SPOC
GRID INVERTER
TECHNOLOGIES™

HOW BATTERIES SUPPORT THE ENGINE IN A HYBRID POWER SYSTEM

The battery is a crucial tool in the power-conversion-system toolbox because it provides a great deal of flexibility for how and when we use power. This becomes particularly pronounced in a hybrid power system, where we bring multiple components together. In order to maximize efficiency, we need the components to be the right size, and we want them each to be able to operate in ways and at times that optimize performance. Batteries, in particular, play an important role in enabling us to do that - particularly with respect to the engine.

Batteries enable the engine to do what the engine is good at, which is to run at a fairly constant RPM and at a load of about 80%. This is where the engine is most efficient and where maintenance costs are minimal relative to the amount of work being done.. The battery allows the engine to only have to operate when it is at that most efficient level, which is the most critical factor in making sure it burns less fuel and cuts emissions.

IT'S ALL ABOUT SIZING THE COMPONENTS OF THE SYSTEM APPROPRIATELY.

It's very common for people to over-size their generators or enginesin order to accommodate the worst case scenario. When this happens, several issues come up, and an inefficient cycle begins that might look something like this:

- An operator's load is normally 300 megawatts (MW).
- Very infrequently that load might go up to 700 MW.
- For those few times a year, the operator sizes their equipment for 700 MW.
- Since generators might notcome in that size, they choose a 1,000 MW generator, which is much higher than necessary.
- The generator only runs at a load of 30% for most of the year.
- This underloaded generator then wastes fuel and creates excess emissions.

With hybrid power systems, we can avoid the above.

HOW WE CAN AVOID THE INEFFICIENCY CYCLE WITH HYBRID POWER SYSTEMS

The operator in the scenario above can size the generator at 300 MW, which is appropriate for the typical load. During times of peak load, the batteries kick in to add the needed power to the system for that shorter period of time. They make sure the engine has all the power it needs to get the job done and allows it to run squarely in its optimal load curve where it's happy and where it can best do its job. The batteries are happy because they get to come in and help the system with stored energy it's been waiting to use.

This is why batteries play a big part in revolutionizing the way we approach electrification for increased energy resilience and reliability in many different industries. Innovation in this area will only become more important as the world moves processes powered by diesel and gas generators toward electrification for a more sustainable energy future.

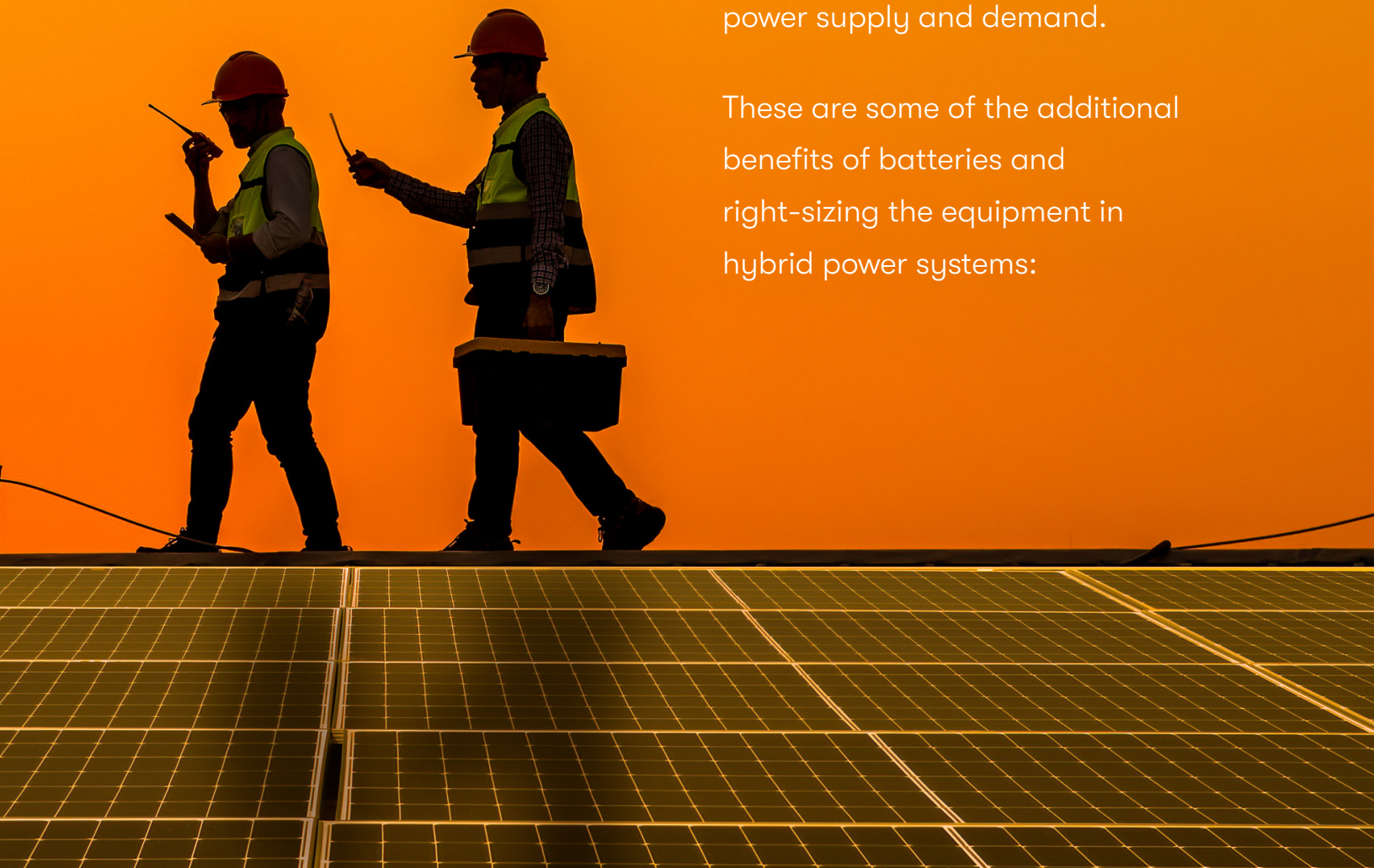
Battery storage also addresses some of the challenges associated with renewable energy sources, which can be intermittent. For example, solar and wind power generation experience fluctuations due to varying weather conditions.

With a battery, excess energy produced during ideal conditions is stored and used during periods of high demand or low generation. Batteries can bridge the gap during peak demand or when the primary energy source is unavailable.

BENEFITS ENABLED BY BATTERIES IN A HYBRID POWER SYSTEM

The world is changing as processes traditionally powered by diesel engines and gas generators are moving toward electrification through hybrid power systems with inverter technology that balances power supply and demand.

These are some of the additional benefits of batteries and right-sizing the equipment in hybrid power systems:



Increased Reliability

Batteries allow the engine to perform optimally and ensure a stable power supply during fluctuations in energy generation or sudden changes in demand.

Better Renewable Integration

Battery storage allows for better balancing of the intermittent generation and consumption patterns of renewables.

Better Renewable Integration

Battery storage allows for better balancing of the intermittent generation and consumption patterns of renewables.

Peak Shaving and Load Balancing

Batteries can be charged during low-demand periods and discharged during peak demand to reduce strain on the grid and lower overall energy costs.

Grid Independence and Resilience

With a battery, we can have complete or partial disconnection from the main grid, which enhances overall system resilience and reduces the risk of blackouts.

Environmental Benefits

By storing excess renewable energy and using it during peak demand, batteries enable the reduction of carbon emissions and they also lower the use of fossil fuels.

Backup Power

Batteries can provide backup power during grid failures, ensuring continuous electricity supply; this is a critical attribute for many applications, from data centers to live event productions.

Fast Response Time

Battery systems can respond quickly and provide power immediately, which enables compensation for sudden load fluctuations or supply disruptions.

Voltage and Frequency Stability

Battery systems help regulate voltage and frequency fluctuations.

Reduced Downtime and Rapid Recovery

Battery storage enables uninterrupted power supply, which helps minimize downtime and associated losses during disruptions or extreme weather events, such as storms, hurricanes or grid failures.

Increased Energy Density and Performance

Batteries now have higher energy density, allowing them to store more energy in a smaller footprint. They also offer higher charge and discharge rates, allowing for quick response to changing demand conditions.

Longer Lifespan

Significant improvements in battery lifespan mean that some technologies may last more than a decade. This can reduce operational costs and enhance economic viability.

Improved Safety and Reliability

Battery storage systems incorporate advanced safety features, such as thermal management systems and monitoring capabilities.

A hybrid power system, running in the optimal range with a happy engine that's being supported by a workhorse battery, will reduce major expenses related to fuel consumption and engine maintenance costs. Burning less fuel also means drastically reducing carbon emissions. The revolutionary change happening as we move toward electrification through hybrid power systems is allowing for improvements in reliability, resilience and sustainability.

The team at SPOC Grid Inverter Technologies works with customers in various industrial settings, such as maritime applications, on-site power and more. We take the complicated task of figuring out the complexities related to power conversion systems and help customers find the right solution based on our expertise, experience and technology.

SPOC
GRID INVERTER
TECHNOLOGIES™