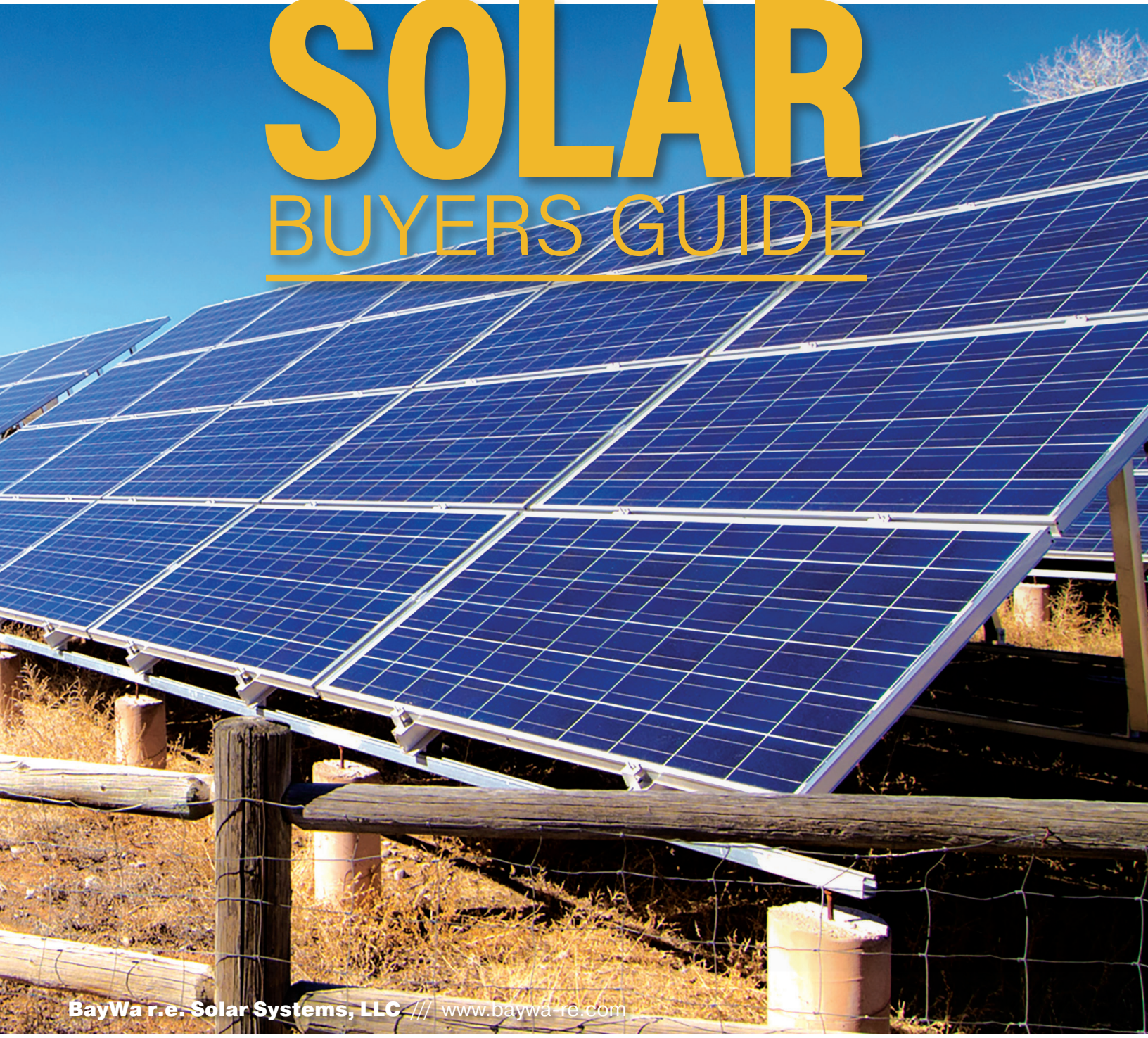


2019

SOLAR

BUYERS GUIDE



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Adhesives, Sealants, Tapes & Pastes



American Polywater Corporation

Polywater FST duct sealant meets the national electrical code for sealing conduit and raceway systems. FST protects electrical equipment and apparatus providing electrical reliability for a user's system. BonDuit conduit adhesive bonds PE conduit to PVC, rigid steel and fiberglass conduits making a water-tight joint. BonDuit creates stronger bonds than push on or reverse threaded couplings. Type RP cable prep and electrical maintenance cleaner offers a safe effective alternative to other cleaners that have environmental and health concerns.

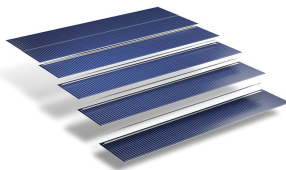
www.polywater.com



CHT USA

Silicone encapsulants and sealants offer environmentally friendly, long-term protection to meet the demands of a variety of solar panel applications from panels to junction boxes. UV resistant encapsulating grades also outperform organics. CHT USA offers optically clear and non-yellowing systems, with corrosion-resistant properties, as well as thermally conductive grades for heat management. UL rated, flame-retardant, potting grades are also available for junction box applications. Additionally, silicones with primer-less adhesion are offered for bonding to a variety of plastics.

www.cht.com/us02.en



Henkel Corporation

Henkel provides electrically conductive adhesives (ECAs) and has a broad technology toolbox and ECA formulation expertise that spans well over 50 years. The company's photovoltaic ECAs and processes are designed to enable heterojunction, shingle, and other solar cell and module types. Henkel supplies unique technology, enabling high volume quality and providing deep process know-how. Henkel's capabilities translate into high quality and low cost per kilowatt-hour for both module OEMs and consumers.

www.henkel-adhesives.com

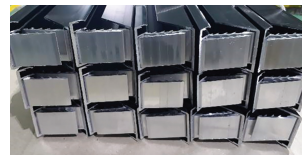
Aluminum Extrusion & Metal Fabrication



Alexandria Industries

At Alexandria Industries, experienced engineers, manufacturing specialists, and solar market experts help create racking and mounting product solutions to specification. Their recommendations are driven by their customer's part's essential functions and how these interact with, and affect, mating parts and the end product solution.

www.alexandriaindustries.com



HYUNDAI ALUMINUM

Hyundai Aluminum Americas, Inc.

Hyundai Aluminum Americas, Inc. is a subsidiary of The Aluko Group of Seoul, S. Korea. With 5 aluminum extrusion and fabrication facilities in S. Korea and Vietnam, they supply solar panel manufacturers with punched, mitre cut, anodized aluminum extruded panel frame sets. Their frames come with corner keys pre-inserted into the short frame, saving time and eliminating waste. Their new (2017) facility near Hanoi, Vietnam has available extrusion and fabrication capacity.

www.hyundaialuminumamericas.com

Architects | Builders



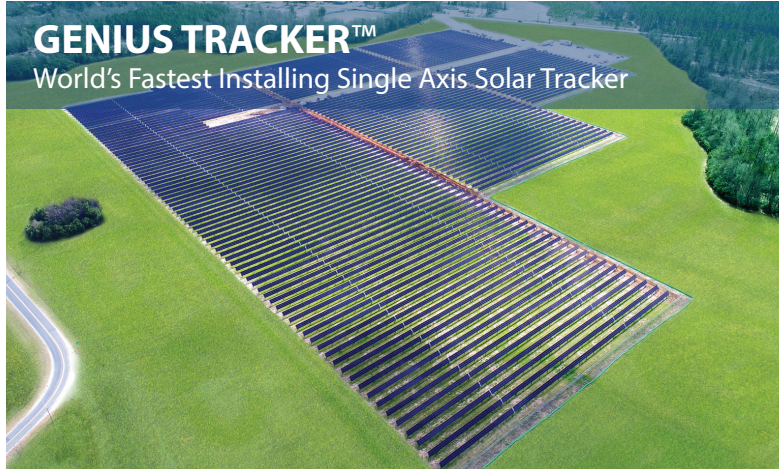
E8 Energy Group, Inc.

E8 Energy Group is a developer and EPC company for renewable energy projects, including photovoltaic, solar thermal, biomass, hydroponic and green houses, operation and maintenance, EPC contracting, electrical contractor, and LED retrofits.

www.e8energygroup.com

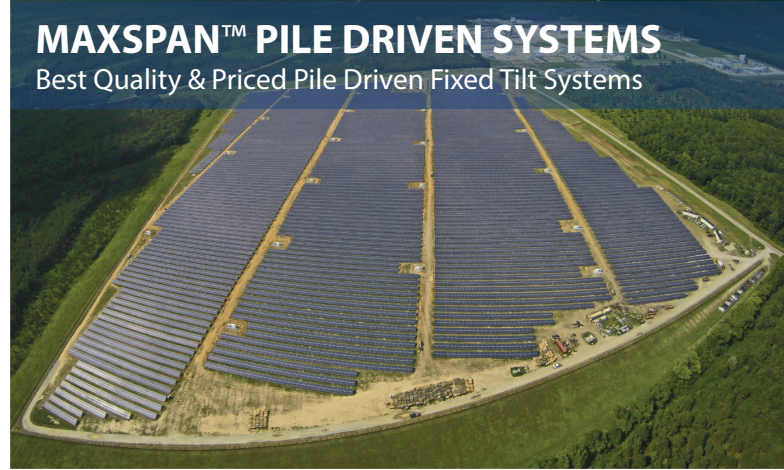
OVER 4 GW SOLD

Every System For Your Every Need



GENIUS TRACKER™

World's Fastest Installing Single Axis Solar Tracker



MAXSPAN™ PILE DRIVEN SYSTEMS

Best Quality & Priced Pile Driven Fixed Tilt Systems



POUR-IN-PLACE™ BALLASTED GROUND SYSTEM

Landfill Leader & Best Solution for Rocky Sites



PRECAST BALLASTED GROUND SYSTEM

Fast Installing Solar Mounting System for Landfill Sites



GRID-LITE™ ROOF SYSTEM

Cost Effective Ultra-Low Weight Ballasted Roof System



STANDING SEAM ROOF SYSTEM

Complete Solution for Metal Roofs Zero Ballast

BANKABLE QUALITY VALUE PRICING

GameChange Solar is driven by its mission to repower the planet with clean solar energy. We do our part by driving fixed tilt racking and tracker equipment costs lower. With over 4 GW sold, GameChange systems combine fast install, bankable quality and unbeatable value through superior engineering, innovative design and high volume manufacturing.



Best in Class Customer Service



Superior Engineering in Structural, Civil, Mechanical & Electrical



In-House Logistics for On Time Deliveries



One Stop Solution for Geotech, Pull test & Turnkey Services

Capital Intro™



GameChange Solar works with IPP's, Private Equity Firms and utilities that invest in and own projects. We introduce them to developers and EPCs who have projects to build. This enables more projects to be financed and built, furthering our mission to repower the planet with cleaner energy.

GameChange Solar's Capital Intro™ program currently has over \$8 billion in available capital from multiple sources.



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gamechangesolar.com

Europe Office:
Dublin, Ireland

Massachusetts Office:
Brimfield, MA



Backsheets



FLEXcon Company, Inc.

Whether it's for use with standard, fast, or ultra-fast cure encapsulants and laminating processes, FLEXcon multiGUARD multi-layer backsheet products offer long-life UV and moisture protection and insulative properties as a back laminate for photovoltaic panels. A high-performing laminating adhesive enhances film bonding for strength and durability. FLEXcon constructions meet strict IEC and UL requirements.

www.flexcon.com

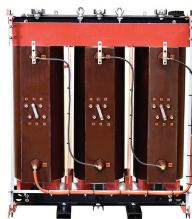


Griff Applied Laminates

ISO Certified manufacturer of traditional and thin film back-sheets, Griff Applied Laminates provides custom extruding of engineered films, barrier films, light management films, EVA extrusion coating, top-sheet coating, and laminating to improve manufacturing efficiencies and custom designs. They also offer complete slitting, rewinding, and sheeting with die-cut notches for connectors. They can assist with product development and complete testing services are offered for existing and new business inquiries.

www.thegriffnetwork.com

Balance-of-Systems (BoS)



Hammond Power Solutions

HPS EnduraCoil cast resin transformers provide a cost-effective solution for utility-scale solar applications. EnduraCoil meets UL standards and is rated up to 35kV and 3MVA. It can be provided within a suitable outdoor rated enclosure or as a core and coil component as needed. Cast resin transformers are environmentally sustainable with low maintenance requirements.

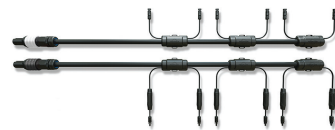
www.hammondpowersolutions.com



HellermannTyton

Announcing two wire fasteners for routing module and homerun wires on utility scale solar systems. The Button Mount with Solar Tie is made of highly engineered plastic and provides a safe attachment point for the tie, isolating it from sharp holes. The Solar Locking Clamp quickly mounts in mounting holes, and an integrated Solar Tie saddle allows installers to add additional cables. Designed to be long-lasting, the locking clamp adjusts to secure up to four cables. Both mounts are made of high impact modified, heat-resistant, UV stabilized material.

www.hellermann.tyton.com



Shoals Technologies Group

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

www.shoals.com



SolarBOS

SolarBOS offers both DC and AC Balance of Systems products for photovoltaic systems. Rapid Shutdown Solutions represent low-cost and space-saving solutions for commercial solar systems utilizing string inverters. AC Combiners then combine multiple string inverter outputs. All solutions are highly configurable to fit any application and are built to customers' specifications. SolarBOS products are designed and manufactured in the USA with emphasis on clean design, quality and cost-effectiveness. SolarBOS products are listed to UL-1741.

www.solarbos.com

DYNAPOWER

C O M P A N Y

Trusted Worldwide Since 1963

>475MWs

of energy storage inverters, DC converters and energy storage systems installed worldwide.

INCREASE PV INSTALLTION REVENUES

DC-COUPLED SOLAR PLUS STORAGE

Adding energy storage to a new or existing utility-scale solar installation with a Dynapower DC-DC converter can increase PV energy production through clipping recapture and low voltage harvest. Further adding to your bottom line, DC-coupled solar plus storage has a higher efficiency than AC-coupled storage and is eligible for valuable tax incentives for installation owners.

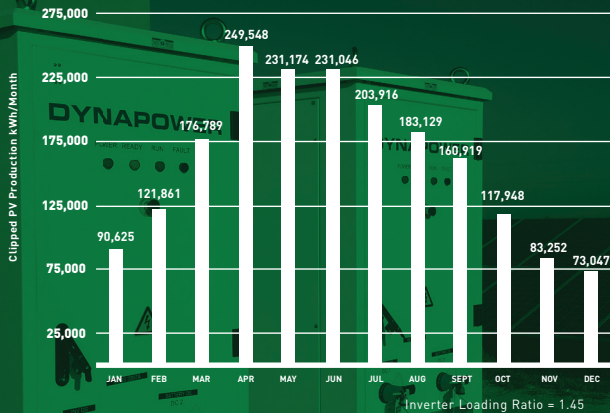
To learn more about how Dynapower's patented line of DC-DC converters can increase project revenues and lower the installation costs of utility-scale solar plus storage, please visit our website to download the white paper.

To speak with a sales engineer today about modeling your PV installation for energy storage, please call

1.877.215.0487

SAMPLE 20MW PV INSTALLATION WITHOUT DC-COUPLED STORAGE

Annual Lost Production: **1,923,256kWs**



WWW.DYNAPOWER.COM/DC-DC



250kW to 4MW

Battery | Energy Storage



AIMS Power

AIMS Power introduces its new battery product line of LiFePO4 batteries. The LiFePO4 batteries maintain constant output voltage, providing more efficient power. This allows the cell to deliver full power until it is completely discharged without harming the battery, and it can simplify or eliminate the need for voltage regulation circuitry. The battery has an approximate 10 year cycle life capacity, and is easy to maintain. The LiFePO4 technology has high thermal and chemical stability, which improves battery safety. AIMS Power's LiFePO4 battery line is powerful in a small and lightweight footprint and uses the same space as existing 12V battery systems.

www.aimscorp.net



Battery Systems

Battery Systems provides their customers with battery products, combined with efficient service, offered at competitive prices. Their batteries are suited for applications including, automotive, marine, RV, solar, golf, industrial, and more. They also offer free battery testing.

www.batterysystems.net



Can Solar, Inc.

Can Solar, Inc. presents their Solar Power Bank for Home, which receives up to 2kW solar power, kept in 2.5kWh or 5kWh LiFePO4 batteries and then converts to 110VAC power, with utility charging capability. Users only have to connect their solar modules. The all-in-one design puts necessary functions into a compact enclosure, bringing conveniences to users. Users can check Power Bank status through an optional mobile phone app.

www.cansolarenergy.com



Crown Battery Manufacturing Company

Crown Renewable Batteries are heavy weights with dense plates that use more active lead material, increasing battery performance and longevity. Crown batteries contain more lead content per ampere-hour of rated capacity. Their two-volt 2CRP3690 Power Module combines ampere-hour capacity availability to renewable energy system users. The battery delivers application flexibility, while providing an ideal solution for temperature management and electrical isolation.

www.crownbattery.com



EnerSys

PowerSafe ESG batteries by EnerSys are designed to provide 187-935 amp-hours (Ah) of capacity range to handle the challenging load profiles and service conditions of utility applications, including substations that support wind farms. The configuration of five multi-cell 4-volt units (185, 234, 281, 354, and 418Ah) reduces the footprint of the PowerSafe ESG battery to enable minimal occupation of floor space. Individual terminal posts on each cell facilitate integration of battery monitoring and test equipment used in routine maintenance and inspection. The Slide-Lock post seal accommodates natural plate growth over time for maximum reliability and reduced maintenance.

www.enersys.com



Fortress Power

Fortress Power offers their new energy storage solution, the G2LFP-15 battery. The V2 battery uses Lithium-Ferro-Phosphate technology and offers a new user-friendly front display, so all aspects of the system can be monitored. Their new V2 series is not only compact, but can power up to 8 stacks in parallel. Fortress Power was able to maximize the power capacity and modernize the V2 battery all while keeping beneficial features such as time-of-use power, self-use, and off-grid. Fortress Power batteries have a 10-year warranty and offer long life cycles (up to 6,000 cycles).

www.fortresspower.com

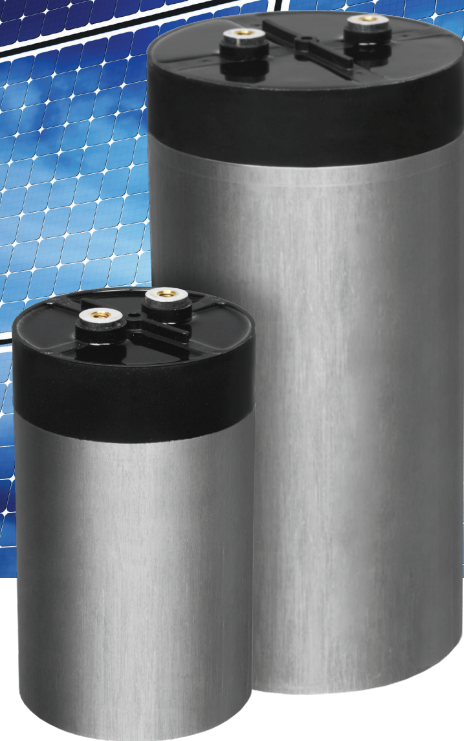
Type 947D

High Density, DC Link Capacitors



DC link power film capacitors

Next generation inverter designs for renewable energy demand reliable DC link capacitors with higher capacitance values, voltage, and current ratings. Available in new case sizes and ratings, Cornell Dubilier's Type 947D power film capacitors offer the highest bulk energy storage, ripple filtering and life expectancy for wind and solar power inverter designs, as well as electric vehicle applications. Select from hundreds of standard catalog listings, or connect with CDE engineers to develop special designs to your requirements.



TYPE 947D POWER FILM CAPACITORS

85, 90, 100 & 116 mm CASE SIZES

CAPACITANCE VALUES TO 3600 μ F

APPLIED VOLTAGE TO 1500 Vdc

RIPPLE CURRENT RATINGS $>100 A_{rms}$

For technical information, visit cde.com/solutions/inverters

CDE **CORNELL DUBILIER**
ENERGIZING IDEAS





Leoch Battery Corp.

Leoch's Pure Lead + Carbon Technology has been specifically engineered to support partial-state-of-charge applications where the batteries are cycled regularly. These high power, energy dense batteries offer super-fast charging from 0% to 90% in 1.5 hrs. with high performance in extreme environmental conditions and a long deep cycle life of 2200+ @ 50% DoD. The ABS-poly-carbonate jars enable wide operating temperatures from -30°C to +60°C. Telcordia approved NEBS level III, GR63, and tested to IEC 60896-21-22 requirements.

www.leoch.us



Lithium Werks

Lithium Werks manufactures lithium ion batteries that can be arranged in systems between 12V-1000V, from kWh to MWh. As a result of stable, high-quality, lithium iron phosphate (LiFePO4) chemistry, Lithium Werks' diverse offerings of 12V, 24V, and 36V modules have a high cycle life and float life, suitable for energy storage markets such as renewables and UPS. Through this design, lithium ion batteries can act as a "drop-in" replacement for lead-acid batteries or be easily assembled into larger systems of any voltage and capacity.

www.lithiumwerks.com



MK Battery

MK Battery now distributes the Deka Solar Fahrenheit advanced AGM battery HT200ET which is specifically designed for energy storage in Grid Tied backup systems in high heat applications. Engineered for high power, their exclusive IPF Technology enhances energy capacity, cell consistency, and long-term reliability. The Deka Fahrenheit battery case is constructed of THT Plastic, specifically designed to resist heat and optimize compression, and the TempX Alloy helps inhibit corrosion under high temperature extremes. Epoxy-sealed posts eliminate leaks while the case and cover are heat sealed and 100% tested to prevent overall leakage. To further mitigate thermal buildup and cell dry-out, the Microcat Catalyst is utilized to lower float current and maximize the efficiency in high-heat applications.

www.mkbattery.com



Phocos Americas, Inc.

The Phocos CIS-MPPT Series of charge controllers offer a solution for off-grid applications such as telemetry, outdoor lighting, SCADA, and monitoring. This product was developed to ensure reliable battery protection under extreme weather/environmental conditions that often results in damaged electronics. The robust CIS-MPPT Series also has advanced lighting controls, programmable load timing, is IP68, and can offer 2 years of performance data (with accessory).

www.phocos.com



Repowertek, Inc.

PRIME Battery regenerators were developed using a high-frequency pulse technology and restoration algorithm, which creates micro-bubble featured de-sulfation effects by the real high-frequency pulsations. PRIME can restore inside cells by melting sulfate crystals on the plates and grids, and improve its capacity and life span almost like a new battery. Thus, PRIME provides high charging performance for used-batteries. PRIME battery regeneration technology provides battery life extension and cost savings.

www.repowertek.com







Rolls Battery Engineering

Designed to deliver longterm reliable energy storage in a heavy-duty, dual-container design, Rolls 5000 Series 6 volt models offer heavy-duty thick plate construction for extended cycle life and durability, convenient modular cell assembly for transportation and maintenance, and high Amp-Hour capacity options to suit small to large-scale renewable applications.

www.rollsbattery.com

We're chasing the sun.

Introducing our latest solution:
Sunflower™ Single-Axis Tracker

-  One Size Foundation Throughout the Array
-  No Special Tooling Required for Install
-  Over 100 MW Deployed
-  Terrain Following Capabilities



(513) 242-2051 | www.rbisolar.com | info@rbisolar.com



Sun Xtender Batteries

Sun Xtender provides renewable energy storage batteries for off-grid and grid-tied systems. Sun Xtender designs high-density plates specifically for renewable energy applications that reduce impedance and improve charge acceptance for high efficiency, reliability, and extended life. Sun Xtender manufactures sealed Deep Cycle Absorbent Glass Mat (AGM) batteries. They never require watering and pose no risk of spilling with minimal maintenance. Sun Xtender batteries are 100% recyclable and offer 2V, 6V, and 12V models.

www.sunxtender.com



Trimark Associates, Inc.

Trimark develops, installs, and maintains performance management systems for utility-scale power sites. These systems measure, control, and enable users to manage power production, energy storage, and utility interconnections. Trimark's integrated products – SCADA, revenue meters, MET stations, battery energy storage, and microgrid management systems – optimize site performance, resulting in increased revenue. Trimark's advanced control functions guarantee power characteristics at POI. Trimark provides CAISO NRI and NERC CIP consulting that results in regulatory compliance and secure operations.

www.trimarkassoc.com



Trojan Battery Company

Trillium, Trojan's Intelligent Lithium battery is designed and engineered in the USA and is available in 3 popular sizes that can be used in a variety of applications in solar. From its cell and battery design to its intelligent, built-in diagnostics, Trillium offers a range of advanced safety, environmental, and electronic features. With life expectancy over 5,000 cycles, Trillium will deliver outstanding return on investment over time. Trillium is designed as an easy replacement for existing lead acid batteries.

www.trojanbattery.com



U.S. Battery Manufacturing

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

www.usbattery.com



VRB Energy

VRB Energy's vanadium redox batteries (VRB) store energy in liquid electrolyte in a patented process based on the reduction and oxidation of ionic forms of the element vanadium. Based on a 250kW containerized module, VRB-ESS is typically 1MW / 4MWh up to 10MW / 80MWh in size installed at utility, commercial, and industrial sites, in support of solar or wind farms, or in isolated microgrids. Typical configurations use 4, 6, or 8 hours of storage depending on the amount of energy required. The battery is safe, reliable, and non-toxic. Components can be nearly 100% recycled at end-of-life, dramatically improving lifecycle economics and environmental benefits.

www.vrbenergy.com



OUR CUSTOMERS EXPECT A LOT.

THAT'S WHAT WE GIVE THEM.

Rolls
BATTERY ENGINEERING



THE LONGEST LASTING
BATTERY FOR YOUR
OFF-GRID HOME.
ROLLSBATTERY.COM

Components | Electrical Protection



ABB Installation Products

ABB Installation Products is a solar-power system component and connections supplier. Some of ABB's products that are available for the solar power industry include metal framing, current-limiting fuses, connectors, conduit and fitting systems, and UV-resistant cable ties. For example, the T&B Fittings Sand Cast Aluminum Form 7 Conduit Body is made of CoroStall aluminum alloy, which is a highly corrosion-resistant aluminum alloy. ABB also provides training for the correct installation and maintenance of their products.

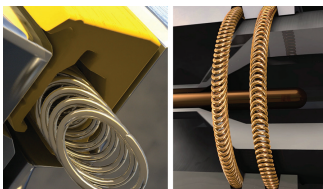
www.tnb.com



Allied Industrial Marketing, Inc.

Allied Industrial Marketing has over 30 years of experience specializing in power quality and helping clients diagnose problems through engineering analysis and computer simulation, and they provide recommendations on problem solving methods. For OEMs of power quality solutions, they offer power quality components; Mangoldt Filter Reactors, Line/Load Reactors, Current Limiting Reactors, Low and Medium Voltage Reactors, Frako Capacitors, Contactors, and Power Factor Corrections Controllers. Educational power quality seminars are also available.

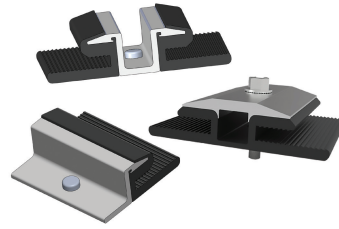
www.alliedindustrialmarketing.com



Bal Seal Engineering, Inc.

Bal Seal Engineering, Inc. works with OEMs and tier suppliers to design and produce sealing, connecting, conducting, and EMI shielding solutions that improve the performance and reliability of equipment used in wind, solar power, and other alternative energy production. Their solutions enable engineers to protect precision components, design more compact, efficient electrical connectors, and ensure consistent current/signal transmission.

www.balseal.com



Clark Rubber & Plastic

Clark Rubber & Plastic is a custom manufacturer of UL extruded and molded rubber and plastic components used in the solar industry. Clark Rubber & Plastic develops and manufactures custom rubber and plastic quality components such as clamp inserts, grommets, rub strips, and fastening applications.

www.clarkrandp.com



Day Ahead Instrumentation

Day Ahead Instrumentation (DAI) is a provider of custom protection relays and remote terminal units (RTU) for distributed generation system integration. DAI provides turnkey multi-function relays for utility interconnection requirements for C&I applications. Typical systems include solid state relays, test switches, mini-station batteries, and NEMA 1/3R/4 enclosures. Assemblies can be configured for DTT, MPLS, or SCADA interface with wired, fiber, or wireless communications. Auto-restoration for utility outages and real time monitoring and reporting of power generation is available. Lead times as low as 20 business days from receipt of basis of design and NTP.

www.day-ahead.com



Eaton

Eaton's globally certified Power Defense molded case circuit breakers embed protection, energy metering, intelligence, and connectivity in a foundational electrical system component to go beyond traditional circuit protection by providing deep power system visibility and predictive diagnostics. Real-time data-driven insights help improve reliability and save costs.

www.eaton.com/powerdefense