



Connected
Energy

Connected Thought

Rethinking power in manufacturing

The role of energy storage in
driving efficiency, sustainability
and supporting growth

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Integrating cutting-edge energy storage technologies with operational growth can revolutionise energy management in the manufacturing industry, enhancing sustainability and efficiency.

Energy is the lifeblood of the manufacturing industry, powering machinery, processes, and facilities around the clock.

However, as global energy demands increase and sustainability goals become more pressing, manufacturers are grappling with the realities of energy consumption in a rapidly changing world. Challenges such as rising costs, capacity constraints, and environmental pressures are forcing the manufacturing industry to rethink how they approach energy use.

Battery energy storage could be the key to unlocking greater and greener energy resilience. Systems can be used to store and provide power as and when it's needed.

This helps to balance the grid on a local level, maximising energy generated from renewable sources – and most importantly for manufacturing – it can deliver the additional power needed to manage periods of high energy demand.

This guide dives into the key challenges the manufacturing industry faces with energy. It outlines the role that energy storage systems can play in supporting power demands of the industry as well as showcasing how systems can play an integral role as part of an overall energy management strategy.

A photograph of a male worker in a grey long-sleeved shirt and safety glasses, operating a large industrial machine in a factory setting. The machine has a monitor and various components. The background shows the industrial structure of the factory with metal beams and overhead lights.

In this guide, we highlight how battery energy storage systems can help manufacturers to balance their need for power against their sustainability targets.

Solving the energy equation involves rethinking not just how energy is sourced but also how it's stored, distributed, and used across manufacturing operations.

The two main challenges:



Capacity constraints and growth

Manufacturers must increase their energy capacity to accommodate growing operations. However, traditional solutions - such as expanding grid connections or investing in on-site fossil fuel generation - are becoming less viable in a rapidly approaching electrification world. Businesses must look for innovative ways to meet their energy needs sustainably.



The sustainability imperative

Public and private sectors alike are championing net-zero energy consumption goals. For manufacturers, this means investing in renewable energy sources and improving energy efficiency in order to meet Scope 3 targets required by their customers. However, achieving these targets requires balancing immediate cost considerations with long-term environmental and operational benefits.



The challenges of diesel generators



For decades, diesel generators have been the go-to solution to overcome power constraints in the manufacturing sector.

They have historically provided a safety net to ensure factories can stay running against increasing energy demand.

But as industries evolve and environmental awareness rises, the drawbacks of diesel - emissions, noise, rising fuel costs, and maintenance - have pushed manufacturers to seek smarter, greener alternatives.

While diesel generators have been a stalwart force in manufacturing, their continued use carries significant drawbacks that cannot be ignored:

1. Environmental Impact

Diesel generators are notorious for their high carbon emissions. According to the European Environment Agency, diesel-powered machines produce up to 20 times more nitrogen oxides and particulate matter than other power technologies. For industries looking to reduce their carbon footprint, diesel becomes a growing liability.

2. Operating Costs

Although initial costs may appear low, diesel systems come with a hidden price tag. Diesel fuel prices

are becoming increasingly volatile, and maintaining compliance with stricter emission standards drives up routine maintenance costs.

3. Regulatory Pressure

Governments worldwide are implementing tighter restrictions on fossil fuel use as part of their net-zero commitments. Both the UK and EU, for instance, have announced plans to reduce industrial carbon emissions significantly by 2030. These shifts in policy are making it harder for manufacturers to rely on diesel solutions as a long-term strategy.

4. Limited innovation

While renewable energy and energy storage technologies are advancing rapidly, diesel generator technology has reached a plateau. This leaves manufacturers with less room to adopt innovations that could increase efficiency or adaptability.

Replacing diesel generators with energy storage systems can provide a response to environmental pressures whilst providing a valuable tool for operational efficiency.

Battery energy storage systems are emerging as a revolutionary alternative to energy management in the manufacturing industry.

Energy storage allows manufacturers to store energy - from renewable sources like solar or wind or directly from the grid - so that it can be used when it's needed most. This enables manufacturers to balance fluctuations in demand and supply, helping to achieve a consistent energy supply.

Connected Energy's E-STOR system is designed specifically for commercial applications. Modular in design, our technology integrates with all energy assets onsite, helping to reduce the reliance on fossil fuels, reducing carbon emissions and maximising renewables.



Driving the transition to net-zero

E-STOR 300kW / 360kWh

Power: 300kW

Capacity: 360kWh

20ft container

Using 24 second life Renault EV batteries

Easy battery replacement

Straightforward to install

Easy to manage

Backed by our software and reporting dashboard

Our world-leading technology, designed and developed in the UK, is powering pioneering businesses across the UK and Europe.



Key benefits of battery energy storage



Overcoming capacity caps

To ensure the fair distribution of electricity, energy providers impose Agreed Supply Capacities (ASC) on businesses. These capacity limits can make scaling up operations difficult, as even minor upgrades to equipment can push energy consumption beyond agreed thresholds. Energy storage enables manufacturers to avoid breaching their ASC limits by providing the buffer during peak loads.

Building resilience

Grid instability is an increasing issue in many manufacturing-intensive regions due to ageing infrastructure and the surging demand for electricity as industries scale up. Energy storage provides businesses with much needed back-up power, allowing operations to run smoothly regardless of what's happening with the external grid.

Cost savings

Energy storage allows manufacturers to manage their energy consumption more strategically. Systems can be programmed to benefit from charging during off-peak tariffs and they can also cut down on fees associated with grid demand spikes.

Scaling up without barriers

Energy limitations often discourage manufacturers from scaling operations or investing in new machinery. Energy storage offers easy access to scalable energy that grows alongside your business. The modularity of battery energy storage provides support to upscale operations without breaching capacity limits or facing prohibitive grid upgrade costs.

Accelerating sustainability goals

Energy storage not only improves efficiency but also aligns with green initiatives by helping manufacturers reduce their carbon footprint. If a site is investing in solar PV, for example, energy storage plays a critical role in enabling a site to maximise its generation.

Second life: carbon reduction from the outset

Connected Energy's second-life battery systems are an example of sustainability in action. By extending the life of EV batteries through repurposing critical minerals and resources, these systems actively support the circular economy and help reduce waste. Meaning that businesses are reducing carbon from the outset.

#1 Overcoming grid constraints

By introducing battery storage now, sites can ensure that their energy supply is **more reliable, resilient, sustainable** and built for the future.

As the way businesses use and consume energy changes, the UK's electricity network is struggling to keep up. This lack of available power is cited as one of the biggest barriers to electrification and business growth.

Adding additional connection capacity not only places stress on local energy networks but also requires significant expenditure and long lead-in times to implement.

Manufacturing has traditionally mitigated this problem with the use of diesel generators however, whilst providing a reliable back-up power, their use has a negative environmental impact. Battery energy storage systems can provide an environmentally friendly alternative to overcoming capacity constraints on site.

#2 Managing peak load spikes

Battery energy storage offers a **dynamic solution to mitigate peak energy demand spikes** and smooth out fluctuations.



Manufacturing operations inevitably experience large fluctuations in energy demand throughout the day, with periods of intense activity with concentrated bursts of energy demand.

Effectively managing these spikes is critical for business operations. Energy storage can help better manage fluctuations and contribute to a more resilient energy management strategy. Instantaneous response times mean energy storage can handle sharp power spikes with ease. They can perform peak shaving by storing energy during periods of low demand and supplying that power during times of high demand.

This helps to smooth out spikes ensuring that facilities don't breach the Agreed Supply Capacities (ASC) set by the DNO whilst also limiting the need for additional capacity to manage those loads.

#3 Enabling renewable energy integration

By storing excess renewable energy for later use, manufacturers can maximise self-consumption, gaining greater energy independence and efficiency.



Investment in renewable energy generation such as solar and wind is increasing in the manufacturing industry. This has the dual benefit of supporting decarbonisation measures as well as helping to achieve some level of energy independence and reliance.

However, for renewable energy to work at its best, it is necessary to balance the intermittent of generation. To maximise its value, energy storage is a key component to complement on-site generation.

When linked with energy storage, energy from renewables can be stored throughout the day to use at times of higher demand meaning that clean energy can be maximised and used much more efficiently. With many manufacturers operating 24/7, battery energy storage can also ensure that cleaner energy can be utilised throughout the evening when solar is no longer providing power.

#4 Supporting electrification

Battery energy storage can provide a consistent power supply, ensuring a **reliable and efficient** transition to electrification.

The transition to electric heating, electric vehicles, and electrified processes is a vital element of any energy efficiency and decarbonisation strategy. But in order to electrify operations, a dependable energy infrastructure is required.

Electrification will significantly increase power demands and the adoption of smart energy management systems and energy storage is key in addressing this.

Energy storage can help facilitate electrification by integrating with the energy assets on site, helping to smooth demand.





Carbon savings

On average,
each year,
1MW of
battery energy
storage:

can store

**300MWH
energy**

saving

**62 tonnes^{*}
of CO₂**

the equivalent CO₂
generated by:

**397 hours
of diesel
generator
use^{*}**

*when energy stored is from renewable sources compared to grid supplied power.

*based on a 300KVA diesel generator at 100% load

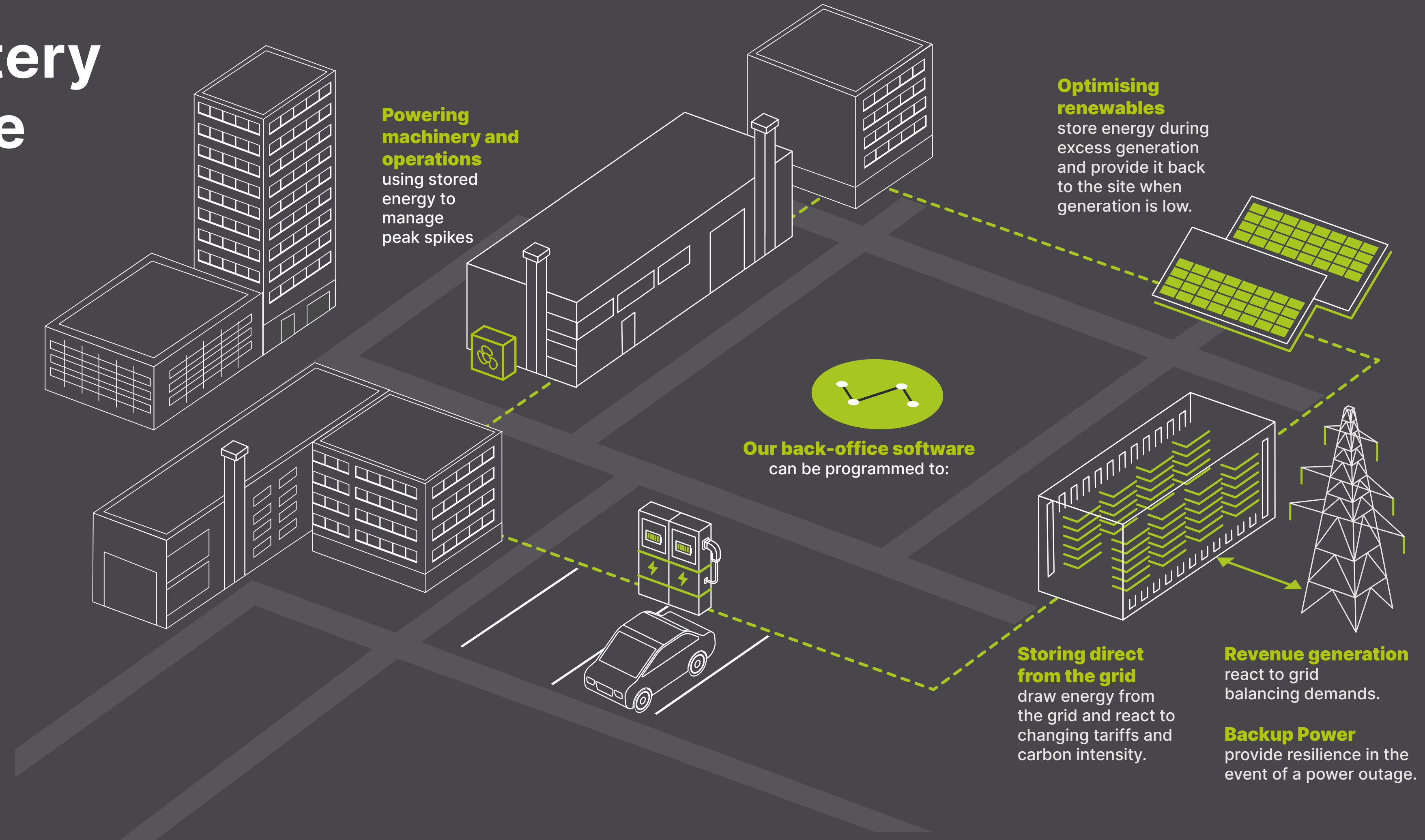


How does a BESS work

How does battery energy storage work?

Put simply, our systems allow organisations to store electricity when excess is available and release it back into the building network when it is needed.

Backed by our programming software, our systems can automate when energy is stored and discharged – responding to the changing operating parameters on site.



When to consider energy storage for a site:

Not all operations are created equal, which is why energy storage systems fill a specific need for manufacturers with certain challenges:

↗ Sites with spikes in load

If your operation involves high power demand for short periods - such as machinery startups or heavy equipment usage - energy storage is ideal. Systems can deliver high-capacity power instantly without the lag of a diesel generator ramp-up.

↗ Operations adding power-hungry equipment

Planning to scale or modernise with new tools and machinery but struggling with limited power availability? Energy storage bridges the gap without the need for expensive grid upgrades.

↗ When DNO upgrades are proving costly

DNO upgrades can often be costly, unfeasible or cause large disruption and delays. Energy storage can often be a more cost-effective alternative to getting the power a site needs.

↗ Leased sites without control over power supply

For manufacturers operating on leased premises where power infrastructure upgrades are out of your control, energy storage offers a simpler, non-invasive solution.

↗ When a site is driven by decarbonisation

From maximising solar, to requiring additional energy for items such as heat pumps or EV charging, energy storage can be an integral part in supporting decarbonisation measures. Even without solar, a site could still benefit from cleaner energy by storing from the grid during less carbon intensive periods.



Calculating the benefits: our feasibility studies

When investing in energy storage, it's crucial to ensure the solution aligns with your goals. Our feasibility studies use real-world data to assess a site's suitability and calculate the financial and carbon benefits.

What our feasibility assessments include:

Objective scoping: Understand goals like handling peaks, maximising solar, or supporting growth.

Data gathering: Analyse half-hourly or even minute-by-minute detailed energy usage, tariffs, renewables, and future plans.

Modelling: Simulate scenarios across days, weeks, and months for full insights.

Report: Receive a comprehensive report with quantified use cases and benefits.

Read more about two recent feasibility assessments over the page.

Case study 1: Battery energy storage to replace a diesel generator

Industry: Food and drink

The problem

After successfully gaining a new nationwide contract, a manufacturer needed to expand its production capacity. However, they quickly discovered that its existing site had a capped power supply of 200AMP and 140kW – which could no longer sustain the businesses' growing energy needs.

The company required additional energy to power new machinery but faced a significant barrier - the cost of upgrading their grid connection ran well into the hundreds of thousands of pounds. To keep their operations going, they were relying on a diesel generator, however, customer requirements for Scope 3 emission reduction, made this a short-term solution.

Our Approach

Phase 1: Analysing the Load Profile

To determine whether battery energy storage could effectively replace the generator, we started by modelling its load profile. The data revealed that:

- the manufacturing site experienced high peak loads, but they occurred in short bursts - ideal for energy storage solutions.
- operational continuity was vital. Business-critical machinery needed uninterrupted power to avoid revenue losses, necessitating a solution that could match the generator's reliability.

Phase 2: Minute-by-Minute Data Modelling

We took a detailed, granular approach by analysing minute-by-minute operational data. This analysis provided the confidence needed to demonstrate that a battery energy storage system (BESS) could support the company's demanding requirements without disruption.

Phase 3: 24-Hour Operation Modelling

The company operates shifts throughout the night, meaning the BESS required the capacity to charge during machine use and handle additional evening peaks. By modelling 24-hour usage patterns, we provided assurances that the BESS's flexibility and performance would align with operational demands.

The Solution

Our recommendation was to implement a battery energy storage system designed to handle the site's 200,000kWh yearly additional energy needs. This solution will not only replace the diesel generator but also incorporate potential future benefits such as solar energy integration and participation in Demand Flexibility Services (DFS) for additional revenue generation.

The Results

£38,000
- annual
cost savings

82,000
kgCO₂e
- reduction
in emissions

Case study 2: Overcoming power capacity breaches with battery energy storage

Industry: Timber

The problem

Power constraints can pose significant challenges for manufacturing sites, limiting productivity and increasing energy costs.

We were recently approached to undertake a feasibility study on a timber manufacturing plant. The site was coming up against a recurring problem. With an annual consumption of 5,000 MWh, a peak demand of 1,500kW, but an import capacity of 1,200kVA, the site was frequently breaching its limits. They had been instructed by the DNO to take action.

With breaches totalling 455 hours throughout the year, this site urgently required a solution to maintain its energy consumption within its set capacity.

The Solution

Connected Energy modelled the site for our E-STOR technology. Using a data-driven approach, we modelled the site's half-hourly energy data to assess the constraints.

The study revealed that our 300kW E-STOR system would sufficiently address the site's capacity breach issues. By dynamically discharging stored energy during peak demand periods, the E-STOR system would help prevent capacity breaches and reduce strain on the power grid.

Key features of the E-STOR solution:

Dynamic Load Management: Maintains consistent energy use within capacity limits, mitigating breaches.

Scalable Design: Perfectly sized to fit the 300kW requirement, with the ability to expand if future demand increases.

Data-Driven Implementation: Tailored solutions based on detailed site-specific energy performance modelling.

The Results

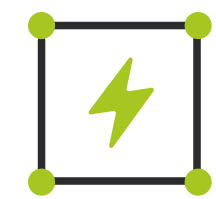
97% reduction
- in hours breached
from 455 hours to just
15 hours.

Cost savings:

Dynamic load management allowed the site to adhere to its 1,200kVA import capacity and therefore avoid any fines associated with breaches.

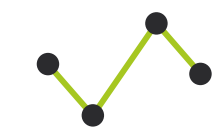
Why Connected Energy?

Connected Energy makes the transition to energy storage easy, by providing a full turn-key solution gained from 15 years of experience.



Technical analysis

Our experts analyse your site's energy usage to identify issues. This is followed by a feasibility study to demonstrate how a BESS could help.



Financial projections

We calculate the return on investment, providing solid financial forecasts to build the business case.



Funding

We can bring a range of funding options to the table and even help with funding applications.



Turnkey deployment

From selecting the best site to overseeing installation, our experts manage everything.



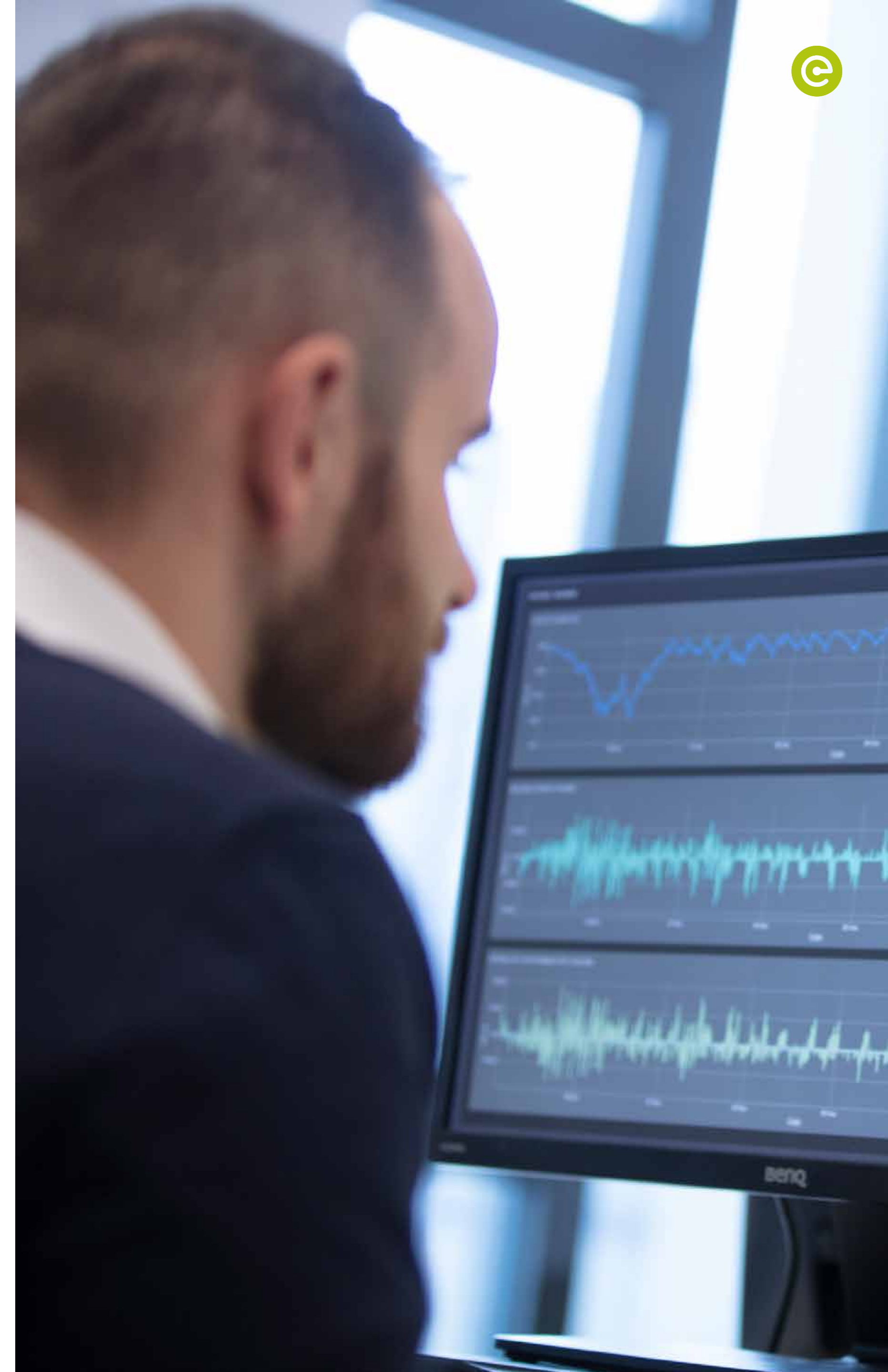
Revenue

Where business operations allow, we can identify opportunities to monetise your BESS through grid services and incentive programmes.



Maintenance support

While the system is self-sustaining, we also provide ongoing technical support.



Our systems can provide a **positive carbon benefit of 450tCO₂e** for every 1MWh installed, compared with a BESS using brand new batteries.

A huge benefit to businesses looking to decarbonise is Connected Energy's use of second life batteries within our battery energy storage systems.

This not only contributes to a company's scope 3 emissions, but it can also help meet funder requirements for suppliers to actively be reducing their own emissions.

Energy storage of any kind can deliver carbon savings for buildings. However, production of new batteries for BESS comes at an environmental cost.

This is where Connected Energy comes in. We have developed a unique solution capable of reusing EV batteries in BESS; creating a system which is better for the environment and goes further to help organisations meet their net zero goals.

Market analysts McKinsey estimate that, in 2025, there will be 800m tonnes of EV batteries ending their first life applications. And this figure will only continue to grow. Finding a solution to reusing these electric vehicle batteries is critical to reduce waste by contributing to the circular economy.

Connect with us

Interested in finding out more about how battery energy storage can support your sustainable buildings strategy?

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 www.connected-energy.co.uk