

Energy on an industrial scale

**What does UK manufacturing need
to make better use of energy and
increase resilience?**

Introduction – why is energy an industrial problem for UK manufacturing?

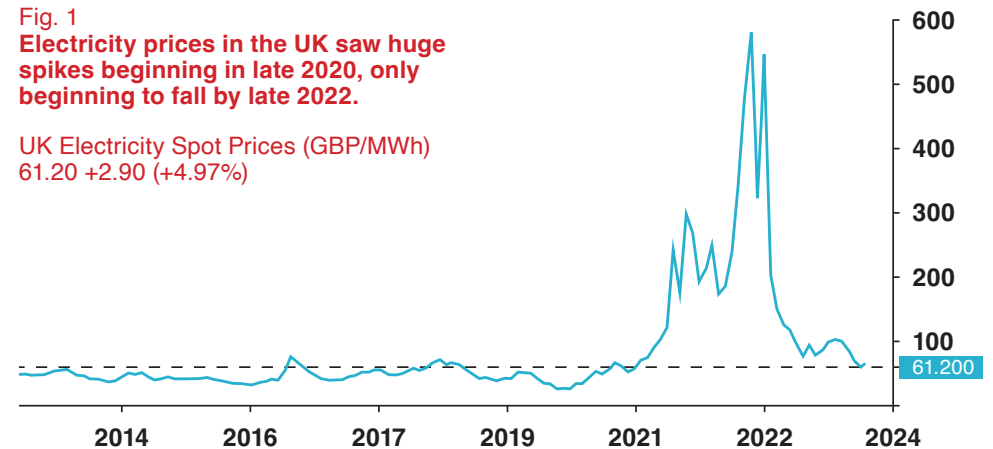
Over late 2022 and early 2023, the situation was dire for hundreds of manufacturing businesses. According to Make UK, the sector's most important trade body, six in 10 businesses were facing possible closure. Soaring energy costs were mostly to blame.¹

This is unsurprising when looking back at the historical figures. Both wholesale electricity and gas costs reached levels not seen this century, and these peaks were sustained for several months.

Whilst costs have fallen considerably in the years since, they still remain at an elevated level when compared to the averages taken across the previous decade.²

Fig. 1
Electricity prices in the UK saw huge spikes beginning in late 2020, only beginning to fall by late 2022.

UK Electricity Spot Prices (GBP/MWh)
61.20 +2.90 (+4.97%)



Source: <https://tradingeconomics.com/united-kingdom/electricity-price>

¹ <https://www.makeuk.org/news-and-events/news/out-of-control-energy-bills-are-now-business-threatening-for-60-of-manufacturers>

² <https://tradingeconomics.com/united-kingdom/electricity-price>

Introduction – why is energy an industrial problem for UK manufacturing?

The trouble is, the full impact of these spikes is yet to be fully realised and, without interventions, businesses could find themselves exposed to further instability. As energy market analyst Cornwall Insight points out, volatility in the wholesale energy market is likely to last until at least 2030 unless significant changes are made to long-term energy strategies.³

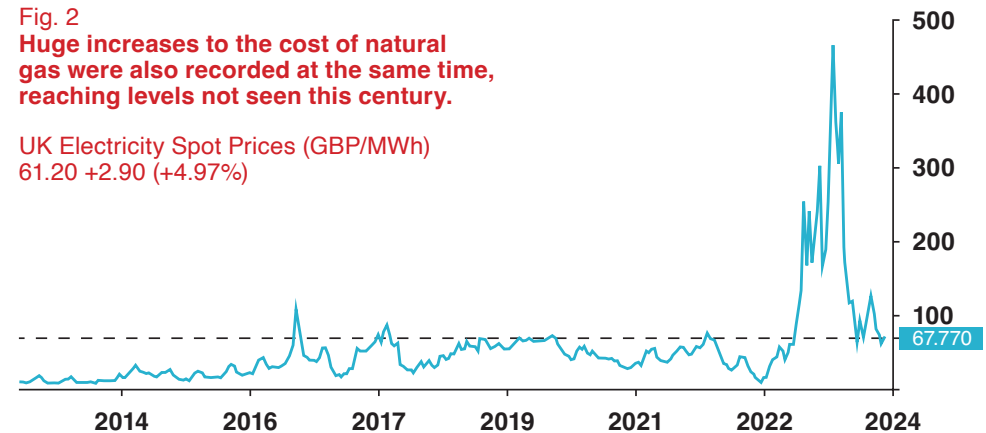
It's true that the cost of wholesale energy is largely beyond the control of manufacturers. Most businesses will be one step removed, purchasing energy from a separate supplier bidding amongst competitors in an international market. If demand increases there, so

do prices across the board. At the same time, the long-term strategies Cornwall Insight refers to are mainly state-level issues of supply and security, suggesting that without government action, the playing field will remain largely unchanged, if not worse, as we head further into the decade.

This is not to say UK manufacturers are consigned to poor margins or unable to take steps in the right direction. Quite the opposite. With costs returning to something resembling 'normal', now is an ideal time for businesses to reconsider their energy strategies and plan for a higher degree of resilience.

Fig. 2
Huge increases to the cost of natural gas were also recorded at the same time, reaching levels not seen this century.

UK Electricity Spot Prices (GBP/MWh)
61.20 +2.90 (+4.97%)



Source: <https://tradingeconomics.com/commodity/uk-natural-gas>

³ <https://www.current-news.co.uk/energy-price-volatility-to-last-till-2030-at-least-warns-cornwall-insight/>

Introduction – why is energy an industrial problem for UK manufacturing?

Energy costs are only one part of the puzzle because today's production environments also have to take action on emissions. Whilst manufacturing has made considerable gains in this area – in part, due to government targets – much of the pressure is now being directed from customers. As PwC points out: "Despite today's challenging environment and cost-constrained market, growing customer pressure to decarbonise means that industrial businesses, including manufacturing companies, can no longer afford to delay action".⁴

These pressures will be familiar to many though worth re-examining. Firstly, because UK manufacturing finds itself in a bind when it comes to energy. And how that energy is used is key to realistic action on climate. Secondly, this scene is being played out as major shifts to the UK's energy infrastructure begin to take hold. This will require businesses to become far more agile and grid-interactive. Thirdly, there is a knowledge gap.

Much has been written about shocks in the energy market since 2022 and the inflation that has followed. However, less is known about its lasting impact. What position do today's high energy users find themselves in? Is energy still a major problem? And what's being done to protect margins as competition from overseas ramps up? These are questions Mitsubishi Electric examines in its latest piece of research, which studies the responses of senior manufacturing managers.

Who did we survey?

- 200 senior decision-makers working in UK manufacturing
- All respondents had decision-making power
- Survey conducted January 2024

⁴ <https://www.pwc.com/mt/en/publications/sustainability/how-customer-led-decarbonisation-can-kickstart-growth-for-industrial-businesses.html>

Key themes – What did we uncover?

Rising energy costs continue to have a profound impact on manufacturers' competitiveness:

25% found energy costs had increased by up to:

↑20%


20% found energy costs had increased by more than:

↑50%

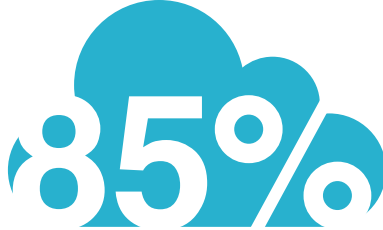
Despite progress in certain aspects of production, UK manufacturing remains exposed to energy price shocks and the shortfalls of UK infrastructure:



Despite rising energy costs and concerns about the grid, energy management systems are still relatively new to most manufacturers only:

24% 
had a fully implemented energy management system

Even with these challenges, net zero is still a major priority for high energy users:

85% 

said working towards net zero was important for their business

35% 

were currently implementing net zero within their business

On-site generation is growing in popularity but the sector lacks the technology to make the most of this capability:

46% 

had installed renewable generation at their site

27% 

Only 27% had a dedicated energy manager

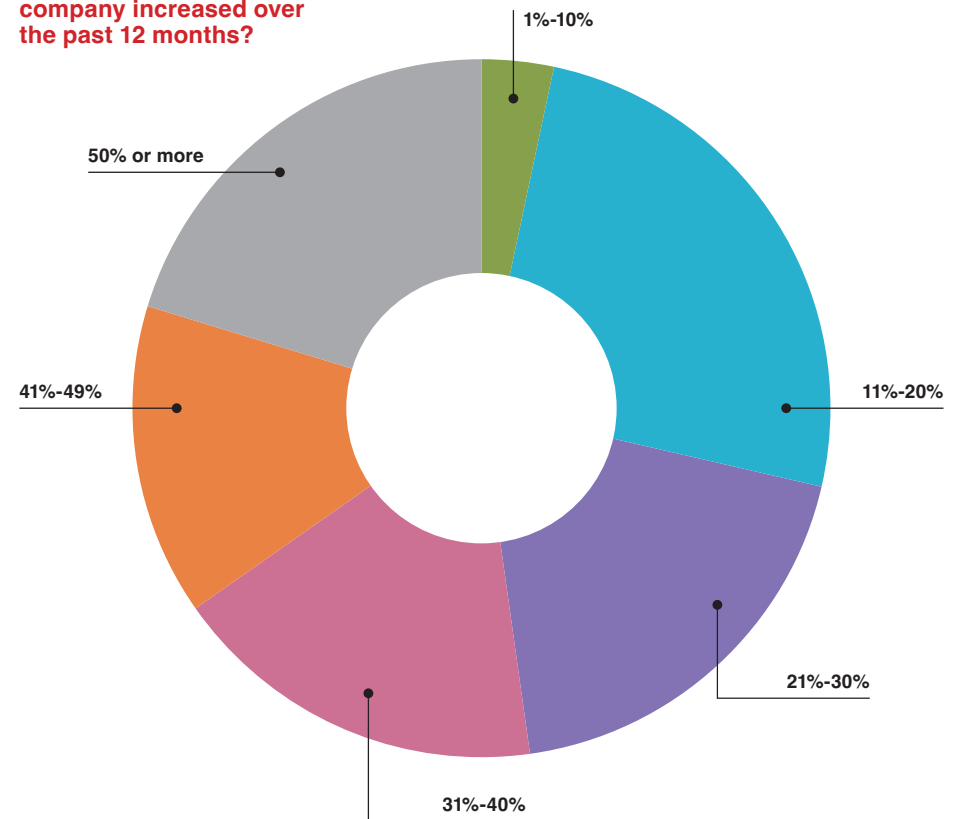
I. The impact of rising energy costs – how big is the challenge?

Energy costs have fallen as sharply as they've risen. Yet the findings from Mitsubishi Electric's research show there is continued pressure for a large number of UK manufacturers, and those savings are not necessarily filtering through to the balance sheet.

At 25%, the highest proportion of respondents said their energy costs had increased between 11%-20% in the past 12 months alone. Meanwhile, 20% said they had increased by 50% or more.

These increased costs have clearly had an impact on the bottom line. Almost half of respondents (46%), for instance, said that instability in the energy market had cut their profit margins. This is a significant finding and one that will require further examination, especially as the sector's net rate of profitability remains well below pre-pandemic levels. As the Financial Times notes, margins in the manufacturing sector averaged 7.6% over 2022-2023, compared with an average of 14.4% between 2014-2019.⁵

Fig. 3
How much have the energy costs in your company increased over the past 12 months?



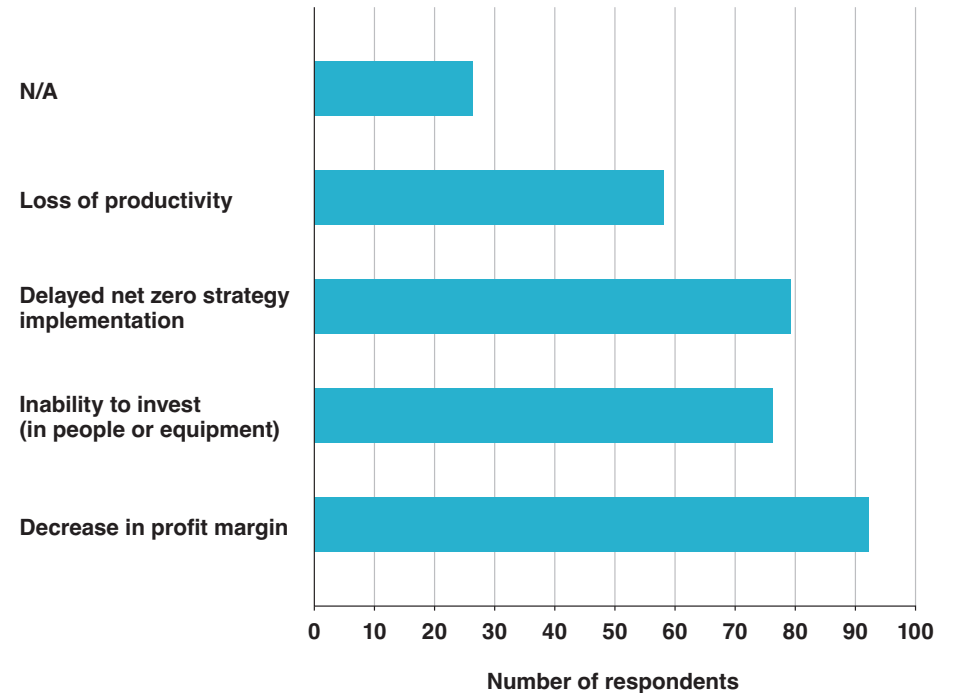
⁵ <https://www.ft.com/content/8e062cc3-9882-4076-ad77-b81db00c17e6>

I. The impact of rising energy costs – how big is the challenge?

The typically thin margins manufacturers work against make these figures alarming enough, though there are other indirect consequences. For instance, 39% said poor market conditions had delayed the implementation of net zero measures. Investment plans had also been held back for 38% of respondents as a direct result of problems in the energy market, whilst 29% said it had impacted their productivity.

Access to skilled labour is a perennial challenge for production. Site teams need knowledgeable maintenance teams to keep assets online and working effectively, as even a small period of downtime can be costly.⁶ Businesses also need capable energy managers to ensure processes are optimised and costs kept within acceptable parameters. Yet almost a third (29%) of respondents admitted that keeping on top of energy spend and access to new recruits had become the greatest challenge to their operations.

Fig. 4
How has instability in the energy market impacted your manufacturing operations?



⁶ <https://www.themanufacturer.com/articles/machine-downtime-costs-uk-manufacturers-180bn-year/>

I. The impact of rising energy costs – how big is the challenge?

This lack of talent may prove difficult for a large number of businesses if Mitsubishi Electric's research is able to be extrapolated across the country. For instance, 36% said they aimed to reduce energy costs in processes by 20%-29% over the next 12 months. This is an ambitious target. However, whether this is achievable without dedicated staff remains to be seen, and it highlights the value for technologies or solutions that can assist existing team members when recruitment falls short.

In short, the challenge is considerable and – despite easing conditions – many respondents still lack confidence in the market. For instance, 91% said they had concerns about energy price security. Whether this stems from recent events or worries for further disruption is unclear, though it demonstrates a general feeling of unease around resilience.

How Mitsubishi Electric can make the difference – tackling energy market volatility

Is a lack of clarity making it difficult for your manufacturing site to cut its energy costs? The financial advantages for introducing a smart energy solution are clear.

It's not just about identifying isolated inefficiencies but having the ability to track a site's performance over time. Continual improvement drives down long-term energy expenditure.

Mitsubishi Electric has a proven track record lowering costs for manufacturers with smart energy management. Finnish manufacturer Ahlstrom-Munksjö, for example, was able to drive down energy bills across 45 sites with the support of ICONICS Suite. Our solution also allowed the business to verify the charges invoiced by its energy provider.

II. Attitudes and efforts towards net zero – is the sector on track?

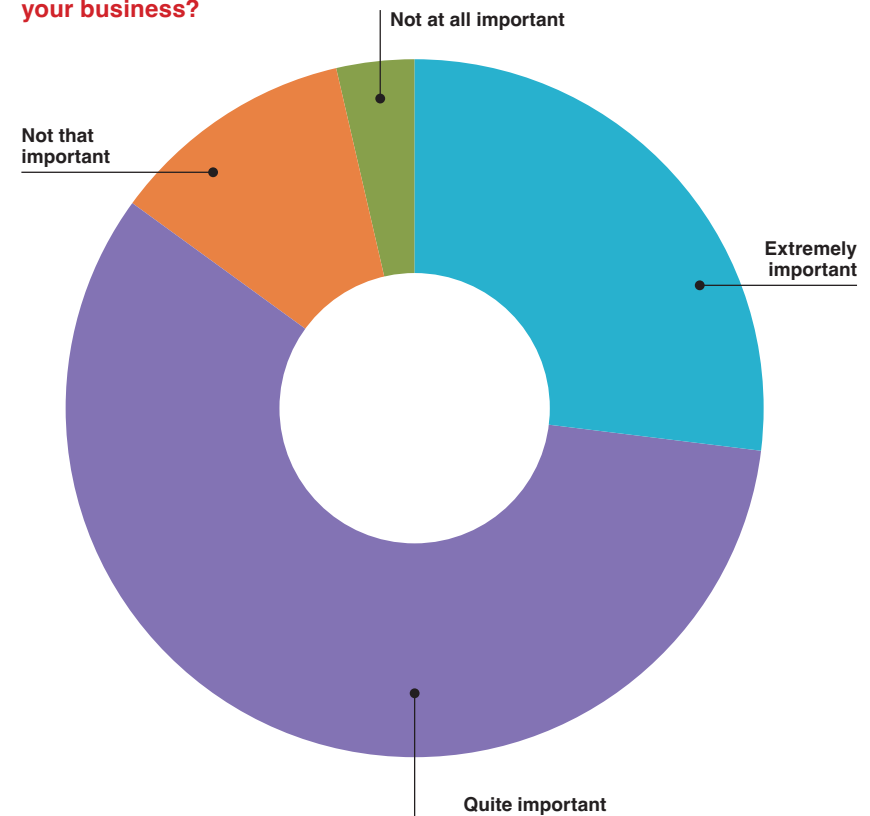
For manufacturing, there is still a large gap to bridge to net zero. This is mainly down to the fact many businesses in the sector are naturally high users of energy. And high consumption still equates to high emissions, even if renewables now account for a significant percentage of the country's energy mix.⁷

Given how much energy manufacturing uses, even minor improvements can have a significant impact on emissions. Though net zero is a relatively new concept, manufacturing has been

working in service of that goal for some time. For example, direct emissions from manufacturing fell by 2% in 2019 alone, and today they are almost 60% below the baseline set in 1990.⁸

There is a tendency to think of long-term carbon-reduction efforts as a barrier to growth. Yet Mitsubishi Electric's research shows this is not the case for the vast majority of manufacturers, even after the difficulties experienced in the energy market. At 85%, a clear majority said that working towards net zero was important for their business.

Fig. 5
How important is working towards net zero within your business?



⁷ <https://www.nationalgrid.com/stories/energy-explained/how-much-uks-energy-renewable>

⁸ <https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Manufacturing-and-construction.pdf>

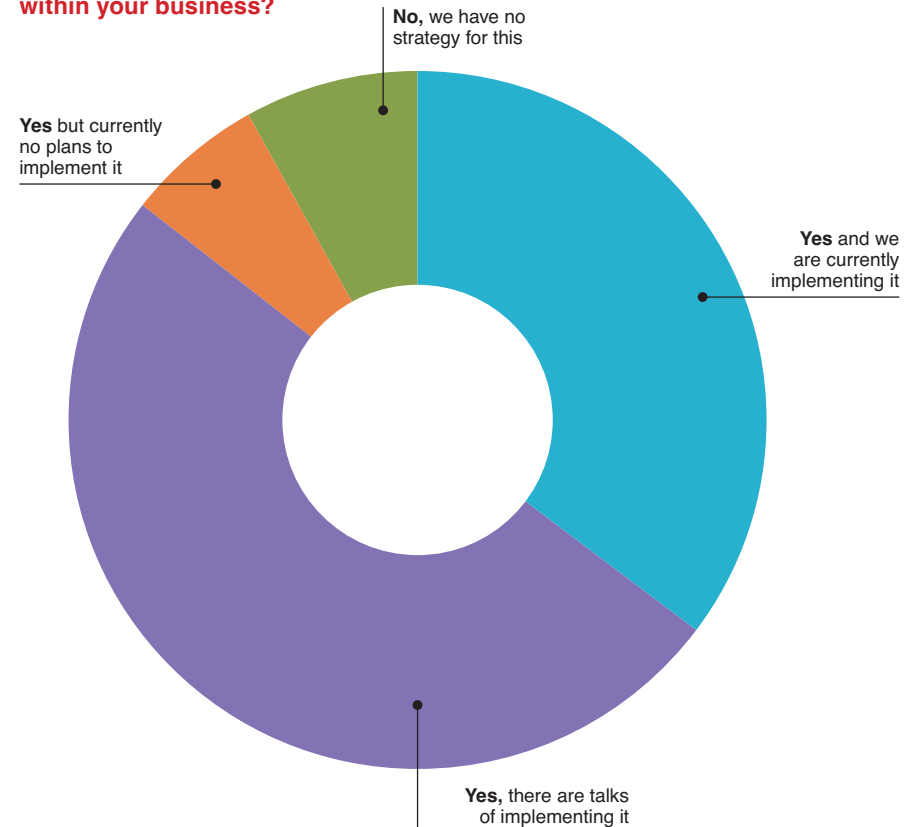
II. Attitudes and efforts towards net zero – is the sector on track?

Electric's research shows this is not the case for the vast majority of manufacturers, even after the difficulties experienced in the energy market. At 85%, a clear majority said that working towards net zero was important for their business.

Of that 85%, over half said that it would improve operational performance, whilst 46% said that it was a useful vehicle to reduce their environmental impact. These explanations are key because they show that most businesses make the connection between sustainability and financial performance. In other words, carbon reduction is not just good for the planet; it also makes good business sense.

Nevertheless, only 35% could say they were implementing net zero within their business, whilst 50% said they were currently developing a plan. These findings merit further examination as understandings of implementation may differ from one site to another. Those who are currently working towards net zero may be enacting measures that have been in place within other organisations for some time. Similarly, the 14% of respondents who said they had no net zero plan in place could be cutting carbon, albeit outside of an official company strategy.

Fig. 6
Do you have a strategy for implementing net zero within your business?



II. Attitudes and efforts towards net zero – is the sector on track?

Other findings give a better indication of where efforts are being directed. For instance, 43% said there was an equal balance between carbon reduction and carbon offsetting measures within their business, whilst 48% said the main focus was on carbon reduction. This is an important finding, as offsetting measures do little for improving on-site efficiency, which is key to driving down emissions. Whilst offsetting is an important tool, more attention should be given to process improvement if energy continues to come at a premium.

However, there is ambition. A third of respondents said they were aiming for process-led carbon reductions in the region of 20%-29% over the next year. As discussed in the introduction of this report, much of this effort is being directed from customers – 70%, for example, said they had been asked to report on scope 1/2/3 emissions as part of a tender process. Of that number, over 91% said they could provide those figures accurately.

How Mitsubishi Electric can make the difference – cutting carbon

Does your business need to cut energy costs across production?

We can help you reduce costs in several ways:

Measuring and checking

Our solutions can store, trend and distribute information about power consumption at all levels, from the shop floor to the board room, or anywhere in the world.

Planning

Our team will share their deep knowledge of efficiency in production environments, preparing your business for the implementation of an energy reduction plan.

Energy saving products

Our efficient drives and servos are designed to cut electricity consumption in energy-intensive environments. Developed for both OEMs and end users, our range is used across a wide range of manufacturing processes.

III. Efficiency and resilience – how concerning is energy security?

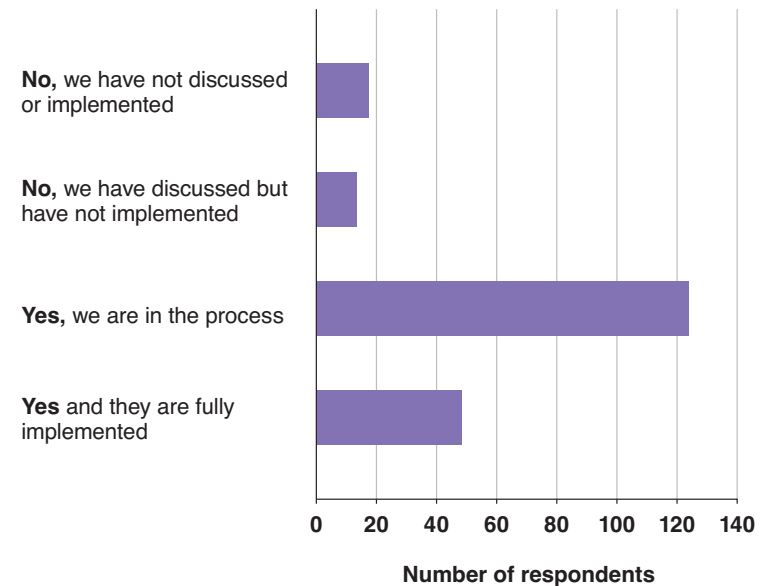
It's well known the UK grid has been struggling to cope for some time. Part of this is down to a growing population and expansion of power-hungry infrastructure, such as data centres, over the last 10 years.⁹

Whilst positive for the climate, the growth of renewables has also introduced its own degree of intermittency, making it difficult for the grid to satisfy demand. As one article in the Guardian points out: "In worst-case scenarios, Britain's power plants will struggle to meet the surging demand

forecast in the early 2030s if a series of nascent technologies struggle to take off".¹⁰

This demonstrates a need for manufacturers to make the most of the energy they're able to secure – both today and in the future. Energy management systems are arguably the most effective and non-invasive way to do this, giving production teams the insights needed to make more informed decisions about individual assets, processes and their overall strategy.

Fig. 7
Has your business started implementing energy management systems?



⁹ <https://www.ft.com/content/53accefd-eca7-47f2-a51e-c32f3ab51ad5>

¹⁰ <https://www.theguardian.com/business/2024/feb/16/fears-uk-power-generation-green-projects-delayed>

III. Efficiency and resilience – how concerning is energy security?

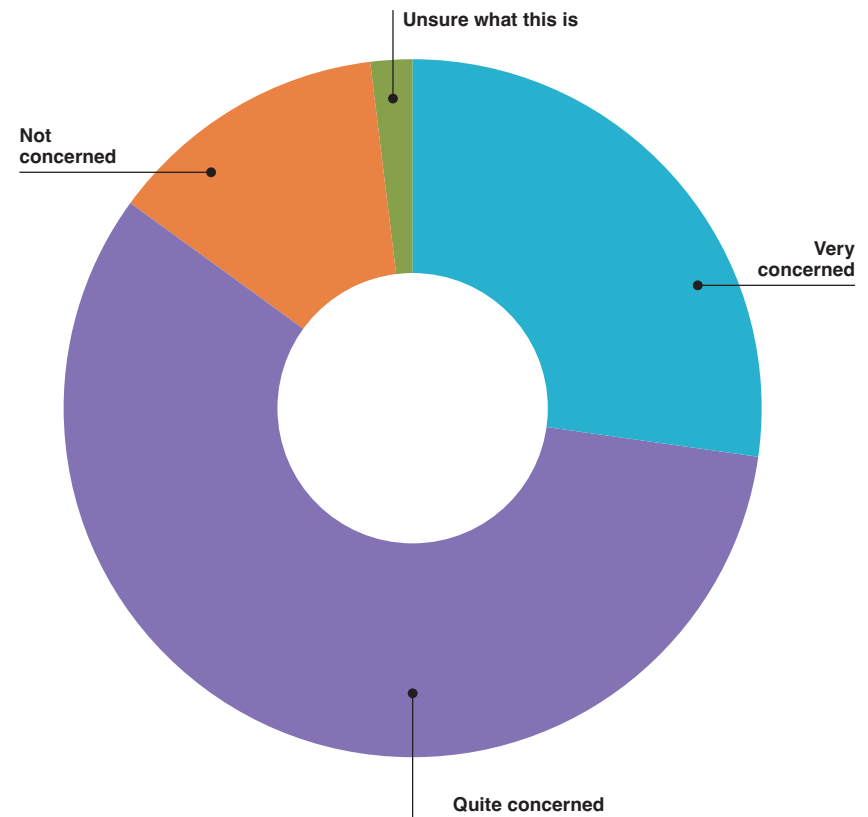
At 61%, the majority of respondents said they were in the process of implementing an energy management system, whilst 24% said they already had one operational. Given most respondents cited difficulty hiring the right talent, it appears some of the interest in this technology is being driven by a desire to plug gaps in knowledge.

This assessment is supported when looking at who was responsible for energy management. For instance, just 27% said they had a full-time energy manager on site. At 30%, the highest proportion of respondents were relying on an operations manager to make key energy decisions; 24% said it was the production manager.

Whilst roles are always different between organisations, it's telling that so few have a dedicated resource for managing energy, particularly as 85% of respondents said they were concerned about grid resilience.

These worries are not unfounded. According to McKinsey, global power consumption is set to double by 2050 as electrification increases in every market. Whilst an issue that extends far beyond the next 12 months, the strain this will place on high energy users is undeniable and manufacturers will need to act in good time before concessions are unavoidable. Most recognised there was a need to act on energy reduction, citing it as the best way to offset concerns about grid resilience. This was followed by preparation for low-likelihood, high-impact events and sustainability initiatives.

Fig. 8
How concerned are you about grid resilience?



III. Efficiency and resilience – how concerning is energy security?

Still, it would be inaccurate to suggest manufacturers lack direction or the drive to take action. For example, 77% were working towards ISO 50001 and 72% said they were involved in the Energy Savings Opportunity Scheme (ESOS). These are important initiatives and guide businesses in the right direction. However, they are unable to plot trends or offer insights into individual assets, which have been identified as priorities in earlier sections of this report.

Arguably the most significant findings for this research relate to on-site power generation – a key aspect of the new energy market and an issue of growing importance for high energy users. As the IEA points out, small-scale energy resources – such as solar

panels, battery energy storage systems (BESS) and microgrids – are rapidly transforming the way electricity is traded, delivered and consumed.¹² And these Distributed Energy Resources (DERs) will allow manufacturers to work more interactively with central grids, supporting with key initiatives such as triad schemes and demand side response.

Mitsubishi Electric's research suggests the sector is ahead in some areas and behind in others. At 46%, just under half said they had installed renewable generation at their site(s). Meanwhile, 30% were using microgrids; 34% said they had a BESS. Yet at 12% a sizeable group had not installed any on-site generation capabilities.

How Mitsubishi Electric can make the difference – becoming more grid-interactive

Are you looking to become more self-sufficient and comply with clean energy goals?

Distributed Energy Resources are falling in cost and are often incentivised, making now an ideal time for your business to lower its dependence on the central grid. However, with many sites and options available, owners need a sophisticated platform to manage assets and extract maximum value from behind-the-meter tariff management benefits.

Strata Resilience

Delivering the core capabilities of DER management, Strata Resilience is our software-based microgrid manager for grid-connected, island and black start operations. It allows your organisation to optimise the value of its microgrid assets and market integration.

Cirrus Flex

Cirrus Flex allows you to remotely optimise DER dispatch. It connects a diverse range of DER assets to fleets to owners, operators and aggregators and traders. We can help you to maximise the returns from energy, grid flexibility services and markets.

¹² <https://www.iea.org/reports/unlocking-the-potential-of-distributed-energy-resources>

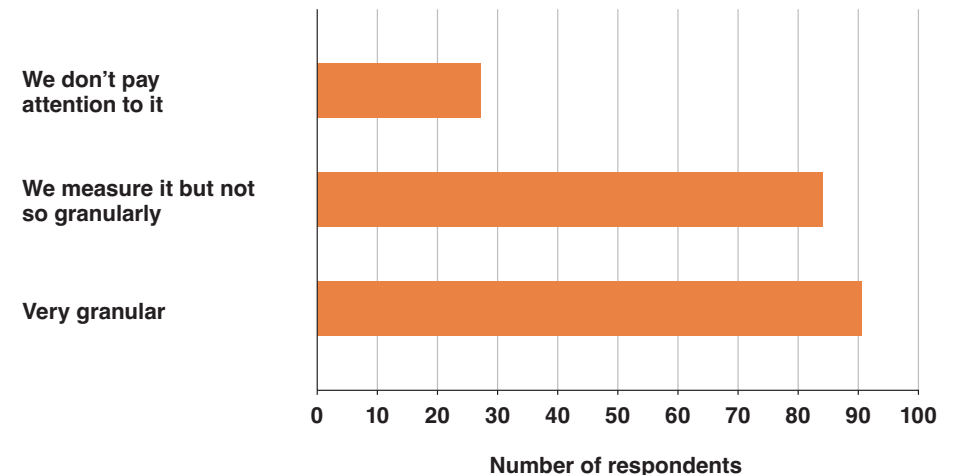
IV. Digitalisation – are manufacturers falling behind?

Relevant data is key to managing energy effectively – especially in production environments. But these insights need to be intelligible and clear to those making the key decisions on shopfloor and at board level.

The previous section showed a good number of businesses are using energy management systems, though the efficacy of these tools was unclear. Digitalisation is powerful but there are risks. Some solutions fail to deliver the right metrics whilst others are over-engineered. As such, it was important for Mitsubishi Electric to determine the sophistication of manufacturers' existing systems.

In terms of energy use in processes, 45% said they were very granular across the entire facility. Meanwhile, 42% said they measured consumption but not in great detail. The latter finding suggests a good number of manufacturers rely on broad or imprecise figures to make important decisions about individual lines or assets, which is often where significant efficiency gains can be made with relatively small interventions.

Fig. 9
At what level of granularity do you measure energy usage in your manufacturing process?



IV. Digitalisation – are manufacturers falling behind?

This assessment appears valid when examining the results in more detail. Per asset, 42% said they were able to be very granular on performance, whilst 40% said they measured energy consumption but not in great detail. Per line, the split was 44% and 36% respectively. In both cases there was a large number of respondents who paid no attention to the energy usage of their lines and assets. For lines, it was a fifth of the sample.

Like energy management, the skills gap appears to be having an impact on manufacturers' plans. Lack of in-house expertise, for example, was given as the main barrier to digitalisation. This was followed by cybersecurity concerns and employee training. Only 24% cited capex as a barrier.

How Mitsubishi Electric can make the difference – data in service of your business

Energy management software delivers rich visualisation of real-time energy consumption by integrating data from BMS, ERP and other manufacturing control systems.

This allows teams to monitor, analyse and optimise performance, be it an individual manufacturing asset, production line, entire facility or across multiple sites.

With ICONICS Suite, users can quickly identify efficiency issues in production processes. In short, Mitsubishi Electric's energy management software gives site managers, facility managers, operational staff and maintenance teams the opportunity to navigate energy-related data and discover opportunities for improvement.

Conclusion – Can manufacturing correct its course?

This research has relied on the opinions of a select number of senior decision-makers. These results cannot provide a complete picture of UK manufacturing, nor can they be considered definitive because conditions are still volatile and the full impact of the energy crisis is yet to be determined.

However, they do offer a much-needed snapshot of the sector's most pressing challenges and an indication of where interventions are now needed to offset the long-term damage.

Production is unquestionably more difficult today than it was at the beginning of the decade. Even the most robust facility will be unable to negotiate price hikes in excess of 50% without a detailed view of consumption – both by individual asset and across an entire site. The question is: can manufacturing correct its course?

The short answer is yes.

With digitalisation, site teams and senior managers can access meaningful data to make more competitive decisions. This is the key driver that will keep manufacturing on track through a period of change and instability.

This is important for the bottom line, but it's also key for negotiating other key priorities identified throughout this research, such as net zero and the need for carbon reduction, energy security and resilience in the face of struggling grid infrastructure.

Still, digitalisation is not a silver bullet and will require ongoing engagement at all levels to deliver a lasting return on investment. Scale and approach are critical considerations, as is the threat of cyber attacks in an increasingly connected world.

These issues should not stop or slow manufacturing's embrace of new technology. If the results in this report can be extrapolated out across the country, it appears relatively few organisations have been able to implement an energy management system, even following one of the most volatile periods for high energy users in recent memory.

This is a huge opportunity that's being overlooked and one that will better prepare businesses for the remainder of the decade. Now is the time for manufacturing to assume the initiative, with scalable solutions that limit exposure to external shocks in the global energy market.

The key to unlocking digital manufacturing

Mitsubishi Electric's Smart Manufacturing Kaizen Level (SMKL) allows manufacturers to 'dream big but start small', delivering ROI by addressing specific energy 'pain points' across a factory floor.

This approach is key. It helps management to make better decisions by showing the purpose, impact and relationship of each investment as a factory becomes 'smarter'.

SMKL also allows a business to build a roadmap for ongoing improvements, giving both newcomers and more digitally advanced businesses the opportunity to 'level up' operations and respond quickly to changing market conditions before they impact output.

In other words, SMKL unlocks the digitalisation process that allows manufacturers to understand and respond to changing energy demands, and is particularly important for the central themes outlined in this research: **energy efficiency and resilience.**



**Automating
the World**