying it. More Americans think efforts from large U.S. corporations (49 percent) and the government (47 percent) are very important in the fight against climate change efforts, as opposed to the contribution by U.S. entrepreneurs/start-up companies (33 percent), or U.S. investors/financial firms (32 percent).

This illustrates the need to better communicate the potential losses to come, and the economic benefits of climate-positive policies. We must work to shift investor perceptions of the cleantech industry and the expected investment performance. We're living in a very different time than we were 10 years ago; the clean energy industry has matured enough to drive the growth of ancillary technologies. Support for climate-friendly products has reached the mainstream, creating high demand. The next wave of innovation has room for even more disruption, by reinventing how we grow our food, bypassing legacy energy grids, building smart cities, and cleaning up industries that are under tremendous pressure to reduce their pollutants.

Another major challenge is the absence of political urgency in the U.S. The lackadaisical approach of big government should inspire the private sector to act now, and not wait for politicians to fall in line. Additionally, investor reticence has led to a lack of funding for cleantech/hardware innovation, in favor of more software-based tech solutions. This creates a bankability challenge for cleantech; it slows commercial adoption of emerging technologies, leading to an industry littered with potentially game-changing innovations that never make it to market.

For the coming decade, investors need to make up for lost time. More conservative investors can focus on deployment of existing technologies through low-risk solar, wind, and battery farms. Investors interested in higher returns should look to second-wave, disruptive climate technologies. With investors involved in both project finance and technology innovation, we will create both the supply and demand, and successfully bring these disruptive technologies to market.

We only get one planet. We have the potential to make life on it sustainable, but it takes more than commitment: it takes an investment in climate solutions. Without that investment, our very survival is at risk.

** This survey was conducted online within the United States by The Harris Poll on behalf of Inerjys Ventures between February 18-20, 2020 among 2,064 adults ages 18+. This online survey is not based on a probability sample and therefore no estimate of theoretical sampling error can be calculated. Survey methodology.*



Stephan Ouaknine is Founder and Managing Partner at Inerjys Ventures, a global investment fund challenging the status quo in the cleantech sector.

Inerjys Ventures
/// www.inerjys.com

JULY

- 01 Innovation Talk: Why Your Home's Energy Matters**
Webinar – 1pm ET; go.schneider-electric.com
- 06-09 NABCEP Continuing Education Conference**
St Charles Convention Center – St Charles, MO; www.nabcep.org
- 09 Global OSW Markets**
Livestream – 9am ET; www.offshorewindus.org
- 09 Innovation Talk: Connected Devices for Intelligent Builders**
Webinar – 1pm ET; go.schneider-electric.com
- 09-10 Community Solar Power Summit**
Philadelphia Marriott Old City – Philadelphia, PA; www.events.solar/community-solar/
- 15 Floating Offshore Wind**
Webinar – 10am; www.forum.all-energy.co.uk
- 16 Restoring Utility PV After Extreme Weather Damage**
Webinar – 11am PT; try.solar-support.com
- 16 Keeping it Real: An Inclusive Transition to Net Zero**
Webinar – 10am; www.forum.all-energy.co.uk
- 16 40GW Solar Deployment by 2030**
Webinar – 2pm; www.forum.all-energy.co.uk
- 21-22 Wind Operations Dallas Virtual**
Digital Conference; <https://events.newenergyupdate.com/wind-dallas/>
- 21-23 Electric Vehicles, Charging & the Grid**
Interactive Online Training – 2pm CET; info.greenpowerglobal.com
- 22 Offshore Wind 101: North Carolina**
Webinar – 1pm ET; www.eventbrite.com
- 23 EMPOWER 2020**
Virtual Summit – 12pm; <https://empower.aurorasolar.com>
- 23 Grid as an Economic Driver**
Livestream – 9am ET; <https://www.offshorewindus.org/2020ipf/#schedule>
- 26-28 ESA's 2020 Annual Energy Storage Conference & Expo**
David L. Lawrence Convention Center – Pittsburgh, PA; www.esacon.energystorage.events.org
- 27-29 2020 SEPA Grid Evolution Summit**
Washington, DC; www.sepapower.org/event-complex/2020-sepa-grid-evolution-summit/
- 29-30 Storage Business Models & Economics**
Webinar – 8:45am PDT; infocastinc.com/event

AUGUST

- 06 R&D and Technology Innovation**
Livestream – 9am ET; <https://www.offshorewindus.org/2020ipf/#schemulem>
- 11-12 Increasing Storage Safety and Performance**
Webinar – 9am PDT; infocastinc.com/event
- 20 Future of U.S. Offshore Wind**
Livestream – 9am ET; <https://www.offshorewindus.org/2020ipf/#schedule>
- 20 Regional Cooperation Jobs & Workforce**
Livestream – 9am ET; <https://www.offshorewindus.org/2020ipf/#schedule>

SEPTEMBER

- 09-10 REFF- Wall Street**
Virtual Event – New York, NY; www.acore.org

OCTOBER

- 04-07 Federation of New York Solid Waste & Recycling Conference with Trade Show**
The Sagamore, Bolton Landing – Bolton Landing, NY; www.nyfederation.org
- 06-08 Solar Power Finance & Investment Summit**
Intercontinental Hotel – San Diego, CA; infocastinc.com/event
- 12-14 7th Annual Demand Response & Distributed Energy Resources World Forum**
Los Angeles, CA; www.smartgridobserver.com/DER-Forum/
- 12-15 IEEE PES T&D Conference & Exposition**
McCormick Place – Chicago, IL; www.ieee-d.org
- 15-16 Solar and Energy Storage Florida**
B Resort Hotel – Orlando, FL; www.events.solar/florida/

Send us your clean energy show and event listings.

Email information to the editor at editor@nacleaneenergy.com

Page	Company	Website
46	Abaris	www.abaris.com
16	ACE Clamp/PMC Industries	www.aceclamp.com/solar-racking-systems
37	Aggreko	aggreko.com
24	AIMS Corporation	www.aimscorp.net
12	American Earth Anchors	americanearthanchors.com
25 & 53	Ampner	ampner.com
3	APA	apalternatives.com
13	Chilicon Power	www.chiliconpower.com
34	Continental Control Systems	ctlsys.com
23	Cotek Electronic Ind. Co. Ltd	www.cotek.ca
17	Crown Battery	www.crownbattery.com
45	CTC Global	www.ctcglobal.com
42	DETECT	detect-inc.com
39	Doleco USA	www.doleco-usa.com
52	e-On Batteries	e-onbatteries.com
35	Eko Instruments (USA) Inc	www.eko-usa.com
41	Electric Materials Company	www.elecmat.com
10	FTC Solar	www.ftcsolar.com
30	Ginlong (Solis) Technologies	ginlong.com
15	Heyco	www.heyco.com
44	Janicki Industries, Inc.	www.janicki.com
43	Leosphere, a Vaisala company	vaisala.com/leadwithlidar
49	MK Battery	www.mkbattery.com
26	Northern Electric Power	www.northernep.com
32	OTT Hydromet	get.otthydrometinsights.com
20	Outback Power	www.outbackpower.com
IBC	Port of Longview	portoflongview.com
IFC	PV Label	pvlabels.com
5	QuickBolt	quickbolt.com
9	RBI Solar	www.rbisolar.com
51	Rhombus Energy Solutions	www.rhombusenergy.com
11	Rolls Battery	rollsbattery.com
56	Satic Inc.	www.saticshield.com
OBC	Shoals	www.shoals.com
6	Siba Fuses	www.siballc.net
27	Sinexcel	www.sinexcel.us
22	Sol-Ark	www.sol-ark.com
19	Solar Connections International	solarconnections.com
33	Solmetric	www.solmetric.com
7	Soltec	www.soltec.com
21	Southern States LLC	www.southernstatesllc.com
29	TMEIC	www.tmeic.com
40	Transportation Partners & Logistics LLC	tpandl.com
18	WeRecycle Solar	weryclesolar.com/nace
54	Word Rock Drills	wordrockdrills.com



CLOSER

ON THE COLUMBIA RIVER IN WASHINGTON STATE

FASTER

DIRECT CONNECTIONS TO MAINLINE RAIL & INTERSTATE HIGHWAYS

SMARTER

STORAGE OPTIONS & FOREIGN TRADE ZONE SPACE

BETTER

ON-DOCK RAIL & DUAL-SERVED BY BNSF & UP

CONTACT US AT SALES@PORTOFLONGVIEW.COM | PORTOFLONGVIEW.COM 

bla

big lead assembly®

NO MUSS. NO FUSS.

The first and only above-ground, patent-pending system that does not require combiner boxes or in-array trenching, and can offer **\$avings** in the field up to **62.5%**

- ⊘ combiner boxes
- ⊘ field o&m
- ⊘ torquing
- ⊘ cable trays
- ⊘ trenches
- ⊘ re-combiners

The BLA (Big Lead Assembly®) takes all the guesswork out of wiring your solar field. Using Shoals' latest in-line fuse and wire manufacturing technology, we offer you a site free of DC string combiners. The entire load is combined into a single pair of aluminum conductors running from the string combiner to the inverter. There's no need to trench for DC feeders or hang string combiner boxes. And when terminated with the BAC connector, the whole array is plug-&-play. Plug in the panel strings, plug into the inverter, and just walk away!

