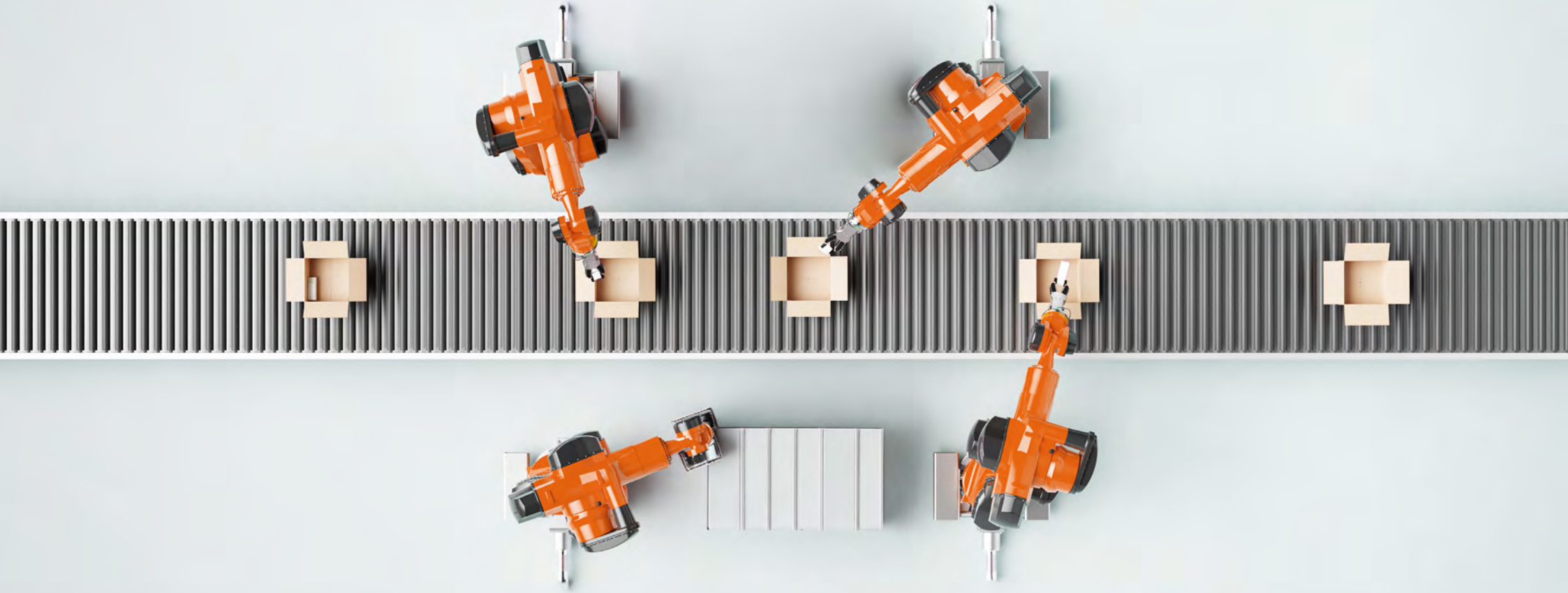
aggreko

Sharing the Load



How manufacturers can harness Battery Energy Storage Systems (BESS) for smarter energy management

Introduction

Unlocking the full potential of BESS

Resilience, efficiency and sustainability. These are the three energy issues today's manufacturers need to manage effectively to remain competitive. Yet securing more sustainable energy at an affordable price is challenging with price volatility and grid limitations across Europe.[1]

Battery energy storage systems (BESS) offer one route forward through this complex situation. When deployed correctly, these solutions can optimise energy consumption, lower the emissions of temporary power systems and make sites far more resilient to the types of shocks seen throughout the energy market over the past five years.

The technology is especially valuable during periods of high power demand. By storing electricity during off-peak hours when on-site energy usage is low and then discharging it during peak times, BESS can significantly reduce the higher costs utility providers charge when demand on the grid is highest.

This is one of many advantages for high-energy users. Yet for all their potential, BESS are still relatively new in today's production environments. Part of this is down to unfamiliarity. Business owners want to know their investment will deliver a return, but they also need guarantees the technology will work when called upon. Here is where a hired model is especially useful, giving manufacturers a risk-free way to integrate and trial the technology without the risks associated with an outright purchase.

We recognise that manufacturing is an industry that relies on certainty. Uninterrupted production is a necessity for maximising efficiency and protecting profit margins. These conditions are tested when introducing new technology, inevitably introducing some degree of risk. This guide has been produced in response to those concerns.

Inside, we explain how – and where – BESS are best applied within manufacturing environments, particularly when seeking to improve efficiency and decarbonise temporary power systems. Armed with this knowledge, your site will be able to unlock the full potential of this promising new technology without the threat of downtime or delays.

1. https://www.ft.com/content/637781d0-1168-4329-b9d5-7d985621e8a1

What BESS offer your site(s)

Battery systems are developing rapidly, which is enabling the technology to support critical functions in today's manufacturing sites. But what are the key benefits at a glance?

Flexibility

With the help of BESS, manufacturers can adapt energy usage dynamically. This allows manufacturers to optimise their energy consumption based on real-time data, market prices and production schedules.

Agility

As grid policies, legislation and energy markets evolve, manufacturers with energy storage systems are better positioned to adapt to changing requirements.

Sustainability

BESS can decarbonise temporary power systems by minimising fuel use and enhancing efficiency through dynamic load management, minimising generator run times and enabling the use of low emission stage V generators. They are also an enabler of renewable generation, allowing a business to store renewable energy created by solar or wind energy.

Applications

How Aggreko is integrating BESS within manufacturing

BESS are an evolving technology with great potential for manufacturing – both as a standalone technology or when integrated as part of a hybrid solution. In this section, we'll look at the areas where Aggreko can integrate BESS as well as expected outcomes when used in a typical manufacturing facility.

1. Efficient load management
2. Providing back-up power
3. Scheduling power and minimising generator runtime
4. Overcoming grid challenges
5. Decarbonising operations

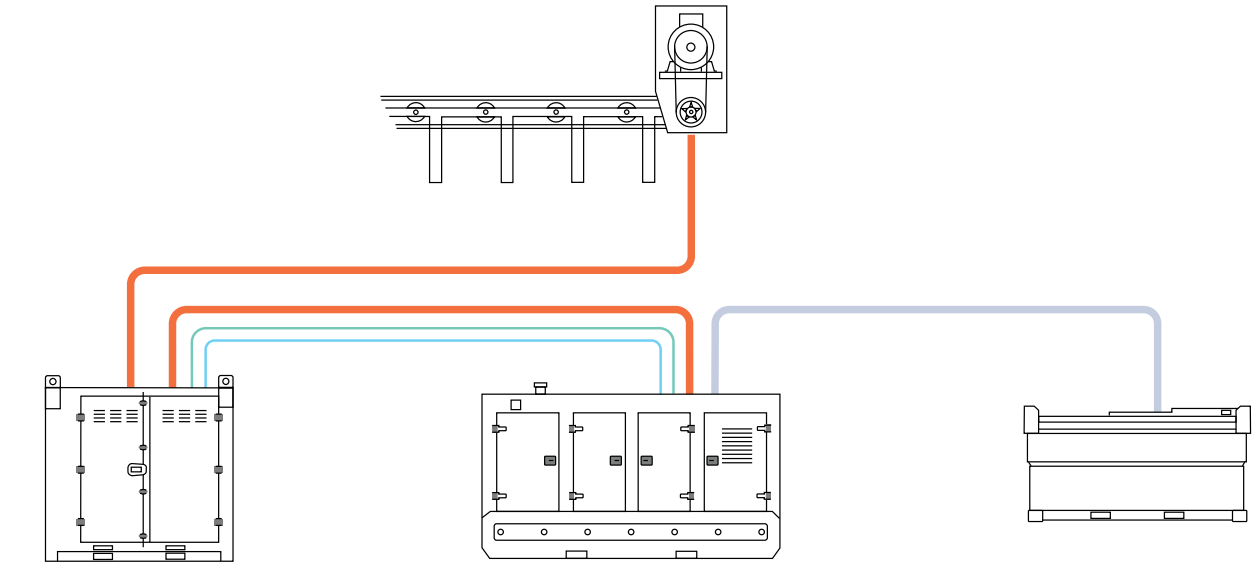
1. Efficient load management

Ensuring optimal equipment sizing

Significant electrical load spikes often occur during the start-up of power-intensive industrial machinery. These can be especially problematic when dealing with a limited power supply. BESS can help overcome these issues by providing additional power when needed and recharging when demand is low.

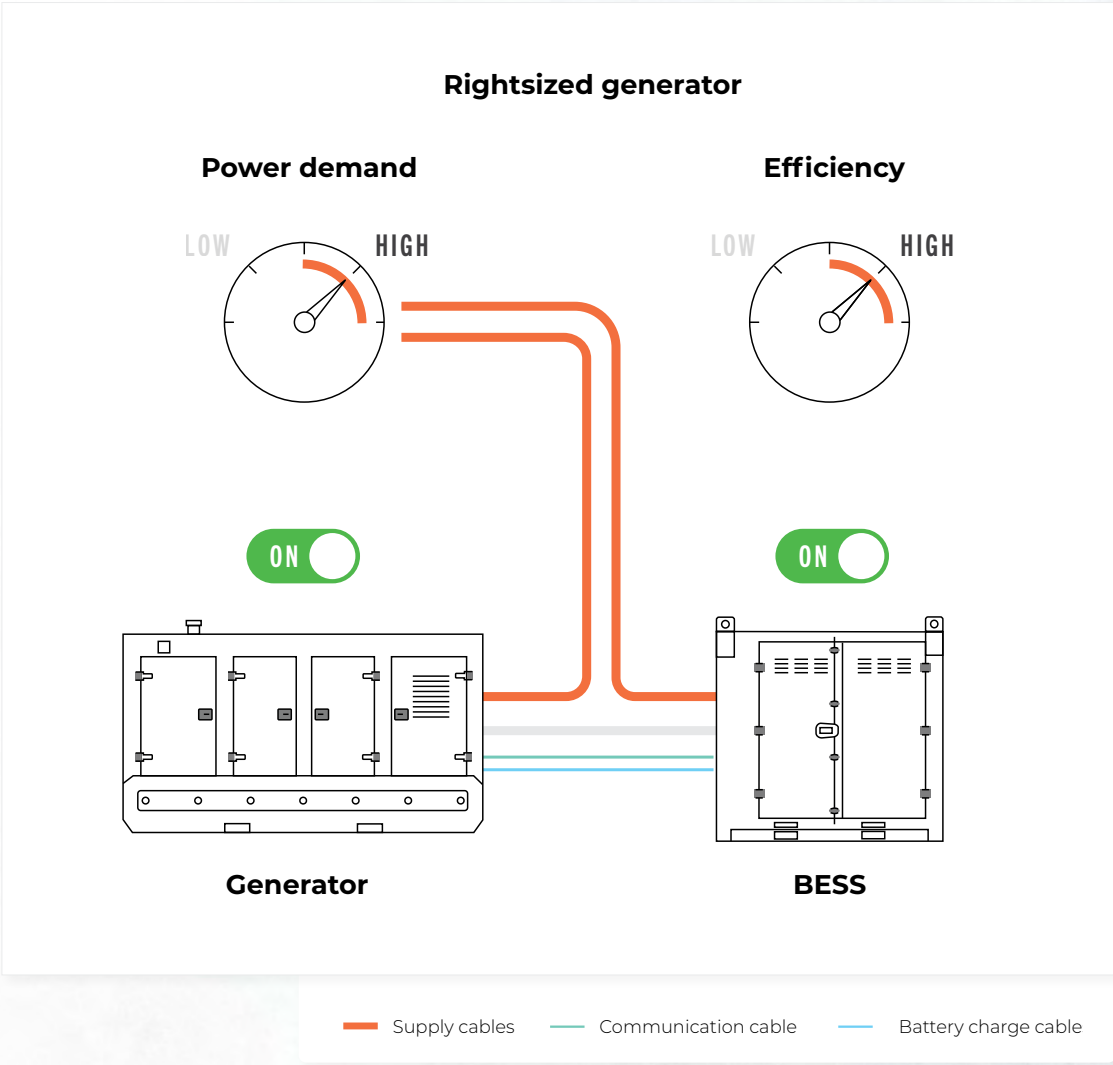
BESS also has significant benefits when used as part of a hybrid setup. Generators are often oversized for their application, as they are typically sized according to the maximum power demand. However, if the base load is much lower, the generator will be running inefficiently, leading to increased fuel use and emissions.

BESS can support the high inrush current, enabling the generator to be sized according to the base load. This optimises equipment performance and minimises fuel expenditure.



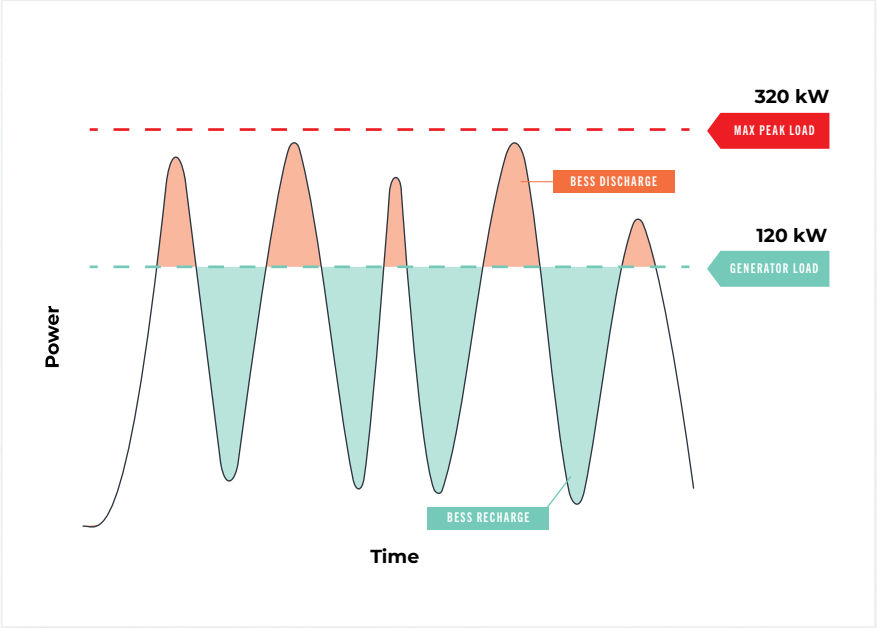
Supporting generator efficiency

Generators are usually only capable of 50-60% load steps. This can limit their ability to meet high-capacity power demands quickly. BESS can instantly supply high-capacity power to cover this gap, allowing the generator to run at its optimal load levels and improving overall system efficiency.



Preventing low-load inefficiencies

Running generators at low loads for prolonged periods can be inefficient and may damage equipment over time. This is particularly critical when running Stage V generators, which need to consistently run at loads over 30%. BESS help absorb excess power during low-demand periods, ensuring the generator operates at its ideal efficiency point, which also extends the equipment's lifespan.



Managing motor starts

The start-up current of some motor start machinery is significantly greater than its steady-state operating current. This surge can cause voltage dips, overload protection tripping and, in the worst cases, damage the motor or other connected equipment. BESS can alleviate these challenges by supporting the initial surge of power required, smoothing out the demand on the primary power source and allowing generators to operate more efficiently.

Project spotlight

Aggreko integrated a hybrid cooling and battery solution for a wine producer in France. By implementing a 360 kW air-cooled chiller, powered by a hybrid system comprising a 300 kVA battery and a downsized 200 kVA generator, Aggreko was able to minimise the customer's generator runtime, fuel consumption, operating costs and emissions.

In total, the project **saved more than 2,600 litres of fuel**, equating to a 40% reduction in associated CO_2 emissions.

2. Providing back-up power

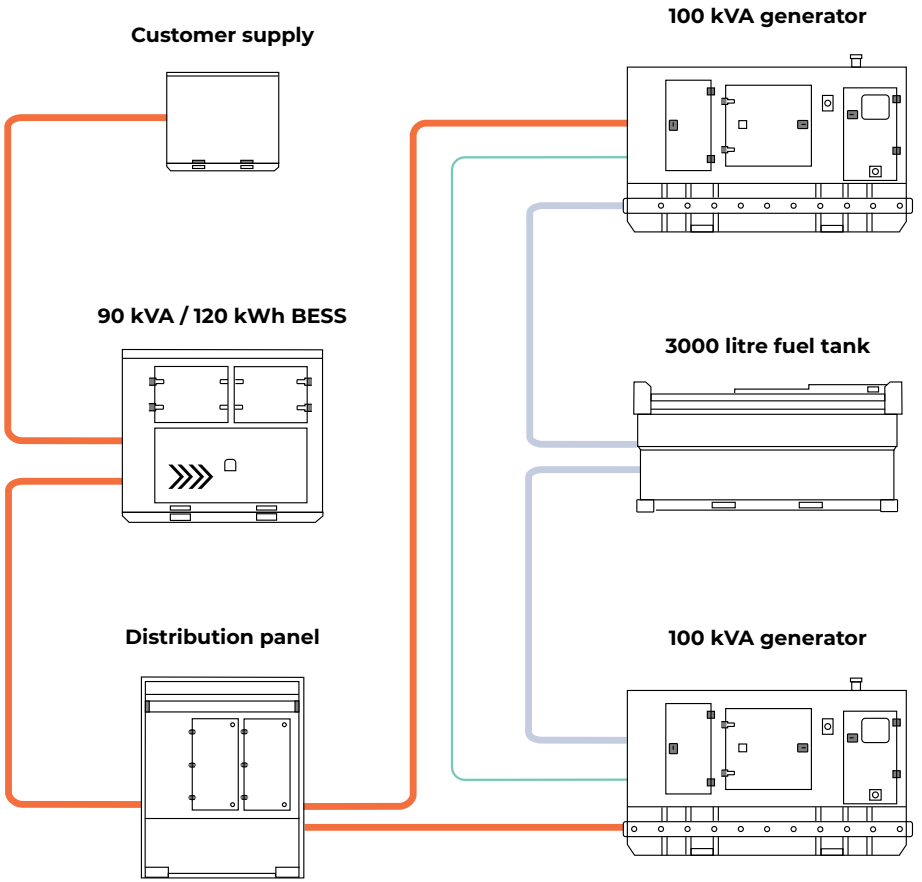
Adding resilience

Manufacturing processes are often sensitive to power disruptions. In certain circumstances BESS can supply resilience to power systems, providing reassurance and production continuity when the unexpected hits.

BESS are especially useful in this respect as they provide fast power delivery for critical loads while diesel or gas generators come online. In this sense, they can work as an important 'stop gap' between the grid and other back-up systems. Aggreko supplied a similar solution for a pharmaceutical company in Italy, providing a reliable 90 kVA battery to cover blackouts after one of its UPS failed to initiate. While BESS are not a UPS (uninterruptible power supply) – and cannot be considered a direct replacement for UPS – this work nevertheless demonstrates the value and versatility of the technology within manufacturing environments.

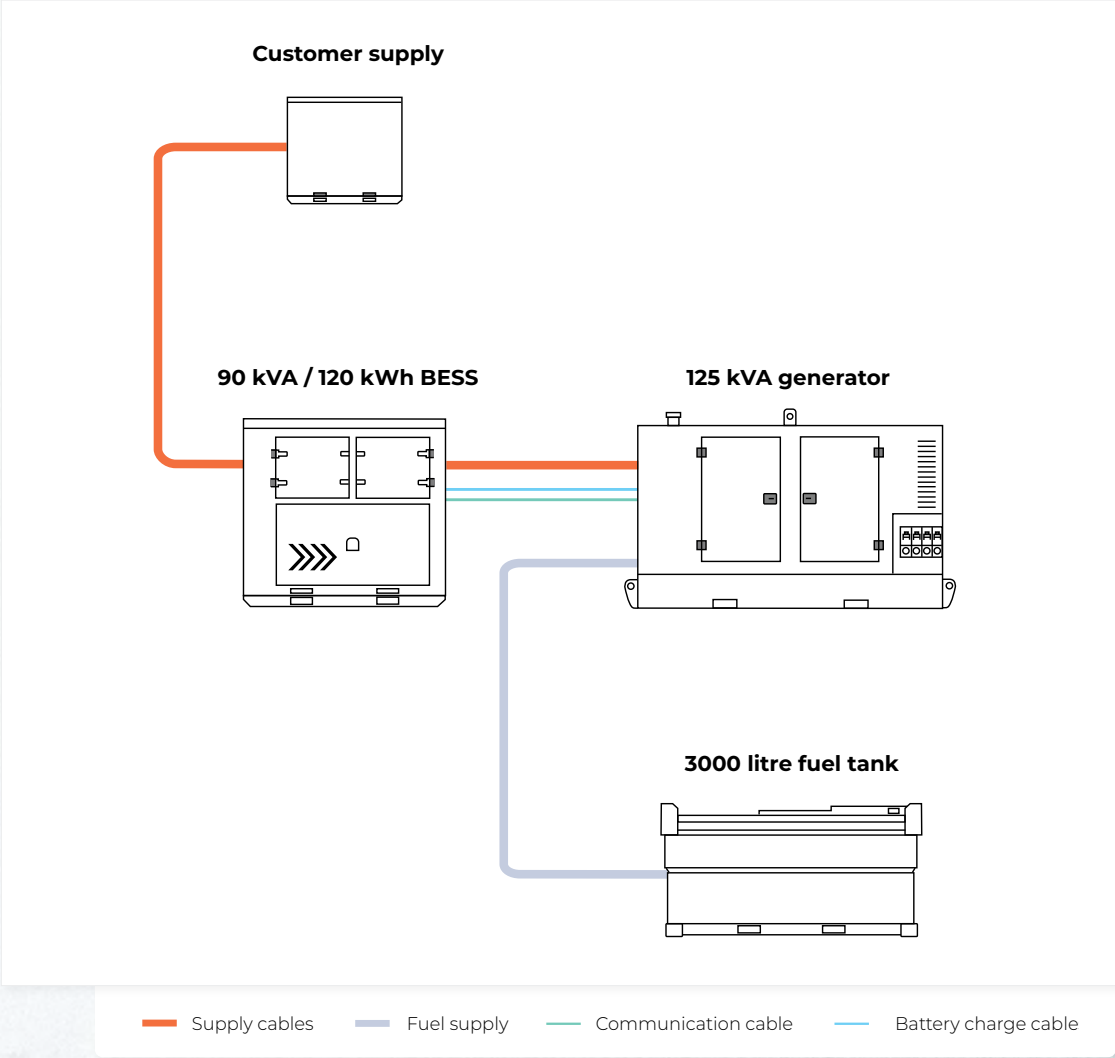
BESS give vital support not only during emergencies but also for planned maintenance and shutdowns. They are ideally suited for powering tools, equipment and safety lighting in situations with restricted power access.

Find out more



3. Scheduling power and minimising generator runtime

BESS accommodate low loads by providing power to essential equipment without the need to operate the generator continuously. The generator is only activated when the state of charge (SOC) of the BESS is low, thereby reducing fuel consumption and emissions. Timers can be configured to enable the BESS to operate during designated timeframes, which is especially advantageous in scenarios where minimal noise or emissions are essential.



4. Overcoming grid challenges

High-energy users suffer when the grid is unable to provide sufficient power or when there is a limited mains power connection on site. BESS offer a useful 'bridging gap' solution when there are capacity issues. Grid constraints are increasingly common across Europe, with major investment needed to meet growing demand from both businesses and consumers.[2]

The technology can be deployed in three key ways:

1. When there is grid congestion

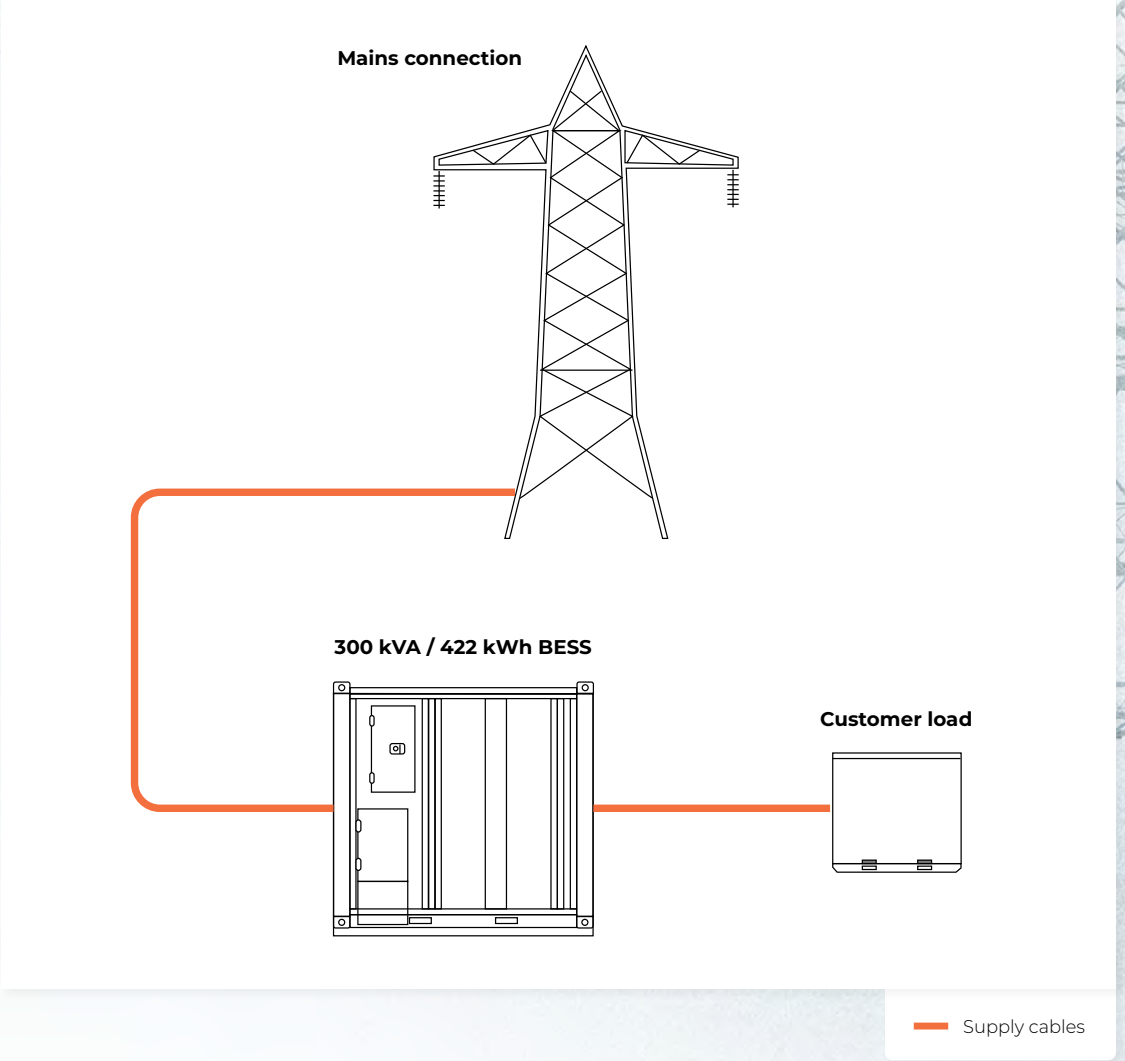
When capacity is pushed to the limits and there is congestion on the grid, BESS can absorb excess power when supply exceeds demand and inject power when supply falls short.

2. When grid reinforcement is necessary

With increasing fluctuations on the grid, BESS can help to stabilise the network and enables the integration of renewable energy sources.

3. When the grid is limited

BESS helps provide virtual capacity when available power is limited.



2. https://www.rechargenews.com/energy-transition/europe-faces-a-600bn-power-grids-challenge-by-2030-heres-how-we-can-meet-it/2-1-1640726?zephr_sso_ott=X5ywzh

5. Decarbonising operations

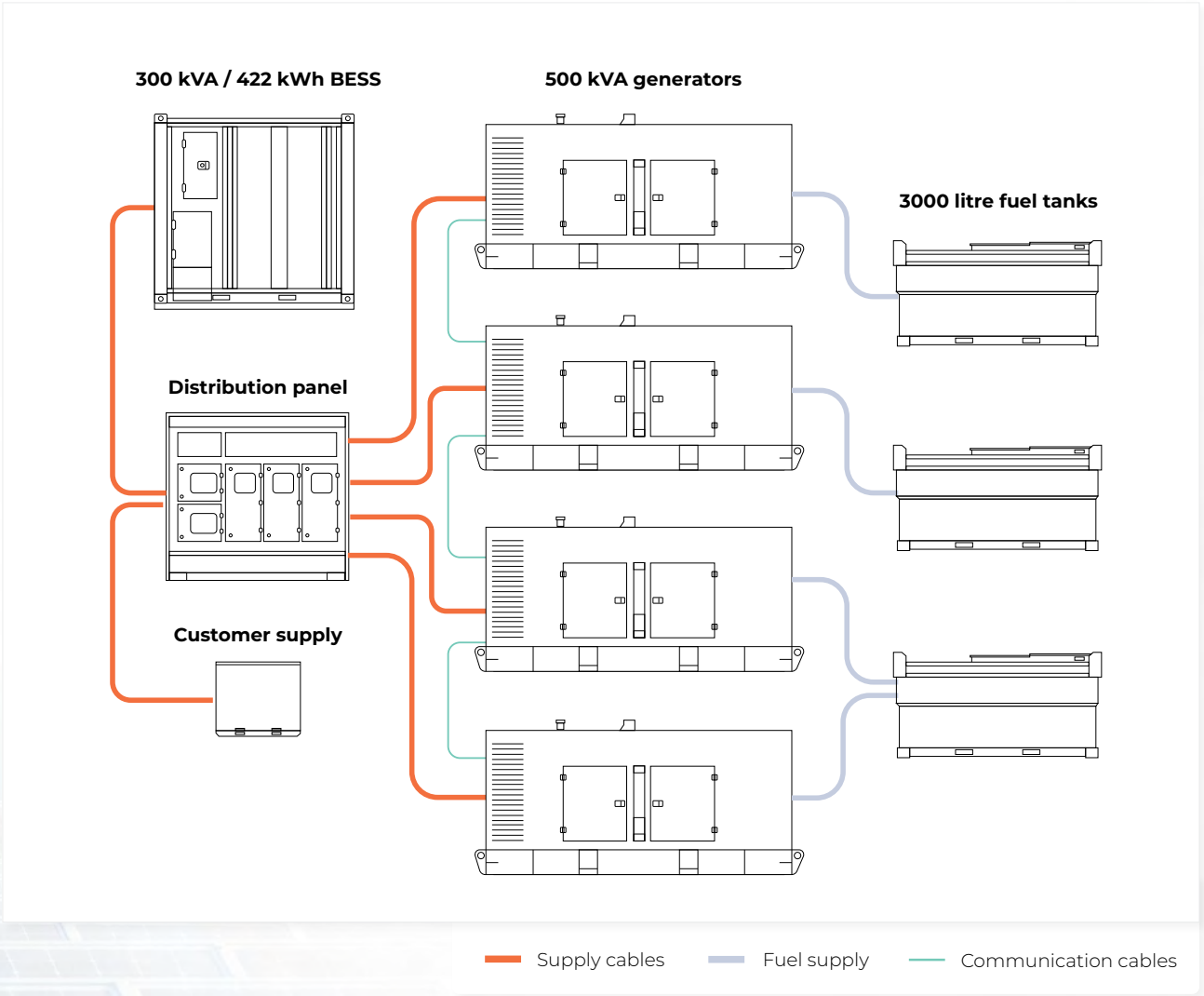
Decentralised energy

Decentralised energy can empower manufacturers to decarbonise by providing cleaner, more efficient, and resilient energy solutions tailored to their operational needs.

Some manufacturers are opting for decentralised microgrids. Through dynamic load management BESS can form a critical part of these microgrids, enhancing their efficiency, reliability, and sustainability.

Integrating renewables

BESS enable the integration of renewable energy sources by storing excess energy produced during peak generation times and releasing it when renewable output is low or demand is high, ensuring a steady and reliable power supply.

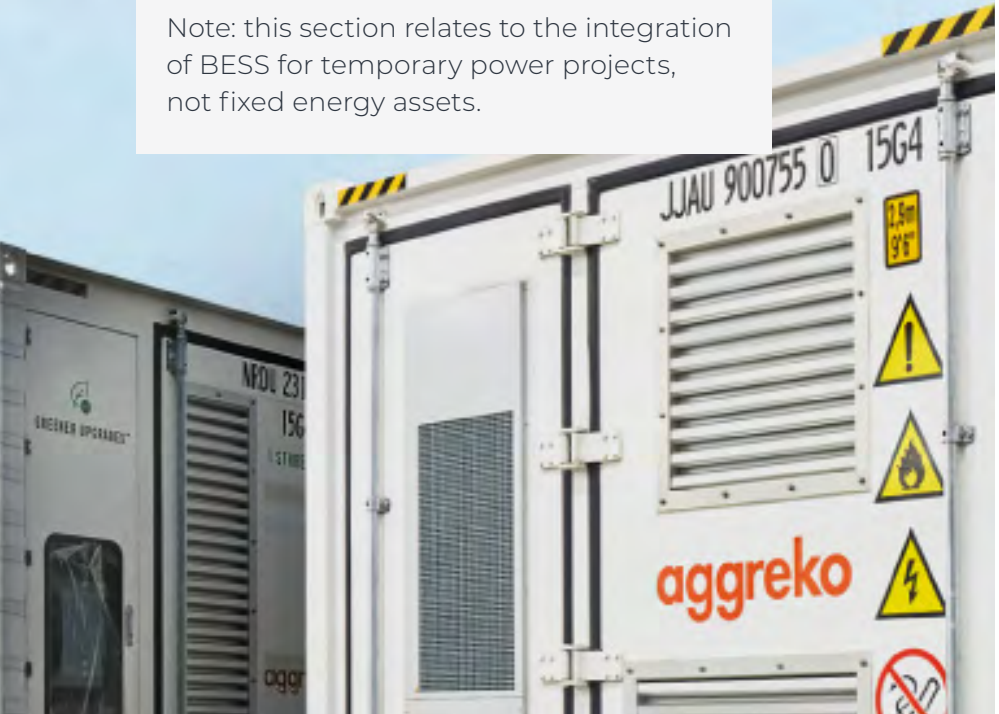


Misconceptions

Dispelling BESS myths

Making the most of BESS means understanding how, when and where they are used most effectively. This brief explainer section answers the most common questions and misconceptions around the technology.

Note: this section relates to the integration of BESS for temporary power projects, not fixed energy assets.



MYTH

BESS can fully replace diesel/ gas generators in all temporary power scenarios.

REALITY

BESS can significantly reduce reliance on traditional generators but cannot completely replace them in all circumstances. Still, BESS are very effective when used alongside generators, reducing the amount of fuel required and increasing efficiency in most instances.

MYTH

BESS are only for long-term applications or static systems.

REALITY

BESS work well in long-term installations and are also highly effective in temporary power setups, providing flexibility for shorter-term needs, such as periods of increased demand or additional site capacity.

MYTH

BESS are only suitable for certain industries.

REALITY

BESS have proved effective in events and construction projects. However, there are many more sectors and applications where they can make a difference:

Manufacturing
Motor starts, Temporary chillers, Limited mains supplies, Bridging power and Power during shutdowns/maintenance

Building Services and Construction
Motor starts, Tower cranes, Welfare cabins, Warehousing and EV charging

Utilities
Outages, Back-up power and Pumping stations

Shipping
Shore supply, Onshore cranes and Heavy-vehicle charging

Data Centres
Construction / commissioning power and Back-up power

MYTH

BESS provide an unlimited power supply.

REALITY

BESS cannot supply power indefinitely; the capacity of a solution is determined by the size and design of the battery system. Once the stored energy is depleted, it needs to be recharged. This requires either connection to a power source or integration with a generator.

MYTH

BESS are complex to integrate into a project.

REALITY

Integrating this technology is significantly easier with the support of an expert partner like Aggreko. We carry out a thorough assessment of the project to find the right BESS or hybrid solution. Aggreko also uses sophisticated controls and advanced software to monitor and optimise both asset and system performance over time. This also enables proactive diagnostics, enhancing the reliability of the system.

MYTH

BESS require no maintenance.

REALITY

BESS do require some maintenance, so choosing the right supplier is key. You'll want a partner that can get the most out of your investment, providing ongoing diagnostic analysis of its performance and suggestions for improving processes.

MYTH

BESS are only suitable when integrating renewables.

REALITY

BESS can work with various sources, including renewables and thermal assets. This makes them compatible with many types of temporary power projects.

Where BESS work well

Tackling network constraints	Creating virtual capacity and overcoming limited grid connections
Emissions and noise reduction	To meet sustainability targets or when located near urban areas
Load management	Effectively managing fluctuating load profiles and improving the efficiency of generators
Power security	Providing back-up power, voltage and frequency regulation and power factor correction

Testing

Pushing the boundaries of BESS

We test BESS at our own facilities to uncover their full potential and discover new ways they can be used.

A test case:

Powering chillers with BESS when there is a restricted mains connection

This test explored the effectiveness of using a battery energy storage system with a limited mains supply to power larger electrical loads such as a chiller setup. The integration of generators and the BESS alongside the mains supply, often requires a complex application process to the Distribution Network Operator (DNO) for a G99 connection. This test aimed to come up with a solution and setup that mitigated this challenge.

The setup involved routing the mains supply through an Automatic Mains Failure (AMF) board to the BESS, allowing power to flow through the BESS, enabling it to perform peak shaving by supplying the extra power needed when the mains power was inadequate. When the BESS charge dropped to 30%, a generator started, prioritising its power output with a rapid 30-millisecond changeover. Once the BESS was fully charged, the generator stopped, and the system reverted to mains power.

Equipment and testing

The test utilised a **300 kVA / 422 kWh BESS**, two **250 kW heat pump chillers** (one in heating mode at 20°C, one in cooling at 0°C), two **generators** (one acting as a mains supply) and various distribution equipment and ancillaries.

Both chillers ran at full capacity, demonstrating the system's ability to handle a maximum 130 kW load.

Applications

The test proved the system is ideal for:

- **Limited mains supply scenarios:** Ideal for situations where the mains supply is constrained, and reliance on a generator alone is not preferable. The BESS performs peak shaving, with the generator kicking in to power the load and recharge the BESS when needed, then switching back to mains.
- **Resilient power supply applications:** Provides uninterrupted power by using the BESS during mains failures and simultaneously starting the generator, seamlessly transitioning back to mains when restored.

Conclusion

The test successfully demonstrated that BESS technology can significantly enhance power resilience and efficiency, especially when powering larger electrical loads in situations where power constraints are an issue.

Conclusion

Allowing your site to share the load

Driven by increasing energy demands, fluctuating electricity prices and sustainability targets, manufacturers need smarter ways to manage their power requirements. This is where BESS are emerging as important resources for the sector, giving high-energy users a much greater degree of flexibility in what are arguably the most challenging trading conditions for decades.

The technology can be integrated as part of a hybrid solution, working alongside traditional generation or deployed as a standalone option for shutdowns, planned maintenance windows and short-term emergency response. This is helping to move manufacturing away from sole reliance on diesel generators or grid power to a position that is far more dynamic, efficient and sustainable. However, the technology is still developing, making outright purchases a risk for businesses with budgets, schedules and customers to consider. We recognise market volatility makes it harder to trial new or unfamiliar energy solutions, simply because guarantees are what count most in the current climate.

Aggreko's model is cutting through this challenge. We eliminate the need for capex, allowing investment to flow to other areas of your business. Our hired energy solutions are also suited to the seasonal changes often seen in manufacturing, allowing sites to scale capacity when it's required.

Combining our expertise with your in-depth knowledge of your site, we can share the load and help BESS realise their full potential in manufacturing.

aggreko

For more information

03458 247 365

aggreko.com