



# HYBRID POWER SOLUTIONS

The Future of Portable Power

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## INTRODUCTION

Innovations in energy storage are revolutionizing portable power, making it more efficient and more sustainable. Leading the transformation are battery energy storage systems (BESS). A BESS paired with a mobile power generator forms a hybrid power solution that produces lower emissions or zero emissions and consumes significantly less fuel.

Flexible, cost effective and easy to adopt, hybrid power solutions are the wave of the future, helping companies shrink their carbon footprint and boost their bottom line. The technology is bringing increased sustainability to construction jobsites, industrial worksites, data centers, events and other settings where temporary or supplemental power is needed.

## WHAT IS A BATTERY ENERGY STORAGE SYSTEM?

A BESS is a battery system that stores energy from an energy source, whether it's the power grid, a solar array or a generator. It's comprised of high-density lithium batteries, inverters and load-sensing technology.

When a BESS is paired with a power generator, the generator recharges the batteries as it runs. In low load situations, such as at night, when the demand for power is reduced, the BESS shuts off the generator and carries the load on its own. When the batteries near depletion or the demand for energy increases again, the BESS instructs the generator to turn on.

In many cases, a BESS is a standalone unit that can connect with a generator or provide power on its own. The POWRBANK is one example. The model offered by United Rentals is rated for 40kW to 60kW of power output—enough to power a guard shack overnight—and provides between 60kW and 120kW hours of storage. Other products, such as the ANA Energy Boss, provide all-in-one continuous power, with the BESS, generator and control systems housed in one unit.

## BENEFITS OF HYBRID POWER

Pairing a generator with a BESS offers a multitude of advantages, especially for eco-conscious companies.

### Lower fuel consumption

Most generators are sized for the maximum load, which wastes fuel and drives up operating costs. When a BESS is integrated with a generator, the generator runs only when the load is high or the stored energy is nearly depleted. At all other times, power is provided by the BESS. The result: Fuel consumption is reduced by as much as 80%. Given the price of diesel, the potential cost savings are significant.

Another advantage: Leveraging a hybrid power solution may allow companies to use smaller generators and realize further cost reductions.

### Improved air quality

When the generator is off, the batteries supply emissions-free power. Switching to a hybrid power system can reduce emissions by up to 50% compared with using a traditional diesel generator. That's a win for the environment, for companies seeking to meet the sustainability requirements of project owners, and for the health and safety of workers and anyone living or working near the site.

### Reduced maintenance

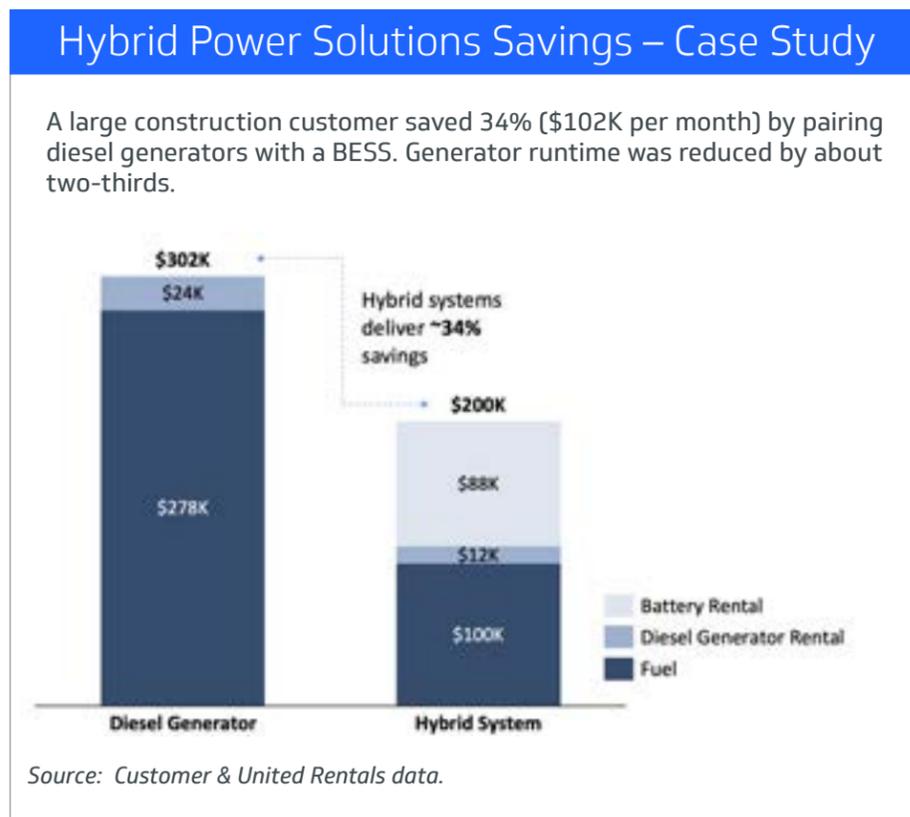
Hybrid power solutions are low maintenance. Battery systems require less maintenance than generators, and generators need less maintenance when runtime is reduced. Minimizing wear and tear on the generator translates not only to longer service intervals but also to lower consumption of oil and filters (in the case of fossil fuel-powered generators) and to a longer lifespan.



Reductions in maintenance requirements and fuel consumption add up to considerable cost savings. The ANA Energy Boss, for example, can cut operating and maintenance costs by 50% to 80%, depending on the site load and operating hours.

### Quieter worksites

Using batteries to power equipment can decrease noise levels by up to 90% compared to using a traditional generator. Quieter worksites aren't just more pleasant, they are also safer and more productive thanks to improved communication and reduced worker fatigue. In areas with noise ordinances, quieter operations can allow work to be done at the most efficient time for the project and without disturbing the neighbors.



## FROM LOWER EMISSIONS TO ZERO EMISSIONS

The wide availability and familiarity of diesel generators makes them a popular choice for temporary power, but not the most sustainable one. Diesel exhaust contains many

of the big names in air pollution, including particulate matter, nitric oxide (a contributor to smog and acid rain), hydrocarbons and carbon monoxide.

Pairing a diesel generator with a BESS curbs those harmful emissions thanks to reductions in generator runtime. Pairing a lower-emissions or zero-emissions generator with a BESS yields even greater emissions reductions. The generator types described below can be used with a BESS.

### Tier 4 Final diesel generators

Generators with Tier 4 Final engines emit considerably less particulate matter and nitrogen oxides than Tier 3 and Tier 2 diesel generators, which are no longer manufactured. They comply with strict EPA-mandated emissions standards for off-highway diesel engines made after 2015. In addition, they tend to use slightly less fuel than older diesel generators. Even Tier 4 Final generators produce significant emissions, but pairing them with a BESS makes them much more sustainable.

### Propane or natural gas generators

Propane (LPG) and natural gas generators, such as the JuiceBox mobile power units recently added to the United Rentals fleet, burn cleaner than Tier 4 Final diesel generators. When run on propane, the JuiceBox produces 17% lower greenhouse gas emissions, with an operating cost up to 40% less. It runs more quietly than a diesel generator and requires minimal oil and no fuel filters.

### Hydrogen fuel cell generators

Generators that run on hydrogen fuel cells are clean burning and emissions free. Their only byproducts are water and heat. A hydrogen fuel cell generator paired with a BESS forms a 100% emissions-free portable power solution capable of powering anything a diesel generator would power.



Currently, hydrogen fuel cell generators are considerably more expensive than diesel generators to purchase, rent and operate. That's likely to change as the technology becomes more widely adopted and the price of hydrogen fuel falls. Hydrogen is available in almost every major city now, and as the distribution network for hydrogen expands, the cost is likely to come down.

## LEVERAGING HYBRID POWER SOLUTIONS

Thanks in part to diesel engine emission regulations, the shift away from diesel generators as standalone portable power solutions has begun. The advent of battery energy storage systems brings new alternatives: Using batteries alone to power small loads and using hybrid solutions to power larger loads. The ability to leverage different options in different situations, including hydrogen or propane generators used with a BESS or on their own, helps businesses stay agile and responsive.

With so many portable power options available, choosing the best one for an application or worksite may seem challenging. The power and HVAC team at United Rentals has the knowledge and experience to guide customers to solutions that fit their needs and budget. Whether the answer is a BESS, a generator or a combination of the two, United Rentals is ready with the equipment and expertise to help customers create more sustainable, more productive worksites.



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