PROSPERITY INSTITUTE

Destroying the Foundations:
How Net Zero Could Wreck British Industry for Good

Rian Chad Whitton
Foreword by Richard Tice MP

Contents

Glossary

AI: Artificial Intelligence

ABS: Annual Business Survey

ASIC: Application specific integrated circuit

BEV: Battery electric vehicle

BF-BOF: Blast furnace-basic oxygen furnace

BUS: Boiler Upgrade Scheme

CfD: Contract for difference

CHMM: Clean Heat Market Mechanism

CNC: Computer numerical control

CPS: Carbon price support

DRI: Direct reduced iron

DUKES: Digest of United Kingdom Energy Statistics

EAF: Electric arc furnace

ECUK: Energy Consumption in the UK

EII: Energy-intensive industry

ETS: Emissions trading scheme

EV: Electric vehicle

FIE: Foundational industrial economy

GDP: Gross domestic product

GPU: Graphics processing unit

GVA: Gross value added

GW: Gigawatt

GWh: Gigawatt-hour

ktoe: Thousand tonnes of oil equivalent

kWh: Kilowatt-hour

LCREE: Low carbon and renewable economy

LLM: Large language model

LPG: Liquefied petroleum gas

MEK: Methyl ethyl ketone

MW: Megawatt

MWh: Megawatt-hour

NESO: National Energy System Operator

NGL: Natural gas liquids

OECD: Organisation for Economic Co-operation and Development

PPI: Producer price inflation

ROC: Renewables Obligation Certificate

SBA: Secondary butyl alcohol

SMMT: Society of Motor Manufacturers and Traders

TWh: Terawatt-hour

ZEV: Zero emission vehicle

About the author

Rian Chad Whitton is an analyst and researcher at Bismarck Analysis, a well-known political risk firm. He focuses largely on energy and industrial markets. He also writes personally at *Doctor Syn* on Substack.

Foreword

Net Zero is the greatest act of financial negligence ever imposed upon the British economy by Westminster. We cannot be a rich nation without cheap energy.

The wishful thinking of intertwining our climate, energy, and industrial policies is becoming increasingly evident. We congratulate ourselves on reduced emissions, when all we have done is outsource them to other countries with lower standards; we claim to be saving the environment whilst blighting our glorious landscape with unrecyclable Chinese solar panels and wind turbines which degrade our oceans and soil. The green energy emperor has no clothes, and British common sense is finally allowing us to say so.

Why is this happening now? Because twenty years of shibboleths and eye-catching headlines about "the green economy" have finally rung hollow as the economic realities have kicked in. British households and businesses have been promised again and again that investing in wind and solar will drive down energy prices. Yet we now have amongst the highest domestic electricity prices in Europe, and the highest industrial electricity prices in the OECD. The chief culprit? Our self-imposed Net Zero regime, which subsidises unreliable and unprofitable green energy, whilst punitively taxing and restricting fossil fuels and neglecting nuclear development.

In no area is this more urgent than Britain's industrial base. In this vital new report, Rian Whitton makes clear just how dire the situation is for what he calls the 'foundational industrial economy', those unglamorous yet essential areas of industry upon which everything else depends, such as concrete, glass, steel, petrochemicals, and fertilisers. Without these products, other industries such as farming, manufacturing, and construction would collapse, spelling local and national economic ruin. Whichever industries managed to survive would see astronomical price rises due to reliance on imports. We would have gone from the cradle of the Industrial Revolution to a client state dependent on others for our most basic materials, all because we dressed up economic stupidity as ecological virtue.

Many, especially the political and media class in London and the South, give little thought to where these industrial products come from—they appear as if by magic. But others are only too aware of what their production requires and how it benefits us. Many communities and local economies in the North, the Midlands, and Wales are based around the facilities that make them. What's more, the major businesses who own and operate them invest substantially in these facilities, creating hundreds of thousands of highly productive jobs in overlooked parts of the country and burnishing the treasury with huge tax revenues.

Yet these businesses are departing the country left and right, taking all their economic benefits with them. Every few weeks it seems the circus of a major industrial closure and calls for a government bailout repeats itself. Without fail, the business leaders shutting up shop—or declining to set up in the first place—cite Britain's high energy costs as one of, if the not the most influential factor in taking their investment elsewhere.

Time is running out. We must scrap Net Zero immediately or face industrial and economic ruin.

Richard Tice
Deputy Leader of Reform UK and MP for Boston and Skegness

Executive summary

At the turn of the Millennium, Britain's manufacturing sector was strong. This was particularly true of its energy intensive industries. The country had the fourth largest industrial economy in the world, and over 800,000 worked in the foundational industries like oil and gas extraction, petroleum refining, metals production, and inorganics. Contrary to popular imagination, British energy-intensive production did not peak in the 1970s, before deindustrialisation and Thatcherism. It peaked in the autumn of 2002.

Fast forward to today, and Britain is on the precipice of industrial collapse. Our energy-intensive industries, from steelmaking to ceramics, from poultry processing to industrial gases, are at just 50% of their annual output in 2000. The industry has gone from over 800,000 jobs to under 413,500, despite Britain's population increasing by nearly 11 million in this time.

The reasons for this are manifold. The expansion of Chinese manufacturing since 2000 has had put enormous downward pressure on profits for manufacturing in all developed countries. Unprofitable overproduction of key commodities like steel and bulk chemicals by China and other East Asian countries has led Western countries to protect their industries, with Britain being a relative exception.

But there is one major factor that is almost entirely domestic and thus well within our control. Since 2004, Britain's energy prices, including both gas and electricity, have significantly increased, with our electricity prices becoming the most expensive in the developed world. This has been largely driven by Britian's self-imposed legal commitments to Net Zero.

Net Zero refers to the growing ambition of the British Government to fully decarbonise the power sector, and eventually all economic activity. From 2019, the Conservative Government planned to decarbonise electricity generation by 2035. The current Labour Government brought forward the target to 2030, followed by fully decarbonising all transport and heating by 2050. Since the Climate Change Act 2008, the British Government has imposed on itself five-year carbon budgets which limit its territorial emissions (that is, those emissions that occur in Britain). While the power sector has been heavily decarbonised, overall emissions when measured through consumption (that is, the emissions created by goods and services at the global level) have not declined anywhere near enough to make a meaningful difference to climate change.

The cost of this policy has been growing pressure on energy bills through levies, as well as indirect costs like the subsidising of dispatchable gas power and increased transmission buildout. **High energy prices are increasingly becoming the number one issue leading to factory closures and job losses.**

The most high-profile example is the British steel sector, which has been *de facto* nationalised after commercial activity at British Steel Scunthorpe and Liberty Steel Rotherham collapsed. Tata Steel's Port Talbot steel mill is only operational because of a £500m Government giveaway.

Sheffield Forgemasters, a key supplier of high-grade steel for the military, was quietly brought under the Ministry of Defence's control in 2021 and continues to cost tens of millions a year to remain active.

But the story is bigger than either electricity prices or the steel industry. Significant carbon costs have been placed on natural gas, the key fuel for the refining of petroleum. Since 2024, Britain has gone from having six operational refineries to four, with the Grangemouth refinery in Scotland and the Prax refinery in Lindsey, Immingham having ceased operations.

Failure is evident throughout the supply chain. Cement production is just 72% of its high point in 2007, while imports are up 108%. This has led to the price of cement rising 15% above inflation between 2015 and 2024. In 2025 alone, the country's largest fibreglass factory, based in Wigan, has closed down due to a toxic mix of high energy costs and Chinese overproduction; the Saudi state-owned chemical company SABIC has closed its olefin cracker at Wilton on Teesside; and Sheffield-based ferro-titanium production operator TiVac Alloys closed down due to energy prices. Meanwhile, the British ammonia industry, which produced ammonia necessary for nitrogen fertilizer production, has vanished entirely.

The temptation of many is to accept decline or even reframe it as a form of positive change. "Let other countries produce basic goods while we move up the value chain", some say. But this is misguided. Britain's retreat from heavy industry has coincided with anaemic productivity growth and a general marginalisation of British corporations at the cutting edge of technology. Products such as glass, plastics, and cement are easily taken for granted. But they underpin our entire economy. **A thriving industrial sector is essential for British prosperity.**

What I propose we call the 'foundational industrial economy' (FIE), including the mining and extraction sector and energy-intensive industries, employed 445,000 people in 2023, accounting for just 1.4% of total employment. But they had a collective gross-value added (GVA) of £57bn, 2.5% of national GVA. This makes the average FIE job 77% more productive than average employment. Outside London, the FIE sector accounts for 1.7% of jobs but 3% of GVA. The average GVA per worker is £72,000, while the average FIE job generates £128,000. This is supported by studies from the OECD. The FIE sector is nearly ten times larger than all manufacturing related to the 'green economy'.

The solution to making our energy-intensive industries competitive again is complex. Yet there are obvious starting points for any Government serious about beginning to address the problem. Net-Zero related levies can be cut from energy bills. Wholesale costs can be reduced further by scrapping carbon-related taxes like the carbon price support (CPS) and providing more free allowances under the emissions trading scheme (ETS). Fruitless subsidy schemes for speculative technologies such as green hydrogen should be scrapped, with funding redirected.

Lastly, the 78% effective tax rate on oil and gas production should be significantly reduced, and restrictions on new oil and gas field licenses should be lifted. While the amount of fuel available will only partially offset our reliance on imports, it will reduce our trade deficit and maintain the roughly 30,000 high-paying jobs in the oil and gas sector.

The FIE is a high-productivity industry whose success translates into broader manufacturing growth. It pays high wages in poorer areas, and if these jobs go, they are unlikely to be replaced by better prospects. Rather, workers will choose between more precarious part-time work, welfare, or migrating to constrained housing markets like London. Britain is currently poorly set up to accommodate internal migration caused by hundreds of thousands of energy-intensive jobs being lost. It is also becoming clear that the green economy is not going to absorb these jobs.

Policymakers from all parties need to make the survival and success of the FIE a matter of first importance. We are entering a far more turbulent period than we have enjoyed for over fifty years, and we must have a strong industrial base. For British decline to be abated, we need to relearn our capacity for production and not accept being the consumers of someone else's modernity.

1. The state of British industrial energy consumption

Main points

- **Britain's industrial economy did not peak in the 1980s, but in the early 2000s.** During this time, we enjoyed low electricity prices.
- **Electricity is only 18% of energy consumption but represents 45% of overall energy expenditure**. As long as we have expensive electricity due to Net Zero policies, electrification means saddling industry with more costs.
- The foundational industrial economy, including energy-intensive industry and the extractive industries like petroleum and natural gas extraction, contributed $57bn in GVA in 2023. **Despite accounting for 1.4% of employment, it produces 2.5% of GVA, making it one of the most productive parts of the economy**. If it fails, the regions that lose the jobs will not be able to replace them with employment of similar quality.

Introduction

This chapter outlines the history of British industry's energy consumption, and the importance of energy to heavy industry. I also propose a definition of what I call the foundational industrial economy (FIE), and discuss the jobs at risk from high energy prices.

Britain is often described as a post-industrial economy. It is undoubtedly true that production is now a smaller share of gross domestic product (GDP) than in any other period in modern history. While services and consumption have grown, production has stagnated. Deindustrialisation, whether perceived as a necessary transition or a betrayal of the working class by monied interests, is taken to have happened in the twentieth century. But this is an incomplete picture. **In 1999, Britain still had the fourth-largest manufacturing base in the world by gross value-added (GVA), behind only Japan, the USA, and Germany.**[1]

At the start of the Millennium, we had a strong manufacturing base. We had yet to normalise trade with China. We also had relatively cheap gas and electricity prices. While British industry still lagged Germany and France in labour productivity and capital investment, it had defensible positions in aerospace, motor vehicles, chemicals, and pharmaceuticals.

But things have changed. **British deindustrialisation has been a defining phenomenon of the twenty-first century as much as the twentieth.** Many factors explain this. The Chinese Government has heavily intervened to steer manufacturing capacity towards its own producers,

1 Gross value added (GVA) is turnover minus total purchases of intermediate goods and services. This includes goods like electricity, other manufactured goods, and services such as consulting. The purpose of GVA is to avoid double counting when tallying up national accounts.

leading to a significant decline in industrial production across the Western world. In response, other Western countries have heavily subsidised their own industries, while Britain has remained relatively open and subsequently been taken advantage of. British companies are, on average, smaller than their European, American, and East Asian competitors, and have failed to invest in capital equipment at rates comparable to their competitors.

One significant factor in our decline, and one which underlies the entire economy has been rising energy prices. There are numerous reasons for these increases, among them the natural decline of parts of Britain's oil and gas production as the North Sea's most accessible fields deplete. This has in part precipitated a rise in more expensive petroleum imports.

However, the major and entirely self-imposed contributor to high energy prices is the cost of levies tied to Britain's Net Zero transition. The original 2008 Climate Change Act mandated an 80% reduction in territorial carbon emissions from 1990 levels by 2050. Since 2019, the Climate Change Act has imposed a legally binding commitment to achieving net zero greenhouse gas emissions by 2050. Renewable obligations certificates (ROCs), feed-in-tariffs, contracts for difference (CfDs), increased balancing costs and curtailment, increased spending on transmission, carbon taxes, and other environmental levies demonstrably impact the energy bills not just of households and regular businesses, but of major British manufacturers as well. Given the high amounts of energy used in their work, spiralling energy costs have been particularly damaging for the latter, accelerating their decline rapidly. **Both Conservative and Labour governments, rather than rethinking their energy policy from first principles, have reactively implemented a patchwork of exemptions from energy costs for manufacturers, but these have done little to stem the closure of multiple facilities in recent years. In 2025 alone, Britain lost two out of six major refineries, two out of three olefin steam crackers, its largest fibre glass producer, and would have lost a majority of its steel production were it not for a government takeover.**

Energy is not the sole determinant of manufacturing success. For instance, despite US manufacturing enjoying relatively low energy prices, the US industrial base has continued to stagnate in comparison to China. Trade imbalances and distortive Government policies play a significant role in determining which manufacturers succeed globally. Some industrial policies can be effective, while others can be disastrous. However, while cheap energy is not sufficient for a thriving and growing industrial base, it is necessary. **Given that Britain's foundational industrial economy provides nearly half a million jobs and generates roughly £200bn in turnover annually, energy prices warrant far more attention than they are given.**

The solutions to this problem are not simple. Although some immediate changes could be made by a new government, turning an expensive energy system into an abundant one will take at least one full parliamentary term to see meaningful results. Meanwhile, **collapse across energy-intensive sectors is being measured in months, and our industrial base will almost certainly have shrunk further by the time of the next general election.** But policymakers and the political leadership can at least unwind the failed status quo. This means moving away from arbitrary mandates, exempting large energy consumers from more levies, and pursuing electrification through cheaper prices, not through banning petrol cars and gas boilers.

A collapse in industrial capacity will have acute impacts on specific towns. Aberafan Maesteg, the parliamentary constituency that hosts Tata Steel Port Talbot facility, also hosts two major paper mills. Overall, 17% of its workforce is in the energy-intensive industries. The constituency of Alyn Deeside has two paper mills, a steel processing facility, and a major cement kiln. Doncaster Central, Ed Miliband's seat, has a glass packaging facility with a capacity of 365,000 tonnes a year. Pontefract, Castleford, and Knottingley, Yvette Cooper's seat, has three glass factories, with a collective capacity to manufacture up to 600,000 tonnes of glass a year. One major fibre glass factory closed in Wigan in 2025, leading to 300 job losses.

The city of Aberdeen lost 18,000 energy-related jobs between 2010 and 2025.[2] As of 2023, there are 23,000 oil and gas jobs left in Aberdeenshire, and they are all at risk due to the Government's effective 78% tax on all oil and gas profits.[3] While oil and gas employment may be expected to slowly decline, this is being exacerbated by the effective ban on new oil and gas developments.

The seat of Redcar, overlooking the Tees valley, is home to both major chemical and steel production facilities. One of its major facilities, SABIC's ethylene cracker at Wilton, closed down this year due to high energy costs. These are remote areas whose prosperity is underpinned by heavy industry, which has effectively halved in output since 2002.

British industry was, until recently, in a strong position and had much to be optimistic about. As we envision a turbulent twenty-first century beset by international uncertainty, the necessity of a strong and growing industrial base is becoming clear to all but the most doctrinaire individuals.

The critical importance of cheap, reliable energy

For industry, the difference between success and failure is often determined by the relative price of inputs. Significant differences in the cost of labour can move whole industrial supply chains across continents. Sufficient spending on productivity-raising capital equipment, through machine tools and robotics, can reduce labour input costs and bring those supply chains back. A key constant input is energy, whether through the combustion of fuels like coal, oil, or natural gas, or the use of electricity.

British energy consumption and expenditure

There are three main components of British energy consumption:

- Petroleum products, refined from crude oil, are essential for transportation fuels such as diesel, gasoline, kerosene, and heavy fuel oil, as well as petrochemicals.
- Natural gas is needed to heat homes and commercial buildings and to provide heat for industrial processes.
- Electricity is produced from turbines and solar photovoltaics. Additionally, there is marginal consumption from coal, biomass, and other fuels, such as coke oven gas.

2 Martin Guttridge-Hewitt, "UK carbon capital Aberdeen 'lost' 18,000 energy jobs in 15 years", *Environment Journal*, 7 January 2025. (link)

3 Ed Hezlet, "Removing the Ampersand in Oil & Gas." *Watt Direction*, 10 February 2025. (link)

In terms of energy consumption (energy supply basis) measured in tonnes of oil equivalent[4] for 2024, petroleum accounted for 45%, natural gas for 28%, electricity for 19%, coal for 1%, and biomass, heat, and other fuels for 7%. But there is high variance in the pricing of such resources. Natural gas, once extracted, is easily transportable via pipeline. Electricity, by contrast, incurs the full costs of generation, transmission, and distribution. As shown in Figure 1, when examining the total energy expenditure in Britain, electricity is the single most significant cost component. Of the £156bn spent on energy in 2024, 43% was for electricity, 37% for petroleum, and 17% for natural gas, with 4% spent on coal and biomass.[5] Electricity's share of expenditure is 233% its share of energy consumption, versus 80% for petroleum and 59% for natural gas. While electricity will likely always be more expensive than fuels, such discrepancies make electrification unaffordable for industry.

Based on 2024 data, for a very large industrial user: coal was £20/MWh, gas was £38/MWh, and electricity was £121/MWh, making electricity 3 to 5 times more expensive than its alternatives.[6] While electricity is more efficient than gas or coal, its higher price means its share of total expenditure is much higher than its share of consumption.

The difference between energy and electricity

'Energy' and 'electricity' are often used interchangeably. Of course they are distinct, but it is also true to say that electricity prices play a hugely disproportionate role in overall energy costs, especially as it relates to manufacturing.

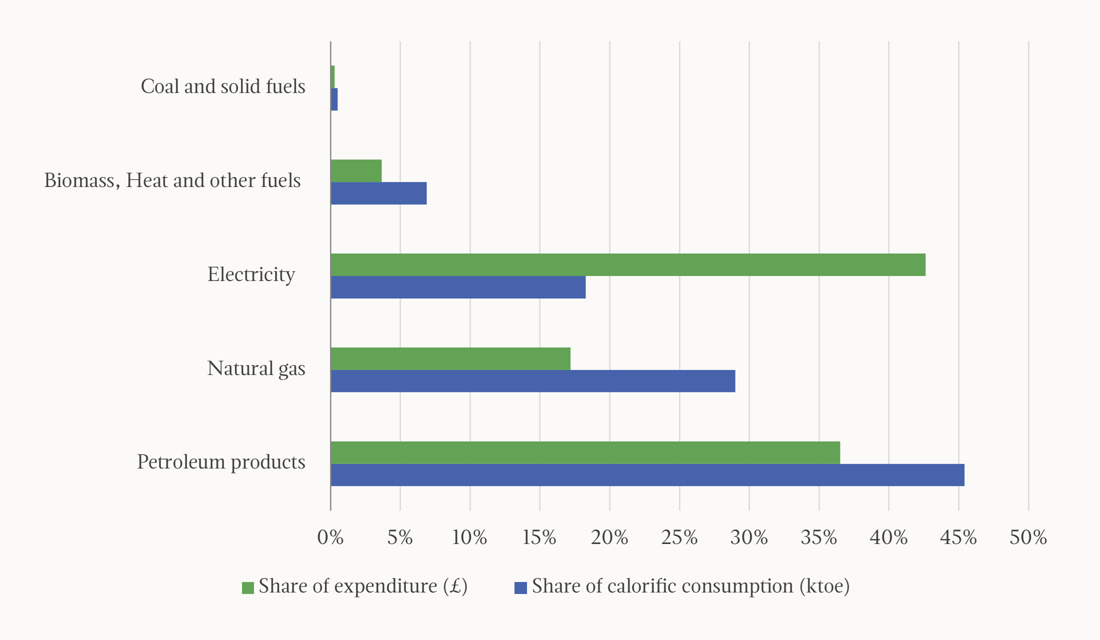
Energy is stored in fuels like hydrocarbons and uranium but can also be produced through kinetic action like the moving of a turbine. Electricity is a specific form of energy, namely the energy created by the movement of an electrical charge. Electricity is valuable because it is versatile, easy to control and highly efficient. Very little energy is lost through the spinning of an electric motor compared to the combustion of gasoline to power a car engine. But because it has to be harnessed from energy sources, electricity is generally far more expensive on an equivalent per megawatt hour basis than standard fuel like natural gas or petroleum.

4 This measure of consumption is based on an energy-supplied basis. This means electricity supplied to final users. This accounts for energy losses on the conversion of fuels to electricity, or energy lost in the production of refined fuels.

5 Electricity shares of energy consumption and expenditure for the UK. Source: Expenditure data sourced from DUKES Table 1.1.6. Consumption sourced from DUKES Table 1.1.5 Energy consumption by final user (energy supplied basis).

6 Department for Energy Security and Net Zero, "Prices of fuels purchased by manufacturing industry", accessed 12 November 2025. (link)

Figure 1: *Energy by share of consumption (energy supplied basis) and expenditure for 2024.*[7]



Source: Expenditure data sourced from DUKES 1.1.6; consumption data sourced from DUKES 1.1.5.[8]

One of the main objectives of Net Zero is shifting from non-electrically powered systems, including industrial heat, gas boilers, internal combustion engines, and blast furnaces, to using electric systems like heat pumps, motors in electric vehicles, and electric arc furnaces (EAFs) for steel production. As noted, the price of electricity is significantly higher than that of other fuels. Certainly, savings can be made via efficiencies. In domestic settings, for example, heat pumps can be three times more energy efficient than traditional gas boilers. But these efficiencies can only offset costs up to a point. **The price of electricity has historically been over 300% that of gas, often with significant spikes** (see Figure 2). Alongside the higher capital costs of electric heat pumps compared to gas boilers, the elevated cost of electricity is a substantial impediment to achieving Government electrification goals in homes. The problem is only amplified in the industrial sector, where Governments have attempted to reduce industrial heat consumption and move heavy industrial processes to electricity. Yet they have pursued electrification while presiding over a widening gap between the costs of gas and electricity (see Figures 2 and 3).

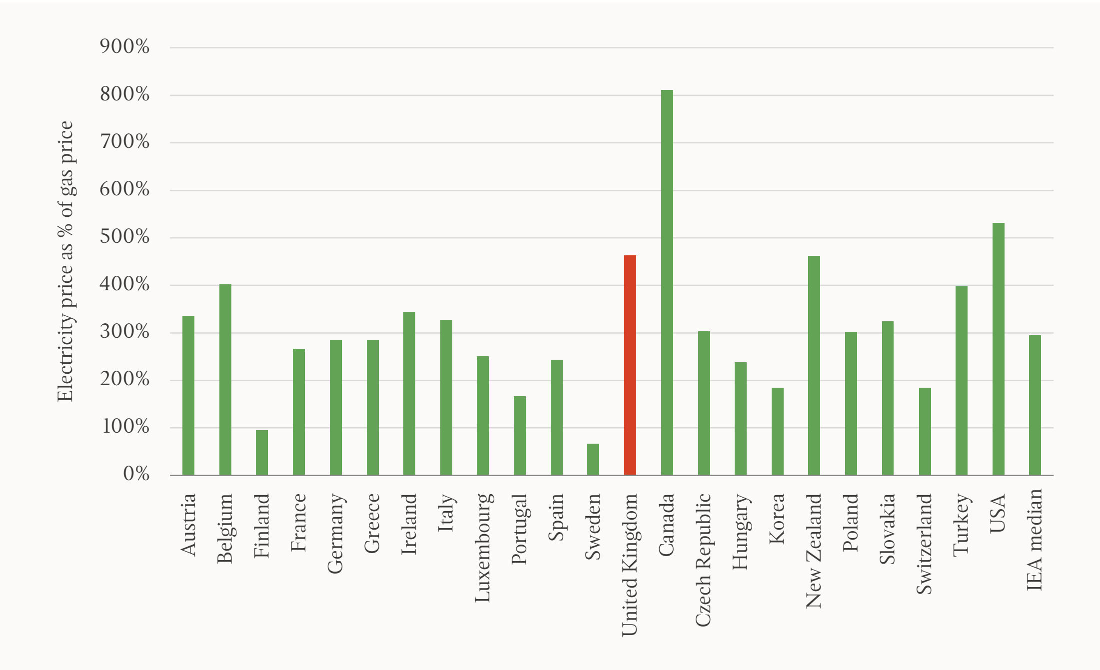
7 ktoe refers to thousand tonnes of oil equivalent.

8 Digest of United Kingdom Energy Statistics (DUKES), "Table of tables", 31 July 2025 (link); Department for Energy Security and Net Zero, "Energy Consumption in the UK (ECUK) 2025", 25 September 2025 (link).

Figure 2: *Electricity to gas price ratio.*

Source: DESNZ Table 3.1.4

Figure 3: *2023 industrial electricity prices relative to industrial gas prices.*



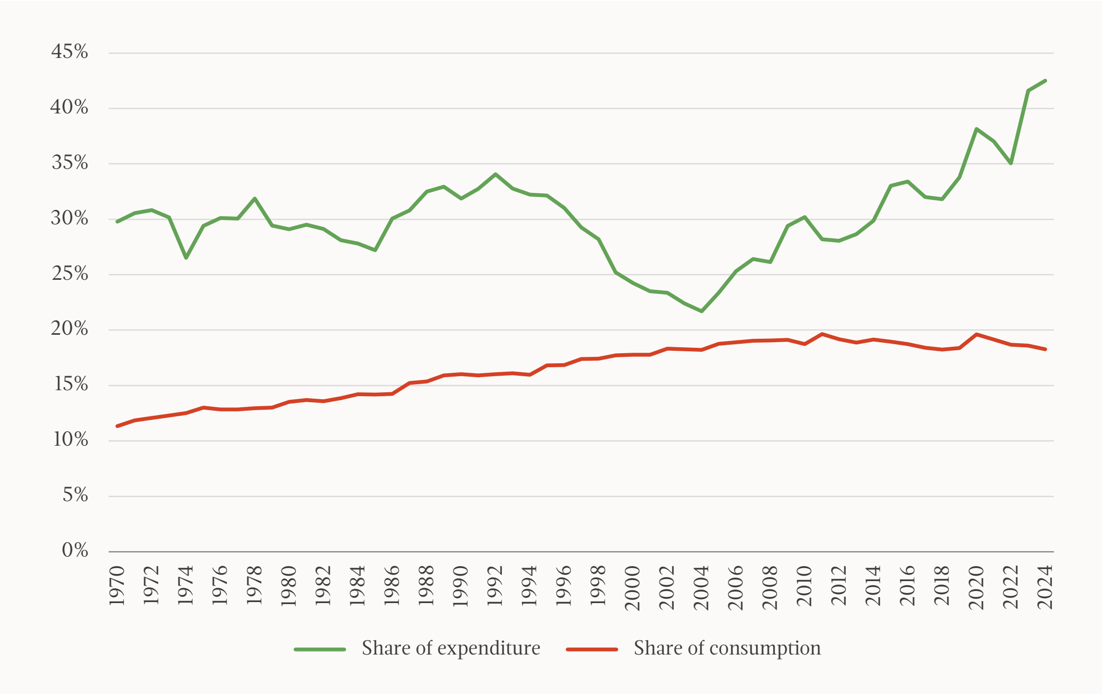
Sources: DESNZ: Table 5.3.1 and 5.7.1[9]

Importantly, and ironically, the high price of electricity, made higher by Net Zero, has stalled the process that could lead to wider decarbonization and electrification. From 2000 to 2024, electricity remained at 18% of calorific energy consumption but has grown from 24% of energy expenditure to over 40% (see Figure 4). **This means that electrifiction of energy consumption has stalled for 20 years, yet its share of expenditure has doubled.** Had prices remained sta-

| 9 Department for Energy Security and Net Zero, "International industrial energy prices", accessed 12 November 2025. (link)

ble, we would have been able to electrify to a far greater extent than we have done under the Net Zero regime.

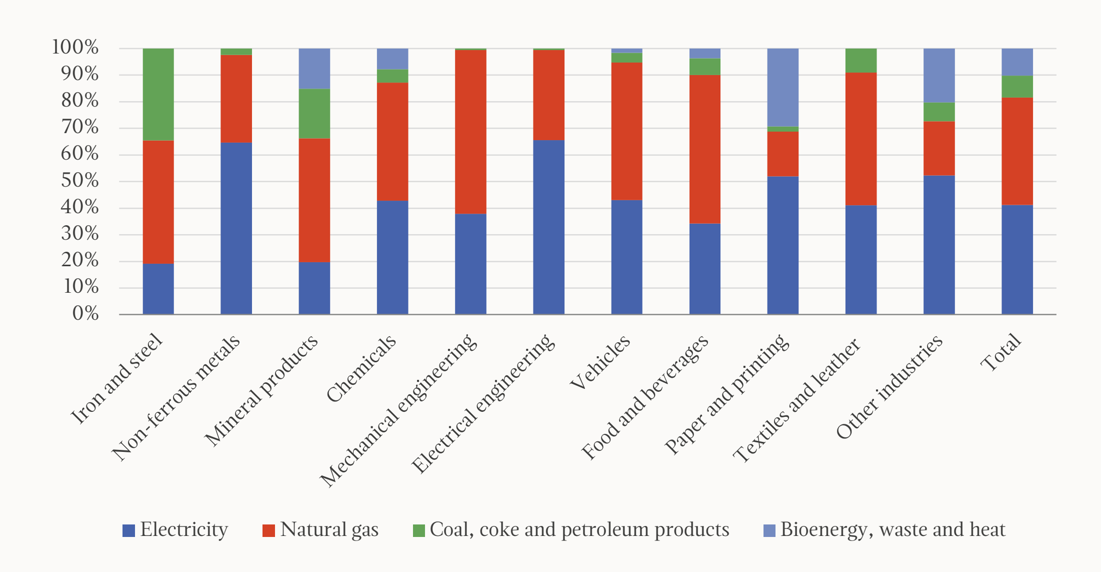
Figure 4: *Electricity shares of energy consumption and expenditure for the UK.*



Source: Expenditure data sourced from DUKES 1.1.6. Consumption sourced from DUKES 1.1.5.

In a scenario of persistently high electricity prices, electrification is synonymous with price inflation and lower competitiveness both in the energy-intensive sectors and across society more generally. The makeup of energy consumption (measured in ktoe) varies by industrial subsector (see Figure 5). Overall, for British industry, electricity is 41% of energy consumption, followed by gas at 40%. For more energy-intensive sectors like chemicals, mineral products, and iron and steel, gas and coal make a larger portion of overall consumption (see Figure 6).

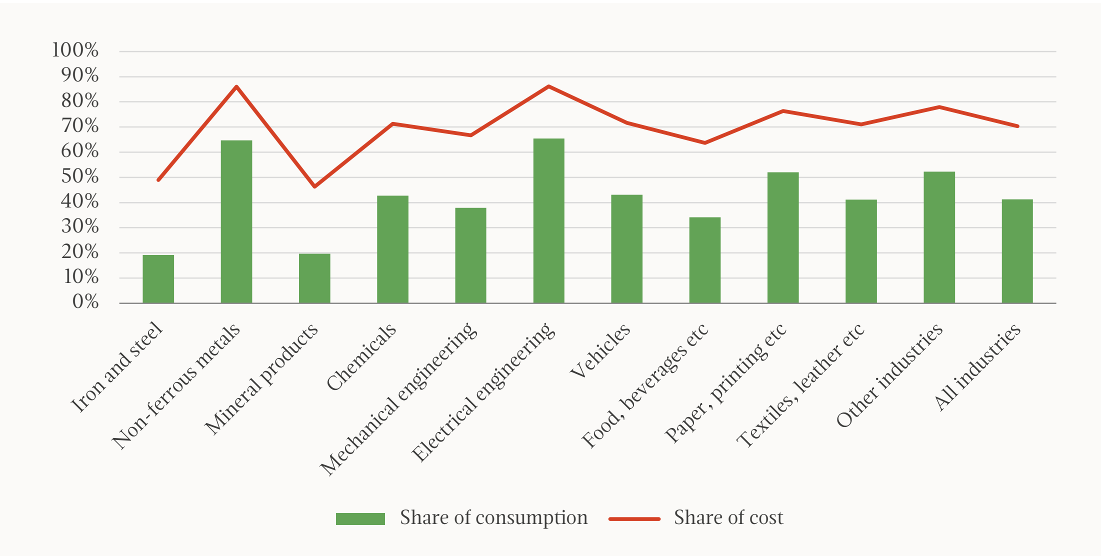
Figure 5: *Energy breakdown by industrial subsector 2023.*



Sources: ECUK Industrial final energy consumption by subsector and fuel to 2023 (ktoe)

Electricity is significantly more expensive than other inputs like coal or natural gas, due to the process of converting raw fuels into power. Based on 2023 average prices, electricity costs on average £190 per MWh for manufacturers, versus £49 for gas and £28 for coal. With these cost differences, electrification is incredibly expensive. There are additional emissions trading scheme costs associated with coal and gas, which can make them more expensive and closer to the price of electricity, but large energy users are to varying degrees shielded from these by allowances. However, it remains the case that, **absent punitive levies, gas and coal on their own terms are far cheaper than electricity. Deliberate policy choices have been made to make gas and coal more expensive. This does not make electricity cheaper, it simply makes industry less competitive.**

Figure 6: *Electricity share of consumption and share of expenditure based on average fuel price (2023).*



Sources: ECUK Industrial final energy consumption by subsector (from 1990) and fuel (from 1998) to 2023 (ktoe) / DUKES Table 3.1.4 Average prices of fuels purchased by the manufacturing industry excluding the Climate Change Levy, in pence per kWh, annually, in Great Britain.

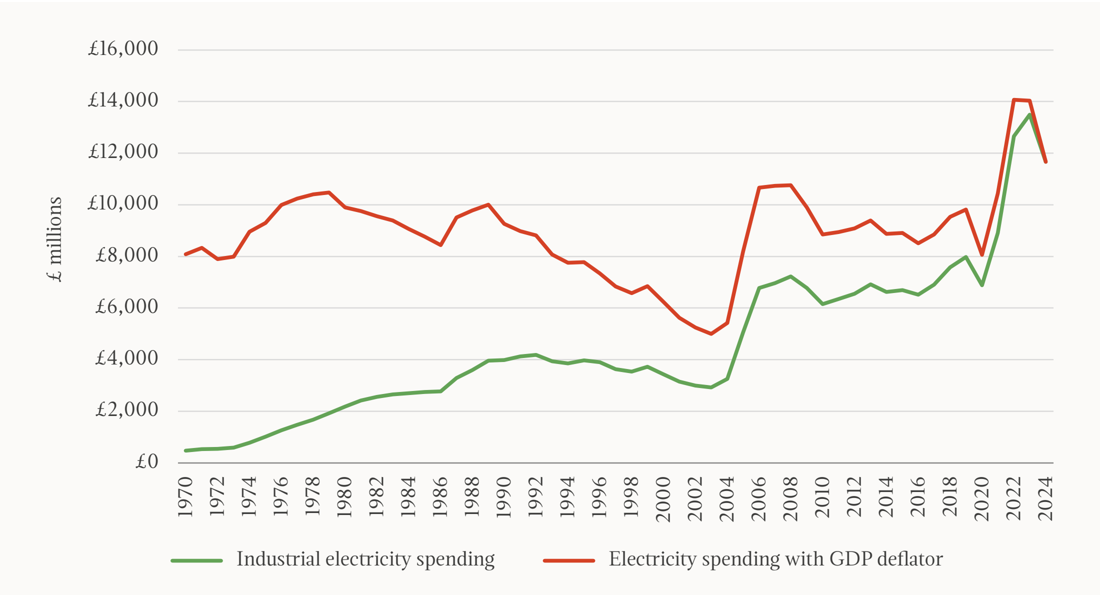
No slack left in the system

There is a view that British industry is stagnant and increasingly marginal due to its inefficiency. But Britain likely has one of the most optimised industrial supply chains in Europe. **Productivity (measured by GVA per worker) for the average manufacturing worker, adjusted for inflation, grew from £58,000 in 2011 to £75,000 in 2021.**[10] But in the same period, turnover and GVA have stagnated. On one level, this is very impressive. British manufacturers have survived high energy prices, distortive trade practices, and disruptions like the COVID-19 pandemic, and, rather than collpasing, grown more productive.

But at the same time, British manufacturers have won no marketshare in any new industry, such as drones or batteries, and have lost market share in virtually every relevant industrial field. If there were a significant manufacturing opportunity that led to significant investment, electricity generation capacity would be a huge bottleneck. Any British manufacturers would quickly face sky-high prices as excessive demand chased limited supply.

Consider the historical electricity purchases of British industry. From the mid-1970s onwards, when adjusted with a GDP deflator, electricity costs gradually declined (see Figure 7). Since 2004, when Britain became a net importer of energy, costs have risen significantly, before plateauing after 2008 and then rising sharply after 2020. They have remained high even since falling from the 2022 peak.

Figure 7. *Industrial electricity spending.*



Source: DUKES 1.1.6 / GDP Deflator[11]

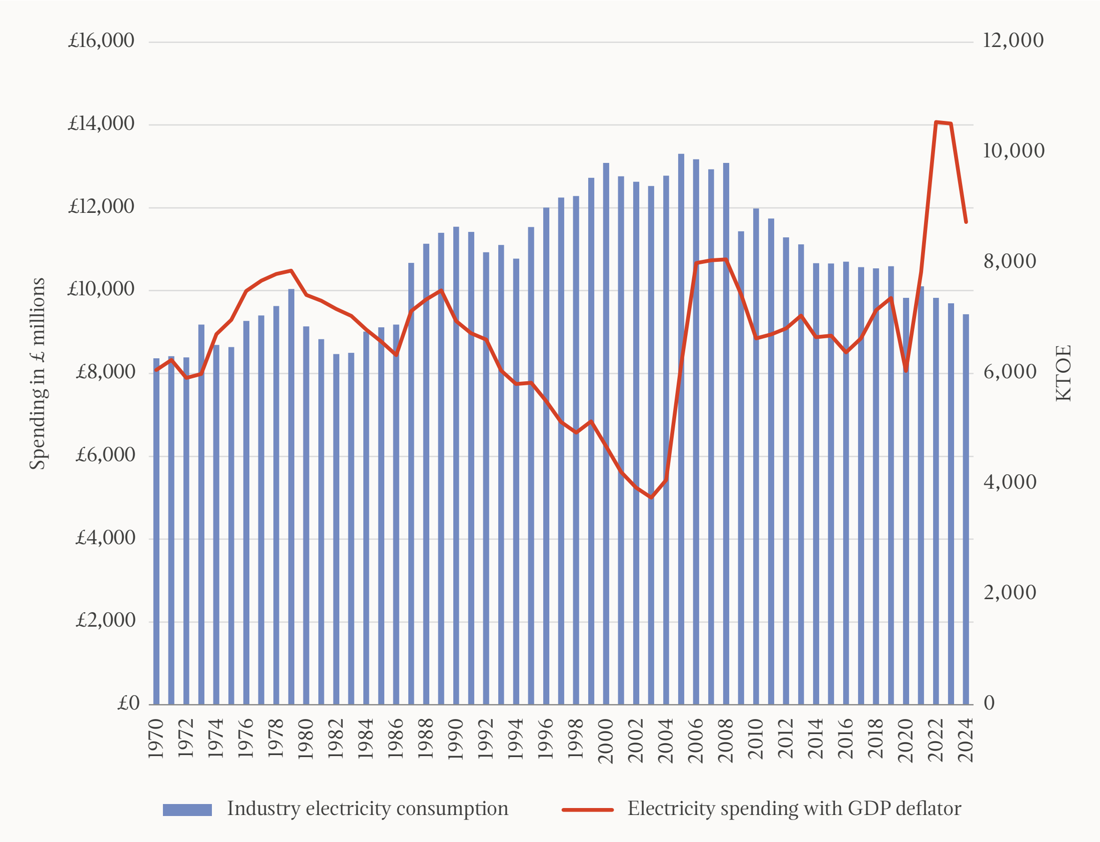
Britain's record electricity expenses are particularly alarming, as the industrial sector has signif-

10 Cambridge Industrial Innovation Policy. "Firing on just a few cylinders: recent performance of the UK machinery and equipment manufacturing sector", 4 June 2024. (link)

11 The GDP deflator accounts for the difference between nominal GDP and real GDP (that is economic growth exclusive of price rises through inflation). It provides a basic tool to account for inflation in energy prices. This helps determine how high electricity prices have actually risen relative to the rest of the economy.

icantly reduced its electricity consumption (see Figure 8). This highlights the extent of our policy failures. **After successfully reducing electricity costs in real terms while boosting electricity consumption in the 1980s and 1990s, British industry has seen electricity costs rise and its bills increase even as it reduces consumption.** While the 2022 Russian invasion of Ukraine brought this home, the elevated electricity costs after 2004 highlight a much more alrarming long-term policy failure.

Figure 8: *Industrial electricity consumption and expenditure*

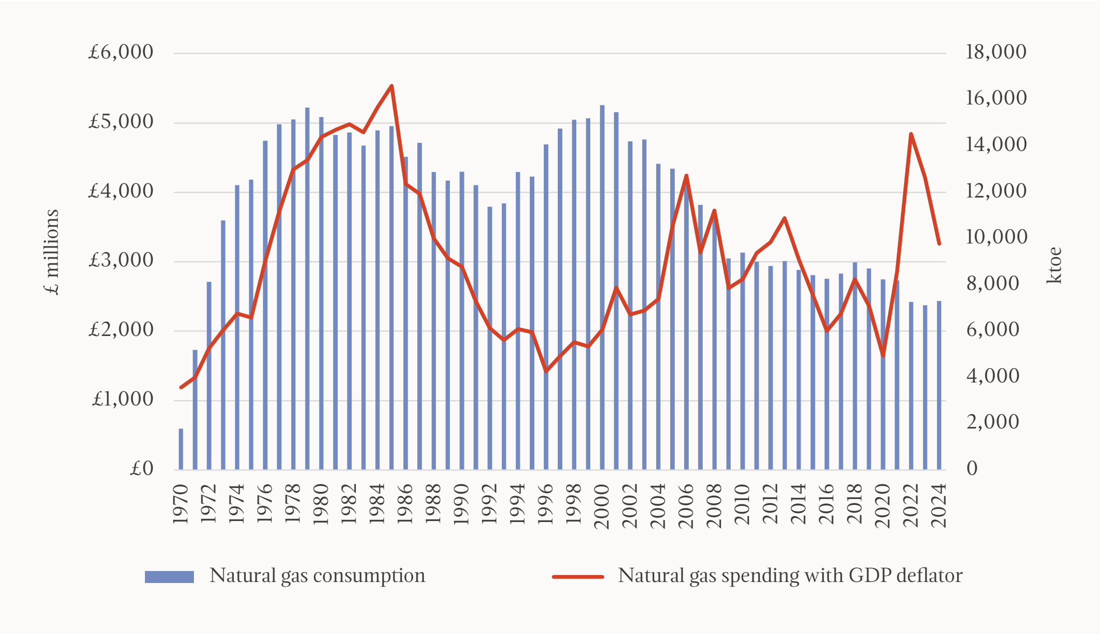


Source: DUKES 1.1.5 / DUKES 1.1.6

Throughout the twentieth and twenty-first centuries, British industry has gradually transitioned from relying on coal and oil to utilising natural gas and electricity. Natural gas usage has declined since the early twenty-first century, but overall costs of natural gas to industry have not followed suit (see Figure 9).

This makes the current energy crisis more alarming than the 1970s energy crisis. At that time, there was a significant increase in energy demand, which was abruptly halted by high prices. However, since 2004, British industry has been paying more for energy, despite a decrease in demand. A counterexample is China, where energy prices have remained relatively stable, despite enormous increases in demand.

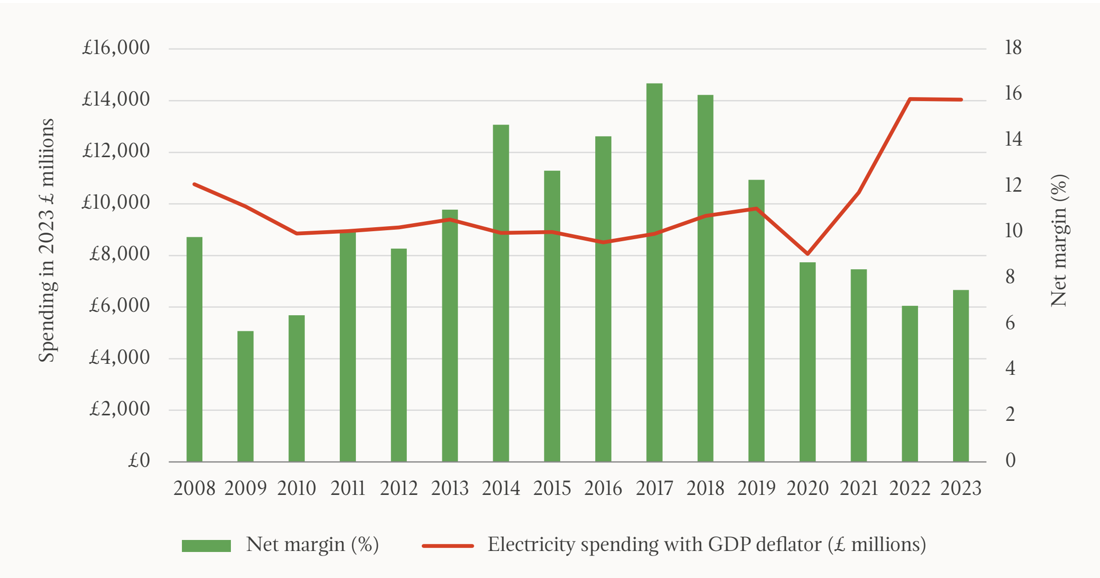
Figure 9: *Industrial natural gas consumption and expenditure.*



DUKES 1.1.6 / ECUK Final energy consumption by sector and fuel 2023 (ktoe)

According to Government figures, in 2023, the GVA of manufacturers was £211bn, while total industrial energy costs were £20bn, representing approximately 10% of the GVA. High energy costs, both direct and indirectly felt through the purchase of other raw materials, are impacting on the net profit margins of manufacturers, which are now at near-record lows (see Figure 10). Moreover, manufacturing profits have declined even as service net profit margins have remained relatively stable. While only one of many problems, the prohibitive cost of energy in Britain and Europe is having a definitively negative impact on industry, which is already struggling to compete.

Figure 10: *Manufacturing return and industrial electricity spending.*



Sources: DUKES 1.1.6; ONS, Profitability of UK companies time series[12]

| 12 Office for National Statistics, "Profitability of UK companies time series", 13 November 2024. (link)

The energy-intensive industries and the foundational industrial economy

It is worth outlining what is meant by the energy-intensive industries (EII) and what I have termed the 'foundational industrial economy' (FIE). The former is a government-defined collection of industries with high energy and trade intensity, which can be considered for climate-related exemptions. The FIE includes EII, but also the extractive industries like oil and gas. First, let us consider the EII sector.

The energy-intensive industries sector and its exemptions

In 2023, the EII sector employed 416,000 workers. In 2023, this sector totalled a turnover of £168bn and an estimated GVA of £36bn. The EII sector has been outlined so as to determine which industries should get exempted from certain-climate related subsidies and energy costs.

Whether a company can class itself as an EII is based on EU law—specifically "Communication from the Commission — Guidelines on State aid for environmental protection and energy 2014–2020 (2014/C 200/01)".[13] This 2014 framework outlines which industrial sectors may be assisted and allowed to avoid environmental costs without breaking EU state aid rules. For British companies, eligible sectors include those found to have a trade intensity of at least 4% and an electricity-intensity of at least 7%, meaning electricity is at least 7% of GVA. The formula for trade intensity is as follows: exports and imports divided by turnover and imports. In order to get exemptions, after meeting the sector test, businesses must pass a business level test, showing that electricity costs are 20% of their GVA. Only then can they receive exemptions.

The exemption scheme for EIIs is called the British Energy Supercharger Scheme, and includes not having to pay green levies such as CfD, ROCs, or feed-in tariffs (FiTs), being exempt from capacity market charges, and significant reductions on network charges. Recently, the Labour Government announced it would increase network charge reductions for eligible industries from 60% to 90%.[14] Overall, these exemptions save around £420m for EII businesses.

However, such exemptions should not be seen as a panacea. It is notable that they have gradually expanded in response to continually high British industrial electricity prices. With the help of exemptions, extra-large British users of electricity paid £121/MWh of electricity in 2024. Very large French industrial consumers paid £66/MWh in 2024, while for Sweden it was £53/MWh. For the whole EU it was £115/MWh. **This scheme at best brings eligible British producers in line with the EU average. But the EU average is far higher than in the US and East Asia, hence why the EU's industrial economy is also declining.**

The rigidity of the EII criteria, set initially by Brussels, also means only a relatively small proportion of industry will ever be eligible. According to the Government itself, the EII exemption scheme only covers 13.4 terawatt-hours of demand, meaning 16% of industrial electricity demand in 2024.[15] This just covers companies that meet the sector level test. When the business level test is ap-

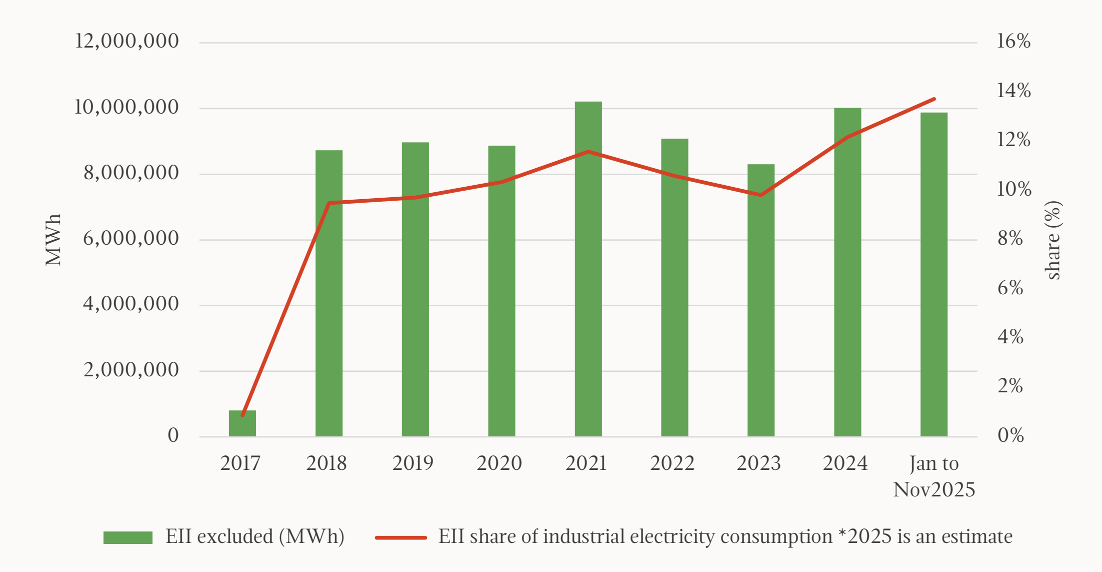
13 European Union, "Communication from the Commission — Guidelines on State aid for environmental protection and energy 2014–2020 (2014/C 200/01)", 28 June 2014. (link)

14 Simon Jack and Michael Sheils McNamee, "UK targets £420m at sky high industry energy bills", *BBC*, 31 October 2025. (link)

15 UK Impact Assessments, "The Energy-Intensive Industry Electricity Support Payments and Levy Regulations 2024", 22 January 2024. (link)

plied, the share of industrial electricity demand that is exempted is even smaller. **According to data from the Low Carbon Contracts Company, in 2024 only 10 TWh, or 12% of industrial demand, was exempt from paying CfD levies (see Figure 11).**

Figure 11: *EII-exempted electricity consumption from 2017 to November 2025.*



Source: Low Carbon Contracts Company, Actual Eligible Demand[16]

Besides probably being insufficient to do anything but limit decline, exemptions also create perverse incentives. Because of the business level test, a company that counts as an EII but is successful and only has an electricity intensity of 19% would not be eligible, but a laggard rival would be. British heavy industry, already suffering from years of decline, is being incentivised to be even more conservative.

The foundational industrial economy

The EII definition is set by the EU, but it is downstream of primary industries whose activity is also hampered by Net Zero. I propose expanding the definition and renaming it the 'foundational industrial economy' (FIE). The FIE includes the EII sector in its entire definition but also adds the entire British mining and quarrying industry.

The mining and quarrying sector in Britain made £41bn in turnover and £24bn in GVA in 2023.[17] Over three-quarters of revenue was related to the extraction of crude petroleum and natural gas, and in the North Sea, with most of the rest being related to quarrying for sand, stone, and gravel. Adding extractive activities to the EII sector amounts to a FIE that, in 2023, had 445,000 workers, turnovers of £202bn and a GVA of £57bn. This economy covers all petroleum extraction, mining, quarrying and heavy industry in Britain (see Figure 12).

The benefit of the FIE sector from a taxonomy point of view is that it includes the domestic production for all primary inputs into the energy-intensive sector. While a large amount of domestically produced petroleum is exported as opposed to being sent to domestic refineries, it still off-

16 Low Carbon Contracts Company, "Actual Eligible Demand", accessed 12 November 2025. (link)

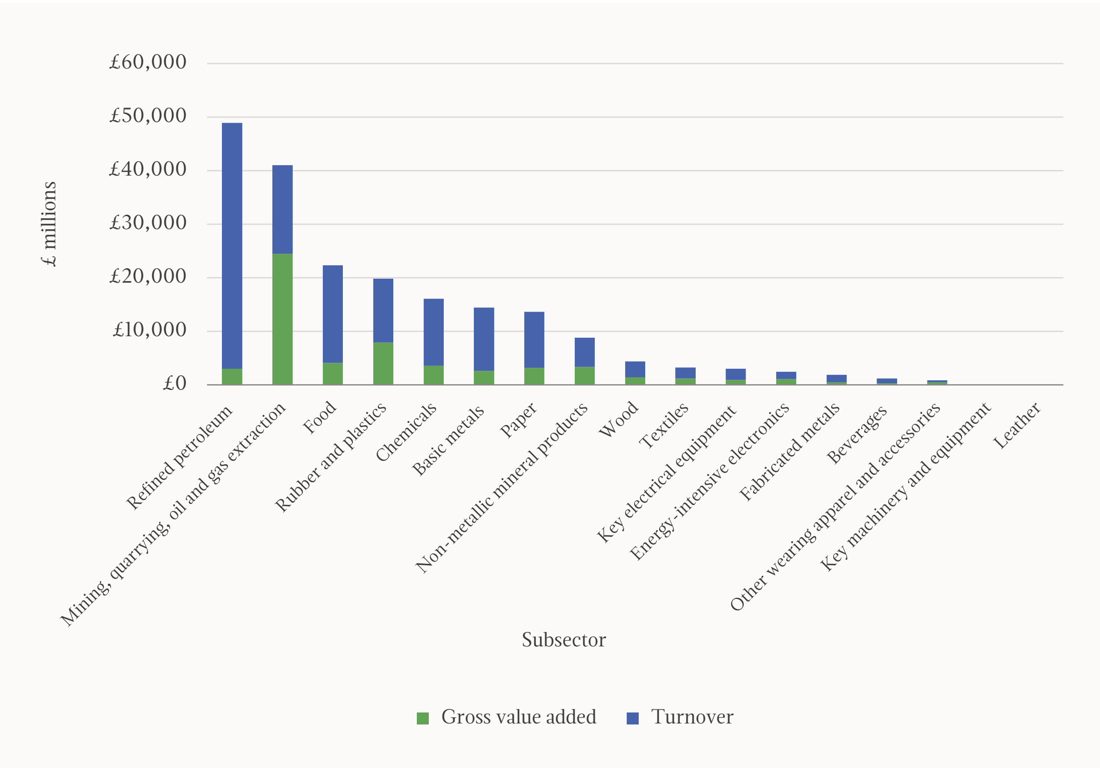
17 Mining and quarrying, as defined by the standard industrial classification (SIC) codes, includes oil and gas extraction.

sets the cost of imports and improves the trade balance, as well as maintaining high-paying jobs. The mining of aggregates is also a necessary step in the production of energy-intensive goods such as cement. **All these industries represent the foundation of our industrial capacity and would be essential in any national emergency.**

The FIE sector covers seventeen large industrial sectors which can be broken down into 73 smaller sectors. The seventeen sectors include:

- Basic metals
- Beverages
- Chemicals (including fertilisers)
- Energy-intensive electronics
- Fabricated metals
- Food
- Key electrical equipment
- Key machinery and equipment
- Leather
- Mining, quarrying, oil and gas extraction
- Non-metallic mineral products
- Other wearing apparel and accessories
- Paper
- Refined petroleum
- Rubber and plastics
- Textiles
- Wood

Figure 12: *The FIE by GVA and turnover in 2023.*



Source: ONS, 2024 Annual Business Survey.

These sectors are immediately at risk of significant declines due to Net Zero, either through high electricity prices, high carbon taxes, or the gradual curtailing of petroleum production. The FIE represents around a quarter of revenue and turnover for all manufacturing and extractive activities, and their decline has many potential knock-on effects for wider manufacturing.

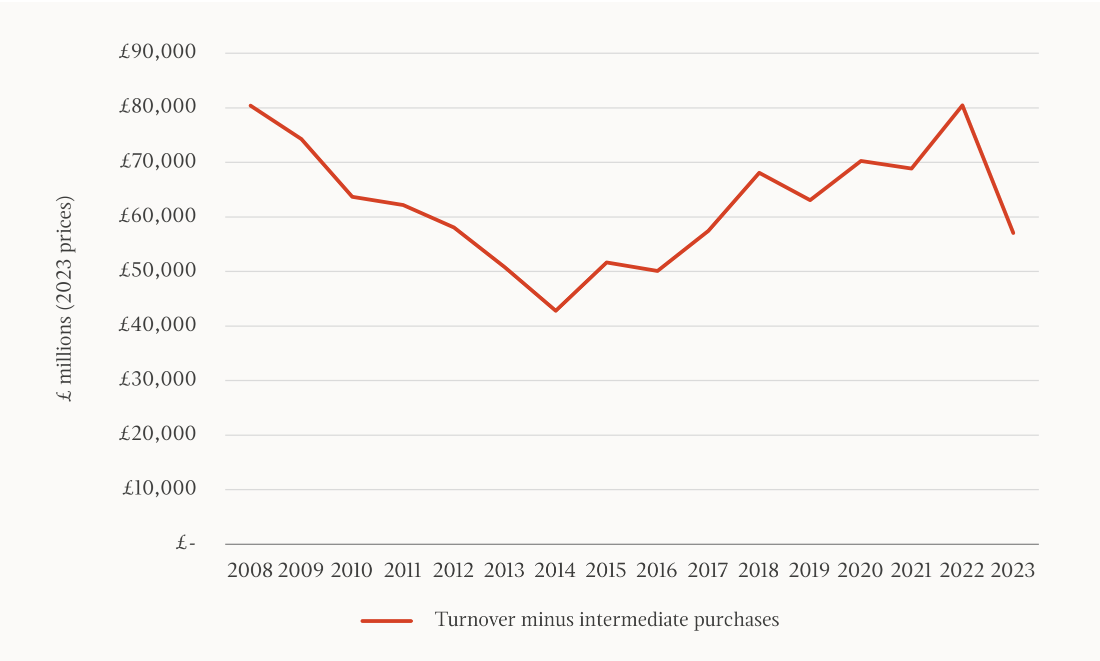
We can get a rough approximation of GVA for the FIE sector by relying on the Office for National

Statistics' (ONS) Annual Business Survey and applying double deflation. This entails taking turnover for the EII and FIE in current prices and adjusting them with the output producer price index (PPI). We then look at intermediate purchases and costs and adjust them using input PPIs. We then subtract the adjusted intermediate purchases from turnover to get an inflation-adjusted GVA estimate.[18]

As can be seen below, approximate GVA (simplified as turnover minus purchases of intermediate goods and services) for the FIE has declined since 2008 (see Figure 13). These figures are based on subtracting total purchases of goods and services from turnover via the ONS annual business survey**. In 2008, the FIE, including energy-intensive manufacturing, oil and gas extraction, mining and quarrying was worth £80bn to the economy in 2023 money. By 2023, the figure had fallen to £57bn. Energy intensive industries produced £43bn in GVA in 2009, but just £36bn in 2023.**

For context, in inflation adjusted terms, "green manufacturing" as defined in the Government definition of the LCREE (Low Carbon and Renewable Economy) has remained stagnant at turnovers between £17bn and £19bn between 2014 and 2023. This suggests GVA growth of around £1bn in green manufacturing over that period. This clearly then has not offset wider industrial decline, which is heavily due to the high costs of energy and reduction in oil and gas extraction.

Figure 13: *FIE Turnover minus total purchases using double deflation method.*



Source: ONS, 24 Annual business survey.[19] *ABS includes turnover and purchases of goods.*

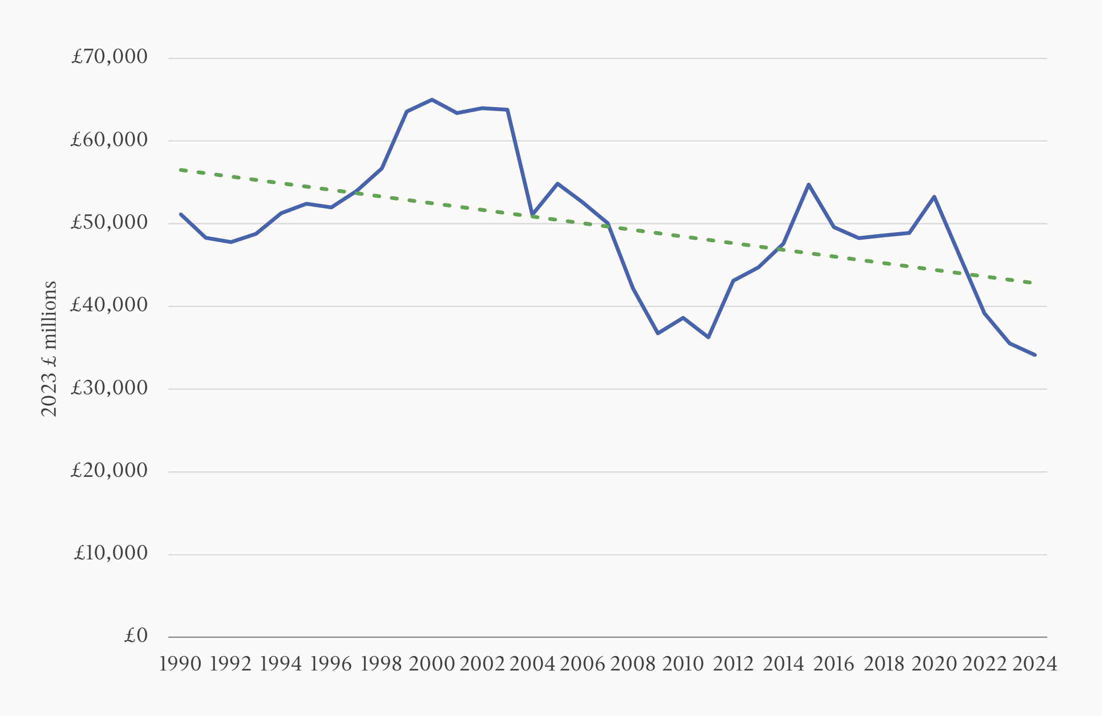
The ONS's own analysis of output for energy-intensive manufacturing tells a similar story. Accord-

18 Double deflation means that an industry's real value added is calculated as its real gross output less its real intermediate inputs, i.e. output and inputs must be deflated separately using appropriate deflators for each. The ONS has, since 2021, used double deflation to estimate real industrial GVA.

19 Methodology: The turnover and intermediate costs are derived from the 2024 ONS annual business survey and adjusted with the manufacturing output PPI index (2023 = 100). Intermediate costs are adjusted with input PPI data (2023 = 100). The intermediate costs are then subtracted from turnover to get real GVA.

ing to the ONS's own analysis, GVA from energy-intensive manufacturing was just over half what it was in 2000 (see Figure 14).

Figure 14: *Real GVA for energy-intensive manufacturing from 1990 to 2024.*



Source: ONS, The impact of higher energy costs on UK businesses: 2021-2024.

While these figures do not line up perfectly, we can see a consistent downward trend since the mid-2000s, with recent years seeing record lows. **We can estimate that, since 2000, close to £30bn (see Figure 14) in GVA has been lost from the contraction in EII and oil and gas extraction.** It is worth considering this loss in the context of the London economy. This is larger than the annual GVA for the capital's construction industry (£21bn), computer programming and consultancy industry (£20bn), advertising industry (£16bn), retail trade (£20bn), and its insurance and pensions industry (£13bn).[20]

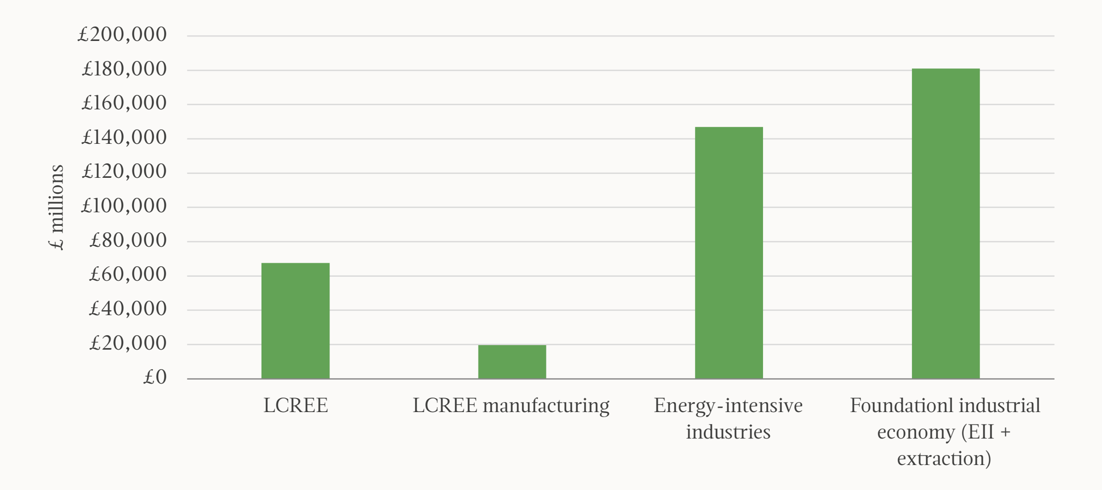
The FIE sector is significantly larger than the much-touted Net Zero economy, as outlined by the ONS Low Carbon and Renewable Energy Economy resource.[21] As of 2023, the LCREE has a turnover of £67bn, of which around £20bn is manufacturing turnover, with no published GVA estimates.[22]

20 These are 2023 GVA estimates sourced from the ONS's table: Regional gross value added (balanced) by industry: all International Territorial Level (ITL) regions.

21 Office for National Statistics, "Low carbon and renewable energy economy, UK: 2023", 9 July 2025. (link)

22 Office for National Statistics, "Low carbon and renewable energy economy, UK: 2023".

Figure 15: *LCREE versus EII and FIE turnover for 2023.*



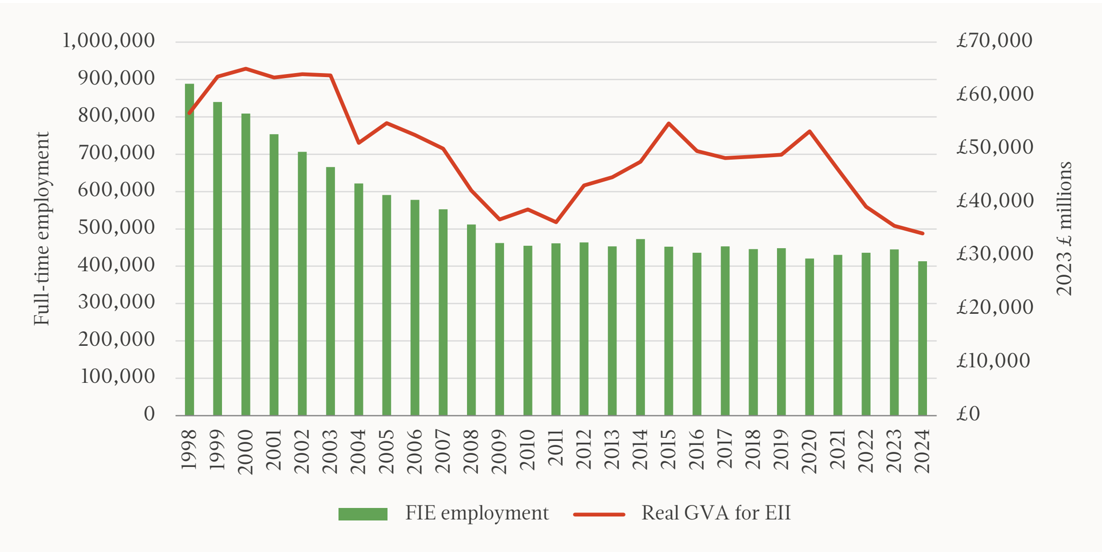
Sources: ONS, LCREE 2023 and ABS 2024.

The potential for significant job losses

The FIE has contracted significantly during the twenty-first century. From 1998 to 2008, employment fell from 880,000 to 511,000 (see Figure 17). Mining and quarrying employment fell 25% from 72,000 to 54,000. Employment for the manufacture of corrugated paper fell 45% to 23,000. Textile work like the manufacture of leather clothes fell 90%.

The sharp decline is down to a number of factors besides energy prices. The expansion of Chinese manufacturing activity shifted production eastward, especially in bulk chemicals, metals and textiles. Meanwhile, automation led to significant efficiencies. Energy prices began to rise from 2004 onward and accelerated job losses up to 2009. Since then, employment has fallen to under 413,500 in 2024. **So far, higher energy prices have been seen more in reduced GVA than in job losses.**

Figure 16: *FIE employment and real GVA for EII.*

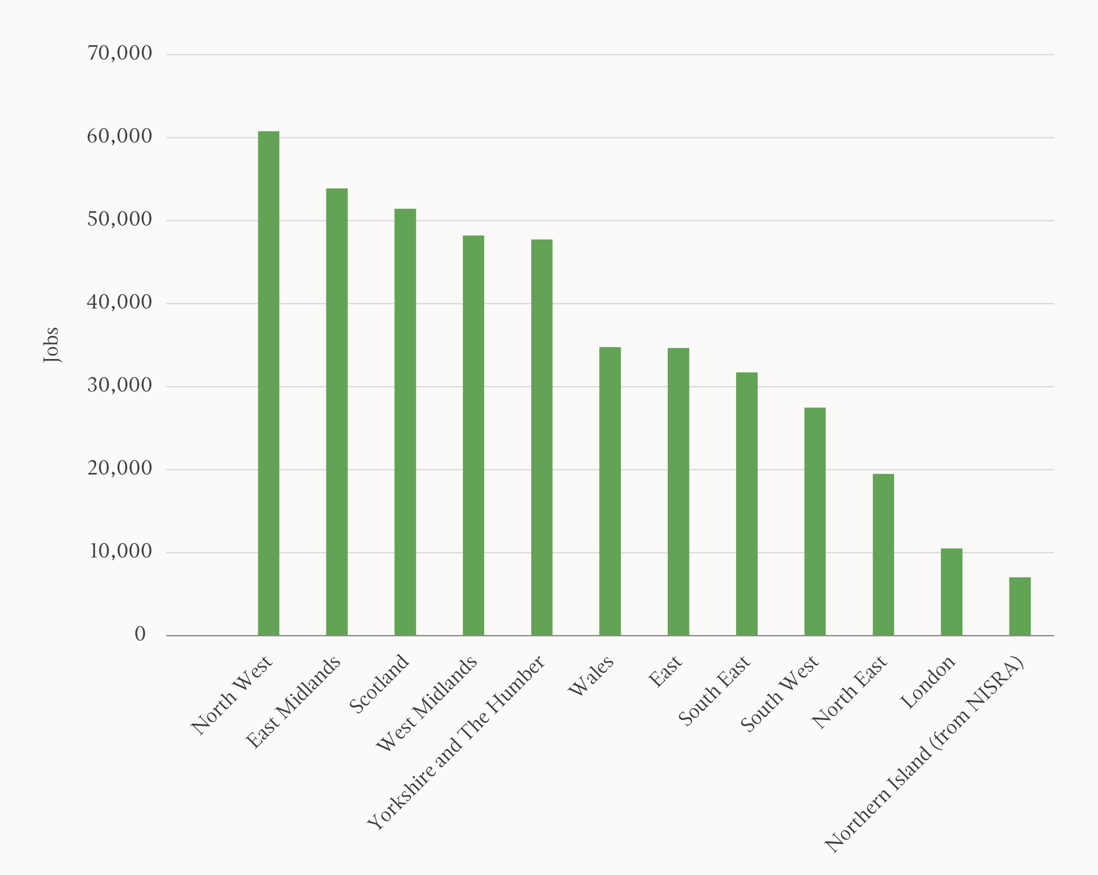


Sources: Various[23]

Declining GVA across chemicals, basic metal production and other sectors is likely to see investment dry up and firms exit Britain. INEOS, a major chemical producer, has said it will no longer invest in Britain due to high energy costs and a restrictive fiscal regime.[24] The remaining 25,000 jobs in the basic iron and steel industries remain only because of direct Government intervention, and many jobs are likely to be shed over the next five years regardless of how much protection the Government offers.

The impending destruction of the EIIs, which have already halved in output since 2000 and halved in employment since 1998, will be most harshly felt in the North and the Midlands. The North West and East midlands host the most FIE jobs, followed by Scotland and the West Midlands (see Figure 17). However, there are many vulnerable jobs in the South, with 66,000 EII jobs located in the South East, South West, and London (see Appendix 4 for maps of major industrial sites in various EIIs for a visual demonstration of this).

Figure 17: *FIE jobs by region in 2023.*



Source: Nomis and NISRA for Northern Ireland.

Based on data from Nomis, there were 445,000 FIE jobs in Great Britain in 2023, or 1.4% of employment. With a GVA of £57bn, they produced 2.5% of national GVA. **This makes the FIE sector**

23 For the FIE, employment data comes from Nomis. Data from 1998 to 2008 comes from the Annual Business Inquiry using standard industrial classifications from 2007. These do not map perfectly onto the modern definition of FIE, but it is relatively close. Real GVA comes from index analysis from the ONS from early 2025.

24 Bruce Beaubouef, "INEOS Energy ends UK and North Sea investment," *Offshore Magazine*, 10 September 2025. (link)

77% higher in terms of productivity per worker than the average job. Considering that these jobs are concentrated in otherwise poorer parts of the country, their contribution to regional prosperity is clearly disproportionate. If we take out FIE employment and GVA related to London, and just consider the non-London economy, FIE is 1.7% of employment and 3% of GVA.

China's dominance of nominally "green" industries like solar photovoltaics and batteries shows there is no great advantage to being a first mover in decarbonisation. The British renewable economy, at least in manufacturing, has stagnated since 2014, and we have no significant exporters in batteries, photovoltaics or wind power, not to mention drones or semiconductors. As of 2025, we still do not produce any battery-electric cars at significant volume.[25]

Decline in job numbers appears to be accelerating. Recent releases of 2024 employment show that FIE employment fell 8% from 2023 to 413,500 workers in 2024, shedding 31,000 jobs.[26] In one year, the number employed in manufacturing fibre cement declined 67%, the number of battery manufacturing workers declined 14%. The decline is expected to continue throughout 2025.

On our current course, British policymakers can continue to delude themselves that their setting of targets and raising of levies is global leadership, but we are becoming spectators to industrial development, and a consumer of someone else's modernity.

25 Rian Chad Whitton, "Replacing LCREE with the Foundational Industrial Economy (FIE)", 7 August 2025. (link)

26 NOMIS data on FIE for 2024 (link)

2. Sector analysis

Main points

- **The British chemical industry has suffered setbacks due to high electricity costs and arbitrary prices on natural gas.** This can be seen clearly in the ETS prices placed on Britain refineries. This partially explains the recent closures of two major refineries at Grangemouth and Lindsay.
- **The British steel sector has effectively gone bankrupt and has been nationalised.** The Government's plan has been to maintain one blast furnace but in the long term move to electric arc furnaces. With electricity prices at their current level, this makes steel production even less economical.
- **High energy prices do not just have a deleterious effect on established industrial sectors, but on new opportunities, including AI supercomputers.** While these are being built at enormous scale in energy-rich environments like the US, Britain is falling far behind.

This chapter delves deeper into individual industrial sectors and outlines their reliance on cheap energy. It provides case studies on energy costs for both the refinery and steel sectors.

Chemicals

Refineries and petrochemicals

Britain is home to four major operational oil refineries, with two closing down in 2025. Together, they have over one million barrels of oil per day in refining capacity and employ over 5,000 people. In 2023, petroleum refining had a combined turnover of £50bn and a GVA of £3bn.[27] They produce most of the fuel needed for transportation, including gasoline, diesel, jet fuel, fuel oil and heating oil.

Oil refineries also produce primary feedstocks for petrochemical production, such as naphtha and liquefied petroleum gas (LPG).[28] Another major source of primary feedstocks is natural gas liquids (NGLs), which are separated from raw natural gas at gas processing plants. These feedstocks, derived from both refineries and gas plants, contain ethane, propane, butane, and other key hydrocarbons essential for producing secondary feedstocks like olefins. The primary feedstocks are heated in steam crackers to produce olefin chemicals such as ethylene, propylene, butadiene, and isoprene. These bulk chemicals are then further processed into fine and speciality chemicals used across a wide range of industries, including plastics and synthetic fibres.

27 Office for National Statistics, "Annual Business Survey".

28 Feedstocks are hydrocarbons that have been refined from crude oil and methane and are cracked in a steam chamber to produce olefins. Olefins are chemically distinct hydrocarbons with carbon-carbon bonds, making them highly reactive and an excellent building block for more complex chemicals, including plastics and synthetic fibres.

Figure 18: *Key chemical feedstocks and olefins*

Category	Chemical	Description	Main use
Feedstock	Naphtha	Petroleum refining	Ethylene, propylene, butadiene
Feedstock	Gas Oil	Petroleum refining	Mix of olefins and aromatics
Feedstock	Methane	Sourced from natural gas	Ethylene and propylene
Feedstock	Butane	Natural gas liquid	Butylenes, butadiene
Feedstock	Propane	Natural gas liquid	Propylene, ethylene
Feedstock	Ethane	Natural gas liquid	Ethylene
Olefin	Ethylene (C2H4)	Smallest and most important olefin; colourless gas with a faint sweet odour.	Polyethylene (plastic bags, films), ethylene oxide (antifreeze), and PVC precursors.
Olefin	Propylene (C_3H_6)	Slightly heavier olefin; second most produced.	Polypropylene, acrylonitrile, and propylene oxide.
Olefin	Butadiene (C_4H_6)	A diene (two double bonds).	Synthetic rubbers for tires and plastics.
Olefin	Butylenes (C_4H_8)	Includes 1-butene, 2-butene, and isobutylene.	Gasoline blending, butyl rubber, and intermediates

The four remaining refineries are, Essar Stanlow (Northwest), Esso Fawley (Southampton), Phillips 66 Humber (Humberside), and Valero Pembroke (West Wales). In 2025, a refinery at Grangemouth (Scotland), owned by INEOS, stopped processing oil, while another refinery, Prax Lindsey, filed for insolvency.[29] Suffering from high energy costs, Prax's capacity will now be filled by imports of petroleum products. INEOS's ethylene and propylene production remains at Grangemouth, but rather than take ethane from the refinery, they are importing it from the US via specialised ethane carrier ships.

Besides olefins, refineries can also be connected to a specialist manufacturing complex to produce chemical products. At Fawley, liquid petroleum gas is sent to chemical plants to produce halobutyl rubber (used in pharmaceutical bottle stoppers), high-purity synthetic isoparaffin (used in pharmaceuticals), as well as methyl ethyl ketone (MEK) and secondary butyl alcohol (SBA), two chemicals used in solvents, coatings and adhesives. It is also used in the production of a special type of adhesive found in masks and respirators. Refineries, essential for fuel supply and security, also support thousands of jobs and billions of pounds downstream. If refineries go, chemical production is hampered.

One of the most alarming trends of the last few years has been the dismantling of Britain's olefin and ammonia industries. In 2020, there were three steam cracker plants producing olefins like ethylene, propylene and butadiene. These were based in Fife, Grangemouth, and Wilton on the Humber, and had a collective process capacity of 2.3 million tonnes per year. In 2025,

29 BBC, "Grangemouth refinery stops processing crude oil", 29 April 2025. (link)

Saudi state-owned chemical company SABIC closed its olefins cracker at Wilton. In November, Exxon confirmed it would close its cracker at Fife, leaving INEOS's Grangemouth cracker as the only remaining source of olefin production in Britain. The loss of capacity to produce olefins means further stages of petrochemical production rely on imports of olefins from elsewhere. **Sir Jim Ratcliffe, the CEO of INEOS, has suggested the entire British and European chemical industry could collapse in the next ten years due to high energy costs.** In 2025, INEOS cut 60 jobs at its acetyls plant in Hull.[30]

Case study: the cost of ETS on the refineries

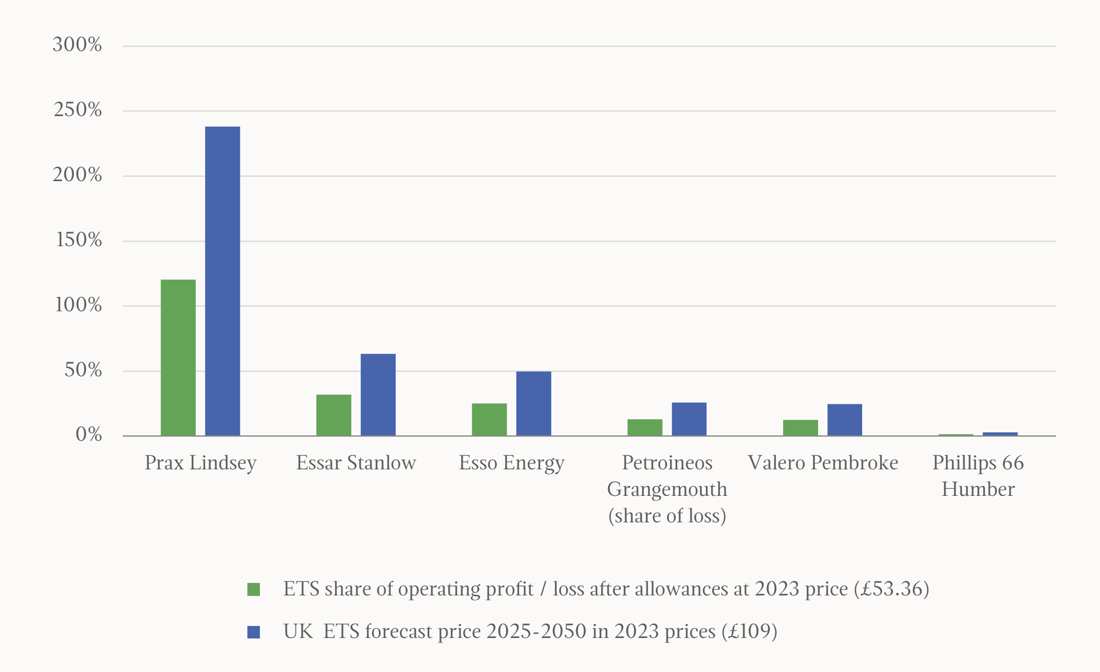
As discussed, refineries are critical to British industrial capacity, as they produce both fuel and petrochemical feedstocks. Most energy discussions relate to high electricity costs, but the most important input for refineries is gas, which emits carbon and is thus subject to the UK ETS. This is a cap and trade system which places a price on carbon per tonne emitted. This incentivises large emitters to be more energy-efficient. Governments do provide free allowances to essentially safeguard large emitters who cannot easily reduce their emissions, or are at risk of imports from other countries with little or no carbon tax. In this case study, I will show how high ETS costs are making British refinery operations increasingly uneconomical.

The vast majority of energy consumption at refineries is heating via methane combustion. As a result, its primary interest is the price of gas as opposed to electricity. Gas costs in Britain have historically been relatively low by European standards. However, they have been repeatedly forced up by lower domestic production, low storage, bad planning, external shocks, and the rising costs of carbon taxes, most significantly the ETS. While the Government provides free allowances for companies to avoid ETS costs, this is not enough to stop the tax eating into the generally low margins for refineries. **While many energy-intensive sectors like steel currently get enough allowances to stop them paying anything towards the ETS, refineries get relatively few allowances.** In 2023, the six major refineries emitted 11.3 million tonnes of carbon dioxide but only received allowances covering 60% of those emissions. Since they have no immediate path to decarbonisation, they are therefore highly exposed to the ETS tax.

As shown below (see Figure 19), for 2023, ETS costs have the potential to be enormously expensive relative to operating profits, even when accounting for free allowances. **In the case of Prax Lindsey, which announced closure in 2025, ETS costs in 2023 were estimated to be 120% of operating profit.** Compared to the US, British refineries suffer from higher natural gas costs, higher electricity costs and higher labour costs due to a relative shortage of workers. But, most importantly, US refineries, or those in India or the Gulf, bear no carbon costs. In 2024, over half of British refined petroleum products came from outside the European Union, with 48% coming from the United States, India, and the Gulf states.

30 Dominic O'Connell, "Collapse of chemicals sector will put 1m jobs at risk," *The Times*, 9 October 2025. (link)

Figure 19: *Estimate of ETS costs as a share of operating profit for major UK refineries in 2023 and future scenario with average UKETS forecast price from 2025-2050.*



Source: DESNZ. Operating profits sourced from Companies House. Methodology in Appendix 1.

The historical analysis from 2023 underplays the precarious position of refineries. Margins for 2023 in the European refinery sector were relatively high, according to TotalEnergies.[31] The next five years could very likely see far lower margins. So even if the ETS price remained flat and allowances remained fixed, current arrangements would likely see more refineries close.

The situation is likely to deteriorate yet further. Alarmingly, the UK ETS price is expected to be much larger in the future (see Figure 19). The Department for Energy Security & Net Zero currently estimates ETS prices up to 2050. From 2025 to 2050, the average yearly ETS price is projected to be £109, in proportion to 2023 prices. This is nearly twice the ETS price in 2023. The impact on refinery margins, were the ETS to reach this price, would be astounding. **ETS costs would on average be nearly 70% of operating profit.** This is assuming the share of free allowances will be maintained, but this is unlikely. The expected British linkage with the EU ETS, as part of the UK-EU Reset, would mean a reduction in available free allowances, including for refineries.[32]

The remaining four refineries face an existential crisis. Britain already imports a significant share of refined fuels and chemical feedstocks from abroad. In 2024, oil product imports were 55% of inland deliveries and 61% of refinery output, compared to 34% and 31% respectively in 2008.[33] In 2024, the UK trade deficit from petroleum products was worth £12bn, the highest in recorded history.[34] Importing refined fuels is more expensive than importing crude oil, making the destruction

31 "TotalEnergies' main indicators," *TotalEnergies*, 31 October 2025 (link)

32 For an overview of the negative impact of ETS and EU-alignment for broadly, see Emmanuel Igwe and Fred de Fossard, *A Road to Nowhere: Why the UK-EU Reset is Not the Answer* (London: Prosperity Institute, 2025)

33 Department for Energy Security and Net Zero, "Crude oil and petroleum: production, imports and exports", accessed 17 November 2025. (link)

34 Department for Energy Security and Net Zero, "Digest of UK Energy Statistics (DUKES): foreign trade statistics", accessed 12 November 2025. (link)

of the British refinery sector a serious concern for the balance of payments. See Appendix 4 for a map of British petroleum refinery locations and figures on what percentage of national capacity each contributes.

Ammonia production

One of the most dramatic collapses in British industrial capacity in recent years has been the shift from self-sufficiency in the production of ammonia in 2021, to having no capacity to produce ammonia at all, in 2025 and relying considerably more on ammonia imports as well as imports of fertilisers more generally. The main function of ammonia today is as the basic feedstock for nitrogen-based inorganic fertilisers used for agriculture. The chemical is into other products such as refrigeration, explosives and diesel exhaust fluid.

Ammonia is produced via the Haber-Bosch process, which involves splitting methane (natural gas) by heating it up to 850°C. This separates carbon dioxide from hydrogen. Hydrogen is then mixed with pure nitrogen filtered from an air-separation unit (air is about 78% nitrogen). The calculation is one part nitrogen for three parts hydrogen. It must be pressurised to 200 bars of pressure and heated to up to 500 °C in an ammonia cracker. It is subsequently cooled to -33 degrees °C, the temperature at which it liquifies into ammonia.

Ammonia is toxic, and so is converted into intermediates like nitric acid, urea, and ammonium sulphate. These are processed further into nitrogen-based fertiliser like ammonium nitrate and urea ammonium nitrate. These are the primary fertilisers used in British agriculture. In 2023, 871,000 tonnes of nitrogen fertiliser were used by British farmers, alongside 182,000 tonnes of potash fertiliser and 102,000 tonnes of phosphate fertiliser.[35] **In Britain, about 120 kilograms of nitrogen fertiliser are used on every arable hectare to produce over 20 million tonnes of cereals annually. Without it, British farming of cereals and vegetables would collapse.**

In 2021, Britain had three major ammonia plants totalling 1.3 million tonnes of annual gross capacity, making it largely self-sufficient in ammonia production. The US firm CF Industries operated plants at Ince in Chester (380,000 tonnes of annual capacity) and Billingham on Teesside (595,000 tonnes), meaning a combined capacity of 975,000 tonnes. Meanwhile, the Norwegian company Yara had an annual capacity of 300,000 tonnes at its plant in Hull. **But due to high natural gas prices between 2022 and 2023, the CF Industries ammonia-producing operations have been closed, leading to nearly 300 job losses[36] and Yara's plant is now mothballed.** CF Industries closed its Ince facility completely in 2022, while Billingham retains the capacity to produce 595,000 tonnes of ammonium nitrate and 410,000 tonnes of nitric acid annually.[37] This decline was caused by the economic shock of the Russia-Ukraine War, but it is also true that the company executives looked at the increasing carbon costs on gas over the next twenty years, and understood that their plants would not be viable.

From 2023 to 2024, the number of jobs in fertiliser production dropped 22% to 1,750.[38] As well as being dependent on ammonia imports, more than 90% of the UK's total ammonium nitrate and

35 Agricultural Industries Confederation, "Fertiliser consumption in the UK (Annual Summary)", 23 September 2024. (link)
36 John Storey, "Upgrade the UK's chemicals industry or risk thousands more jobs moving overseas", *TUC*, 3 September 2024. (link)
37 CF Industries, *Companies House*, 2025. (link)
38 SIC Code 20:15 at NOMIS (link)

urea ammonium nitrate supply is imported from the EU, and 40% of urea arrives from the EU. [39] The loss of ammonia production has also led to shortages in industrial carbon dioxide supply, which is essential in the food and drinks industries for carbonation and refrigeration. In 2021, 46% of industrial carbon dioxide came from domestic ammonia production.[40] Bioethanol plants can supply more carbon dioxide, but one of Britain's two plants closed in Hull in 2025, and the remaining bioethanol plant in Redcar is at risk of closure.

Basic metals

Steel production

There are three principal modern methods of making steel. All face major issues in Britain.

Option #1: BF-BOF

New steel can be created using pig iron via a blast furnace-basic oxygen furnace (BF-BOF) route. Iron ore, coke (a carbon-rich coal-based fuel), and limestone are placed in a blast furnace. The mixture is heated with hot oxygen, which creates carbon dioxide. This combines with the coke to produce carbon monoxide, which reduces the oxygen content of the iron ore. The limestone breaks down into calcium oxide, which combines with impurities in the iron ore, like silica, and forms a molten liquid called slag, which is drained off from the liquid iron. This is cooled into solid, brittle, carbon-rich iron ingots called pig iron.

These are placed in a basic oxygen furnace. Here, they are blasted with pure oxygen at high pressure. The carbon in the pig iron, along with impurities, is oxidised to form gases, as well as slag. This new steel is then treated with new elements to remove impurities and is combined with other metals to form alloys. About 89% of a BF-BOF's energy input comes from coal, 7% from electricity, 3% from natural gas and 1% from other gases and sources.[41]

Option #2: EAF

The second option is an electric arc furnace (EAF). Here, recycled scrap steel is placed in a furnace, where it is heated by graphite electrodes. A high voltage electric current is passed through the electrode, creating an electric arc that can reach temperatures of up to 1,800°C. EAFs are cheaper to build, less dirty than the BF-BOF process, and increasingly popular, but their emphasis on recycled steel has historically limited the range of products and qualities they can be used for. Over time, EAFs have improved their ability to manufacture higher-quality steel grades through selecting different qualities of scrap and adding other inputs. Their main drawback now is that they rely heavily on electricity. For an EAF, the energy composition is approximately 50% electricity, 11% coal and 39% gas.[42] If electricity is expensive, they are uneconomical.

Option #3: DRI

The third option, in conjunction with EAFs, is using direct reduced iron (DRI) furnaces, which com-

39 Department for Environment, Food and Rural Affairs, "United Kingdom Food Security Report 2021: Theme 2: UK Food Supply Sources", 22 October 2024. (link)

40 Mission Zero, "CO2 shortages: Why are we running out of CO_2 and how can we fix it?", 25 April 2025. (link)

41 World Steel Association, "Energy use in the steel industry", April 2021. (link)

42 House of Lords Economic Affairs Select Committee, *The Economics of UK Energy Policy Inquiry*, September 2016, written evidence, UEM005. (link)

bine iron ore, hydrogen, methane and carbon monoxide to reduce carbon content and create sponge iron, which is then mixed with scrap metal in electric arc furnaces.[43] In a DRI process, iron ore pellets are fed into a reactor. Here, they are reduced by a synthetic gas created by mixing natural gas with high-temperature steam. This produces hydrogen, which reduces the oxygen content of the iron ore, creating sponge iron. Blending DRI with scrap steel can improve the steel quality produced by EAFs. Where scrap supply is poor or non-existent, local DRI plants can provide a substitute feedstock.

Currently, over 90% of DRI is produced using natural gas, and coal can also be used as a reducing agent. As a byproduct of this process. carbon dioxide is released, but it does not play an essential role in the process. To reduce carbon emissions, attempts have been made to replace natural gas with pure hydrogen as the primary reducing agent. But this requires hydrogen to be produced first, and is likely to be considerably more expensive than the BF-BOF or EAF route.

Currently, Britain has no DRI infrastructure. In 2024, 80% of British steel was produced from two BF-BOFs, versus 20% for EAFs.[44] This is going to change as Tata Steel's Port Talbot blast furnace was closed in 2024, and British Steel's Scunthorpe furnace was taken over by the Government in 2025. EAFs can indeed produce the highest quality grades of steel, but with greater complications, and there remain a handful of grades that they are unable to make. Though there is significant regional variation, the BF-BOF route is, on average, the cheapest per tonne.[45]

Case study: BF-BOF and EAF cost breakdown

Basic iron and steelmaking, according to the ONS, is the most energy-intensive manufacturing activity, with energy purchases being 79% of GVA.[46] As the Government is planning to shift production from blast furnaces to electric arc furnaces, it is worth considering how differing energy prices impact the overall cost of energy for differing operations.

According to the World Steel Association, a BF-BOF steel furnace's energy consumption to produce a tonne of steel is 89% coal, 7% electricity, and 4% natural gas and other fuels. For an EAF, it is on average 11% coal, 50% electricity, 39% natural gas, and other fuels (see Figure 21).[47] Based on 2024 data, for a very large industrial user: coal was £20/MWh, gas was £38/MWh, and electricity was £121/MWh, making electricity 3 to 5 times more expensive than other inputs.[48] Since steel operations are usually extra-large customers with considerable discounts in place, these are likely the most accurate available figures for a hypothetical steel operation in Britain. Based on the energy shares, the cost per MWh for the BF-BOF is far cheaper than for an EAF.

43 Sponge iron is the result of the DRI process. It is iron ore that has been stripped of oxygen without being melted, and so has a porous, sponge-like structure.

44 World Steel Association, "World Steel in Figures 2024". (link)

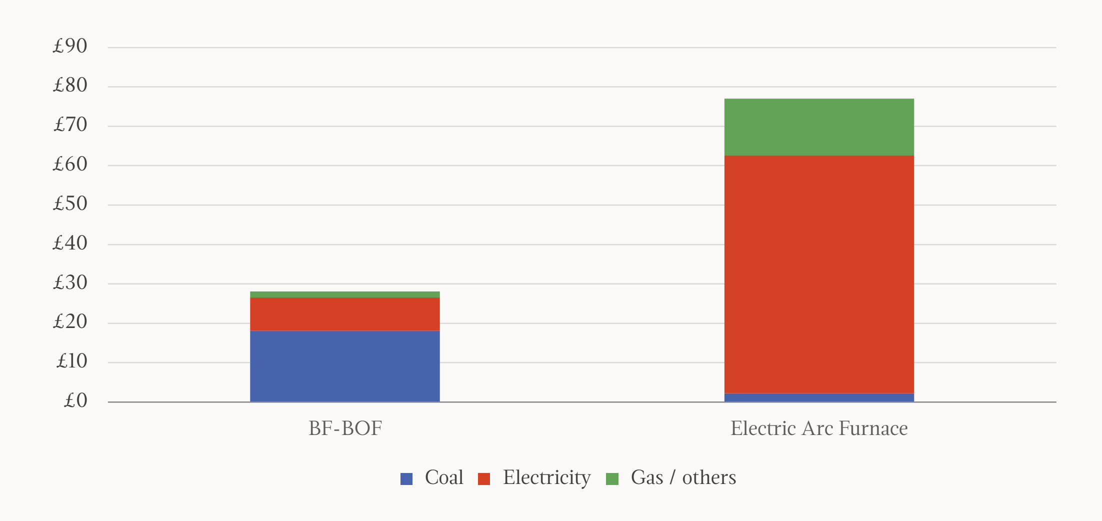
45 Max de Boer, Grace Frascati, Mimi Khawsam-ang, Hassan Riaz, Hyae Ryung Kim, and Gernot Wagner, "Decarbonizing Steel", *Columbia Business School*, 17 October 2024. (link)

46 This is based on the 2019 ONS ABS, so it could be subject to fluctuations. It is likely that, due to higher energy costs, the energy intensity of respective industries is now considerably higher than outlined in 2019.

47 World Steel Association, "Energy use in the steel industry".

48 Department for Energy Security and Net Zero, "Prices of fuels purchased by manufacturing industry", accessed 12 November 2025. (link)

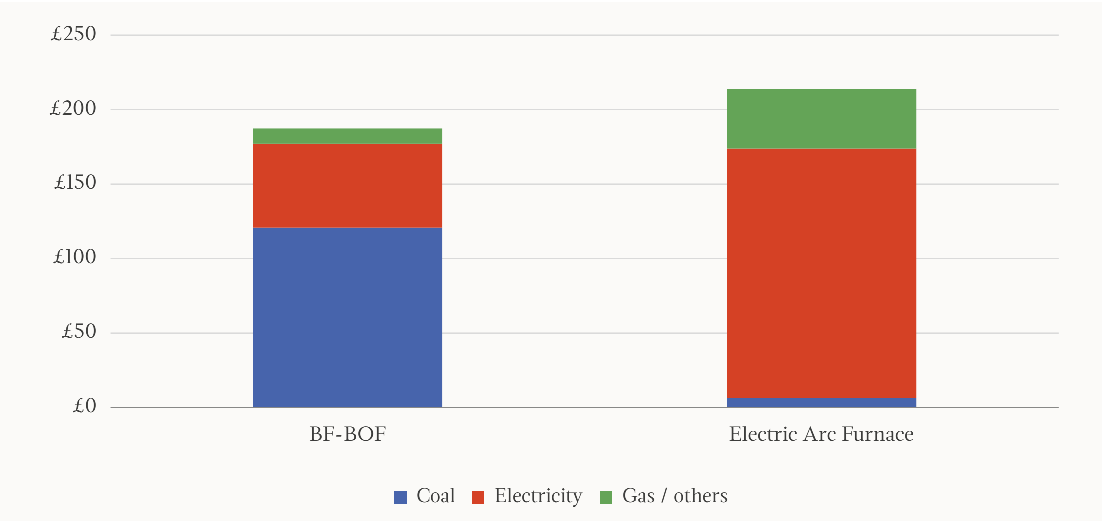
Figure 20: *Cost per MWh for BF-BOF and EAF.*



Sources: Based on the World Steel Association, DESNZ fuel prices for manufacturers, and "Decarbonizing Steel".

Because coal is far less energy efficient than electricity, a BF-BOF has an energy intensity of 6.7 MWh per tonne of steel versus 2.4 MWh per tonne for an EAF.[49] Therefore, the energy cost to produce a tonne of steel is £187 for a BF-BOF, and £214 for an EAF (see Figure 22). This is consistent with similar assessments from Columbia Business School.[50] Assuming both EAF and BF-BOF operations have an energy intensity of 79%, then electricity is 24% of GVA for a BF-BOF or 62% of GVA for an EAF. **Even for a BF-BOF operation then, electricity prices are of huge importance.**

Figure 21: *Energy cost per tonne of steel in £*



Sources: Based on World Steel Association, DESNZ fuel prices for manufacturers, and Columbia Business School.

As can be seen, the key determinant in making EAFs preferable to BF-BOF plants is cheap, abundant electricity. This explains the popularity of EAFs in the United States, which is helped by low

49 de Boer et al. "Decarbonizing Steel".
50 de Boer et al. "Decarbonizing Steel".

electricity prices. In the U.S., 70% of steel is produced in EAFs.[51]

Even if EAFs could be run more cheaply, there are still reasons for keeping BF-BOFs. EAFs can produce most but not all grades of high-grade steel and iron. Currently, British Steel's Scunthorpe blast furnace is still needed for the production of high-quality billet iron that is used in sensitive military applications.[52] Around 10,000 tonnes of billet iron is produced at Scunthorpe, a tiny fraction of overall output. But it is currently very difficult to source it from EAFs due to high purity demands. These niche iron grades, plus the cheaper price of steel, mean BF-BOFs are not a redundant technology. Indeed, it is still comfortably the most popular method of steel making worldwide and is not going to decline dramatically any time soon.

Net Zero, then, has jumped the gun. It has sought to force a speedy electrification without providing the foundation of cheap electricity. Currently, regardless of method, steelmaking in Britain is not economical. **Moving from BF-BOFs to nominally green EAFs is pointless if prices are so high. This is shown by the fact the Government did not let British Steel Scunthorpe, the last major blast furnace, cease operations in 2025. If steel decarbonisation was inevitable and desirable, why would it be necessary to bailout the one remaining blast furnace?**

The truth is the Government's policy on steel is incoherent. On the one hand we have placed carbon taxes and levies on industry to pay for Net Zero and have reactively provided exemptions for steel producers. We have asked producers to move towards electric arc furnaces and have offered generous grants, but we still need a blast furnace, as evidenced by the de facto nationalisation of British Steel Scunthorpe. Rather than prioritise production volume and cheap energy for producers, we have flip-flopped between imposing costs on them, offering them huge subsidies, and bailing them out when they fail.

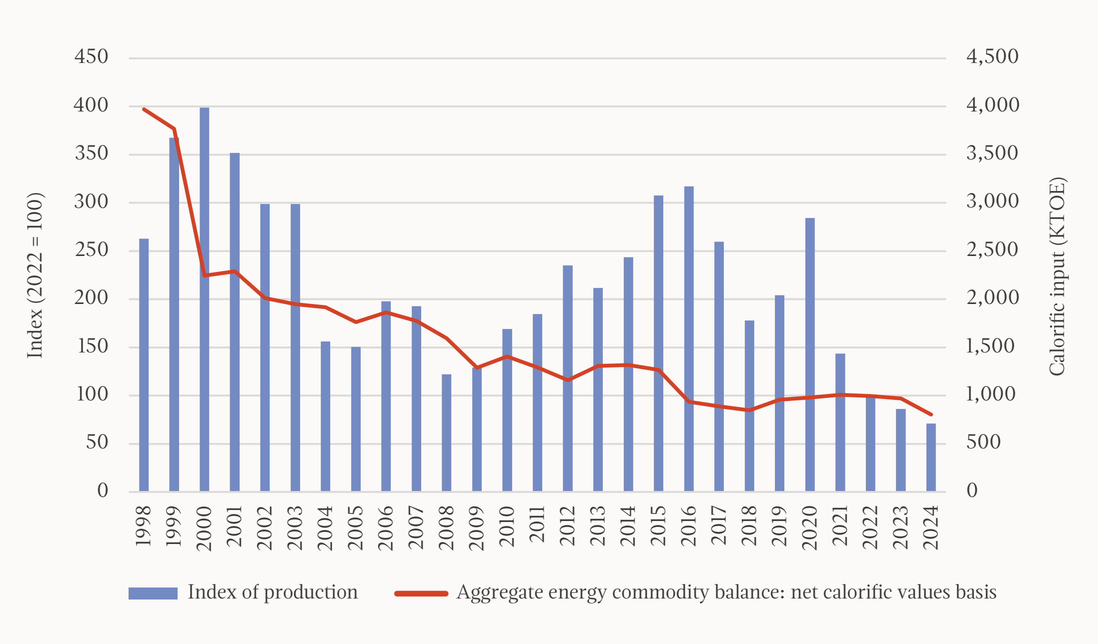
British steel today

At its peak in 1970, the British steel industry employed over 300,000 people and produced 28.3 million tonnes of steel, placing it fifth in the world behind the USSR, the US, Japan and West Germany.[53] Much of the decline had already happened by 1980 as annual production fell to 15 million tonnes. From that period, it was stable for decades, with over 12 million in 2013. However, by 2021 production was just 7.2 million tonnes, with 33,000 employed throughout the entire supply chain. By 2024the figure was 4 million tonnes.[54]

Today, Britain is the 26th largest producer globally, behind Italy, Spain, Austria, Saudi Arabia, Egypt, Poland, and Belgium. **Even in the UK's broader context of de-industrialisation, the steel industry's performance has been particularly abysmal.** In real terms, it has declined by over 50% over the last thirty years, even as broader manufacturing output has remained stagnant. Measured by the industrial production index, the iron and steel industry in 2023 is less than 25% of what it was in 2000.

51 World Steel Association, "World Steel in Figures 2024".
52 Blyth Metals Limited, "High Purity Billet Iron", accessed 12 November 2025. (link)
53 Chris Rhodes, "UK Steel: Decades of decline." *Commons Library*, 18 December 2017. (link)
54 ISSB, "UK steel industry's 2024 production dramatically declines." *ISSB*, accessed 12 November 2025. (link)

Figure 22: *Basic iron and steel energy consumption and output index.*



Sources: DUKES Table I:1, Aggregate energy commodity balance: net values basis; ONS, Index of Production time series.

At present, in 2025, the British steel industry has two major blast furnace facilities: Scunthorpe (previously owned by British Steel and now controlled by the Government) and Port Talbot (owned by Tata), with a combined capacity of 7.5 million tonnes per annum. There are four major EAFs. These include two sites in Sheffield, one in Rotherham and another in Cardiff.

Tata Steel closed its two blast furnaces in late 2024 and is building a single large EAF with a capacity of 3 million tonnes, leading to about 2,000 jobs being lost. Tata's EAF replacement is only happening due to Government support. Of the £1.25bn needed to build Port Talbot's EAF, Tata is spending £750m, and the Government is providing £500m. If electricity prices remain high in Britain, these new furnaces are unlikely to be profitable in the long term, as the energy intensity of basic steelmaking is 79%.[55]

British Steel's Scunthorpe plant fared worse. In April 2025, following failed negotiations on funding new EAFs, British Steel said it would close down the remaining blast furnaces at the Scunthorpe plant, ending Britain's ability to make steel from scratch. The Government hastily took effective control of the plant, even buying new supplies of coking coal to keep the plant running. It is not clear yet whether the plant will be permanently nationalised.

In August 2025, the Government also took effective control of the Speciality Steel electric arc furnace plant in Rotherham, after Liberty Steel was forced to declare insolvency. Therefore, of the three largest primary steel production sites, the Government directly controls two, and the other is operating purely because of a £500 million handout.

55 Office for National Statistics, "Business energy spending: experimental measures from the Office for National Statistics' business surveys." 7 September 2022. (link)

There are three other central primary steel furnaces in the country: Celsa Steel in Cardiff, Marcegaglia and Sheffield Forgemasters in Sheffield. In addition to these significant sites, there are dozens of smaller facilities. These arc furnaces depend on cheap electricity to be competitive. They are shielded by Government exemptions, but remain financially precarious and reliant on Government business. Sheffield Forgemasters itself was bought by the Ministry of Defence in 2021.

Aluminium and non-ferrous metals

While iron and steel products represent the bulk of British and global metal production, non-ferrous metal production remains a significant primary metals industry, with a turnover of £4.5bn in 2023. Aluminium is the most important, with a £1.5bn turnover. It is resistant to corrosion and has a high strength-to-weight ratio, making it a critical material for aircraft, cars, packaging, and construction.

The manufacture of primary aluminium consists of three steps: bauxite mining, alumina production, and electrolysis. Bauxite is a clay-like mineral rich in aluminium oxide (alumina), but it contains many impurities that must be removed. Four tonnes of bauxite are needed to produce two tonnes of alumina, which in turn produces one tonne of aluminium. Aluminium is formed at about 900°C in carbon-lined electrolysis pots, where an electric current passes through cryolite and molten alumina to make the molten metal, which is then further refined into fabricated products.

Once formed, aluminium's melting point is only 660°C, making recycling much easier and more cost-effective than production. Aluminium is often referred to as 'congealed electricity' due to its high electricity costs. While the energy intensity per tonne of steel is between 3 and 7 MWh per tonne, for aluminium it is around 16 MWh.[56] Other materials can be even more energy intensive. For example, graphite production can range from 10 to 21 MWh per tonne, while nickel can range from 38 MWh to 131 MWh per tonne (see Appendix 3).

British aluminium production has declined significantly in recent years, falling from a GVA of £474m in 2008 to £146m in 2020.[57] In 2009, the country had a cumulative capacity of over 300,000 tonnes per annum. Since then, a major plant at Anglesey in Wales was closed leading to 400 job losses, and in 2012, the aluminium smelter at Lynemouth in Northumbria ceased production, eventually closing in 2018, putting over 500 out of work.[58] **The only remaining aluminium smelter is in Lochaber, Scotland, and owned by Sanjeev Gupta's GFG Alliance. It has an annual capacity of just under 50,000 tonnes, which is around a quarter of domestic annual consumption. It has been insulated from high electricity prices because it receives power from a local hydroelectric plant. Were it powered more conventionally, it would almost certainly not be viable.** The Anglesey aluminium plant in Wales was successful for decades because it enjoyed a long-term contract with the local Wylfa nuclear power station. When the contract ended in 2009, the Anglesey plant promptly shut down.[59]

Forges and foundries

Another significant area for the metal industry, downstream of basic steel and metal production,

56 Martin Schichtel, "Tackling emissions in aluminium production." *Kraft Block,* 9 October 2024. (link)

57 ONS, 2024 Annual Business Survey.

58 BBC, "Hundreds of jobs lost as Alcan Lynemouth smelter closes", 6 March 2012. (link)

59 BBC, "Power deal threat to metal plant", 15 January 2009. (link)

is the forging and casting process. Once steel, aluminium, or other metals are created in their primary form, they are refined into fabricated metal products.

After liquid steel is produced, it undergoes refining. It can be turned into structural steel or tool steel. Chromium, nickel and molybdenum can be added to make corrosion-resistant stainless steel. Other metals can be added to make steel alloys. The metal then goes into the continuous casting stage, where it solidifies into semi-finished shapes such as slabs, billets, or blooms. These are then rolled into final products like coils, plates, rods, tubes, sections, and wire. Hot-rolling is used to make more malleable products like wire, while smooth, strong steel products are rolled at cold temperatures.

Foundries are places where molten steel and alloys are poured into moulds, such as the site of Goodwin PLC a major producer of castings based in Stoke. Materials such as wood are processed to make patterns. Sand, often mixed with resin, is formed around the pattern to make a mould. Metal, usually steel alloys, is melted in either an induction furnace or an EAF and then poured into the moulds. The subsequent metal cast is treated with grinding and finishing tools and is ready for use.

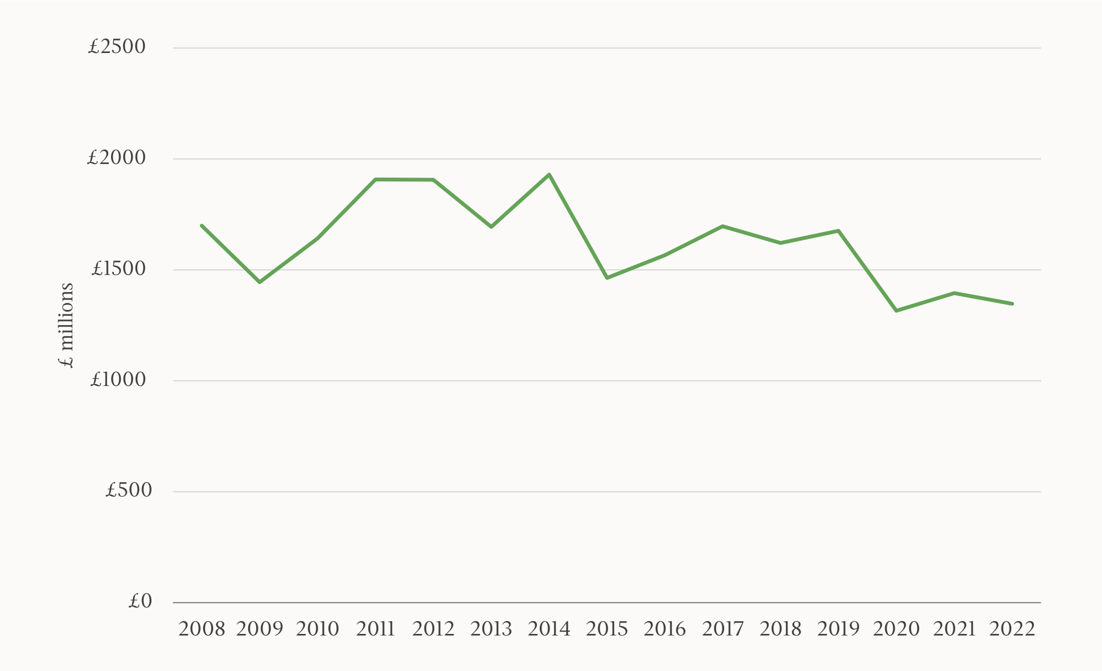
Large ingots, up to hundreds of tonnes, can be cast. These are then sent to a forge where they are shaped by a forge press, or can be passed through an extrusion press. These presses must exert extreme forces on the ingot to refine the grain structure and reduce porosity. The higher the requirements, the more force must be exerted. Britain's Sheffield Forgemasters operates one of the few large forge presses capable of producing ultra-heavy forgings, such as components for nuclear reactor pressure vessels. It has recently acquired a forge press from Japan that weighs 8,000 tonnes and can exert 13,000 tonnes of force.[60] Outside Britain, there are even larger forge presses of up to 80,000 tonnes.[61] These are needed to create the highest-strength components used in the aerospace industry.

After casting and forging, fabricated metal components are cut by machine tools in machining shops. Some steel companies, like Goodwin PLC, own dozens of milling machines and computer numerical control (CNC) machines, supplied primarily by Japanese, South Korean, and European vendors. These components are then processed, integrated and assembled by larger manufacturers to become finished products. The size of the forging and casting industry has declined since 2008 in real terms. **While notable closures have been limited, employment has fallen from 33,000 in 2015 to 26,000 in 2023.**

60 Sheffield Forgemaster, "Forge project at Sheffield Forgemasters enters second phase", 30 May 2024. (link)

61 Rian Chad Whitton, "Start the Presses." *Doctor Syn*, 13 August 2023. (link)

Figure 23: *Real GVA for forging and casting of metals.*



Source: ONS, 2024 Annual Business Survey, SIC codes 24.5 and 25.5. Adjusted using double deflation.

Inorganics

Cement

Cement production contributes nearly £1bn in turnover, and contributes indirectly to the concrete industry, which has turnovers of £7bn.[62] **Cement is the essential binding ingredient in concrete, which is the second most consumed substance in the world after water.**[63] Concrete, indispensable to all construction activities, is a mix of roughly 10% cement, 15% water, and 75% aggregates like sand, gravel and crushed rock.[64] Cement is made by grinding raw materials like limestone and clay into fine powder, then heating them in a kiln to temperatures up to 1,450°C. The resulting 'clinker' is then ground into a cement mill and combined with gypsum, which increases the setting time of the mixture.[65]

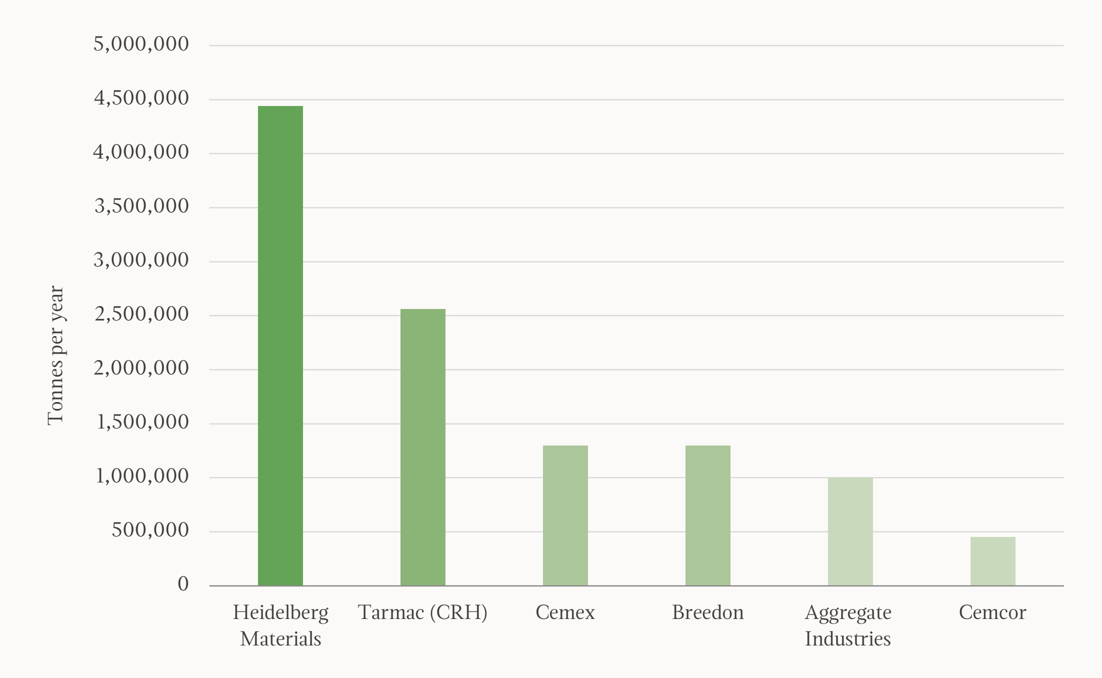
Cement is also used as a binder for mortar, a material used for bricklaying, plastering and tiling. In this case, the cement is mixed with finer sand aggregates and is usually 20% of the final mixture.[66] Cement is also used in the production of cement plaster, which is often used for interior and exterior walls. In Britain today, 20 cement plants supply 817 ready-mix concrete plants, 192 precast concrete plants, and 83 mortar plants.[67]

Britain's cement industry is split between six major producers across fifteen significant sites, with twelve outside of London. The key producers include Breedon, Cemcor, Cemex, Heidelberg

62 ONS, 2024 Annual Business Survey.
63 World Cement Association, "Cement Facts", accessed 12 November 2025. (link)
64 Mineral Products Association, "Profile of the UK Mineral Products Industry", *Mineral Products Association*, 2023. (link)
65 Marlene Gasdia, "The Cement Manufacturing Process", *Thermo Fisher Scientific*, 20 December 2023. (link)
66 "A Guide to Mortar Mix Ratios & Cement Mixing." *Beesley & Fildes*", accessed 12 November 2025. (link)
67 Mineral Products Association, "Profile of the UK Mineral Products Industry".

Materials, Aggregate Industries, and Tarmac, a subsidiary of the Irish building materials conglomerate CRH. Currently, there are 11 million tonnes of annual clinker capacity, with 40% controlled by Heidelberg Materials (see Figure 24). The manufacture of cement employs 1,250 as of 2023.[68]

Figure 24: *Cement 2024 capacity by company.*



Source: Research based on map resources provided by MPA Cement, a subsidiary of the Mineral Products Association.

Britain's cement industry has declined markedly over the twenty-first century. Production fell from 11 million tonnes in 2001 to 7.6 million tonnes in 2023, while imports rose from 1.5 million tonnes to 3.6 million tonnes (see Figure 25).[69] After confirming in 2025 that cement production was at its lowest level since the 1950s, the Mineral Products Association cited energy costs alongside regulatory blockages as a major cause of decline.[70] During the twenty-first century, seven cement clinker plants closed, while just two have opened.[71] Up to 2008, Britain had a positive trade balance of concrete products, a major derivative of cement, but it has since become a major importer.[72] According to the ONS, the cement industry's energy costs represent 12% of GVA, making it vulnerable to price shocks.

68 NOMIS (link)

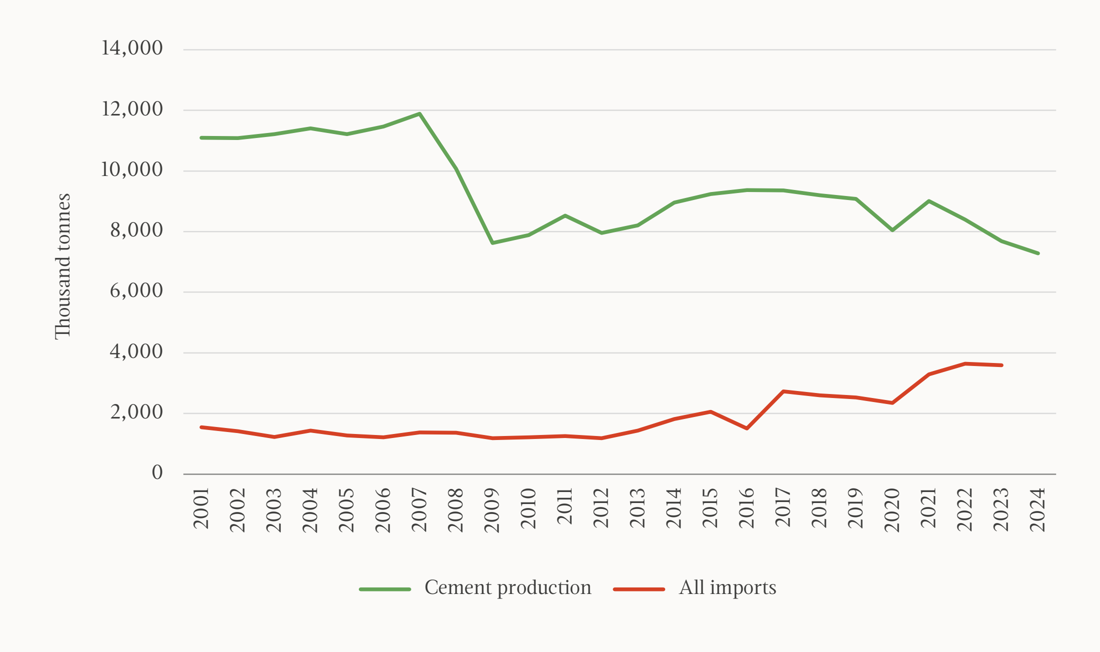
69 Mineral Products Association, "Annual Cementitious Production", *Mineral Products Association*, accessed 12 November 2025. (link)

70 Mineral Products Association, "Government buildings plan at risk as UK cement production falls to 75-year low", 3 September 2025. (link)

71 Dylan Moore, "List of Plants", *Cement Kilns*, accessed 12 November 2025. (link)

72 Mineral Products Association, "Profile of the UK Mineral Products Industry".

Figure 25: *Domestic cement production and imported cement sales.*



Source: Mineral Products Association

Lower domestic production capacity and higher reliance on imports is linked with rising input costs. Cement is counted in a broad category of metals and non-organic mineral products when assessing PPI rises. These input costs, including for cement, have risen 74% between 2015 and 2024.[73] In 2024, despite the worst of the energy crisis being over, the cost of cement for building purposes rose 0.1% from 2023, while derivative products like ready-mixed concrete and pre-cast concrete products rose 5%.[74] Comparing building material costs with the Consumer Prices Index material cost inflation was 15% higher than general inflation from 2015 to 2024.

In summary, Britain's declining cement capacity due to high energy prices is translating into higher building material costs, which are outstripping general inflation and making it much harder to build, in a country which already desperately struggles to construct adequate amounts of housing and to deliver infrastructure projects effectively. See Appendix 4 for a map of major British cement kilns and figures on their contribution to overall capacity.

Ceramics and refractories

Ceramics are materials made by shaping and then heating natural substances like clay, minerals, or powders to very high temperatures. They have many valuable properties, such as low conductivity, making them excellent for insulation. They also are resistant to oxidisation and corrosion and have high-melting points. They also retain their structure without deforming. Because of this, ceramic products can range between mundane bricks and tiles to the coatings for blades in Rolls-Royce aircraft engines.

Refractories are ceramic products designed to withstand very high temperatures. As an example, refractory material will be used to line the internal segment of blast and electric arc furnaces to

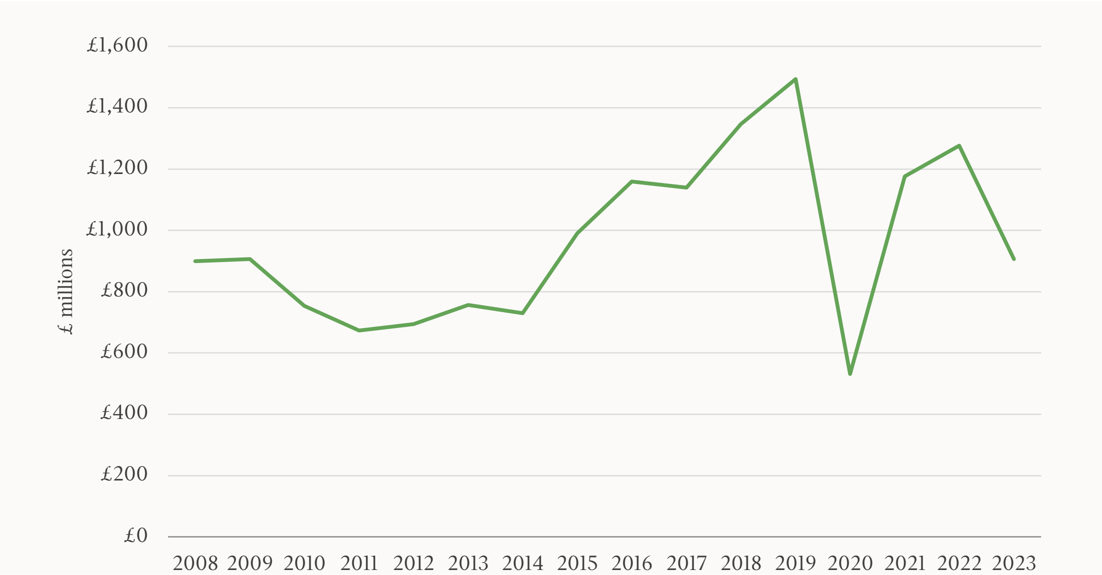
73 Office for National Statistics, "PPI INDEX INPUT GROUP - C23TC25 Inputs of Metals and non-metallic mineral products 2015=100", accessed 17 November 2025. (link)

74 Department for Business and Trade, "Building materials and components statistics: September 2025", 1 October 2025. (link)

prevent heat damage. Vesuvius, Britain's largest refractory manufacturer, builds ceramic linings for EAFs and ladles used to transport molten metal.

The two largest refractory manufacturers in Britain are Vesuvius, with sites in Chesterfield and Tamworth, and Goodwin, which is headquartered in Stoke-on-Trent. Vesuvius closed its Ayrshire factory in Scotland in 2009, leading to the loss of 130 jobs.[75] **As can be seen below, the ceramics and refractory industry recovered well from the 2008 financial crisis. But it has been hit hard by high energy costs and declined since 2019** (see Figure 26).

Figure 26: *Estimated real GVA in 2023 prices (using double deflation) for ceramics and refractory products.*



Source: ONS, 2024 Annual Business Survey

This decline is highly linked to spiralling energy costs. On 16th May 2025, Patrick Andre, the CEO of Vesuvius, warned investors: "Clearly, the regions which remain the most difficult in terms of the situation of our customers is the EU plus the UK, where our customers are not only confronted with a relatively weak level of demand, but the situation of the energy sector is not favourable to them and is not helping our customers improve their cost base."[76]

Glass

British glass production had a turnover of £4.6bn in 2023 and a GVA of £1.8bn, employing over 20,000 people directly.[77] Glass relies on four main raw material inputs: silica, limestone, soda ash and cullet (recycled and broken glass). Britain is relatively self-sufficient in silica production, producing nearly 5 million tonnes per year, with 40% of this used in glass manufacturing.[78] Britain is a mild net limestone exporter, and Tata Chemicals operates the sole soda ash facility at Northwich in Cheshire, with an annual capacity of around 500,000 tonnes.[79] For glass production, these inputs are mixed into a furnace, heated to temperatures of 1,600°C, and melted and moulded into products. The melting of glass in furnaces is energy-intensive, at around 1.6 MWh per tonne, which is comparable to EAF steel.[80] There are various categories of glass: cullet, flat glass, container

75 Hayley Millar, "Ayrshire hit by manufacturing cuts", *BBC*, 6 May 2009. (link)
76 Market Screener, "Vesuvius: Financial Report (Vesuvius plc 2025 spring trading update transcript)", 19 May 2025. (link)
77 ONS, 2024 Annual Business Survey.
78 Samsa, "Industrial Sand: Economic importance", accessed 12 November 2025. (link)
79 Ian Young, "Tata Chemicals to reorganize", *Chemical Week*, 22 November 2024. (link)
80 European Union, "Best available techniques (BAT) reference document for the manufacture of glass". (link)

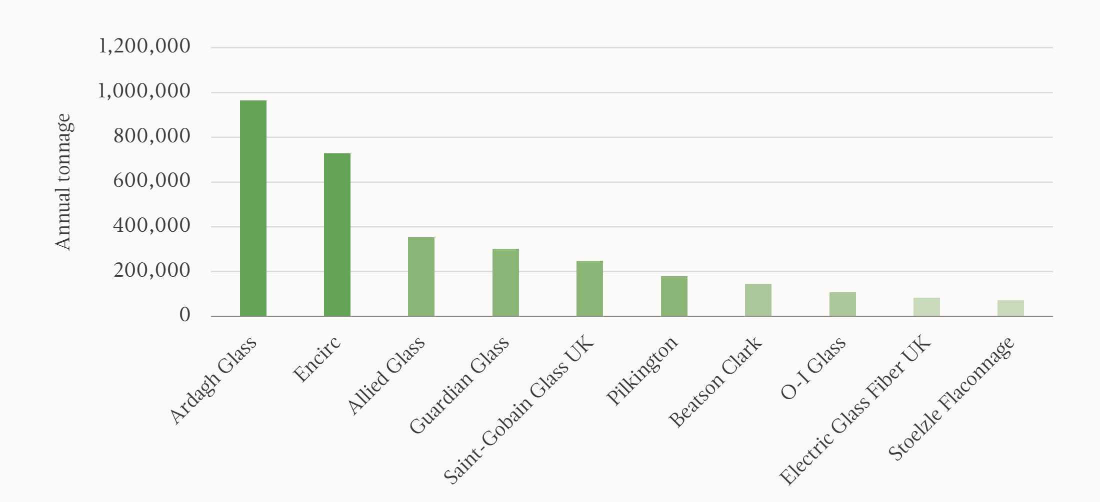
glass, crystal and tableware, fibreglass, and special glass.[81] About 3 million tonnes of glass are produced domestically in Britain, with a significant amount imported.[82] In 2023, Britain imported 1.1 million tonnes of glass, 800,000 tonnes of which were from the European Union. In total, these imports cost £2.2bn.[83]

Britain has three major flat glass manufacturers: Guardian Glass (300 jobs), Pilkington (nearly 200 jobs), and Saint-Gobain Building Glass. There are six major glass container manufacturers: Allied Glass (600 jobs), Ardagh Group (near 1,000 jobs), Beatson Clark (350 jobs), Encirc, O-I Glass (over 500 jobs) and Stoelzle Flaconnage (250 jobs).

Electric Glass Fibre UK, a subsidiary of the Japanese firm Nippon Electric Glass, produced continuous glass fibre at its factory in Wigan. **In June 2025, Nippon closed the plant, leading to 250 jobs being lost due to energy costs.**[84] The local Member of Parliament, Josh Simons, said, "I am bitterly disappointed and enormously frustrated at the outcome. Both the Government and potential buyers worked flat out to meet every condition Nippon imposed, even when those conditions changed, repeatedly, often with very little notice."[85]

The total annual glass production capacity is 3 million tonnes, but only 14% is owned by British corporations. The largest suppliers by capacity are the Irish Ardagh Group and Spanish Vidrala (via its ownership of Encirc; see Figure 27). **As Britain's electricity prices make manufacturing here untenable, the largely foreign owners of our heavy industry will be looking to move to more competitive jurisdictions. We have little home bias advantage to fall back on. See Appendix 4 for a map of major British glass producers and figures on their share of national capacity.**

Figure 27: *Glass capacity share by manufacturer.*



Sources: Information collected from company websites.

81 British Glass, "End of Year Review 2024/2025", accessed 12 November 2025. (link)

82 British Glass, "A Clear Future: UK glass manufacturing sector decarbonisation roadmap to 2050", accessed 12 November 2025. (link)

83 British Glass, "End of Year Review 2024/2025".

84 Gaynor Clarke, "Wigan fibre glass factory to close despite 'tireless' efforts to save it", *Wigan Today*, 18 June 2025. (link)

85 Josh Simons, "Josh Simons MP: I am bitterly disappointed at Nippon site closure", *Wigan Today*, 19 June 2025. (link)

Motors and boilers

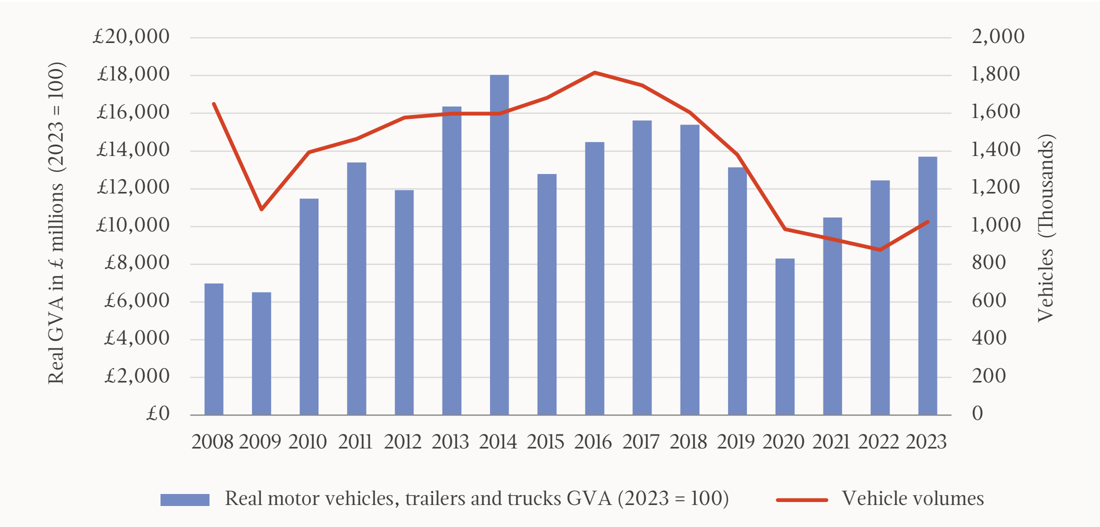
Besides the impact of high energy prices on energy-intensive industries, Net Zero is affecting the manufacture of finished goods, particularly gas boilers and internal combustion engines, two sectors in which British industry has, until recently, been relatively strong. The British boiler industry is the largest in Europe by value.[86] Meanwhile, the motor industry is one of Britain's largest manufacturing sectors.

The motor industry

Britain has a well-established car industry. Production is dominated by four companies: Nissan, Jaguar Land Rover, BMW via their ownership of the MINI brand, and Toyota. While the record for car production was in 1973 (2 million), the industry has up until now been resilient.

As recently as 2016, the British automotive industry produced over 1.8 million vehicles annually, compared to 906,000 in 2024.[87] British car production, from September 2025, had rolling-year annual output of 730,000.[88] Much like other European countries, unit volume has declined in part due to a massive increase in Chinese production, as well as stagnation in purchases (see Figure 28).

Figure 28: *Real GVA and vehicle volumes for the British automotive industry.*



SOURCE: SMMT for volumes and the ONS annual business survey for calculating GVA. Turnover is adjusted with the manufacturing PPI index, and purchases are adjusted with the input PPI index.

The reasons for Britain's struggling car industry are many. Globally, export opportunities are stagnating due to flat overall demand and increasing competition from cheap Chinese vehicles. **Electricity costs are often viewed as a less relevant cost for automakers than for heavy industry, but with margins getting tighter, Britain's uncompetitive energy landscape is still important. In 2025, Alan Johnson, a senior vice president for manufacturing for Nissan, told**

86 IPR "UK must realise its 'huge potential' to make heat pumps for the switch to clean home heating, says IPPR", *IPPR*, 11 October 2024, https://www.ippr.org/media-office/uk-must-realise-its-huge-potential-to-make-heat-pumps-for-the-switch-to-clean-home-heating-says-ippr.

87 Figures sourced from SMMT, 2025.

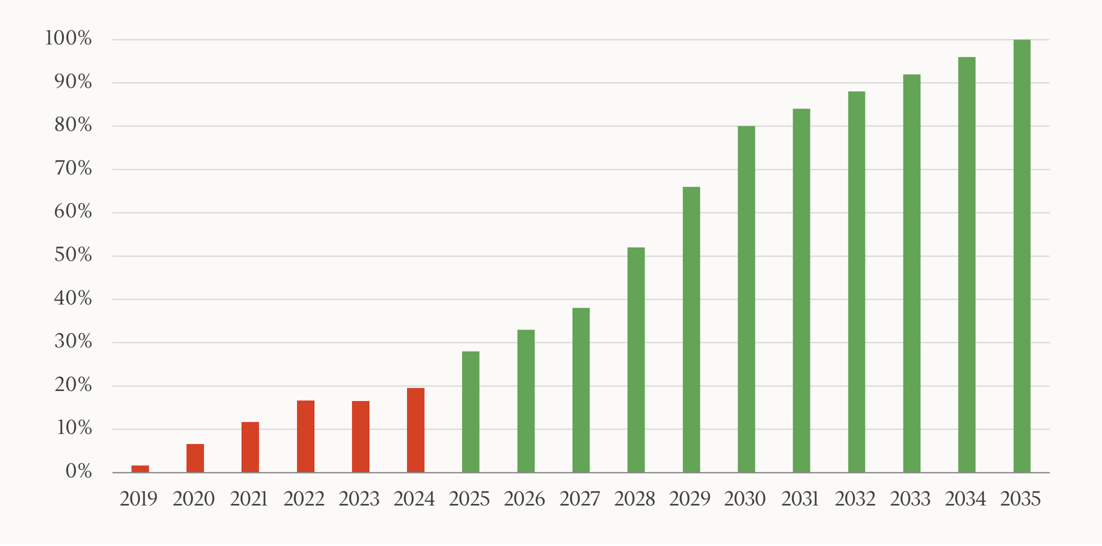
88 "UK: yearly car production." *Statista*, 25 December 2024, https://www.statista.com/statistics/298923/total-number-of-cars-produced-in-the-united-kingdom/.

MPs the Nissan Sunderland factory pays more for its electricity than any other Nissan plant in the world.[89]

One of the primary challenges facing British car making is the fact we are mandating a fully electric industry, but because of high energy costs we are poorly placed to manufacture electric vehicles at home. Britain has a zero-emissions vehicle (ZEV) mandate, which stipulates that by 2035, 100% of British motor sales have to be battery-electric vehicles (BEVs) (see Figure 29).[90] There are incremental targets set for every year, with penalties for car manufacturers that do not meet the target share of sales in Britain. The 2024 target of 22% was not met, with the share of sales for battery electric vehicles being 19%. It is certain that the target of 28% for 2025 will also not be met, given that up to November, the yearly share has been 22%.[91] Meanwhile, 58% of new car registrations were petrol or diesel.[92] Of the 42 million vehicles on the road, 90% are petrol or diesel-powered.[93]

The failure to meet the ZEV target is being covered up with exemptions. Incentives to buy electric vehicles also exist to try and reach the targets. Companies can claim a 100% first-year allowance on the purchase of a BEV, deducting its costs from annual profits. Such cost recoveries are not possible with standard ICE vehicles. Individual buyers can also apply for plug-in grants. There is also currently a significant tax advantage to buying electric vehicles as drivers can avoid fuel duty, although this cost advantage is likely to disappear in the long term as taxing electric vehicle usage is being planned.

Figure 29: *ZEV targets 2019 to 2035.*[94]



Sources: Drive Electric and The Guardian (link)[95]

89 Daniel Holland, "Nissan boss claims building cars in UK is too expensive", *BBC*, 23 April 2025. (link)
90 Drive Electric, "UK Government announce changes to Zero Emission Vehicle (ZEV) mandate", 9 April 2025. (link)
91 What Car?, "ZEV mandate: 28% of new cars must be electric this year." *What Car?*, 7 April 2025. (link)
92 SMMT, "Record EV market share but weak private demand frustrates ambition", 6 January 2025. (link)
93 SMMT, "SMMT motor industry facts 2025", accessed 12 November 2025. (link)
94 Red highlights the share of ZEVs as a proportion of total car sales from existing data. Green shows the forecasted share that needs to be met to reach the mandate by 2035
95 Jasper Jolly, "Record number of electric cars were sold in UK in 2024", *The Guardian*, 4 January 2025. (link)

While the shift to EVs is being promoted, British productive capacity is poorly placed to take part in the transition. According to the Society of Motor Manufacturers and Traders (SMMT), 198,000 were directly employed in the automotive industry in 2023.[96] The Faraday Institute assesses that in a worst-case scenario, without significant domestic production of electric vehicles, British motor vehicle employment could fall to as low as 20,000 by 2040.[97]

Unless the country has a significant electric vehicle base to match its own targets for a fully electric fleet, the car industry will collapse. This has potentially enormous implications for Britain's exports. The two largest goods exports for Britain are finished cars and mechanical generators (which largely refers to internal combustion engines). If the British car and engine manufacturing base fails, up to £65bn in annual exports could be lost.[98]

As of 2024, 65% of British car production was petrol or diesel cars, with 35% being EVs, almost all of which were hybrids.[99] As of November 2025, there is no significant battery electric passenger car production in the country. This is because there is almost no battery cell manufacturing currently in place. The high-value component of BEV manufacturing is the battery pack itself, as well as the underlying software. This supply chain is already dominated by heavily subsidised Chinese, North American, and European incumbents.

Britain currently only has one small EV battery plant in Sunderland with 2 gigawatt-hours[100] of annual capacity, but this will hopefully have expanded to 54 GWh by 2027, with significant support from Government financial guarantees.[101] In order to have the capacity to maintain similar levels of car unit capacity to today, Britain needs 100 GWh of battery capacity by 2030, and 200 GWh by 2040. This will still leave it a minnow in battery manufacturing. As of 2023, battery manufacturing in Britain has a GVA of just £340 million.[102] Battery cell manufacturing is energy-intensive, with energy spending being close to 15% of GVA on average.[103] It is therefore unlikely further expansion can take place either without a significant drop in prices or more government financial support.

Instead, we are likely to see greater imports of very cheap electric vehicles from China, like the BYD Dolphin Surf. The high embodied carbon emissions of Chinese EVs, including their manufacture and transit, have led the European Union and United States to place significant tariffs on their importation.[104] This will mean more Chinese vehicles being dumped onto the British market. While this will provide consumers with cheap EVs, it will place huge pressure on domestic producers, who are already struggling.

Besides assembling finished vehicles, in 2024, British companies produced just under 1.6 million internal combustion engines.[105] Alongside aircraft engines and turbines, these are a significant

96 SMMT, "SMMT motor industry facts 2025".
97 Faraday Institution, "UK electric vehicle and battery production potential to 2040", September 2024. (link)
98 Department for Business and Trade, "UK trade in numbers (web version", accessed 12 November 2025. (link)
99 SMMT, "SMMT motor industry facts 2025."
100 For battery plants, GWh refers to the total electricity capacity that can be held by one year's production of batteries.
101 Rian Chad Whitton, "Britain's Motor Industry." *Doctor Syn*, 27 October 2025. (link)
102 ONS, 2024 Annual Business Survey.
103 Office for National Statistics, "Business energy spending: experimental measures from the Office for National Statistics' business surveys".
104 Christopher Cytera, "Are cheap Chinese vehicles good for the environment?", *CEPA*, 23 October 2024. (link)
105 SMMT, "SMMT motor industry facts 2025".

component of what the ONS called intermediate mechanical generators—the second largest goods export in Britain after cars. As plug-in hybrid vehicles still require internal combustion engines, this industry could retain a viable future where it services both petrol and diesel vehicles and hybrids. But under a draconian ZEV mandate where all new sales must eventually be battery-electric, it will cease to exist.

Britain's Government is prioritising the adoption of BEVs, but our industry is poorly set up to compete in this field in part due to the energy-intensive nature of battery manufacturing. At the very least, preference for batteries should follow on from having a strong domestic battery manufacturing sector. The benefits of being a first mover apply primarily to production, not consumption.

Gas boilers

The boiler industry is relatively small, but it is also relatively successful. The British gas boiler market has a turnover of £1.6bn and a GVA of £550m as of 2023, and employs roughly 4,500 workers.[106] For context, the renewable heat manufacturing industry, which includes heat pumps, had a 2023 turnover of£862m according to the Office of National Statistics.[107] The top four boiler manufacturers (Worcester Bosch, Vaillant, Ideal and Baxi) collectively account for 81% of boiler sales in the UK (1.3 million).[108] Worcester Bosch's central plant is in Worcester, with another plant in Derbyshire.[109] Vaillant is also based in Derbyshire. Baxi's production is primarily in Preston.[110] Ideal Heating is based in Hull.[111] These companies are stable and successful, but have very low market shares in the heat pump industry , and so are not well placed to benefit from government intervention.

Under the rationale of reaching Net Zero, the Government has tried to steer consumers away from gas boilers and towards heat pumps. The Clean Heat Market Mechanism (CHMM), beginning in 2025, is like the ZEV mandate in that it sets fines on manufacturers who fail to reach a certain quota of heat pump sales. Boiler manufacturers will need to meet a target of heat pumps accounting for 6% of boiler sales in 2025. Alongside the CHMM, the Government's Boiler Upgrade Scheme (BUS) encourages adoption by offering £7,500 grants towards heat pumps.[112] The Government is also *de facto* banning gas boiler installations for new homes via the Future Homes Standard, which will come into force sometime in the next two years.

There is nothing wrong with the electrification of home heating *per se*, but it should be downstream of cheap electricity and in response to consumer demand. It is not surprising that France, having relatively cheap nuclear-powered electricity, has achieved high rates of heat pump installation. But currently, British policy is subsidising a more expensive technology while hurting a domestic industry that has, to date, performed relatively well. **From 2008 to 2018, the GVA for the boiler industry grew in real terms from £300m to £800m, but has since fallen and stag-**

106 Nomis, "Business Register and Employment survey: open access", accessed 12 November 2025. (link)

107 Office for National Statistics, "Low carbon and renewable energy economy, UK: 2023".

108 Department for Business, Energy and Industrial strategy, "Heat pump manufacturing supply chain research project", November 2020. (link)

109 Bosch Home Comfort Group, "Plants", accessed 13 November 2025. (link)

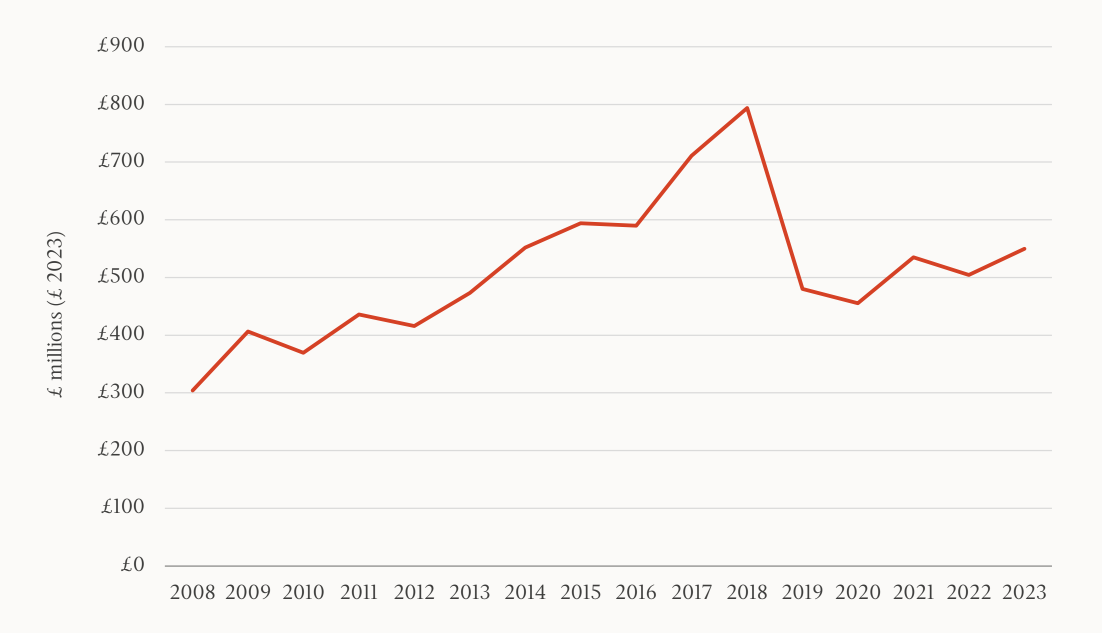
110 The Manufacturer, "Baxi Heating UK moving production from Norwich to Preston", 10 January 2019. (link)

111 Simon Bristow, "Ideal Heating launches first UK heat pump production line at Hull site as part of £60m net zero drive", T*he Hull Story*, 8 August 2023. (link)

112 Energy UK, "Energy UK Explains: The Clean Heat Market Mechanism", April 2025. (link)

nated at £550m in 2023.

Figure 30: *Real GVA for manufacture of central heating radiators and boilers.*



Sources: Initial turnover and purchases taken from the ONS 2024 Annual Business Survey. Turnover is adjusted using manufacturing output PPI, while intermediate purchases are adjusted with input PPI.

While the boiler market is not currently facing existential threats, it is being undermined by government support in favour of heat pumps, where British domestic manufacturing is less strong. Much as with automobiles, the Government is tipping the scales against its domestic manufacturers.

Data centres

While the British economy has weathered high energy prices thus far, it has fallen behind in high-growth sectors critical to future industrial growth. One example is data centre capacity. Data centres are not heavy industry, but share some notable similarities, the most obvious being a very high energy intensity. The infrastructural needs are also similar. A site in Northumberland that was earmarked to be for an electric vehicle battery plant project, which has since been cancelled, is now being turned into a data centre.[113]

Data centres are susceptible to electricity costs since electricity ranges from 40% to 60% of operating costs.[114] Computing is demanding more electricity than ever, particularly as data centres are being tasked with training and running increasingly complex artificial intelligence (AI) programs. From 2022 to 2030, according to Grid Strategies, US data centre capacity is expected to grow from 17 GW to 45 GW.[115] This estimate entails data centres growing to nearly 8% of total US electricity demand before the end of the decade.

113 Mark Denten, "Northumberland battery factory ditched in favour of data centre", *BBC*, 15 April 2024. (link)

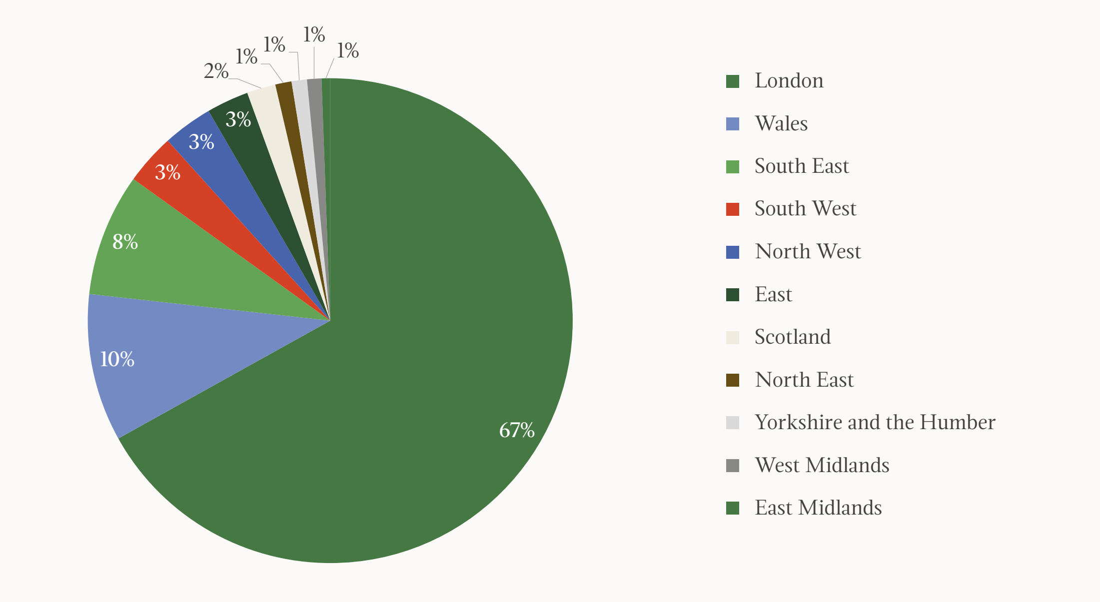
114 IDC, "IDC Report Reveals AI-Driven Growth in Datacenter Energy Consumption, Predicts Surge in Datacenter Facility Spending Amid Rising Electricity Costs", 24 September 2024. (link)

115 John D. Wilson and Zach Zimmerman, "The Era of Flat Power Demand is Over", *Grid Strategies*, December 2023. (link)

Large data centres are central to modern computing. AI workloads, including natural language processing, large language models (LLMs), are completed in large data centres, often referred to as clusters or superclusters. They use specialised hardware called AI accelerators. These accelerators, either in the form of graphics processing units (GPUs) or application-specific integrated circuits (ASICs), are housed in their thousands across hundreds and even thousands of specialised servers.

Britain has many data centres, mainly located around London and the M25 (see Figure 31). Measured in terms of the maximum rated IT load of colocation data centres, London accounts for 67% of data centre capacity.[116] Britain's data centre demand capacity is equivalent to half the generation capacity of the Sizewell C nuclear plant (3.2 GW).

Figure 31: *Regional share of UK data centre capacity.*



Source: UK House of Lords.[117]

Britain's data centre electricity consumption is not fully understood. When looking at electricity end use for computing services based on energy consumption tables from DESNZ, computing electricity consumption appears to have declined by 17% from 9.6 TWh in 2017 to 8.1 TWh in 2024.[118] The National Energy System Operator (NESO) reported data centre consumption was 3.5 TWh in 2020 and projects it could increase tenfold to 35 TWh by 2050.[119] Bloomberg New Energy Foundation estimated British data centre consumption at 7.2 TWh in 2021.[120] Independent Commodity Intelligence Services (ICIS) estimates British data centre electricity consumption is 13 TWh annually as of 2025.[121]

116 UK House of Lords, "Data Centres: Energy Supply", written question, 25 February 2025, UIN HL5239. (link)

117 "Data Centres: Energy Supply", written question, 25 February 2025, UIN HL5239. (link)

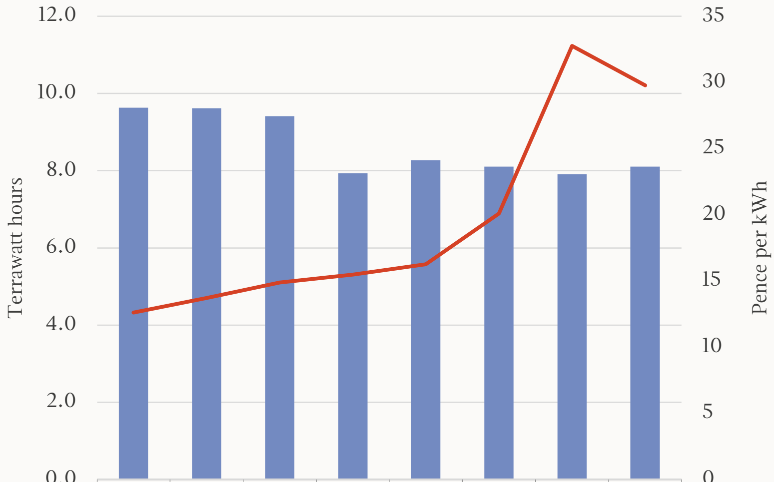
118 Department for Energy Security and Net Zero, Energy Consumption in the UK (ECUK): End Use Tables. (link).

119 NESO, "Data Centres", March 2022. (link)

120 European Commission, "Energy Consumption in Data Centres and Broadband Communication Networks in the EU", 14 February 2024. (link)

121 ICIS, "Data centres: Hungry for power", accessed 12 November 2025. (link)

Figure 32: *Electricity consumption for all computing services from 2017 to 2024 and commercial electricity prices in pence per kWh (adjusted with a GDP deflator with 2024 = 100).*



	2017	2018	2019	2020	2021	2022	2023	2024
kWh	9.6	9.6	9.4	7.9	8.3	8.1	7.9	8.1
Commercial electricity prices (pence per KWh) - GDP deflator applied with 2024 = 100	12.60	13.72	14.89	15.47	16.25	20.09	32.76	29.79

Sources: Consumption from ECUK End Use Tables. Price figures from DUKES Table 1.3.B Sales of electricity and gas by sector, United Kingdom, Average net selling value per kWh sold.

When looking specifically at AI computing, Britain is clearly behind. Using the Epoch AI database of over 500 supercomputing clusters, Britain is an irrelevant market. Currently, we only have 12 MW of power capacity dedicated to supercomputers, compared to 25 megawatts for Germany, 26 MW for Finland, and 29 MW for France. In terms of total existing and planned supercomputing capacity, Britain has 102 MW of capacity earmarked, versus 2 GW for France, 2.3 GW for Saudi Arabia, 3 GW for South Korea, and 20 GW for the United States.[122]

We are seeing individual data centre clusters eclipse British national computing infrastructure. As an example, Grok-3, an LLM developed by Elon Musk's artificial intelligence company xAI, was trained on 100,000 Nvidia H100 chips at a data centre in Memphis, Tennessee named Colossus. These 100,000 chips required 150 MW of electric generation capacity to power. [123] A further 100,000 was added in late 2024, increasing demand to 250 MW. As of October 2025, Colossus requires 350 MW of power.[124] This enormous buildout required a massive expansion in gas generation, including the installation of fifteen gas turbines.[125] Under its planned expansion, Colossus will consume 1.4 GW of power.[126]

It will not stop there. Meta is planning to build a supercomputer with power demands of 1.5 GW. The largest proposed data centre, co-sponsored by the U.S. and the United Arab Emirates, is pro-

| 122 Konstantin Pilz, Robi Rahman, James Sanders and Lennart Heim, "GPU Clusters", *Epoch AI*, accessed 12 November 2025. (link)

| 123 Brian Wang, "xAI Grok 3 is Number One AI Across Categories", *Next Big Future*, 18 February 2025. (link)

| 124 Pilz et al, "Data on GPU clusters".

| 125 Matthew Gooding, "xAI granted permits for 15 gas turbines at Memphis data center", *Data Center Dynamics*, 3 July 2025. (link)

| 126 Pilz et al. "Data on GPU clusters".

jected to house 20 million H100-equivalent chips, resulting in an energy demand of 5 GW.

AI-specific data centres are a growing component, but only part of the overall data centre activity. By the end of 2025, ABI Research projects there will be over 6,000 public data centres worldwide.[127] As of 2024, Britain has 1.6 GW of data centre capacity. For context, the world's largest data centre cluster in Northern Virginia has a capacity of nearly 5 GW. As of early 2025, the U.S. has a total of 25 GW of data centre capacity, and an additional 55 GW is expected to be needed by 2030.[128]As of 2023, Google was the corporation with the largest operational data centre capacity, at 3.5 GW, more than double Britain's current capacity. [129]

Relative electricity prices impact where companies are willing to invest in data centres. In 2025, the BCS Institute released a survey of data centre operators. Over 70% of surveyed companies cited the availability of power as the most critical determinant of where they would invest, well ahead of other factors like skills, land price, total build cost, access to fibre-optic network, or political stability.[130] Some 84% of respondents reported that they expect their power consumption levels to rise over the next three years.[131]

With the future of software development becoming increasingly energy-intensive, countries with low electricity prices are likely to gain, while those with high prices are likely to lose out. While British AI developers can outsource training to third parties, being utterly detached from computer infrastructure will have a negative impact on Britain's broader AI ecosystem in the long term, causing us to miss out on the economic benefits of the AI revolution.

127 ABI Research, "How Many Data Centers Are There and Where Are They Being Built?", accessed 12 November 2025. (link)

128 Bloom Energy, "Data Centers Are Turning to Onsite Power Sources to Address 35 GW Energy Gap by 2030", 21 January 2025. (link)

129 Ilkhan Ozsevim, "Top 10 data centre hyperscalers", *Data Centre Magazine*, 28 June 2023. (link)

130 James Hart, "Powering the Future: Winter Report 2024", *BCS Consultancy*, 5 January 2025. (link)

131 Hart, "Powering the Future".

3. Conclusion and recommendations

Given the dire straits of Britain's energy-intensive industries and the expectation of significant turbulence in the global economy going forward, it is clear why governments feel compelled to offer industry exemptions and even subsidies for energy prices, and to takeover failed operations like British Steel and Speciality Steels. However, these are reactive measures that do not alleviate the largely self-imposed conditions of decline. Time is running out to change the course of Britain's deindustrialisation. **Improving British electricity price competitiveness will take between five and ten years, but large sections of the energy-intensive industries could be severely diminished within just 24 months without course correction.**

Any government support for industry must be supplemented by a real plan to improve industrial competitiveness, prioritising low energy costs, reducing and removing onerous regulations, and cutting back self-defeating mandates. Approval of active industrial policy has to be contingent on supply-side reform.

British government policy can immediately be improved at the conceptual level. The Office for National Statistics annually provides estimates for the LCREE. This collection of industries is prioritised through Government policy in the form of subsidies, levies, research grants and direct funding. Yet it has a small turnover of £70bn versus over £200bn for the foundational industries**. From now on, the energy-intensive sector should take priority over the green sector when considering government targets for revenue growth and improving prosperity outside of London.**

The longstanding policy of increasingly expensive climate-related levies to build wind and solar makes a quick change of course extremely difficult. **But work can begin to extricate the Government from long-term contracts.** Britain's nuclear regulatory task force has already outlined reforms that could be taken to ease the progression of a nuclear buildout[132]

It is becoming clear that there will have to be more free ETS allowances for relevant producers—or better yet, the total repeal of ETS. The British steel industry is already receiving significant free allowances, and this will have to be expanded to refineries and major chemical producers, as the carbon price is likely to increase in line with the European Union's ETS. This hurts British industry, as other major manufacturing zones either have no ETS, or, in the case of China or South Korea, have such low carbon prices they may as well not have them at all.

British leaders of all political parties understand they will have to take emergency measures to protect energy-intensive industries. But the real change has to come at the strategic level. Environmental targets need to be separated from industrial performance, and economic growth must take priority over meeting carbon reduction targets.

132 Department for Energy Security and Net Zero, "Nuclear Regulatory Taskforce Interim Report, 2025", accessed 12 November 2025. (link)

We know from recent history that the British energy-intensive sector does not have to be weak. It reached its peak in 2002. The problem is not lack of skills, but the excessive price of inputs. A Government that succeeds in lowering energy prices will reinvigorate industry, make Britain a more formidable country, and promote job growth across the whole of the country. Failure to change course means more factory closures, more subsidies that will never be paid back, and stagnation giving way to a fundamental collapse in British manufacturing capacity, meaning more import dependency, losses of good jobs, and higher taxes from increased welfare and a growing current account deficit.

Recommendations

The British Government must take emergency action to save the British industrial economy. This should include:

- **Reforming or abolishing the Climate Change Act of 2008, and most importantly, doing away with the Climate Change Committee and the tying of industrial strategy to carbon budgets.** Any replacement legislation should focus on electrification through lower prices and on reducing overall emissions rather than just territorial emissions.

- **A significant number of levies related to Net Zero can be quickly done away with.** The ROC and CPS schemes can be cut almost immediately. The cutting of ROCs would force a large number of renewable developers to receive the market price for their power or exit the market. Getting rid of carbon price support would also reduce the wholesale cost of electricity from gas power stations. CfDs are a more challenging legal prospect, as they are private law contracts between the generator and the low carbon contracts company.

- **Attempts to link the UK and EU ETS should be stopped**. The UK ETS, which has already contributed to the closure of two out of six refineries, is currently in the process of being linked to the more expensive EU ETS. This will result in a higher carbon price and prevent the British Government from issuing more free carbon allowances to protect industry.

- **In the short term, more free allowances should be issued to preserve heavy industry from the ETS, particularly refineries. In the long term, the ETS should be abolished.** Getting rid of the ETS at the legal level should not be difficult. It will lead to a loss for the Treasury of around £2.6bn (based on 2024 figures), but this will be offset by improvements in industrial competitiveness. It is not obvious whether companies already holding permits should be compensated or should be expected to absorb the permit costs should the ETS be wound down.

- **Improving the long-term affordability of the grid will require a significant expansion of gas and nuclear power.** While solar and wind generation are not off the table, they should be required to pay for the additional costs of balancing, transmission and dispatchable capacity they necessitate. A network levy charge on generators would begin to move costs away from consumers onto those who create the costs. Such a charge could not be generation-specific, as it would trigger generation tax clauses that exist in CfD contracts. Instead, it would have to apply to all generation but could be designed in such a way that those sources of generation that create the most additional network costs pay their way.

- **The effective tax rate of 78% on oil and gas production should be significantly reduced, and any *de facto* restrictions on North Sea exploration and production should be lifted.** There should also be a wholesale attempt to reduce barriers to hydraulic fracturing and onshore petroleum production. Since around 80% of British energy consumption is still not electric, we are going to need fossil fuels for the foreseeable future. It makes sense that we extract as much domestically as possible. This will be beneficial for jobs and will reduce the trade deficit.

- **Crude attempts at imposing the energy transition like the ZEV mandate or the subsidising of heat pumps should be scrapped.** Any resulting funds should instead be directed towards lowering electricity prices, which is the most effective path to electrification.

- **Money earmarked for subsidising hydrogen should be cut or reallocated.** Electrification has significant potential advantages, but hydrogen-based heating or transportation is not likely to be economical this century, even with enormous subsidies.

- **British industrial policy is bloated and unfocused. Investments should be targeted towards supporting the purchasing of key capital equipment, like machine tools and robotics, to make the industry more competitive**. £1 billion should be earmarked annually for the purchase of new machine tools, casting and forging machines, and industrial robotics. This, alongside relief with energy prices, would be a strong signal for manufacturers in the energy-intensive sector and wider manufacturing economy to invest. Other initiatives could include increasing recoverable capital cost for building investment. As of 2024, in Britain companies can only recover 39.1% of building capital costs, versus an OECD average of 47.6%.[133] These industrial support measures should be limited, focused on recapitalising British industry, and funded from scrapping various Net-Zero related levies.

Britain has an illustrious industrial history, and the greatness of our heavy industry was not confined to the twentieth century. As late as 2002 this was a thriving and competitive part of the economy, and to this day it remains a highly productive sector, providing 2.5% of GVA with just 1.4% of the workforce. Whilst its decline has certainly been exacerbated by outside influences, many of its problems stem from the impositions of successive Governments of both the Right and Left, whether through levies on electricity, prioritising territorial decarbonisation over a reliable grid, or placing taxes on industrial fossil fuel consumption. Rather than take a systemic view, Governments have carved out various exemptions for certain levies, while pressing on with Net Zero. This is evidently not working.

Unless Britain's leaders treat the survival of heavy industry and getting cheap energy as a tier-one economic priority, we are going to become the consumers of someone else's modernity.

133 Cristina Enache, "Capital Allowances | Capital Cost Recovery across the OECD, 2025", *Tax Foundation*, 10 June 2025. (link)

Appendix 1

Methodology for ETS refinery case study:

Refinery operating income comes from the annual accounts of the six major refineries. The 2023 reports come from these codes via Companies House.

07071400 (Essar Stanlow)
26538 (Esso Fawley)
SC010612 (PetroIneos Grangemouth)
00529086 (Phillips 66 Humber)
00564599 (Prax Lindsey)
08566216 (Valero Pembroke)

Data on the average UK ETS price is sourced from the International Carbon Action Partnership. The Pound to Euro conversion rate is sourced from the ONS via data from Fuels Industry UK. Emissions are sourced from the company reports and cross referenced with data from the surrender tables from the UK ETS Trading Registry.

For Esso Energy and Prax Lindsey, energy consumption figures did not match up with carbon emissions. Therefore, the decision was taken to calculate new energy consumption numbers from carbon emissions (assuming 90% of emissions are from natural gas and the rest are from other fuels and electricity).

From the CO_2 tonnage, we can calculate the methane tonnage. It takes 0.364 tonnes of CH_4 (methane) to burn a tonne of CO_2. This gives us methane demand in tonnes for the whole year of the refinery. Methane has an energy content 13.9 KWh per kilogram. From this, we can calculate the total KWh from carbon emission tonnage. We then adjust for electricity, oil and coke emissions by multiplying the initial figure by 0.9, assuming gas is 90% of energy demand. This gives us rough estimates of energy consumption for both Esso Energy and Prax Lindsey for 2023.

The free allowances of emissions for each company, provided by the UK ETS allocation table, are subtracted from the total tonnage of emissions to determine the amount of carbon taxed under the (ETS). As we are covering annual reports from 2023, we take an average ETS price for 2023, as opposed to 2024 or 2025. ETS prices fluctuate on a weekly basis. The average clearing price for ETS auctions in 2023 was £53.36 per tonne of CO2. We use a counter-example to show the long-term expected ETS cost to refineries in the 2025-2050 year period. DESNZ provides forecasts for market traded carbon values. We take the average price from the range of 2025 to 2050, which comes to £106.00 per tonne of CO2 in £2024 money. This is adjusted with a GDP deflator to come to £109.00 in 2023 money. Based on this, we estimate ETS costs as a share of the operating profit for all major refineries.

Note: *PetroIneos endured a £224m net operating loss in 2023.*

Note: *The Phillips 66 Humber refinery has a relatively low carbon footprint relative to its free allowance. We hypothesise that it is emitting more via its access to gas from the local Immingham gas plant, which has no free allowances. It is likely Phillips 66 is paying for a portion of the Immingham gas plant's ETS costs through a bilateral agreement. Therefore, Phillips 66's ETS costs are likely to be significantly understated by this methodology. This methodology, though not perfect, provides justifiable estimates of the cost of ETS to oil refineries with the best available public information.*

Appendix 2

Double deflation for GVA calculation

All double-deflation calculations are based on data on turnover and purchases from ONS annual business survey. We adjust turnover with output producer price inflation (specific to manufacturing).[134] For purchases, we adjust with input producer price inflation (specific to the production of manufactured goods).[135] In both cases, the reference year has been moved from 2015 to 2023 (100).

134 Office for National Statistics, "PPI INDEX OUTPUT DOMESTIC - C Manufactured products, excluding Duty 2015=100", accessed 27 November 2025. (link)

135 Office for National Statistics, "PPI INDEX INPUT - C Inputs into production of Manufactured products, excluding Climate Change Levy 2015=100", accessed 27 November 2025. (link)

Appendix 3

Energy use per tonne for key metallic and mineral products

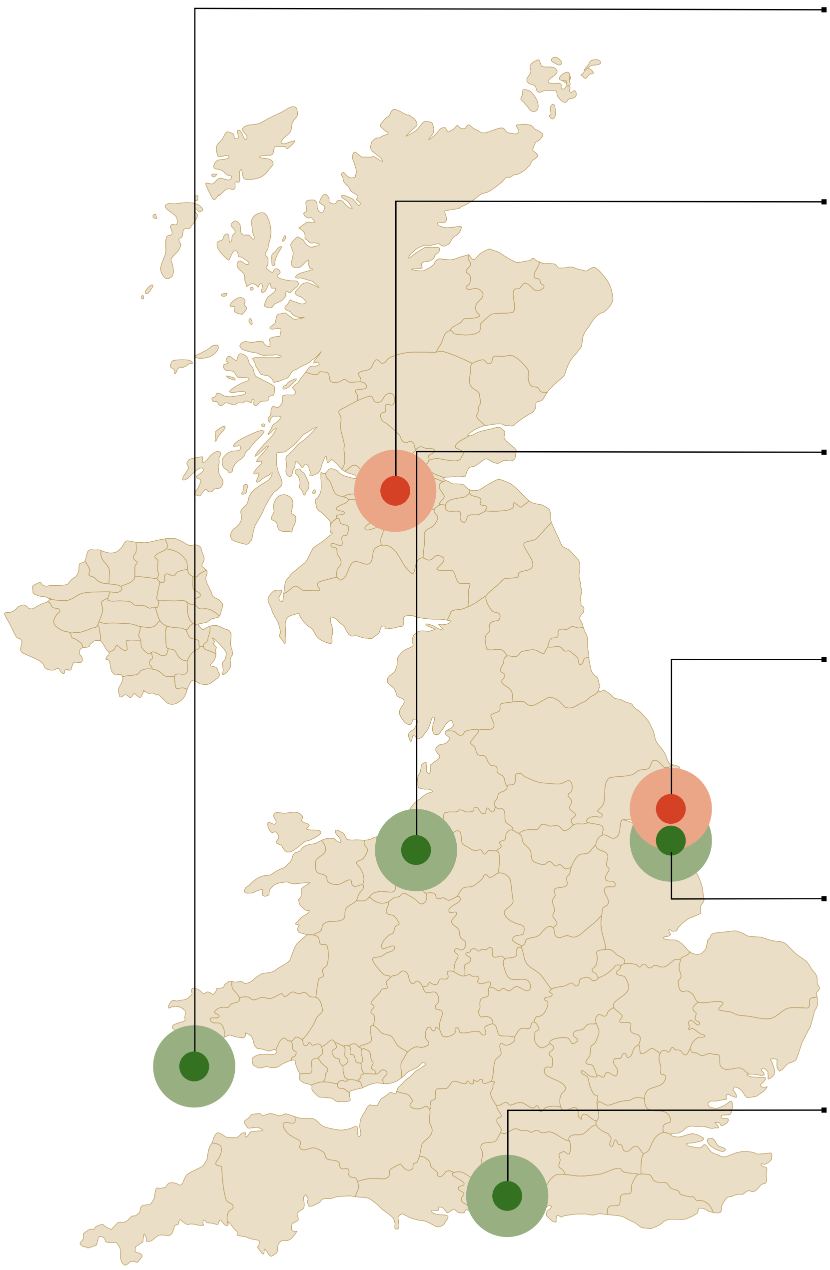
Figure 33: *Key metallic and mineral products, Estimate MWh per tonne, global production, and British production in thousands of tonnes, and uses.*

Product	Megawatt hours per tonne	Global production 2024 (thousands of tonnes)	UK production (thousands of tonnes)	Uses
Steel (BF-BOF)	7	1,300,000	4,000	All grades of steel
Steel (EAF)	3	550,000	1,000	99% of steel grades
Natural Gas-Based Direct Reduced Iron – EAF	6	140,000	0	Used in EAFs alongside scrap metal
Primary aluminium	16	70,000	48	Lightweight high-strength metal required in cars, aircraft, packag-ing and household goods
Zinc electrolysis	4	13,500	0	Coating steel to protect it from corrosion
Copper (pyrometallurgy)	8	20,000	0	Used in electrical appliances and cathode production, combining with copper to make brass
Nickel (class 1)	38	900	40	Cathodes and speciality alloys
Nickel (class 2)	131	2,000	0	Primarily alloyed to create stain-less steel
Natural graphite	10	1,700	0	Used in anodes, refractories, and as a lubricant
Synthetic graphite	21	4,000	0	Mainly used for electrodes in EAFs
Ferro-titanium	18	100	4	Alloys, deoxidising molten steel, metallurgy

Sources: Steel figures come from Columbia Business School. Aluminium and Zinc figures come from EU ETS state aid guidelines. Copper, nickel, and graphite figures come from 2024 Systemiq critical mineral report. Ferro-titanium figures come from 24 Chemical Research report.

Appendix 4

Maps of major industrial sites: Petroleum refineries



Owner: Valero
Location: Pembroke
Capacity: 9.9 million tonnes
% of UK capacity: 17.6%

Owner: Ineos
Location: Grangemouth, Falkirk
Capacity: 7.219 million tonnes
% of UK capacity: 12.8%
Closed in 2025

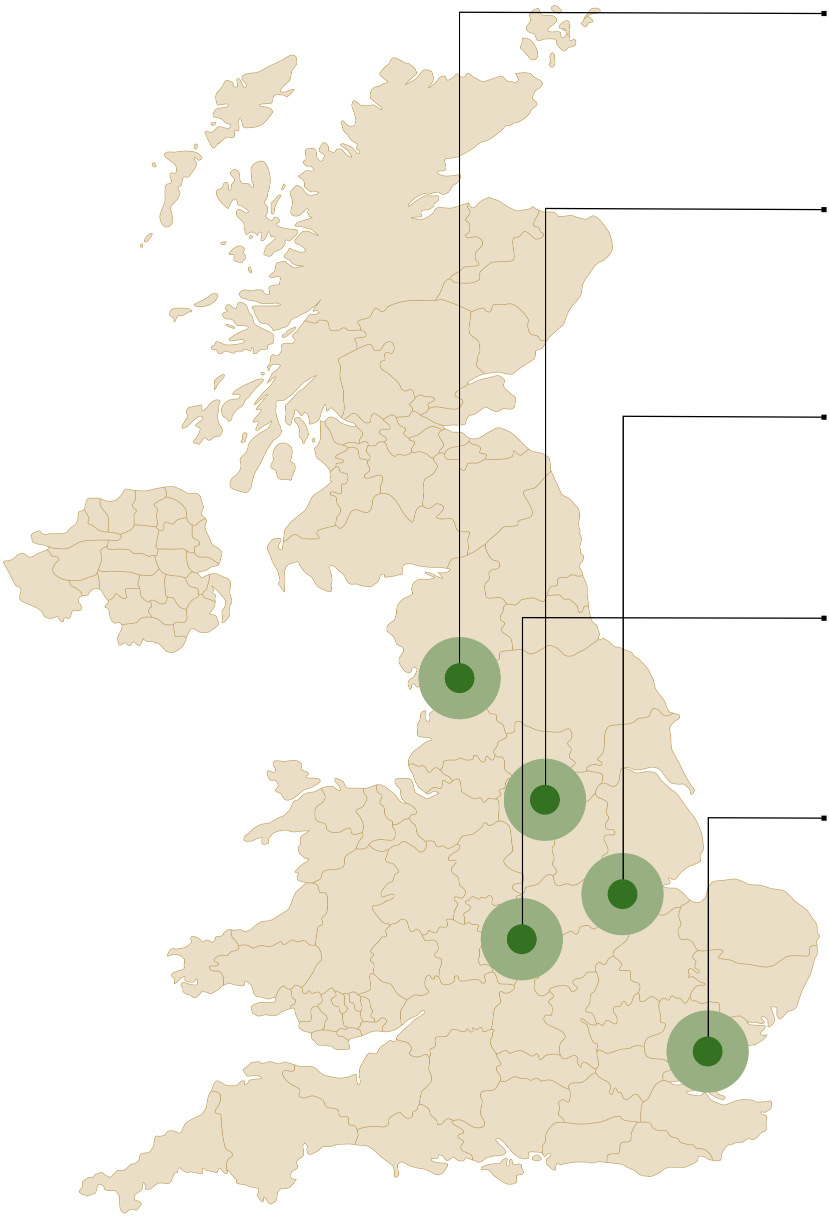
Owner: Essar
Location: Stanlow, Cheshire
Capacity: 9.7 million tonnes
% of UK capacity: 17.2%

Owner: Prax Group
Location: Immingham, N. Lincolnshire
Capacity: 6 million tonnes
% of UK capacity: 10.7%
Closed in 2025

Owner: Phillips66
Location: Killingholme, N. Lincolnshire
Capacity: 11 million tonnes
% of UK capacity: 19.6%

Owner: ExxonMobil
Location: Fawley, Hampshire
Capacity: 12.4 million tonnes
% of UK capacity: 22.1%

Cement kilns



Owner: Heidelberg Materials
Location: Ribblesdale, Lancashire
Capacity: 1.3 million tonnes
% of UK capacity: 11.8%

Owner: Breedon
Location: Hope, Derbyshire
Capacity: 1.3 million tonnes
% of UK capacity: 11.8%

Owner: Heidelberg Materials
Location: Ketton, Rutland
Capacity: 1.39 million tonnes
% of UK capacity: 12.6%

Owner: Cemex
Location: Rugby, Warwickshire
Capacity: 1.3 million tonnes
% of UK capacity: 11.8%

Owner: Heidelberg Materials
Location: Purfleet, Essex
Capacity: 1.1 million tonnes
% of UK capacity: 9.9%

Other Locations

Owner: Aggregate Industries
Location: Cauldon, Staffordshire
Capacity: 1 million tonnes
% of UK capacity: 9%

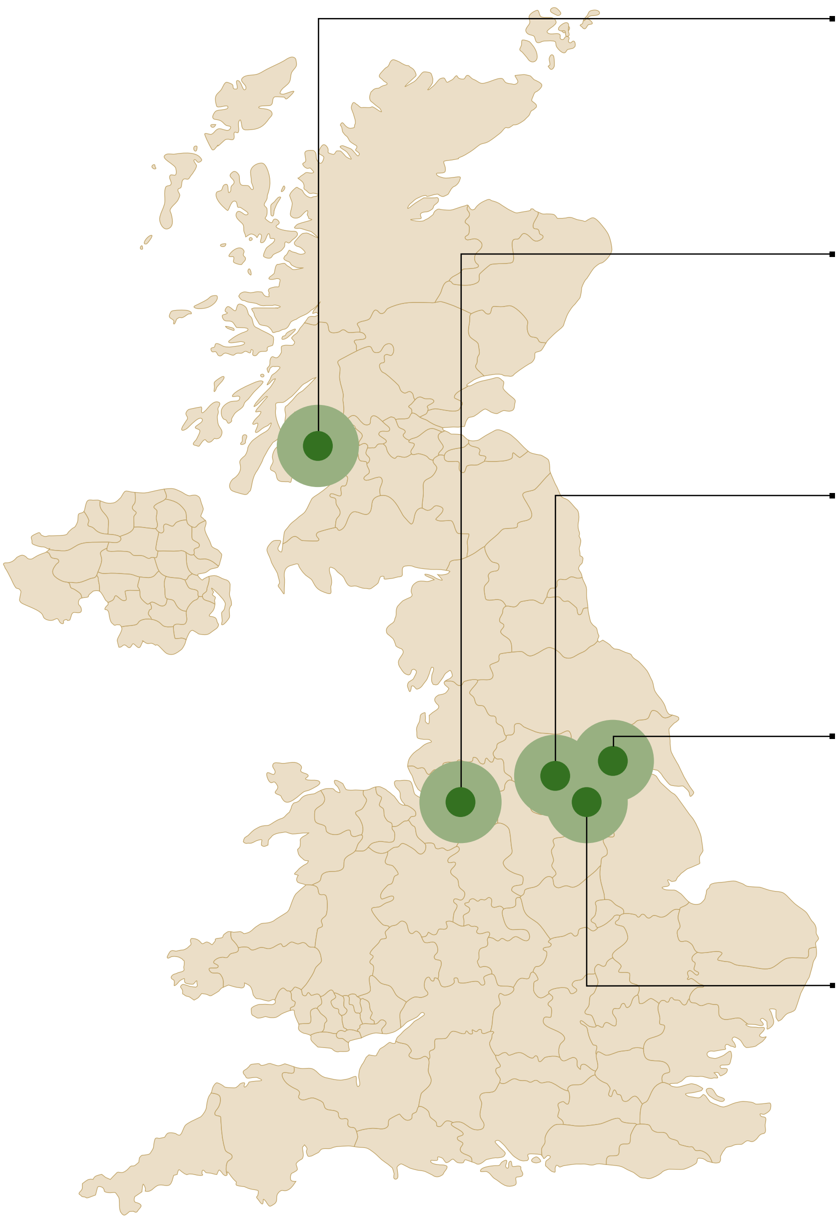
Owner: Tarmac (CRH)
Location: Tunstead, Derbyshire
Capacity: 1.095 million tonnes
% of UK capacity: 9.9%

Owner: Tarmac (CRH)
Location: Dunbar, East Lothian
Capacity: 900,000 tonnes
% of UK capacity: 8.1%

Owner: Heidelberg Materials
Location: Padeswood, Flintshire
Capacity: 650,000 tonnes
% of UK capacity: 5.8%

Owner: Tarmac (CRH)
Location: Aberthaw, Vale of Glamorgan
Capacity: 565,000 tonnes
% of UK capacity: 5.2%:

Glass



Owner: Ardagh Glass
Location: Irvine, N. Aryshire
Product: Glass packaging
Capacity: 200,000 tonnes
% of UK capacity: 6.28%

Owner: Vidrala
Location: Elton, Cheshire
Product: Container glass
Capacity: 328,500 tonnes
% of UK capacity: 10.31%

Owner: Ardgah Glass
Location: Knottingley, W. Yorkshire
Product: Glass packaging
Capacity: 200,000 tonnes
% of UK capacity: 6.28%

Owner: Guardian Glass
Location: Goole, E. Riding of Yorkshire
Product: Flat glass
Capacity: 301,125 tonnes
% of UK capacity: 9.45%

Owner: Ardagh Glass
Location: Doncaster, S. Yorkshire
Product: Glass packaging
Capacity: 365,000 tonnes
% of UK capacity: 11.45%

Other Locations

Owner: Saint-Gobain
Location: Eggborough, North Yorkshire
Product: Flat glass
Capacity: 250,000 tonnes
% of UK capacity: 7.85%

Owner: Ardgah Glass
Location: Barnsley, South Yorkshire
Product: Glass packaging
Capacity: 200,000 tonnes
% of UK capacity: 6.28%

Owner: Verallia
Location: Leeds, West Yorkshire
Product: Glass packaging
Capacity: 189,800 tonnes
% of UK capacity: 5.96%

Owner: NSG
Location: St Helens, Greengate, Lancashire
Product: Flat glass
Capacity: 180,000 tonnes
% of UK capacity: 5.65%

Owner: Verallia
Location: Knottingley, West Yorkshire
Product: Container glass
Capacity: 164,250 tonnes
% of UK capacity: 5.15%

Owner: Beatson Clark
Location: Sheffield, South Yorkshire
Product: Container glass
Capacity: 145,000 tonnes
% of UK capacity: 4.55%

Other Locations

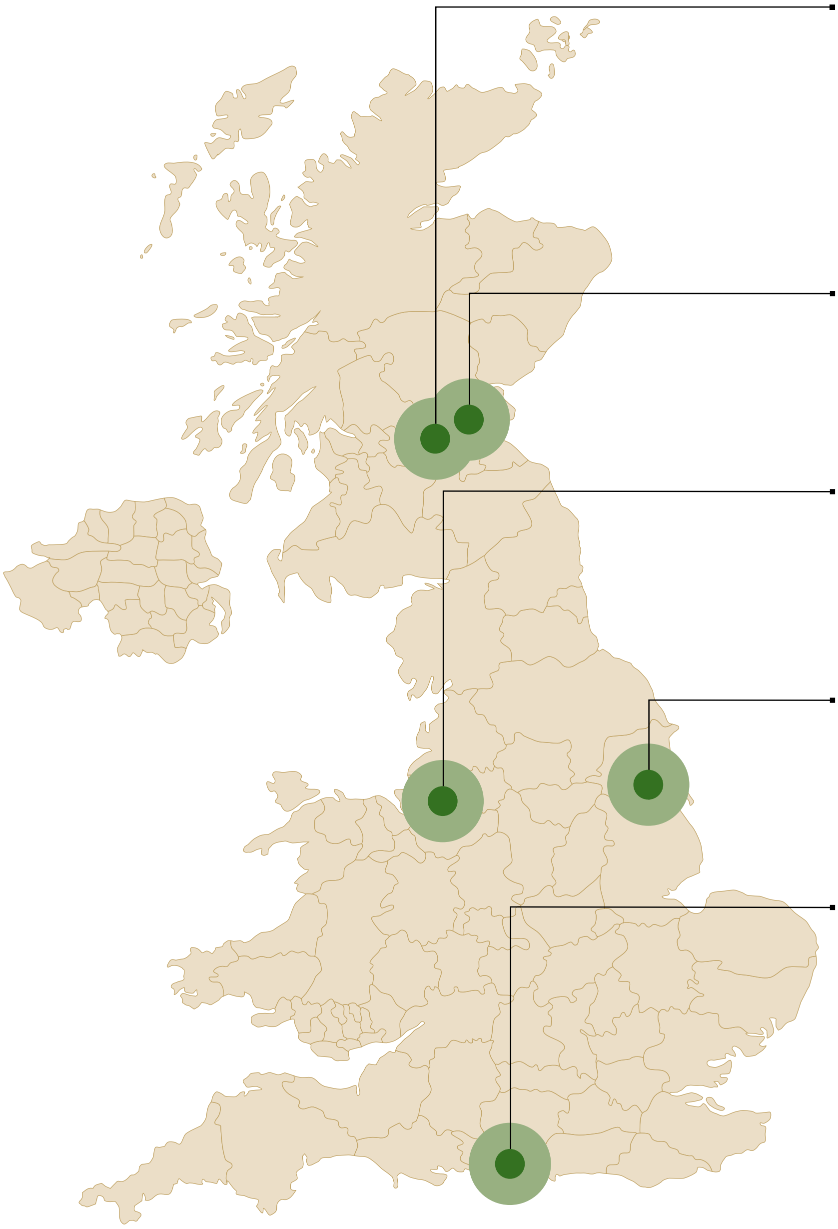
Owner: O-I Glass
Location: Alloa, Clackmannanshire
Product: Container glass
Capacity: 100,000 tonnes
% of UK capacity: 3.14%

Owner: Electric Glass Fiber UK
Location: Wigan, Greater Manchester
Product: Continuous glass fibre
Capacity: 84,250 tonnes
% of UK capacity: 2.64%

Owner: Stoelzle Flaconnage
Location: Knottingley, West Yorkshire
Product: White flint glass
Capacity: 71,175 tonnes
% of UK capacity: 2.23%

Owner: O-I Glass
Location: Harlow, Essex
Product: Container glass
Capacity: 7,300 tonnes
% of UK capacity: 0.23%

Chemicals and petrochemicals



Owner: Ineos
Location: Grangemouth, Falkirk
Product: (Petrochemicals) Ethylene, propylene, Polyethylene, Polypropylene, LPG, home heating oil
Capacity: 1.4 million tonnes

Company: ExxonMobil
Location: Mossmoran, Fife
Product: Ethylene
Capacity: 800,000 tonnes

Company: Ineos
Location: Runcorn, Cheshire
Product: Chemicals
Capacity: Unknown

Company: Ineos
Location: Hull, E. Riding of Yorkshire
Product: Chemicals
Capacity: 850,000 tonnes

Company: ExxonMobil
Location: Fawley, Hampshire
Product: Petrochemical feedstocks
Capacity: 850,000 tonnes

Other Locations

Owner: Mitsubishi Chemical Group
Location: Hull, E. Riding of Yorkshire
Product: Chemicals
Capacity: 39,000 tonnes

Company: Victrex
Location: Thornton Cleveleys, Lancashire
Product: Plastics
Capacity: 7,000 tonnes

Company: AGC Chemicals Europe
Location: Hillhouse, Lancashire
Product: Plastics
Capacity: 3,000 tonnes

Company: PET Processors
Location: Dumfries, Dumfries and Galloway
Product: Plastics
Capacity: 20,000 tonnes

Company: Nynas/Shell
Location: Eastham, Wirral
Product: Polymer modified binders and emulsions
Capacity: 800,000 tonnes

Company: Ineos
Location: Northwich, Cheshire
Product: Chemicals
Capacity: Unknown

Other Locations

Company: Tata Chemicals
Location: Winnington, Cheshire
Product: Sodium bicarbonate
Capacity: 180,000 tonnes

Company: British Salt
Location: Middlewich, Cheshire
Product: White salt
Capacity: 400,000 tonnes

Company: Inovyn
Location: Newton Aycliffe, County Durham
Product: Plastics
Capacity: 440,000 tonnes

Company: SABIC
Location: Wilton, North Yorkshire
Product: Petrochemicals
Capacity: 400,000 tonnes

Company: Alpek Polyester
Location: Wilton, North Yorkshire
Product: Plastics
Capacity: 350,000 tonnes

Company: Mitsubishi Chemical Group
Location: Wilton, North Yorkshire
Product: Methacrylates
Capacity: Unknown

Company: Mitsubishi Chemical Group
Location: Billingham, Country Durham
Product: Electrolyte division
Capacity: Unknown

Company: Bassell Polyolefins
Location: Manchester
Product: Plastics
Capacity: 230,000 tonnes

Company: Down Silicones UK
Location: Barry, Vale of Glamorgan
Product: Performance materials & coatings
Capacity: Unknown

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