

powerstar[®]



**Solving Energy Pressures for
Food and Drink Manufacturers**



Minimising the impact of elevated energy prices and finding ways to make a business more energy efficient are vital in managing costs and protecting increasingly narrow profit margins.

Introduction

Food and drink manufacturers face unprecedented pressure when it comes to cost reduction, as food price inflation has become one of the most contested areas of the ongoing cost of living crisis. Pressure from retailers and consumers alike to avoid price increases, at a time where supply chain, raw material and equipment costs have been rising, means that the narrow margins that most food and drink producers work to are being squeezed even further.

Lowering manufacturing costs to remain competitive is vital, but doing so without impacting on productivity or profitability is challenging. An area that has seen substantial cost increases is energy. However, this is also one of the areas where manufacturers can directly impact on and reduce their own costs, given the right strategy to do so.

With energy accounting for around 15% of the total costs for the average Food and Drink manufacturer, minimising the impact of elevated energy prices and finding ways to make a business more energy efficient are a vital way to manage costs and protect increasingly narrow profit margins.

At the same time, food and drink producers are under increasing pressure to reduce their carbon emissions. Achieving this without increasing their costs can be extremely complex and difficult to achieve. The food and beverage industry represents the single largest manufacturing sector in the UK by turnover, as well as the fourth largest in terms of energy consumption. As a

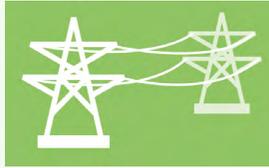
result, it has a vital role to play in ensuring the UK is able to meet its legally binding net zero targets. Outside of legislative requirements, there is a growing expectation from consumers, and as a result the large retailers that cater to them, that the food and drink they purchase is as environmentally friendly as possible. While the trend for consumer support for more sustainable food has become clear in recent years, cost pressures mean that while green credentials are nice to have, customers are not willing to pay extra for the privilege.

Finding solutions to this is challenging, particularly as UK energy markets remain highly volatile and difficult to predict. In this white paper, Powerstar will outline the current energy landscape and how things might change in the coming years, the challenge of ensuring cost-effective, sustainable energy faced by the food and drink industry, and some of the options available to tackle them.

The UK's Energy Landscape



Rising Costs



Grid Constraints



Growing Demand



Reaching Net Zero

While the energy prices seen earlier in the year and throughout 2022 have begun to recede, they remain around double those seen pre-pandemic. The reality is likely that rather than an acute energy crisis, the rapid increases seen following the pandemic and the Russian invasion of Ukraine marked a new normal for energy costs. In a best-case scenario, prices may return to something that more closely resembles a pre-pandemic energy market some time in 2024.

More likely is that the wholesale costs for electricity and gas will remain elevated, continuing to increase costs for food and drink producers. The UK's continued reliance on natural gas for generation, and the stresses placed on the energy network by the energy transition, means that even if prices trend back downwards, markets will remain volatile.



Security of Supply

While the UK grid remains largely very reliable, the risk of disruption can have a significant impact on the productivity and profitability of food and drink manufacturers. Narrow winter margins and constrained distribution networks all have the potential to disrupt manufacturing sites, as does aging electrical infrastructure and the addition of new, energy-intensive technologies.

For many manufacturers, seasonal disruption such as narrow winter margins and the risk of load shedding to ensure sufficient power means amending shift patterns or production schedules to use power at periods when it is sufficiently available. While this is typically effective at avoiding disruption, it can also mean that a site is not operating as efficiently as it might otherwise.

While investing directly in power resilience technology at a time when the food and drink industry face significant cost pressures can be a difficult decision, with the right combination of technology a site is able to reduce its energy costs while also guarding against the risk of disruption. With the establishment of advanced systems such as a smart microgrid, a production facility has the potential to operate independently of the grid to prevent power disruption impacting on production.

When supply margins on the grid do prove tight, the bulk of the demand side response required typically falls to energy-intensive manufacturers. By reducing the amount of electricity they draw from the grid during periods of peak demand, manufacturers can play a kg disruption. This can also represent a new source of revenue, as National Grid provide payments in return for providing these grid balancing services, or in some cases simply making a site or asset available to respond when grid balancing is needed. The amount of income this can generate varies significantly, both by how often grid balancing is called upon and how quickly participants are able to react to requests.

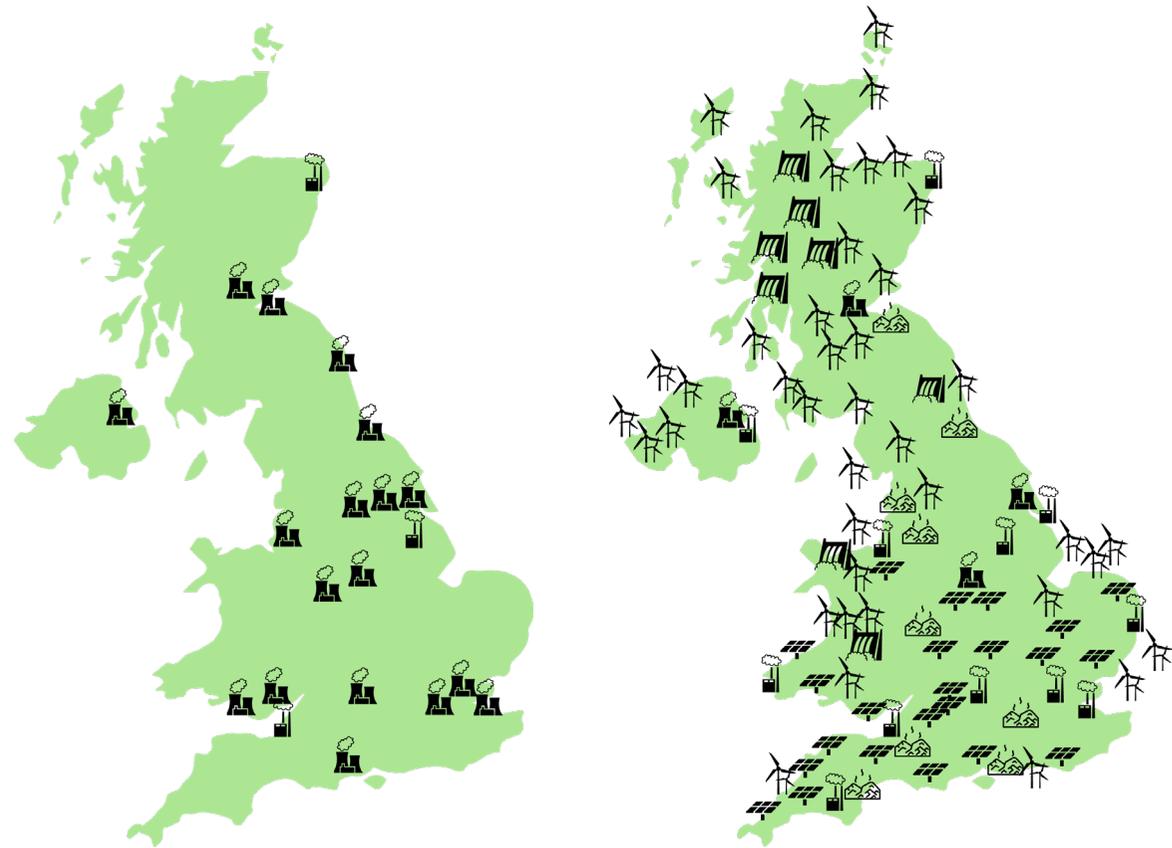
The UK's Energy Landscape

The Energy Transition

This energy mix is dramatically greener than it was just a decade ago. While carbon-intensive, coal and gas generation are ideal for providing baseload power, with the ability to ramp up generation to meet spikes in demand. Similarly, they can be easily turned down, or even off, when generation exceeds demand.

Renewable energy such as solar and wind is inherently inflexible, generating at a set rate governed by elements that we have no control over. We can't turn the wind up or down, nor can we influence the hours of darkness where solar cannot generate power. This presents National Grid with a hugely complex and difficult balancing act. As more and more renewable generation capacity is added to the grid, our risk of blackouts or other disruption increases.

The energy transition represents an opportunity for the UK to bolster energy security and ensure cleaner, more cost-effective energy. However, it also means that there is likely to be a lengthy transitional phase where energy prices remain highly volatile. For individual businesses, minimising exposure to this medium-term market volatility is an important aspect of mitigating energy costs. There are a mix of technologies that can achieve this, with many also offering benefits in terms of reduced carbon emissions. In the longer term, the energy transition means that even when using grid-supplied electricity, lower carbon density from the UK's mix means that the emissions of manufacturers will trend downwards over time.



Shifting energy generation: 20th Century

21st Century

Legislative Changes

ESOS

One of the main reporting requirements for large UK businesses is the Energy Savings Opportunity Scheme, that requires all businesses of a certain size to audit, measure, and report their annual energy use. Up until now, organisations required to report are those that employ 250 or more staff, have an annual turnover of £44 million, or an annual balance sheet of £38 million.

Whether your organisation currently qualifies for ESOS or not, there are changes in the pipeline. This year the government announced an expansion to ESOS, both in terms of the number of businesses that it will cover and the scope of reporting. Initially, this will focus on bolstering audit requirements and standardising reporting. ESOS reports include high-level recommendations as to how

an organisation can improve their energy efficiency, and it will become a requirement to publicly disclose those recommendations. With pressure on food and drink manufacturers to act on carbon emissions from retailers and consumers alike, failure to follow up on recommendations that could deliver clear improvements would be increasingly called into question.

Further down the line, ESOS is expected to be expanded to medium-sized enterprises, making far more manufacturers eligible for the scheme. The government update in 2023 also indicated their intention to mandate action on improving energy efficiency identified through ESOS reports. Currently, failure to follow ESOS recommendations has no impact other than a potential hit to brand perception, but failing to provide accurate, timely reports risks substantial fines.

Climate Change Agreements

Climate Change Agreements (CCA) are a vital way for energy-intensive industries to secure a discount on their energy bills. In return for meeting minimum sustainability improvements as laid out by their trade federation, businesses can secure a 90% discount on their Climate Change Levy, an environmental tax placed on each unit of energy used.

The current CCA scheme has been extended until 2027, and while the eligibility criteria, sectors and rules will remain the same, penalties for non-compliance and incorrect reporting will increase. For Food and Drink manufacturers that are not currently signed to the FDF's umbrella agreement, which they hold on behalf of UK food and drink producers, the window to sign up closes on September 30th 2023.



Sustainability Pressures

While all UK manufacturers face mounting pressure to demonstrate a commitment to reducing carbon and improving sustainability, it is perhaps most pronounced for food and drink producers.

Consumers increasingly factor the sustainability of a product into their purchasing decisions. More significantly for most of the food and drink producers, major grocery retailers have focused on this change in behaviour to set themselves apart from competitors. This has resulted in something of a green arms race between major supermarkets, with often weekly announcements and press releases from major chains highlighting their latest efforts to reduce carbon emissions, environmental impact, or waste. For food and drink manufacturers, this means that they must balance the primary customer goal, which remains avoiding increases in cost, while also meeting the supply chain expectations of large retailers.

While all UK businesses have a role to play in our collective efforts to reach net zero, the rapid scale of improvement from major retailers is putting substantial pressure on their suppliers to follow suit. With the majority of large chains already well on their way to addressing their Scope 1 and Scope 2 emissions, their attention is quickly shifting towards Scope 3: those originating within their supply chain. In 2021, Tesco confirmed that 90% of their total emissions were Scope 3.

Tesco were also the first major UK retailer to communicate to their suppliers that there is a growing expectation to demonstrate clear, measurable sustainability improvements if they wish to continue their working relationship. Three

years later, in 2020, 70 of their biggest suppliers had collectively reduced emissions by 12%. [Source.](#)

Competitors have quickly adopted similar strategies. Sainsbury's and Morrisons have both committed to reducing their supply chain emissions 30% by 2030, while Asda is launched a landmark new project to accurately measure Scope 3 emissions, alongside the Carbon Trust, in 2021.

The simple reality for food and drink manufacturers is that if they wish to continue to do business with the UK's largest grocery retailers - sustainability progress, and ultimately a clear pathway to achieving net zero is rapidly becoming a necessity.



Consumers

Figures show that consumers consider the sustainability of the products they purchase increasingly important. However, a significant caveat is that while they value the green credentials of their food and drink, they don't want to pay more for it, nor do they want products to be more difficult to access. This presents a major challenge for food and drink manufacturers, who are forced to find ways to deliver sustainability improvements without impacting on retail prices.

- 61% of UK consumers in 2023 indicated that sustainability was more important to them now than it was two years ago.
 - 65% think about the environmental impact of the products they buy.
 - 30% of shoppers stated that they would shop more sustainably if not for the impact of the cost-of-living crisis.
 - 32% would spend more on an item with better environmental credentials, rising to 45% for those aged between 18 and 34.
- [Source.](#)

Managing Energy Costs

In 2019, before the current energy price crisis, energy costs made up around 2% of the total cost for food manufacturers. Since then, that figure has risen to between 7.5% and 10%, while for the hardest hit manufacturers energy costs now make up 30% of their total overheads. Milling, baking and fruit and vegetable processing are typically some of the most energy-intensive processes and have seen the largest increase in costs.

Most food and drink manufacturers also face significant cost pressures, as the cost of raw materials has steadily increased while the impact of the cost-of-living crisis on consumers makes retailers reluctant to pass additional costs onto their customers. This can risk manufacturers stranded in the middle of cost pressures from both their upstream and downstream supply chain, with little wiggle room when it comes to meeting their own mounting costs.

Energy, while a growing concern for many, is one area that manufacturers can reduce their overall costs. Energy is not simply a static cost, and efforts to reduce consumption or source energy more cost effectively can have a major impact on a manufacturer's bottom line.

Many food and drink manufacturers have already explored a range of way to improve energy efficiency and cut costs in the face of rapidly rising bills, there are typically still improvements to be made. While historically better energy procurement was seen as the primary way to mitigate costs, the rapidly evolving energy market means that manufacturers have less choice and flexibility when it comes to switching contracts and suppliers. Instead, savings are made through a combination of physical changes to infrastructure and a better understanding of how a site consumes power and the ways that can be improved.



Power Resilience

When it comes to investing in energy infrastructure improvements, cost and sustainability pressures means that power resilience has slipped down the list of priorities for many food and drink manufacturers.

In many cases, investing in new processes or ingredients that are more resistant to brief power disruption, altering production schedules or absorbing the cost of disruption when it does happen can be the most practical approach.

Power disruption remains a significant threat to many food and drink manufacturers, however. Not only does it impact on productivity but can also result in significant spoilage and wasted raw materials, as well as potential damage to production lines. In an industry that has narrow windows in terms of the supply and delivery chain, delays caused by power disruption can also cause reputational damage or erode relations with key partners, such as major retailers.

While the cost of mitigating power disruption alone can be prohibitive, it can also be improved by the implementation of technologies that also deliver on other energy management priorities: cost and carbon reductions. A battery energy storage solution can help to reduce energy costs in several ways, as well as reducing carbon by charging from on-site generation or during periods where the carbon intensity of the grid is lower, while also providing Uninterruptible Power Supply (UPS) for a site in the case of a disruption.



Solving Complex Power Infrastructure Challenges

The rapid pace of progress in terms of electrification, new technologies and options such as on-site generation can result in a range of challenges when it comes to incorporating them together on the same site. While many of these options can significantly reduce costs or improve sustainability performance, or both, often it is not simply a case of investing in and installing them.

One of the most significant challenges can be ensuring that your site does not exceed its agreed supply capacity, the amount of electricity that your Distribution Network Operator (DNO) is prepared to make available through your grid connection. Exceeding it can result in costly fines, while upgrading it could require the costly or lengthy process of a new grid connection being established. In some cases, new technology projects can be halted completely after your DNO simply refuses permission for them to over concerns that they could disrupt the distribution network.

- Switching from gas-powered manufacturing techniques to electrification can reduce emissions significantly but can drive up energy costs and put strain on what may already be a constrained grid connection.
- Installing new on-site generation is a great way to reduce emissions and save on grid energy costs but can pose an issue when excess power needs to be fed back into the grid. If your local distribution network is already constrained, as can be the case for many out-of-town industrial parks, there may not be the infrastructure capacity available for this to happen.
- Whether it is for commuting staff, distribution fleets or 'last mile' deliveries, many food and drink sites will be looking to install or upgrade their EV charging facilities. Rapid chargers bring with them a huge increase in electricity demand for a site, with even a small handful easily exceeding agreed supply capacity in many cases.

Solving these issues can be challenging, or turn a proposed, carefully costed project into something that runs significantly over-budget.

For a growing number of food and drink producers, establishing a smart microgrid is the most effective way of resolving these complex infrastructure challenges. By combining on-site generation, battery energy storage and intelligent control software, sites can use electricity much more effectively to prevent unnecessary strain being placed on their supply capacity or allowing them to operate independently of their grid connection entirely.

Improving Sustainability

As energy prices have risen, maximising energy efficiency has become imperative when it comes to mitigating exposure to volatile wholesale energy prices. Improved energy efficiency also typically delivers benefits towards two key areas of focus for food and drink manufacturers: reducing energy costs, while also improving sustainability and cutting down Scope 2 emissions.

The food and drink industry relies on many energy-intensive processes. While this increases energy costs, it also means there is typically plenty of opportunity for energy efficiency improvements. A major opportunity for the food and drink sector is with variable speed drives: many systems that operate using motors, which would often run more efficiently when the speed can be varied to match the load, meaning less energy is wasted. A variable speed drive (VSD) achieves that, matching the motors that run equipment such as fans, compressors, and conveyor belts to meet specific process demand. VSDs also reduce wear and tear and subsequent maintenance costs for equipment.

For energy efficiency to be properly implemented, it is vital that manufacturers can get a clearer understanding of their site's current energy consumption. A range of energy monitoring software is available that can provide a real-time overview of how a site is operating. This in turn allows potential improvements to be more readily identified. Fundamentally, improving energy efficiency is about eliminating wasted energy, whether that is through improvements to equipment, changes in processes or by finding and eliminating faults that are causing wasted energy. This process of better understanding how a site is operating can also provide valuable insight when it comes to investing in new equipment, allowing for more informed procurement decisions.



Quorn Foods Case Study

Quorn Foods committed to achieving net zero emissions within its own operations by 2030, as part of its Supply Chain Sustainability Strategy. Making production processes as efficient as possible was identified as a key party of this strategy.

Reducing energy costs was also key for the business, as was ensuring that their reputation for excellence was not impacted by disruption during the installation of a chosen solution.

Following a Powerstar site review of Quorn Foods' factory in the Northeast of England, a combination of low-loss distribution transformers and integrated voltage optimisation was identified as the optimal solution.

As a result of the installation of two transformers, the site's aging transformers that were a point of potential power failure were transformed into a cost and carbon savings opportunity, delivering the following results:

- 🔸 10.2% annual reduction in energy consumption
- 🔸 £71,000 annual savings on energy bills
- 🔸 365 tonnes annual reduction in carbon emissions

Powerstar Technologies

Voltage Optimisation

Voltage optimisation optimises incoming supply from the national grid to match the voltage required by equipment on a site. Optimising voltage reduces energy use and costs, as well as lowering associated carbon emissions.

Typically, UK sites are supplied with an overvoltage, averaging 242V. This increased voltage not only means that electricity is being consumed unnecessarily, but also significantly increases wear and tear on equipment, increases the amount of equipment failures experienced as well as costs for maintenance and replacement.

Spikes and sags in voltage can significantly disrupt a manufacturing site, even if the disruption itself is only momentary. A spike in voltage can cause sensitive equipment or controls to trip and reset, turning a momentary change in voltage to a lengthy shutdown and restart process. The conditioned voltage provided by voltage optimisation helps to avoid this.



Battery Energy Storage

A battery energy storage system has the potential to form the cornerstone of an intelligent energy management system and infrastructure, supporting an organisation in improving a wide range of their energy management objectives.

This highly adaptable and flexible technology allows energy to be stored for use when needed later, as well as providing site-wide power resilience to prevent disruption if a site's grid connection is disrupted. Battery storage plays a key role in maximising the return on investment of on-site generation such as solar, allowing electricity generated when conditions are optimal to be stored and used later, such as overnight. Battery storage can also be vital in allowing new, energy-intensive technologies to be incorporated into a site without the risk of disrupting existing infrastructure or exceeding agreed supply capacity on the site's grid connection.



Low-Loss Transformers

Transformers are at the heart of the electrical infrastructure of many manufacturing sites. However, the UK's transformer fleet is aging, and with that comes significant inefficiencies that can increase energy costs and carbon emissions. With many electrical transformers having exceeded their intended design life, the risk of transformer failure is also steadily increasing, an event that could disrupt the productivity of a site for hours, or even days, while the transformer is replaced.

For older transformers, efficiency can be as low as 85%, significantly inflating energy costs for no additional benefit. Modern, low-loss transformers achieve energy efficiency ratings of up to 99.75%, providing a dramatic improvement to a site's overall energy efficiency. Replacing a transformer with a modern, low-loss alternative also provides a substantial boost to decarbonisation efforts, turning a site's transformer from a potential point of failure to a key cost reduction and sustainability improvement.



Powerstar Technologies

Smart Microgrids

Combining energy storage, on-site generation, and intelligent energy management software, a smart microgrid has the potential to transform the energy management of a site. The ability of a microgrid to operate independently of the grid, known as island mode, means that a site will continue to operate as normal even when power from the grid is unavailable.

Microgrids play a key role in unlocking new infrastructure projects that are hampered by increasingly constrained distribution network, such as rapid EV charging or new on-site generation, that otherwise might be turned down by a DNO due to their potential impact on local infrastructure. Reducing reliance on grid power can substantially reduce energy costs for a manufacturer, while the use of on-site generation, including maximising that available power through battery storage, can also significantly reduce the environmental impact of your products.

Feasibility Studies

The first step towards any energy infrastructure investment should be a comprehensive and data-driven feasibility study. Whether the objective of the project is to reduce costs, improve sustainability, increase efficiency, or a combination of factors, a feasibility study will ensure that the proposed solution will deliver the expected results and is the right fit for your specific site. This also ensures that issues with planning permissions or applications to your network operator are factored in from the beginning of the project, giving better oversight in terms of time scales.

Funding options available and how a project will be paid for is also included, giving you full oversight of the cost of a project, including any potential grants or support, from the beginning.



Power resilience for a net zero world



Work with Powerstar

Powerstar are the UK's leading provider of intelligent battery solutions and voltage optimisation, with an established track record supporting businesses in the manufacturing sector. From design and testing, through commissioning, installation, and aftercare, Powerstar supports you to ensure your chosen energy solution delivers exactly what you need from it.

To find out how Powerstar can help you achieve your energy management goals, however unique or complex they may be, contact our specialists on:

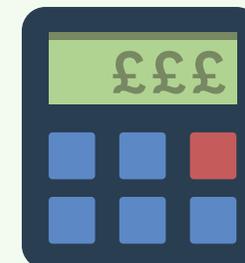
+44(0)1142 576 200 | info@powerstar.com

www.powerstar.com

4 Cowley Way, Ecclesfield, Sheffield, S35 1QP

Energy Saving Calculator

To find out how much Voltage Optimisation could save your business on both your energy costs and associated carbon emissions, find out quickly and easily with the Powerstar Energy Savings Calculator:



powerstar.com/calculator