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2012 WIND BUYERS GUIDE

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Avoiding the flaw of averages

Improved Techniques for Geothermal Exploration

Boiler MACT Rules & the Biomass Industry

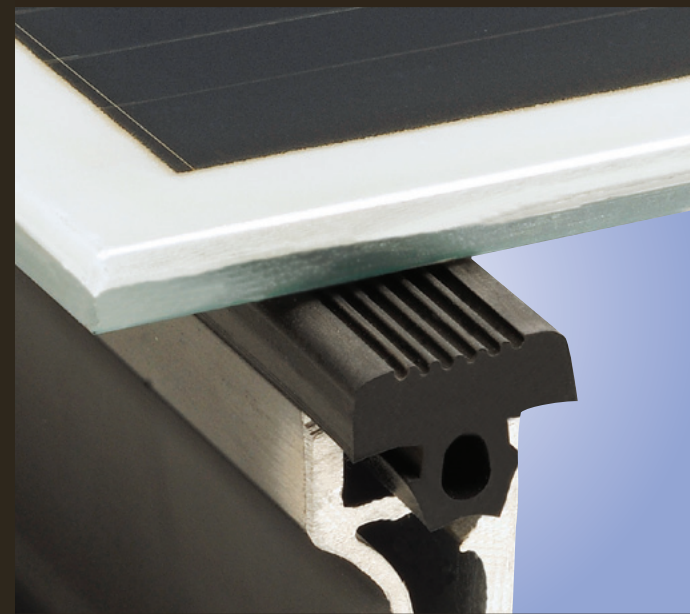
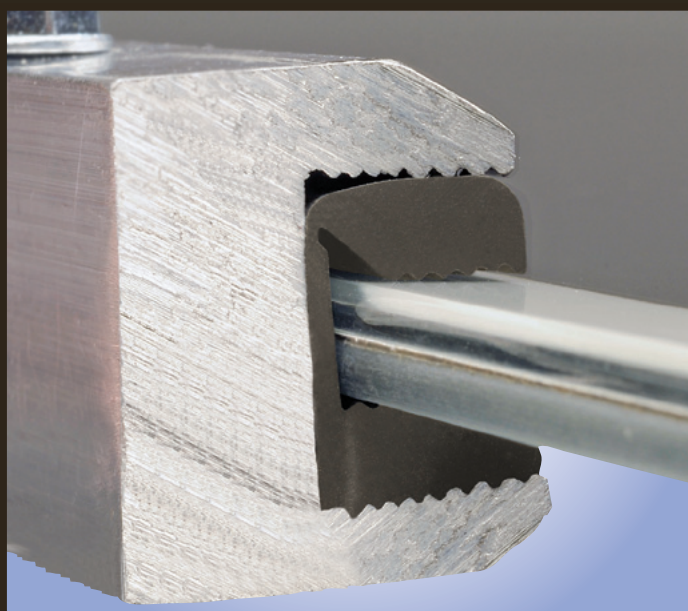
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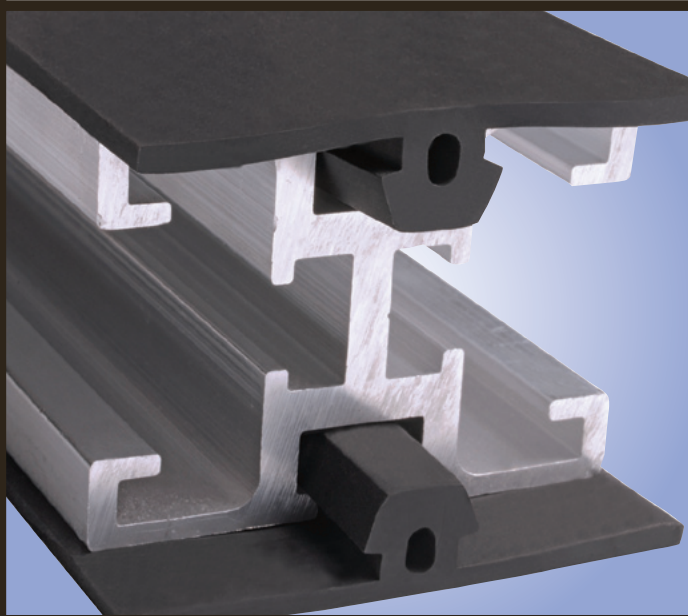
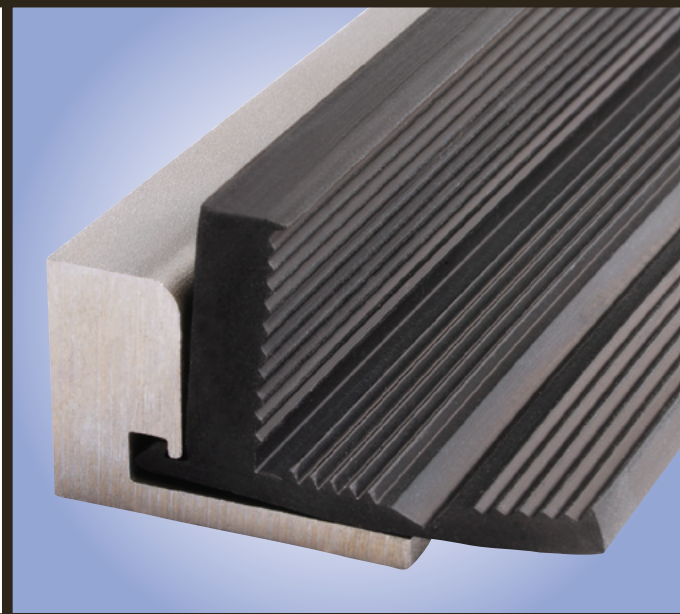
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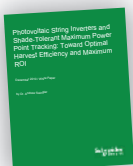
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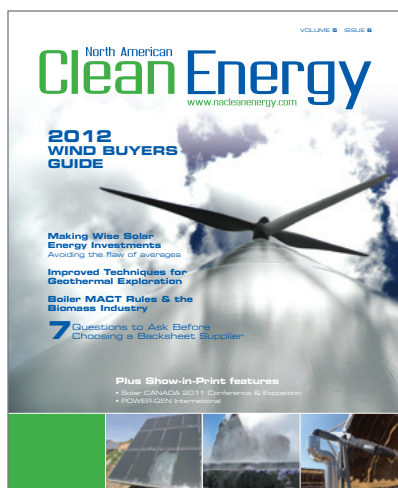
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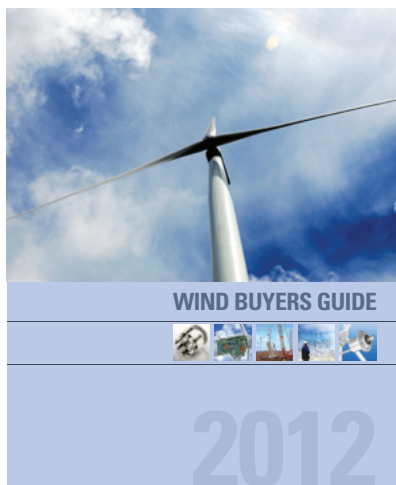
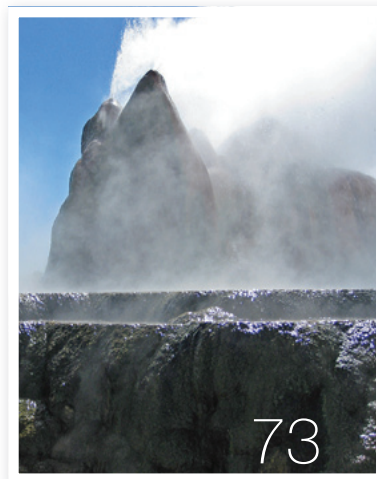
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North American
Clean Energy
www.nacleanenergy.com

NOVEMBER / DECEMBER 2011
Volume 5, Number 6

EDITOR
Michelle Froese
mfroese@nacleanenergy.com

ART DIRECTOR
Rommel Ramirez
production@nacleanenergy.com

SALES MANAGER
Ian Stuart
istuart@nacleanenergy.com

SALES
Ian Stuart
istuart@nacleanenergy.com

Jake Fidler
jake@nacleanenergy.com

Dave Benton
dave@nacleanenergy.com

CIRCULATION MANAGER
Kristy Vail
circulation@nacleanenergy.com

ACCOUNTING
Alison Bell
abell@nacleanenergy.com

PUBLISHER
Ian Stuart
istuart@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.

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Editorial, Advertising, Production and Circulation are at 255 Newport Drive, Suite 336, Port Moody, B.C. V3H 5H1 (604) 461-6223. Subscriptions: \$48 per year. Email: circulation@nacleanenergy.com



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Photo by Michelle Moore

IT MAY BE A YEAR LATER, but as 2011 slowly draws to a close, it seems we're in much the same position in terms of renewable energy projects as we were at the end of last year—awaiting word on whether government grants will be extended.

In the waning days of 2010, the Section 1603 Treasury program was extended for one year. Originally created in the wake of a downturned economy, Section 1603 allowed qualified energy developers to receive a federal grant instead of claiming energy tax credits. And, according to Rhone Resch, president and CEO of the Solar Energy Industries Association: "The 1603 Treasury Program has been the single most effective policy driving renewable energy growth during the past two years." (SEIA | www.seia.org)

Based on the findings of a recent solar-related study, *Economic Impact of Extending the Section 1603 Treasury Program*, another one-year extension into 2012 would result in the solar industry supporting an additional 37,394 jobs, plus another 2,000 or so more megawatts of solar installations above baseline by 2016—that's enough to power 400,000 homes (EuPD Research | www.eupd-research.com)

There's also research that demonstrates solar and wind energy subsidies, distributed through cash grants, are approximately twice as effective as government tax incentives, such as PTCs. Production Tax Credits allow companies that generate wind, solar, geothermal, and closed-loop biopower to be eligible for a 2.2-cent per kilowatt-hour PTC for the first 10 years of a project's operation. The Bloomberg New Energy Finance-commissioned study by the Bipartisan Policy Center in March of this year found cash grants lower the cost of capital as compared with tax credits, which give energy developers a limited capital, as well as expensive financing costs.

This isn't what past studies have shown, however. In comparing cash grants to tax credits, a combined report by Lawrence Berkely National Laboratory (LBNL) and the National Renewable Energy Laboratory (NREL), back in 2009, showed PTCs provided more value in about two-thirds of the wind energy cases analyzed. Here it seems a project's installation costs and range capacity proved to be factors.

With a year to go, PTCs for wind power are set to expire at the end of 2012 (while the PTCs for incremental hydro, wave and tidal energy, geothermal, MSW, and bioenergy expire at the end of 2013). Interestingly, as of press time, news hit that US Representatives Dave Reichert (R-Wash.) and Earl Blumenauer (D-Ore.) have introduced legislation to extend the federal Production Tax Credits. The *American Renewable Energy Production Tax Credit Extension Act* (H.R. 3307) bill lengthens the tax incentive for the production of wind, geothermal, and hydro power, and other forms of renewable energy through to 2016.

At least this proposal is a little ahead of the game. And, according to the Geothermal Energy Association's website, a must for the industry: "There is an immediate, critical need to postpone the renewable energy tax credit placed-in-service deadline for new geothermal projects to December 31st, 2016, to provide parity with solar projects." (GEA | www.geo-energy.org)

In this issue of *North American Clean Energy*, we delve a little further into government incentives by looking at cash grant disputes, with tips for dealing with Treasury (page 44). We also evaluate Feed-in-Tariffs (with a focus on California) as individual state policies and incentives for renewables are expected to expand (page 8). And, don't miss our annual Wind Buyers Guide, featuring a variety of must-see products and services.

Wishing you much success in 2012!

Michelle Froese

news bites



Renewable energies reach milestone

According to the most recent issue of the "Monthly Energy Review," by the US Energy Information Administration (EIA), with data through June 30th, 2011, renewable energy has passed another milestone as domestic production is now significantly greater than that of nuclear power and continues to close in on oil.

During the first half of 2011, renewable energy sources (biomass and biofuels, geothermal, solar, water, and wind) provided 4.687 quadrillion Btus of energy or 12.25% of US energy production. By comparison, renewables accounted for 11.05% of domestic production during the first half of 2010 and 10.50% during the first half of 2009. (On the consumption side, which includes oil and other energy imports, renewable sources accounted for 9.45% of total US energy use.)

More significantly, energy production from renewable energy sources in 2011 was 17.91% more than that from nuclear power, which provided 3.975 quadrillion Btus, and has been declining in recent years. Energy from renewable sources is now equal to 79.83% of that from domestic crude oil production, with the gap rapidly closing.

The US Energy Information Administration's "Monthly Energy Review" can be found at: <http://www.eia.gov/totalenergy/data/monthly>.



Job-creating grid modernization pilot projects

In October of this year, the Obama Administration announced it would accelerate the permitting and construction of seven proposed electric transmission lines. This move will speed the creation of thousands of construction and operations jobs while transforming the nation's electric system into a modern, 21st century grid that is safer and more secure, and gives consumers more energy choices. These projects will serve as pilot demonstrations of streamlined federal permitting and increased cooperation at the federal, state, and tribal levels.

"Transmission is a vital component of our nation's energy portfolio, and these seven lines, when completed, will serve as important links across our country to increase our power grid's capacity and reliability," said Secretary of the Interior Ken Salazar. "This is the kind of critical infrastructure we should be working together to advance in order to create jobs and move our nation toward energy independence."

Read more at <http://energy.gov/articles>.

California's Cap-and-Trade program gains final approval

On October 20th, 2011, the California Air Resources Board ("CARB") voted to make the final adjustments to the nation's only comprehensive limit on greenhouse gases in its implementation of Assembly Bill 32 ("AB 32"), California's Global Warming Solutions Act of 2006. AB 32 gave legislative authority, as well as implementation and enforcement guidance, to CARB to prepare and approve a Climate Change Scoping Plan, with the goal of significantly reducing greenhouse gases emissions levels by 2020. The program will go into effect on January 1st, 2012.

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Feed-in-Tariffs

Keeping track in California

By C Thomas Paschall

In the United States, with the upcoming expiration of the commencement of construction deadline underpinning the Section 1603 cash grant *in lieu* of tax credit under the American Recovery and Reinvestment Act of 2009, it's anticipated state incentive programs and policies will be the next catalyst of renewable energy expansion. States have been, and are expected to continue serving as, classic laboratories of experimentation in achieving energy independence and sustainability.

Among the many state policies impacting renewable energy (such as the newly revised California RPS), Feed-in-Tariff contracts remain important economic and financing tools, particularly for small to mid-sized renewable energy generation projects. Although there may be as much negative press relating to Feed-in-Tariffs as there are favorable reports (often looking at the potential overpricing of such tariffs, as happened in Europe, and administrative difficulties of ensuring competitive pricing by qualified bidders), there's no doubt Feed-in-Tariffs remain critically important to developers and others seeking to be "incentivized" to continue developing independent generation projects.

In the state of California, following in the wake of Governor Brown's announcement of his intention to encourage development of 12 gigawatts (GW) of small-scale distributed generation projects by 2020, and to achieve the 33% RPS, project developers (particularly in the solar industry) have closely monitored progress toward achievement of a sound and effectively managed Feed-in-Tariff program.

Under current California regulations, there are three feed-in-tariff programs either implemented or in process, but approaching finalization of implementation:

1. The AB1969-based California Renewable Energy Small Tariff (CREST) Power Purchase Agreement (PPA) for projects up to 1.5 megawatts (MW) of nameplate capacity;
2. The SB32-driven Feed-in-Tariff for projects up to 3.0 MW; and
3. The Reverse Auction Mechanism (RAM) for projects greater than 1.5 MW, but not larger than 20 MW.

With so many moving parts, the California Feed-in-Tariff programs have arguably had the unintended consequence of creating confusion among developers and financing institutions, as it can be difficult to track the latest status of such programs. This article attempts to add clarity by focusing primarily on recent developments in the CREST PPA program and the RAM.

CREST PPA: Seeking expedited reform before cash grants expire

Until recently, the CREST PPA program has been largely written off as an example of a failed Feed-in-Tariff program, but last-minute revival efforts may create opportunities for projects pursuing CREST PPAs to realize their objectives in time to be "safe harbored" under the Treasury Grant in 2011—while achieving commercial operation in 2012. The original CREST PPA based on AB 1969 was approved in 2008, but it's only achieved a small fraction of the intended Feed-in-Tariff contracts designed for the program. Originally, the issue was a pricing problem. The CPUC Market-Priced Referent (MPR) was based on the long-term ownership, operating, and fixed priced fuel costs for a new proxy 500 MW natural gas-fired combined cycle gas turbine, with time of day (TOD) adjustments lower than bid-winning and bilaterally negotiated PPA prices.

After solar equipment costs plummeted to their current levels, the MPR-based pricing became more attractive. But, the ability of developers to obtain customary non-recourse project financing from commercial lending institutions in reliance on the CREST PPA proved impossible. The CREST PPA in its original form proved to be unbankable. In particular, the CREST PPA contained regulatory and change-of-law "outs" enabling a contract to be terminated, or pricing altered for reasons outside the seller's control. It also didn't contain customary pledge and assignment clauses in favor of lenders as typically required by banks lending in reliance on long-term power purchase agreements. As a consequence, several years into the CREST PPA program, only 3.35 MW of CREST PPAs had been approved and executed out of a total program capacity allocation of 247.7 MW, at least as of September 13th, 2011 (according to the Southern California Edison website).

On October 11th, 2011, an Administrative Law Judge issued a Proposed Decision granting, with modifications, the Clean Coalition's motion for immediate amendments to the CREST PPA. Notwithstanding SCE's efforts in late 2010, and into the summer of 2011, to establish a process for revising the CREST PPA to cure many of the provisions making it non-financeable—with the CPUC moving toward approval of the new 3.0 MW Feed-in-Tariff referred to above—SCE unilaterally suspended its CREST PPA reform ef-

forts in late July, prompting the Clean Coalition and others to file a motion in August, 2011 seeking Commission approval of certain reforms recommended as of such date in the existing stakeholder process.

In the Proposed Decision, it's recommended the CREST PPA be amended to:

- i) Offer a six-month extension in the case of regulatory delays;
- ii) Replace the termination section and amendment clause with significantly improved provisions borrowed from the 2010 SPVP contract (removing the regulatory "out" and the ability to modify the contract at the direction of the CPUC);
- iii) Insert customary pledge and assignment clauses in favor of lending institutions; and
- iv) Insert customary *force majeure* and indemnification clauses.

As of press time, SCE has a near-term deadline to file its comments to the Proposed Decision (October 31st, 2011) and comments to SCE's response will be due a week later. It's anticipated by November 10th, 2011, a final decision will be made in which the utilities will be ordered to issue a Tier 1 advice letter incorporating all relevant amendments into a revised CREST PPA. Consequently, developers with CREST PPA projects may have the opportunity to execute CREST PPAs with greatly enhanced protective provisions as early as November 15th, 2011, and should see their projects enjoy greater likelihood of obtaining traditional non-recourse project financing.

RAM updates

The California RAM program has experienced a wild ride in 2011, commencing with euphoria surrounding its early announcement in the beginning of the year, followed in April by its suspension for 150 days after protests were filed regarding its proposed implementation by the utilities. But, culminating with announcement of the first RAM RFO in September (proposals due no later than November 15th, 2011) has set the stage for the highly anticipated bi-annual RAM RFOs going forward. Interestingly, the RAM pricing may also serve as a pricing benchmark under the SB32 Feed-in-Tariff, although competing proposals continue to be digested by the CPUC regarding the optimal pricing mechanism.

In conclusion, it will be fascinating to see whether the CREST PPA can be finalized and approved before year-end for stranded CREST PPA projects to be: revived, obtain, and executed with interconnection agreements in the remaining weeks of 2011; seek commercial project financing; and, qualify for the Treasury Grant. In addition, the results of the inaugural RAM auction pro-

cess in mid-November will set the stage for what may prove to be a pivotal Feed-in-Tariff experiment combining the power of market forces with the certainty of a regulated and financeable RAM Feed-in-Tariff PPA. Developers and financing institutions should consult

with their counsel and financial advisors to navigate through these critical months and in planning ahead.

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The Business of Predictability

Moving toward a new framework for valuing solar energy

By Boris Schubert

SOLAR IS AT THE CUSP of becoming a primetime player in the utility power-generation market. As utilities prepare to make large bets on solar technology, some companies with an uncertain business model will be left behind, while others will rise to dominate the market. Who will reach the top? It will be companies that can offer a guaranteed return on investment (ROI) for their customers.

How do you guarantee a solar power plant? You provide the same confidence in performance and return on investment as a utility with traditional energy. Solar systems haven't delivered a guarantee because the solar market has been too young to offer the depth of data needed to guarantee with certainty system performance. But, the market has matured and is ready to change the game by offering a guaranteed ROI.

In order to offer greater certainty for utilities, however, it's important to address the shortcomings of current solar project cost models. Over the past few years, the PV industry has turned to levelized cost of energy (LCOE) as a standard performance indicator for power-generation investment assessments. LCOE attempts to measure the value of a system by adding projected costs and dividing it by assumed performance. This is an improvement over previous models, but it still only measures the sum of the parts, rather than the whole. This difference might seem academic, but only summing the parts allows assumed

variables that fail to live up to their original projections and assumptions to multiply in effect over other parts of the system. This leads to a performance gap between LCOE assumed and LCOE actually achieved.

For the solar energy industry to take the next step, it needs a performance model that can offer investors confidence and predictability in their ROI. To achieve this confidence, a new model must do more than merely offer performance expectations—it must assure system performance.

Power plant performance ratio

A new model for evaluating solar systems is emerging: the power plant performance ratio. The performance ratio measures a system's efficiency in converting solar radiation into electricity. It's a dimensionless quantity used to describe the amount of available sunlight converted to AC electrical energy, generally measured at the revenue meter for the power plant. It's calculated by dividing the final PV system yield (also known as the specific energy of the system) by the reference yield.

Because the performance ratio looks at the whole, rather than the sum of the parts, this indicator provides a straightforward basis for assessment. By measuring performance ratio, power plant owners and operators can immediately and fully predict the performance of the plant over its lifetime, accurately assessing the value of the plant.

If a guarantee can be issued against that measured performance, the performance gap of the expected versus actual LCOE disappears. However, most solar players lack vertical integration and the field experience of solutions in real-world conditions to know precisely how their equipment performs and what energy yield they can reasonably guarantee. This lack of continuity and long-term experience among solar players has led to a patchwork of warranties in which each company involved in the project can cover their portion of the system.

Today's solar energy market is still evolving, and a measure of component cost is not the same as the measure of value delivered.

This collection of warranties doesn't allow for anything like the assurance of an energy output over time. A car can come with a single 200,000-mile warranty because it's specified, designed, built, tested, and maintained by people who know the vehicle inside and out, and consider it a single operational entity and not a collection of parts. In the same vein, only solar players with integrated systems experience can wrap or bundle their offerings based on the real-world experience of product performance. With a project-level perspective, an experienced integrated system developer possesses a thorough knowledge of field-tested system performance down to the level of the module and even the cell. This breadth and depth of knowledge and experience allows an integrated player to offer true performance guarantees.

By calculating the value of a power plant as a whole, and offering a guarantee of performance across the entire system, certainty of ROI is achieved. Any solar player that can offer this level of confidence in ROI will offer greater value to utilities.

Today's solar energy market is still evolving, and a measure of component cost is not the same as the measure of value delivered. When betting on a solar energy project, investors and utilities will look beyond technology components and assess the entire value chain to find projects that offer a guaranteed return.

Boris Schubert is COO of Q-Cells North America.

To access Q-Cells' full white paper on this topic, please visit the company website.

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Inverter Topology Issues for Grounded PV Modules

By Roberto Gonzalez

EVER-EVOLVING SOLAR PANEL TECHNOLOGY has led to the development of different types of solar cells. As a result, new types of crystalline cells, such as backside contact solar cells and a number of thin-film technologies, have gained a foothold in the market. Some of these technologies require the inverter to operate in special conditions to maximize the energy produced, or to avoid premature cell degradation. Now, it's possible to adapt the conversion stage to the conditions required by different types of modules to deliver the optimum system performance.

Thin-film modules

Two construction technologies are available for thin-film modules: one is based on superstrate technology, typically used for Amorphous Silicon or Cadmium Telluride; the other is based on substrate technology, generally used for Copper Indium Selenide (CIS) modules.

The manufacturing process used in the superstrate technology means there's direct contact between the glass and the TCO (Transparent Conductive Oxide) used to obtain the negative pole. With regard to this module type, recent studies have shown the TCO layer either deteriorates or corrodes after a relatively short period of time in operation. This corrosion is caused by the circulation of leakage currents, which appear when the module is subjected to a negative potential with respect to ground. These currents transport the sodium ions (Na+) present in the glass to the TCO, causing the deterioration.

The circulation of these ions is particularly important in hot and humid conditions. The deterioration of the TCO is irreparable and produces a considerable reduction in the module efficiency.



TCO corrosion in a superstrate amorphous silicon module.

To mitigate the deterioration of the TCO, module manufacturers have adopted various measures, such as improving the module side seal, or increasing the distance between the TCO and the grounding structures (for the frame of the module itself). The first measure prevents the ingress of humidity into the module, while the second measure reduces the circulation of currents that could transport the Na+ ions to the TCO.

In any case, to prevent the circulation of Na+ ions to the TCO, inverters can be used with a grounding kit, to ground the PV array negative pole.

Backside contact modules

The backside contact modules feature solar cells in which the metallization of the positive and negative contacts takes place on the reverse side of the cell. This technology makes it possible to obtain an efficiency of more than 20%, representing a real milestone in the development of solar modules.

Despite the good performance achieved in laboratory conditions, in practice the first high-voltage field-installed arrays have not yet achieved their theoretical efficiency. This drop in performance is the result of the accumulation of charge carriers on the cell surface due to the circulation of small leakage currents through the EVA and the upper glass—a phenomenon known as the polarisation effect. Given the fact cells don't have contact on the upper surface, these

charges cannot be released and, therefore, have an important impact on the overall cell performance. The direction of the leakage current is a decisive factor in the loss of performance. If the cell is subject to a positive potential with respect to ground, then the negative charges remain on the surface, thereby reducing efficiency. However, if the cell has a negative potential with respect to ground, then the effect is reversed and the cell regains its original efficiency.

To avoid the polarisation effect, inverters can be used with a grounding kit, grounding the PV array positive pole. In this way, the module cells operate at a negative potential with respect to ground.

PV array grounding & inverter configuration

PV array grounding can be only done with transformer-based inverters or transformerless inverters connected to a dedicated IT network. To make it easier to select the most appropriate inverter for each type of module (should there be no recommendations from the PV module manufacturer), use the following selection table below, which shows the various inverter modules that can be used for the different panel technologies.

Continued on page 14.

Module technology	Transformerless inverters connected to neutral grounding network (TT or TN)	Transformer-based inverters or Transformerless inverters connected to IT networks		
	Inverter	Inverter	Inverter + grounding negative terminal	Inverter + grounding positive terminal
Monocrystalline silicon Polycrystalline silicon Amorphous silicon (substrate) CIS	✓	✓	!	!
CdTe Amorphous silicon (superimposed)	✗	✗	✓	✗
Backside contact modules	✗	✗	✗	✓

✓	Recommended	!	Possible	✗	Not recommended
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Selection Table

Nature provides us with the gift of energy through the sun, but unfortunately, nature's wrath may not be all that friendly to your PV system under stressful conditions. Snow, wind, extreme heat or cold, and seismic activities can wreak havoc on underengineered, underdesigned and insufficiently tested racking structures. Only UNIRAC solar structures have been engineered and third-party tested to withstand the harshest of elements and events for a long and enduring service life. Complies with IBC, IRC, ASCE-7-05, ADM, AISI, AISC, NEC and UL. For the highest level of engineering and construction with the lowest cost of ownership in the business, Unirac is the 24/365 solution for performance in and out of the sun. Visit unirac.com for more information.



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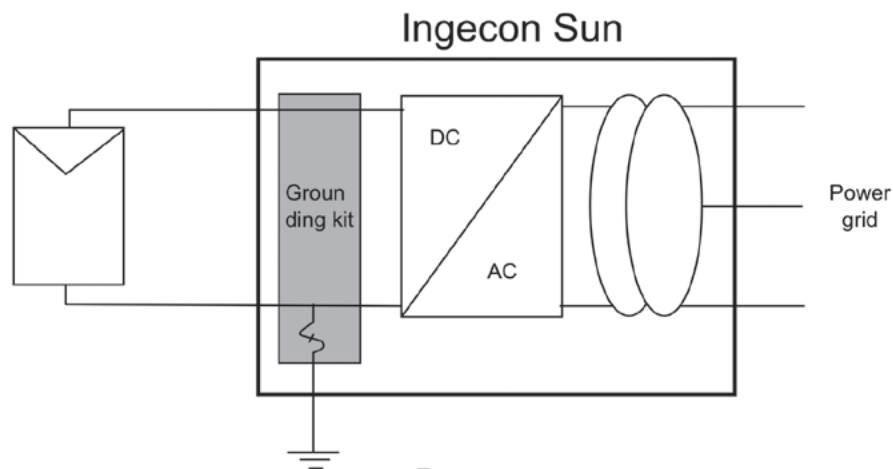


Figure 1. Example of the grounding of the negative pole with an Ingecon Sun inverter.

...continued from page 12.

A grounding kit for the transformer-based inverters offers the possibility of grounding either the PV array positive or negative pole, in a simple operation. This is a kit that is mounted inside the inverter itself, with no external modification to the array.

To use a grounding kit for modular inverters, they must be configured with the master-slave option. On the other hand, if using a grounding kit with transformerless (TL) inverters, then it's only possible to connect one inverter per transformer winding.

Figure 1 shows a typical grounding layout for negative pole grounding on a transformer-based inverter. The PV array grounding is achieved through a protective device (fuse or thermal magnetic breaker, depending on the version), offering protection against fires in the event of a ground fault at the ungrounded pole.

Roberto Gonzalez is the R&D PV solar director for Ingeteam Energy, S.A.

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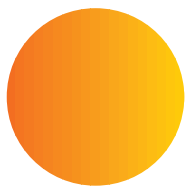
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7 Questions to Consider

Before Choosing a Backsheet Supplier for PV Modules

By Michelle Ostiguy

MOST PEOPLE KNOW that product consistency and quality are integral considerations when choosing a backsheet supplier for photovoltaics and, naturally, pricing and reputation for quality are key factors as well. However, before making a decision to select or change a backsheet supplier, there are several other important factors to consider.

Here are several questions to ask that will (given the right answers), hopefully, simplify this important decision for a successful solar project...

1. How many years has the backsheet supplier being considered been serving the photovoltaic industry?

Since the PV industry is an emerging market, it's vital to not only ask how long a supplier has been in business, but also what qualifications they have to produce backsheets. Almost more importantly, it's critical to understand how the company would address integral product performance challenges, such as: delamination issues; electrical insulative properties; moisture resistance; bonding to encapsulants; and, weatherability. Find out if the supplier has a history of developing backsheets, or other related products, and if the product lines have been stable. Many start-ups are looking to break into this growing industry, so watch out for inexperienced suppliers that could negatively impact the end product and, ultimately, one's bottom line.

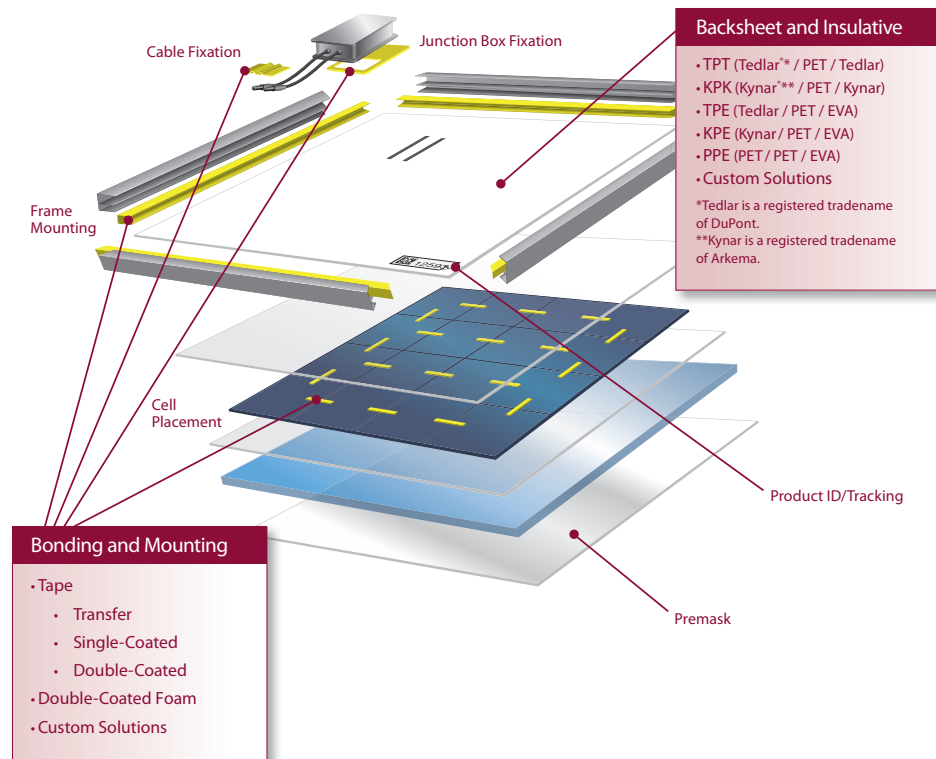
2. Does the supplier have the capacity to meet immediate and future demands, while keeping up with the impending growth of the industry?

The backsheet producer selected should have the ability to consistently deliver high-quality backsheets in large quantities with very tight timeframes. The prospective supplier should be strategically located with globally based manufacturing, have scalable manufacturing capacity, and warehousing and distribution capabilities to deliver the product when and where it's needed.

3. Is there a strict adherence to global quality standards, or are key testing protocols and certifications in place?

Photovoltaic modules can be delivered and installed anywhere across the globe, so it's understandable that this requires the establishment of strict testing protocols and adherence to a wide range of certification standards by the supplier. This is an important factor in an industry where non-compliance claims can damage profitability, as well as a solar panel manufacturer's reputation.

It's necessary to obtain a backsheet supplier that has earned mandatory certifications, such as NEN-EN-ISO 9001:2008 and ISO-9001:2008. If the supplier doesn't have these certifications, internal testing protocols must be in place to support key quality standards such as UL, IEC, and TUV. The capability to comply with these various global standards enables module manufacturers to partake in government-supported initiatives and broaden its increased revenue streams.



4. Does the prospective supplier provide technical support?

To help drive efficiency, quality assurance efforts, and profitability, it's important that a backsheet supplier readily allow access to technical support. Suppliers who have the ability to develop, test, and deliver customer products can offer distinct advantages. However, it's important their in-house field representatives offer the know-how to optimize backsheet performance for specific processes, applications, and custom products.

5. What other solar module assembly products, besides backsheets, can be provided?

A good way to save time and money is to work with a partner that can provide ancillary components for solar module assembly. Just bear in mind, these components also need to be compatible with other key components of the solar module. One way to ensure compatibility, as well as leverage buying power, is to align with a dedicated, single-source supplier. In this case, the supplier would provide a one-stop shop, offering a large variety of products for solar module assembly. Since solar panels also entail associated bonding, mounting, and labeling components, it often makes sense to streamline ordering and gain considerable pricing advantages by choosing a supplier that can offer all of these different capabilities.

6. Is the supplier able to provide a competitive advantage?

Product innovation is an essential differentiator for both start-ups and established solar module manufacturers. One characteristic all backsheet suppliers should possess is the ability to formulate unique product solutions that clearly distinguish solar panel offerings as compared to competitors. In successful relationships, suppliers will make a serious commitment to research and development, and continuously look ahead to develop next-generation solutions while offering ongoing advantages.

7. Is transition included in the costs the supplier will cover?

There's often a steep cost associated with switching a provider, so the decision to qualify a new backsheet supplier shouldn't be something to take lightly. It's important to consider if the prospective supplier will subsidize the cost of obtaining the proper certifications for the new bill of materials. Top suppliers usually help cover the substantial transition costs by offering competitive and consistent pricing, as well as by contributing to the cost of module certification.

Selecting the right supplier and backsheet product can affect production and performance objectives, and have long-term implications for customer satisfaction and one's bottom line. By considering the seven questions addressed above, photovoltaic module manufacturers can ensure they're making an educated and informed decision when selecting a partner.

Michelle Ostiguy is a market development specialist for PV for FLEXcon.

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Specifications For Non-Metallic Enclosures in PV Applications

Selecting the right material for decades of use

By Jeff Seagle

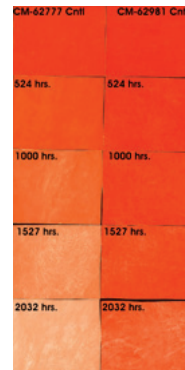
THE SUN IS OUR MOST BASIC LIFE-GIVING FORCE. Its beneficial powers give life and energy to our planet. When it comes to capturing this energy, however, challenges do arise. Solar power projects are costly on the front-end, and require many years (even decades) before yielding a solid return on investment. It's imperative that systems produce flawlessly from the time the installation first goes on line. The proper selections of components that support the longevity and durability of the installation become critical choices in this process.

Enclosures are essential components for solar applications, and are designed to provide varying degrees of protection from external environmental conditions. Solar applications require several important environmental considerations. First of all, most applications are found outdoors and, therefore, are subject to the corrosive impact of the local environment. Given that installations need to operate for decades, outdoor corrosion becomes an important issue to resolve. Secondly, solar installations by their very nature are Ultraviolet Radiation (UV) intensive, and the damaging impact of UV energy must be addressed.

UV energy attacks materials and works to break apart their substrates. This degradation can lead to the structural breakdown in certain materials and, over a period of time, result in failure of the system. The key factor for any specifier of solar component enclosures is to determine an enclosure's ability to withstand long-term exposure to UV.



1. Failed enclosure



2. UV testing



3. Enclosures

The basics

• Plastics

Thermoplastics, such as polycarbonate, polyester, and PVC offer a degree of corrosion protection beyond painted carbon steel. Thermoplastics, however, are more susceptible to UV and weathering degradation over time. Certain stabilizers can be added but, ultimately, the nature of the thermoplastics will yield to extended weathering.

• Composites

Thermoset materials, such as a polyester resin combined with glass, create a unique composite Fiberglass Reinforced Polyester (FRP) that's exceptionally durable and weather-resistant. Like thermoplastics, FRP provides a greater degree of corrosion than painted carbon steel, but will perform better than metal and plastics in extremely harsh environments.

Effects of UV radiation on FRP materials

UV radiation has been a concern with non-metallic manufacturers for many years. The rate at which the UV degradation occurs will vary depending on heat, humidity, and the latitude in which the product is installed. There are also differences in the way UV degrades various non-metallic materials. For instance, the effects of UV light quickly become more critical with thermoplastics than with thermosets of similar chemical structure.

When FRP products are exposed to UV radiation, two factors can occur, which have an affect on the end product: change in gloss and change in color. Gloss is one measurement of the ability of a material to reflect or scatter light. UV degradation can attack the Sheet Molding Compound (SMC), causing the polymer material to degrade and the surface to roughen, followed by fiber blooming. Over time, the color of an SMC material can also be affected by this UV degradation. Pigments or colorants can be attacked and broken down similar to the way in which UV attacks the polymer chains. When this happens chalking, whitening, or some other form of discoloration can occur.

Many manufacturers have developed alternatives to prolonging the life of electrical enclosures in outdoor environments. Some of these are painting with various acrylics or epoxy paints, waxing, or using exterior gel-coats on molded products. Though effective in prolonging the life of the product, they can also be expensive and require upkeep or maintenance out in the field.

Traditional formulations vs higher-performing SMC

Chemical compositions of unsaturated polyester resin-based sheet molding compound play an important role in the materials' ability to resist UV degradation, and its resulting weatherability in outdoor environments.

Many formulations are primarily a fire-retardant isophthalic resin system in which the base resin contains bromine to aid in fire retardency. A more recently developed formulation has a neo-pentyl glycol (NPG) isophthalic-based resin system that contains no bromine. This is important because bromines interfere with a composite's ability to resist UV rays and increase toxicity.

Bromine in a thermosetting resin system bonds itself to the polymer chain during the manufacturing process of the resin. This bond is much weaker than the carbon-carbon bond of the polymer chain, and is more easily broken under UV or heat energy. This is desirable for fire-retardency, but is undesirable for weathering-resistance. In the NPG system, there are none of these weak links in the polymer chain. The UV energy required to break these links is greater, thereby giving the SMC material better UV weathering characteristics. Fire-retardency is achieved via alumina trihydrate fillers that meet the current UL 94 5V standard.

An additional proprietary additive in a new formulation is a UV absorber. This additive works to absorb UV energy and release it without damaging the polymer chain. This prevents the polymer bonds from breaking apart. This material will also absorb UV energy more readily than the links of the polymer chain, providing increased protection of the polyester material and increased resistance to the damaging effects of UV radiation.

Toxicity of the material when burned is also a serious consideration. SMC with bromine added, along with antimony, can give off small amounts of toxic emissions and black smoke when burned. This can be a factor in areas that are confined spaces or tunnels, where limiting smoke generation is crucial. This type of SMC is sometimes referred to as a halogenated system. By removing bromine and antimony from the SMC, toxic emissions are reduced and the new formula can be classified as non-halogenated.

When selecting enclosures for protection of solar components, investigate the material for its ability to resist the strong UV rays found in solar installations. An errant or over-estimated material choice can have many repercussions in the lifecycle of a product.

Jeff Seagle is the president of Stahlin, Non-Metallic Enclosures.

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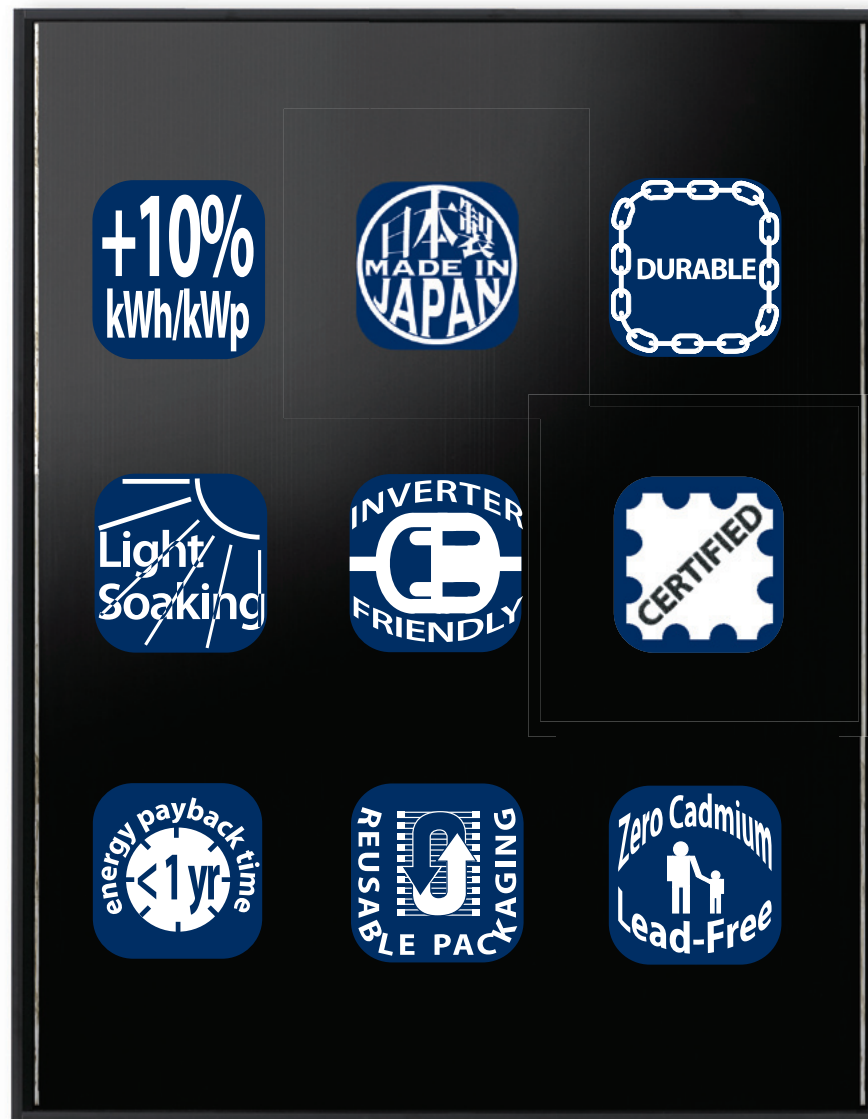
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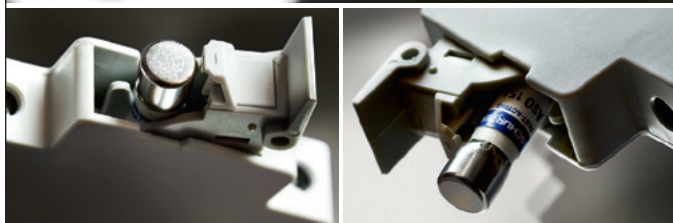
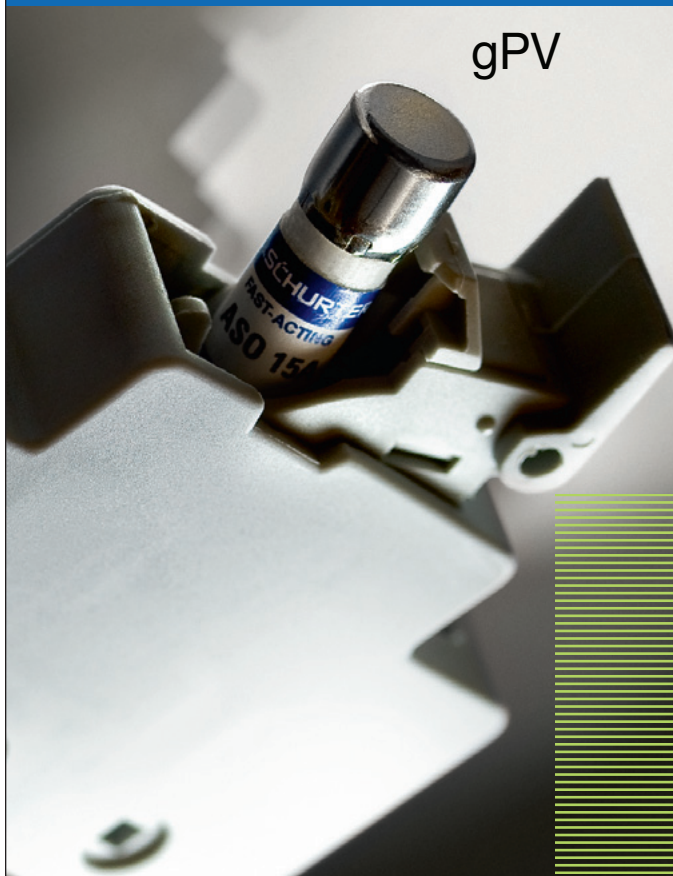


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Keeping Solar-cell Production Costs Down Selecting the right pumps

By Sergio Avila

THE MANUFACTURING OF SOLAR CELLS is one of the fastest growing power-generation segments in the world. Playing an enhanced role with respect to this trend is the total cost of producing solar-cell materials. Since unscheduled shutdowns that result in production downtime can quickly accumulate into higher solar-cell production costs and effect the overall bottom line, choosing the correct industrial process solutions to improve efficiencies and avoid downtime can go along way in keeping costs low. Therefore, it is crucial that the right components contribute to a solar cell plant's operation, including the industrial pumps that do much of the heavy lifting during the various stages of the production process.

Avoiding pump downtime

Although selecting the correct pump for each application during the solar-cell production process is important, this is of great significance during the wafer-creation phase of the process. While this phase is precise, it can also be harmful to pumping equipment and push a pump beyond its maximum capability. Selecting a pump that hasn't been specifically designed for this type of demand can result in unwanted maintenance costs and downtime.

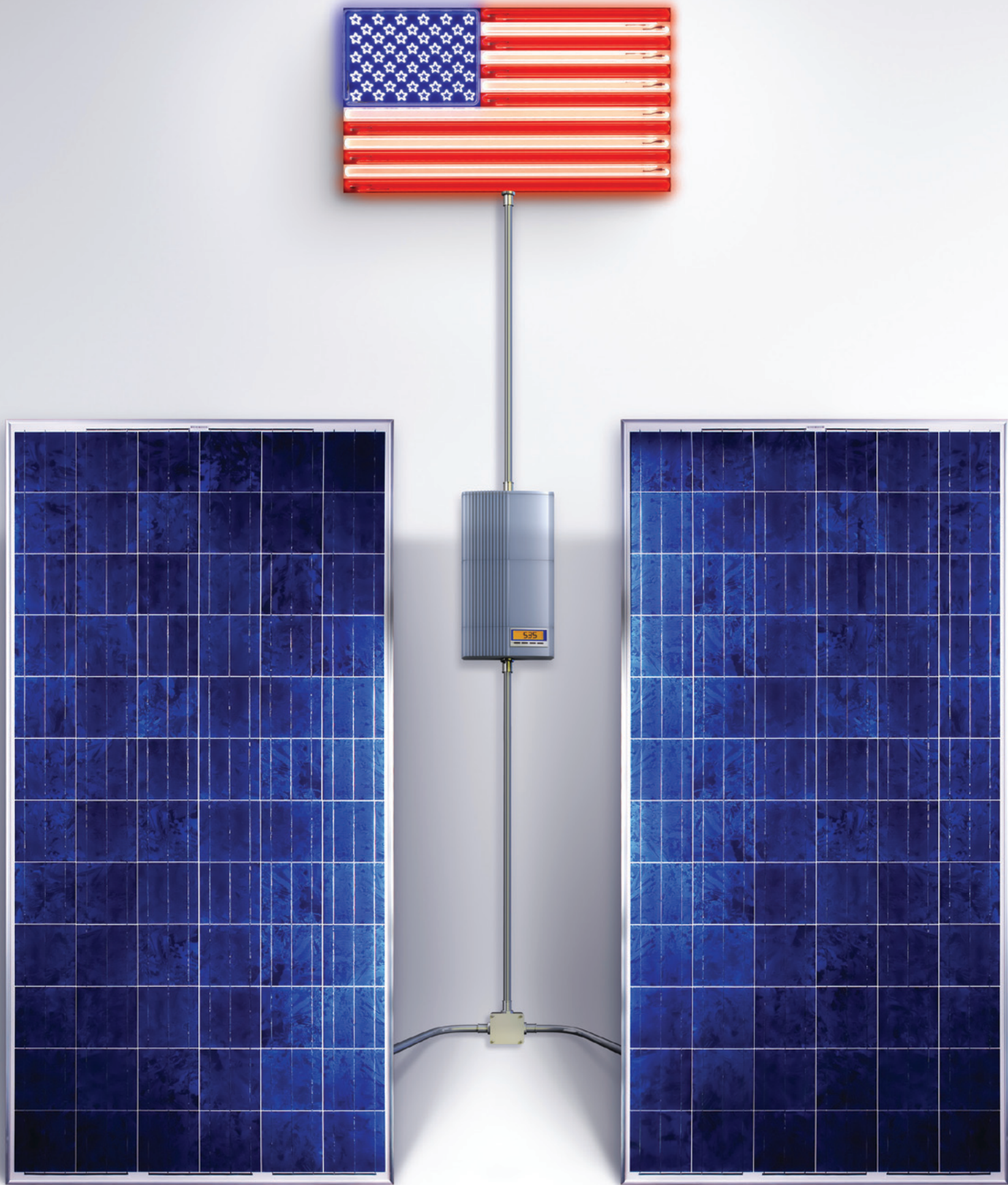
One of the many reasons pumping equipment is pushed to such extreme measures during the wafer-creation process is because of the abrasive slurry that's used during the cutting process. This slurry, which is a mixture of glycol and powdered silicon carbide, is pumped into a wire saw machine and acts as the cutting agent between the silicone ingots and the wire saw machine as it cuts the silicone into wafers. Eventually, the slurry becomes polluted by silicon particles, iron, and other byproducts from the sawing process, which makes it unusable.

Slurry is one of the more expensive costs during the solar-cell production process. Rather than discard it after use, many customers have invested in systems that utilize pumps to recover, recondition, and reuse the slurry to help cut down the costs of production. In addition to being able to handle slurry during the cutting process, pumps utilized during the wafer-creation phase must also achieve functional reliability during the etching and cleaning process. During this process, abrasive liquids and sharp silicon particles must be continually drained, filtered, and circulated by the pumping systems. Since this process is harsh, the pumps chosen to complete this task must have a solid construction and a high capacity to resist abrasion.

Over the years, a number of different pumps have been selected for use during the wafer-creation phase. However, many of the processes involve wet and dry applications, and few pumps are well suited for both. For example, pumps made with metal parts frequently corrode, and the sealing oil's lubricating properties degrade under the abrasive liquids and sharp materials associated with solar-cell production. Some pumps also pulsate during liquid transfer, which can interrupt or clog the flow of material, resulting in pressure spikes and, ultimately, leakage.

Since pump malfunctions and maintenance downtime adds time and costs to solar-cell manufacturing operations, getting just the right pump for use during this wafer-creation phase is essential. Fortunately for those involved in the production of solar cells, there's a pumping technology available that offers the design, materials of construction, energy consciousness, and operational efficiencies needed for this critical application: Solid Body Air-Operated Double-Diaphragm (AODD) Pumps.

Continued on page 22.



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Application photo of an E-Series pump installed in a slurry application.

...continued from page 20.

Pumps for increasing uptime

Solid AODD pumps offer many advantages during the production of solar cells, especially during the wafer-creation phase. AODD pumps don't require electricity, are self-priming, and can pump media ranging from wastewater to more viscous substances such as slurries and media with solids in suspension—like the hard sharp silicon particle byproduct of the wafer cutting and cleaning processes. AODD pumps are also designed to operate in rugged applications where most other pumps fail.

By utilizing a solid body construction, AODD pumps create a more reliable and efficient pump that has the capability to handle the demands of working with slurry, all while lengthening the pump's lifecycle and eliminating many maintenance concerns. The mechanical machining of a solid plastic block is economical, thanks to modern computer numerical controlled (CNC) technology that enables far tighter tolerances than those pumps that use injection-molded parts.

This solid-body construction provides a wide range of advantages to the end-user, including: increased pump safety due to an innovative ring-tightening structure; increased product capacity; decreased air consumption; reduced noise level; optimized flow pattern; and, a screwed-on or flanged pulsation dampener. The pump's structure allows all housing bolts to be tightened against a diaphragm-sized ring on each side of the liquid housing. This creates a greater and more even compression at the sealing surfaces, which results in increased safety.

Other critical parts of the pump's construction are the pump housing, valves, and air valve. The pump housing can be made from many types of material. Some popular plastic materials of construction are Teflon, polypropylene, polyethylene, and acetal. Stainless steel, aluminum, and cast iron can also be used, but they're not as compatible with the chemicals and abrasives used in solar-cell construction. The pump's check valves are a ball-type that fit snugly with the valve seat to ensure the pump chambers are completely sealed. The air valve, which is sealed off from the pump chambers by the diaphragm, handles the variable displacement of air behind the diaphragm.

In addition, the characteristics of the AODD pump design offer many other benefits. Among them: the absence of an axle seal or other lubricated parts, which allow the pumps to run dry; the pump's capacity can be adjusted by increasing or decreasing the air pressure or air volume; and, the pump will shut down automatically if the discharge pressure exceeds the air pressure.

Designed specifically to handle the pumping requirements at solar-cell plants, solid body AODD pumps is constructed in polyethylene (PE) and PTFE, which are ideal for solar-cell production. PE pumps are used for the abrasive silicon carbide slurry and have a high-abrasion resistance. PTFE pumps have an excellent chemical resistance, and are used for the chemical supply within the solar-cell manufacturing. The diaphragm used in advanced solid body AODD pumps are available in EPDM or PTFE/EPDM, while components like ball valves are available in EPDM or PTFE, with the cylinder valves constructed of PTFE.

Sergio Avila is the Almatec Product Specialist with Pump Solutions Group (PSG).

Almatec | www.almatecsolar.com



UV-protected cable ties

Heyco Products, Inc., US-based designer and manufacturer of wire protection products and power components, has announced availability of their new SunBundler Cable Ties. Excellent for solar installations where product durability is required, the ties are designed to handle cable bundles from 2.30" (58.4 mm) to 4.20" (106.7 mm) in diameter. The SunBundler Cable Ties are constructed from aircraft-grade stainless wire with a UV-protected vinyl jacket. They're extremely durable, and the UV-protected smooth vinyl jacketing prevents damage to installation cable insulation. The tinned copper crimp sleeve permits easy field installation. Standard wire cutters can be used to both crimp the sleeve and cut any excess wire.

Heyco Products, Inc. | www.heyco.com

Arc and ground fault detection & interruption solutions

SolarBOS, Inc. unveils the industry's first Arc Fault Detection and Interruption (AFDI) combiner box, as well as the first true Ground Fault Interruption (GFI) solution for PV systems. The threat of PV systems starting fires is an unfortunate reality. There's a real danger of grounded PV systems creating a condition known as a "double ground fault," in which the positive side of an array essentially shorts to the negative side of the array through the equipment ground conductor. In most cases, the inverter's GFI is incapable of detecting one of the ground faults or preventing the ground wire from catching fire.

The new AFDI combiner allows system integrators to meet the letter of 2011 NEC in a cost-effective and reliable manner. SolarBOS' AFDI combiner box has a module that detects series arcs and automatically disconnects the ungrounded conductor from the rest of the system, breaking the circuit, which stops the arc and prevents a fire from starting. The SolarBOS AFDI combiner can also be configured to work with a Ground Fault Interruption (GFI) device or system to open the ungrounded output of the combiner box when a ground fault is detected.

SolarBOS | www.solarbos.com



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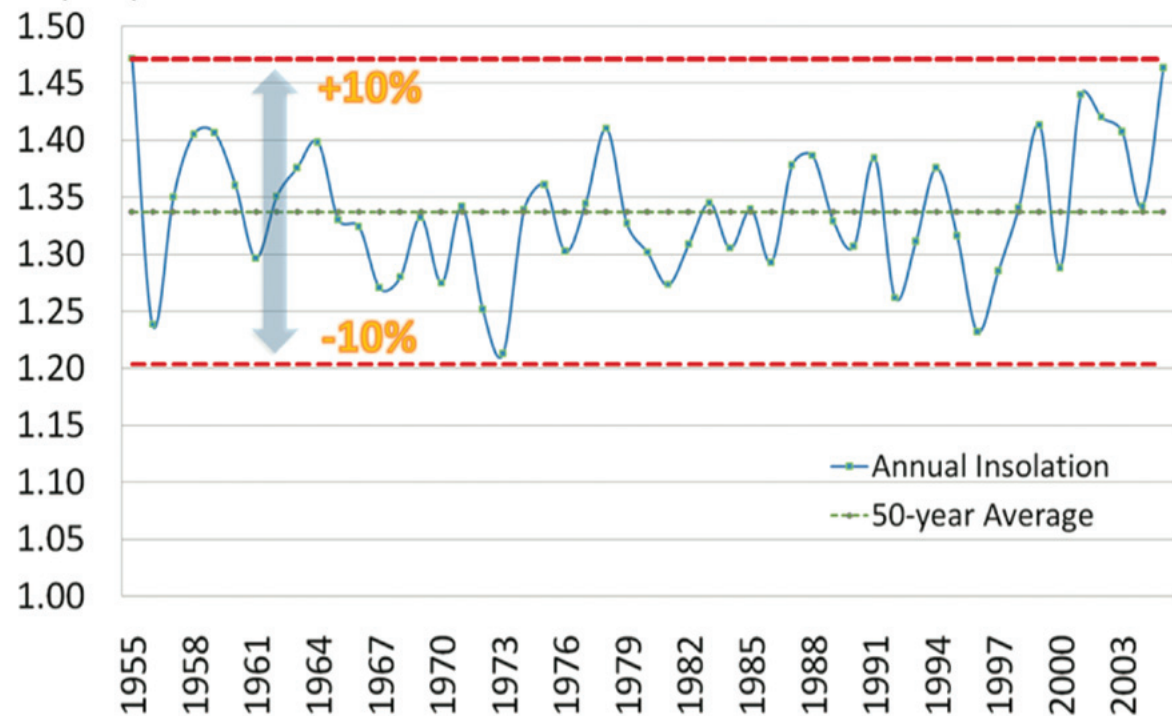
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“Plans based on average assumptions are wrong on average.”

This is how Stanford scientist Sam L. Savage defines the flaw of averages. Our natural inclination is to make decisions solely based on the long-term average values, without taking into account the variation around this average. In solar energy, this is precisely what many developers are doing: using a single-point estimate for the solar irradiance of a project site, and assuming that the level of incoming solar radiation will not change dramatically over time.

Much like the story of the statistician, who is perfectly happy in general, with his head in the fridge and his feet in the oven, this way of thinking may lead to some very bad decisions.

Solar variation

There's a widespread perception in the solar energy industry that solar irradiance doesn't vary too much from year-to-year at a given project site. Research suggests that, even on an annual basis, solar irradiance can vary significantly. Data for Ontario, Canada, obtained from both ground measurements and satellite observations, indicate that the variation can reach up to 10% from the long-term average for any given year.

This level of variation may not seem significant at first, but it's the likelihood of back-to-back lower than average irradiance years that may cause a real problem. Such an event can dramatically hinder the debt servicing capability of a solar energy investor. So, how do we avoid the flaw of averages in the solar industry? The key is to understand the statistical behavior of solar irradiance by using historical time series data. This is precisely why large-scale solar energy investments require painstaking resource assessment studies. Although these stud-

ies are costly, developers and creditors are interested in them, as they decrease the level of uncertainty of an investment.

In recent years, a new generation of solar resource assessment tools has been developed, significantly cutting the cost of these studies. Today, obtaining a detailed analysis of solar irradiance is within reach of individual households, empowering investors to make the best possible decisions. When one considers the potential of a project site, a useful metric is the hourly average global horizontal irradiance (GHI). GHI is the total amount of short-wave radiation reaching a flat surface on the ground, generally measured in watts per square meter. As the standard yardstick of the industry, it's a useful metric for comparing different project sites.

Any data collection method is prone to have missing data points. That's why computing the hourly average of GHI can give a more accurate comparison of year-to-year variation (as opposed to the sum of all observations for a given year). One can always convert this value to the annual sum by multiplying it with the number of hours in a year. For example, the hourly average GHI in Toronto, Ontario is 158 watts/m² and the annual average GHI is 158 x 8760 = 1,384,080 or 1.38 MWh/m². However, these metrics are not sufficient for assessing the natural variability of the solar resource.

Meaningful statistics

One way to move beyond the long-term averages is to derive meaningful statistics, such as the standard deviation of solar irradiance, from historical data sets. There are three main alternatives for finding historical data: onsite measurements, existing databases from ground and/or satellite measurements, and reanalysis data.

The most accurate data come from onsite measurements taken at the project site, ideally for a period of more than five



Charge-collection tapes for thin-film solar

3M announced the commercial launch of two new charge-collection tapes for use in the manufacturing of thin-film solar modules: 3M Charge-Collection Solar Tape 3007 and 3M Charge-Collection Solar Tape 3011. These tapes are available globally in standard and custom dimensions. 3M charge-collection solar tapes can be applied at high speeds using automation to various thin-film target substrates, resulting in enhanced manufacturing productivity. The “no-mess,” pressure-sensitive adhesive provides for immediate hold, and ensures the tape stays in place during the panel assembly process. The tin-plated copper foil provides for corrosion-resistance and solderability to bus bars. Both tapes have shown durable test performance for high currents.

3M | www.3m.com/solar

years. Using instruments such as pyranometers, solar irradiance can be measured with great accuracy. Although this is by far the most reliable method, it's not very practical for two main reasons: high cost and the long duration required for taking sufficient measurements. One's own “weather station” composed of a good quality pyranometer, a data logger, and a transmitter will cost thousands of dollars. Perhaps more importantly, this type of data is not available on demand. At least one year of data has to be collected before any significant analysis can be performed. Even then, multi-year variations cannot be captured with one year of data.

The second alternative is to use existing databases, which contain solar irradiance data. These databases are maintained by the government and the private sector, and their spatial and temporal data coverage varies. In recent years, solar radiation estimates from meteorological satellite data have become more common. Complementing existing ground measurements, satellite data helps increase the spatial coverage of the databases. Although these data sources may not be as accurate as onsite measurements, they are available on demand, and can be obtained at a reasonable cost.

The third data source is reanalysis data. Reanalysis is a scientific method that combines historical data from many different measurement systems using a consistent numerical model. These datasets cover multiple decades, and they enable us to conduct many different types of analysis. One disadvantage of reanalysis data is the relatively poor spatial resolution, so finding a data point close to a project site may not always be possible.

Of course, combining these different options according to one's specific needs is probably the best way to avoid the flaw of averages. Moving beyond a single-point estimate of a solar resource may seem daunting at first. But, by setting realistic expectations of an investment right from day one, one can avoid a lot of headache down the road.

Dr Ozgur Gurtuna is the president of Turquoise Technology Solutions Inc.

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Solar roof-mount system

SunLink Corporation has released Core RMS, the newest addition to the company's trusted solar roof-mount product line. Core RMS features a sturdy grid assembly that provides superior strength and load distribution for framed or laminate solar projects of 10° or less. The system is simple to install and durable enough to withstand high wind loads and extreme conditions. The product's signature design links north-south rows and east-west panel sections to one another, dispersing loads across the total array and requiring less ballast in most instances. Rails and clamps streamline installation by auto-aligning and auto-spacing modules. The system also offers +/-2.5° of roof-following adjustability in north-south and east-west directions. Like all SunLink roof mount products, Core RMS is designed with roof-friendliness in mind, often requiring zero penetrations. Further, the Core system sits on rubber feet made from recycled tires. Each foot eliminates two tires from their landfills.

SunLink Corporation | www.sunlink.com

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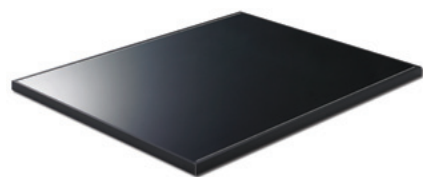


Measurement system for solar simulators

Ocean Optics has introduced an optical measurement system for absolute irradiance measurements of solar simulators and other radiant sources. The RaySphere enables measurement of absolute irradiance ($\text{mW}/\text{cm}^2/\text{nm}$) over different spectral ranges from the UV to the NIR (380 nm to 1700 nm). RaySphere is especially useful to solar simulator manufacturers and R&D labs as a tool to validate the output of installed solar flash lamps. The flash of a solar simulator is used within the PV manufacturing process for the binning of cells, according to spectral response, and for final PV module efficiency measurements.

RaySphere provides a system with the necessary accuracy and resolution to measure and analyze the performance and stability of the flasher, with advanced, ultra-low jitter triggering electronics for timing the measurement to the flashes. The calibration of the RaySphere has been validated by an accredited certification lab to ensure accurate detection, allowing evaluation and qualification of the spectral distribution of solar flashers and simulators according to norms established by standards-setting bodies such as ASTM and IEC (IEC60904-9 2007).

Ocean Optics | www.oceanoptics.com



Thin-film solar modules

Solar Frontier's new SF140-155 module series offers the highest conversion efficiency of any mass-produced thin-film module, up to 12.6%. The modules feature the light-soaking effect unique to Solar Frontier's CIS technology, which provides higher output than initially specified. All modules are RoHS compliant and cadmium- and lead-free. Fewer production steps and raw materials also mean an energy payback time of less than one year. SF140-155 modules are shipped in cardboard-free packaging and use recyclable corner pieces.

Solar Frontier | www.solar-frontier.com



High-efficiency central inverters

The Conext Core XC Series is a new line of central inverters designed for high efficiency and flexibility for any PV panel type and installation. The Conext Core XC Series has peak efficiencies of 98.7%, and its flexibility allows the inverter to be configured with voltage and power outputs up to 680 kVA. In addition, the Conext Core XC Series is designed to allow for DC inputs up to 1000 Vdc for longer string lengths. It contains the latest grid management features to meet global utility requirement including the new BDEW requirements for Germany.

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Advancing Renewable Energy Investment with Extreme Reliability Design

By Rob Dixon

RELIABILITY IS KEY to the proliferation of any renewable energy product, especially those involving sensitive electronics, such as solar power optimizers, micro inverters, wind turbines, smart grid devices, etc. For renewable energy to gain mainstream market penetration, electronic products must be durable enough to withstand harsh environments, and last at least 25 years.

Many technologies on the market today simply haven't been in standard use long enough for hard field data to prove their reliability. Fortunately, there are steps and considerations engineers can take to build an extreme level of reliability into a product. These steps translate into long-lasting, durable products with lower lifetime costs of ownership, which in turn provide project developers and investors a higher level of confidence to fund projects.

Component selection

An accepted guideline for thermal acceleration of failure rate states that for every 10 degrees of operational rating in a given environment, the failure rate for a given part at a specific temperature is cut in half. So, at a given temperature a +105° C rated part will have four times the reliability of a +85° C rated part. As an example, solar power optimizers mounted on the backs of solar panels commonly experience temperatures that exceed +85° C. This significantly over-stresses the electronic +85° C rated components and puts the PV system at risk of failure because component failure mechanisms are highly accelerated by temperature. Therefore, a component's temperature rating fundamentally affects the failure rate of that component—and the entire system.

To increase the reliability of renewable energy products, it's advised engineers run hundreds of "what if" scenarios, model actual mission profiles for locations worldwide, and identify the highest contributors to product failure rates. Throughout the telecommunications, aerospace, and military industries, this modeling and analysis demonstrates that devices containing optocouplers, electrolytic, tantalum and large multilayer ceramic capacitors, as well as powdered iron core inductors with organic binders, and any component part rated +85° C or lower, can severely limit a product's ability to withstand long-term environmental stresses. Such environmental stresses are identical to those found in the renewable energy industry.

In terms of customer satisfaction, this means products containing these components might not be robust enough to last. By eliminating these and other components/technologies, engineers can provide the industry a lower total lifecycle cost of ownership, with inherently more robust solutions and ultra-low failure rates.

Component de-rating

De-rating is the intentional reduction of applied stress on a component to assure reliability. By incorporating de-rating guidelines provided by the Reliability Information Analysis Center (RIAC), a US Department of Defense technical center into their design process, renewable energy engineers can increase circuit construction reliability, as well as circuit performance.

Such guides are applicable to a wide variety of electronic industries, from telecommunications and aerospace, to renewable energy. By meeting or exceeding the military/aerospace level of component stress de-rating recommended for mission critical long-life applications, renewable energy technologies can be designed as robust and dependable as those technologies sent into space.

Understanding MTBF

Throughout the electronics and power conversion industry, the Mean Time Between Failure (MTBF) metric is widely misunderstood to mean the "useful life of the product." Many presume a product with a high MTBF rate will last longer than a similar product with a lower MTBF rate. This isn't always the case since how the MTBF is generated determines not only the accuracy of the prediction, but also the metric's validity. For example, if a product has a five million-hour MTBF, people might think it should last over 500 years. However, MTBF is the mean of the distribution of failures. So, for any single product, there's a 62% chance (the mean time to failure in a population) the product will have failed by the MTBF estimate.

Additionally, it's essential to understand a calculated MTBF is a poor predictor of wear-out in a product. It's entirely likely that using 85° C parts in an application that exposes those parts to

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Product	Upper destruct limit	Upper operating limit	Product Certification Rating	Lower operating limit	Lower destruct limit	Vibration operating limit	Vibration destruct limit
AP300	>+130° C	>+120° C	+90° C	<-90° C	<-90° C	>50 Grms	>50 Grms

Figure 1. Final HALT results for AP300 smart junction box. The Azuray Technologies' AP300 is rated at 90° C. Its upper operating limit is >+120° C, and its lower operating limit is <-90° C. This means, even though the AP300 is rated at 90° C, it's built to operate well above that temperature and as such, is built stay reliable after exposure to extreme conditions.

the 100% stress ratio of an 85° C environment would have a high calculated MTBF. In actual application, this will appear as a low, steady state failure rate that rapidly increases due to wear-out well before the required 25-year useful life.

Besides rigorous component selection or de-rating guidelines, another path to avoid a steady decline in reliability over time is to build in very wide design margins. Design margins are when a product is designed to handle stress well above its operating environment. By using multiple Highly Accelerated Life Tests (HALT) during product development, engineers can test a product design to the fundamental limit of technology, and attain its highest reliability potential (see example in Figure 1).

Summary

Regardless of the sector, demand is growing in the renewable energy industry for long-life products. By developing advanced and comprehensive reliability guidelines, engineers can give buyers greater confidence that products will last, and are robust and durable enough to warrant investment. When system customers feel assured a product will generate renewable energy reliably, regardless of the environmental conditions, that confidence supports the financial models used to fund the installation. Well-designed products help make the return on renewable energy investments work.

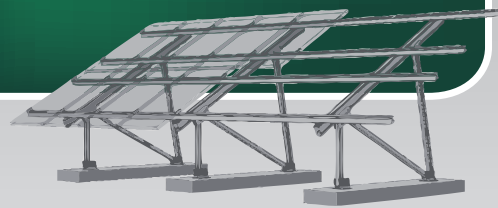


Rob Dixon is the senior reliability engineer at Azuray Technologies, and a senior member of the American Society for Quality, and a certified quality engineer.

Read the full "Extreme Reliability" white paper from Azuray Technologies.

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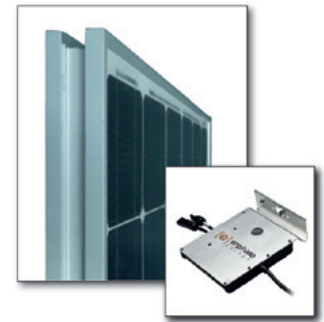
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Solar thermal collector

Solar Skies Mfg., has added a 4' x 4' solar thermal collector to their product line, providing customers with a flat plate collector they can install in a landscape configuration and still maintain the proper flow for a drainback system. Since the 4' x 4' collector is square, it's not necessary to rotate the collectors; therefore, the risers always run in a vertical position. Link up to eight collectors for a nice looking, low profile, horizontal array and still maintain the drainback configuration. This SRCC-rated, low-profile collector weighs less than 60 lbs., making it lightweight and compact for easy installation. The SS-16 4' x 4' collector can be ordered with any of the Solar Skies options, uses the standard SS Series hardware, and is built with the same Solar Skies high quality standards. Crating is available in a 6- or 12-pack.

Solar Skies Mfg. | www.solarskies.com



AC module solution

Upsolar and Enphase present the AC Module Solution (ACM), combining efficient micro inverter technology with a best-in-class solar module to enable a significant reduction in balance of systems costs and installation time. Enphase micro inverters attach directly to the frame of Upsolar's Zep-compatible modules, converting direct current (DC) to alternating current (AC), without specialized cabling or mounting hardware. Superior aesthetics are achieved with a completely flexible system design and full utilization of available roof space.

The ACM eliminates the need for externally mounted inverters, and is available with black-framed and all-black solar modules to suit homeowners' individual tastes. Advanced networking technology provided through web-based monitoring provides intelligence and insight into solar system performance, maximizing the potential solar resource. With a 100% uptime guarantee and both products backed by a 25-year comprehensive warranty, the ACM ensures maximum solar energy harvest for the life of the product.

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Online design utility

MacLean Dixie HFS announces the completion of the MacLean Design Recommendation System (MDRS). MDRS is an online design utility that will enable the rapid creation of helical foundation pile designs for a variety of applications, regardless of the user's previous foundation design experience. The user simply enters the soil data and loads that need to be resisted by the foundation (such as compression, uplift, and lateral loads due to wind), and the system will automatically generate an appropriate helical pile for the project. For more experienced users, MDRS allows the helical pile to be fine-tuned for value engineering. Additionally, MDRS generates a complete set of submittal documents for each helical project including product drawings, specifications, construction QA/QC forms, etc. MDRS provides the tool necessary to design and compare helical pile foundations in minutes.

MacLean Dixie HFS

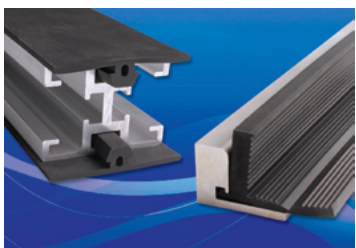
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Ground-mount racking system

Unirac, Inc. announced the newest generation of its premier product for commercial installations—the ISYS Ground Mount racking system. Available for order, ISYS Ground Mount (IGM) 2.0 is stronger, lighter, and installs more quickly than its predecessor. Engineered to accommodate virtually every foundation option, IGM 2.0 easily adapts to any project site by allowing customers to select the most cost-effective foundation system for their specific project site. This improved version of IGM is constructed of roll formed C-channel beams, rather than the roll formed and toggle-locked I-beams used for the earlier version of IGM. This clever design cuts down on material use while maintaining the same structural integrity. Manufacturing time is slashed by as much as 50% through the use of C-channel beams, reducing project ramp-up time. The new beams can also be stacked interlocked, saving valuable space and allowing more beams to be transported on fewer trucks. On a typical 1 MW project, the shipping weight of the new IGM rails can be reduced by as much as 14% over the earlier design.

Unirac, Inc. | www.unirac.com



PV panel isolators

Lauren Manufacturing, a manufacturer of custom-engineered seals and gaskets, introduces the Isolator Seal for PV solar panel mounting systems. Lauren Manufacturing provides a wide variety of custom isolators for steel fabricators, PV panel manufacturers, and PV panel installers. Lauren engineers custom-designed isolators to fit within the markets diverse mounting systems. The isolator slides easily into a mounting bracket and is designed to protect the PV panel glass, reducing the repair rate. Lauren provides high-performance products that exceed industry standards for weatherability, and are a part of systems designed to last 25 years or more. Customers benefit from engineering support through state-of-the-art materials (UL and ASTM Specifications), FEA capabilities, custom designs, and value-added operations.

Lauren Manufacturing | www.lauren.com



Commercial inverter

KACO new energy announces a new 10 kW inverter, designed for the North American commercial market. The blueplanet XP10U-H4 is a 10 kW three-phase 480 VAC transformerless inverter, perfectly suited for commercial applications. The inverter's maximum efficiency is 98%, which will accelerate the system's ROI. The XP10U offers the most precise tracking of two-string inputs with standard dual MPPT. The result is pinpoint power tracking accuracy. Designers will benefit from a wider range of system layouts. Dual MPPT also enables more overall system production by reducing the effect of erratic insolation. The inverter is lightweight (88 lbs) in its power class, and has an easy-to-handle cast aluminum enclosure. It allows for a better side-by-side installation, and comes with an inside fan air intake and top exhaust. The compact design allows for a convenient and quick installation.

KACO new energy | www.kaco-newenergy.com



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BIPV Installation Challenges & Solutions

Incorporating smart modules

By Hannah Mann

BUILDING-INTEGRATED PHOTOVOLTAICS (BIPV) products first became commercially available in the 1990s, and are applied in public as well as private buildings of various sizes. In the US, research on “zero energy” buildings—meaning buildings that consume 50% to 70% less energy than conventional ones—is supported by the US Department of Energy’s (DOE) Building America Program. Within the framework of the program, the DOE is awarding \$40 million to the development of zero energy buildings until 2012.

There are two predominant ways to integrate PV modules into a structure. Modules can be integrated into the roof of a building, where they replace conventional roofing materials such as tiles, shingles, or metal. Standard in-roof systems present the simplest and most common approach. It’s sometimes debated whether such products are true BIPV products; however, they do account for an important segment of the industry. Such modules can be

integrated into the façade of a building, where they replace materials such as cladding or glass, and are designed to act as part of the building envelope.

The types of modules most commonly applied in BIPV are thin-film modules and crystalline silicon modules. Thin-film modules can appear to be more aesthetic, but difficulties exist in making them fully uniform during the manufacturing process. Standardization is important because the building industry highly depends on uniform building blocks, plus it reduces expenses. A customized production of a small amount of uniform thin-film modules entails increased overhead costs. Manufactures of crystalline silicon modules already have highly standardized products in place, and simply need to modify these to make them thinner and flush with the base structure. Crystalline silicon modules are, therefore, often a preferred choice.

Constraints of traditional PV systems

In architecture, good design matters. Architects who handle BIPV projects would like a PV system to blend naturally into the design of the building. According to a study published by the National Renewable Energy Laboratory (NREL) and Gregory Kiss of Kiss+Cathcart Architects, PV system sizing is one of the major architectural design considerations unique to solar. Constraints leading back to PV system sizing can pose a limitation to the freedom of architectural design.

While string length specifications vary between different inverter manufactures and depend on the type of module used, the typical range is nine to 14 modules per string. Here is why: in a serial connection a module’s output voltages add up. The sum of all voltages in a string must not exceed the maximum allowed input voltage of the inverter. If the maximum input voltage of the inverter is 600V, and the module output voltage is 50V, the maximum string length allowed are 12 modules. When connecting more than one string in parallel, the strings need to be exactly equally long.

Architects further need to take into account the conditions under which a PV system can produce the maximum amount of energy possible. Although a module’s peak operating points are diverse (obtaining them requires individual currents), traditional inverters use a one-size-fits-all approach to harvest energy by pulling a single current from the array. Output diversification caused by shadows cast on some of the modules in an array leads traditional inverters to lose disproportional amounts of energy. The city is a jungle and in the urban environment partial shading can be caused by anything from neighboring buildings and trees to antennas. Traditional inverters don’t provide for a level of flexibility high enough to ensure the plug-and-play features desired by architects.

PV risks & codes

In traditional PV installations, DC voltages typically reach high levels whenever the PV array is exposed to sunlight. This poses a potential hazard to first responders in cases of emergency such as fire. PV inverters are required to include a DC/AC safety switch, which merely interrupts current flow. Hazardous voltages still remain within the array.

Besides various local regulations, the codes BIPV designers are required to abide by are the International Building Codes (IBC) and the National Electric Code (NEC). With BIPV being increasingly applied to publically accessible and sometimes publically owned structures, such as train stations and office buildings, these structures must be safe for emergency responders. Safety requirements specified in the applicable codes could face growing public scrutiny.

Lastly, what if some sort of system failure is suspected? Traditional inverter-level monitoring lacks access to the inside of an array. As a result, it’s difficult to determine if and where a system has failed. A technician needs to take apart pieces of the building structure to search for malfunctioning modules, which makes maintaining a BIPV installation more challenging to BIPV owners.

Smart module solutions

Smart module technology makes use of module-level power management (MLPM) technologies that are incorporated into the heart of a PV module: the junction box. MLPMs provide a number of module-level features that, by the inherent nature of PV, are best accomplished at the generation source.

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Off-grid PV system

The successful Steca Solarix MPPT 2010 range has been extended with a new 10 A variant: the innovation under the name of Solarix MPPT 1010 is distinguished by even higher efficiency. The solar charge controller with Maximum Power Point tracking is able to charge a 24-volt battery in systems up to 250 Wp, and a 12-volt battery in systems up to 125 Wp. The new product for off-grid systems boasts a good price/performance ratio. This further development offers all the proven quality advantages of the Steca Solarix MPPT 2010: full power for all areas of application in stand-alone systems, professional battery care, modern design, high-performance protection systems, and easy-to-read display for optimum operation of a PV system.

Steca | www.steca.com

To start with, MLPMS can increase flexibility in PV system sizing. The input and output voltages at the junction box are independent from each other—a topological change that removes module output voltage as a string length limitation factor. In addition, smart modules track their own MPP. Module-level MPPT adjusts the current to the specific maximum power-point current of each module, guaranteeing modules work at their maximum capacity regardless of other modules in the string. Designers can apply modules to different orientations and tilts in the same string without worrying about the side effects of partial shading or power mismatch.

Breakthroughs in monitoring exist, as well. Smart modules constantly transmit data on the state of their performance and send off an alert in the case of underperformance. The data can be analyzed through an online portal where a visual layout gives the exact location and performance data for each module. Maintenance staff is, then, able to pinpoint the location of malfunctioning modules remotely and uncover the building structure where needed.

Finally, smart modules make BIPV installations safer for emergency responders. Modules continue in operation mode only as long as a green light signal from the inverter is renewed. In absence of the signal, when a building is disconnected from the electrical grid or the inverter is shut down, smart modules automatically go into off-mode, shutting down current and voltage.

Despite the progress, there still lies a stretch ahead before intelligent BIPV products become commonplace. Progress in the BIPV industry will be determined by the three key actors in the field: the construction industry, governments, and the PV industry. The latter needs to ensure the power harvesting process will become more BIPV friendly.

SolarEdge Technologies
www.solaredge.com



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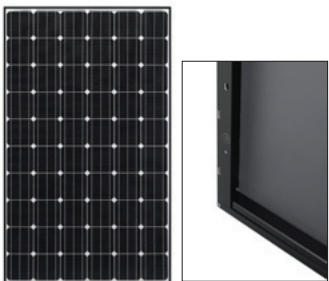
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TYPE	CAPACITY Amp-Hours (AH)			VOLTAGE
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IND13-6V	533	673	820	6 VOLT
IND17-6V	711	897	1090	6 VOLT
IND23-4V	977	1233	1500	4 VOLT
IND29-4V	1245	1570	1910	4 VOLT

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High-efficiency modules

LG's Mono X and Multi X offer a new standard of quality assurance. LG's solar module test lab has received full certification from TÜV and UL, a first in the industry. Taking advantage of extensive research and development, LG has utilized its unique cell technology to ensure product durability and sophistication. The frame of both modules—designed for durability—has been manufactured to withstand frontal and rear pressure of 5,400 Pascal, and dust-resistance has been optimized for long-term performance reliability. As with LG's full range of solar module products, the Mono X and Multi X build upon the company's premium brand awareness, along with a 25-year warranty program. The Mono X boasts the highest power among all LG modules in its class. The Mono X comes in four models: the 260 W, 255 W, 250 W, and 245 W. The Multi X offers the highest efficiency rating in its class, and is available in four models: the 240 W, 235 W, 230 W, and 225 W.

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A comprehensive approach to the application of lightning and surge protection will help to ensure the maximum life expectancy and efficiency for your solar PV power system. The following illustration details the application points for the surge protectors and the primary protection goal of each device.

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Are you protected?

- 1 AC Distribution Panel
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- 4 Inverter DC Input
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Integrated battery rack system

The new Integrated Battery Rack System joins the OutBack Radian Series Inverter/Charger as a standardized solution built from the industry's most proven technology and materials in the field of renewable energy management and storage. The fully integrated Battery Rack System is easy to order and install as a complete solution, including cell interconnects, cabling, and series string over-current protection and disconnects. All electrical connections are made at the factory and ship fully assembled with the exception of the batteries, which can be quickly added and connected on the jobsite. Unlike typical steel racks, the Outback design is engineered from aluminum, resulting in a rack that weighs less than 90 pounds and, when combined with its powder-coated finish, is much better able to withstand environmental extremes. Polycarbonate protective covers provide additional protection for the batteries and electrical connections. The rack can support up to 12 x 110 pounds.

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Tracking mounts for PV panels

ATR introduces a fully integrated sun-tracking PV panel mount for ground-mount applications. This mounting system makes it easy to configure small and highly efficient “power gardens” for residential and small commercial applications, where conventional roof mounts may not be desirable. Each tracking mount supports two 235-watt panels, and can be attached to any suitable pole-type structure. Simple 6" x 6" wooden posts, pipe mounts, or screw-in piers can be used to make installation a snap for professionals and homeowners alike. The tracking mount incorporates a one-axis sun tracking mechanism, motor and controller, and is ready to run. Energy collection efficiency is improved by over 30%, and multiple units can be connected together for different power requirements. Set-up is easy: orient the unit south and turn it on. A GPS chip auto-configures the tracker for different locations, time of year, and time of day.

ATR Solartech (a division of Advanced Technology & Research Corp.) | www.atrsolartech.com



Groove mounting components

Westinghouse Solar, Inc., a designer and manufacturer of solar power systems, announced the availability of affordable mounting components for all solar panels with side grooves. Four years ago, Westinghouse Solar introduced the first solar panel with a side mounting groove—thereby substantially reducing installation costs. These “Andalay” panels, with integrated racking, wiring, and grounding, quickly won industry acclaim. To improve reliability and provide these same low installation cost benefits to other grooved solar panels, Westinghouse Solar has released a line of Andalay Groove mounting components.

Andalay Groove mounting components have been designed with a positive locking mechanism that prevents twist out failures. Tested to over 5400 Pascals in both positive and negative load conditions, these components are engineered for rooftops in which high winds and snow loads are expected. With fewer parts and no expensive tools required for installation, the low cost and simplicity of Andalay Groove components make them an ideal solution for residential rooftops.

Westinghouse Solar

www.westinghousesolar.com

Off-grid streetlight panels

Renogy now offers off-grid applicable panels for streetlights, power ranges from five watts to 100 watts. Being vertically integrated from solar ingots to solar modules, Renogy specializes in developing turnkey PV projects and delivering cost-effective solar energy solutions.

Renogy | www.renogy.com

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Loss Prevention & Protection for Solar Power

By Rob Cruickshank



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IN THE RELATIVELY new North American solar energy industry, there's a bit of a learning curve in terms of risk management for solar projects. How do you protect a big solar park? And what, exactly, do you protect it from? Insurance will cover some of the financial burden arising from theft, equipment breakdown, or natural disaster. However, as with any other kind of business, prevention is an effective way to minimize the impact, and it goes a long way to keeping insurance premiums down.

Solar parks face many of the same threats as other businesses, but often with novel twists. Thieves, for example, have found ingenious new ways to prey on renewable energy installations. Earlier this year, at a solar park in Coomera, Australia, thieves got away with 300 solar panels and inverters, worth more than \$500,000 (AU). The brazen pre-dawn theft left one solar business owner in awe. "That's massive," the owner was quoted as saying. "They'd need a forklift and it would take you an hour. Those things are heavy." (source: www.futuresustainability.com.au/news)

In 2010, the German market experienced a shortage of inverters, which connect solar panels to the grid and convert DC to AC, after one manufacturer failed and another suffered production bottlenecks. As a result, the number of inverter thefts at solar parks rose dramatically, with German authorities citing the involvement of organized crime.

Security-guard services can help mitigate this risk, as can perimeter fencing and video-surveillance systems. Consider assigning security responsibilities to supervisory staff, including inspection of trash removal. On request, local law enforcement will often provide regular drive-by checks. It's also a good idea to secure rolling stock and keep as little fuel in vehicles as practical—don't let thieves use your forklifts to load your equipment into your trucks and drive away.

Remember, too, that theft can sometimes be an "inside job." Prior to hiring, all personnel should go through an appropriate screening process, and consider a key-control program to limit the distribution of keys within your company.

Sometimes, thieves come disguised as suppliers, selling stolen panels and inverters. The industry has also experienced an influx of fake photovoltaic modules. "Made in China," and sometimes sold at suspiciously low prices, these modules are copies of reliable—and costlier—equip-

ment made by well-known manufacturers. The knock-offs are hard to detect, even on close inspection, and no efficient detection system is available yet. So, it's a good idea to know your suppliers.

Business interruption has also taken on a whole new look in the face of the shortage of qualified installation and repair companies. The industry is young enough that there are relatively few regulations governing installation of PVs. This has led to an influx of less-than-qualified amateurs and fly-by-nighters, which explains why losses to both ground- and building-mounted solar arrays most often arise from faulty installation.

The shortage of qualified repair companies, along with parts' shortages resulting from occasional production bottlenecks, create a substantial risk for business interruption. It's always a good idea to seek out and identify certified and experienced professionals to perform installations correctly the first time. The same goes for maintenance. It's tempting in a difficult economy to do less of it, but failure to keep up with regular maintenance leads to higher wear and tear. This means equipment becomes ineffective more quickly. Proper ongoing maintenance, again with those same certified professionals, is a lot more affordable than a complete overhaul or replacement. As for replacement parts, this may be one time where a just-in-time delivery isn't such a good idea. Consider building up a stock of spare parts when supply is plentiful. When you need them, you won't be at the mercy of those manufacturing bottlenecks that always seem to hit at the wrong time.

Snow accumulation on building-mounted solar arrays is one of the most frequent, natural causes of damage to solar parks. Prevention here begins at the design phase where it's important to lay out the array in a way that makes it easy to regularly remove snow, while ensuring roofs are reinforced to handle all the extra weight. Even if existing facilities haven't had the benefit of this design-phase work, occasional sorties by snow-shovel-wielding employees can go a long way to heading off damage from heavy accumulation.

Wind is also a significant loss control factor for rooftop panels, as winds upwards of 100 kilometers an hour can dismantle a solar panel that's not properly secured. Preventive measures for this type of loss are, again, related to the design phase, as proper engineering is required to ensure the brackets remain intact and are well-secured to the building on which they're erected. It's equally important to ensure panels are properly installed to maintain the integrity of the building and avoid any ancillary damage to the building in the event of high winds.

Solar parks can also fall prey to that oldest and most conventional of risks: fire. Common causes include poor preventive maintenance, improper fueling of equip-

ment, or improper storage of equipment and materiel. Good house-keeping can keep fire risk in check. Keep equipment away from hazardous locations and potential sources of fire, such as containers of gasoline, and other flammable liquids and gases. Equipment should always be parked away from dry grass or brush.

There's no such thing as foolproof protection from all threats. But, with a little effort and forethought, it's possible to reduce risk considerably by adapting and applying the lessons learned from the old economy to the business of renewable energy.



Rob Cruickshank is the director of Construction and Renewable Energy at RSA Canada

RSA Canada | www.rsagroup.ca



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Surge protection devices

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Features include: compact UL50E Type enclosure that can be directly mounted to panel and installed in a small space; LED status monitoring; 40 kA 8/20 μ s maximum surge rating per phase; CE, UL 1449 Edition 3 Listed; and, optional bracket to accommodate various mounting applications and conditions

ERICO | www.erico.com



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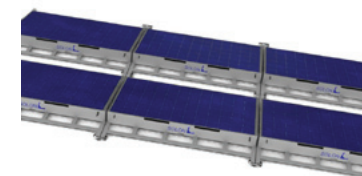
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Commercial rooftop solution

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SOLON Corporation | www.solon.com



Utility-scale power conversion solution

Bonfiglioli USA has released a complete utility-scale power conversion solution for the North American market. The new product line-up, designed to meet UL1741 standards and support utility-grid integration and management features, boasts the same technology as Bonfiglioli 1200MW+ PV systems that are currently installed or in progress in Europe. Bonfiglioli's PV solution supports 300 kWAC to 1465 MW AC medium-voltage power platform; it provides maximum energy harvest, reduces maintenance, and boosts uptime. Products include the RPS Modular Outdoor 200 kWAC inverter, which offers superbly flexible installation due to smaller dimensions (just 6.7'x2.7'x3.11'). The RPS TL Modular Inverter is uniquely designed with scalable and multi-MPPT configurations for maximum reliability and efficiency: a single fault affects only one inverter, while the balance continues to operate. The RPS station, string connection box, and RPS log complete the product family.

Bonfiglioli USA

www.bonfiglioliusa.com/pv



Filling & flushing station

For solar thermal pros, filling and flushing solar thermal systems is a day-to-day business. The SBS 2000 is the ideal companion for a professional performance. The new filling and flushing station has been designed for the professional; many thought-out details facilitate transport, operation, and cleaning. The additional handles at the bottom, for example, make it easy to lift and carry the station in a horizontal position—at the same time, the handles serve as bumpers to protect the pump during upright transport. The robust 30-liter tank is semi-transparent, visualizing the filling level at any time. A hose reel and the safety plug are situated at an ergonomic height next to the handlebar. The powerful pump is equipped with a dirt trap at its inlet; the drain valve at the deepest point of the tank enables easy and complete draining. But even if some fluid remains in the station, the angled tank ensures a spill-free transport even in a horizontal position. The SBS 2000 can be used with water, water-glycol mixtures, and cleaning fluids, and it is available for power supply voltages of both 115 volts and 230 volts.

RESOL | www.resol.com



Solar array cables

C&M Corporation offers a full line of customizable cable products for solar array installations. Consisting of motor power, communication, signal, and control products, these cables are water-resistant, sunlight-resistant, and carry the required TC-ER, AWM, or MTW agency certifications to include THHN-2. Available as bulk cable, mechanical assemblies, or molded cable assemblies, these products can be kitted for increased efficiency during installation. In addition, C&M offer full engineering support to assist clients with specifying the correct cable products, or, if necessary, developing them for the specific challenges of an installation.

C&M Corporation | www.cmcorporation.com

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BURNDY, a manufacturer and provider of electrical connector solutions and application tooling, announces a force gauge designed to assure that their BURNDY 12- or 15-ton tool is supplying sufficient force to crimp connectors properly. A precision, self-contained load cell converts the tool's output force into a pointer motion on a calibrated dial. With two different green ranges, it's easy to identify that the correct output force for either a 12- or 15-ton tool is obtained. Specifically designed for the BURNDY PATRIOT PAT46 and PAT750 family of tools, the FORCEGAUGE12 can also be used with the Y750 and Y35 self-contained family of tools. Supplied with two blank "U" dies, force test gauge and operating instructions in a molded carry case.

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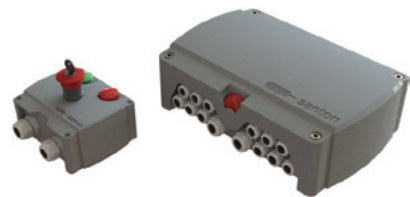
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www.solarcanadainc.com

Show in Print

Features just some of the companies and technologies attendees will see at this year's show.



Switchgear

Santon develops, produces, and maintains DC switchgear, and has for over 60 years. Since the global growth of the PV industry, Santon has been dedicated to developing safety solutions. With the X-Type Switch (16A to 30A), P-Type Switch (40A to 100A), E-Type Switch (250A), Silios range (switches in a box), and the Firefighter Safety Switch, Santon offers a complete range of DC safety switches for many applications. The renewed Firefighter Safety Switch is their latest solution, which can isolate a PV installation quickly, completely, and remotely with one simple action. The Firefighter Safety Switch uses a motor-driven switch, located as close as possible to the PV panels, which can be operated remotely (both on and off).

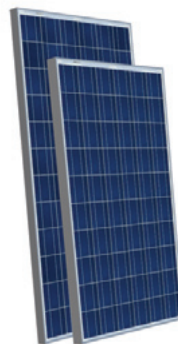
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Renewable energy consultancy

GL Garrad Hassan is one of the world's largest dedicated renewable energy consultancy and a recognized technical authority on the subject. It offers independent technical and engineering services, products, and training courses to solar sector, as well as the wind, wave, and tidal energy sectors. Although the GL Garrad Hassan name is new, the company has a rich heritage. It's borne of the integration of specialist companies that, united, form the renewable energy consulting division of the GL Group. GL Garrad Hassan is a consulting company; it has no equity stake in any device or project. This rule of operation is central to its philosophy, something that sets it apart from many of its competitors.

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Polycrystalline solar modules

Made in Ontario, following strict testing and quality standards, the Project Pro Series by Sovello of high-quality polycrystalline solar modules do not only offer high performance, but also longevity and a high degree of flexibility regarding system configuration and installation. They provide customers with maximum security with a long-term warranty on material and workmanship. Soventix Canada also guarantees at least 90% (80%) of the given nominal performance after 10 (25) years. In addition to that, these solar modules are bankable and backed by Sovello in Germany.

Soventix Canada | www.soventix.ca



Energy management specialists

Essex Energy Corporation has an experienced team of diverse energy management specialists, serving the needs of the public sector for 10 years. Their team of engineers and business professionals offer all services related to renewable energy projects (solar PV), conservation/demand management, and sustainability planning. These services range from consulting roles, including roles as educators, to complete project development.

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Designed for residential or commercial water and radiant floor space heating, the new SOL 27 PREMIUM low-profile flat plate collectors offer all the latest industry features. The SOL 27 Premium is a highly efficient thermal solar collector. The net absorber surface of over 25 square feet results in a maximum output of 31,300 btu/day per panel (SRCC clear day rating). The SOL 27 Premium also offers: high selective absorber coating; low iron; tempered solar glazing; and, very effective insulation around the absorber plate. The internal fluid tubes are copper and the absorber plate is aluminum. Installation is quick and easy with push nipple plumbing connections and versatile mounting rack kits. There's an industry leading 10-year warranty on Stiebel Eltron solar panels and tanks.

Stiebel Eltron
www.stiebel-eltron-usa.com



Solar mounting solutions

Applied Energy Technologies (AET), a global provider of solar mounting solutions, showcases their stainless steel Rayport Stainless Series Racking Systems, T6 Ground Mount Rack, and T6 Pitched Roof PV Rail System. AET racks fit all major solar modules, with a quick installation time. A full layout and loading analysis is provided for every project, and AET offers the shortest lead-times in the industry. Features of AET racking solutions include: racks for all panels available on the market; fewer parts to order; no cutting or drilling required; no heavy equipment required; and, a full layout and loading analysis for every project.

Applied Energy Technologies | www.aetenergy.com



Solar mounts

HES-PV POWER HOUSE is a quality producer of solar mounts for a variety of applications (MicroFIT compliant). They use only the highest grade aluminum (6063 and 5052) and powder-coated steels available, and can have mounts available with one of the fastest lead times available. The Fast Rack Solar Mounting System was designed for metal roofs and larger installations; it makes installs quick and seamless with integrated grounding and a 6' span on centre. Home Energy Solutions is dedicated to helping Canadians use solar electricity in their homes. With over 25 years of industry experience, they use the best equipment available to provide quality energy solutions.

HES-PV POWER HOUSE | www.hespv.ca



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When it comes to large-scale installations, a solar solution that's modular and with maximum efficiency in converting raw DC power into sellable AC energy is required. Schneider Electric provides turnkey solar solutions tailored to meet customers' needs, and that can be delivered the world over. That means lower operating costs, faster ROI, and an accelerated design and build phase on projects. Their customized solar solutions provide end-to-end electrical infrastructure, complete with power conversion, electrical distribution, supervision, and security. And, with their high-efficiency inverters, a global service organization, and co-design capabilities, performance and productivity are all but guaranteed. Real-time monitoring, advanced automation, and customized modular solutions—all this adds up to improved total system efficiency and reliability, and the assurance of meeting local codes and regulations wherever a project happens to be.

Schneider Electric | www.schneider-electric.com



Off-grid equipment

In addition to providing high-quality grid-tie PV modules and components, SunWize also carries a full line of off-grid equipment such as the SunWize 12 volt SP Series solar module. Ranging in power from five watts to 150 watts, the SP Series feature high-efficiency polycrystalline solar cells, a heavy-duty 50 mm (2.0 inch) height, clear-anodized aluminum frame, and a high-volume junction box that accepts 1/2" nominal conduit or cable fittings. SunWize's off-grid line includes inverters, controllers, batteries, racking solutions, and more, which are in stock and ready to ship.

SunWize Technologies | www.sunwize.com

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Solar panel device

OPTI-Solar announced the availability of its 12W Green Energy Kit, which lets users charge their mobile phones and tablets with a lightweight, compact, solar panel system. The device can be used anywhere, so users can simply unfold the durable solar kit and get the power they need quickly, easily—and for free. At the heart of OPTI-Solar's 12W Green Energy Kit is Maximum Power Point Tracking (MPPT), a key technology that lets users harvest the maximum amount of energy from a solar panel. OPTI-Solar's advanced analog MPPT algorithm locks in the maximum power point in less than 1000th of a second, meaning that the solar charger can spend 99.99% of the time charging the battery while harvesting the maximum power possible from the solar panel.

OPTI-Solar | www.opti-solar.com



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The ISGA Series Grid-tied PV inverters feature a transformerless design, which does not incorporate a cooling fan. Naturally, with no moving components, the ISGA Series will have longer, maintenance-free product lifespan, and has a warranty of up to 10 years. The ISGA Series are available in 2.2 kW to 5.3 kW outputs with a 240VAC 60Hz output, and an output efficiency of up to 96.4%. They can accept 150-450VDC inputs, and up to two strings/two MPP trackers. The input is protected from overvoltage, ground faults, reverse polarity, and surges. The ISGA PV inverters feature an environmentally robust and durable powder-coated metal housing with a NEMA3R outdoor rating, and can operate from -4° F to 122° F (-25° C to +50° C). They come standard with an RS232 output with RS485, Ethernet, USB, and web server also available as optional communications outputs. They are CE marked and ETL approved to meet all relevant standards.

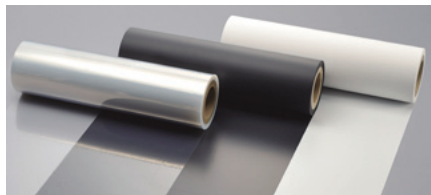
CARLO GAVAZZI Inc. | www.carlogavazzi.com



Single-axis tracker

DEGERenergie presents its newest innovation, the single-axis TOPtraker 8.5 system with an elevation angle of 30°. The new system is available in the US and Canada, and supports the worldwide trend toward smaller solar energy facilities. The single-axis TOPtraker 8.5, with an elevation angle of 20°, was particularly designed for the requirements of the North American market. It's the smallest system DEGERenergie offers. Depending on the location, the system is optionally available with an elevation angle of 20° or 30°, and is suitable for installation on buildings. The system is designed for a module area surface of 8.5 square meters, and it can be operated with all available solar modules. Depending on the module type, the rated power is between 500 Wp and 1,300 Wp.

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CPP Solar | www.cppsolar.com



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The Fronius IG Plus V line of string inverters, available from 3 kW to 12 kW, offers a range of innovative features that simplifies installation, makes repairs a snap, and increases energy yield in low-irradiance conditions. These automatic, high-frequency transformer inverters are 96.2% efficient, and are perfect for residential and commercial installations between 3 kW and 500 kW. Fronius' power-plug system and PC board replacement concept mean the inverters can be serviced in the field, on the first visit. Master Inverter X-Change (MIXTM) technology, an improvement of the classic master/slave principle, enables Fronius' inverters to work smarter, not harder, thereby increasing their service life and maximizing efficiency under partial load.

Fronius | www.fronius.ca



PV mounting system

Schletter Inc., a US manufacturer of solar PV mounting systems, announces that its FS System passed test requirements to be identified as classified with the ETL Listed Mark. Extensive system testing of the FS System by Intertek, the issuing organization of the ETL Listed Mark, qualified the entire system and corresponding components. Photovoltaic mounting (racking) systems sold under the FS System model number now comply with the standard for safety under UL-1703, CAN/ULC-ORD-C1703, and UL-Subject-2703. Schletter will begin producing the FS Systems with the ETL Listed Mark in early November.

Schletter | www.schletter.ca

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Cash Grant Disputes

Strategies for dealing with the Treasury Department

By Pamela Marple (left) & Eli Katz (right)



THE TREASURY CASH GRANT PROGRAM has been a hugely helpful incentive to the development of renewable energy projects in the US. In large part, this program has run smoothly with well-defined rules and principles, already having awarded over \$9BB to projects since its inception in 2009. Not all grant applications have gone well, though. There is growing evidence that Treasury is challenging what it perceives as aggressive cash grant applications, offering reduced awards and, in some cases, seeking to deny or recapture the cash grant in its entirety.

All project owners applying for a cash grant should be mindful of the principles that will govern any future dispute. Though there are still very few court cases dealing with the cash grant program, the general principles that should apply to a dispute with Treasury have been set forth by courts over the years. This article highlights some important considerations to keep in mind when applying for a cash grant and communicating with the Treasury Department.

Disputing Treasury's determination

In the context of any dispute with Treasury, it's important to get agreement on the core facts that support one's analysis. Better yet, have Treasury confirm it's not disputing

these facts. Doing so not only narrows the focus (hopefully leading to a successful resolution), but also establishes that the dispute is a legal one and not a factual one. A legal dispute affords a better chance of success—as well as less deference to Treasury's position.

Next, consider the Freedom of Information Act (FOIA). FOIA mandates that all documents and information maintained by a federal agency be disclosed upon request, unless exempt under nine specific areas. The information submitted in the cash grant application is no exception. If notified that the information submitted is responsive to a FOIA request, write a proper objection letter and follow up with the appropriate FOIA officials. If submitting information one would rather not be made public, take appropriate precautions.

Although it's fine to negotiate with Treasury, use care when doing so. Once a dispute is possible, be cautious when setting out positions in writing or conceding to issues. There's no "administrative record" supporting grant decisions. If court is inevitable, a judge will have no official record to assess. What's likely to happen is Treasury will submit affidavits of its decision makers, attaching letters, emails, and other relevant materials to convince the judge that its decision was reasonable. Don't make the mistake of providing the government with anything useful. Having a litigator experienced in government program litigation review all correspondence with the Treasury is a useful precaution.

Treasury often cuts short a dispute by issuing a notice that it's sending funds as the agency's "final determination." The notice often also states that acceptance of the funds means you agree with the award. But, what if the amount is unacceptably low? Any decision here poses risks, but the safer bet (depending on the circumstances) is to accept the funds, noting that the amount is to be disputed. A unilateral notice by a federal agency doesn't create a binding contract. Treasury's authority under Section 1603 is set forth in that statute. Unless expressly agreed in writing, acceptance of the funds shouldn't prejudice the right to seek a remaining amount. Further, it's better to be fighting over the remaining amount rather than the entire amount.

Communication counts

When shaping any argument or communication to Treasury, remember the cash grant program should be governed by tax law precedents. This means that one's cash grant amount should be calculated by the rules in the tax code and the Treasury tax regulations. These rules take legal precedence over the cash grant guidance issued by Treasury. While the practical wisdom of following the cash grant guidance put out by Treasury is obvious, what's less obvious is how low it ranks if a legal dispute were to arise. As a result, review the tax credit regulations and tax court precedents that apply. Use those rules and principles to guide a grant application, any additional information provided at Treasury's request, and any written or oral negotiations with Treasury.

So far, there's only one reported court case involving the cash grant program. The court in that case decided that the Court of Claims has jurisdiction to decide disputes relating to this program. This decision is an important one because it means a cash grant applicant is entitled to money damages if Treasury fails to follow the rules. The judge in this case helpfully described Treasury's discretion as virtually nil, but never reviewed the merits of the actual decision made by Treasury. The case, therefore, did not resolve the level of judicial deference Treasury's decision would be afforded. The level of deference the courts will, ultimately, give to Treasury's decisions on the cash grant will be an important factor in how many of these cases are won or lost by project owners.

Finally, don't discount the political environment. There isn't a program or subsidy immune to being drawn into the political realm. Keep this perspective when responding to requests from an Inspector General office, or from Congress. Don't treat these requests in the same manner as "regulatory" or other routine requests from Treasury.

Pamela Marple is a partner in the commercial litigation practice at Chadbourne & Parke, and Eli Katz is a partner in the firm's tax and project finance practices.

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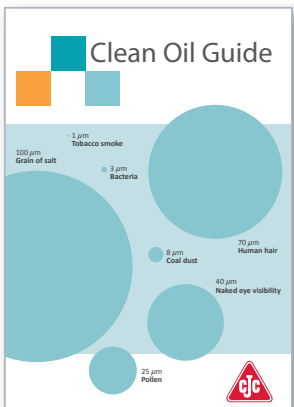
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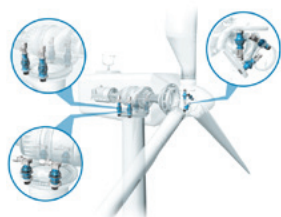
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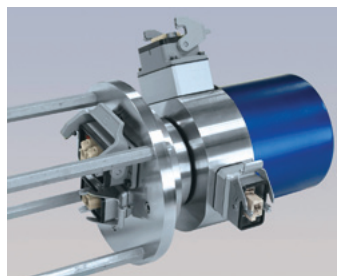
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Hi-Tech Controls has RoHS cable and wires, including: control; drag chain; tray-rated/NFPA 79; PVC; PUR; Servo/VDF; power; composite; intrinsically safe; robotics; data; halogen-free; harmonized; rubber; flat/ribbon; multi-approved; oil-resistant; and hook-up wire. They also carry enclosures (plastic/metallic) and pneumatic components (fittings, valves, cylinders, FRL's, etc.).

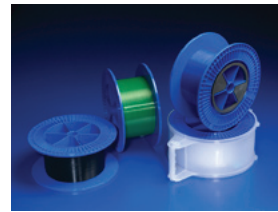
www.hitechcontrols.com



KEMET Electronics

KEMET offers a complete range of capacitor and EMI filter solutions for the wind turbine industry including DC link, AC filter, and control circuit applications. The new EMI filter series FLLD3_PV is designed specifically for wind and solar power converters. Placed between the converter output and the grid, these filters reduce EMI with minimum power loss. They accommodate three-phase power systems in a convenient chassis-mount package. Ranges are available in operating currents from 150 to 2500A with busbar or threaded terminal connections.

www.kemet.com



Polymicro Technologies, a subsidiary of Molex

Polymicro Technologies is a supplier of silica capillary tubing and specialty optical fibers, optical fiber and capillary assemblies, discrete micro components, and quartz optical fiber ferrules. Polymicro Technologies offers a total manufacturing solution, providing initial component design, product and process development, prototyping, beta trials, and volume production.

www.polymicro.com



Rotek

Rotek provides engineering and production of slewing rings and seamless rolled rings. With all products made in the USA, Rotek manufactures ball and roller slewing rings, gears or gearless, as well as diameters from 12" to 50". Rotek recently doubled the capacity of their ring rolling and machining operations. The expanded capabilities allow Rotek to manufacture seamless rolled rings in diameters up to 275", which are ideal for turbine tower flanges.

www.rotek-inc.com



IMO USA Corp.

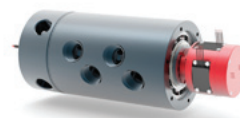
IMO is a manufacturer of single-row and double-row ball slewing rings, used as blade and yaw bearings, as well as for azimuth gear rims to a diameter of 5,200 mm.

www.imo.us

Leeco Steel

Leeco Steel provides steel plate products for the wind industry. Their products are used in the construction of the towers, tower components, doorframes, and various nacelle components. Leeco Steel offers steel plates in ASTM and EN standards, CE mark approved for EN steels, and source plates from 6 mm thick to 150 mm thick, from 1524 mm wide and 3556 mm wide, and up to lengths of 20,320 mm long.

www.leecosteel.com



Rotary Systems, Inc.

Rotary Systems is a manufacturer of fluid rotary unions (rotary joints, swivels, rotary couplings) and electrical slip rings for wind turbine pitch systems. Standard and custom, single- or multi-passage unions of all major types are available, including soft seal, mechanical seal, and hydrostatic gap seal. Electrical slip rings to pass power, signal, and data are also available, as are rotary union and slip ring integration for a total rotating solution. Exclusive large-diameter capability. Latest 3D modeling and analysis techniques.

www.rotarysystems.com

Sky Power International

Sky Power International is the exclusive authorized USA distributor for Thies Clima of Germany—manufacturer of the First Class Advanced and Ultrasonic Series of wind transmitters, known for its engineering, durability, and performance under the most challenging conditions. The new Compact Ultrasonic, including a marine version, is already a proven success. A complete line of transmitters and sensors for precipitation, temp-hum-pressure, and radiation are also offered.

www.skypowerinternational.com



SIPCO-MLS

SIPCO-MLS offers a wide variety of wind turbine drive solutions using planetary gearboxes with reinforced bearings and custom pinion gears to meet the most demanding project specifications. Planetary gearboxes are available with a range of electric motors to best fit an application including AC/DC, servo, and fail-safe brake options. SIPCO's pitch and yaw drive solutions are optimized for high reliability, availability, and operational safety.

www.sipco-mls.com



Staubli Corporation

Staubli is a worldwide mechatronics solution provider with three divisions: textile machinery, connectors, and robotics. The wide range of Staubli connectors cover all industrial applications, including wind power. Whatever type, all Staubli couplings adhere to the strict rules of ergonomics, safety, and long-term leak-proof characteristics, for more efficient and economical applications.

www.staubli.com

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White Construction

White Construction specializes in renewable energy power-generation projects by utilizing the strengths of their long-standing history of heavy industrial construction. White Construction was one of the pioneering companies in the early days of wind farm construction across North America. Their experience combined with high-quality standards and safety practices has gained the company recognition in wind industry. Currently, they have installed more than 4,000 MW in the US and Canada. White Construction is distinctive in their ability to provide the engineering, procurement, and construction necessary to provide a turnkey approach to renewable energy projects. They have the knowledge, experience, equipment, and management to ensure projects are on time and within budget—a philosophy that has led to many repeat customers.
www.whiteconstruction.com



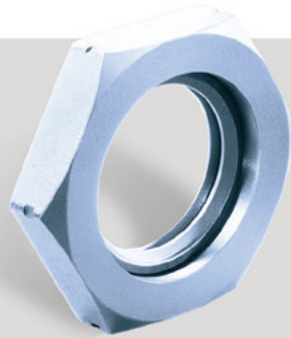
DAVI

The DAVI tower systems enables users to roll the tower cheaper, faster, easier, more accurately, and with more profit—in less than 20 minutes. Using only one operator, and capable of producing one tower per day, costs can be cut by 50% to 80%. The Davi “High-productivity Package” allows them to be one of the most competitive in the industry, rolling a tower cone in less time and with just one person. DAVI has more than 150 wind tower fabricating lines installed. They precisely roll plates in just one pass without re-rolling with the most advanced CNC.
 DAVI | www.davi.com

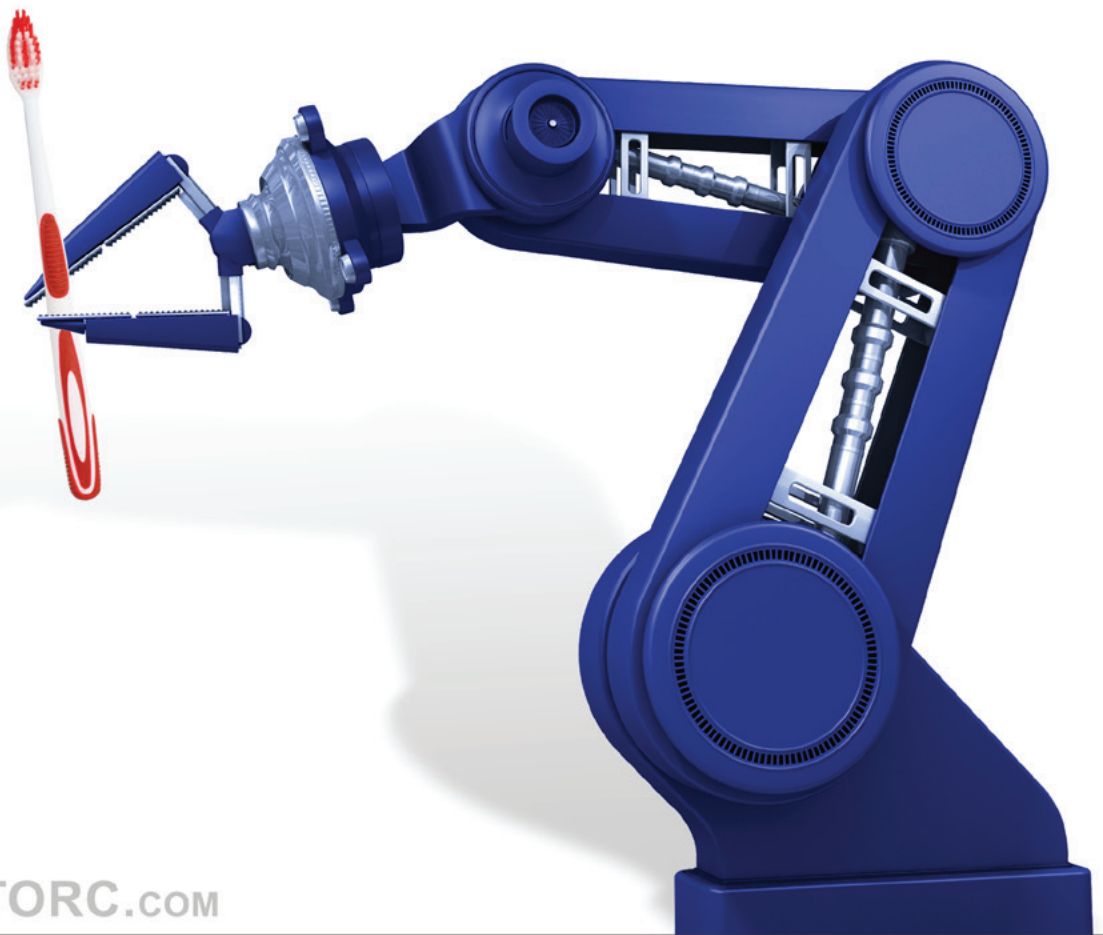


Ditch Witch

The Ditch Witch organization specializes in the design and manufacture of high-quality underground construction equipment. The company is a one-stop source for: trenchers; vibratory plows; backhoes; electronic guidance and locating tools; horizontal directional drilling systems; drill pipe; downhole tools; chain, teeth, and sprockets; vacuum excavation systems; excavator-tool carriers; as well as compact tool carriers.
www.ditchwitch.com



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Grundfos provides advanced pump solutions and is a trendsetter in water technology. They contribute to global sustainability by pioneering technologies that improve quality of life for people and care for the planet.
www.grundfos.us



Presco

Presco is America's premier manufacturer of industrial and commercial marking products and customized PVC films. Their marking products include marking flags (customizable with artwork), underground warning tape (APWA uniform colors, tracer, and non-detectable), roll flagging (survey's tape including their Texas Brand, Arctic, Coarse Matte, and Taffeta), barricade tape (stock legends or customized), and marking paint.
www.presco.com



Tetra Tech

Tetra Tech is the only North American firm that provides a full range of environmental, engineering, and construction services for all phases of a wind energy development project. In the past 10 years, Tetra Tech has worked on more than 1,000 power projects, including 450 wind projects, and more than 22,000 MW of wind generation projects that are either in operation or scheduled for construction.
www.tetrattech.com



Total Wind Canada Inc.

Total Wind Canada Inc. is an independent and privately owned company specialized in providing skilled and experienced manpower within installation, maintenance, and repair of wind turbines. Total Wind's team of supervisors, project managers, and technicians have many years of experience on a variety of makes and models of turbines. Quality, safety, flexibility, and teamwork are all keywords in their way of doing business.
www.totalwind.com

Varco Pruden Buildings

Varco Pruden Buildings, (VP Buildings), one of the nation's largest participants in the worldwide metal building industry, offers complete building systems solutions for industrial, commercial, and municipal applications. VP Buildings' products include multiple structural framing options that are custom-designed and engineered to meet specific building requirements. VP also manufactures all-metal roof and architectural wall systems. VP is a member of the USGBC and Cool Roof Rating Council, and uses advanced design with recycled steel material to develop sustainable projects. With multiple manufacturing locations in the US, VP markets its products through a network of more than 1,000 authorized builders. A founding member of MBMA, the company is IAS/IBC AC 472 accredited, with global has affiliations.
www.vp.com

CONSULTING SERVICES



Ecology and Environment, Inc.

Experienced at 350-plus wind energy sites, E & E provides guidance through every phase of wind projects. Its strategic consulting services helps meet the tight schedules mandated by tax credit legislation, renewable energy portfolio standards, and other economic incentives. It offers public engagement programs to engage stakeholders early and throughout the permitting process. It can also help select a site that can be permitted and perform all of the specialized studies needed to gain regulatory approval.
www.ene.com/markets/wind



The Elexco Group

Founded in 1976, Elexco Ltd.'s mandate is to provide a comprehensive range of land and title services for renewable energy development, as well as right-of-way needs to private enterprise, utilities, and governmental agencies. Services offered include: ROW; easement; wind farm agreements and surface use acquisition/disposition; post-construction damage settlements; title curative; 40-year searches/abstracts; Notice of Claim registration; title checks; drafting legal descriptions; registrations; and, map data administration.
www.elexco.com



KEMA

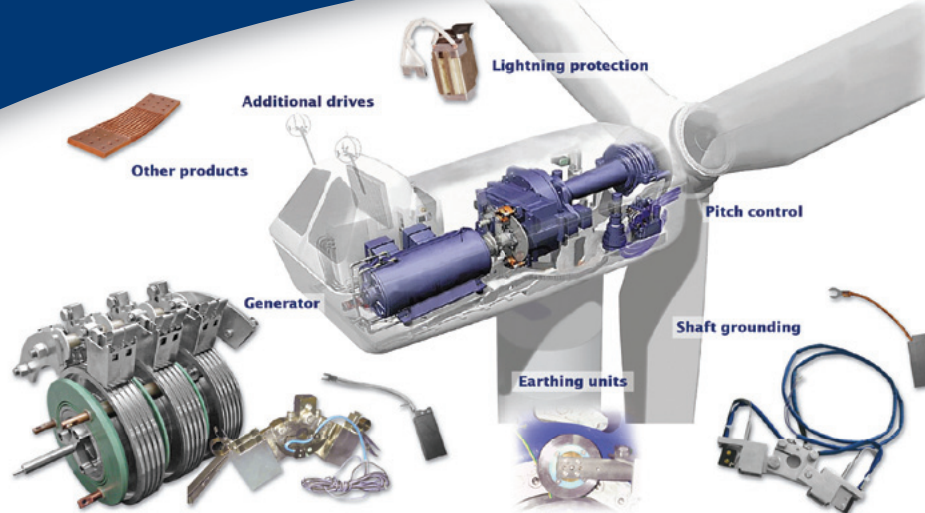
KEMA provides management and technology consulting services to analyze, plan, and implement wind energy projects. Their services include integration and operation solutions for new energy technology areas, including wind to electricity and wind to hydraulic energy, and project development from a greenfield site to a wind farm. KEMA conducts studies to help clients evaluate the impact of wind generation on the electric grid, and develops optimal interconnection strategies for wind energy.
www.kema.com

Keystone Engineering Inc.

Keystone Engineering Inc. has focused on offshore engineering since its inception in 1988. Nearly four decades of experience gained from the design, procurement, and project management of oil and gas platforms in the Gulf of Mexico, North Sea, and numerous other global sites has led to innovative structural concepts and the development of analysis methodology. Keystone Engineering is unique among US firms in that they work intimately with fabrication and installation contractors, engineering the techniques required to construct deepwater platforms. Additionally, unique among US-based companies is their knowledge of wind turbine loadings on offshore foundations and their capability to analyze these structures for said loadings. This has resulted in an innovative foundation concept, Keystone's patented "Inward Battered Guide Structure" (Twisted Jacket) that has been identified by the European renewables community as a solution for the next-generation of offshore wind turbine foundations.
www.keystoneengr.com



We offer solutions to complex problems and demanding applications



Schunk is a globally-active, technology group - comprising largely independent individual companies. Today we are active in the core markets of carbon technology and ceramics, environmental simulation technology and climate technology, sintered metal technology and ultrasonic welding technology. **The Schunk Group is a technology leader in these fields.**

WWW.SCHUNKGRAPHITE.COM



FORCE Technology

FORCE Technology provides P-scan automated scanner systems for full quality (QC) inspection on vital WTG components, such as blades and towers. Onsite blade NDT inspections are facilitated by the introduction of smart blade guided working platforms. FORCE Technology also introduces advanced automated NDT for condition testing of installed blades erected on wind turbines.

www.forcetechnology.com



GL Garrad Hassan

GL Garrad Hassan is one of the world's largest dedicated renewable energy consultancy, and a recognized technical authority on the subject. It offers independent technical and engineering services, products, and training courses to the onshore and offshore wind, wave, tidal, and solar sectors. Although the GL Garrad Hassan name is new, the company has a rich heritage, borne of the integration of specialist companies that, united, form the renewable energy consulting division of the GL Group. GL Garrad Hassan is a consulting company; it has no equity stake in any device or project.

www.gl-garradhassan.com



Ocean Surveys, Inc.

Ocean Surveys, Inc. is a US-based, oceanographic survey firm with the most extensive offshore wind and marine linear project experience, including support of Cape Wind, Deepwater Wind, and Bluewater Wind. Founded in 1965, OSI provides highly responsive hydrographic, oceanographic, geophysical, sediment sampling, and vibratory coring surveying services with scientists, engineers, and technicians having a broad range of experience working in freshwater and marine environments.

www.oceansurveys.com



Faulk & Foster Real Estate, Inc.

Faulk & Foster is experienced in utility-scale wind and solar project development. Project footprints have ranged from 5,000 to 150,000 acres in size, and up to 700+ landowners within the project. They offer: project management; project scoping/fatal flaw analysis; site acquisition/leasing; zoning; permitting; transmission right-of-way; mapping; as well as title.

www.faulkandfoster.com

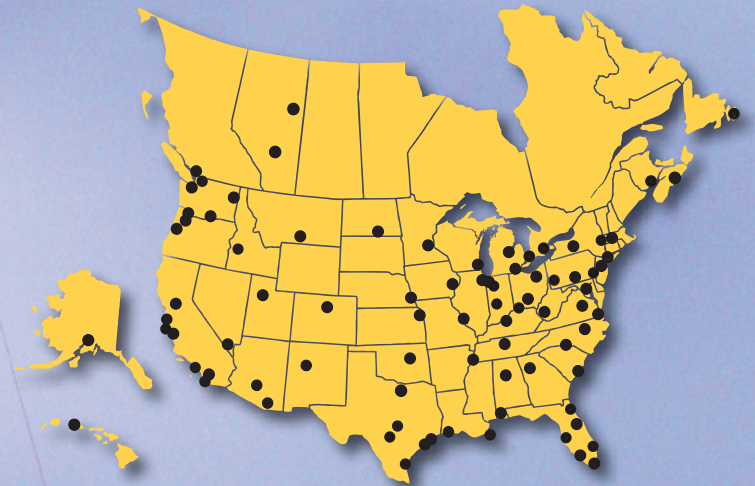


SafAscent™

Turbine Maintenance Platform

Any turbine, anywhere

Designed specifically for wind turbines, the SafAscent™ Turbine Maintenance Platform enables unrestricted access to the tower and blades. With more than 85 branches throughout North America, Safway and SafAscent can reach any project, in any location.



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Mortenson Construction

Mortenson Construction has built safe, quality construction projects since 1954. As a full-service EPC and BOP contractor, Mortenson has been at the center of constructing more than 100 wind and solar projects, totaling more than 11,000 MW across the US and Canada. Mortenson is a US-based, family owned construction company that provides a complete range of services, including: planning; program management; pre-construction; general contracting; construction management; design-build; and, turnkey development.
www.mortenson.com/wind



Quanta Services

Quanta Services delivers the resources, industry knowledge, and experience to support the nation's renewable energy goals. The company's strategic approach and flexible solutions result in custom programs that meet specific renewable infrastructure needs—whether single-service, complete program management, or full engineer-procure-construct services.
www.quantaservices.com

DMI Technologies, Inc.

At DMI, they understand the overall energy context—from power generation to transmission and final distribution within the national grids. They are dedicated to helping customers provide the most suitable cable solution to meet their expectations and beyond, understanding that cable types and standards vary significantly throughout the world. Pre-qualified in many locations for infrastructure, DMI Technologies is well positioned to take on multiple projects and joint ventures, providing a solution that will work within any system.
www.dmitechinc.com



Dovetail Solar and Wind

Dovetail provides wind and solar systems for new and existing commercial, residential, farm, and non-profit organizations. Established in 1995, Dovetail is one of the Ohio region's oldest and largest design and installation firm. They enable organizations and individuals to become more sustainable, while saving money on their utility costs with safe, reliable, high-quality renewable energy systems. They have installed over 2.5 MW and 200 systems, all built to be clean, safe, low-maintenance, and durable.
www.dovetailsolar.com



Milbank Manufacturing | PowerGen Division

Milbank builds solutions that move power for the residential, commercial, industrial, utility, and transportation sectors. Milbank combines more than 80 years of expertise in electrical distribution with a commitment to develop and globally implement sustainable, integrated power solutions. Milbank's comprehensive portfolio includes 1 kW to 100 kW wind turbines, solar and electric metering systems, EVSE, and portable power.
www.milbankpowergen.com



Wanzek Construction, Inc.

Wanzek Construction, Inc. specializes in heavy and industrial projects in market sectors including power, renewable energy, industrial process, heavy/civil, and wind energy construction. Wanzek is a direct-hire company providing services from site preparation and tower and turbine erection, to balance-of-plant construction and project management. Wanzek is a dependable and experienced contractor with the field resources and equipment to handle projects of all sizes and complexities.
www.wanzek.com

CRANES | HYDRAULIC EQUIPMENT



Liebherr-Werk Nenzing GmbH

The Liebherr crawler crane LR 1280 W (belonging to the company Sarilar) is being used for the assembly of wind turbines. The LR 1280 W is particularly suitable for assembly of wind power stations and service work. This Liebherr crawler crane is fitted with a narrow telescopic undercarriage to provide economical transportation if the available space is restricted. This narrow track version meets with the requirements made on efficient lift cranes for the installation of wind power stations. The standard track traveling width of the LR 1280 W is 7.5 m, but the undercarriage can be retracted to a width of 4.8 m. The hydraulic track width adjustment allows for traveling of the crane with all its equipment (including boom and complete counterweight).
www.liebherr.com

Henkels & McCoy, Inc.

Henkels & McCoy is one of the largest privately held engineering, network development, and construction firms serving the communications, information technology, and utility industries. Henkels & McCoy is committed to being at the forefront of the renewable energy market, offering specific expertise and experience in the wind and solar markets—plus, the benefits of nearly nine decades of proactively working with customers to meet their objectives.
www.henkels.com

Michels Corporation

Michels has over 3,800 MW of wind farm experience. Across North America, Michels is a BOP contractor that self-performs civil, wind turbine erections and wiring, complete substations, collection systems, transmission and distribution work, as well as fiber optics and foundations. Comprehensive HSE & QA/QC and project management support with experienced personnel help them execute a project safely and on time.
www.michels.us

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Today, harnessing the wind is at the forefront of renewable energy projects around the world. ILSCO® is here to meet your needs with innovative new products and best-in-class service.

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ECONOMIC WIND DEVELOPMENT REGION



Pampa Economic Development Corporation

Pampa, Texas, in the Eastern Texas Panhandle, is a community of 18,000 people with a diverse economy and skilled labor force. Located in the heart of the wind corridor, they are fortunate to be on the main BNSF line between Chicago and LA. Pampa's Clarendon College – Pampa Center offers wind training. The Pampa EDC has acquired 100% of the membership interest in Pampa Energy Center, LLC. This site is now the Pampa area's new rail served industrial park. www.pampaedc.com



Idaho Department of Commerce

Idaho's natural wind, open spaces, work ethic, and stable regulatory environment make the state a great place to do business. Boise currently has the largest wind project in the South Central region, with more projects planned for the future. And, the first large-scale (11,000-acre) wind farm is now in Eastern Idaho. Many more projects have been approved for future development. www.commerce.idaho.gov

EDUCATION



Royal Roads University

The challenge of sustainability is global, and with it comes new opportunities for collaboration across disciplines, between governments, scientists, and business leaders, and among those committed to innovative responses to complex ecological, social, and economic issues. Royal Roads University's programs provide the leadership skills and interdisciplinary knowledge that lead to sustainable solutions. As a key part of its mandate, the School of Environment and Sustainability is committed to applied, problem-solving research that supports Royal Roads University's innovative partnerships with communities, business, industry, and the public sector. www.royalroads.ca

ELECTRICAL EQUIPMENT & SERVICES



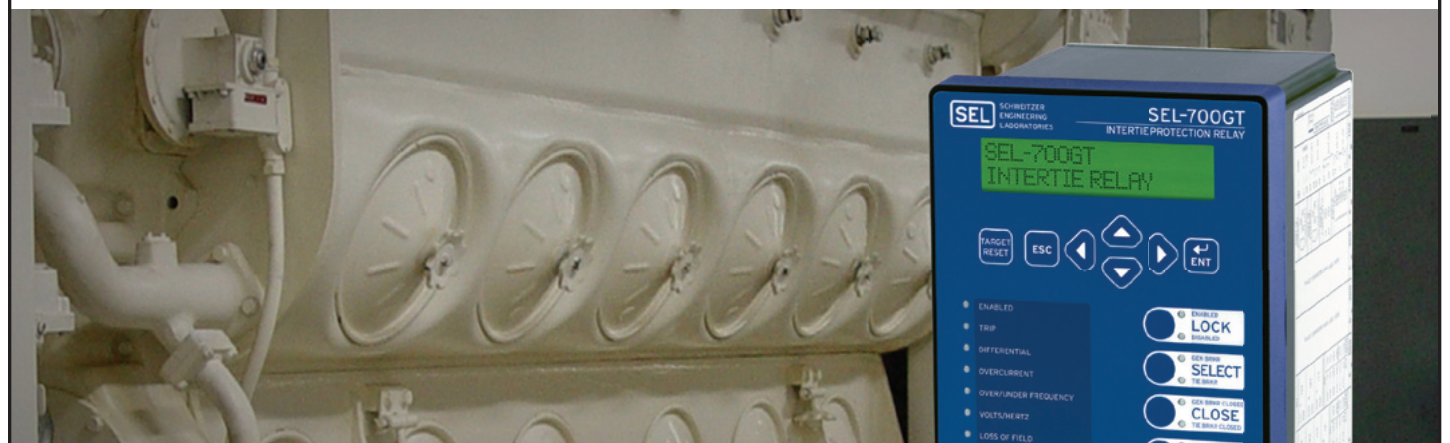
Border States Electric

Border States Electric (BSE), one of the largest electrical distributors in the US, is entirely employee-owned. With its unique culture, the company focuses not only on providing innovative products, but excels when arranging services and determining each customer's unique needs. When it comes to renewable energy projects like wind and solar, BSE offers an experienced team of professionals dedicated to its founding values: to deliver total customer satisfaction. www.borderstateselectric.com

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Dynamic Ratings Inc.

Dynamic Ratings is a global provider of monitoring, control, and communication equipment. They offer engineering, manufacturing, installation, and application expertise of sensors, online monitoring, controls, analytic and asset management software, as well as secure communications to enable renewable energy producers reliable operations while increasing uptime and asset life. Their subject matter experts can help increase renewable energy production and delivery worldwide. www.dynamicratings.com



General Cable

General Cable provides wire and cable for the generation, transmission, and distribution of electricity from emerging wind energy technology, with more than 11,000 associates operating in 25 countries and 47 manufacturing facilities. From the nacelle and tower of the wind turbine, to the step-up transformer to the collection system, and from the substation to the power grid, General Cable provides a broad range of traditional and next-generation renewable energy products for the terrestrial and offshore wind markets. A complete cable solution for wind applications—from optical fiber and grounding wires for SCADA systems, low-voltage DC and AC connections, and medium-voltage distribution, to high-voltage overhead, underground, and submarine transmission lines, is engineered to withstand the demands of entire wind power generation, transmission, and distribution systems—from the wind to the outlet. www.generalcable.com



HUBER+SUHNER

HUBER+SUHNER is the main supplier to several of the largest wind turbine manufacturers for high-reliability fiber-optic interconnection products and services. Their connectivity solutions are ideally designed for the harsh conditions of wind power applications in the nacelle, the tower, and across the wind park. These include fiber-optic cable and fiber management systems, electrical cables for energy transmission, and control from the nacelle down the tower. www.hubersuhner.com



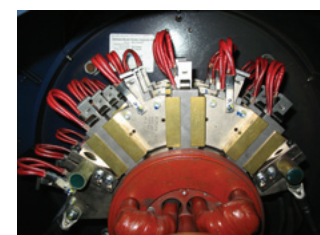
Schweitzer Engineering Laboratories, Inc.

SEL serves the electric power industry through the design, manufacture, and support of products/services for power systems worldwide. SEL's power-interconnect, protection, communications, control, and metering products are ideal for renewable energy and distributed power sources. In addition to solutions to manage electrical generation systems at wind farm, biofuel, PV, and combustion-powered sources, SEL offers unmatched local support and a worldwide, 10-year product warranty. www.selinc.com



C&M Corporation

C&M Corporation offers wind turbine designers the option to create plug-and-play interconnect systems. With the daily cost of a crane rental totaling tens of thousands of dollars, the ability to increase the speed at which the turbine is assembled can significantly improve an installer's bottom line. With engineering, cable manufacturing, and cable assembly capabilities under one roof, C&M can create custom kitted cable assemblies for control, signal, communications, lighting, elevator, and ground fault systems. These kitted products can replace a hardwiring approach within the turbine structure, significantly improving the time it takes to prepare each section of the turbine. C&M's engineering team is available to support a client with design services around their specific requirements. The cable products available to support the installation include tray and WTTTC-rated cables, as well as molded and mechanical cable assemblies. www.cmccorporation.com



Morgan AM&T

Morgan AM&T manufactures carbon brushes and slip rings for the electrical generators, while providing quality engineered solutions that yield a long life, reduced O&M, and more uptime for turbines. Every brush application is carefully engineered to maximize performance for that region, turbine, and application. Varied regions require unique solutions, and Morgan AM&T has over 100 years experience and a global footprint to serve everywhere. www.morganamt.com

A Leader in Engineering Energy Solutions



Ulteig will help drive the power of energy for generations to come. Our electrical, civil, and structural engineers have decades of experience in the energy industry. We are recognized leaders, providing services and expertise on energy projects worldwide. Ulteig provides complete wind farm design services from the wind farm development stage to a complete design package. For more information about the many services Ulteig has to offer, visit our website at www.ulteig.com.



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Noramco Wire & Cable

Noramco Wire & Cable is a distributor of electrical, electronics, and data communication wire and cable. In the power cable distribution industry for over 40 years, specialty cables are Noramco's strength. The company carries an extensive inventory of standard and everyday items, as well as many specialized products used in the clean energy market, including power cable, grounding cable, fiber optics, PV cable, and others.

www.noramco.ca



Semikron, Inc.

Semikron is a one-stop provider of silicon chips, discrete semiconductors, IGBT/SCR/Diode modules, IPMs, power assemblies, and systems for the wind market. Globally, Semikron technology powers nearly every second windmill. Semikron's latest revolutionary technology (SKiN) eliminates wire bonds internal to the power modules, resulting in a 10x improvement in product lifetime.

www.semikron.com

Plexus Corp.

Plexus has delivered optimized product realization solutions through a customer-focused service model since 1979. This service model seamlessly integrates product conceptualization, design, commercialization, manufacturing, fulfillment, and sustaining services to deliver comprehensive end-to-end solutions to customers in the Americas, as well as the European and Asia Pacific regions. Plexus is ideally suited to meet the technology, quality, and reliability requirements of the wind industry.

www.plexus.com



Rosendin Electric

Rosendin Electric recognizes that renewable energy is an integral part of the future of power generation. Over the last decade, they've installed the capacity to harness more than 8000 MW of clean, renewable energy—enough to power more than 800,000 homes. This includes a portfolio of more than 50 wind energy projects throughout the United States and Canada, ranging in size from 7 MW to more than 800 MW. Rosendin Electric's core mission is to provide unparalleled service, safety, and value, which is the reason over 90% of their work is with repeat customers.

www.rosendin.com



S&C Electric Company

S&C delivers VAR compensation solutions for new and existing wind energy plants of all sizes, in any location worldwide. Their team offers a broad range of services that assure timely completion of a system. They'll work with clients from the beginning of a project to develop a cost-effective approach customized for a plant. S&C also offer field-proven products that maximize plant availability. Their PureWave DSTATCOM Distributed Static Compensator provides fast, continuous VAR compensation.

www.sandc.com

Capture the full potential!



Invite a yellow coat.

The wind power business is growing rapidly leading to new metal cutting challenges. As a Sandvik Coromant partner, you can always rely on a specialist nearby, focused on your success. Smart solutions for every component; from the base of the tower to the blade.

24-hour delivery of premium tools to almost every corner of the world is only one promise. Measurable results on the bottom line is another. Let's optimize your potential together!

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SANDVIK
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ENGINEERING



HRGreen

HR Green

HR Green offers comprehensive engineering, procurement, and construction services for wind-powered facilities. They've been consultants to clients nationwide and have a focus on renewable energy—specifically wind energy and single-turbine installations from approximately 50 kW to 3 MW. HR Green has turnkey capabilities to provide consultation, scientific analysis, design engineering, construction, and contracting services. They offer customized solutions tailored to a client's needs. HR Green is a professional engineering and technical consulting firm serving clients throughout the US and beyond, with a longstanding reputation for business accountability.

www.hrgreen.com



Romax Technology Limited

Romax Technology is pioneering lifecycle engineering for wind turbine drivetrain. Their GL Certified high MW gearbox designs are selected by major manufacturers because of its proven durability. RomaxWIND is one of the industry's most comprehensive, precision, drivetrain simulation and analysis software, complemented by expert consultancy. Onsite services provide wind turbine operators the latest technology for minimizing generating downtime over the lifecycle of multi-turbine installations.

www.romaxtech.com



Ulteig

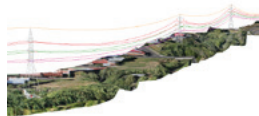
Ulteig is an employee-owned company delivering comprehensive engineering, planning, and surveying solutions. As the energy industry has evolved, Ulteig has continued to adapt to changing client needs. The company remains customer service-focused with each client's specific goals and objectives in mind. Ulteig has grown into a nationally accredited company, currently ranked number 207 in the Top 500 Engineering Design Firms in the nation by Engineering News Record.

www.ulteig.com

BBA, Inc.

BBA is a Canadian consulting and engineering firm, providing services specifically to the energy and mining and metals sectors. BBA stands out with its unique delivery of integrated services, ranging from consulting services to corporate executives, technical expertise to operations and commissioning.

www.bba.ca



W.I.R.E. Services

Worldwide Integrated Rating Enhancement (W.I.R.E.) Services began operations in 2001, using the experience and expertise developed in applying LiDAR data to transmission line analysis and upgrade engineering solutions. Being the first utility-based company to create a business that combines LiDAR technology with utility applications, they have strengthened knowledge and gained experience over the past decade by assisting clients in achieving cost-effective, environmentally friendly, and energy efficient transmission line solutions. Their services provide electric utilities a full solution package for transmission line needs. W.I.R.E. is a one-stop shop for transmission line modeling, thermal rating analysis, upgrade engineering, danger tree/vegetation assessments, new route surveys, design engineering, and other environmental applications.

www.wireservices.ca

ENVIRONMENTAL CONSULTANTS & BUSINESS SERVICES



Kleinfelder

Kleinfelder has the resources and expertise to handle the most demanding jobs with ingenuity, integrity, and attention to client service. Their depth of service, experience, and solutions-orientated philosophy makes Kleinfelder exceptionally suited to serve the wind energy market. From environmental clean-up at older facilities, to the planning, design, permitting, and ongoing operation of new facilities, they maintain a proven record of providing exceptional client service with diligent attention to regulatory and facility requirements.

www.kleinfelder.com

GEARBOX SERVICE & REPAIR

Broadwind Energy, Inc.

Broadwind Energy applies decades of deep industrial expertise to innovate integrated solutions for customers in the energy and infrastructure markets. From gears and gearing systems for wind, oil, gas, and mining applications to wind towers, to comprehensive re-manufacturing of gearboxes and blades, to operations and maintenance services, and heavy weldments, they have solutions for the energy needs of the future. With facilities throughout the US, Broadwind Energy's talented team is committed to helping customers maximize performance of their investments.

www.bwenergy.com



Ormazabal

Ormazabal is a worldwide manufacturer of medium-voltage equipment, providing customers with solutions for their renewable energy needs, based on high added value products and services.

www.ormazabal.com

GENERATORS



Danotek Motion Technologies

Danotek develops and manufactures highly efficient energy conversion systems in the 600 kW to 8 MW range for wind energy and industrial markets. They also have patents pending on permanent magnet generators and power electronics for wind turbines.

www.danotekmotion.com



ZBB Energy Corporation

The ZBB EnerSystem integrated energy management platform is one of the only platform's that's configurable, modular, and scalable for on-grid, off-grid, and grid back-up applications. Each system combines advanced power and energy controls, plus energy storage that supports renewable energy sources and other power inputs. ZBB EnerSystem is a factory built and tested system, uniquely configured to each customer's application.

www.zbbenergy.com



The Switch

The Switch is a supplier of megawatt-class permanent magnet generator and full-power converter packages that effectively capture power from highly variable new energy sources such as the wind and the sun. Their technology ensures reliable, future-proof grid compliance and maximized energy yields. The Switch has nearly 3 GW of installed wind power capacity since starting operations in July 2006.

www.theswitch.com

INSURANCE

Travelers

Travelers has been supporting the wind energy industry for over two decades. Travelers Clean Energy & Technology Practice has extensive capabilities and interest in supporting US and internationally based entities, which focus on technologies that are energy efficient. They provide customers, including wind turbine component manufacturers, contractors, power producers, owners, and developers, with industry-specific insurance protection. For example, their WindPak proprietary product was created specifically for developers, owners, power producers, and installers to provide property coverage from builder's risk through commissioning and for ongoing operations. Travelers domestic presence, risk control services, and claim handling expertise specific to the wind energy industry are also an important component of the value they bring customers.

www.travelers.com

GRID CONNECTION | ENERGY STORAGE



Alstom Grid Inc.

Alstom provides global power generation, power transmission, and rail infrastructure. Alstom's Grid sector provides developers, contractors, and utilities with mission-critical high-voltage equipment and solutions, as well as software the systems need to forecast and control the flow of electricity in grids.

www.alstom.com/grid

LARGE WIND TURBINE MFG (OVER 100 KW)



Gamesa Technology Corporation

Pioneering advances in design and technology have solidly established Gamesa's G9X-2.0 MW wind turbine platform in the multi-megawatt segment. A highly versatile platform, the G9X offers a variety of rotor sizes that achieve maximum energy production in all types of wind conditions (suitable for Class I, II, or IIIA winds). The uniquely designed aerodynamic blades are lighter, increase energy output and, along with Gamesa's NRS noise control system, minimize noise emissions. Gamesa's proprietary predictive maintenance system, SMP, forecasts lifecycle issues and provides data for continuous operations and maintenance improvement. WindNet, the SCADA system developed by Gamesa, is a web access remote control system that collects vital analytical data to support and optimize decision-making. The G9X-2.0 technology is designed to extract the greatest possible energy from the wind, and to do it as efficiently as possible. With over 10,000 MW installed worldwide, the G9X-2.0 platform has established itself as an industry workhorse.

www.gamesacorp.com

LEGAL SERVICES



Bond, Schoeneck & King, PLLC

Bond, Schoeneck & King, PLLC is a full-service law firm providing a broad spectrum of counsel to wind energy generators that spans: project planning, contracts, and public finance; permitting and municipal and state government administrative representation; construction, labor, and OSHA matters; transmission interconnection liaison; as well as any required litigation real property valuation, liability analysis, and tax counsel in New York State and beyond.

www.bsk.com

Stoel Rives LLP

Stoel Rives LLP represents major national and international energy developers and operators throughout the United States and abroad. Stoel Rives' attorneys have advised clients in connection with more than 100 large wind energy projects that were online operational at the end of 2010, representing a total of 11,130 MW of installed capacity in the US and Canada. They've been rated as one of the nation's top renewable energy law practices by Chambers and Partners and the US News & World Report.

www.stoel.com



TWR Lighting, Inc. orga
Lighting Technology

LIGHTING

TWR Lighting, Inc./Orga Aviation Lighting

TWR/Orga Aviation introduces the new L450 FAA LED all-in-one solution. This concept incorporates the most advanced optical engineering/LED technology, built-in power module, controller, and synchronizer, making these lights simple to install. It also enables them to operate reliably under the harshest conditions, while minimizing capital costs and cost of ownership. The L450 products are focused on minimizing the visual impact lights can have on the surrounding environment, at the same time further reducing power consumption.

www.twrlighting.com

Unlimited Solutions to Harness Limitless Resources



Sapa Extrusions Renewable Energy Organization is a major supplier to the solar and wind power industry. We provide critical components that support your designs to harness the Earth's most abundant sources of renewable energy.

Powering the Future Together

Sapa's cornerstone for renewable energy products is comprehensive and seamless. Our North American Technical Center provides innovative customer features for new end-use applications. We can help optimize the value of your products, affording you a competitive advantage in the marketplace.

Advanced product solutions for the solar, renewable energy and wind power markets

Sapa's 16 North American plants and Technical Center work with customers to optimize designs for:

- Nacelle support structures
- Turbine mounting brackets and frames
- Profiles for ladders and lifts
- Platforms, stairways, railings and elevator components
- Bus bar
- Aluminum hydraulic manifolds
- Rigid aluminum conduit
- Photovoltaic mounting systems
- Solar module frames and components
- Concentrated solar power collectors
- Inverter housings and components
- Thermal management systems

Sapa is the right development partner for your renewable energy application.

See us at Solar Canada 2011

Booth 914

Jason Weber

Manager, Business Development
Renewable Energy
605-321-4387

Andrew Pappas

Business Development Manager
(Canada and Northeast US)
416-606-8640

For solar information: www.sapagroup.com/solar
For wind power information: www.sapagroup.com

sapa:
Shaping the future



Flash Technology

Flash Technology, an SPX brand, has over 42 years of experience in FAA approved obstruction lighting, site monitoring and management, and reporting solutions including wind energy, solar energy, standby generators, obstruction lighting, and access control. Flash Technology supplies complete lighting systems for the wind industry. They offer the largest selection of medium-Intensity and high-intensity lighting systems, OEM parts, and component-level training. Flash Technology continues to remain up-to-date on all regulations and requirements for tower lighting set forth by the FCC/FAA with the highest quality lighting, including incandescent, strobe, and LED

www.flashtechology.com



Hughey & Phillips

Hughey & Phillips provides obstruction lighting equipment to mark structures that may present a hazard to air navigation. A full range of strobe and LED products are available as stand-alone red, white, or dual systems to meet lighting needs. The HORIZON Series of LED fixtures are lightweight and energy efficient (<20W). Designed with universal input voltage of 95-277VAC for operation anywhere in the world. The unit is available with integrated GPS and Photocell for use on wind turbines.

www.oblighting.com

International Tower Lighting, LLC (ITL, LLC)

International Tower Lighting (ITL, LLC) is a recognized for their design and manufacture of obstruction lighting and monitoring systems for the wind energy, utilities markets. The company offers a full line of medium-intensity strobe, LED and incandescent lighting systems, as well as replacement parts for the majority of US-made strobe lighting systems.

www.itl-llc.com

LIGHTNING & SURGE PROTECTION



Raycap

Raycap Inc.

Raycap is a global supplier of lightning protection solutions for wind turbine manufacturers. Raycap's Strikesorb SPD technology provides maintenance-free continuous protection with the ability to withstand multiple lightning strikes and power surges. Raycap solutions, featuring Strikesorb technology, enhance the reliability of the wind turbine operation and conform to IEC and UL standards, making them suitable for global installations.

www.raycapsurgeprotection.com



ERICO

ERICO is a global designer, manufacturer, and marketer of precision-engineered specialty metal products, including ERICO electrical products and CADDY fixings, fasteners, and supports for the alternative energy market. Years of experience in the fields of lightning protection, low-voltage power distribution, and reinforced concrete construction, combined with global manufacturing capabilities, allow ERICO to provide comprehensive solutions for the wind energy industry.

www.erico.com

LUBRICANTS



Mobil Industrial Lubricants

Mobil Industrial Lubricants

Designed to excel in some of the most demanding conditions such as high heat, heavy load, and water contamination, Mobil SHC synthetic lubricants and greases will help keep wind turbines operating in top form. They can help reduce unscheduled downtime, lower maintenance costs, even extend oil life. For example, Mobilgear SHC XMP, a synthetic wind turbine gear oil, is approved and/or used by several major gear, bearing, and wind turbine manufacturers. With extensive builder approvals, it lubricates more than 30,000 wind turbines worldwide. Analysis of more than 15,000 used-oil samples of Mobilgear SHC XMP indicates superb wear protection.

www.mobilindustrial.com

OPERATION & MAINTENANCE



Frontier Pro Services

Frontier Pro Services utilizes in-house services and technologies to increase responsiveness and reliability, and to drive out unnecessary costs. Their experience encompasses traditional maintenance and installation activities and includes gearbox, generator, hydraulic, controller, and composite repairs. Additionally, they offer in-house remote monitoring, oil and grease analysis, and the industry's only mass-specific dynamic rotor balancing. Their team draws on three decades of experience, maximizing production and minimizing costs by eliminating surprises.

www.frontierpro.com



Klüber Lubrication North America L.P.

Klüber understands the value of efficient, low equipment operational costs and how to generate more output from less input-effective lubrication. Their gear oil avoids sludge build-up, foaming, and micro-pitting issues. Consolidate grease lubrication portfolio to simplify maintenance and eliminate the risk of using the wrong product.

www.klueber.com



Palfinger North America

The WT 1000 All Terrain was developed by Palfinger for assembly and maintenance work on wind turbines and high-access requirements. Mounted on a five-axle, all-terrain mobile crane chassis, the WT 1000 All Terrain can go just about everywhere. Its heavy-duty workman's basket can carry nominal loads of up to 600 kg (1300 lbs). Since it can be set-up in four different stabilizing configurations, the WT 1000 All Terrain can also be operated in tight spots.

www.palfinger-northamerica.com

MORE WIND POWER AMERICA?

Sika® helps you reduce costs and increase quality.

Wind turbines operate in some of the toughest climatic conditions on land and sea. That's why Sika creates state-of-the-art, technologically advanced solutions to keep turbine blades operating under extreme stress.

For more than 15 years, we have globally offered the wind industry a full system of high performing sealing, bonding, protecting and reinforcing solutions from the foundation base to the tip of each blade. Sika strives to exceed the standards of innovation that our customers expect from our products that allow for rapid, reliable, and more cost efficient solutions for manufacturing, installation, and repair applications. Sika helps make wind power a breeze to operate.

For more information, visit www.sikausa.com or call 248.577.0020.



Innovation & Consistency since 1910

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Sika Corporation 30800 Stephenson Highway, Madison Heights, MI 48071 Phone: 248.577.0020 www.sikausa.com



Safway Services, LLC

The SafAscent Turbine Maintenance Platform is designed to provide access to the exterior of wind turbine towers for maintenance, cleaning, and repairs. With more than 85 branches across North America, Safway Services offers access solutions, and has localized products and services to quickly and safely help with any wind turbine project. The 6'6" 500-pound capacity modular platform allows companies to perform routine maintenance on turbines, while the padded roller system protects the tower. www.safway.com



Sage Oil Vac

Sage Oil Vac manufactures the Gear Oil Exchange System for gearbox maintenance. The skid- or trailer-mounted equipment features ASME-rated pressure vessels for fresh and used oils, and has options for flush and rinse fluids. On-board heating and filtration systems allow for clean, fast oil exchanges. www.sageoilvacwind.com



Availon, Inc.

Availon, Inc. is an independent service provider to the North American wind industry specializing in operation and maintenance, end-of-warranty inspections, custom engineering, and parts supply and management. Availon's full-service turbine technicians and engineers have extensive experience with megawatt-class wind turbines of almost any make. Based on this expertise and the knowledge base accumulated over 30 years, Availon offers a unique approach for a service provider: listening to concerns; analyzing specific needs and challenges; and, designing custom solutions and innovative engineering upgrades that solve reoccurring fault problems and shortcomings. Availon is uniquely qualified to deliver: reliable, comprehensive technical services; quick turnaround on parts and components from trusted manufacturers; and, custom-tailored innovations and the latest technology. www.availon.com



Bronto Skylift

Bronto Skylift offers a wide selection of high-reach truck-mounted aerial devices for wind turbine blade and tower inspection, maintenance and repair, and other applications. With advanced controls and one-button automatic leveling of the outriggers, Bronto aeriels can be driven onto the site, then set-up and elevated to the overhead area faster and safer than other methods currently in use. Bronto machines have been used in Europe for many years, and have been time-tested in the toughest conditions. When elevated, S 90 HLA machines, for instance, can withstand winds speeds up to 35 mph (12 m/s) and can lift up to 1000 pounds in a 8-foot x 3-foot fully-enclosed platform, to a 295-foot (90 m) maximum working height. Maximum horizontal outreach is 108 feet (33 m). www.bronto.fi

Equipment Express Inc.

SPECIALIZED TRANSPORTATION & LOGISTICS



- Largest Fleet of Specialized Wind Transport Equipment in Ontario
- Long/Short Term Outdoor Storage for Wind Turbine Components
- Warehousing for any size Cargo
- Project Management
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daveb@equipmentexpress.com
www.equipmentexpress.com



Climax Portable Machine Tools, Inc.

Climax Portable Machine Tools is a full-service provider of onsite machining solutions, specialized engineering consulting services, and customized training. They offer a broad selection of standardized portable machine tools, as well as a range of custom-built solutions based on extensive experience in the renewable energy sector. Many wind power manufacturers utilize Climax Portable Machine Tools as part of their manufacturing operations.

www.cpm.com



LUDECA Inc.

LUDECA Inc. is a provider of preventive, predictive, and corrective maintenance solutions, which includes laser shaft alignment, geometric measuring, online condition monitoring, vibration, analysis, and balancing equipment, as well as related software, services, and training.

www.ludeca.com



NRG Systems

NRG Systems, manufacturer of measurement systems for the renewable energy industry, announces the introduction of its new line of ultrasonic wind sensors that measure wind speed and direction using sound waves. The NRG Systems IceFree Ultrasonic Wind Sensor, designed for turbine control applications, carries a 240-watt heater in a rugged aluminum body for all weather conditions. Two additional models are polycarbonate—ideal for turbine control in moderate climates or wind resource assessment. NRG Systems' ultrasonic wind sensors have a flexible, factory-configured interface to meet customer specifications. Various signal outputs are available for easy integration with most turbine controllers.

www.nrgsystems.com



PSI Repair Services

PSI Repair Services offers fast, affordable repairs. They also offer upgraded, longer life products for the electronic, hydraulic, and precision mechanical components that drive wind turbines' pitch and yaw systems and down tower electronics. PSI repairs components from the major manufacturers. For unsalvageable parts, PSI offers remanufacturing services. All repairs come with a free evaluation and one-year warranty.

www.psi-repair.com/160.html



OwnEnergy, Inc.

OwnEnergy partners with landowners to develop, construct, own, and operate 10 MW to 80 MW wind energy projects across North America. With 35 wind farms at various stages located across 16 states, OwnEnergy has a unique business model for energy entrepreneurs. Local partners take an active role in the development, and in return they are provided with a significant ownership stake in the resulting wind energy project.

www.ownenergy.net

PROJECT DEVELOPER | OPERATOR



Advantech

Advantech provides embedded and automation products and solutions to the wind industry. Advantech offers comprehensive system integration, hardware, software, customer-centric design services, and global logistics support—all backed by front and back office e-business solutions. They cooperate closely with their partners to provide complete solutions for a wide array of applications across a diverse range of industries. Advantech has always been an innovator in the development and manufacturing of high-quality, high-performance computing platforms. Their mission is to empower these innovations by offering trustworthy ePlatform products and services.

www.advantech.com

ROLLFORMING MANUFACTURER

Faccin USA

Faccin offers the production of heavy-duty bending rolls for plate, angle, beam, and other structural shapes. Faccin has many options designed specifically for the wind tower industry to improve speed and accuracy of the rolled components for the tower sections.

www.faccin.com

SAFETY EQUIPMENT | FALL PROTECTION



CORGO Industries

CORGO Industries, which offers aerial lift bags and turbine accessories, is launching a new line of lifting accessories. For over 20 years, CORGO Industries has been working on creating new and improved products that raise the bar for safety in the workplace. With the COR-600 and their other lift bags made of ballistic nylon, mold, grease, and wear are becoming a thing of the past. No other products can be used from -40 to +40, or have stitch testing. CORGO puts safety first.

www.corgoind.com



Cascade Renewable Energy

Cascade Renewable Energy provides distributed renewable energy solutions tailored for residential, community, and commercial needs. They develop "behind-the-meter" wind and solar energy projects throughout the US. As a division of Cascade Engineering Inc., a Certified B-Corp, Cascade Renewable Energy is part of a family-owned company that has been in business for over 35 years.

www.cascaderenewableenergy.com

Orisol Energy US, Inc.

Orisol Energy is a developer of utility-scale wind energy projects. Established in 2009, Orisol Energy is a subsidiary of Orisol Corporation Energetica S.A., which has wind and solar projects in all stages of development, globally.

www.orisolenergy.com

BOLTING PROBLEMS SOLVED



Making difficult bolting obsolete all over the world.

Superbolt® Multi-Jackbolt Tensioners provide a safe, fast & easy bolting alternative. Benefits include:

- Only hand/air tools required
- Reduces install/removal times
- Tightens in pure tension
- A better bolted connection



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1-412-279-1149

SMALL WIND POWER | TURBINE MFG (under 100 kW)



IOWA WIND TURBINES, LLC



Iowa Wind Turbines, LLC
Iowa Wind Turbines, LLC is a distributor, installer, and refurbisher of small wind turbines, sizes 350 W to 50 kW. Horizontal axis and vertical axis models, as well as on-grid or off-grid systems are available. Their tilt towers are attractive and do not require large machinery onsite to do install or service work. Iowa Wind Turbines also has non-penetrating roof-mounts for smaller turbines. Solar Panel Boost packages are offered, as are weather/energy monitors. Off-grid hybrid lighting systems and variants are now available, as well. The company is a member of the Iowa Better Business Bureau, and provides free site analysis and consultation to best fit customer needs.

www.iowawindturbines.com



Aerostar, Inc.

Aerostar, Inc. is an established US manufacturer of quality wind turbine systems. Aerostar's six-meter 10 kW and Independence 32 kW turbines are simple, rugged, and efficient. The induction generator interfaces directly with the utility grid, with no expensive inverter. Each system includes an Aerostar exclusive touch screen display, which monitors and records all performance data. All Aerostar systems have tilting towers that allow for easy cost saving installation and maintenance.

www.aerostarwind.com



East Wind Power Inc.

East Wind Power Inc. was incorporated in 2009 to market Ghrepower wind turbine systems, and to provide local sale and technical support for North America customers. Ghrepower has grown from a wind energy research institute and university spin-off to a solution provider in the small wind turbine market—specializing in the design and product development of small wind turbines, with a product line of 300 W, 2 kW, 5 kW, 10 kW, 30 kW, 50 kW, and 100 kW.

www.eastwindpower.com



Sonkyo Energy S.L.

Windspot is a small wind turbine from the renewable energy company Sonkyo Energy. Features of Windspot is that it's an efficient, durable, reliable, high-performance turbine that comes in three models with powers of 1.5 kW, 3.5 kW, and 7.5 kW—to adapt to every user's need. These small wind turbines have many applications for households or light industry, ranging from self-sufficiency, grid connection, water pumping, telecommunications aerials, etc.

<http://usa.windspot.es>



SAWT Inc.

SAWT is a vertical axis wind turbines (VAWT) manufacturer. Products offered range from 200 w, 500 w to 1 kW, 3 kW, 5 kW, and 10 kW. Their turbines, both in-grid and off-grid, are widely used in urban lighting, farms, telecommunication stations, etc.

www.sawt.us

Talco Electronics

Talco is a wholesale distributor specializing in third-party certified wind systems since 2000. They have been involved in over 100 North American installations. They offer experienced industry professionals, ensuring a smooth, successful, and profitable wind turbine installation.

www.talco.com

Boss: Those torque tools we bought... are they broken again?
Worker: YES, but I found a better option, a company called Torcup!
Boss: Good, can we trade-in the old tools for New Torcup Tools?
Worker: Yes-they are easy to work with & will be on site shortly!
Boss: Send me contact info, we have other sites that need tools.
Worker: No problem, they have sales reps all over North America.

Square Drive Hydraulic Torque Wrench

Low Profile Hydraulic Torque Wrench

Torcup
www.torcup.com

Torcup Industrial Bolting Tools
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 1-888-Torcup-1 sales@torcup.com



Wind Simplicity

Wind Simplicity's Windancer is a high-efficiency, compact, noise-free horizontal-axis small wind turbine (3 kW, 7 kW). Features include: low-maintenance, direct-drive patented technology that maximizes power output; sustainable product lifecycle/production; adaptable towers; a portable asset; negligible noise/vibration; quality components for durability/sustainability; color customization; anodized aluminum (windblades, body, or powder-coated finish); and, maximum safety offered for owners/installers. Windancer is a classic, multi-award-winning design.

www.windsimplicity.ca

SOFTWARE PROVIDER



InduSoft, Inc.

InduSoft provides HMI and SCADA software tools that access data stored on industrial devices, as well as test and measurement equipment. InduSoft Web Studio provides all the building blocks to develop complete Human Machine Interfaces, SCADA systems, and embedded instrumentation solutions. Built-in features include scalable runtime, trends, alarms, easy database connectivity, over 240 PLC drivers, web publishing, and many additional tools to make existing equipment run more efficiently.

www.indusoft.com

TESTING & INSPECTION SERVICES



Herguth Laboratories, Inc.

Herguth Laboratories, Inc. provides testing, analysis, and consulting services of the following: **new and used oil analysis; tribology studies; refrigerant analysis; field test management/program implementation; condition monitoring training; as well as applied research of lubricants, greases, additives, and petroleum fuels.** Herguth Laboratories, Inc. has a professional staff, which includes chemists, consultants, technicians, evaluators, and administrators.

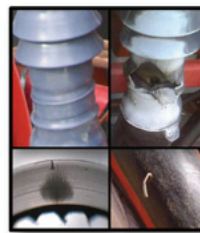
www.herguth.com



Borescopes-R-Us

Borescopes-R-Us is a manufacturer and supplier of borescopes and videoscopes for all industries. They offer a full line of pipe inspection cameras, rigid borescopes, micro fiberscopes, ultraviolet (UV) borescope, flexible fiberscopes, and economy videoscopes. If required, they can customize a client's borescope to meet specific inspection needs. In addition, they provide borescope repair services on any make or model unit with free repair estimates

www.borescopesrus.com



IMCORP – Power Cable Reliability

Most medium-voltage cable system workmanship defects cannot be detected by a VLF or DC test, and most defects won't go into failure within a couple-year warranty period. To avoid costly outages, the IMCORP 50/60Hz PD test will assure cable systems are built to a manufacturer's standards before the installer walks off the jobsite.

www.imcorpotech.com



SGS Germany GmbH

To assist in assessing wind energy project investments and assure the quality of wind farms, SGS works as an independent global service provider, carrying out consultancy, inspection, testing, supervision, monitoring, management, verification, and certification services for onshore and offshore wind farm projects. For each phase of a wind farm project, SGS Renewable Energy offers a wide range of services, ensuring a wind farm will perform successfully throughout its intended lifetime. Services include, but are not limited to, wind farm project certification, in-service inspection, manufacturing inspection, technical due diligence, and regulatory compliance.

www.sgs.com

Spin Trends LLC

Spin Trends, LLC performs integrated inspection services of gearboxes and turbines with a customer base accounting for 48% of the world's installed turbines. Their area of operation spans throughout North America and Mexico.

www.spintrends.com



TÜV Rheinland

TÜV Rheinland offers testing and certification services to domestic and international wind energy standards, as well as inspection and quality assurance services for the manufacture, fabrication, erection, and in-service examination of wind energy turbines. As a National Recognized Testing Laboratory (NRTL) and a European Notified Body, TÜV Rheinland tests to all applicable ANSI, ASME, CSA, NFPA, OSHA, UL, and other related standards, offering a single source for manufacturers seeking CE Marking and NRTL listings. For unlisted equipment, Field Evaluation Services can be provided onsite. Other offered services include: materials testing; welder and welding procedures qualification; structural base inspection; non-destructive testing; quality assurance/control services; sub-system certification; as well as others. TÜV Rheinland can also help manufacturers determine which types of certification procedures, applicable directives, harmonized standards, and documentation are necessary to sell their products, domestically and worldwide.

www.tuv.com/us/wind-energy

TOOLS



HYTORC

HYTORC makes bolting safer and simpler with one of the world's most trusted industrial torque and tension systems. Their wind power bolting division puts over 40 years of R&D to work on solutions for wind turbines. They have worked with nearly every major manufacturer in the wind power industry to improve manufacturing processes, and create safe and efficient tooling for in-field assembly and maintenance. HYTORC's new mobile service vehicles bring tool maintenance and calibration directly to a site.

www.hytorcwind.com

RomaxWIND

ENGINEERING SOLUTIONS FOR THE WIND ENERGY INDUSTRY

For the last 20 years Romax has provided world leading technical engineering solutions to businesses across the globe. Able to rise to every challenge and exceed expectations at every turn - nothing is impossible with Romax.

www.romaxwind.com
enquiries@romaxwind.com

Design

Design services for wind turbine gearboxes, bearings and drivetrains. Designed Samsung's first wind turbine drivetrain, now passed GL B design assessment.

Analyse

Detailed analysis by RomaxWIND allows design modifications leading to more reliable and robust wind turbine drivetrains.

Certify

China's first offshore 3MW wind turbine - the Sinovel SL3000. Gearbox designed by Romax & DHI, DCW and certified by GL. Certification support & guidance provided throughout the process.

HYTORC

WIND, LLC

HYTORC makes bolting safer and simpler with one of the world's most trusted industrial torque and tension systems. Their wind power bolting division puts over 40 years of R&D to work on solutions for wind turbines. They have worked with nearly every major manufacturer in the wind power industry to improve manufacturing processes, and create safe and efficient tooling for in-field assembly and maintenance. HYTORC's new mobile service vehicles bring tool maintenance and calibration directly to a site.

www.hytorcwind.com



SANDVIK Coromant

Sandvik Coromant

For all heavy machining operations in large components, Coromant Capto size C10 improves performance by allowing higher feeds and greater depths of cut. A flange diameter of 3.937" means a coupling suitable for heavy loads, providing extreme stability in milling and turning applications. By increasing removal capacity at higher torques, the C10 provides higher bending strength. The C10 includes a wide range of holders and adapters from shrink fit, SL adapters, ER chucks, to tap adapters.

www.sandvik.coromant.com/us/wind



TorcUP Industrial Bolting Tools

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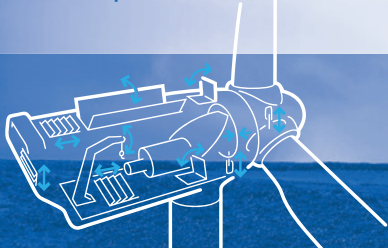
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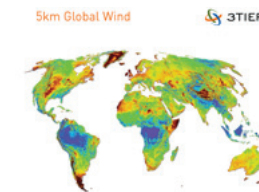


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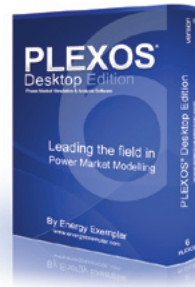
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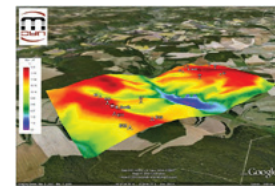
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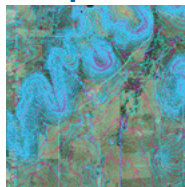


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Improved Techniques for Geothermal Exploration

By James E Faulds

Jim Faulds, geologist and research professor at the University of Nevada, Reno's Bureau of Mines and Geology, lectures his geothermal exploration class in April at the Fly Ranch Geysler north of Gerlach, Nevada. (Photo courtesy of the University of Nevada, Reno).

The Great Basin region of the western United States, which includes Nevada and parts of adjacent states, contains abundant geothermal resources, including more than 400 known geothermal systems and many additional blind or hidden sites.

These blind or hidden sites have no surface expressions, such as hot springs, to indicate a geothermal resource at depth. Studies by University of Nevada, Reno geologists Mark Coolbaugh and Lisa Shevenell estimate that most of the geothermal resources in the Great Basin are blind. Better characterization of known geothermal systems and improved exploration techniques are, therefore, critical for new discoveries, targeting drilling sites, and ultimate development. Research is helping to alleviate the large upfront costs associated with this development.

Blind geothermal resources are analogous to most petroleum deposits, as surface-oil seeps indicating large reservoirs at depth are rare. However, in contrast to the petroleum industry, robust databases indicating the most favorable settings or markers for geothermal systems are generally lacking.

Both temperature and permeability are critical for geothermal development, and so exploration techniques must be aimed at discovering permeable reservoirs of hot fluids. Such reservoirs reside in many geologic environments including volcanic provinces, regions of extending crust and high heat flow, and deep sedimentary basins where hot fluids in permeable sedimentary rocks exist.

For example, the northwestern parts of the Great Basin are extending at the highest rates today due, in part, to the influence of plate boundary motion associated with the San Andreas fault system. Higher rates of extension generate higher heat flow and greater dilation on faults. As a result, the northwestern part of the Great Basin has the greatest abundance of geothermal systems, and most of these systems are controlled by faults (see Figures 1 and 2).

A combination of techniques is usually needed to locate and develop a single geothermal system. Three, of several methods enabling resource identification and reducing the risks in drilling expensive geothermal wells are structural studies, shallow temperature surveys, and geochemical analysis.

Structural studies

Structural studies involve analysis of the geometry and movement histories of faults, which permits estimation of the most likely channel ways for hot fluids. Geothermal exploration in the Great Basin is limited without basic knowledge of which fault and fracture patterns, stress conditions, and stratigraphic intervals are most conducive to hosting geothermal reservoirs.

The University of Nevada, Reno, through its College of Science and the Nevada Bureau of Mines and Geology, has undertaken a thorough inventory of the structural settings of known geothermal systems in the region. Of more than 200 geothermal fields catalogued in the past year, it has been found that steps in normal (extensional) fault zones serve as the most favorable setting, hosting nearly one-third of the systems. Such areas are characterized by multiple overlapping fault strands, increased fracture density, and enhanced permeability.

Other common settings include fault intersections, where multiple minor faults typically connect major structures, and fluids can flow readily through highly fractured,

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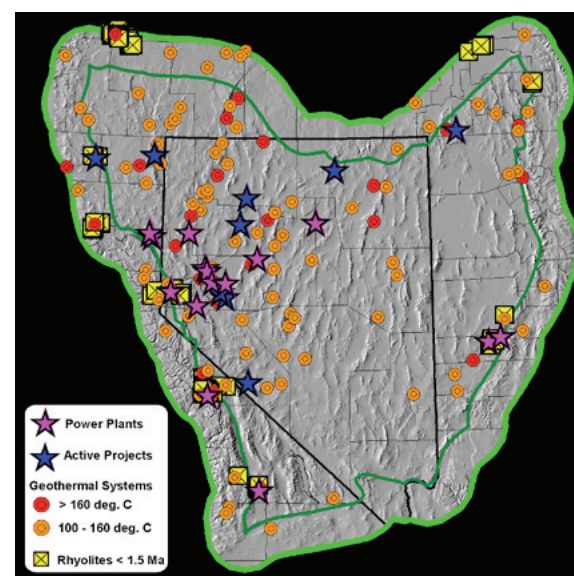


Figure 1. Distribution of geothermal systems in the Great Basin region. Systems with young rhyolites (yellow squares) probably have a magmatic heat source. Most other systems are controlled by faults.

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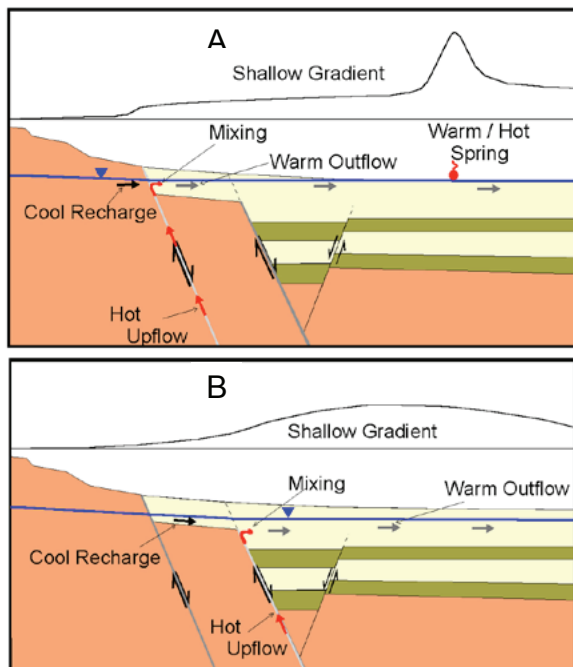


Figure 2. Schematic diagram (modified from D Blackwell) showing how geothermal fluids coming up along faults may emanate at springs far from their source (A), or be trapped beneath the surface (B), as well as mix with cooler, near-surface waters.

...continued from page 73.

dilational quadrants; as well as normal fault terminations, where major faults splay into a myriad of closely spaced minor faults that increase permeability.

Recently active faults typically lie within or near most geothermal systems. However, geothermal systems appear to be rare along faults with large offsets, possibly due to reduced permeability in thick zones of clay gouge (which develops along such faults), and periodic release of stress in major earthquakes.

The steps, terminations, and intersections of faults correspond to long-term, critically stressed areas, where fluid pathways would more likely remain open in networks of closely spaced fractures. To date, this work has led to the discovery, development, and/or expansion of several geothermal fields in Nevada, such as Desert Queen, Desert Peak, and Salt Wells.

Geochemical analysis

Through the use of various geothermometers, geochemical analysis of water from springs or wells allow for estimating the temperature of underlying geothermal systems. Some of the recent advances in geothermometers, as applied to Great Basin systems, have been time-consuming and offered only modest improvements in accuracy of reservoir temperature estimation.

As a response to this, Shevenell has been experimenting with a new method involving theoretical mixing models, which involves combined use of quartz, no steam loss, and chemical-corrected geothermometers. Several trials suggest this new mixing method is superior to others, and can predict realistic reservoir temperatures in the Great Basin and other environments, such as Central America. This method has significant potential for identifying blind geothermal systems at depth.

Shallow temperature surveys

Even though hot springs may not be present above most of the geothermal systems in the Great Basin (See Figure 2B), high-temperature groundwater in many places has heated up rocks and soils to the extent that it's becomes possible to detect this excess heat by measuring temperatures at a depth of one to two meters below the surface.

Recent research has improved the speed, accuracy, and cost of running shallow temperature surveys. Surveys of this type have recently identified at least seven previously unknown hidden geothermal systems in Nevada, and drilling at several of these sites has verified shallow thermal groundwater at temperatures near boiling. Continued use of shallow temperature surveys, in conjunction with improved structural analysis and fluid geochemical studies, holds the promise to significantly expand the production of electricity from geothermal resources.

Ongoing research will provide the baseline studies that are absolutely needed if geothermal is going to expand in Nevada and across the country.

James Faulds is a geologist and research professor in the University of Nevada, Reno's Bureau of Mines and Geology in the College of Science.

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WaterFurnace International Inc.

www.waterfurnace.com

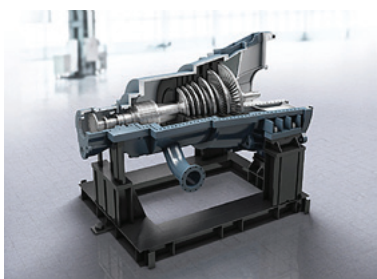


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Atlas Copco | www.atlascopco.com



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Siemens Energy | www.siemens.com

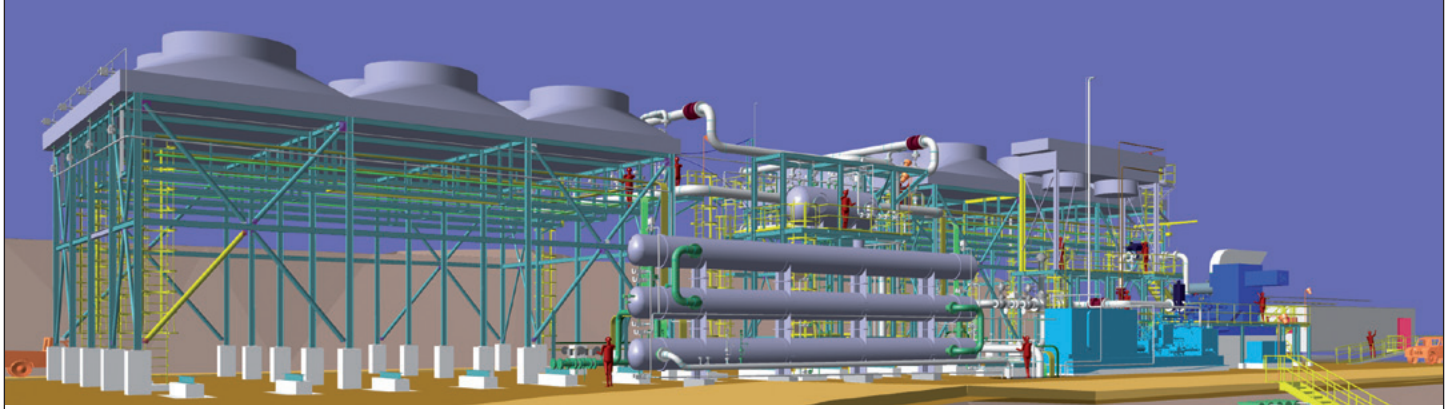


Gate valves for aggressive fluids in geothermal power plants


One of the problems faced by geothermal power plant operators is the very short lifetime of valves due to the corrosive and erosive action of the fluid. With standard materials, the average life of a valve installed in geothermal power applications could be five to six months. After this period, valve components like the stem, wedge, and body can begin failing due to the erosive action of the fluid and corrosive effect of the fluid moisture and possible condensation. However, there are new valves that can minimize these effects and extend the life of the installed valves. Using special cladding technology, the valve internals are protected. Tyco Fasani has developed this innovative gate valve design, suitable in applications near the extraction pit where aggressive geothermal fluids are present. This new Fasani design will allow operators to reduce plant shutdowns for the replacement of worn-out components.


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Chipper machine

CBI's new ChipMax 484 is an extreme-duty biomass production workhorse. Its main components such as the rotor, chipper box, and feed system are significantly stronger than any other chipper in its class. With two rotor options, the ChipMax can make high-quality fuel chips custom-sized from 12 mm to 25 mm, as well as "micro-chips" from 2 mm to 12 mm from logs up to 24" in diameter. These micro-chips produce a consistent fiber length that dramatically reduces the overall cost of producing pellets, and improves the function of small boilers.

The hydraulically adjustable chip discharge chute facilitates top or end loading of chip trailers. It also features a hydraulic driven blower for stronger chip discharge that automatically increases power when needed (without any wear or excess power consumption), and a chip deflector that is hydraulically actuated into position when top loading. The discharge chute can be ordered in a flex or straight configuration. Adding to its versatility, the ChipMax is available as a portable (pintle hook or 5th wheel mounting hitch), track, or truck-mounted unit, and is road legal in both width and weight.

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Yokogawa Corporation | www.hxs10.com



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Solving the Wood Waste Dilemma

Briquetting solutions for wood processors

By Greg Tucholski

For as long as there have been sawmills and wood processing facilities, operators have struggled with the issue of what to do with all of the sawdust and wood residues created during production runs. Years ago, before much attention was paid to the negative effect that wood waste disposition might have on the natural environment, solutions included dumping collected sawdust into nearby streams and rivers, or allowing the waste to accumulate over time before burning it on site. Fortunately, today's wood processing industry is much more mindful of environmental sustainability, and is working to develop cleaner ways to dispose of its waste products.

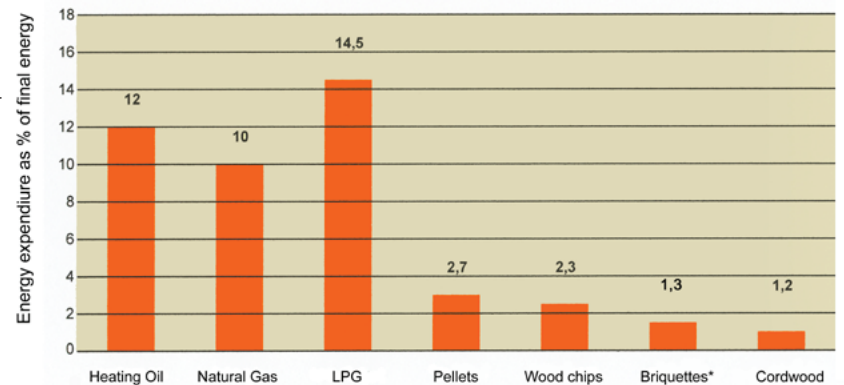
Wood processing mills throughout Europe, and increasingly now in North America, are embracing briquetting as a viable alternative for wood waste disposition. Briquetting is a cost-effective, efficient process that produces blocks of compressed sawdust and wood residues that make the waste cleaner and easier to manage at the facility level. Briquetting can even provide additional revenue streams, acting as a carbon-neutral source of heating fuel.

Better climate, better business

In the real world, companies that want to do what's right for the environment have to do it in ways that are also good for business. Some well-known methods of wood waste disposal popular in today's North American wood processing industry include repurposing the residuals as animal bedding and pelletizing, which involves compressing the waste into tiny pellets for use in pellet stoves. Although these methods are more eco-friendly than sending the waste to landfills or burning it in incinerators, they aren't necessarily the most cost-effective or efficient ways of enacting environmental responsibility. For starters, both of these disposition approaches require substantial investments of time and energy, and they present storage and logistics challenges that, in light of a return on investment (ROI), can further drag down feasibility.

On the surface, reusing wood waste as animal bedding seems like a straightforward way to dispose of it, and it is, but there are other factors that make it less attractive. First, storage of tons of sawdust and residues is a headache that most facilities could do without. The waste is cumbersome to transport and, because wood dust can be highly combustible in large concentrations, it can pose serious safety risks. Many processors end up simply giv-

Energy consumption in the production of fuels



The energy consumption for the extraction, conversion and delivery of fuels in relation to the corresponding fuel's energy content is 1.2% for cordwood, 2.3% for wood chips W30 and 2.7% for pellets. The requirements for the fossil fuels, such as natural gas and oil, must be set to a minimum of 10-14.5%. These were the findings of a study by the Technical University of Graz/Austria conducted in 1996.

ing the waste away to farmers or animal bedding producers just to get rid of it (granted, in some situations it can sell for up to \$40 per ton). Unless done well, however, the proposition doesn't make much business sense.

Pelletizing has the potential to generate greater revenue, and it's largely easier on the bottom line, but it still has drawbacks. Concentrating wood residue into tiny pellets requires a tremendous amount of energy. Not only does this drive up utility costs and eat into profitability, it also undermines the environmental benefits as it consumes additional energy that's harder to offset. The process is also labor and maintenance intensive, requiring diligent oversight and frequent wear-part replacements. Although somewhat easier to manage logistically than the loosely packed wood waste intended for animal bedding, pellets are challenging because they tend to roll around and must be boxed or bagged. Moreover, the pellet market is limited because pellets can only be used in specially designed devices like pellet stoves. This means that any revenues generated by the pellets are dependent on the success of one particular industry.



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Briquetting defined

As the name implies, the briquetting process takes quantities of small, loose materials like sawdust and other residual wood waste and compresses them into compact, uniformly shaped forms. In the wood processing industry, briquetting allows businesses to salvage waste materials for use in other applications such as biofuel.

Briquetting solutions

Briquetting solves all of these problems. Briquetting is a popular disposition method in Europe, and has been for many years, mainly because there's a robust market on the continent for briquettes as a source of eco-friendly heating fuel. The method is now coming into its own in North America as more businesses become aware of it, and the market for briquette-based fuel continues to grow.

More flexible than pellet fuel, briquettes can be used in any fire-burning device and typically sell to distributors for between \$140 and \$200 a ton. Not a bad return for wood waste that might otherwise have been given away.

Briquetting systems are good for the environment and good for business with an excellent ROI—and the source of added revenues via the production of carbon-neutral heating fuel. From the processing floor to the warehouse, briquetting improves operations by eliminating dirty and potentially dangerous wood dust from the air, where it could damage machinery or threaten the health of employees and visitors.

These systems are easy to install and operate, and require less than half the energy of pelletizing machines to dispose of wood waste. In some instances, briquetting machines have been installed and integrated into milling operations in as little as one day. And, as briquettes are typically square in shape as opposed to round or cylindrical like pellets, they can easily be placed on pallets and shrink-wrapped to simplify transportation and warehousing—saving time, money, and valuable floor space.

As briquetting becomes more common throughout North America and beyond, its benefits to businesses and the environment will continue to grow.

RUF | www.ruf-briquetter.com



Capacitance probe with remote electronics

BinMaster Level Controls introduces a newly designed Pro Remote capacitance probe that offers the ability to mount the sensor's electronic components up to 75' away from the sensing probe. This point level indicator is designed specifically for hostile applications, such as high temperatures or excessive vibration, featuring a unique "split" configuration that houses sensitive electronics away from extreme conditions that may interfere with proper probe operation. The Pro Remote can be used for high-, mid-, and low-level detection of solids, liquids, or slurries using a variety of Delrin, Teflon, food grade, flush-mounted, stubby, or extended probe options.

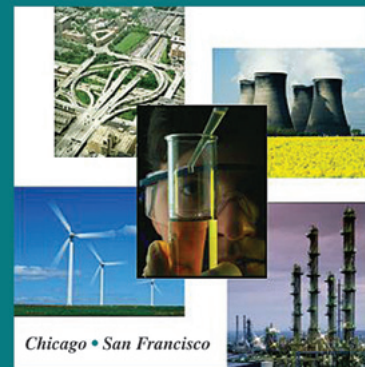
The Pro Remote capacitance probe features a new housing with a triple-thread, screw-off cover that allows easy access to internal components and an FDA-recognized powder-coat finish. This housing also has dual conduit entries to simplify wiring and installation. Another new electronic feature is a dual-time delay that allows the user to set flexible time delays for covered and uncovered conditions. Users can set a probe to react immediately or with up to a 30-second delay when it detects a covered or uncovered state. For example, the capacitance probe can be set to send an immediate alert when it reaches a covered state, but can also be set to alert with a 15-second delay when it detects an uncovered state.

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Continuously Evolving Boiler Standards

Boiler MACT rules & the biomass industry

By Stephen Gunther

THE FAMILIAR STRUGGLE BETWEEN environmental and industry interests is once again playing out as the Environmental Protection Agency (EPA) develops its new national emission standards for hazardous air pollutants for industrial, commercial, and institutional boilers and process heaters.

In response to the combined efforts of many stakeholders in the biomass industry, the EPA has continued to revise these rules to reach a fair balance between the two interests. Often referred to as Boiler MACT, these standards are calculated based on maximum achievable control technology (MACT). However, according to many biomass supporters, emissions standards as originally drafted were based on inaccurate data of existing technologies, and the definition of biomass feedstocks was unclear in the Non-Hazardous Secondary Materials (NHSM) rule. While supporters of biomass thermal often struggle for the inclusion of their industry in renewable energy legislation, the Boiler MACT standards would have worked in the opposite direction and set back progress in promoting biomass as a reliable energy source.

A growing number of renewable energy advocates view biomass as a clean, efficient alternative to fossil fuels, finding that the EPA's proposed rule didn't sufficiently represent the biomass industry. In response, the EPA has made several revisions that benefit biomass and is currently improving its newest set of proposed rules, which were released on October 31st, 2011. Finalized rules are scheduled for promulgation in April of 2012, but the future of the Boiler MACT rules is still uncertain, especially in light of the growing trend among many House Republicans to oppose environmental regulations.

An evolving process

On June 4th, 2010, the EPA released proposed rules for National Emissions Standards for Hazardous Air Pollutants (HAP) for industrial, commercial, and institutional boilers at both the area and major source levels under the authority of the Clean Air Act (CAA). It also released proposed rules for Emission Standards for Commercial and Industrial solid waste incinerators on that same date. The proposed rules sought to reduce the level of toxic air pollutants including mercury and other metals, as well as organic air toxics emitted by boilers and process heaters that burn natural gas, fuel oil, coal, biomass, refinery gas or other gas, and solid waste incinerators. Standards were calculated based on maximum achievable control technology (MACT).

The EPA received over 4,800 individual comments raising concerns about issues that it failed to consider. This strong reaction prompted the EPA to file for a motion with the federal District Court for the District of Columbia on December 7th, 2010, seeking a five-month extension for developing new proposals—which would push back the completion of finalized standards to April of 2012. A federal judge denied the bid, requiring the EPA to issue finalized rules on February 21st, 2011, to become effective on May 20th of the same year.

This was not the end of the road for the Boiler MACT standards. The EPA filed with the Court of Appeals and on May 16th, and EPA Administrator Lisa Jackson signed an action to delay the effective dates for final standards for major source boilers and certain solid waste incinerators. Revised proposals were released on October 31st, and final standards are scheduled for promulgation by the end of April 2012.

Possible threats to biomass thermal

Throughout the entire process, supporters of the biomass thermal industry have expressed their concerns about the detrimental effects the proposed emission standards for boilers that burn biomass products would have on the growing industry. Biomass thermal energy refers to the use of biomass, organic matter including woody materials, agricultural residues, and grasses for space and

domestic water heating, process heating, and the thermal portion of combined heat and power (CHP). Boilers and process heaters that burn biomass were included under the standards set by the boiler MACT rules, and many stakeholders believed the proposed standards would have a negative affect on the biomass industry due to the high compliance costs involved in meeting unreasonable emissions standards.

Of course, it's important to advocate for efficiency and clean burning appliances, but also stress the importance of developing standards—and standards that can be realistically achieved. According to some, EPA's data set for Area Source boilers was incomplete and inaccurate regarding available technologies, boiler sizes, biomass fuel types, and health effect estimates. For instance, no boiler in the dataset could meet the dual emission limits of PM and CO, proving that the proposed standards were unrealistic. As a result, complying with these rules would've discouraged renewable biomass use and disproportionately negatively impacted rural economies.

Such comments were used by the EPA as it re-worked the emission standards. But despite the release of the re-proposals on February 21st, 2011, many stakeholders and politicians are still concerned about the effects the regulations will have on the growth of thermal installations, due to high compliance costs and other issues such as the definition of biomass under the Non-Hazardous Secondary Materials (NHSM) rule.

Nevertheless, it should be noted that the EPA has been receptive to feedback, as demonstrated through its reply to a letter sent from Senator Olympia Snowe (R-ME) and 10 other Senators that urged the EPA to clarify its definition of biomass. In the letter, the senators argued that the NHSM rule created uncertainty about whether certain biomass fuels would be defined as a fuel or non-hazardous solid waste, which are subject to stricter regulations. The EPA has recognized these flaws, and is in the process of revising the rule to clarify which materials are included in the biomass fuel definition.

Boiler MACT in congress & the road ahead

Politicians haven't only attempted to influence the boiler MACT rules through letters, but they've also introduced legislation to void or delay the proposed standards. The boiler MACT rules were swept up in a growing trend in Congress, especially among House Republicans, to target regulations that they regard as "job stifling burdens placed upon American businesses and citizens."

On October 13th, 2011 the House of Representatives passed H.R. 2250, which specifically targets boiler MACT rules by a vote of 275-142. The bill has been placed on the Senate Legislative Calendar and, if passed, would void the EPA's current emission standards for Area Source and Major Source boilers, along with emission standards for solid waste incinerators and the NHSM rule. The EPA would then have 15 months after the Act's enactment to finalize new regulations, in which the date for compliance would be at least five years after the regulations become effective.

It's uncertain how H.R. 2250 will fare in the Senate, which had already introduced a similar bill: S. 1392. The bill was co-sponsored by several Senators, but recent concessions by the EPA may have altered their opinion. One thing for certain is that stakeholders in the biomass industry will be watching closely as Congress votes on legislation that may reduce the influence of the EPA and the resulting impact on finalized boiler MACT rules in the next few months.

Stephen Gunther is the Policy and Government Affairs Fellow at the Biomass Thermal Energy Council.

Biomass Thermal Energy Council

www.biomassthermal.org



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Chain flail debarker

Peterson's popular 4800E Chain Flail De-barker, the industry standard for removing bark for clean pulp and paper chips, has had a major redesign with many new features that clean chip producers demand. The new 4800F features: a 350HP (265KW) CAT C9 TIER 4 engine; upper and lower flail drives (similar to Peterson's 5000H whole tree chipper); direct drive lower in-feed and out-feed rolls; floating direct-drive upper feed rolls; a five-foot wide bark pusher, and Peterson's IQAN control system.

The machine also features a dedicated 100-gallon (567 l) hydraulic oil tank, and a 200-gallon (757 l) fuel tank to allow the 4800F to run an entire shift without fill-up. With a retractable gooseneck, the high-way legal 4800F is easily moved between jobs, and has an estimated curb weight of 48,100 pounds (21,817 K). The four fixed landing gear (with floating pads) allow the 4800F's operating height to be adjusted easily, and to be stable once it's on the job. The operator can operate the machine with a wireless remote, which also can pair with the Peterson 5900 disc chipper.

Peterson Pacific Corp.
www.petersoncorp.com



Wastewater pumps

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CBI's **ChipMax 484** is an extreme-duty workhorse. Its main components are significantly stronger than any chipper in its class. Featuring two rotor options, the ChipMax can make high-quality fuel chips from 12-25 mm or "micro-chips" from 2-12 mm from logs up to 24" in diameter.



Splitting

CBI's **Log & Stump Screw** splits oversized logs and stumps with ease and efficiency. It's ideal for excavators, log loaders, front-end loader/backhoes, farm tractors, and skid steer units.



Continental Biomass Industries, Inc. Newton, NH USA 603-382-0556 www.cbi-inc.com



Biomass receiving systems

Robert White Industries, Inc. announces the development of biomass receiving systems, designed for receiving biomass discharged from standard or live floor semi-trailers. The system is designed to deal with the environmental, safety, and material handling challenges presented by biomass unloading, processing, and storage. The receiving system prepares the biomass for storage by smoothing biomass surges at the trailer discharge, metering the product into the handling system, sizing the product to specification, and removing tramp metal prior to storage. The systems are designed to work with green or dry wood products, corncobs, corn stover, and other types of biomass material.

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www.rwii.net



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New York, New York; www.seia.org/cs/fin
- 26-27 MiaGreen 2012 Expo & Conference**
Miami Beach Convention Center—Miami, Florida; www.miagreen.com
- 29-31 EUEC 2012: Energy, Utility & Environment Conference**
Phoenix Convention Center—Phoenix, Arizona; www.euec.com
- 31-2 Solar Power Generation USA**
Rio All Suites Hotel and Casino—Las Vegas, Nevada
www.greenpowerconferences.com

FEBRUARY

- 1-2 Clean-Tech Investor Summit**
The Renaissance Esmeralda Resort—Indian Wells, California
www.cleantechsummit.com
- 13-14 EnerCan West 2012: Energy and the Environment**
Delta Regina Hotel—Regina, Saskatchewan; <http://enercanwest.com>
- 14-15 SEIA Installer Safety Seminar & EXPO**
Westin Mission Hills Resort & Spa—Rancho Mirage, California
www.seia.org/cs/iss
- 14-16 SOLAR Power-Gen Conference & Exhibition**
Long Beach Convention Center—Long Beach, California
www.solar-powergen.com
- 15-16 AWEA Wind & Transmission Workshop**
Indianapolis, Indiana; www.awea.org/events
- 22-24 Offshore Wind Power USA**
Hynes Convention Center—Boston; Massachusetts
www.greenpowerconferences.com
- 27-28 Inverter & PV System Technology Forum—USA 2012**
San Francisco, California; www.solarpraxis.de/en/conferences
- 27-1 Solar Power Finance & Investment 2012**
Rancho Bernardo Inn—San Diego, California; www.infocastinc.com
- 28-29 AWEA Wind Power Project Siting Workshop**
Las Vegas, Nevada; www.awea.org/events

MARCH

- 6-7 AWEA Wind Power Supply Chain Workshop**
Chicago, Illinois; www.awea.org/events
- 7-8 23rd Annual GLOBALCON Conference & Expo**
Atlantic City Convention Center—Atlantic City, New Jersey
www.globalconevent.com
- 7-10 9th Annual Green Energy Summit and Exposition**
Frontier Airlines Center—Wisconsin, Milwaukee; <http://greenenergysummit.us>
- 14-16 GLOBE 2012**
Vancouver Convention Centre—Vancouver, BC; www.globeseries.com
- 19-21 PV America**
San Jose Convention Center—San Jose, California
www.pvamericaexpo.com
- 21-22 AWEA Wind Power Transmission Seminar 2012**
Indianapolis, Indiana; www.awea.org/events

APRIL

- 3-4 Good Jobs, Green Jobs**
Philadelphia, Pennsylvania; www.greenjobsconference.org
- 12-13 AWEA Wind Power Finance & Investment Workshop**
New York, NY; www.awea.org/events

Send us your clean energy show and event listings. Email information to the Editor at mfroese@naceanenergy.com

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10	Advanced Power Products	www.advancedpowerproducts.com
30	American Solar Energy Society	www.nationalsolarconference.org
30	Apogee Instruments	www.apogeeinstruments.com/clean-energy
26	Applied Energy Technologies	www.aetenergy.com
5	Baja Construction	www.bajacarports.com
39	Bosch Solar Energy	www.bosch-solarenergy.com
77	Bureau Veritas North America	www.us.bureauveritas.com
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43	Canadian Solar (USA)	www.canadiansolar.com
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