



REDDIE & GROSE

2026

SUSTAINABLE INNOVATION REPORT



Laing, Scotland, UK

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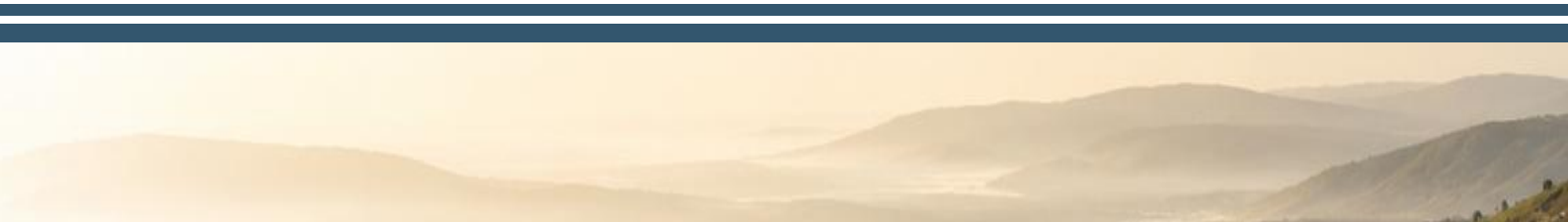
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INTRODUCTION

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FOREWORD

Welcome to the third edition of Reddie & Grose's Sustainable Innovation Report. Since participating in London Climate Action Week in 2021, we have been proud to contribute to conversations around the role that innovation and intellectual property can play in addressing the climate and ecological crises. Each year, this report has evolved alongside those discussions, highlighting the technologies, businesses and innovators developing solutions for a more sustainable future.

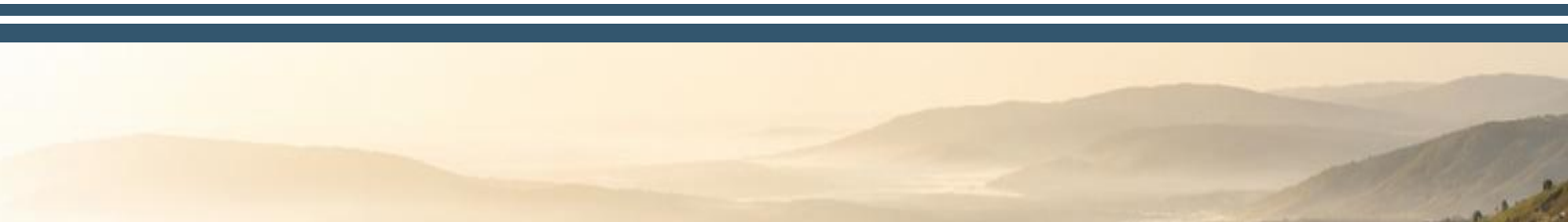
As Intellectual Property specialists with offices in the UK, Germany and the Netherlands, we work closely with innovators across a wide range of technology sectors. Through our work with early-stage clean technology start-ups, university spinouts, innovation accelerators and established companies, we see first-hand the ingenuity and determination being applied to some of society's most pressing environmental challenges. Many of the themes explored in this report reflect those experiences and the sectors in which we are privileged to work.

Our analysis is informed by trends identified in published patent data, providing a unique perspective on emerging technologies and innovation activity. This year's report examines developments across waste reduction and packaging, buildings, ICT and data centres, energy, transport and heavy industry, highlighting the inventions and organisations helping to drive progress towards a more sustainable economy.

We have also used Beauhurst, the go-to database for discovering, tracking and understanding companies in the UK and Germany, to identify fast growing, innovative UK companies operating in this space.

The urgency of this work continues to grow. Despite the scale of the challenge, there is considerable reason for optimism. The technologies and trends highlighted throughout this report demonstrate that meaningful progress is being made across many sectors, with the UK continuing to play a significant role in sustainable innovation. Technology alone cannot solve the climate crisis, but it remains an essential part of the wider solution.

We hope this report provides valuable insight into the remarkable work being undertaken by inventors, entrepreneurs, researchers and businesses, and that it encourages further collaboration, investment and innovation in the years ahead



METHODOLOGY

We used the LexisNexis TotalPatent One® platform and online patent databases, such as Espacenet, to search for patents and applications classified in section Y02 of the European Patent Office's (EPO) Cooperative Patent Classification (CPC). This classification code focusses specifically on "Technologies or Applications for Mitigation or Adaptation Against Climate Change".

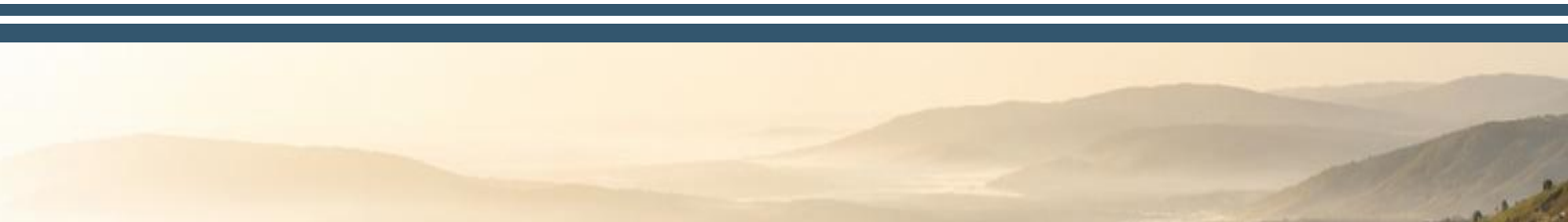
The Y02 CPC code is subdivided into more detailed categories dealing with specific areas of technology. We have dedicated a chapter of the report to each sub-category of interest. The mapping between the chapters and the subcategories is shown on the following page "Classifications".

Patent publications are not classified by a single top-level classification, and so may appear in the results more than once. Single publications may therefore have been counted in one or more chapters.

Patent publications are typically first published approximately 18 months from their priority date if they remain pending ("A publications"). They may be re-published at a later stage, for example when formally granted by a patent office as a "B publication". Our search includes both A and B publications that were published between 2018 to 2025 in the name of UK applicants.

Beauhurst identifies high-growth companies using a range of indicators that signal strong growth, innovation or ambition. These include equity investment, venture debt, participation in selected accelerator programmes, receipt of significant innovation grants, inclusion on recognised high-growth company rankings, academic spinout status, management buyouts and companies achieving scale-up growth thresholds.

A company is classified as high-growth if it meets one or more of these criteria, creating a dataset that captures businesses demonstrating exceptional growth potential or performance. The analysis in chapter 8 is based on active UK companies identified by Beauhurst as operating within the sustainable innovation sector and holding at least one patent. The dataset includes companies that have triggered one or more of Beauhurst's high-growth indicators and operate in areas such as carbon capture, clean energy, clean technology, energy management and reduction, nuclear energy and renewable energy.



CLASSIFICATIONS

Information about the EPO's Cooperative Patent Classification (CPC) can be found on the EPO and CPC websites:

The subsections of the Y02 classification have been mapped to the chapters below:

Top Level Classification

Y02 - technologies or applications for mitigation or adaptation against climate change

Buildings

Y02B: ...relating to buildings, e.g. energy efficient lighting, insulation, etc.

Greenhouse Gas Capture

Y02C: Capture of Greenhouse Gases.

Information and Communication Technologies

Y02D: ...relating to Information Communication Technologies e.g. reduced energy consumption computing.

Energy

Y02E: Reduced emission of greenhouse gases, e.g. renewable energy generation.

Heavy Industry

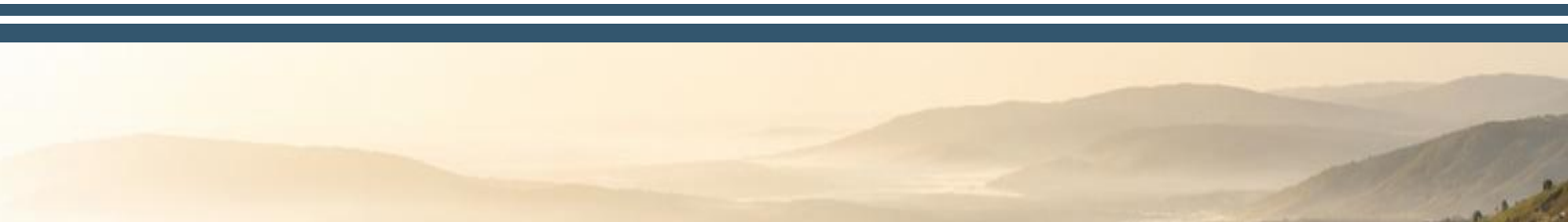
Y02P: ...relating to producing goods, e.g. industrial processes and consumer goods.

Transport

Y02T: ...relating to transportation.

Waste Reduction & Packaging

Y02W: ...relating to waste reduction, e.g. environmental packaging



REDDIE & GROSE

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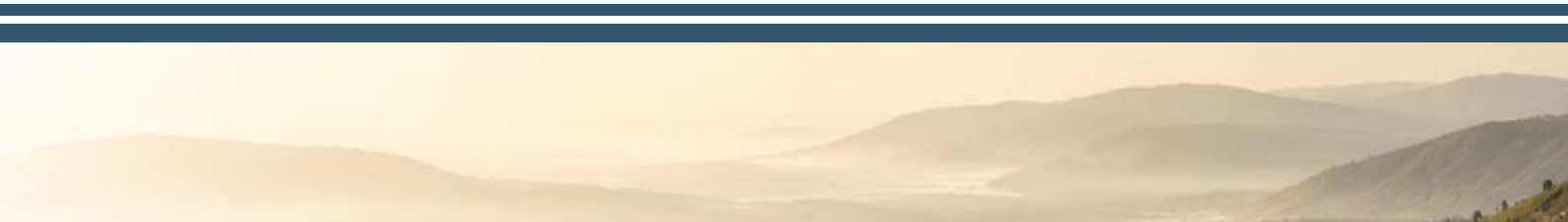
Our clients range from SMEs
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to large corporations with rights
in over 100 countries.

We specialise in patent, trade mark and design protection, advising on protecting and obtaining unregistered and registered rights, and exploiting those rights commercially. We advise individuals, start-ups, small and large companies, based in the UK and overseas.

Sustainability is very important to us. In 2022, we introduced an Environmental Management System into our London and Cambridge offices and became ISO 14001 accredited. We are committed to measuring and reducing our impact on the environment. Information about our Environmental Social and Corporate commitments can be found [here](#).

We are passionate about supporting UK businesses that are developing the technologies needed to deliver a more sustainable future. In particular, we enjoy working with start-ups and early-stage technology companies, helping them identify, protect and build value from their innovations as they develop and grow.

Our work in cleantech and sustainability is supported by an active interest in the technologies, markets and challenges shaping the sector. We regularly participate in relevant industry seminars and events, and share our thinking through insights on Cleantech and Energy and Sustainability. This helps us combine strong IP expertise with a genuine understanding of the commercial and technological environment in which our clients are operating.



01

WASTE REDUCTION AND RECYCLING

By Adam Kelvey



OVERVIEW

The Y02W code categorises innovations which help to mitigate the climate impact from waste. It covers a broad range of technologies, including those aimed at: reducing the amount of material used in products and processes; improving the way materials can be re-used/recycled; mitigating the climate impact from materials which cannot be re-used/recycled; and replacing existing materials with alternative bio-based materials, which may be disposed of in a more environmentally friendly manner.

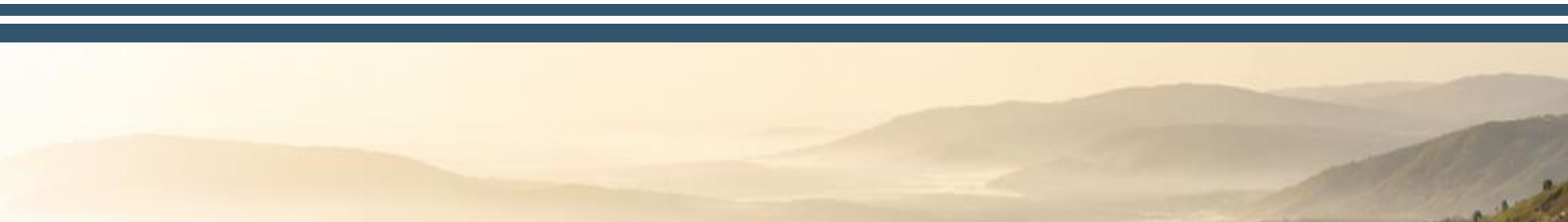
Y02W is not the only code relating to waste reduction. For example, C22B7/00 covers working up scrap metal to produce non-ferrous metals, and B29B17/00 covers recovery of plastics or other constituents from waste material. However, Y02W is directed specifically to waste management in the context of climate change mitigation.

Unlike transport or energy production, it may not be immediately apparent how waste reduction can mitigate the worst effects of climate change, but how our waste is processed, and particularly the extent to which it is effectively recycled, can drastically influence the carbon cost of the waste management. [A 2022 study by the Department for Environment, Food and Rural Affairs](#) estimated that 0.9 million tonnes of CO₂ were emitted from the UK's landfill sites in 2020. The main source of this is decomposing food, garden, and cardboard waste. However, waste management also represents an opportunity for considerable carbon savings. For several material classes, our existing waste management in the UK is actually carbon negative. Recycling of textiles results in a carbon saving of 14,315 kg CO₂ per tonne of material (the 'emission factor'). This saving is particularly large since virgin textile production is energy intensive, and manmade fibres contain high levels of fossil carbon. Recycling of textiles typically involves some sort of reuse of the material with minimal preparation. Similarly, while metals do not emit greenhouse gasses when they are in landfill, if they can instead be recycled, considerable carbon savings can be achieved. Recycled copper has an emission factor of 6,022 kg CO₂ per tonne of material, and aluminium has an emission factor of 7,469 kg CO₂ per tonne of material.

In view of these opportunities, the UK government aims to increase the UK's household recycling rate from 43.4% in 2022 to 65% by 2035. This will play a key part in the UK's journey to net-zero carbon emissions by 2050.

The Y02W code covers a wide range of technology areas; from wastewater treatment (Y02W10/00) to glass recycling (Y02W30/60). As a result, this area is not dominated by a handful of key players. Instead, in the following analysis, we will see that hundreds of UK companies are working in this space, exploring a wide range of solutions. Indeed, of the roughly 400 UK entities filing Y02W UK or European patent applications in the past 8 years, over 300 were found to only have a single patent publication. We can also see that a large number (23) of universities from around the UK hold an unusually high share of the patent filings in this sector – 29 in total. Such statistics could be a sign that certain technologies are at an early stage of development and commercial maturity. If this is the case, then we would expect the coming decade to be one of rapid change and development for Y02W technologies in the UK, especially if the net-zero targets in this space are to be met.

In this chapter, we will take a closer look at each of the two main technology areas which make up the Y02W class; Recycling and Sewage & Waste Management. We will also explore some of the top filers in this space.



TECHNOLOGY AREA 1: RECYCLING

The majority of the patent publications relating to waste reduction (Y02W) concern how the waste is handled once it has been recovered, separated, or otherwise processed for recycling. Just over half of the Y02W sub-classes relate to technologies which concern recycling of a series of specific materials. The materials can be grouped into Electronic, Construction, Glass, Plastic & Polymers, Paper & Wood, and Textiles; although there was only one publication which included the code for Textile recycling between 2018 and 2025. The break-down of the materials is set out in **Figure 1.1**. Perhaps unsurprisingly, 69% of applications are directed to Plastic & Polymer recycling. More intriguing is that 19% of applications concern the recycling of Construction waste, which includes the use of waste materials as fillers for concrete.

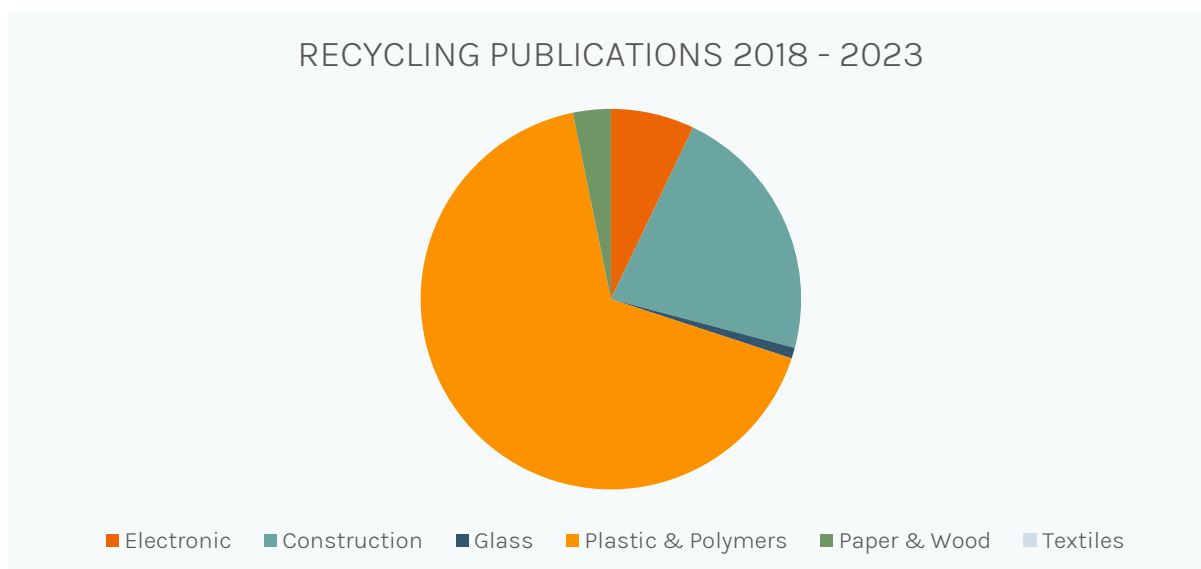


Figure 1.1

While returning materials to their pristine state may be the gold standard for recycling, it is not possible for all materials. For example, fibre-reinforced polymers are currently almost impossible to recycle back into a virgin state. This is particularly problematic as our energy network transitions to renewable sources. Wind turbine blades, which are rightly becoming more commonplace, are typically formed from glass-reinforced polymer composite materials. Given most turbine blades have a lifespan of no more than 20 years, a veritable glut of used polymer composite turbine blades need to find a home. The EU estimates that by next year 10% of all global thermoset composite waste will be decommissioned turbine blades.

Despite these efforts, the majority of used wind turbine blades which escape landfill are broken up and used as concrete filler. While this may seem a little unimaginative and low-tech, concrete and cement accounts for almost 7% of global carbon emissions. This is mostly due to the large amount of energy required during the calcination and clinker formation stages requiring temperatures of over 1200°C. Viewed through this lens, a steady supply of used turbine blades to act as concrete filler could drastically reduce the amount of cement required, leading to a corresponding drop in the carbon cost of making the concrete.

While the development of more sustainable construction materials based on recycled filler material continues apace, it is the work in the field of recycling Plastic & Polymers which appears to attract the most innovative effort by UK filers, as evidenced by the very high proportion of patent filings.

Looking at annual filing trends from 2018 to 2025, we can see that the number of Y02W patent applications directed to Plastic & Polymer recycling has always outstripped the other materials. However, while Plastic & Polymers represented 61% of the total Y02W recycling filings in 2020, this jumped to 77% in 2022 and sits at 73% in 2025 (see **Figure 1.2**). Most applicants who filed in 2025 only field a single application, demonstrating that the spike is not entirely down to a few high-filing organisations.

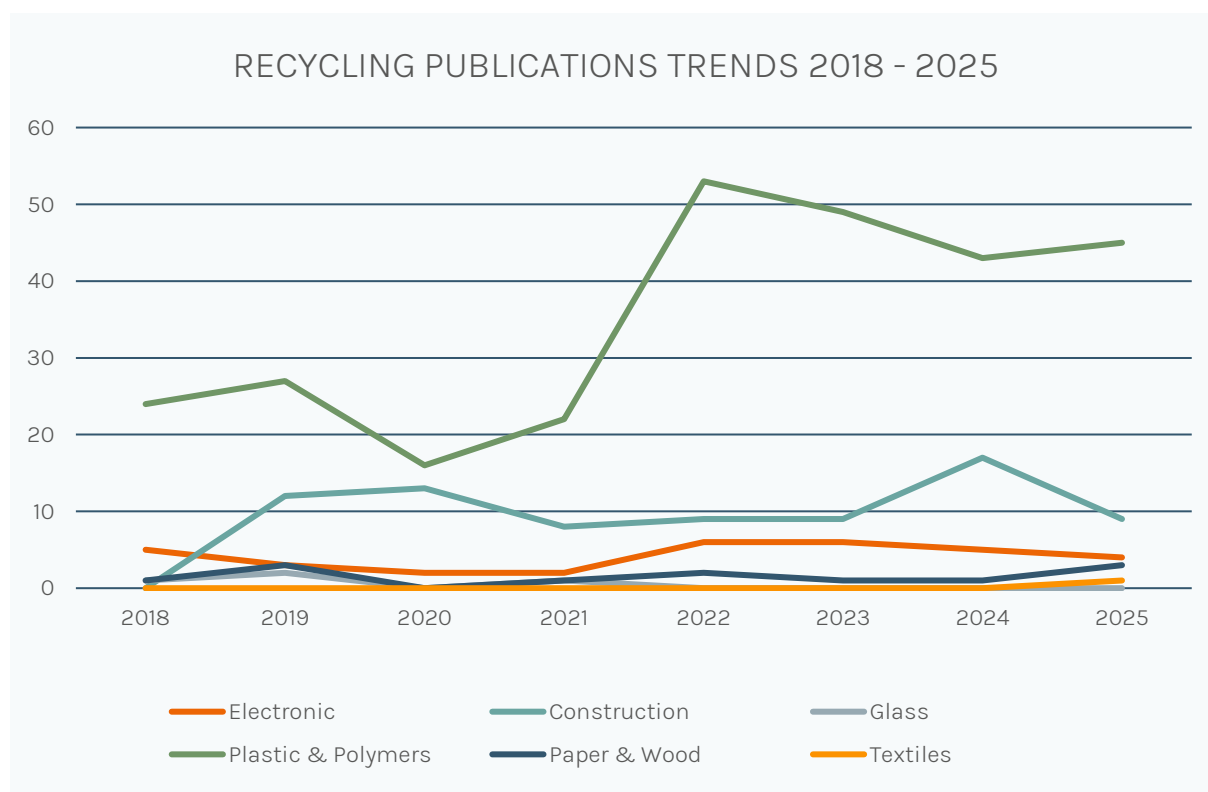


Figure 1.2

If we focus our attention on the number of 2025 publications, we can see a modest 5% increase in the number of publications relating to Plastic & Polymer recycling (see **Figure 1.2**). However, this was balanced against a 47% drop in the number of publications concerning Construction materials, with the remaining materials categories remaining generally flat year-on-year. The number of annual recycling publications remained essentially constant between 2024 and 2025, falling by just 6%.

It is worth noting that the absolute numbers of publications are relatively small for the Y02W recycling sub-category. Because of this, the activities of one company can shift the statistics considerably.

In the 2024 report, we noted an apparent trend away from Plastic & Polymer recycling in favour of Construction material. However, this was apparently short lived and the growth in this sector is once again being driven by Plastic & Polymer recycling.

TECHNOLOGY AREA 2: SEWAGE & WASTE MANAGEMENT

Other than recycling, the Y02W class concerns two other key technologies which can be summarised as sewage and solid waste management. Sewage includes technology relating to biological treatment of waste water, and sludge processing in the context of innovation which helps to reduce the climate impact of this liquid waste. As a result, Y02W also includes treatment of wastewater using renewable energy sources. On the solid waste management side, Y02W covers technologies including solid waste collection, transportation, or storage, waste processing or separation, landfill technologies aiming to mitigate methane emissions, and reuse, or recovery technologies – essentially all the steps to prepare the material for recycling which is covered above.

Perhaps unsurprisingly, in the UK, sewage & waste management is a less developed tech area when it comes to patent filings compared to the various material specific recycling applications described above. **Figure 1.3** shows that this wasn't always the case. In 2018, patent publications directed to sewage & waste management were as common as publications for all of the material specific recycling technology combined. However, in the years since, the number of annual recycling publications has grown considerably, while those concerning sewage & waste management have stagnated. There is also a noticeable dip in publications in 2020. While it would be tempting to attribute this to covid lockdowns, the latest these applications could have been filed was June 2019, well before any covid restrictions. Something else was likely at play.



Figure 1.3

In terms of a split between applications directed to sewage and those directed to waste management, between 2018 and 2025, there was a 60:40 split in favour of applications concerning sewage (see **Figure 1.4**).



Figure 1.4

Much like the recycling sub-group, the majority of the 90 UK applicants with publications between 2018 and 2023 had one or two publications.

KEY APPLICANTS

The overwhelming majority of UK applicants working in the waste reduction and recycling space have very few patent publications between 2018 and 2025; 80% of applicants having only one patent publication including the Y02W CPC code. However, a few applicants bucked this trend. The 11 applicants with five or more patent publications in the Y02W CPC class between 2018 and 2025 are shown in the heat map below.

EP, PCT, GB PATENT PUBLICATIONS BY YEAR									
Gb applicant	2018	2019	2020	2021	2022	2023	2024	2025	TOTAL
Unilever plc [gb]	1	1	0	2	6	3	7	4	24
Johnson matthey plc [gb]	1	0	0	0	2	4	4	5	16
Ccm tech limited [gb]	0	0	1	1	0	3	1	1	7
Inheriting earth ltd [gb]	0	0	0	0	5	1	0	0	6
Cambridge entpr ltd [gb]	0	0	0	0	0	1	2	3	6
Evolution aqua ltd [gb]	0	0	1	0	0	0	1	4	6
Poseidon plastics ltd [gb]	0	0	0	0	2	0	3	0	5
Nicoventures trading ltd [gb]	0	0	0	1	1	3	0	0	5
Fiberlean tech ltd [gb]	0	3	0	1	1	0	0	0	5
Adaptavate ltd [gb]	1	0	0	2	1	0	0	1	5
Koch tech solutions uk limited [gb]	0	0	0	0	0	4	0	1	5

Table 1.1

Consumer goods giant **Unilever** tops the table with 24 publications between 2018 and 2025. **Unilever's** apparent filing strategy was explored in more detail in our 2024 report.

This year, we wanted to look more closely at **Johnson Matthey**, the second biggest patent filer in the Y02W space. As can be seen, publications in the name of **Johnson Matthey** have ramped up considerably since about 2023.

Historically, **Johnson Matthey's** focus was on metals, minerals, and chemical extraction, and processing. In recent years, the company has emerged as a global leader in sustainable technologies, fundamentally structured around catalyzing the net-zero transition, promoting circularity, and driving sustainable chemical innovations.

The distribution of Y02W codes associated with filings published in the name of **Johnson Matthey** are set out below.

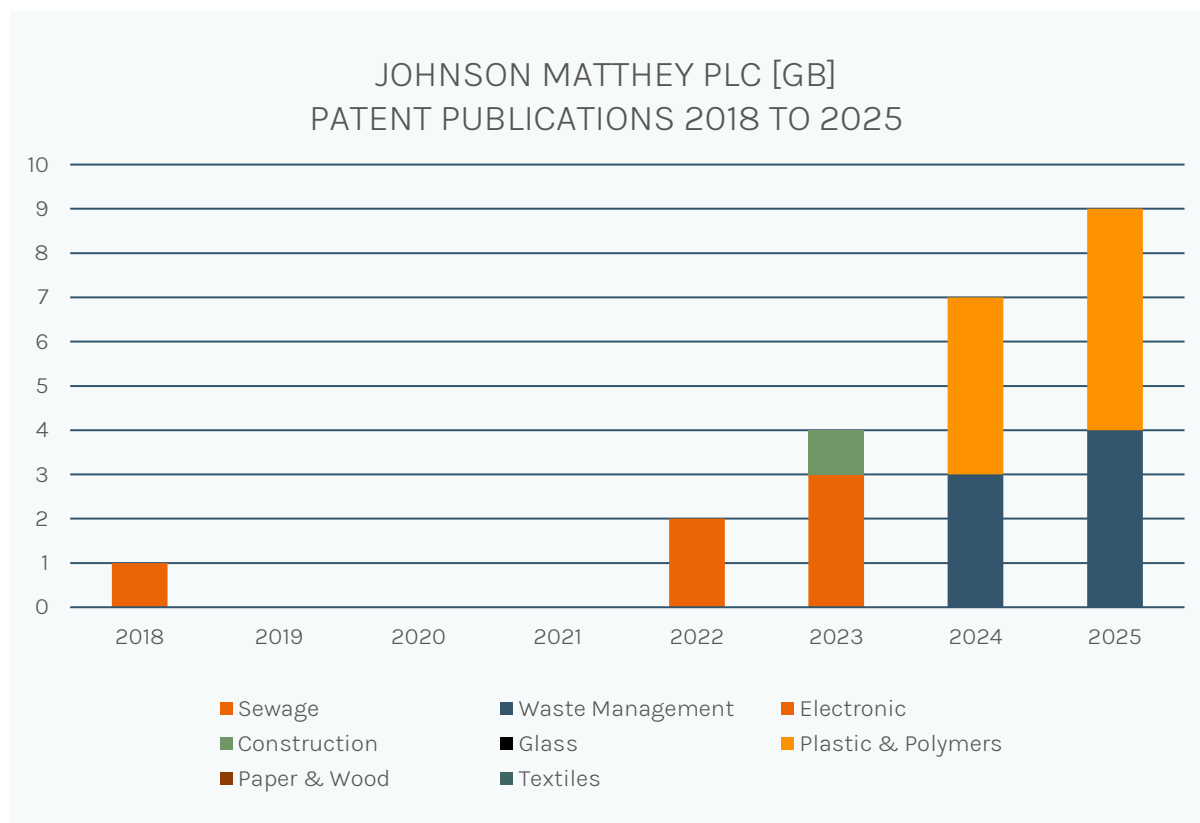


Figure 1.5

Unlike **Unilever**, whose publications are concentrated in the Plastic & Polymer recycling, **Johnson Matthey** is clearly engaged in innovation in a number of fields across the Y02W class. In addition to a steady increase in overall filings year-on-year since 2022, we can also see that in recent years **Johnson Matthey** has pivoted away from Electronic recycling towards Plastic & Polymer recycling and Waste Management.

Digging a little deeper, the recent spike in publications is entirely attributable to technology related to the recycling of catalyst coated membrane components. For example, GB2626404A describes an environmentally friendly method for recycling waste catalyst coated membranes (CCMs) and membrane electrode assemblies (MEAs) used in fuel cells and hydrogen electrolyzers. The process involves dispersing and separating the valuable fluorinated ionomer components from a solvent, which leaves behind a waste dispersion media contaminated with harmful fluorine-containing species and residual metal cations. To create a closed-loop system or allow for safe disposal, this waste media is treated using solid adsorbents like activated charcoal and ion-exchange resins to significantly reduce the concentration of these toxic impurities.

It seems that this is a relatively new venture for **Johnson Matthey**, it would be interesting to see if they continue to innovate in this space over the coming years.

LEGISLATIVE LANDSCAPE

While the data suggests this is a growing area for innovation, the extent to which much of this technology will be commercialised remains uncertain. Improved efficiency driven by innovation will likely drive costs down, which should lead to a corresponding increase in adoption of waste reduction technologies. However, all over the world governments and international organisations are intervening to accelerate uptake of Y02W technologies. In the end, it may be legislative pressure rather than purely commercial considerations which sees the broad adoption of Y02W technologies. We will consider three illustrative provisions which may help tip the balance in favour of sustainable waste management.

England & Wales Single-use Plastics Ban and DRS – 2026 Update

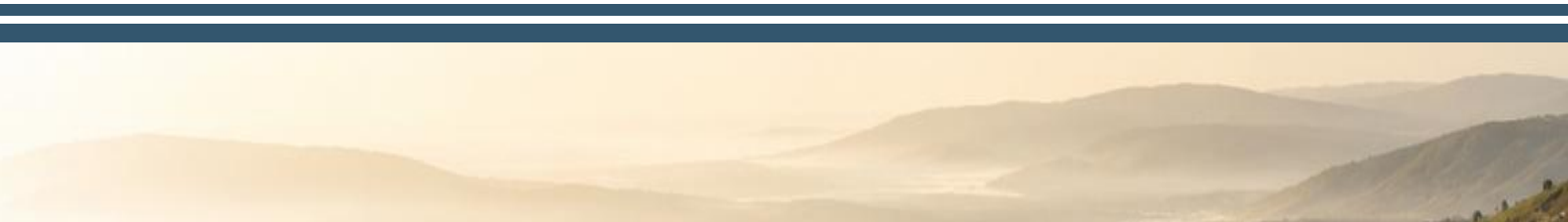
The England and Wales single-use plastics ban, which entered into force in October 2023, remains the region's most sweeping attempt to limit disposable plastic. This legislation prohibits or strictly limits the supply of plastic cutlery, balloon sticks, polystyrene food containers, and plastic plates, bowls, or trays, though exemptions remain for containers filled at the point of sale or those requiring further preparation like microwaving. Critics initially argued that the choice of restricted articles was driven by what was politically easy rather than what was necessary, pointing out that PET drinks bottles—which accounted for nearly thirty percent of UK litter—managed to completely dodge the ban.

To address this loophole, the Environment Act 2021 laid the groundwork for a UK-wide Deposit Return Scheme (DRS) where consumers pay a small, redeemable deposit on beverage containers. Although early estimates optimistically targeted an October 2025 launch, the scheme has been beset by political gridlock and logistical friction, pushing the official launch date back until October 2027. While a central industry body has now been appointed to run the network, regional fragmentation persists because England and Scotland have excluded glass from their parameters to ease pressure on retailers, while Wales has broken ranks by laying down regulations to include glass bottles in its independent scheme.

EU "Empowering Consumers for the Green Transition" (ECGT) Directive

In parallel, the European Union has drastically tightened the rules governing the sustainability and environmental claims used to sell consumer goods. For years, products have been heavily marketed using vague words such as "sustainable," "climate friendly," and "eco," despite a landmark European Commission study revealing that over half of examined environmental claims in the EU were vague or misleading, and forty percent were completely unsubstantiated. To combat this widespread greenwashing, the EU successfully bypassed delays in its proposed Green Claims Directive by passing the sibling Empowering Consumers for the Green Transition (ECGT) Directive.

Following a mandatory two-year transposition period, this law enters full enforcement on September 27, 2026. The ECGT Directive completely blacklists generic, unqualified environmental claims and explicitly bans companies from claiming a product is "carbon neutral" or "climate positive" based solely on buying carbon offsets. To make any environmental claims, companies must provide an independently audited, scientifically proven roadmap, heavily motivating consumer goods brands to invest in Y02W tracking innovations to ensure their supply chains can withstand intense regulatory scrutiny.



Global Plastics Treaty - 2026 Update

By far the most consequential piece of international law aimed at curbing reliance on virgin plastic is the UN Global Plastics Treaty. First conceived in 2017, the treaty aims to reduce global plastic pollution, expand recycling infrastructure, and mandate circular product design. However, the optimistic goal of finalizing a legally binding treaty text collapsed into extraordinary geopolitical gridlock during the Intergovernmental Negotiating Committee (INC) sessions, creating a stark divide between two irreconcilable diplomatic camps.

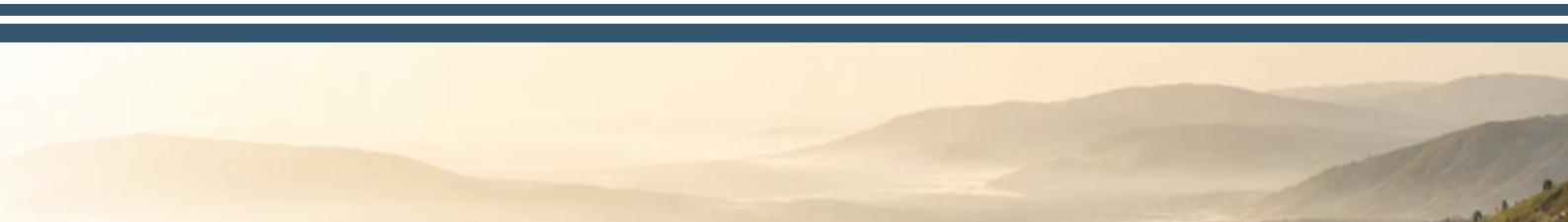
On one side, the High Ambition Coalition—which includes the UK, the EU, and the United States—insists on a mandatory, globally binding cap to reduce the production of primary plastic polymers by forty percent by 2040. Conversely, the Petrochemical Bloc—led by major fossil-fuel exporting nations like Russia, China, and Saudi Arabia—rejects any upstream limits, arguing instead that the treaty should focus strictly on downstream waste management and improving recycling infrastructure. The highly anticipated INC-5.1 session in Busan, South Korea, ended in a bitter stalemate back in December 2024, as the petrochemical historical bloc successfully leveraged the UN's strict consensus-based rules to block production caps. To prevent a total collapse of the initiative, negotiations have been dragged into an extraordinary overtime session in Geneva, leaving the final text stalled in diplomatic limbo while regional blocs forge ahead with their own independent supply chain standards.

CONCLUSION

The shifting global legislative landscape confirms that the future of waste management will be dictated by rigorous statutory compliance rather than purely commercial motivations. As structural frameworks move into full enforcement and regional regulations tighten, the industrial sector faces an unavoidable ultimatum to eliminate greenwashing and adopt genuine sustainability.

Fortunately, the patent data underscores a vibrant, decentralized ecosystem of innovation perfectly positioned to meet these regulatory pressures. Driven by agile UK companies, forward-thinking academic institutions, and ascending market leaders like **Johnson Matthey**, patent filings under the Y02W classification are paving the way for crucial advancements in this field.

By establishing patent protection over these essential green processes, innovators are actively securing the high-value commercial pathways necessary to transition global supply chains toward a circular economy and realize the UK's net-zero carbon goals.



02

ENERGY

By Bruce Torrance



OVERVIEW

The Y02E CPC code is used for classifying patent applications relating to energy, and specifically to reducing greenhouse gas emissions through technologies related to energy generation, transmission and distribution. Y02E therefore captures innovation relating to: generating energy with renewable sources and nuclear energy; alternative fuel sources, such as biofuels; enabling technologies such as hydrogen and energy storage; and technologies for mitigating the harmful effects of existing combustion, such as carbon capture.

In 2023, it was estimated that approximately 35% of global carbon emissions were produced by generating electricity and heat.ⁱ Energy technologies that reduce carbon emissions are therefore essential for the UK – and indeed the world – if we are to avert a climate crisis and achieve Net Zero by 2050.

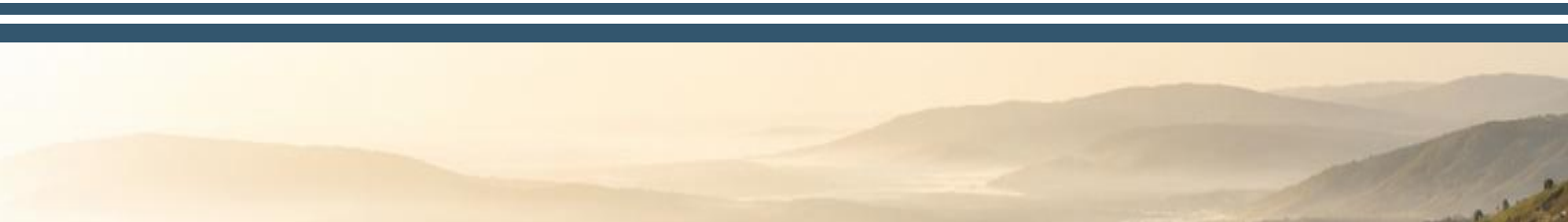
From a UK policy perspective, the House of Commons Library recently issued a research briefingⁱⁱ on the UK Government's progress towards reaching Net Zero in 2050. The briefing found that emissions had been successfully reduced to be 50% lower than 1990 levels, and that the UK's electricity supply now provides less emissions than its aviation industry. Despite these successes, decarbonisation is a multi-sector endeavour and it is clear that further emissions reductions must still be made across all industry sectors.

Since our last report there have been numerous exciting innovation breakthroughs in the energy sector. Recent advances in stellarator technologies have enabled nuclear fusion to take a big step forwards, and resulted in a record plasma-containment performance at Wendelstein 7-X. The efficiency of solar panels continues to be pushed beyond conventional limits, with implications for lower costs and higher performance for consumers. Finally, Norway's world-first open source carbon capture and storage facility entered early commercial deployment that will enable large-scale transport and permanent storage of industrial carbon dioxide. These developments reflect meaningful innovation that could have a lasting and significant impact on our ability to reach Net Zero.

In this chapter, we will take a closer look at recent homegrown success stories focussing on two technology areas of apparent strength (nuclear and hydrogen technologies) and two areas where we may see increased future innovation (photovoltaic and grid technologies).

ⁱ <https://www.wri.org/insights/4-charts-explain-greenhouse-gas-emissions-countries-and-sectors>

ⁱⁱ <https://researchbriefings.files.parliament.uk/documents/CBP-9888/CBP-9888.pdf>



PATENT FILING TRENDS FOR ENERGY TECHNOLOGIES

According to a recent report by the International Energy Agency (IEA),ⁱⁱⁱ the proportion of global patent applications for energy technologies grew to around 10% of all applications up to 2024 – ahead of other significant sectors like chemicals, pharmaceuticals and transport. Energy-related patent applications rose by 3.2% in 2023, reaching 47,200 published applications.^{iv}

The UK picture, however, appears somewhat less positive. As can be seen from the table below, the total number of patent publications for energy technologies by UK applicants has fallen significantly since 2023, the last complete data set included in our previous report.

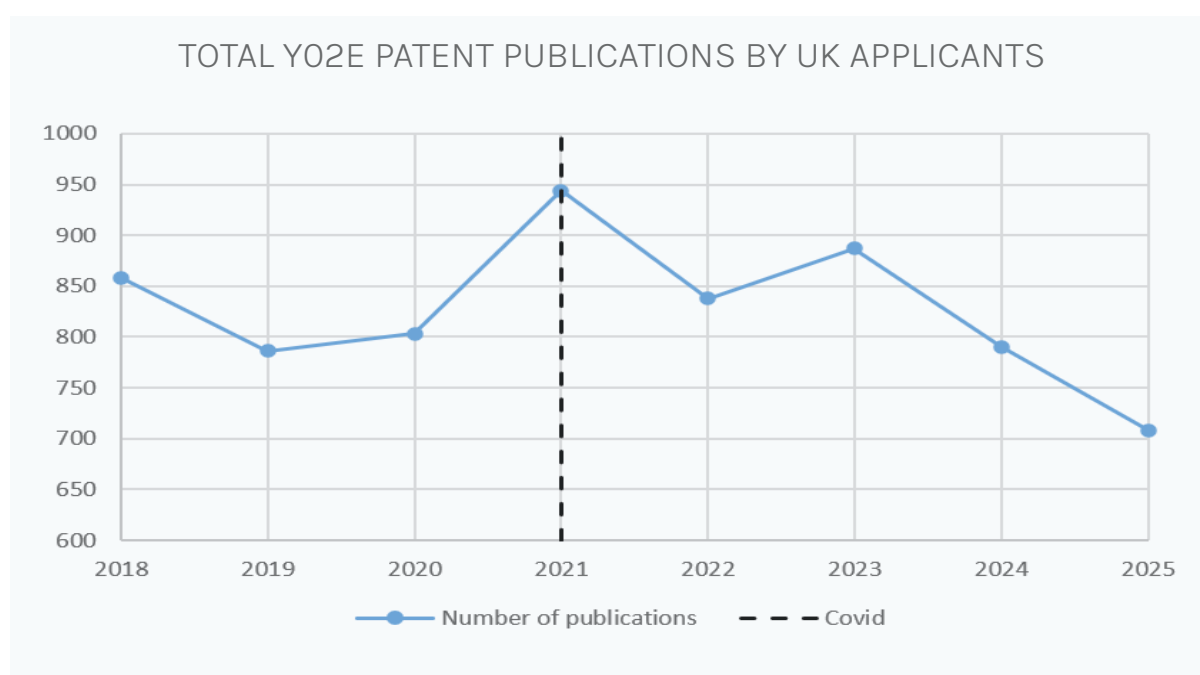


Figure 2.1

Due to patent applications typically being published 18 months after they are filed, the 2021 publication figures above are indicative of the volume of patent applications before the Covid pandemic. Accordingly, some of the reduction could be attributed to reduced levels of patent filing by UK applicants following the pandemic. However, global patent filings have generally shown year-on-year growth in recent years following the pandemic and so these figures, which reveal a 25% reduction in energy patent publications by UK applicants from pre-pandemic levels, suggest a cooling in the UK energy sector.

ⁱⁱⁱ The State of Energy Innovation 2026

^{iv} <https://www.wipo.int/web-publications/world-intellectual-property-indicators-2025-highlights/en/patents-highlights.html>

TRENDS IN TECHNOLOGY AREA

In previous reports, we have highlighted that battery technologies remain the largest focus of energy innovation for UK companies. This is representative of global innovation, where the share of energy patenting for storage solutions reached 40% in 2023.^v However, our analysis for 2025 publications shows that – despite remaining the largest driver of innovation – the number of patent publications for battery technologies by UK applicants was the lowest for the last 5 years.

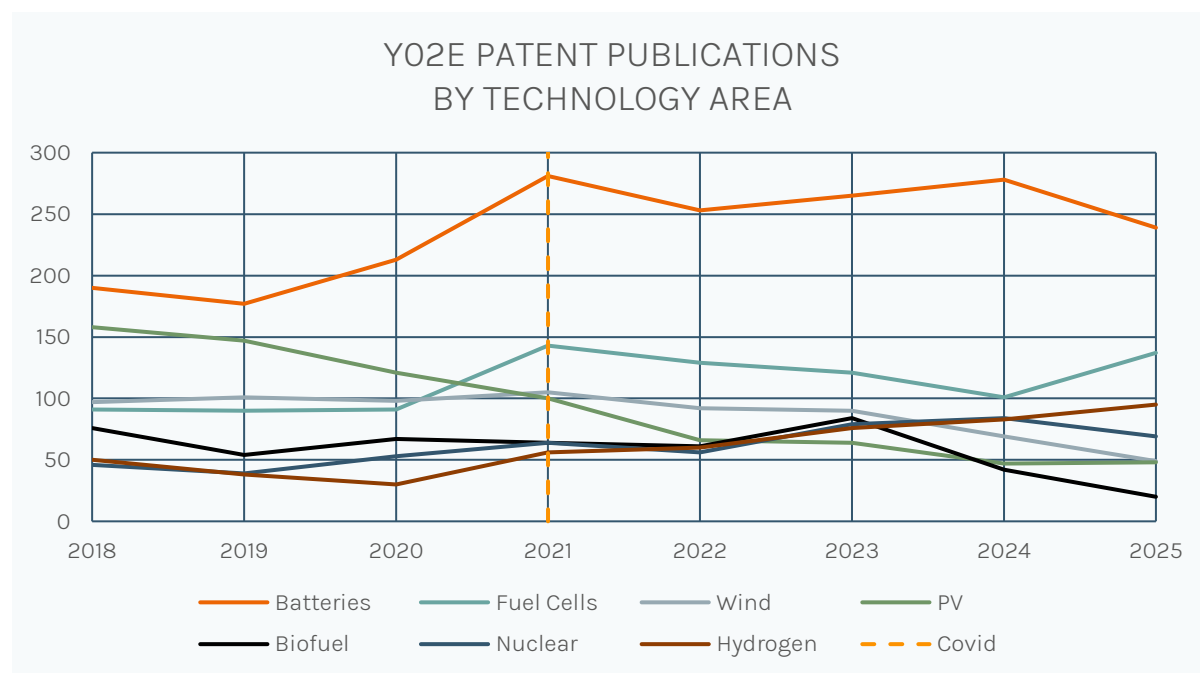


Figure 2.2

In fact, since our last report, the only two technology areas to show positive growth compared to pre-pandemic levels are Nuclear and Hydrogen with some technology areas showing a dramatic post-pandemic decline in publication numbers.

Technology Area	2018	2019	2020	2021	2022	2023	2024	2025
Batteries	190	177	213	281	253	265	278	239
Fuel Cells	91	90	91	143	129	121	101	137
Wind	97	101	98	105	92	90	69	49
PV	158	147	121	100	66	64	47	48
Biofuel	76	54	67	64	61	84	42	20
Nuclear	46	39	53	64	56	79	84	69
Hydrogen	50	38	30	56	60	76	83	95

Table 2.1

We will take a closer look at these two growth areas, and two technology areas that seem primed for growth, in the sections below.

^v The State of Energy Innovation 2026

Technology Focus 1: Hydrogen

The Y02E CPC code captures technologies involving the production, storage and distribution of Hydrogen, and its use in a fuel cell. Fuel cells operate similarly to batteries by providing clean electricity for as long as they are provided with a renewable fuel source.

Hydrogen has been investigated as a fuel source for a very long time due to its relatively high energy density, plentiful amounts of feedstock resource (water), and lack of carbon emissions when used as a fuel. A recent report^{vi} by the House of Commons Science and Technology Committee heard that hydrogen will have an essential role in the UK's decarbonisation efforts as a means of providing a gaseous fuel in our energy system to replace our reliance on natural gas.

Summarising, Franz Lehner, Head of International Cooperation at NOW GmbH stated simply:

“...if we cannot agree that green molecules will be abundant by 2050, we cannot reach Net Zero.”

Despite having a critical role to play in the push to Net Zero, commercialisation of hydrogen technologies remains complex. Hydrogen processes are relatively inefficient and hydrogen generation via electrolysis requires electricity, which may not be produced cleanly. Additionally, recent flagship projects, such as Aberdeen's planned hydrogen bus fleet, have encountered difficulties.^{vii}

The majority of recent patenting activity from UK applicants has focussed on producing hydrogen efficiently, either through electrolysis or chemical conversion (e.g. cracking or other thermochemical processes). Applications naming one or more UK universities accounted for about 5% of recent patent publications for hydrogen technologies, which typically suggests that the technology area is relatively mature.

The two biggest UK applicants filing patents for hydrogen technologies over the last few years are Johnson Matthey Hydrogen Technologies Ltd and Ceres IP Co Ltd.

Ceres IP Co Ltd are an IP holding subsidiary of Ceres Power Holdings PLC who aim to facilitate industry, particularly data centres, commercial units, portable power supply units and the national grid, to make the energy transition to greener energy sources.

A recent patent publication for Ceres GB2632328A describes a method of producing methane directly inside an electrolyser by combining electrolysis and methanation in a single integrated process. This allows exothermic heat produced by the methanation process to be reused by the electrolyser, improving efficiency. The methanation process also extracts carbon dioxide from the air and converts it into methane for subsequent use.

Systems such as these will help support the UK's push to Net Zero by providing processes that are carbon-neutral by recycling existing carbon dioxide, enabling surplus energy to be stored as methane for later use, and potentially providing methane as an alternative to extracted natural gas in the UK's fuel supply system.

^{vi} <https://committees.parliament.uk/publications/33292/documents/180198/default/>

^{vii} <https://www.bbc.co.uk/news/articles/cjd8v31gvpmk>



Technology Focus 2: Nuclear

We are living in an exciting new nuclear age, where technological developments for both nuclear fission and fusion continue apace. However, while the number of patent publications has increased for both fusion and fission technologies compared to pre-pandemic levels, both technologies experienced a slight dip in patent publications from UK applicants last year, as may be seen in the graph below.

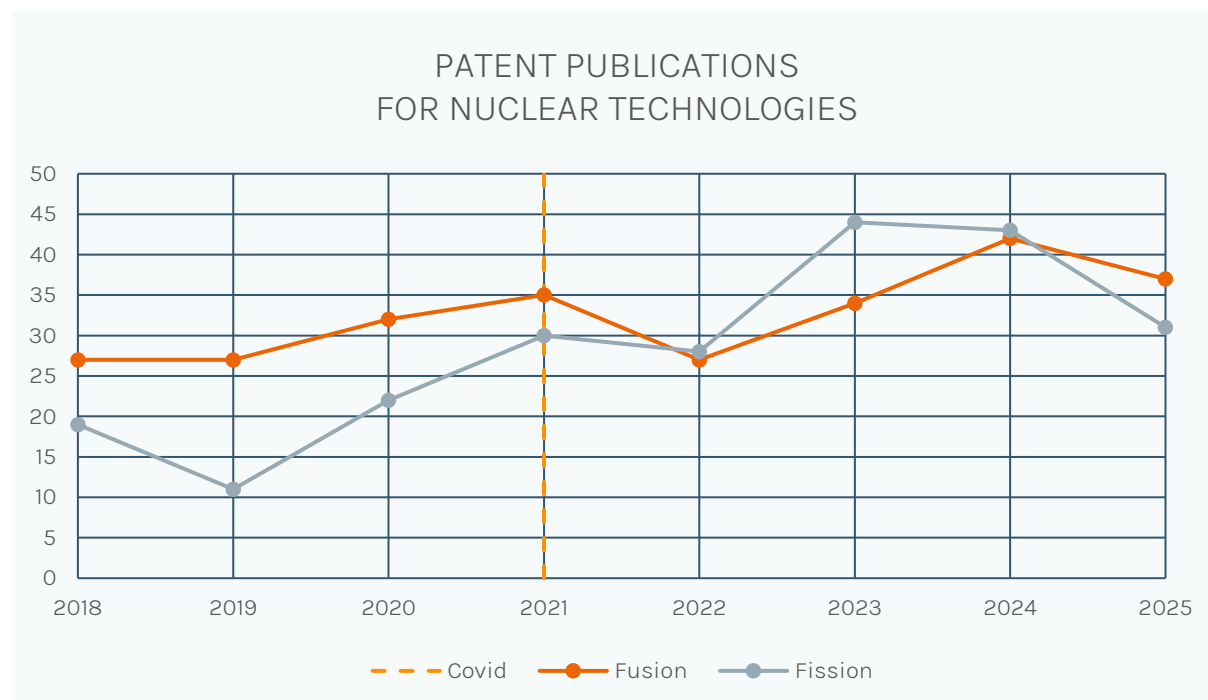


Figure 2.3

The nuclear industry was the largest area of energy research and development expenditure in the UK in 2024, and so it will be interesting to see whether this R&D expenditure will stimulate an uptick in patent publications from 2026 onwards.

Globally, nuclear research and development is still being led by publicly funded international initiatives (such as ITER) due to the significant cost – particularly for fusion technologies. However, UK applicants have historically bucked this trend, with private companies Tokomak and Rolls Royce conducting R&D and filing substantial numbers of applications for fusion and fission technologies respectively. There are also growing numbers of startups in the nuclear sector as may be shown in the figures below.

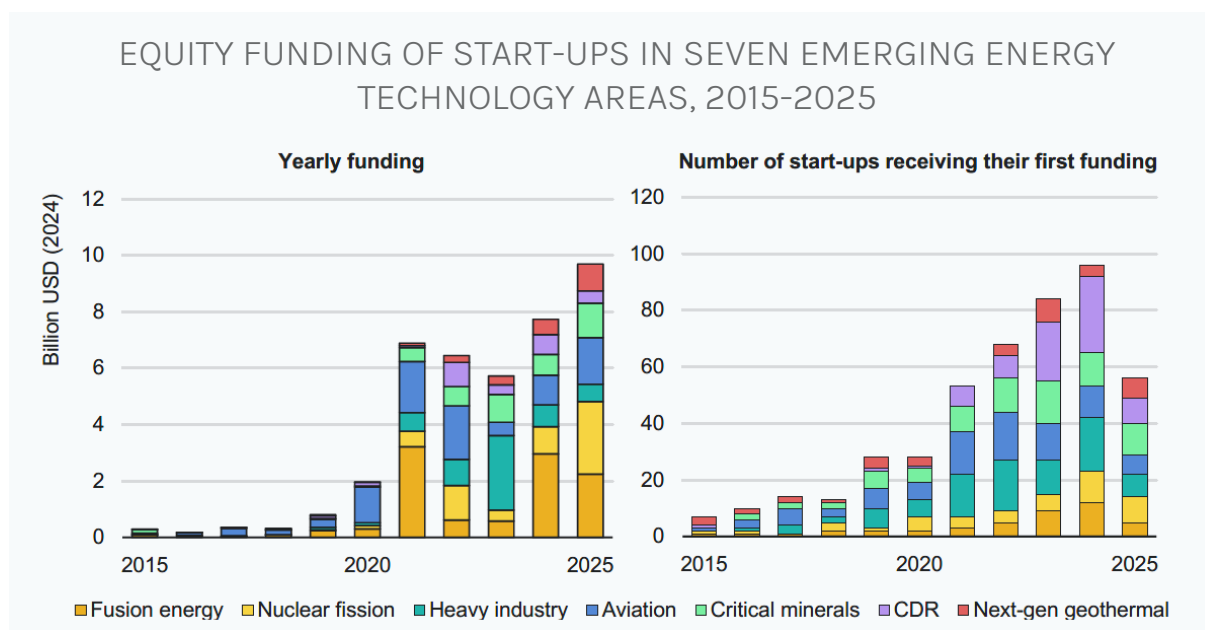


Figure 2.4

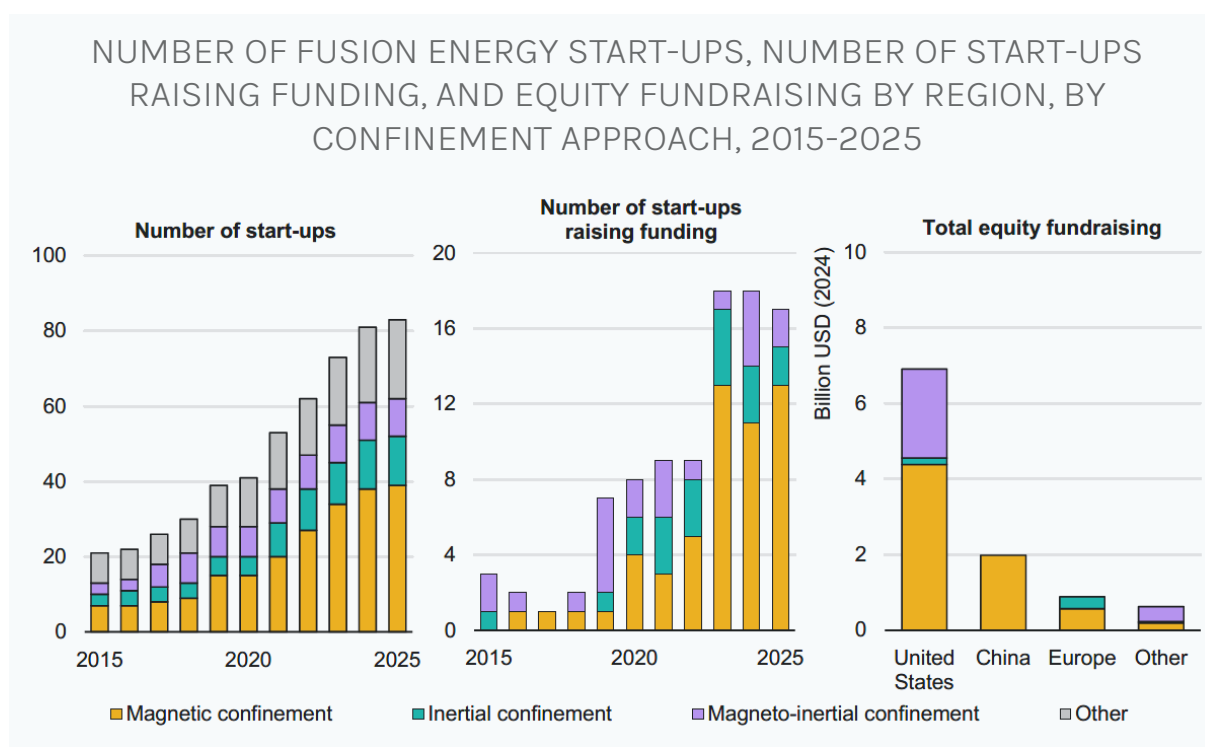


Figure 2.5

CDR = carbon dioxide removal. Next-gen geothermal = Next-generation geothermal. Heavy industry excludes chemicals, an area that was raised significant funding before 2020. CDR category matches scope described in Chapter 9 of *The State of Energy Innovation 2025* and includes only technology-based solutions.

Source: IEA analysis based on data from *Cleantech Group (2025)* and *Crunchbase (2025)*

Nuclear Fission

As may be seen in the graph below, Rolls Royce have been the leading UK-based filer of patent applications for fission technology, with recent innovation relating to small modular nuclear reactors (SMRs), which are essentially miniature conventional reactors that can be built in factories, making the construction of nuclear power plants quicker, cheaper, and more scalable. BAE Systems, also in the defence industry, has also recently started filing patent applications for nuclear fission technology relating to reactors and fuel assemblies.

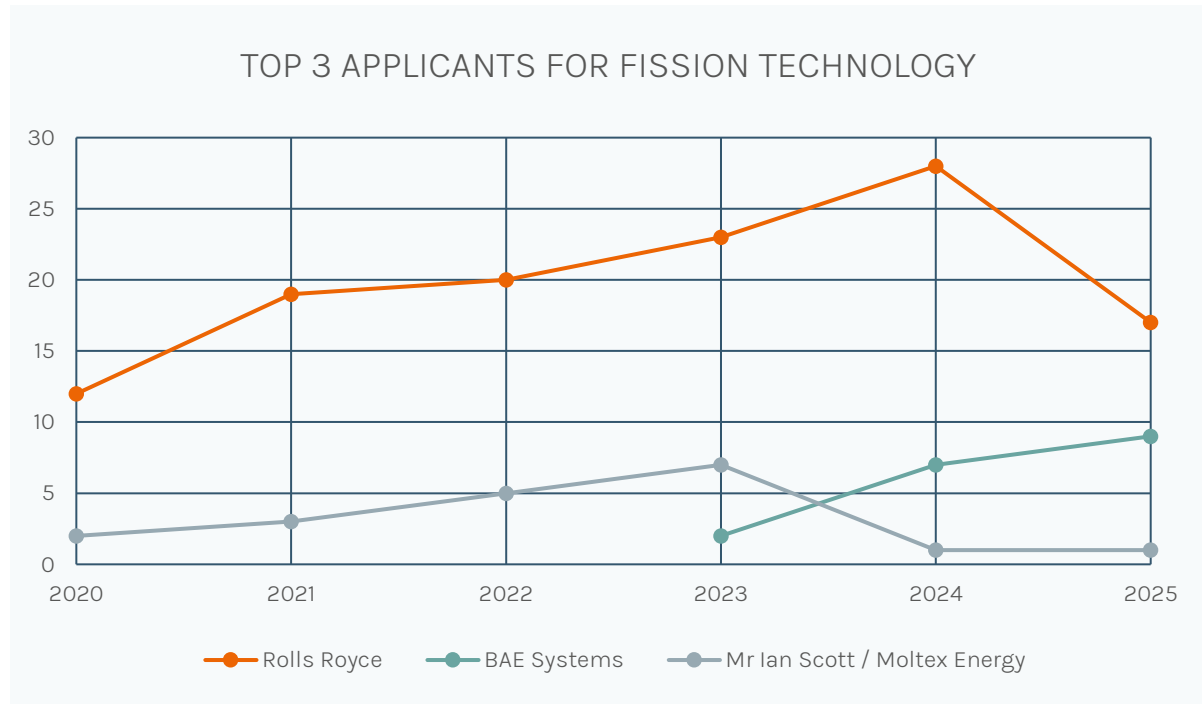


Figure 2.6

An interesting presence in the above graph is an individual, Mr Ian Scott, who filed nearly 30 applications between 2018-2023 in a private capacity. According to Mr Scott's LinkedIn profile, after a successful career in bioscience, he discovered what he believed to be a fundamentally flawed approach taken by the nuclear industry in 1950 and invented a molten-salt-fuelled nuclear reactor with several advantages over the latest reactor technologies. Mr Scott formed Moltex Energy LLP, which have been named as the applicant for patent publications in 2024 and 2025. Moltex is currently developing a nuclear reactor in Canada for electricity and hydrogen production that uses recycled nuclear waste as fuel.

Nuclear Fusion

As we explored in our series of articles in 2023,^{viii} recent technological breakthroughs are suggesting that nuclear fusion – the long-time holy grail of energy research – could be commercialised within the next two decades, and thus within the lifetime of a patent. We therefore anticipate patent filings for fusion technologies to increase significantly in the coming years.

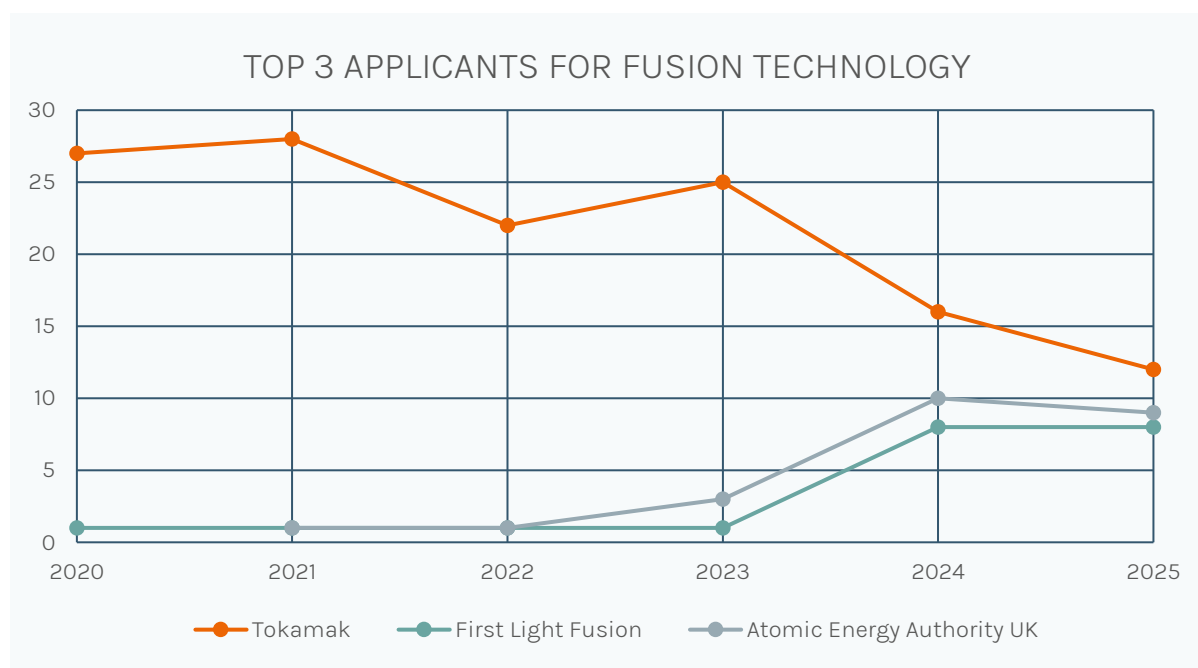


Figure 2.7

The UK continues to play a leading role in the development of fusion technology.

Tokamak Energy, a specialist in plasma containment with high-temperature superconducting (HTS) magnets based in Oxford, has been a significant innovator in the industry. Although still the largest UK-based applicant for fusion technologies, the number of year-on-year patent publications for Tokamak has decreased notably in the past two years, which may be indicative of Tokamak pivoting their focus away from R&D towards commercialisation of their technologies. Tokamak's financial data indicates that R&D expenditure peaked in FY2022 at £11.8m, reducing to £7.7m in FY2023 and £7.4m in FY2024. Tokamak have also recently announced their involvement in the UK's STEP Program,^{ix} which aims to deliver net electricity generation from fusion in the UK by 2040, and recently announced^x their involvement in a UK-US consortium to build the first private-sector-led fusion power plant project in the UK.

The nuclear sector is clearly buoyant, as shown below in a recent survey^{xi} by the International Energy Agency where respondents in the nuclear industry were the most optimistic across the energy sector about their innovation progress, as shown below.

^{viii} <https://www.reddie.co.uk/2023/12/21/powering-tomorrow-intellectual-property-nuclear-in-the-age-of-net-zero-series-round-up/>

^{ix} <https://tokamakenergy.com/2026/04/14/tokamak-energy-named-magnet-systems-partner-for-step-fusion-programme/>

^x <https://tokamakenergy.com/2026/05/06/uk-infinity-fusion-consortium-to-accelerate-development-of-uk-commercial-fusion-power-plant/>

^{xi} The State of Energy Innovation 2026, IEA

SURVEY RESPONDENTS' PERCEPTIONS OF PROGRESS IN OVERALL ENERGY TECHNOLOGY INNOVATION AND IN THEIR DOMAIN IN THE PAST YEAR

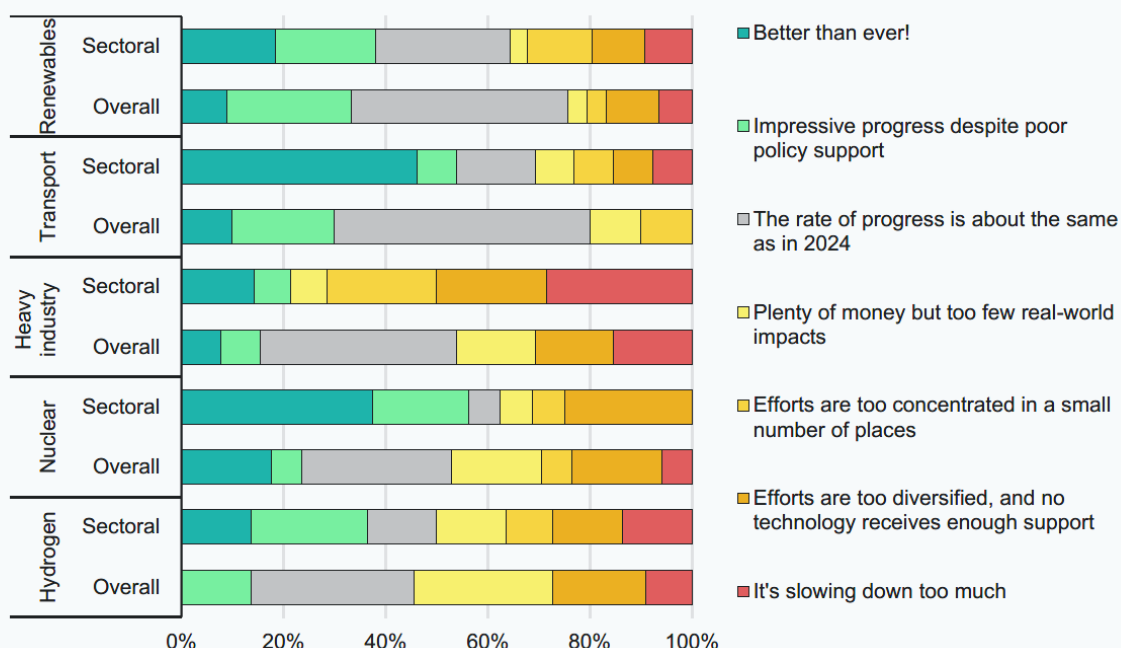


Figure 2.8

Technology Focus 3: Thermoradiative cells (aka “Night-time solar panels”)

An interesting technological breakthrough for solar cells was reported earlier this year.^{xii} Thermoradiative cells are an emerging class of semiconductor energy devices that produce electricity when emitting thermal energy. Accordingly, solar panels that heat up while producing electricity during the day could potentially also generate electricity at night due to the temperature gradient between the hot panel and the cool ambient air.

Although recent experimental work has yielded a working proof of concept, current performance is modest: several orders of magnitude lower than the electricity produced during the day. However, the current technology could find use on satellites, where the differences in ambient temperature are much greater and electrical loads could be sufficiently small for the thermoradiative cells to provide meaningful power.

Despite the general concept of radiative cells being known for some time, our research has only uncovered a couple of patent publications relating to this technology, none of which were filed by UK applicants.

As shown in the graph below, the global number of patents for solar photovoltaic cells has declined steadily in recent years despite increasing investment.

^{xii} <https://www.nature.com/articles/d42473-024-00483-8>

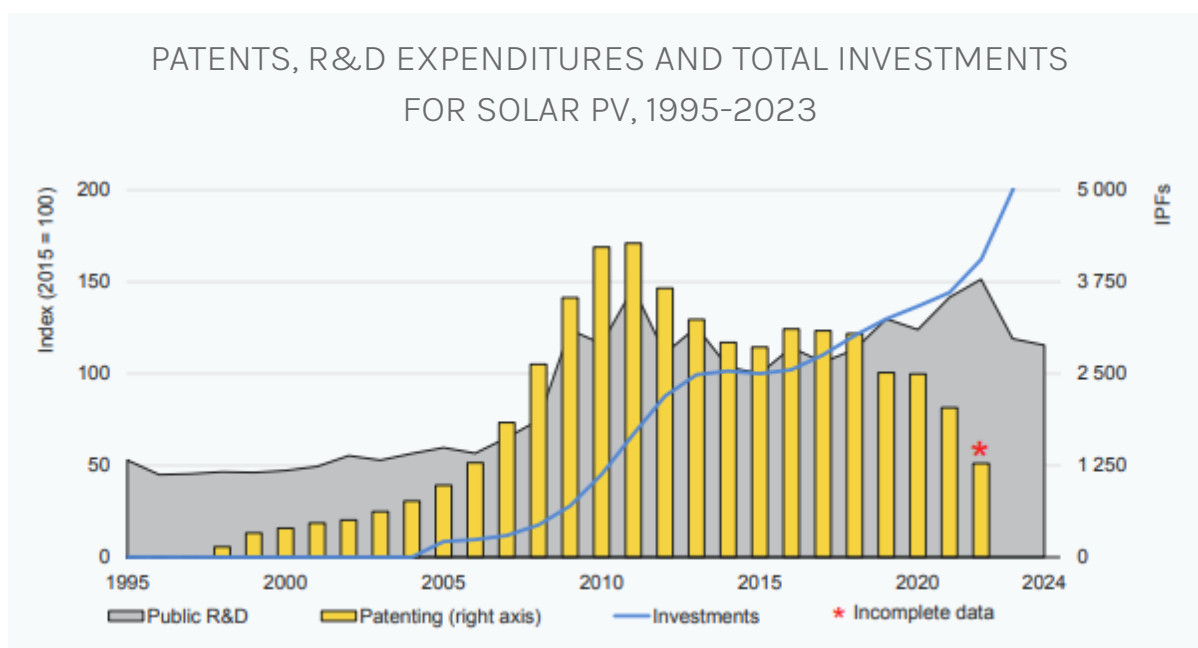


Figure 2.9

This is typically a sign that the technology has reached technical maturity, but it will be interesting to see whether interest in developing thermovoltaic cells re-invigorates patent filings in this sector.

Notes: IPF = international patent family. Patent data stops at 2022 while deployment and R&D spending are reported until 2024. Patenting data for 2022 is incomplete.

Source: IEA analysis based on December 2025 data from the European Patent Office (EPO).

Technology Focus 4: Smart Grids

It is undeniable that the rapid implementation of AI is being seen in patent filing trends across all sectors. An area in which we are likely to see AI interfacing with the energy sector is the development and implementation of a national smart grid: an electricity network that uses digital technologies to monitor and manage the distribution of electricity in a “smart” manner.

The need for a smart grid in the UK is becoming increasingly acute as our energy mix diversifies, energy demand increases, and the North-South geographic imbalance between supply and demand remains. The increasing use of AI and data centres means that electricity is the fastest-growing source of final energy demand, and is forecast to outpace growth in total energy consumption over the next 25 years. Recent studies^{xiii} have estimated that implementing smart grid technologies could save \$1.8 trillion of grid investment globally through 2050 by extending the lifetime of grids, while also helping to integrate renewables and minimise supply interruptions. Conversely, failure to implement smart measures could cost nearly \$1.4 trillion. To be successful, smart grids of the future will need to offer power stability, resilience and quality, system flexibility and robust protection against cybersecurity threats.

Despite these motivations, patenting activity for smart grids remains notably behind other energy technology areas, both globally and for UK-based applicants.

Our analysis shows that of the 3,000 patent applications published globally in 2025 that relate generally to electrical power generation, transmission and distribution, only 7.5% of those related to smart grids (of which 2% were registered to UK based applicants). This lag may be due to a relative lack of funding: recent estimates^{xiv} suggest that global smart grid investment must double to \$600 billion a year to achieve NetZero by 2050.

In any event, if necessity truly is the mother of invention, then we expect to see increased patenting activity relating to smart grids in the years to come.

^{xiii} <https://www.iea.org/energy-system/electricity/smart-grids#tracking>

^{xiv} A Global Review of Patent Data for Smart Grid Technologies, IEA

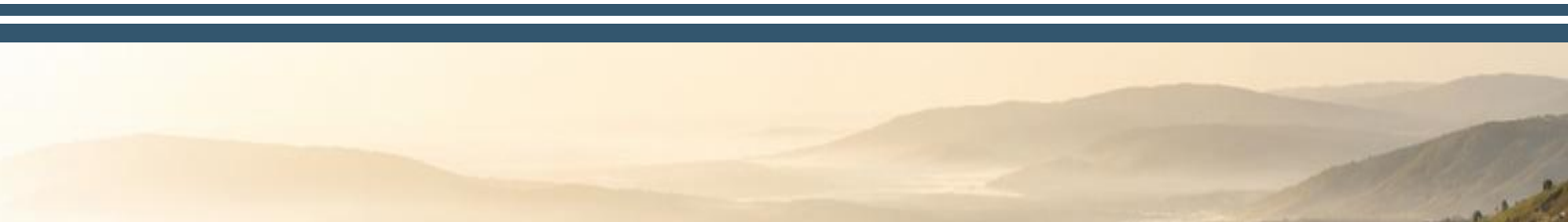


SUMMARY

In this chapter we have examined recent trends in UK-based energy innovation, with a focus on nuclear and hydrogen, which appear to be areas of growth, and photovoltaic and grid technologies, which appear to be areas for future patenting growth. In particular, nuclear innovation appears to be a relative strength for UK innovation, supported by significant public and private investment, with advances in small modular reactors and continued progress toward fusion commercialisation.

However, our analysis reveals that UK-based energy innovation risks falling behind internationally, despite strong policy commitments to Net Zero and energy security. Although battery technologies remain the dominant focus of UK (and global) innovators, our analysis suggests UK innovation for this important technology area cooled last year along with wind, solar and biofuels.

Finally, as we have seen elsewhere, the increasing deployment of AI will likely transform the energy landscape into the future. There are many opportunities for AI to have a positive effect on the energy sector, with the most notable perhaps being the digitalisation and management of our national energy infrastructure. The UK has a very particular set of grid challenges, but UK patent activity for smart grids remains modest; innovators who are able to secure protection for solutions to these challenges will be enviably positioned and will play a crucial role in enabling the UK to realising Net Zero.



03

BUILDINGS

By Nick Tyrie



OVERVIEW

Why Buildings Became Climate Infrastructure

Buildings account for a major share of global emissions through heating, cooling, electricity use and construction materials. Yet for decades they were treated as static assets rather than dynamic technological systems.

The Y02B CPC classification captures a broad range of climate mitigation technologies related to buildings, from heat pumps and smart controls to insulation materials and energy management systems. Together, these technologies reflect a wider transformation in how buildings are designed, operated and valued.

The central story within Y02B is not simply the growth of individual technologies, but the convergence of electrification, software and materials innovation into a new model of the building itself: connected, efficient and increasingly responsive to energy systems.

ELECTRIFICATION AS THE DEFINING TRANSITION

One of the clearest trends in building decarbonisation is electrification. Heat pumps are replacing fossil-fuel heating systems and becoming central to climate policy across Europe.

Innovation is no longer focused solely on efficiency. Companies are competing around controls, integration, installation methods and software optimisation. As a result, the sector increasingly overlaps with digital platforms and energy management systems.

Buildings are therefore shifting from isolated structures to interconnected electrical systems.

This is highlighted by the emergence of Mixergy, an innovative British company that produces smart, connected hot water cylinders, into the top patent filers in the last couple of years.

Top 4 UK companies by UK/Europe patent publications in 2024 and 2025 (Buildings – Y02B)

	Publications
Nicoventures trading	9
Octopus energy heating	7
Cirrus logic int semiconductor	7
Mixergy	5

Table 3.1



SMART BUILDINGS AND THE RISE OF SOFTWARE-LED CLIMATE CONTROL

A major development within Y02B is the emergence of software-defined buildings.

Efficiency improvements are increasingly driven by smart controls, occupancy sensing and AI-enabled energy management rather than physical infrastructure alone. Buildings are becoming active participants in energy systems, able to respond dynamically to demand and pricing conditions.

This shift also changes the nature of intellectual property in the sector, where data, software and interoperability may become as valuable as traditional engineering patents.

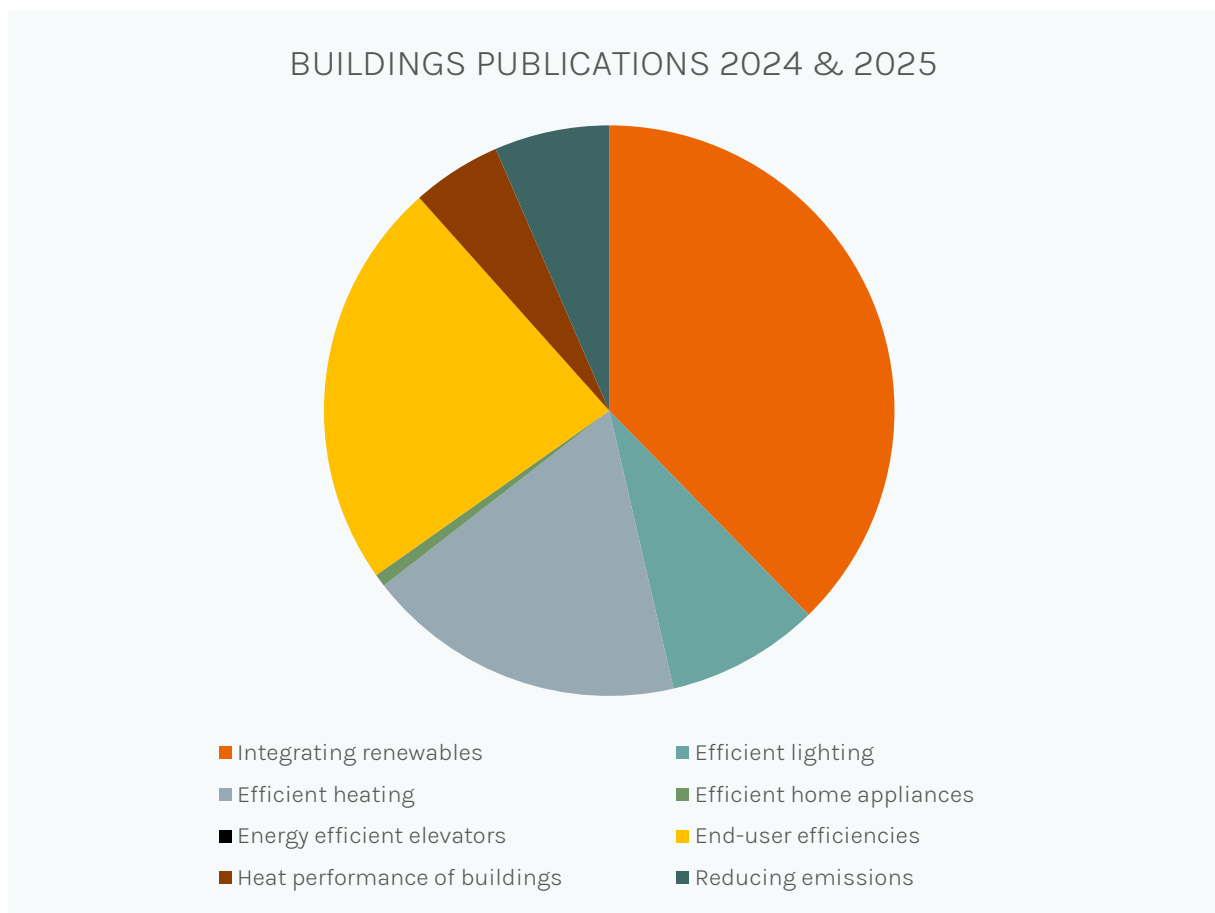


Figure 3.1

Figure 3.1 reinforces the point that Y02B innovation is being shaped by a cluster of adjacent technologies rather than one dominant stream. Read alongside the discussion on electrification, it suggests that activity is distributed across systems that improve thermal efficiency, heating performance and building-level energy use. The broader implication is that decarbonisation is not about swapping one appliance for another, but about combining equipment, controls and operational optimisation.

MATERIALS INNOVATION AND THE EMBODIED CARBON CHALLENGE

Alongside operational efficiency, attention is increasingly turning to embodied carbon, the emissions associated with construction materials and manufacturing.

This has accelerated interest in low-carbon cement, engineered timber, recycled materials and advanced insulation technologies.

Unlike software-led innovation, materials innovation often depends on longer development cycles and more traditional manufacturing and patent models. The challenge is not only invention, but scaling low-carbon materials at commercially viable cost.

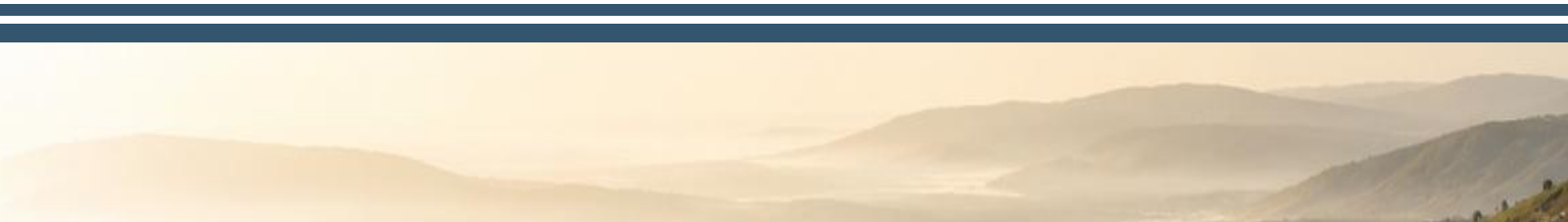
The narrative here is not simply technological progress, but industrial transition. Construction, one of the world's oldest sectors, is being pushed toward innovation at a pace it has historically resisted.

RETROFIT: THE LARGEST UNTAPPED CLIMATE OPPORTUNITY

The greatest climate challenge lies in existing building stock rather than new developments.

Cities such as London contain millions of older buildings that require significant retrofit to meet net-zero targets. This includes insulation systems, smart controls, efficient heating technologies and modular retrofit solutions.

Retrofit also demonstrates that climate innovation is not purely a technical issue. Financing, regulation and ease of installation are often more important barriers than the technologies themselves.



THE FINANCIALISATION OF BUILDING PERFORMANCE

Building performance is increasingly linked to asset value, regulation and access to finance.

This creates growing demand for technologies that can measure, verify and optimise energy and carbon performance. As a result, climate mitigation technologies are becoming closely tied to ESG reporting, monitoring systems and carbon accounting platforms.

Innovation in buildings is therefore being driven not only by sustainability goals, but also by economic and regulatory pressure.

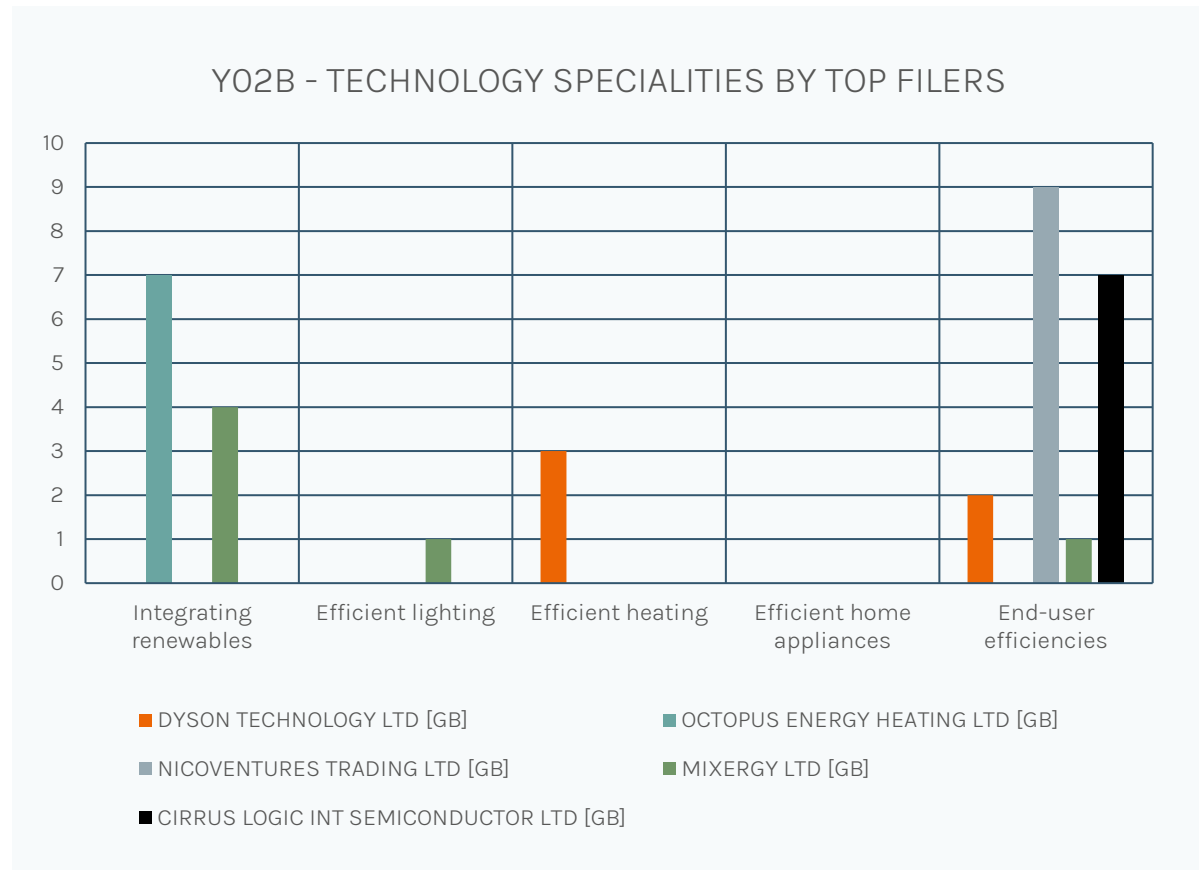


Figure 3.2

Figure 3.2 helps complete the picture by showing how the innovation landscape is evolving across categories or market segments. Taken together with the table and earlier figures, it underlines a central theme of this chapter: Y02B is best understood as a systems category. The data points not only to continued innovation in physical building technologies, but also to the growing importance of integration, control and performance management.

CONCLUSION

Buildings as platforms for climate transition

The Y02B classification reflects a broader shift in how buildings are understood within the climate transition.

Buildings are becoming electrified, digitised and data-driven systems that interact directly with wider energy and financial networks. The future of climate mitigation in buildings will likely depend less on individual breakthrough technologies and more on the successful integration of scalable, affordable and deployable solutions.



04

GREENHOUSE GAS CAPTURE

By Katie Smith



GREENHOUSE GAS CAPTURE (Y02C)

The capture of greenhouse gases (GHGs) is a key factor in global strategies to mitigate climate change. Patent analysis provides a valuable insight on developments in technological innovation, key industry players, and emerging solutions in this field.

The patent classification code Y02C, covers technologies for the capture, storage, and reduction of greenhouse gas emissions. As part of the broader Y02 scheme for climate change mitigation, Y02C encompasses a wide range of approaches, including post-combustion capture, direct air capture (DAC), membrane separation, adsorption and absorption systems, and hybrid methods.

Interest in greenhouse gas capture is increasing, with a clear shift towards more efficient and scalable technologies such as advanced solid sorbents, electrochemical systems, and modular capture solutions. This trend is reflected in recent patent activity within the Y02C category. This report uses the Y02C classification as a framework to analyse developments in greenhouse gas capture technologies.

Patent Activity Trends

Figure 4.1 shows the total number of publications having a UK applicant over the last eight years, compared with EP/UK publications. The numbers are closely related. After a sharp dip in 2018-2019, publication numbers have steadily increased, with 2025 continuing the upward trend observed in recent years. This rise appears to reflect ongoing commercial progress and increased investment in the sector.

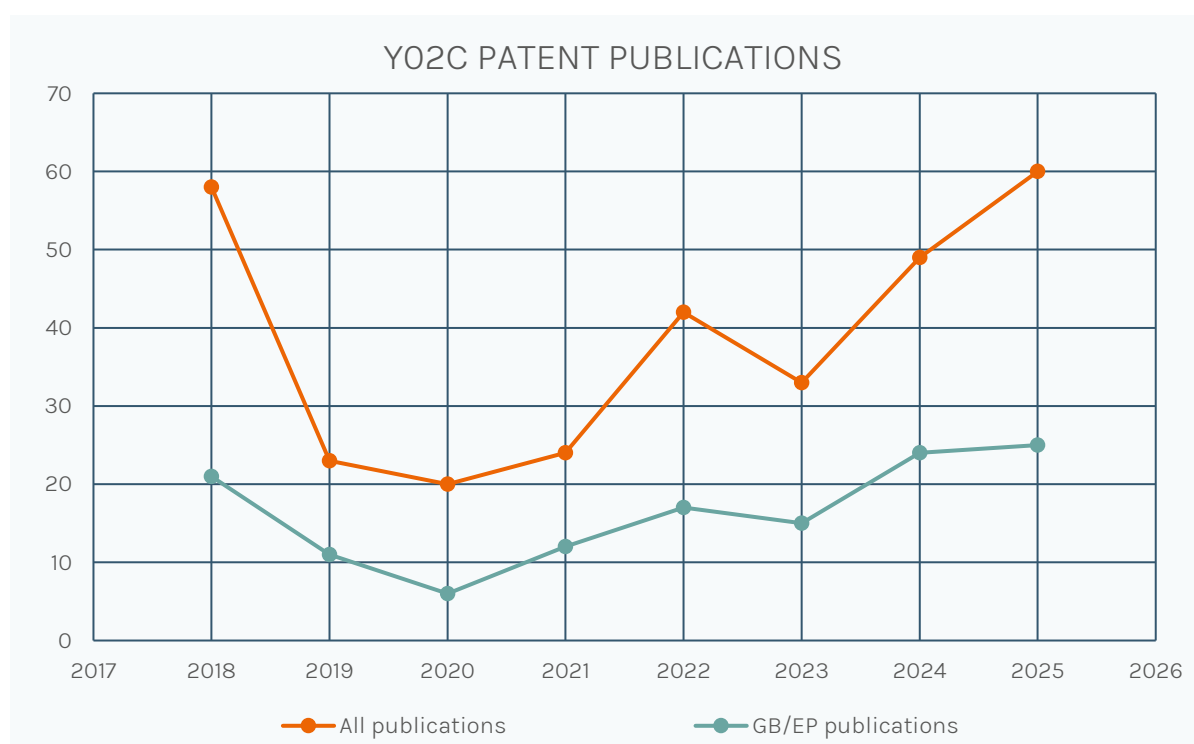


Figure 4.1

EXPANSION OF CCS DEPLOYMENT

Carbon Capture and Storage (CCS) has been expanding globally. According to the Global CCS Institute ([Global-Status-of-CCS-2025-report-9-October.pdf](#)), by July 2025 there were 77 operational CCS facilities worldwide, representing a 54% year-on-year increase. This growth reflects accelerating investment and policy support in response to record global CO₂ emissions and rising temperatures.

This expansion reflects accelerated investment and policy support as global CO₂ emissions and temperatures hit record highs.

This growth also signals a transition from pilot projects to industrial-scale CCS deployment, particularly in hard-to-abate sectors such as cement, steel, and chemicals

In the UK, CCS development is progressing with strong government support. The UK Carbon Capture, Utilization and Storage (CCUS) market follows a cluster-led model, where projects are developed through multi-company consortia rather than individual companies.

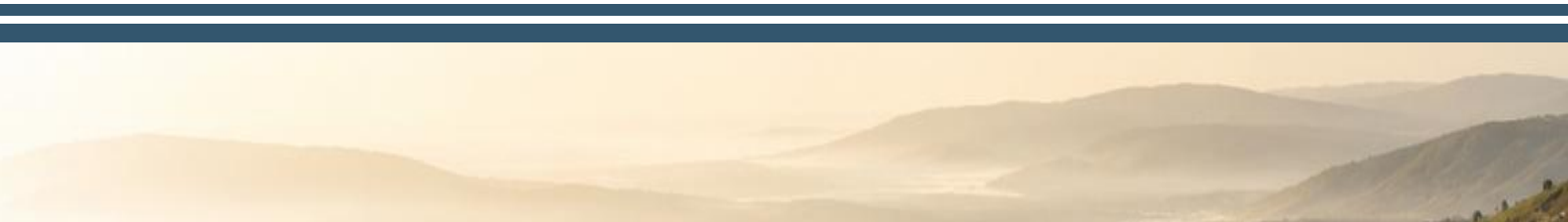
Commercial development and construction are already underway in the UK. For example, the Net Zero Teesside project, which is expected to become one of the world's first commercial-scale gas-fired power stations with carbon capture, is under construction and scheduled to start-up in 2028.

In October 2024, the UK Government announced that it made available £21.7 billion in funding for CCUS, further accelerating deployment.

Large oil and gas companies, including BP, Equinor, Shell, Eni, and TotalEnergies are currently dominating in large-scale infrastructure and storage initiatives in the UK. Among these Equinor Low Carbon UK stands out as a leading UK-based patent filer in the Y02C category.

In 2025 alone, Equinor Low Carbon UK had nine UK/EP applications published, focused on improving the energy performance of CO₂ capture systems, including absorber designs and DAC technologies. Their filings largely centre on direct air capture using solvent-based systems such as monoethanolamine (MEA).

While many major developers are not UK-based applicants, a growing ecosystem of UK companies is actively developing capture technologies.



UK-BASED TOP PATENT FILERS

Over the past six years, Johnson Matthey has recorded the highest number of UK and European patent publications in the Y02C class, with 21 filings between 2018 and 2025. However, as shown in **Figure 4.2**, after a peak in 2018, their activity has stabilised at approximately one to two publications per year.

In contrast, Equinor Low Carbon Ltd, as discussed above, has emerged rapidly, increasing from zero publications in 2023 to nine in 2025.

Edwards Ltd ranks as the second-largest filer over the past 7 years in the Y02C CPC class, with a total of 18 GB/EP publications.

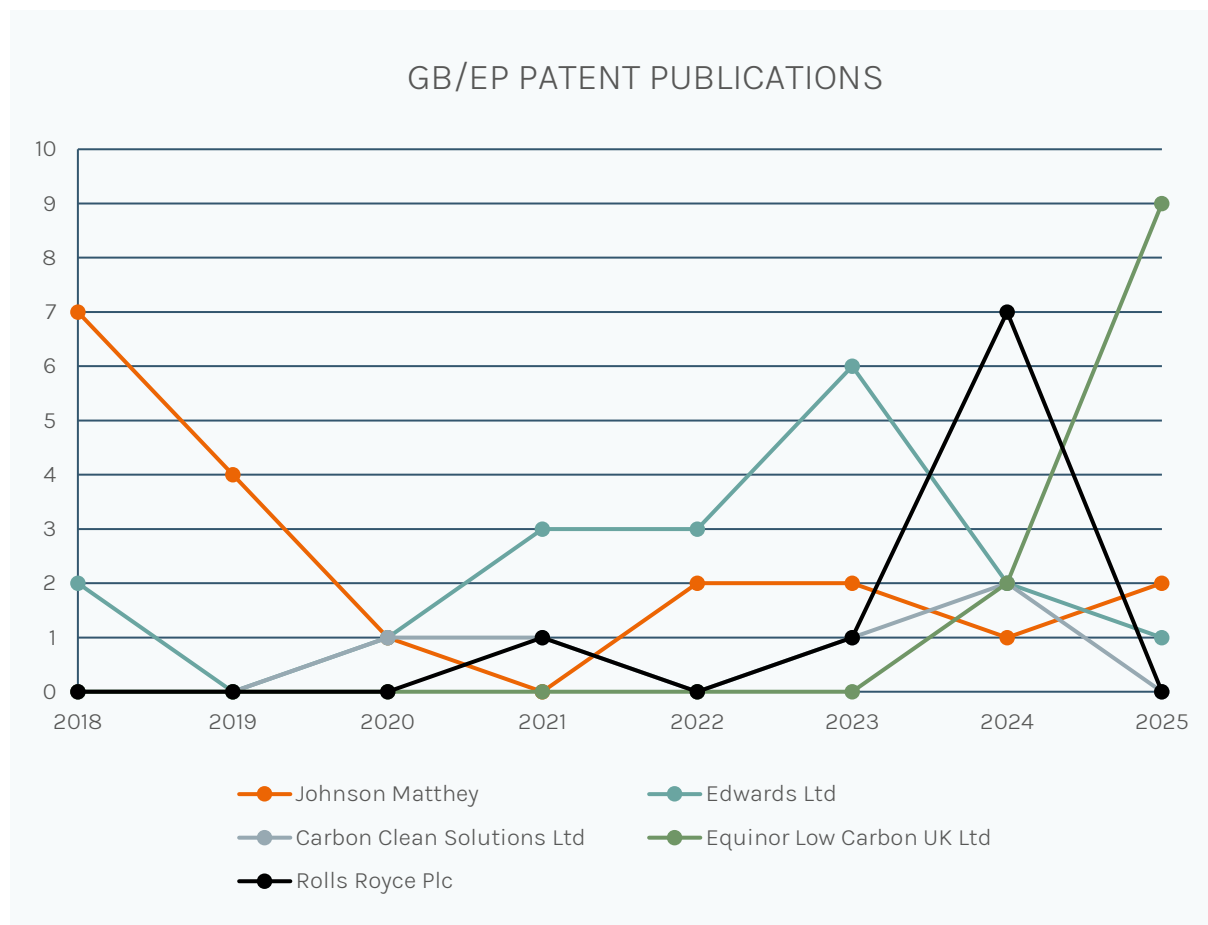


Figure 4.2

Most leading filers are large chemical, engineering, or energy companies integrating carbon capture into broader technology portfolios. For example, Rolls Royce had a surge in patent publications in 2024, aligning with its commercial developments. In 2025, Rolls Royce, in partnership with energy services provider Landmark and carbon dioxide specialist ASCO commissioned a 10-megawatt gas engine power plant with a carbon capture system in the East Midlands. The plant generates electricity and heat. The waste CO₂ from this process is captured and supplied for use in the food industry, illustrating practical deployment of capture technologies.

SPECIALIST CARBON CAPTURE TECHNOLOGY COMPANIES

Alongside large industrial players, a growing number of specialist carbon capture companies are filing patents.

Carbon Clean, which develops solvent-based capture systems, has steadily been filing patent application over the past eight years and ranks among the top five UK-based filers in Y02C.

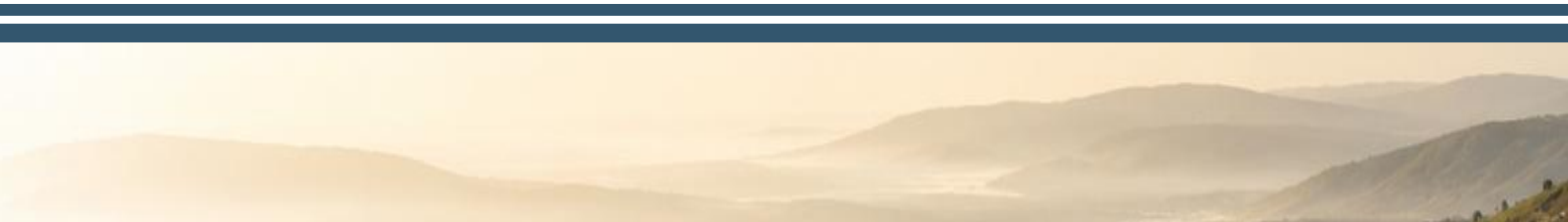
Another notable UK-based patent filer is MOF Technologies Ltd which acts under the trade mark Nuada. MOF Technologies focuses on metal-organic frameworks (MOFs) for carbon capture. MOFs are highly porous, crystalline materials formed by linking metal ions with rigid organic molecules. MOFs can be designed to selectively trap specific gases like carbon dioxide. These materials may provide the next generation of CO₂ capture materials.

Nuada's approach combines MOF solid sorbents with mature vacuum swing adsorption (VPSA) technology. The company claims its system can reduce energy consumption by up to 90 percent compared to conventional solvent based approaches, significantly lowering capture costs.

MOF Technologies has filed several patent applications, including WO2025093597A1, which describes CO₂ removal from exhaust gases using non-amine MOFs.

MOF Technologies Ltd are not the only filer in this growing area of MOF-based carbon capture systems. Since 2018, there have been 27 Y02C patent publications, referencing metal-organic frameworks or MOFs.

Other notable UK applicants are Mission Zero Technologies, who focus on direct air capture (DAC) systems, Seabound who are developing ship-based carbon capture systems, and Airhive who have developed a fluidised bed for DAC systems.



UNIVERSITY APPLICANTS

While large-scale commercial deployment is advancing, there remains significant scope for further research and development. This is reflected in the relatively high proportion of UK university applicants in the Y02C category.

Figure 3.3 shows that, since 2018, an average of 13% of UK-based Y02C applications include a UK university as an applicant. This highlights the continued importance of academic research in supporting innovation and early-stage technology development.

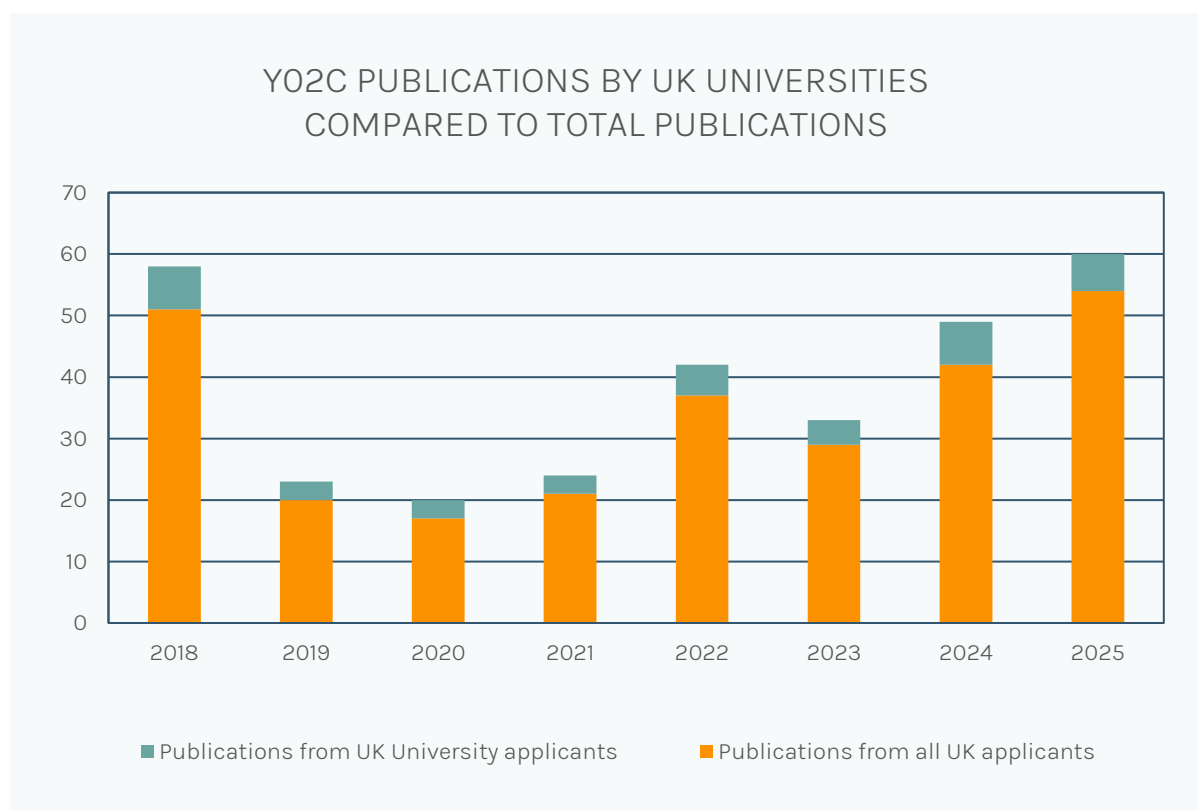


Figure 4.3

CONCLUSION

Since 2018, the UK has transitioned from defining climate targets to actively developing a carbon capture market, with a focus on cluster-based projects.

Patent data within the Y02C classification indicates that the sector is growing in both scale and diversity. Notably, the number of applicants filing multiple patents has increased significantly: in 2025, nine applicants had more than one publication, compared to five in 2022 and only two in 2020.

The patent trends suggest a deepening and broadening of the UK greenhouse gas capture innovation landscape, driven by both established industry players and emerging technology specialists.

05

INFORMATION COMMUNICATION SYSTEMS

By Nick Reeve



DATA CENTRES: THIRSTY FOR WATER, HUNGRY FOR POWER?

The rapid expansion of data centres in the UK reflects their growing importance as the backbone of the modern digital economy. These facilities provide the computing power and infrastructure that underpin everything from cloud storage and telecommunications to online banking, e-commerce, streaming services, cybersecurity, and increasingly, artificial intelligence applications.

A BBC reportⁱ estimates that there are now around 500 data centres operating in the UK, with a further 100 planned in the coming years. Recognising their strategic importance, the UK government has this year designated data centres as nationally significant infrastructure projectsⁱⁱ.

Physically, data centres range from relatively small enterprise facilities hosting fewer than 100 servers to hyperscale sites containing tens of thousands—or even more than 100,000—serversⁱⁱⁱ. These facilities are essentially purpose-built buildings filled with densely packed computing hardware, networking equipment, cabling, and power and cooling infrastructure designed to maintain continuous operation.

However, this digital growth comes with a substantial physical footprint. Data centres are highly energy-intensive and require significant volumes of water for cooling. The UK's electricity grid currently has capacity of around 40 GW. In 2024, data centres accounted for approximately 1.5 GW of demand—roughly 2.5% of total capacity—but this figure is expected to rise sharply in the coming years.

Some projections suggest demand could increase fourfold by 2030, potentially reaching 6 GW and accounting for around 15% of UK electricity consumption^{iv}. Giving exact predictions is difficult, but an estimate might be that data centres presently consume about the same amount of energy as 3 million homes, and that this figure will likely increase to 12 million homes in just a few years' time.

At the same time, water demand associated with cooling of data centres is becoming a significant constraint. The Environment Agency has warned that by 2050 the UK could face a daily water shortfall of nearly 5 billion litres^v—around a third of current public supply—driven by climate change, population growth, and increasing industrial demand.

The scale of emerging AI systems adds further pressure. Training and operating large machine learning models requires significant computational resources, and therefore substantial energy and cooling capacity. Estimates suggest that training large models can consume hundreds of thousands of litres of water, depending on system design and location, due to the cooling requirements of high-density computing infrastructure.

Taken together, these trends highlight a sector under increasing pressure to improve efficiency. As demand for digital services continues to grow, operators and technology developers are being pushed to find new approaches that reduce both energy and water consumption while maintaining performance and reliability.

In the following sections, we examine a range of UK-based innovations aimed at addressing this challenge, including developments from Dew Point Systems, EkkoSense, Iceotope, and Ceres Power.

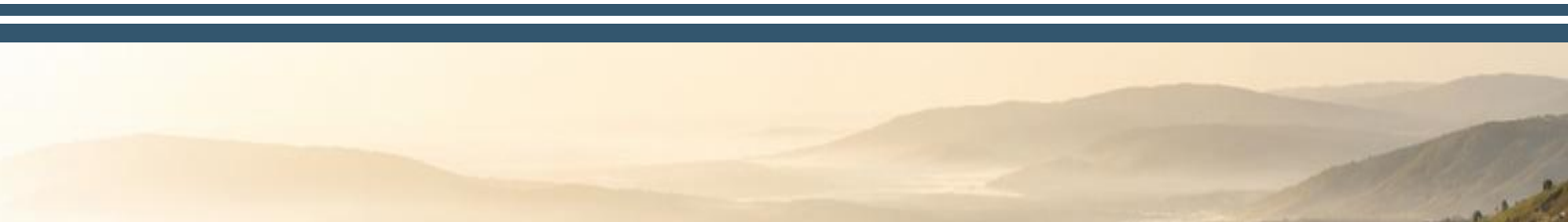
ⁱ <https://www.bbc.co.uk/news/articles/clyr9nx0jrzo>

ⁱⁱ <https://www.gov.uk/government/publications/cyber-security-and-resilience-network-and-information-systems-bill-factsheets/data-centres>

ⁱⁱⁱ <https://www.ibm.com/think/topics/data-centers>

^{iv} <https://researchbriefings.files.parliament.uk/documents/CBP-10315/CBP-10315.pdf>

^v <https://www.gov.uk/government/news/england-faces-5-billion-litre-public-water-shortage-by-2055-without-urgent-action>



DEW POINT SYSTEMS

A membrane-based dehumidification and cooling system developed from research at the University of Hull takes a different approach to conventional moisture control in air conditioning and data centre cooling. The system is the subject of International patent application WO2026/068430, and the technology is claimed to cut the power consumption of some dehumidification based cooling systems by over 80%.

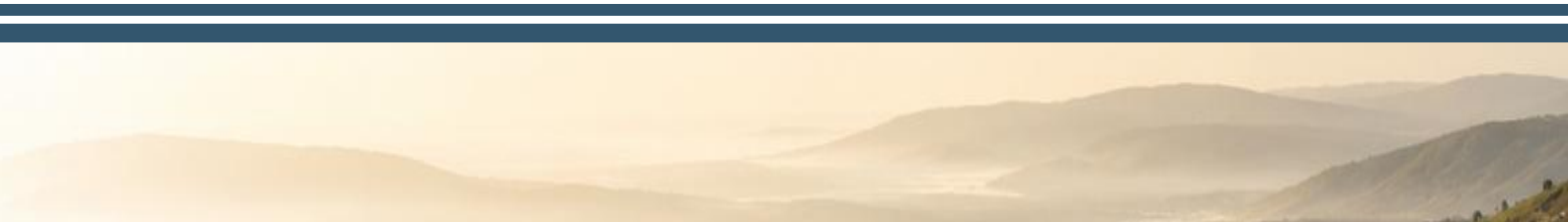
The work originates from long-running research at the University of Hull into dew-point and evaporative cooling technologies. It has been commercialised through the spin-out company Dew Point Systems Ltd, supported through university intellectual property structures and early-stage investment activity involving technology commercialisation partners including Cambridge Future Tech. The company is positioning the technology for high-efficiency cooling applications, particularly in data centres, where growing energy demand has intensified interest in alternative, lower-carbon cooling strategies.

At its core, the system described in WO2026/068430 uses a water vapour-selective membrane to separate humid air into two streams: a dehumidified air supply and a low-pressure vapour stream drawn into a vacuum chamber. Moisture passes through the membrane under a vapour pressure gradient, while most of the air is retained on the supply side. Rather than relying on conventional refrigeration-style condensation, the system processes the extracted vapour in a low-pressure loop where it is compressed to a relatively modest level and injected directly into a vessel of circulating cooling water. In this vacuum mixing condenser, the vapour comes into direct contact with the liquid and condenses immediately, removing the need for a separate heat exchanger. This direct-contact approach is intended to simplify the thermal design and reduce the energy losses typically associated with multi-stage condensation systems.

The circulating water loop plays a central role in both heat removal and air management. After absorbing heat and condensed moisture, the liquid is continuously recirculated through a cooling stage before returning to the condenser. A multiphase pump is used to move a combined mixture of water and entrained air through the system, allowing non-condensable gases that pass through the membrane to be carried along with the liquid flow. These gases are ultimately vented at the cooling stage, avoiding the need for a second, dedicated vacuum pump to continuously purge air from the system.

Another distinguishing feature is the use of height differences between system components to assist circulation. By arranging the condenser, pump and cooling elements at different elevations, the system exploits gravity to help move fluid through the loop and partially reduce the load on mechanical pumping. For example, by locating the multiphase pump 10m or so lower than the vacuum mixing condenser, energy usage may be reduced by 10%. The result is a hybrid circulation strategy that combines mechanical pumping with passive gravitational assistance to improve overall efficiency.

The approach is particularly relevant to cooling applications where humidity limits the effectiveness of evaporative systems, such as in many data centre environments across temperate and coastal regions. By reducing moisture content before or during the cooling process, the technology is designed to extend the operating range of evaporative cooling and reduce reliance on more energy-intensive refrigeration-based systems.



Beyond this core system, the research programme has also generated a broader portfolio of related intellectual property. Earlier filings include WO2018/069393, which relates to a heat exchanger system, as well as GB2589841A covering a heat pump system (with corresponding WO2021/094787 and EP4058741 applications), and GB2587343B, which describes a thermal storage approach for heat pump operation (corresponding to WO2021/053357). Taken together, these filings indicate a wider development effort focused on heat transfer optimisation, heat pump integration, and thermal energy management alongside the core membrane-based dehumidification technology.

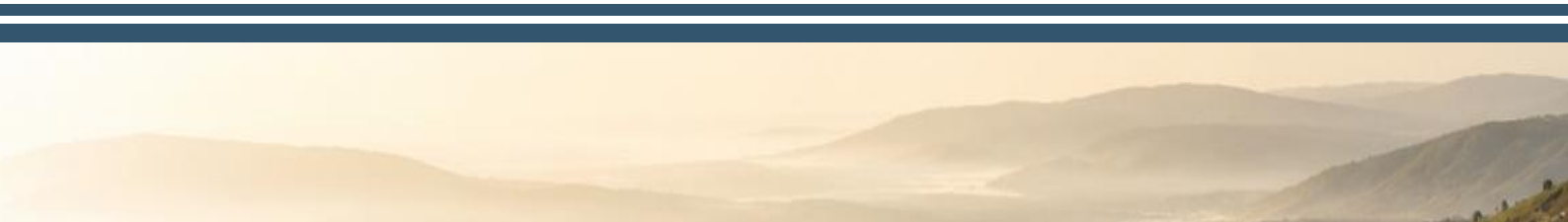
EKKOSENSE: REAL-TIME INTELLIGENCE FOR DATA CENTRE COOLING

EkkoSense develops software-based systems aimed at improving the efficiency and stability of data centre cooling infrastructure. As demand for cloud computing and AI-driven workloads increases, operators are under growing pressure to manage heat loads dynamically while reducing energy and water consumption. This has driven a shift towards software-led control systems that model, monitor, and optimise cooling performance in real time.

One development, set out in patent GB2608531B, focuses on optimising airflow within a data centre by modelling the facility as a grid of interacting cells. Each cell represents physical infrastructure such as server racks, vents, or floor tiles, and is assigned a role-based identifier. A scoring system is then used to capture how cooling demand from high-density racks interacts with airflow supply from vents across the layout. By aggregating these interactions, the system generates a live score map of the data centre, identifying areas where cooling is either excessive or insufficient. Cells that fall outside defined thresholds are flagged for adjustment—such as opening or closing floor vents. The model is recalculated iteratively after each change, allowing the cooling configuration to be progressively refined, incorporating real-time temperature data from individual racks.

A second development, described in patent GB2580817B focuses on real-time monitoring and fault detection. In this system, sensors across air handling units and server racks measure parameters including airflow temperature, pressure, humidity, and power consumption. These inputs are continuously used to update a computer model of cooling performance. The system monitors inlet air temperature at each rack, tracking both absolute values and rates of change. If readings move outside acceptable ranges, an alert is generated and sent to a display module at the affected rack, with the underlying model used to help identify likely causes such as airflow disruption or changes in air handling unit performance.

Additional filings, including GB2701835A and GB2594737A, build on similar modelling techniques to refine optimisation processes and improve the interpretation of system-wide cooling and sensor data across data centre environments.



ICEOTOPE

Inventors at Iceotope have taken a different and more specific approach to cooling in data centres. As AI and high-performance computing workloads increase the power drawn by individual racks, traditional air-based cooling systems struggle to keep temperatures stable without significant energy and water overheads. The company's approach, described as precision liquid cooling, focuses on removing heat directly at the source using dielectric fluid within sealed, chassis-level systems, reducing reliance on large-scale airflow infrastructure.



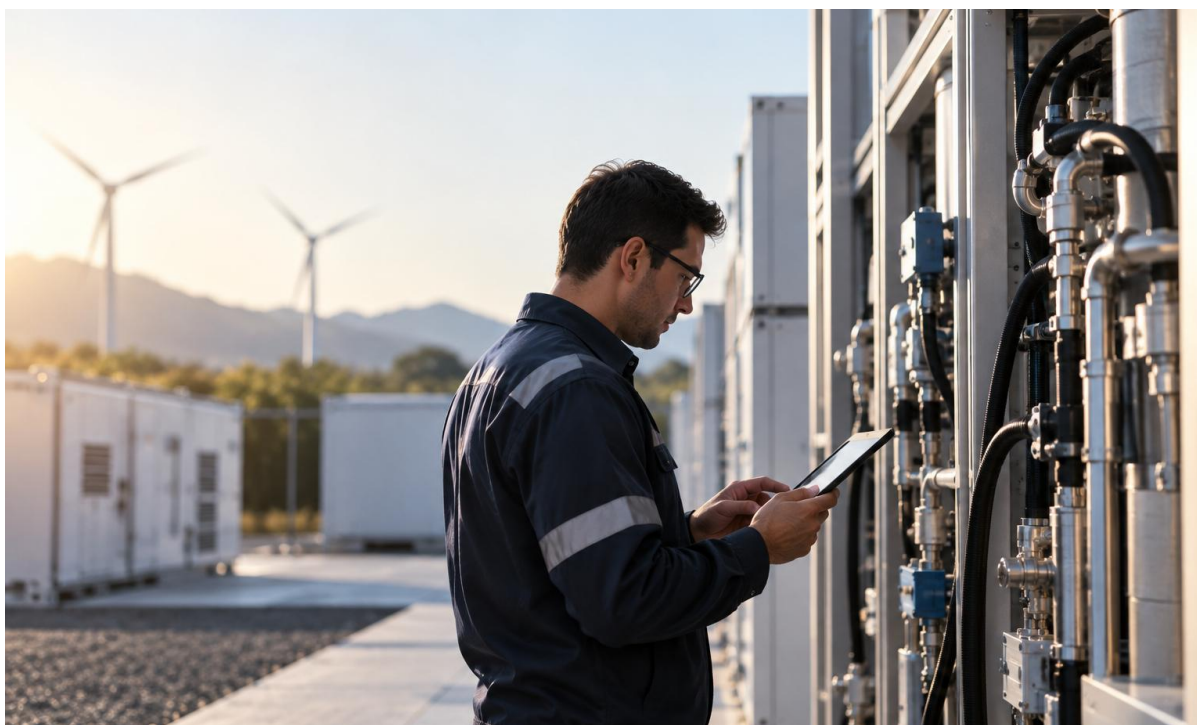
This approach is reflected across its numerous patent applications. Application GB2637674A for example describes a liquid cooling module in which electronic devices are enclosed within a coolant-filled housing, with pumps, sensors and controlled heating used to actively manage fluid conditions. The system uses internal conduits and manifolds to distribute coolant across multiple components, enabling more uniform thermal control within densely packed compute environments.

Other filings extend the same architecture into supporting infrastructure: GB2629443B sets out an overhead coolant distribution system having cooling modules incorporating manifolds divided into first and second sections by “weir” structures which act to stabilise the flow of liquid coolant so that fluid is delivered consistently across multiple server modules. GB2629598B on the other hand focuses on a pump docking assembly designed to simplify maintenance and replacement within liquid-cooled loops; GB2631251A expands liquid cooling to externally mounted networking devices through shared thermal interfaces; and GB2623755B describes a heat exchanger that allows controlled transfer between isolated coolant circuits.

Taken together, these patents and application outline a modular liquid cooling ecosystem designed to integrate directly into server hardware, supporting higher compute densities while reducing dependence on conventional air cooling systems.

CERES POWER: INNOVATIONS IN FUEL CELL TECHNOLOGY

While companies such as Ekkosense and Iceotope focus on improving the efficiency of data centre cooling infrastructure, Ceres Power addresses a different challenge: how to supply the growing amounts of electricity that modern data centres require. As AI workloads drive demand for power ever higher, Ceres has positioned its solid oxide fuel cell (SOFC) technology, and solid oxide electrolyser cell (SOEC) technology as a potential source of efficient, low-carbon, on-site generation.



Three patent applications GB2644315A, GB2644099A, and GB2643198A published in 2026, all concern novel methods of controlling fuel cell, or improvements to the physical structure of the cells themselves. Ceres Power have a history of filing patent application in this sector, having previously sought protection for developments in intermediate-temperature solid-oxide fuel cell stack technology, such as via patents GB2411043B and GB2405028B.

The technology reflects a broader theme within Ceres' development programme: using sophisticated control systems to make fuel cells more commercially practical and efficient. In the context of data centres, where operators are increasingly seeking reliable power sources that can be deployed close to demand, such innovations could help support the transition towards more resilient and lower-carbon digital infrastructure.

CONCLUSION

As demand for digital services and applications of artificial intelligence continues to grow, the challenge facing data centre operators is no longer simply one of adding more and more computing capacity. Increasingly, the industry must find ways to deliver more processing power while consuming less energy, using less water and reducing its environmental impact.

The technologies developed by companies such as Dew Point Systems, EkkoSense, Iceotope and Ceres Power illustrate the breadth of innovation being applied to these challenges, from advanced cooling and thermal management systems to new approaches to power generation and energy efficiency.

Behind many of these innovations lies a substantial investment in research and development, often supported by universities, investors and industrial partners. Patent protection plays an important role in this process, enabling companies to secure and commercialise the intellectual property arising from their work.



The patent applications discussed in this article provide a valuable insight into how UK innovators are seeking to address some of the most pressing infrastructure challenges of the digital age, and how intellectual property continues to support the development and deployment of new technologies that may help shape the next generation of data centres.

06

TRANSPORT

By Dustin Bauer & Paul Loustalan



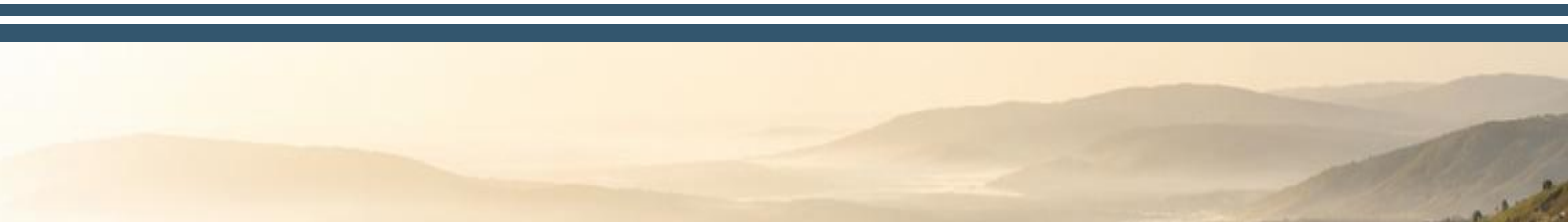
SUSTAINABLE TRANSPORT (Y02T)

The Y02T CPC code is used to categorise technologies related to climate change mitigation in transportation, making it a useful lens through which to assess innovation directed at reducing the environmental impact of moving people and goods. Worldwide, well over 350,000 patent applications have been published in the last five years alone in Y02T, ranging from pavement anomaly detection to bidirectional vehicle charging and everything in between. The UK has long been seen as a pioneer in transport, historically in rail and more recently in aerospace and automotive technology, and the transport industry remains an important economic sector.

According to the latest reports from the Society of Motor Manufacturers and Traders (SMMT), the automotive industry contributes £25 billion in value added to the UK economy, with around £4 billion invested in R&D. While, according to the latest World Intellectual Property Organization (WIPO) report on Technology Trends: Future of Transportation, UK inventors do not appear in the worldwide top 5 when considering total number of international patent families, UK inventors' first patent filings are among the top 5 in each of land, sea, air, and space, indicating high quality inventive output coming from the UK. In other words, although the UK may not dominate by sheer volume, it appears to punch above its weight in high-quality first filings and specialist niches.

Not only is the transport sector important for the UK economy, as the world deals with the urgent need to combat climate change, sustainable transport is a vital component of the solution. The United Kingdom, with its ambitious environmental goals, including net zero by 2050, remains at the forefront of promoting and adopting innovative transportation solutions. We will explore some of the pioneering companies in the UK that are revolutionising sustainable transport, with a focus on patent filings.

Unsurprisingly, most patent filings relate to automotive, with Jaguar Land Rover (JLR) by far the most prolific filer, representing the UK's historic and current leadership in automotive technology. However, some of the other most prolific GB filers in Y02T since the beginning of 2024 specialise in other fields seeking to decarbonise by electrification or by making internal combustion engines (ICE) more efficient: be it by improving gas turbines and engine systems in aerospace (Rolls-Royce, GKN Aerospace) or catalysts (Johnson Matthey). Rounding out the top 5 is JCB/Bamford Excavators, the manufacturer of heavy equipment. This is an important consideration: these filings may not always relate to zero-emission transport in the narrow sense, but they still sit within the wider transition towards lower-emission mobility by improving efficiency and reducing the environmental impact of existing transport technologies.



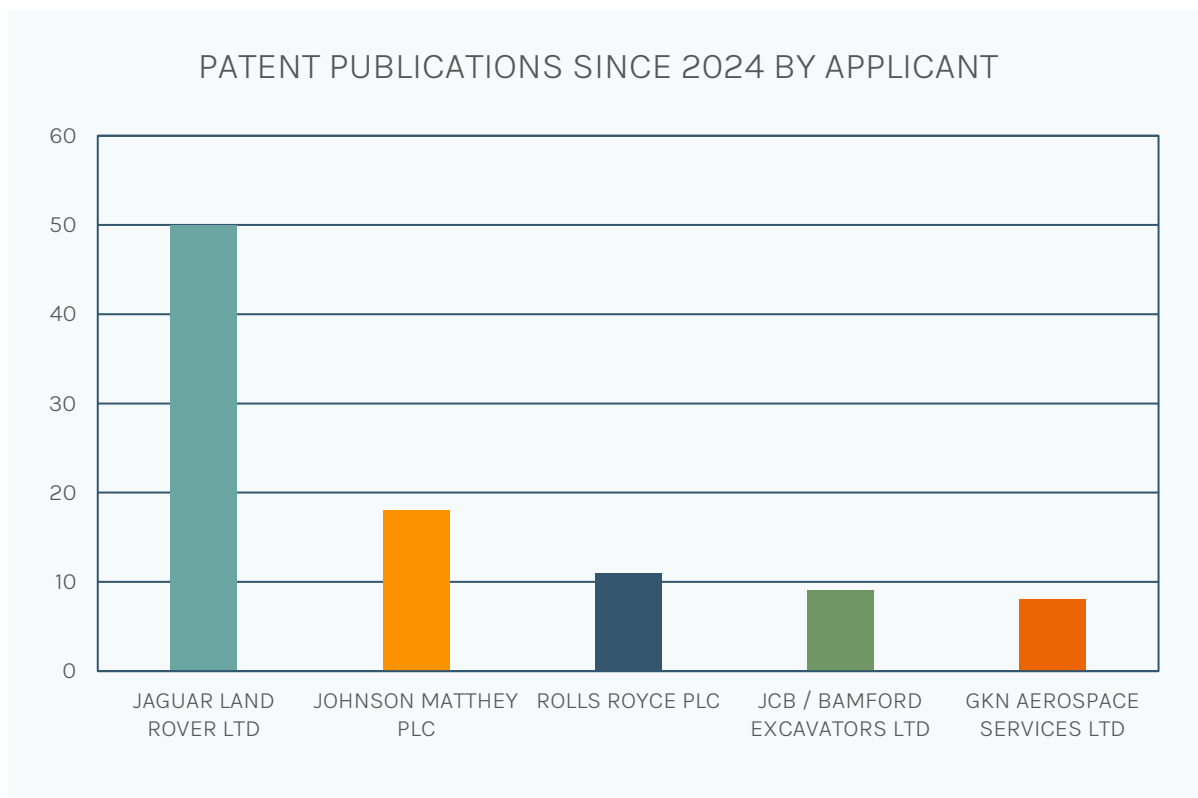


Figure 6.1

Ocado is another interesting company to make the top 10 – while some may know it mostly as an online supermarket, it is a global technology business whose patent publications in sustainable transport relate to various aspects of robotics and automated warehouse technology. This includes battery exchange stations, a charging apparatus for a robotic load handling device, and control methods for transporting devices.

However, GB applicants are also well represented in areas which are more typically seen as “sustainable transport”, with smaller companies like Zeroavia Ltd and 3TI Energy Hubs Ltd included in the Top 15 – Zeroavia Ltd is a developer of hydrogen-electric aircraft, and 3TI Energy Hubs Ltd develops smart EV charging infrastructure.

And while battery technology, one of the biggest drivers of growth in patent publications in the sustainable transport sector, remains dominated by Asian companies (mainly from Korea, China and Japan, see Figure 2), the GB applicants remain active in particular niches.

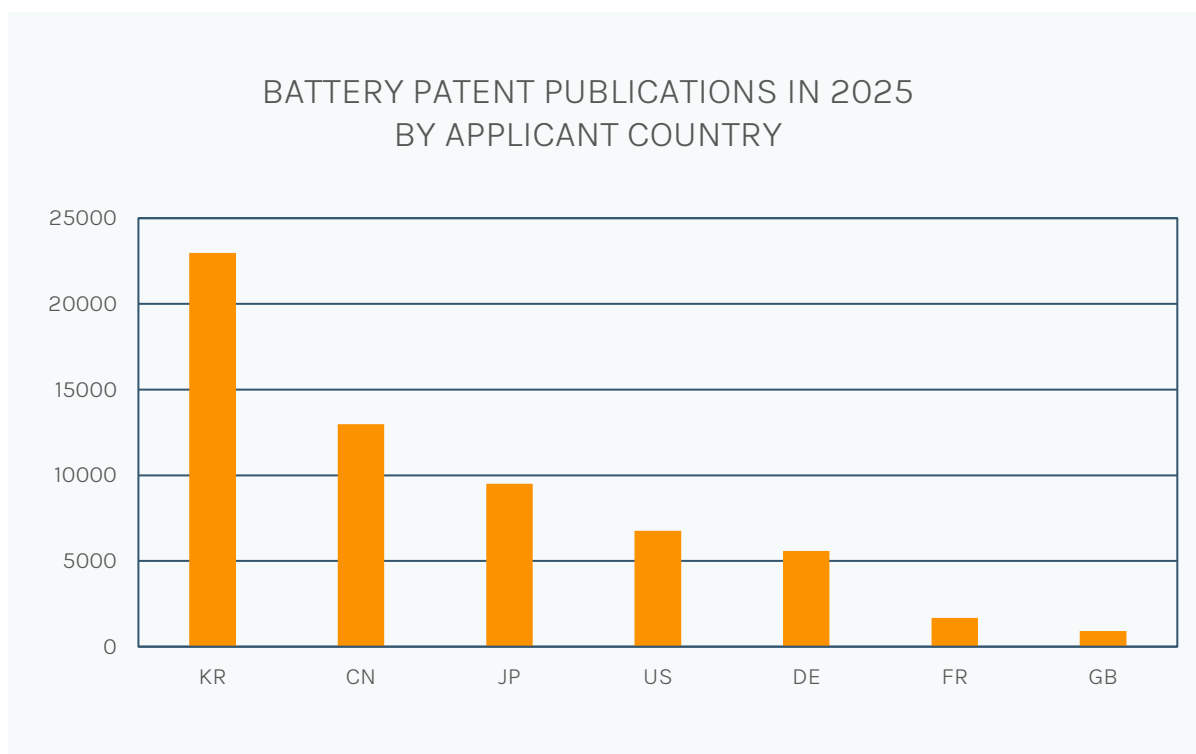


Figure 6.2

Taken together, the filing data suggests that the UK's strength in sustainable transport is not concentrated in a single technology area. Instead, it spans a set of commercially important niches, from turbine efficiency and emissions control to EV charging, battery materials, hydrogen-electric aircraft and automated logistics.

CASE STUDY: NYOBOLT

One of the most interesting recent GB success stories in the battery sector is Nyobolt, which recently became the UK's latest unicorn (company valued at US\$1 billion or more). Nyobolt develops batteries and energy storage systems, with a particular focus on high-power, fast-charging applications.

Broadly speaking, Nyobolt's patents and patent applications mostly relate to battery chemistry and materials, while also covering system architecture, charging, and power electronics. Given the dominance of Chinese manufacturers in the battery space, and the strength of IP portfolios of incumbents and increasing enforcement activity, GB manufacturers must continue to differentiate themselves by developing and protecting their unique technologies.

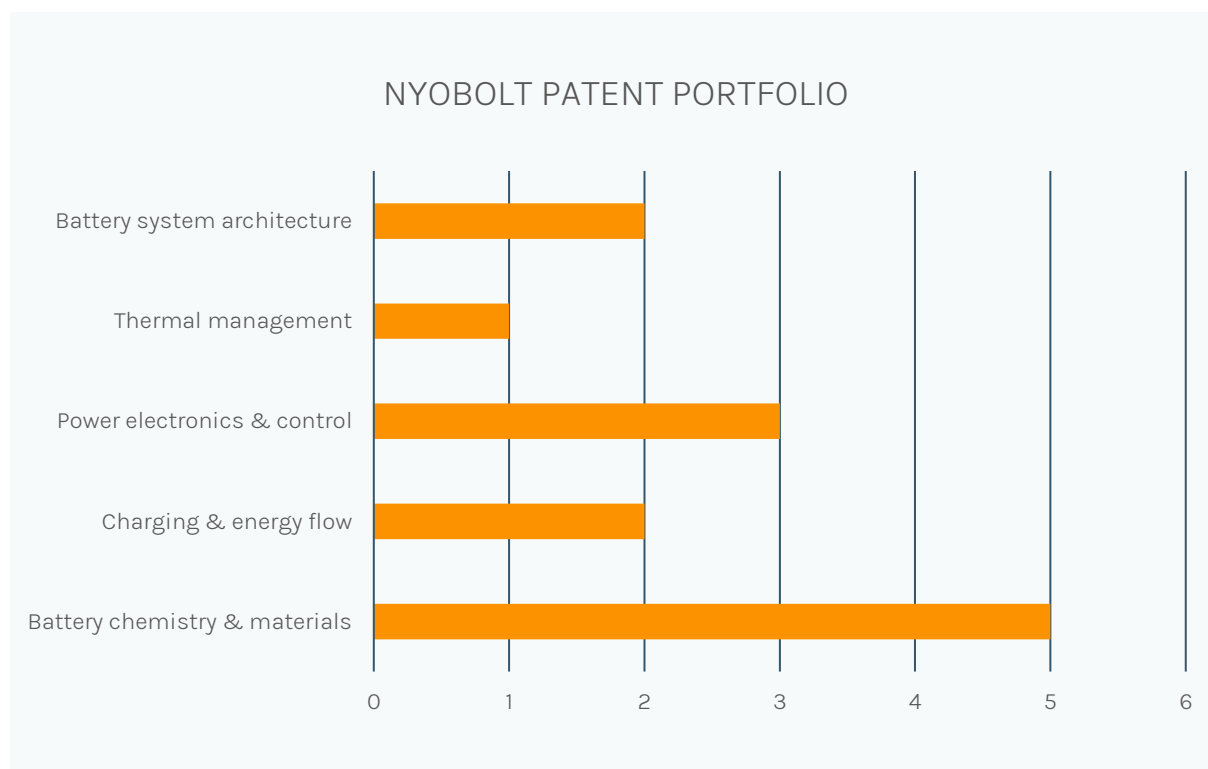


Figure 6.3

Other UK battery technology companies like Gaussion, which develops magneto-electrochemical technology, and Nexeon, which develops silicon anodes, charging technology companies like Capactech and Octopus Energy, and developers of recycling processes like Altilium, round out the picture of UK technology leadership.

From an IP strategy perspective, this makes early and focused protection particularly important for UK companies. In a sector where larger overseas players often hold extensive portfolios, UK innovators may need to protect not only core hardware or chemistry inventions, but also control methods, system architectures, charging protocols, manufacturing processes and data-driven optimisation techniques. Patents can also support partnerships, investment rounds and commercial negotiations.

CONCLUSION

Sustainable transport is a critical aspect of combating climate change, and the UK continues to play an important role in driving innovation in this field.

Companies like JLR, Johnson Matthey, and JCB show how established industrial players can contribute to the transition by improving efficiency and emissions performance in various sectors, while companies such as Zeroavia, 3TI Energy Hubs, Nyobolt, Nexeon and Capactech demonstrate the importance of high-value specialist niches.

The filing data therefore points to a UK opportunity based less on sheer patent volume and more on high-quality, defensible, commercially relevant technologies across the sustainable transport supply chain. By supporting specialist innovators, supply-chain collaboration and focused IP protection, the UK is well placed to remain influential in the future of sustainable transport.



07

HEAVY INDUSTRY

By Duncan Nevett



HEAVY INDUSTRY (Y02P)

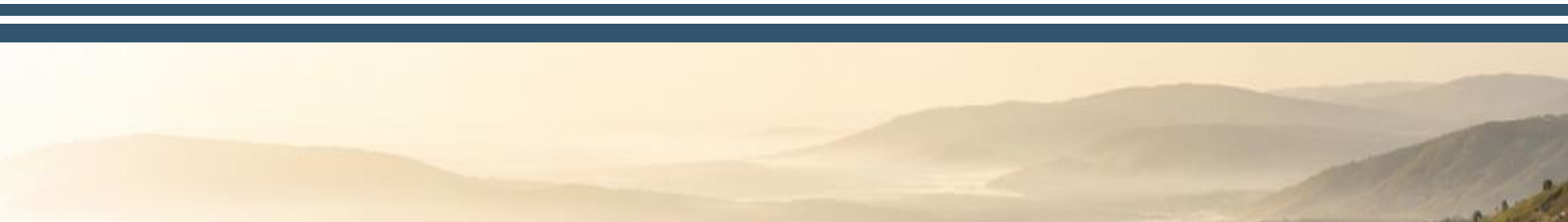
The Y02P code is used to categorise innovations which help to mitigate the climate impact from 'heavy industry', i.e. the production of goods and materials that underpin the modern society we live in. As such, the Y02P space has specific sub-categories focusing on each of metals, chemicals, oil & gas, minerals and agriculture and livestock.

Heavy industry and its wider supply chain were estimated to contribute £152 billion in Gross Value Added and supports over 1.4 million jobs in the UK in 2023. As such, there is a strong economic case for encouraging this sector to flourish in a future low carbon UK. However, heavy industries are among the most difficult to decarbonise largely due to technical factors like the extremely high heat/energy needed for production processes. Historically, green energy sources like hydrogen, wind and solar struggle to provide a commercially viable on demand alternative to traditional fossil fuels which currently support this sector. Innovations in the Y02P space therefore face significant technical challenges and generally focus on the following three categories:

A) improving the commercial viability of introducing green energy sources to heavy industry processing; B) reducing or capturing emissions from current fossil fuel driven processes; or C) improving the overall efficiency of production processes.

In our previous report, we found that metals and chemicals were the most active sectors in the Y02P space, with a reasonable amount of patent activity happening in agriculture and relatively little activity in oil & gas and minerals. We also found that the vast majority of Y02P activity could be attributed to innovations seeking to generally improve process efficiencies (category C), whilst proportionally very few innovations related to the use of green energy for producing heavy industry materials (category A). This seemed reflective of the technical difficulties in decarbonising energy sources for heavy industry.

As shown in Figure 7.1, in 2025, the metals sector has maintained its position as the largest area of Y02P activity, with 81 of the 187 publications. The chemicals sector follows with 42. Perhaps the most notable development is the continued growth of the agriculture sector, which contributed 16 publications in 2025. Oil & gas (9) and minerals (4) continue to see relatively modest levels of activity.



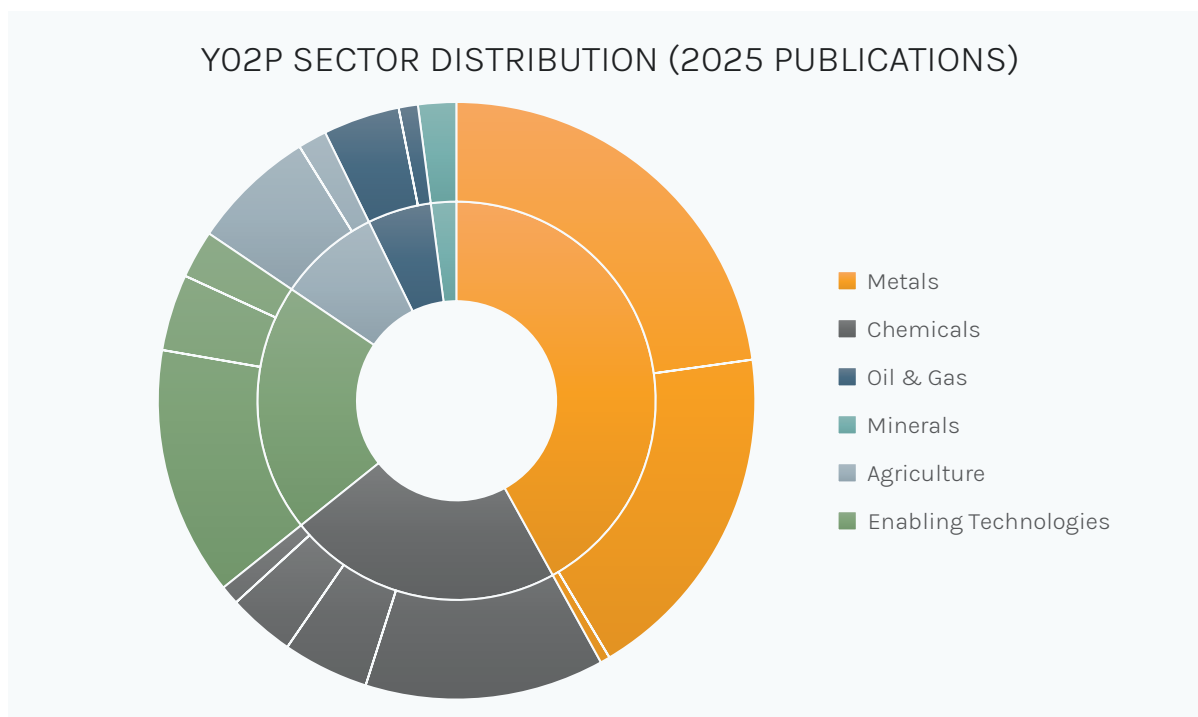


Figure 7.1

The chart above provides an overview of the distribution of 2025 publications across key industry sectors. **Table 7.1** expands on this by providing a detailed breakdown of the sub-categories within each sector, highlighting the specific sustainability themes represented across the publication dataset.

Metals	Additive manufacturing	44
	Process efficiencies	36
	Green energy	1
Chemicals	Process efficiencies	25
	Green energy	9
	Emission reduction	7
	General	2
Oil & Gas	Process efficiencies	8
	General	2
Minerals	Process efficiencies	4
Agriculture	Process efficiencies	13
	Emission reduction	3
Enabling Technologies	Manufacturing	26
	Smart factories	8
	Other ICT	5

Table 7.1

METALS: THE RISE OF ADDITIVE MANUFACTURING

Looking deeper into the metals category reveals that it is now being driven by two distinct technology areas. Of the 81 metals-sector publications, 44 relate to additive manufacturing (Y02P10/25) and 36 relate to metals processing and recycling (Y02P10/20). Additive manufacturing has become the single largest sub-category across the entire Y02P classification for UK filers in 2025. As shown in Figure 7.2, Renishaw PLC leads the way with 13 publications, followed by Stratasys Powder Production Ltd (5), Rolls Royce PLC (5), Alloyed Ltd (5), LPW Technology Ltd (3), and Wayland Additive Ltd (3).

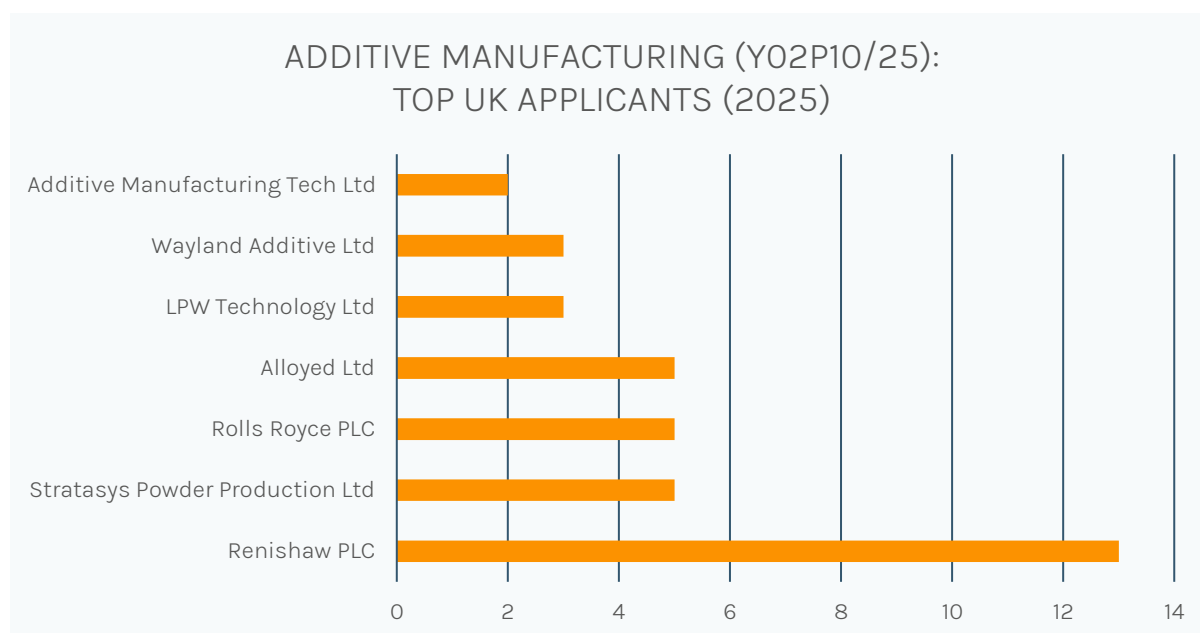


Figure 7.2

The presence of several UK-based specialists in this space, rather than a single dominant player, suggests a healthy and competitive innovation landscape.

Additive manufacturing can reduce the climate impact of metal goods production by reducing material waste, enabling lighter and more efficient component designs, and allowing for on-demand production which reduces the need for large-scale stockpiling and transport. The growing prominence of this technology within Y02P may signal a shift in how UK heavy industry is approaching industrial decarbonisation, i.e. not only through changing what energy sources are used, but by fundamentally rethinking how metal components are produced.

JOHNSON MATTHEY: A PIVOT TO PRECIOUS METAL RECYCLING?

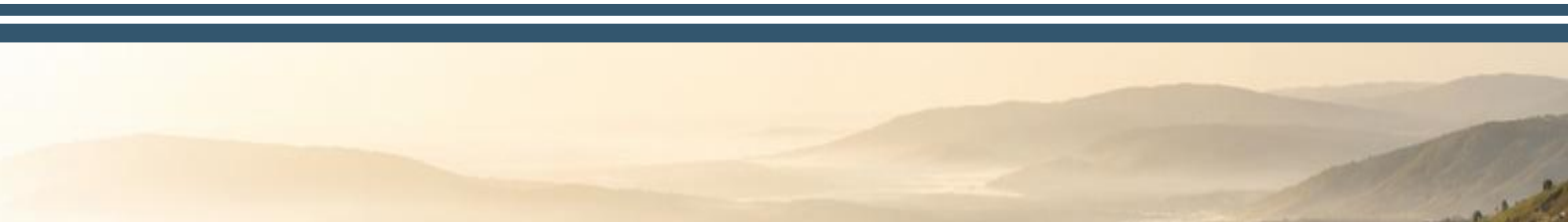
The distribution of top applicants in 2025 overlaps considerably with those identified in our previous report, with Johnson Matthey (including its Davy Technologies subsidiary) once again occupying top spot. However, the content of Johnson Matthey's filings might suggest a strategic shift from the previous years. Of their 2025 publications, approximately half relate to recycling catalyst coated membrane components, platinum group metal recovery, and precious metals refining. These include patent applications for recovering iridium, recycling membrane components from fuel cells and electrolyzers, and separating and purifying platinum and palladium from spent catalysts. This appears to mark a change from the broader chemical process innovation which has historically characterised their Y02P portfolio.

This shift may also be reflective of a wider trend in the industry. As fuel cells and electrolyzers are deployed at scale as part of the energy transition, they will create a growing waste stream of spent catalytic membranes containing valuable and scarce platinum group metals. Our 2025 patent data could indicate that Johnson Matthey is positioning itself at the heart of this emerging circular economy, leveraging its deep expertise in precious metal chemistry to address a problem that will only grow as the energy transition accelerates.

GREEN ENERGY SOURCES FOR HEAVY INDUSTRY: EARLY SIGNS OF GROWTH

In our 2024 report, we saw how there was relatively little activity in patent filings for the use of green energy in heavy industry processes (category A). Our 2025 data shows early signs that this picture is beginning to change.

Seven publications in 2025 specifically address the integration of renewable energy sources into heavy industry. These include patent publications from the University of Oxford on photocatalytic water splitting, the University of Birmingham on improved metal production using renewable energy, and Ceres IP Co Ltd and Hydrogen Waves Ltd on electrolyser systems designed for industrial hydrogen production. While these numbers are low in absolute terms, the involvement of multiple universities alongside commercial applicants could suggest that more substantial commercial activity may not be too far away.



AGRICULTURE: VERTICAL FARMING AND METHANE REDUCTION

The agriculture sub-sector continues the upward trend we identified in our 2024 report. The patent publications in 2025 in this space span two main themes. The first is vertical farming and controlled environment agriculture, with publications from companies including Jones Food Company, Lettus Grow, and Plain Greens. Notably, Ocado Innovation - a company better known for warehouse automation - has multiple publications applying its robotics and logistics IP to vertical farming systems, demonstrating how enabling technologies can cross sectoral boundaries.

The second theme is the reduction of methane emissions from livestock. Carus Animal Health Ltd has a publication directed to a viral composition for inhibiting methane production in ruminants, while Mootral Innovations Ltd and Aberystwyth University have both filed patent applications for feed compositions designed to reduce methane emissions from cattle. Given that agricultural methane is a potent greenhouse gas, innovations in this area could have a disproportionate climate impact relative to the modest number of patent filings.

ENABLING TECHNOLOGIES: SMART FACTORIES AND AI

In our 2024 report, we found that Y02P enabling technologies - and in particular the 'smart factories' sub-category - peaked in 2021 before gently declining in 2022 and 2023. As shown in Figure 7.3, our 2025 data suggesting this moderate decline has continued.

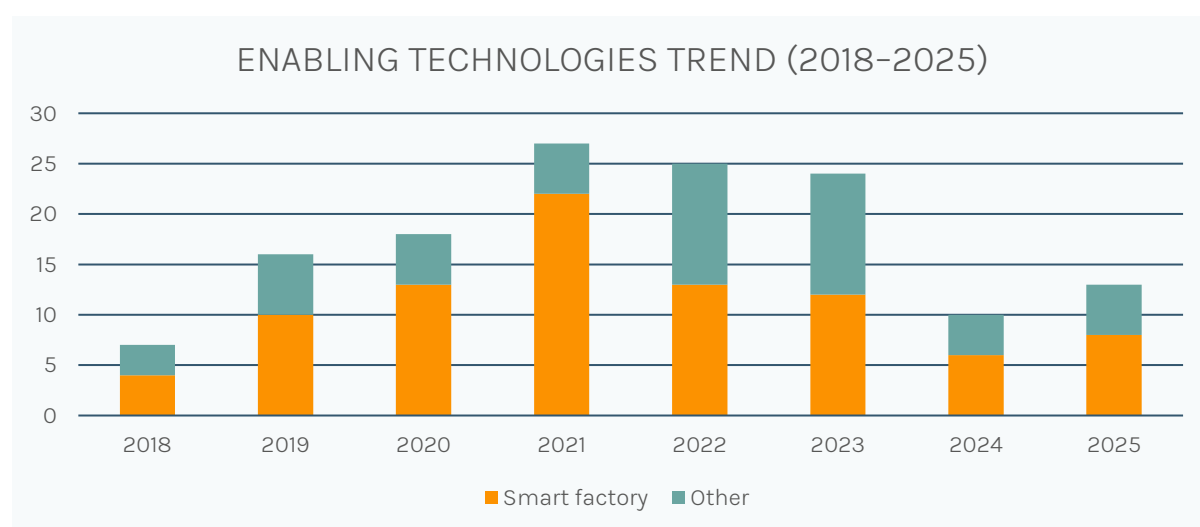
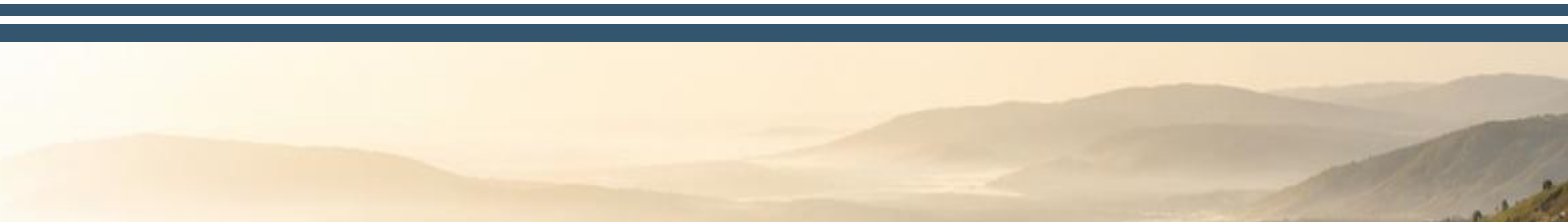


Figure 7.3

However, the character of the filings may be changing. A notable new entrant is DeepMind Technologies Ltd, which has a publication titled "Simulating Industrial Facilities for Control". This represents the entry of one of the world's leading AI research organisations into the industrial process optimisation space. Given the rapid advances in AI capabilities since 2023, we may see a new wave of AI-driven process control patents entering the Y02P space over the coming years, potentially reinvigorating the enabling technologies category.

CONCLUSION

Overall, the Y02P data for 2025 paints a picture of an evolving innovation landscape in heavy industry. With 108 unique UK applicants across 187 publications, the space remains fragmented, with most companies being responsible for only one or two patent filings - a pattern consistent with a sector where many green technologies remain at an early stage of commercial maturity. However, some clear trends are emerging; additive manufacturing has become a strong technology area within the metals category; Johnson Matthey seem to be growing its patent portfolio around the circular economy for critical materials; agriculture continues its steady growth, driven by both controlled environment agriculture and methane reduction; and there are early signs that AI-driven process optimisation may bring new dynamism to the enabling technologies category. As such, it seems that an interesting and potentially promising future lies ahead for green innovations in the UK's heavy industry space.



08

HIGH GROWTH COMPANIES

By Ann-Charlotte Binnberg



SUMMARY

Across the UK, companies are developing technologies and services that address challenges such as decarbonisation, energy security, resource efficiency and climate resilience. Many of these businesses are attracting investment and scaling rapidly as demand for sustainable solutions continues to grow.

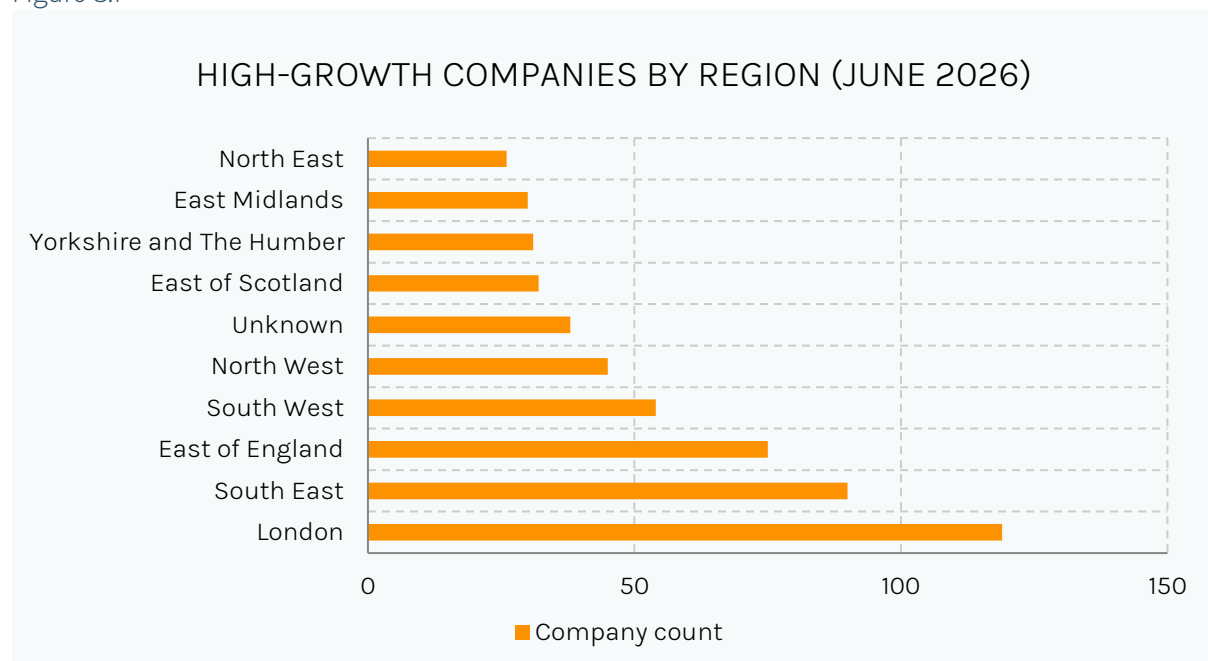
This chapter explores 627 high-growth companies identified by Beauhurst. Operating across areas including renewable energy, energy management, clean technology, sustainable transport and environmental services, these businesses provide a snapshot of the UK's evolving sustainable innovation landscape.

REGIONAL DISTRIBUTION OF HIGH-GROWTH COMPANIES

London remains the leading location for high-growth companies, with 119 businesses headquartered in the capital. The South-East follows with 90 companies, while the East of England accounts for 75. Together, these regions continue to form the core of the UK's innovation economy, benefiting from access to world-leading universities, investors and research institutions.

Outside the South-East, significant clusters can be found in the South-West (54 companies), Scotland (69 companies across East of Scotland, West of Scotland, Aberdeen, Tayside and the Highlands & Islands) and the North-West (45 companies). This distribution demonstrates that innovation-led growth is increasingly spread across the UK, supported by strong regional ecosystems and specialist industry clusters.

Figure 8.1



STAGE OF EVOLUTION

Venture-stage businesses represent the largest segment of the high-growth company population, accounting for 226 companies. Established companies account for 117 businesses, while 107 have reached the growth stage and 93 remain at the seed stage.

The dominance of venture-stage companies reflects the strength of the UK's innovation pipeline, with many businesses successfully progressing beyond proof-of-concept and attracting investment to commercialise technologies and expand their operations. The presence of 27 exited companies also highlights the maturity of parts of the ecosystem and the ability of businesses to achieve successful acquisitions or public market outcomes.

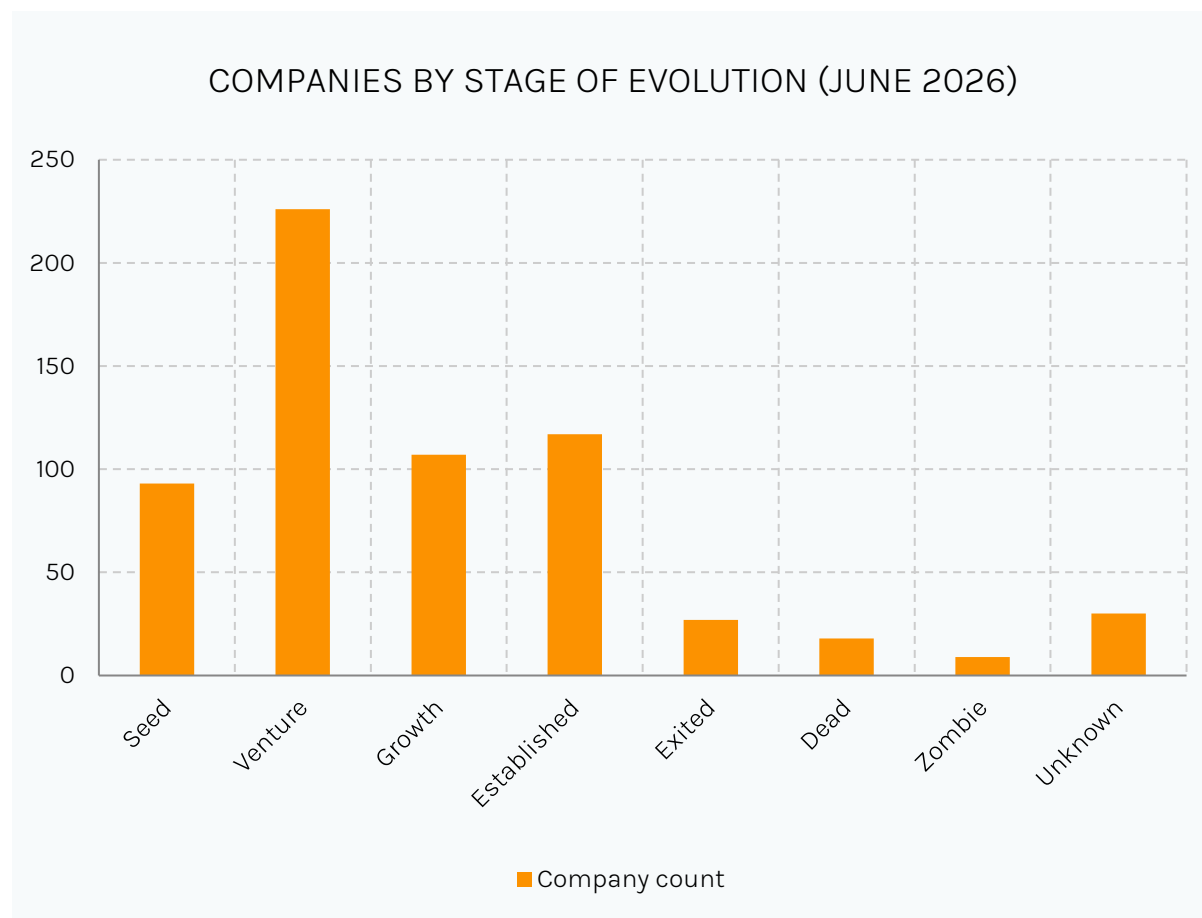


Figure 8.2

FUNDRAISING

The companies analysed have collectively secured more than £9.4bn in equity funding, demonstrating continued investor confidence in high-growth innovative businesses.

Fundraising activity remains strong. While funding conditions have become more selective in recent years, many businesses continue to attract capital to support product development, international expansion and commercial scaling. Notably, 125 companies recorded a fundraising event during 2025, with a further 49 already raising investment during 2026, indicating that investor appetite for high-growth businesses remains.

Strong fundraising in 2025 reflects the growing commercial importance of cleantech and sustainability, against a backdrop of significant investment in the transition to clean energy, supportive UK policy and increasing demand for technologies that can help businesses and economies decarbonise.

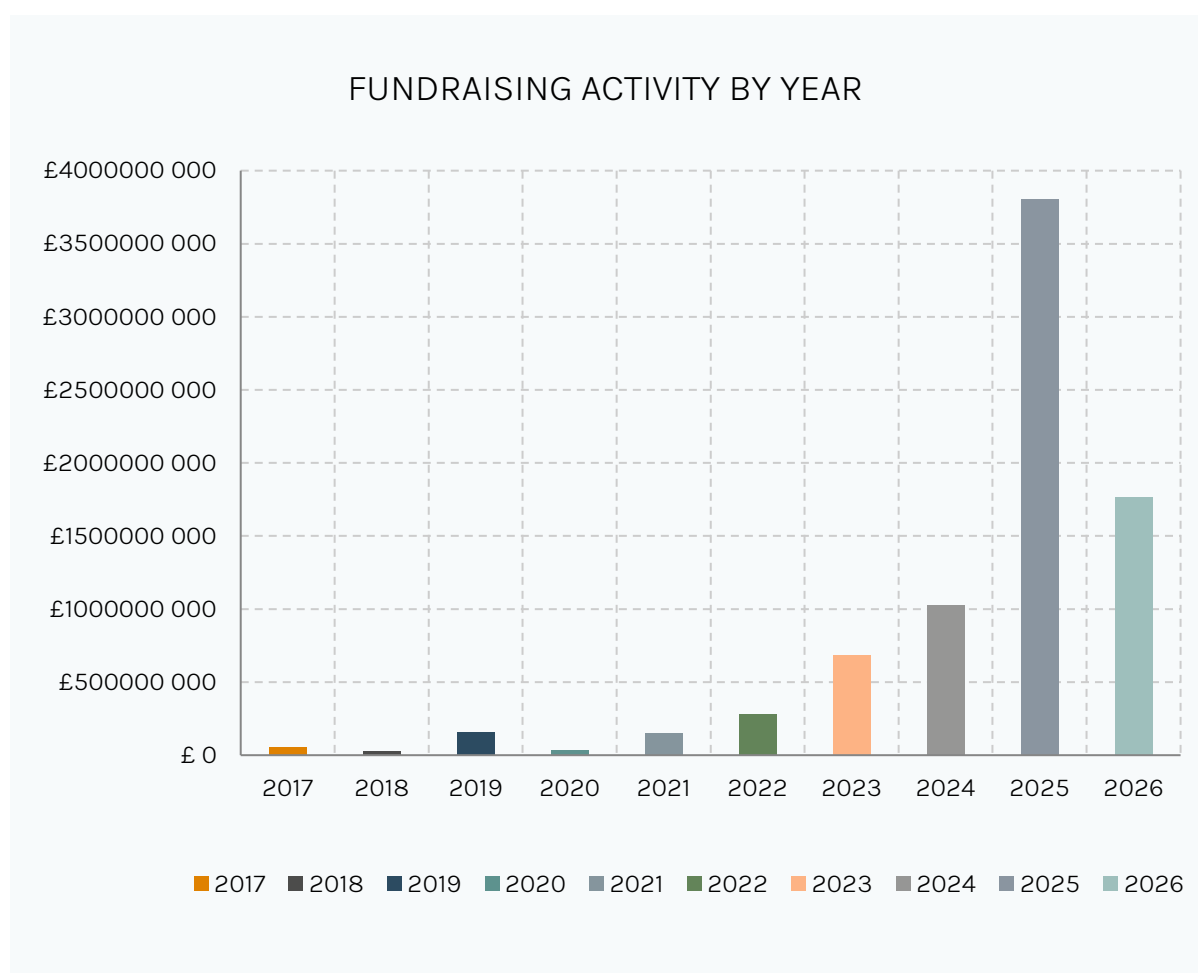


Figure 8.3

TOP FUNDRAISERS

Several companies have secured substantial levels of investment over their lifetime. Centrica leads the group, having raised more than £1.1bn, followed by Scottish Power (£600m), ITM Power (£521m) and Highview Power (£507m).

Other significant fundraisers include Vertical Aerospace, Nexeon, Tokamak Energy, Connected Kerb, Oxford Photovoltaics and Mura Technology. These businesses operate across a range of sectors including clean energy, advanced materials, transport and infrastructure, demonstrating the breadth of innovation attracting investment in the UK.

TOP 10 COMPANIES BY TOTAL FUNDRAISING	TOTAL FUNDRAISING (£)	REGION	STAGE
Centrica	£1,126,000,000	South East	Established
Scottish Power	£600,000,000	West of Scotland	Established
ITM Power	£520,800,000	Yorkshire and The Humber	Established
Highview Power	£506,911,984	London	Growth
Vertical Aerospace	£307,740,389	South West	Growth
Nexeon	£272,824,544	South East	Growth
Tokamak Energy	£221,833,081	South East	Growth
Connected Kerb	£182,694,577	London	Growth
Oxford Photovoltaics	£168,747,491	South East	Growth
Mura Technology	£155,944,862	North East	Growth

Table 8.1

GRANT FUNDING

Alongside private investment, grant funding continues to play an important role in supporting innovation. The companies included in this analysis have collectively secured almost £2bn in grant funding.

Grants are particularly important for research-intensive businesses developing new technologies, helping to bridge the gap between early-stage innovation and commercial deployment. Public funding programmes therefore continue to complement private investment and support the growth of the UK's innovation economy.

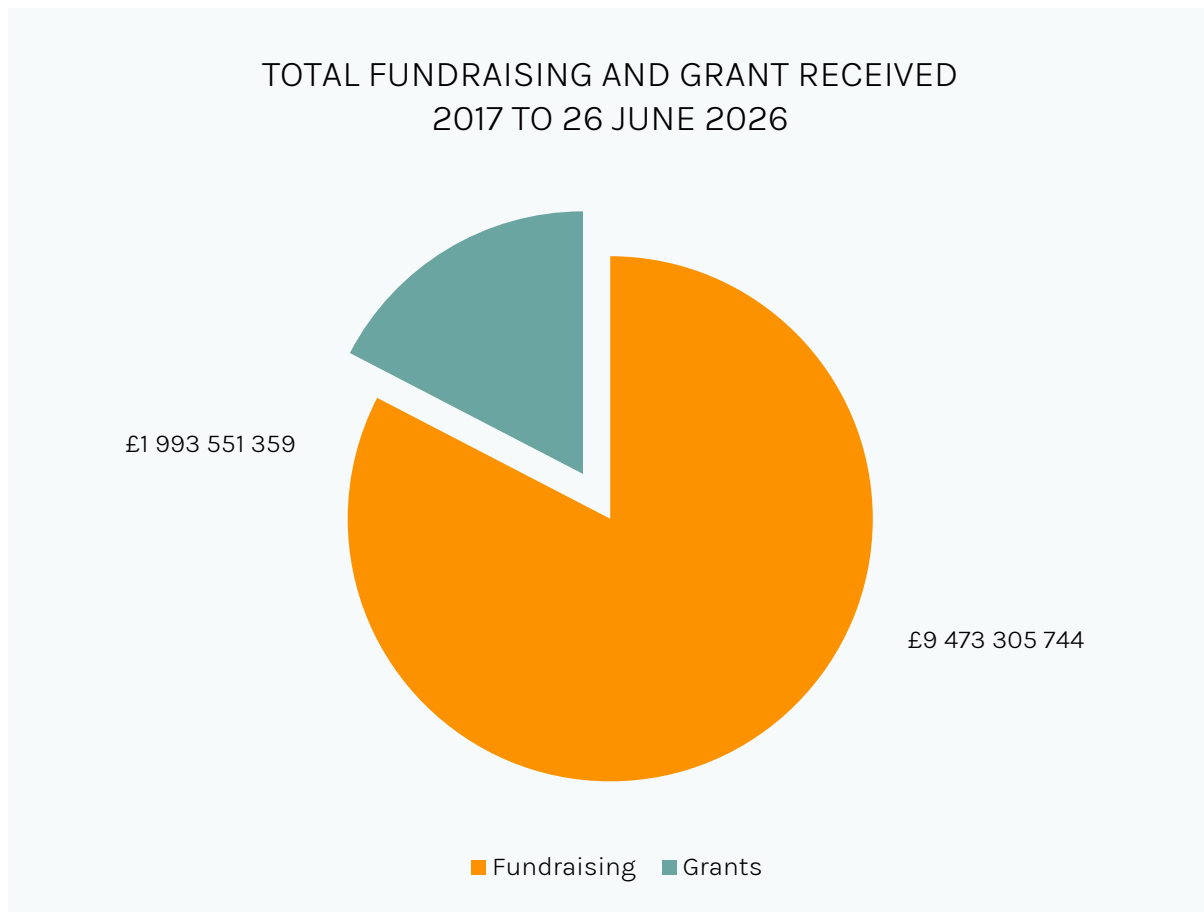


Figure 8.4

COMPANY SIZE: TURNOVER AND EMPLOYEE COUNT

Despite their growth ambitions, most companies within the dataset remain relatively modest in size. The majority employ fewer than 250 people, reflecting the innovative and technology-led nature of many of these businesses.

Similarly, turnover data shows that most companies remain within SME revenue bands, although a smaller number have successfully scaled into larger commercial organisations. This profile is consistent with the wider UK high-growth company population, where younger, innovation-led businesses account for a significant proportion of economic growth and job creation.

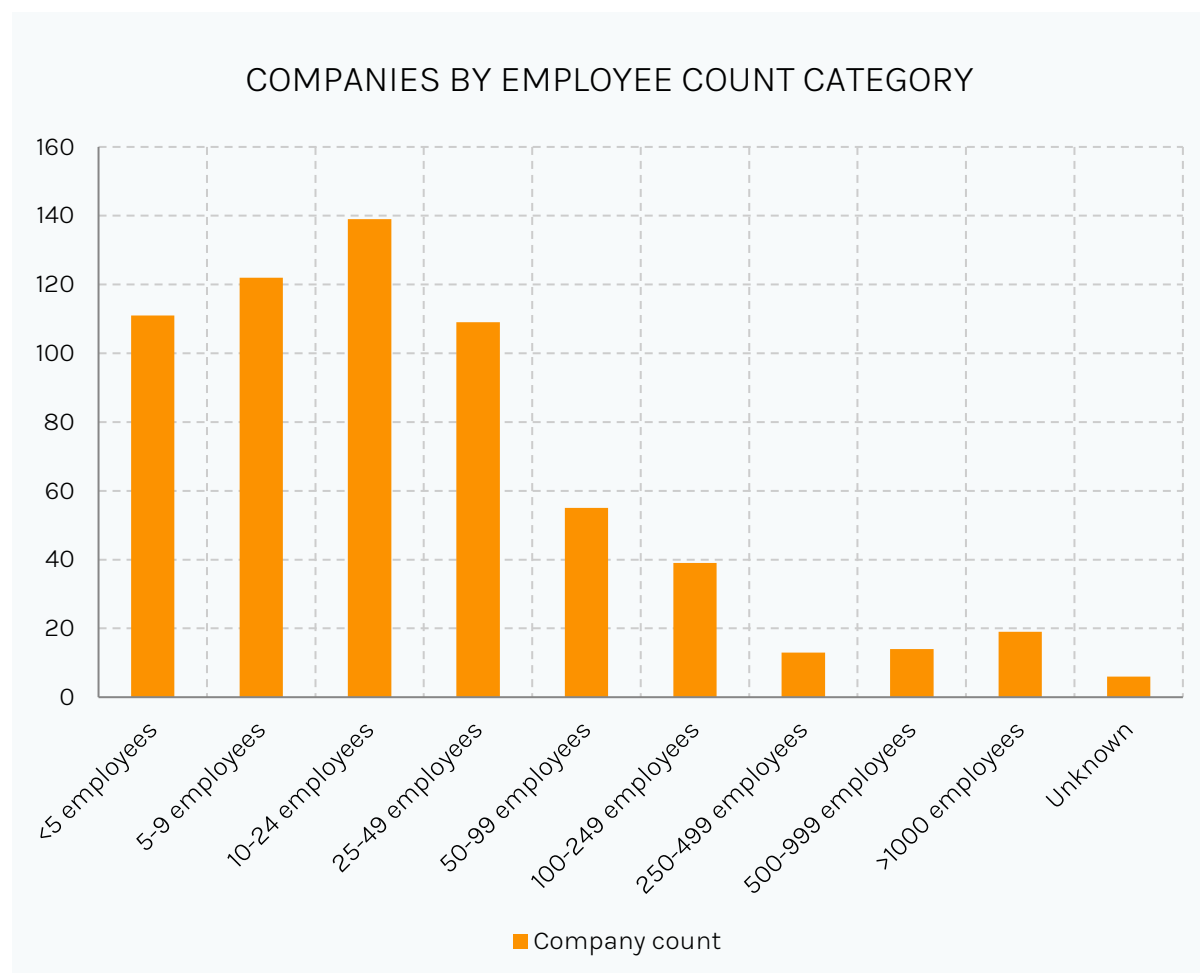


Figure 8.5

ACKNOWLEDGEMENTS

Contributors



CONTRIBUTORS

This report has been shaped by the expertise and collaboration of our patent attorneys, technical specialists and industry experts. Their combined knowledge across intellectual property, engineering, science and technology has helped inform the analysis and insights presented throughout.



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Ann-Charlotte leads the firm's Business Development and Marketing strategy. She is a member of the firm's Start-ups group.



Nick Reeve

Nick specialises in Physics, telecoms and software innovations, as well as energy storage and control systems. He advises many cleantech start-ups.



Bruce Torrance

Bruce leads our Renewable Energy group, and has a strong interest in green tech, recently supporting a global leader in maritime decarbonisation.



Nick Tyrie

Nick is a member of our CleanTech and Energy group and he handles patent work in the engineering, materials and consumer products fields.



Duncan Nevett

Duncan works in our consumer products and manufacturing teams. He leads our clean tech and energy focus group.



Dr Paul Loustalan

Paul is a mechanical engineer who works in our engineering teams. He leads our Future Transport team.



Dr Dustin Bauer

Dr Dustin Bauer specialises in patent work in medical devices, advanced materials, and battery technology.



Dr Xiaoxi Zhu

Xiaoxi handles patents in the fields of electronic, electrical engineering and software and is a member of our renewables team.



Jake Knight

Jake is a trainee patent attorney within the Electrical, Electronics, and Software group and is a member of our renewables team.



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