Mobile security trailer

Optimizing mobile solar power assets

Mobile solar systems are experiencing significant growth as industries increasingly adopt them for remote and distributed power needs. These systems, which include mobile skids, cabinets and trailers, offer flexibility and independence from the electrical grid, making them ideal for applications in energy infrastructure, telecommunications, sensor systems and video security.

Morningstar has been a leading wholesale supplier of high performance off-grid solar electronic components for over three decades. Now, alongside its value-added system partners, it is expanding its services to include design support and innovative integration solutions. This enables the company and its partners to offer tailored product design and optimization for their shared end customers, particularly in the market for mobile-powered system applications.

'We don't think of ourselves purely as a solar power systems supplier. We're present and highly visible in a variety of markets and industry associations, representing various industry verticals from security to the oil and gas industry,' says Brad Berwald, Director of Product Marketing at Morningstar.

'We find that when we reach out to and engage with these customers from a collaborative perspective, they're really motivated to work with us to realize new potential for their products.'

Industries across the globe are serving a variety of complex and distributed industrial customer needs. Industrial solar customers are putting new solar module and storage technologies to work, taking their systems where their customers need them, nearly anywhere and without a tether to the electrical grid.

Despite the diversity of these companies' uses and benefits to their markets, they all share some commonalities. These include managing the lifecycle of their assets, ensuring reliable system uptime and recognizing the importance of operational data in optimizing asset performance. These pillars are essential across industries for enhancing asset value and delivering consistent customer outcomes.

Capital purchases move aside to make room for leased assets

A significant shift is occurring in how companies acquire and utilize mobile solar power systems. Customers increasingly prefer leasing models over traditional capital purchases. This preference is driven by the desire for immediate system utilization without the burden of large upfront costs. Leasing allows companies to adopt a cost-effective, pay-as-you-go approach rather than owning and maintaining the asset directly. As Berwald observes, 'We're seeing a shift in the business model for many of these markets.'

This trend, initially prominent in the telecommunications sector where network operators sought to remove substantial capital assets from their balance sheets, is now expanding into other industries. Examples include the video security industry, road construction support equipment and portable hybrid generator systems offered by major equipment rental providers. The increasing reliability and predictability of these systems contribute significantly to the appeal of leasing.

The providers of these solutions also benefit from offering a consistent and well-engineered design to a broad market with well-defined performance parameters. While they can customize the mechanical, mounting and mobility features to suit their customers' preferences, the core power system's design adheres to constraints that ensure its suitability for the task.

Older off-grid systems that ran on lead acid storage typically lasted for about five years. However, as they aged, predicting when they would completely fail was difficult. Signs of decreased performance would begin to appear, but total failure often occurred

Brad Berwald

unexpectedly, leaving the owner or operator without a readily available solution and an immediate problem in the field.

With the advanced data and Battery Management Systems (BMS) capabilities of modern lithium storage, the battery's state of health and cycle count can be easily tracked. Based on consistent usage patterns and historical load trends, it's relatively straightforward to predict the battery's decline. This allows for proactive planning and remediation during scheduled downtime. This predictable ownership model offers consistent performance, lifespan and cost of ownership.

The secondary market for used equipment is growing, with customers finding new uses for batteries that no longer meet their original performance requirements. This trend, which began in the EV industry, involves repurposing batteries for less demanding applications where their range is less critical.

Initially, retrofitters and experimenters took advantage of these low cost batteries, but now the practice has become more professionalized, with companies using repurposed batteries in autonomous solar systems and backup power solutions to solve problems in secondary markets.

These batteries continue to offer significant value in stationary applications, where extended runtime is less critical than during their initial deployment. This extends their ROI, as they can either be resold to recoup part of the original cost after their peak performance period has passed or repurposed for less critical functions within the organization.

Technological convergence is creating market opportunities

The industrial IOT market is expected to experience substantial growth, with a projected CAGR of 23.2% from 2024 to 2030. Leveraging this growth is the combination of redeployable power packages paired with the connectivity enabled by expansive wireless connectivity. These developments have created new opportunities for companies that had not previously utilized solar power in their solutions.

Security trailer

The expansion of 5G has benefited both industrial customers and consumers through increased speed and bandwidth. A significant advantage of the new wireless spectrum has been the availability of lower bandwidth and lower power network technologies, including LTE-M and LoRa, which have repurposed the spectrum from older wireless generations. These systems, ideal for autonomous solar systems due to their minimal power draw, also offer increased signal strength for greater range in remote locations.

Satellite options have become more prevalent, affordable and easier to implement as secondary or primary connectivity options. Requiring only a clear view of the sky, they enable power system telemetry in even the most remote areas with limited cellular coverage.

Adapting to the ease of wireless access, Morningstar has enabled IP connectivity in the majority of its product line. Data is now a primary consideration in product selection, with the majority of large projects featuring a major telemetry component in their design.

Berwald explains that the company often facilitates the integration of various protocols, enabling customers to directly access site data within their cloud and IT back-end infrastructure. Depending on the industry and product, different methods can be employed, ranging from industrial automation control protocols to direct-to-cloud data streams, ensuring real-time reflection of system performance data.

'This integration not only allows customers to monitor their solar power fleet operations' health, but also enables them to incorporate energy costs into their business intelligence tools,' he suggests. 'By doing so, customers can effectively measure their return on investment and operational expenses.'

Morningstar works with a variety of close energy storage partners to streamline the integration of these battery systems with their products. This enables better charging management and longer life, as well as giving Morningstar's products direct access to the battery BMS data, which optimally informs a lot of the decisions made by the system in managing various energy sources.

Today's off-grid market now offers a wide range of storage solutions. Previously, lead acid systems were used in mobile applications, but their weight and configuration complexity for higher voltages was limiting. Lithium enabled systems, with their mounting flexibility, high power density and reduced weight can be easily shipped, towed and redeployed.

Adding sophisticated control with multiple power sources

Mobile sites often need to utilize the most cost-effective or available power sources based on their location. This prioritization can vary as they move between sites or are idle.

Berwald shares how the company has seen recent use of a system that could recharge from the grid when not in use, but utilize both solar power and a methanol-based fuel cell when deployed. 'In traffic applications, it's common for equipment to be stored centrally overnight, allowing them to use standby charging from the grid and be at 100% and ready for use in the morning. During the day, the systems would primarily use solar power, with the fuel cell covering any shortfalls to keep the load operating for weeks at a time. Configuring the system to automatically use the right energy source at the right time, without user intervention, is a common request.'

The outcome is a simple and straightforward operation, with the system controller autonomously making decisions to save costs and minimize fuel consumption.

'We've also deployed similar configurations and prioritization schemes in the telecommunications market, taking pure diesel genset sites that required continuous genset operation and converting them to cycling hybrid energy systems, reducing fuel consumption by over 67%,' Berwald reveals. 'The extended runtime has also reduced service and refueling costs due to the much lower operating hours on the generator.'

Thinking innovatively about the true customer use case will continue to help bring more of these industry segments into a remote power mindset. 'We're sharing our years of experience and helping customers to expand their market, while at the same equipping them with the energy data they need to continuously make solar a foundation of their portfolio,' concludes Berwald.

Morningstar remains committed to its mission of solving critical energy needs with experience and passion, collaborating closely with industry partners. It takes pride in the successes it has enabled globally, particularly in providing power, light and data connectivity to those most in need. Its core values of innovation and customer focus will continue to drive sustainability and industry achievement.

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