

# Charting the Progress

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Building the next generation  
of cleantech champions

**UK Cleantech 2023 in review**

# Acknowledgments

This report was researched and written by Cleantech Group, with the support of Breakthrough Energy.

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# Executive summary

In 2023, amidst global economic volatility characterised by inflationary pressures, rising interest rates, and geopolitical uncertainties, the UK economy remained remarkably resilient, despite challenges such as elevated inflation and subdued growth.

Venture capital investment in UK cleantech remained a standout performer, maintaining robust levels throughout 2023, comparable to those of 2021 despite a slight decrease from 2022. This resilience underscores the sector's stability amidst broader declines in total venture capital investment in the UK.

Despite the strides made by cleantech innovators, securing funding remains a formidable challenge, particularly at the critical first-of-a-kind (FOAK) stage. Our report reinforces this reality, highlighting the persistent gap in Series B and demonstration / FOAK funding and the urgent need for targeted interventions to remedy the scarcity of later-stage financing opportunities.

Nevertheless, amidst these challenges, our report showcases the invaluable contributions of several cleantech innovators and investors. Their unwavering commitment to entrepreneurship not only propels advancements in technology but also ignites economic growth and fosters job creation. Their endeavours serve as a beacon of possibility for the UK, illustrating the profound benefits that can be realised through optimised policies and financial frameworks.

We propose the following top-level recommendations to stimulate private investment in cleantech, thereby fostering company growth and scalability, while aiding the UK in achieving its climate targets.

# Recommendations

## **1. Finance:**

The government should employ public funding to attract private investment during critical stages of project development, such as the FOAK phase. Innovative strategies may involve blended finance options, a simplified loan program, an accessible application process for financial products, and the mobilisation of institutional capital.

## **2. Regulatory Agility:**

The government must keep up with the fast-paced evolution of cleantech innovation by establishing agile regulatory frameworks that respond swiftly to emerging technologies and market shifts. This includes enabling quick connections to the electricity grid and building essential new infrastructure alongside reinforcing existing ones for the transition. By fostering regulatory flexibility and collaboration among policymakers, industry stakeholders, and innovators, we can rapidly adopt and scale cleantech solutions, driving our transition to a sustainable economy.

## **3. Equity in the Transition to a Low-Carbon Economy:**

A just transition is non-negotiable. As we embark on the journey towards a low-carbon economy, we must ensure that no one is left behind. Political leaders must safeguard the livelihoods of workers in carbon-intensive industries, providing retraining opportunities, and investing in communities disproportionately affected by the transition. Additionally, addressing affordability concerns is crucial, necessitating innovation and scalable deployment of clean technologies to drive down costs. Temporary measures may be required to support those unable to afford the transition, ensuring equity and inclusivity throughout the process.

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# Background

In our inaugural [report](#), released last year, we highlighted the UK's growing accomplishments in cleantech, attracting unprecedented levels of investment in both 2021 and 2022. The document highlighted governmental efforts to bolster emerging cleantech enterprises, providing financial support and demonstrating a resolute commitment to achieving net zero by 2050 through groundbreaking legislation. Despite these achievements, the report acknowledged the onset of a new phase in global cleantech competition, observing the swift actions of the USA, China, Japan, and the EU in securing their positions in this burgeoning market.

While noting the strides made, the report also illuminated existing gaps in both funding and policy that, if addressed, could empower the UK to establish a competitive advantage, ensuring it remains on par with other global leaders in cleantech.

So how has the UK fared in cleantech over the last year? This updated report evaluates progress over the past year, delving into the evolution of cleantech in the UK and examining shifts in the investment, innovation, funding and policy landscape, unveiling insights crucial to maintaining the country's standing in the global cleantech arena.

# Investment

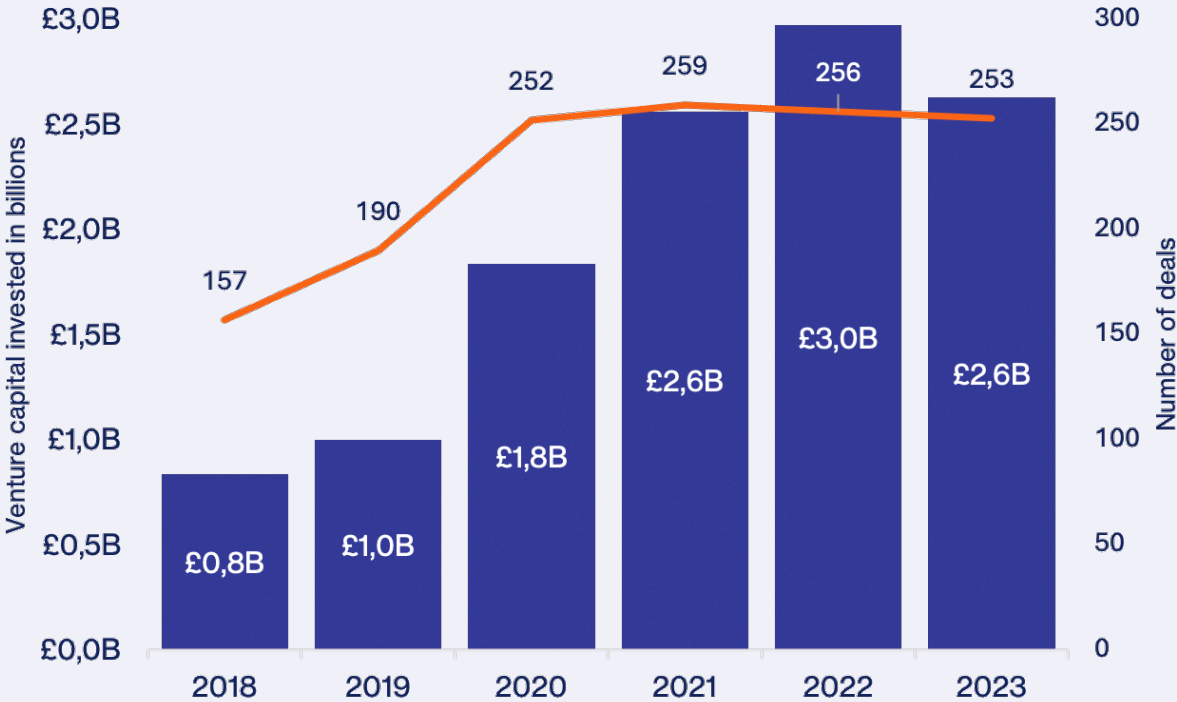




# UK cleantech investment remained buoyant

2023 was a turbulent year for the global economy, with inflation pressures, rising interest rates and large geopolitical shocks all causing uncertainty in the financial markets. Despite this, the UK economy proved more resilient than anticipated, but it is still suffering from high inflation and weak growth.<sup>1</sup>

Venture capital investment into UK cleantech has also remained remarkably buoyant throughout 2023, matching 2021 levels of investment, although saw a small drop off from 2022 because of the difficult market conditions. This is particularly surprising given that total venture capital investment in the UK slumped to £16.7 billion in 2023, down from £24 billion in 2022 and £32 billion in 2021 because market uncertainties and aggressive interest rate hikes have raised the cost of borrowing and reduced investors' appetite for risky investments.<sup>2</sup> Figure 1 details the level of venture capital investment over the last six years, and the number of deals done in each of those years.



**FIGURE 1: TOTAL VENTURE CAPITAL INVESTMENT IN THE UK PER YEAR OVER THE LAST SIX YEARS IN CLEANTECH AND THE NUMBER OF DEALS DONE IN EACH YEAR**

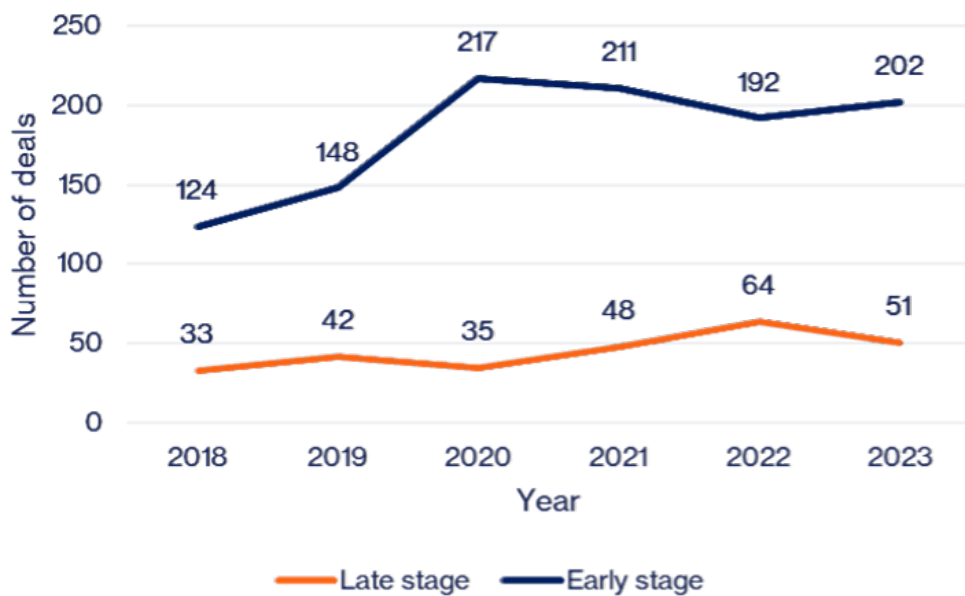
1 <https://obr.uk/efo/economic-and-fiscal-outlook-november-2023/>

2 <https://www.reuters.com/world/uk/venture-capital-investment-uk-firms-still-below-pandemic-era-peak-2024-01-10/>

Although figure 1 shows that there was a slight drop off in investment from the record levels seen in 2022, cleantech still attracted £2.6 billion. However, as we will see later in the report, there are gaps in the investment lifecycle, making it hard for some projects to commercialise.

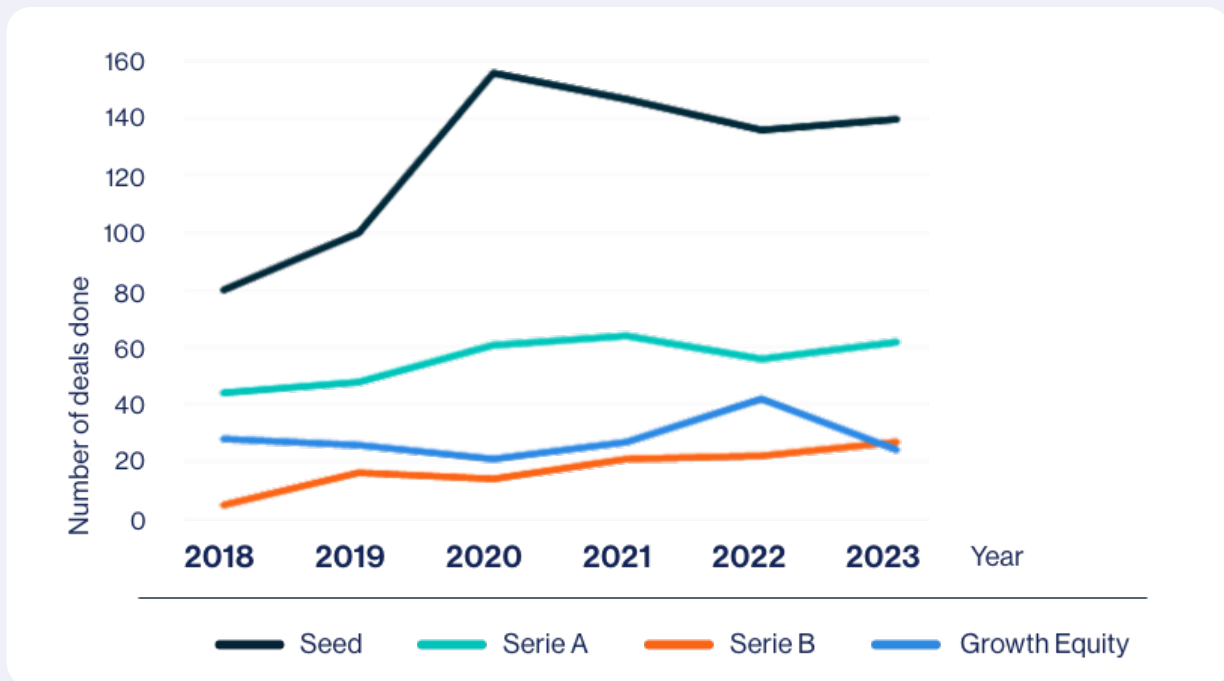
## What about the valley of death?

In 2023, figure 2 indicates a decrease in the number of late-stage deals compared to 2022, yet this still surpassed the number of deals observed in 2021. Early-stage activity remains notably higher than late-stage activity. This trend is not exclusive to a particular region; globally, late-stage deals typically constitute 27% of total deals, whereas the UK averaged slightly lower at 20% of total deals being late-stage.



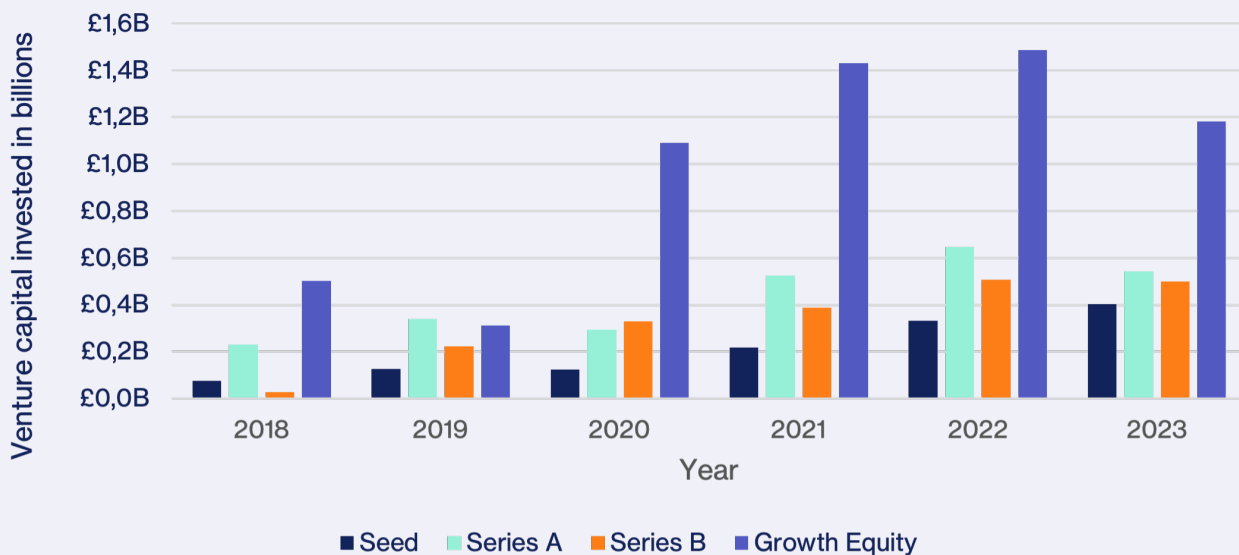
**FIGURE 2: NUMBER OF EARLY-STAGE VERSUS LATE-STAGE DEALS DONE OVER THE LAST 6 YEARS**

Figure 3 and 4 shows that whilst we continue to see low activity at Series B, the growth equity stage has slumped to be the least active investment stage in the UK, in terms of number of deals. The number of growth equity deals completed fell to almost the lowest level following a high in 2022.



**FIGURE 3: NUMBER OF DEALS COMPLETED AT EACH INVESTMENT STAGE PER YEAR**

Series B investment loosely corresponds to the demonstration and first of a kind (FOAK) stages of a company (typical deal size of £25-60 million). Projects require significant capital investment to take a project from pilot phase, to a FOAK, to nth of a kind. Specialist investors for these stages are scarce so the capital pool is small. Although there are new venture capital and specialist funds emerging with a focus on later stages of cleantech development, these are insufficient to address concerns of unclear revenue streams, market uncertainties of nascent technologies and a lack of internal climate expertise in generalist investors all compounding to stymie the wider investment market. In the UK, limited policy signals and opportunities for blended finance to share risks are creating hesitancy to invest in these solutions nationally. Digging into the deals done at series B, very few correlate to investments into hard and deep tech and instead have been used to fund software or EV charging. This is largely because of the risk and capital intensity needed to build first of a kind deep tech.



**FIGURE 4: TOTAL INVESTMENT IN £ BY STAGE PER YEAR**



**It's encouraging to witness cleantech founders demonstrating resilience in fundraising, particularly evident in the earlier investment stages. However, there's a noticeable trend away from traditional VC funding, towards angel investors, impact investors, and crowdfunding. This shift highlights both the challenges faced and the maturation of the cleantech capital stack in the UK.**

**Cathal Hughes**

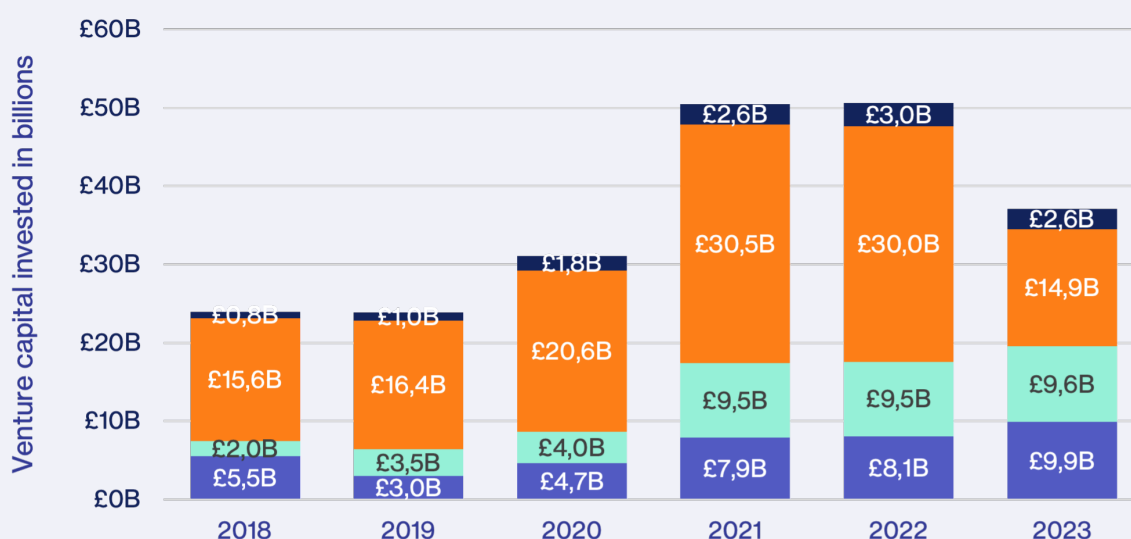
Cleantech Startup Manager  
**Undaunted**

## How did the UK fare with international competitors?

Venture capital investment in the USA experienced a sharp decline of 45% from 2022 to 2023, marking the most significant adjustment in the global dataset. This decline in venture capital investment mirrors the conclusion of a period of abundant capital, alongside less favourable conditions for exits, notably in IPOs. It underlines the notable fluctuation patterns that have long defined the landscape of US venture capital. Whilst the sharp decline in venture capital (VC) investment in cleantech may raise questions about the efficacy of the USA's landmark legislation, the Inflation Reduction Act (IRA), it isn't the whole story. Unlike other sectors of the tech economy, cleantech experienced a less severe downturn in VC funding despite being affected by the same global economic pressures. The IRA prompted a displacement of equity with debt as more manufacturing

and real projects come online, particularly in the energy & power and materials & chemicals sectors. The IRA in turn has created push and pull effects in the market, such as an uptake in heat pumps and solar. Undoubtedly, landmark legislation like the IRA in the U.S. has played a significant role in facilitating this transition, encouraging investment in sustainable ventures and bolstering the cleantech industry's trajectory towards greater stability and growth.

In contrast to the US, VC investment into Chinese cleantech increased by over a billion compared with 2022, largely driven by significant activity in Chinese solar and battery manufacturing and innovation. EU cleantech investment continued to defy global headwinds for venture capital, growing stronger than in North America, but less than strongly than in Asia Pacific.

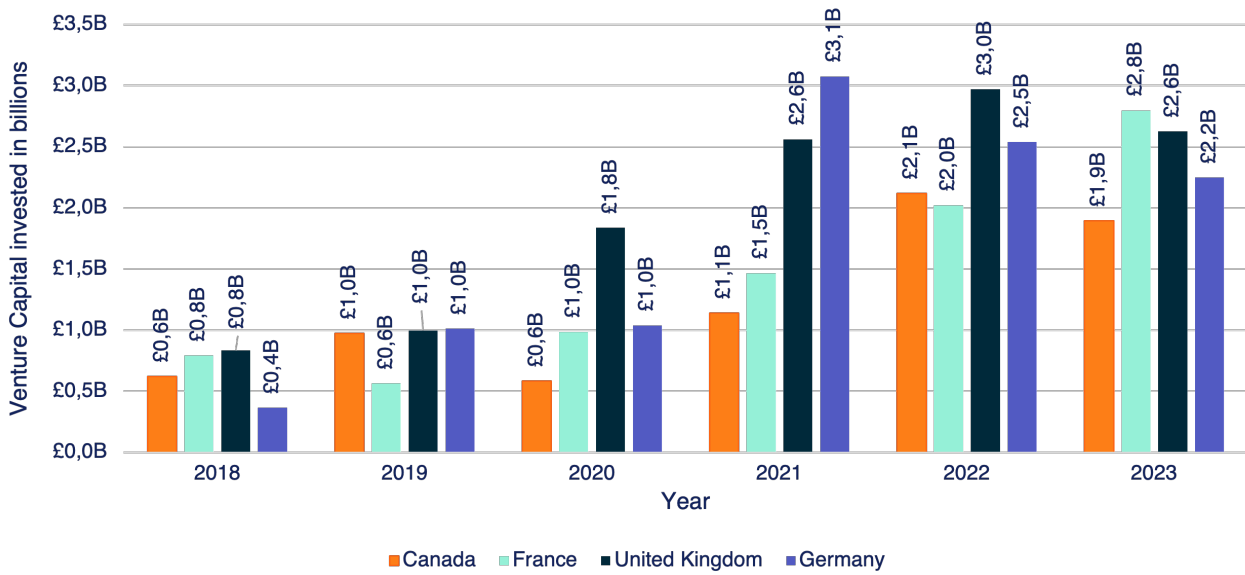


**FIGURE 5: INTERNATIONAL COMPARISON OF INVESTMENT. THE UK HAD A SMALL DROP IN 2023, THE US SAW A MUCH LARGER DROP OFF. CHINA SAW THE BIGGEST GROWTH. THE EU REMAINED CONSISTENT IN THE LAST THREE YEARS**

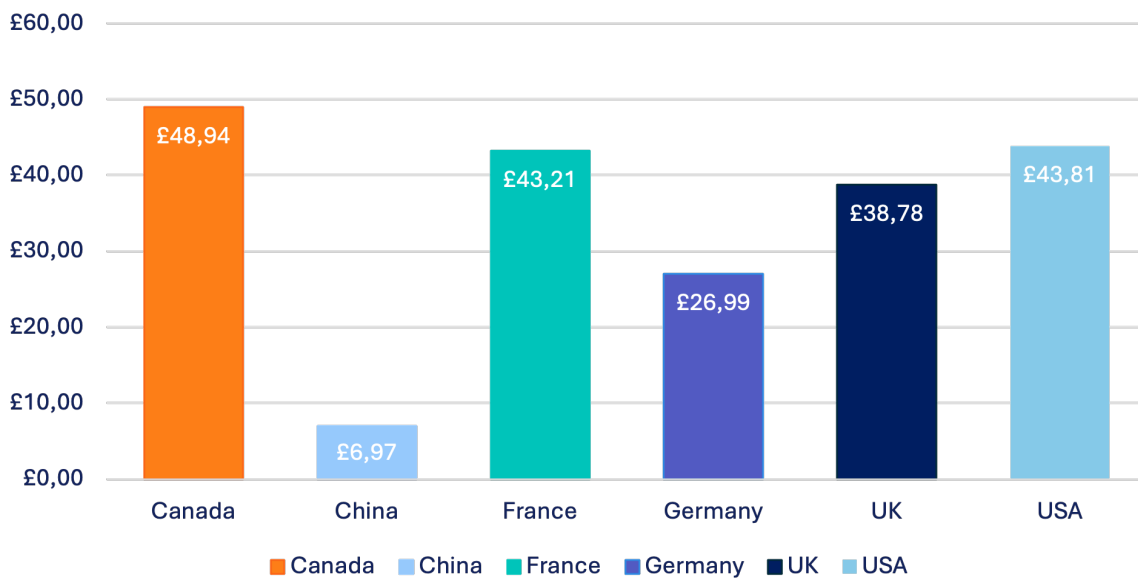
Figure 6 compares countries active in cleantech with a similar population size to the UK. France, with a population of 64.7 million received the most VC investment in 2023 (£2.8 billion)<sup>3</sup>.

Germany, with the largest population size compared in the figure (83.2 million) received £2.2 billion, trailing France and the UK. Despite having the smallest population size of the countries compared (38.7 million). Investment in Canadian cleantech reached £1.9 billion. However, when considering these figures by per capita, as shown in figure 7, Canada is the top spender, followed by the USA and then the UK.

<sup>3</sup> <https://www.worldometers.info/world-population/population-by-country/>



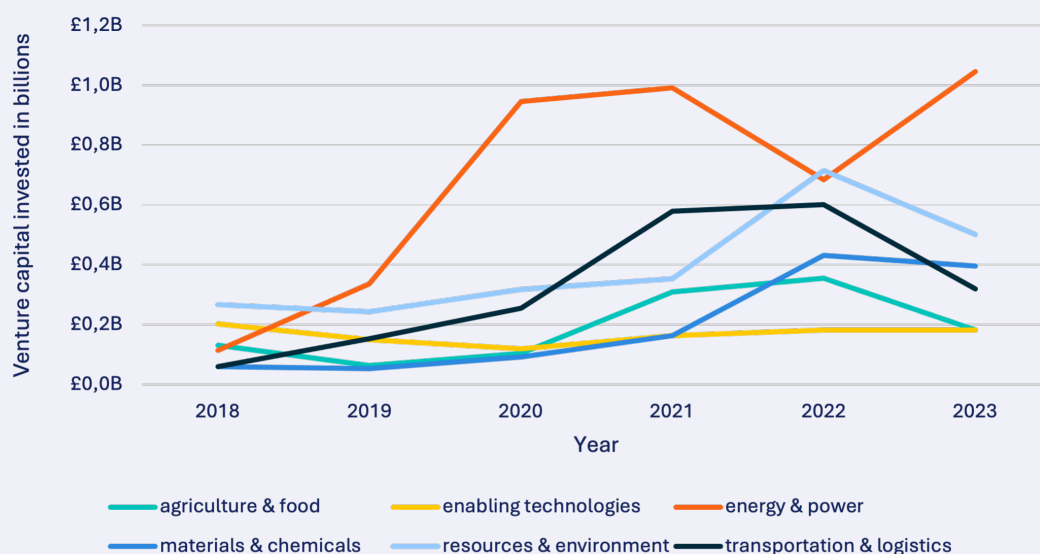
**FIGURE 6: COMPARISON OF COUNTRIES ACTIVE IN CLEANTECH WITH A SIMILAR POPULATION AND ACTIVITY IN CLEANTECH**



**FIGURE 7: £ INVESTED PER CAPITA BY COUNTRY**

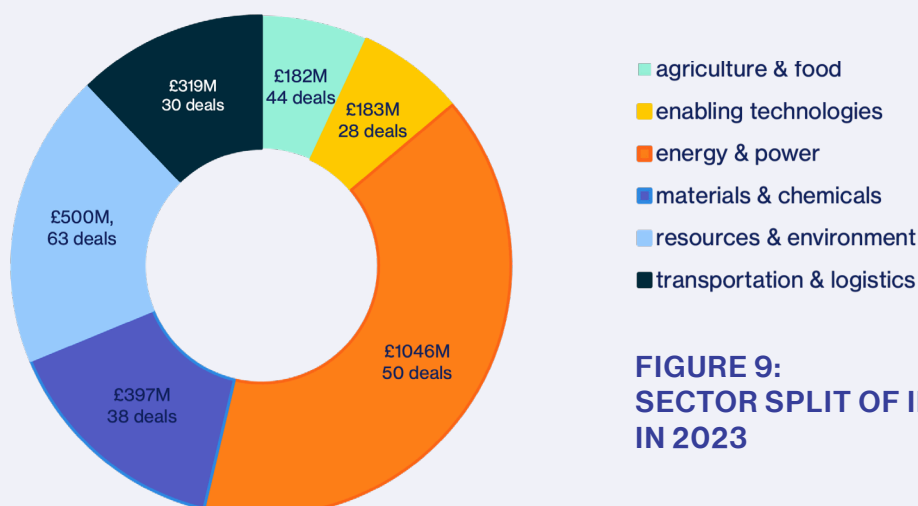
# 2023 was all about energy and power

Figure 8 details the sector breakdown for investment in the last 6 years. The energy and power sector received just over £1 billion of investment in 2023, compared to £0.68 billion in 2022. This is principally due to another large investment of £705 million for Octopus Energy (who also had two big deals in 2022). Energy and Power was the only sector which saw an increase in investment compared to the previous year, all other sectors saw a decrease.



**FIGURE 8: VENTURE CAPITAL INVESTMENT BY SECTOR OVER THE PAST SIX YEARS**

Whilst the total investment was highest in the energy sector, figure 9 shows that the Resources & Environment sector attracted the highest number of deals in 2023, with 63 completed.



**FIGURE 9: SECTOR SPLIT OF INVESTMENT IN 2023**

# Case study: Bradford Hydrogen Project

In 2023, it was announced that the government would allocate funding to 11 green hydrogen projects under its Hydrogen Production Business Model. Among the recipients, Bradford Hydrogen is poised to boast the largest capacity. The overarching ambition is to achieve a capacity of 24.5 MW, with plans underway for 10 MW to be fully operational by 2030.

This project is an excellent example of collaboration between the local authority, project developers and the owners of a decommissioned brownfield site. It is also an example of how public funding can be used to provide revenue certainty to entice private investment. The developers are also hoping it will provide a blueprint for how to do these types of projects in the future.

The project is a collaborative venture between Hygen and N-Gen UK and is slated to be situated on the former site of a Northern Gas Networks gas holder. Plans for the project, encompassing a hydrogen production facility and refuelling station, have been submitted. Pending approval, construction could commence as early as late 2024.

Once operational, the hydrogen facility will serve as a crucial support system for future bus and fleet operations in Bradford. It is projected that by 2030, the facility will generate approximately 9,000 job opportunities.



**FIGURE 10:  
ARTIST IMPRESSION  
OF THE BRADFORD  
HYDROGEN FACILITY**



# Top deals and activity

[Octopus Energy](#) takes the top spot for the second year in a row as most invested in company. The second spot has been taken by innovative, flexible integrated chip manufacturer, [PragmatlC](#). Sensor and platform data management company, [Infogrid](#) attracted the third highest amount of investment, closely followed by [TopHat](#), a prefabricated house developer and [Cornish Lithium](#), a mineral extraction company. Last year, all top 5 investments were made in or around London; this year, whilst London dominates, we also see a Cambridge and a Cornwall-based company.






	Company	Sector	Company HQ	Investors	Amount Invested
1.	 octopusenergy	Alternative energy Retailer and Investor	London	   	£705 million
2.	 Pragmatic	Semiconductor Fabricator	Cambridge Durham	        	£182 million
3.	 INFOGRID	Smart energy Reduction solutions	London	      	£73 million
4.	 TopHat	Developer of technology enabled, Sustainable housing	London	 	£70 million
5.	 Cornish Lithium	Developer of sustainable lithium extraction	Cornwall	  	£54 million

FIGURE 11: TOP 5 CLEANTECH DEALS DONE IN 2023

Cleantech deals holding the 6-10 spots are also quite London or London adjacent based.









































	Company	Sector	Company HQ	Investors	Amount Invested
6.	 Sylvera	Provider of carbon offset ratings and intelligence tools	London	 Balderton Capital  INSIGHT  Seedcamp  LocalGlobe  BAIN & COMPANY  Index Ventures  Salesforce Ventures  Si  Fidelity  9 YARDS	£46 million
7.	 ENVISICS	Developer of a dynamic holography platform for cars	Milton Keynes	 HYUNDAI MOBIS  TARSADIA CAPITAL  InMotion  STELANTIS  QIM VENTURES  SAIC  Van Tuyl	£40 million (completed March 2023)
8.	 OPEN COSMOS	Designs and builds satellites	Harwell	 etf partners  TRILL IMPACT  eit  InnoEnergy  CLARET CAPITAL PARTNERS  a&g  accenture  Santander	£40 million
9.	 ENVISICS	Developer of a dynamic holography platform for cars	Milton Keynes	 M & G  Van Tuyl	£40 million (completed March 2023)
10.	 Hometree	Provider of energy efficient home improvement services	London	 2150  L&G  INVEIN CAPITAL  AENU  e ENERGY IMPACT PARTNERS  CEZ GROUP  F J LABS  OXFORD CAPITAL	£37 million

FIGURE 12: TOP 6-10 DEALS DONE IN 2023

# Case Study: PragmatIC

PragmatIC is revolutionising semiconductor technology design and fabrication, with R&D in Cambridge and manufacturing in Durham. The company was founded in 2010 by Scott White and Dr Richard Price, and now has around 300 employees, with significant plans for further expansion. It is also a portfolio company of Cleantech for UK's coalition member, Future Planet Capital.

PragmatIC's innovative and unique approach produces ultra-low-cost, flexible integrated circuit (FlexIC) technology. Low-cost, more sustainable alternatives to silicon chips, FlexICs are ultra-thin, with a flexible form factor that enables connect, sense and compute capabilities just about anywhere, fuelling the Internet of Things (IoT) across multiple sectors including consumer, industrial, healthcare and beyond. The company's mission is to provide item-level intelligence to trillions of smart objects over the next decade. Applications with significant opportunities include smart packaging of fast-moving consumer goods that will significantly improve levels of reuse and recycling, transforming waste management and enabling a circular economy. Other use cases include wearables, sensors, and flexible controllers.

The company's sustainable approach extends to its manufacturing, using fewer process steps and a more concentrated footprint than silicon fabs. The company's optimised manufacturing process supports extremely rapid production cycles of less than 48 hours, at very low cost, and also uses significantly less energy and water than typical silicon manufacturing, and fewer harmful gases. PragmatIC's modular 'Fab-in-a-Box' approach enables co-location of end-to-end FlexIC manufacturing at customers sites, rationalising extended supply chains and supporting sustainable practices.

Aside from a strong value proposition with low costs, the company benefits from strong global market demand across multiple verticals, building a pathway to power sector-wide digital transformation. Meanwhile, ownership of development and manufacturing capabilities enables rapid roll out of new products to customers and offers greater levels of supply chain resilience.

Initiatives in the UK have provided support for PragmatlC's technology development and application use cases. For example, Innovate UK provided funding for the SPRITE project which applied unique digital IDs to PET plastic bottles and refillable packaging to support automated identification and recycling, while UKRI provided funding for the £2.4 million INSPIRE project further developing PragmatlC's sustainable approach to semiconductor manufacturing.

PragmatlC has raised over £300 million to date, including £182 million in December 2023 co-led by the UK Infrastructure Bank and M&G's Catalyst Strategy. The company recently commissioned a new fabrication line in Durham and plans to expand production at its site, PragmatlC Park, with the new funding. This will further contribute to the development of the North East Advanced Material Electronics (NEAME) cluster as an area for world-class innovation and scale-ups, and bring additional high-quality jobs to the region.

**Our latest Series D round is a clear testament to the tremendous opportunity for our innovative technology to enable item-level intelligence in virtually any object on the planet. Scaling our manufacturing capacity on the UK's first ever 300mm wafer production lines at PragmatlC Park in Durham will enable us to deliver hundreds of billions of chips to customers worldwide over the coming decade. PragmatlC is proud to be a trailblazer, in developing and unlocking British-based sources of funding for future UK technology scale-ups.**

**David Moore**

CEO

**PragmatlC Semiconductor**



# Newcomers

Many exciting new innovators founded their companies in 2023. Figure 13 shows the five newcomers who raised the most investment into their companies. [Letoon](#), a developer of ingredients from vegetable waste and botanical products for use in food, pharma and cosmetics took the top spot. AI bioengineering company [Twig](#) raised £3 million, platform energy management company [Elyos](#) raised £2.5 million, Grid balancing [Axle](#) raised £1.3 million and AI carbon accounting company [Preoptima](#) raised £990,000.



Company	Sector	Company HQ	Investors	Amount Invested
1. <b>Letoon</b> holding	Developer of ingredients for food and pharma	London		£20 million
2. <b>tw:g</b>	Developer of alternative proteins	London		£3 million
3. <b>Elyos</b>	Flexible grid management solutions	London		£2.5 million
4. <b>axle</b>	Grid balancing services	London		£1.3 million
5.  <b>preoptima</b>	Provider of artificial intelligence optimised carbon accounting	Berkshire		£990 thousand

FIGURE 13: NEWCOMERS IN 2023 WHO RAISED INVESTMENT

# Cleantech: an opportunity for the entire UK

Beyond the activity of the headquarters heavy London, the United Kingdom is an increasing hive of activity, teeming with innovation and growth. This section provides a glimpse into the numerous cleantech developments across the UK's devolved administrations, though it's important to note that we've selected just a couple of examples to highlight.

## **Scotland**

Home to the world's first tidal array, first floating offshore wind farm, a carbon capture and storage project and some hydrogen projects, Scotland is an obvious choice to develop a start-up.

## **Wales**

In 2023, the UK and Welsh governments announced the commencement of two freeports. Freeports are zones where companies benefit from tax and duty relief and simplified customs processes. Each freeport was chosen to exploit renewable energy opportunities and are expected to contribute to UK net-zero ambitions.

## **Northern Ireland**

2023 saw the release of a new renewable strategic plan for Northern Ireland which sets out bold plans to get Northern Ireland to the 2035 grid decarbonisation target. It commits to a new renewable electricity support scheme and forward-looking investment into the national grid.

### Ionic Technologies

is a spin-out company from Queen's University Belfast. In 2022, they became the magnet recycling subsidiary 100% owned by Ionic Rare Earths Limited (ASX: IXR). Ionic have developed a permanent magnet recycling process to recover magnet rare earths, creating the first sustainable magnets. This innovation offers a scalable solution for countries to establish a supply chain insulated from geopolitical risk. Based in Belfast, Ionic employs 26 people.

### Smart Green shipping

is developing a solution to reduce emissions from cargo ships. It has developed technical, commercially viable, digitally enabled wind-powered 'wings' to accelerate shipping's green transition. The company has received investment from Innovate UK, Scottish Enterprises and from private investors including Future Planet Capital. The company is based in Dumfries and current employs 9 people.

### Marine Power Systems

develops technology designed to convert ocean waves into energy. The company can configure their technology to deliver wave power (WaveSub) or floating wind power (WindSub), or a combination of the two (DualSub). The company has received >£16m of EU / UK and raised over £2 million on Crowdcube in 2023 (more than twice their target!). Based in Swansea, MPS was founded in 2008 and currently employs 25 people.

**FIGURE 14: SPOTLIGHT ON A COMPANY IN EACH DEVOLVED ADMINISTRATION**

# Case Study: JET Connectivity

UK Cleantech case study

The Net Zero Technology Centre is a not-for-profit organisation based in Aberdeen. Working with industry, government and academia, the organisation drives technology innovation to accelerate the energy transition to net zero. Central to its mission is TechX, an accelerator program designed to empower start-ups with essential funding, tools, resources and training crucial for their evolution and expansion.

Their 2022 TechX cohort featured JET Connectivity, a start-up with bases in Cornwall, Farnborough, and New York, is developing 5G mesh network floating buoy technology that will make telecoms at sea a reality, uniquely utilising 5G to increase the level of bandwidth available.

The technology enables the offshore wind industry to speed up the installation and commissioning of new wind farms, using drones and autonomous vessels to cut costs and carbon emissions, and enable more offshore renewables deployment.

***“TechX was instrumental in our success, it allowed us to expand our network and also work with potential customers to better understand their needs whilst being an early stage business.”***

James Thomas, Founder and CEO of JET Connectivity.

Since graduating from the TechX Accelerator program, JET has grown the team to 25 people, and taken on several additional employees, and in 2023 secured £1M equity investment to scale up its operations and deliver offshore 5G services to the maritime and offshore renewable energy sectors. Investors include Katapult Ocean and FSE Group.



In October 2023, the company launched its 5G ocean data platform. JET worked with a consortium including Microsoft and the Offshore Renewable Energy (ORE) Catapult, and received funding from industry, from OWGP, the Greater Lincolnshire LEP and Innovate UK, to deliver a 5G testbed at an operational windfarm. This will be utilised by companies developing and trialling technologies which require resilient and high bandwidth connectivity, such as drones and autonomous vessels.



**FIGURE 15: PHOTO OF JET-5 TE FITI, JET'S LATEST 5G OCEAN DATA PLATFORM**

# UK innovators recognised globally

Each year, Cleantech Group releases its top 100 companies. The [list](#) is compiled by an expert panel of Cleantech Group experts and 80 investor and multi-national corporation representatives. The companies are evaluated based on their potential to generate significant market impact within the upcoming five to ten years. 9 UK companies made the list in 2024 as detailed in figure 16. The list was dominated by companies in the USA, with 41 companies on the list. Germany had 10 companies, France had 4, and Canada was very successful with 14 companies on the list.

Company	Description
 OXFORD PV™ <small>The Perovskite Company</small>	Technology plug and play perovskite-on-silicon tandem solar cells that enable solar energy cost reductions
 piclo®	B2B flexibility auction marketplace that facilitates flexible contracts, and an energy management platform for efficient and reliable energy grids
 econic	Catalysts that enable production of polycarbonates, polyols and polymers from CO2
 OXCCU	Sustainable fuels, chemicals and biodegradable plastic products generated from captured CO2
 carbon clean	CO2 capture technology and solvents that significantly reduces the costs and environmental impacts of CO2 separation
 Circular	Traceability software for materials in industrial supply chains, including e-waste, battery materials and plastic
 dendra SYSTEMS	Drone-powered aerial seeding and reforestation monitoring services on an industrial scale
 greyparrot	Computer vision solutions to power robotics and smart systems for waste management at each stage of the value chain
 ev. energy	Software platform to integrate electric vehicles into residential energy systems, leveraging predictive forecasting to optimize renewable energy integration, reduce charging costs and grid demand

**FIGURE 16: UK COMPANIES ON THE CLEANTECH GLOBAL TOP 100 COMPANIES**

# Study: OXCCU

OXCCU is a developer of carbon utilisation technology based in Oxford and founded as a spinout from the University of Oxford's Chemistry Department in 2021.

A key focus for OXCCU is the efficient production of sustainable aviation fuel (SAF) using carbon dioxide (CO<sub>2</sub>) and hydrogen (H<sub>2</sub>). The approach is enabled by a novel catalyst which enables direct production of fuels from CO<sub>2</sub> and H<sub>2</sub> where usually an intermediate step is required. This reduces energy usage and plant costs.

OXCCU benefits from market and policy tailwinds. Responsible for 2.5% of global emissions, the aviation industry is looking for a cost-effective approach to cut emissions without relying on offsets. EU SAF blending quotas will require fuel suppliers to provide a minimum share of SAF at EU airports with sub-mandates for eJet. The export market for technology could also be lucrative with eJet production in US bolstered by generous incentives.

UK policy has some attractive elements. A SAF mandate sets out a long-term trajectory for SAF uptake in the UK, requiring at least 10% of jet fuel to be made from sustainable feedstocks by 2030. The government's £165 million Advanced Fuel Fund provides grant funding for development of UK SAF production. OXCCU and the Translational Energy Research Centre are developing a demonstration plant that uses to convert biogenic CO<sub>2</sub> and green hydrogen into sustainable aviation fuel (SAF). The project also includes the design of a commercial scale plant, expected to be operational in 2026.

Although at a relatively early stage of development, the potential for impact has not gone unnoticed by the investor community. OXCCU raised £18 million in Series A funding in June 2023 to scale-up the technology, expand its facilities, and grow the team in the UK. The company was added to the Cleantech 100 list in 2024.

OXCCU's experience is a potential model for linking golden triangle IP with regional regeneration. While suitable lab space was difficult to find in the Oxford area, the Translational Energy Research Centre, which is based in Sheffield, is set up for chemical engineering at the requisite scale. OXCCU sees opportunities to base larger production facilities in the North of the UK, due to abundance of offshore wind energy, fewer land constraints, and availability of EPC companies.

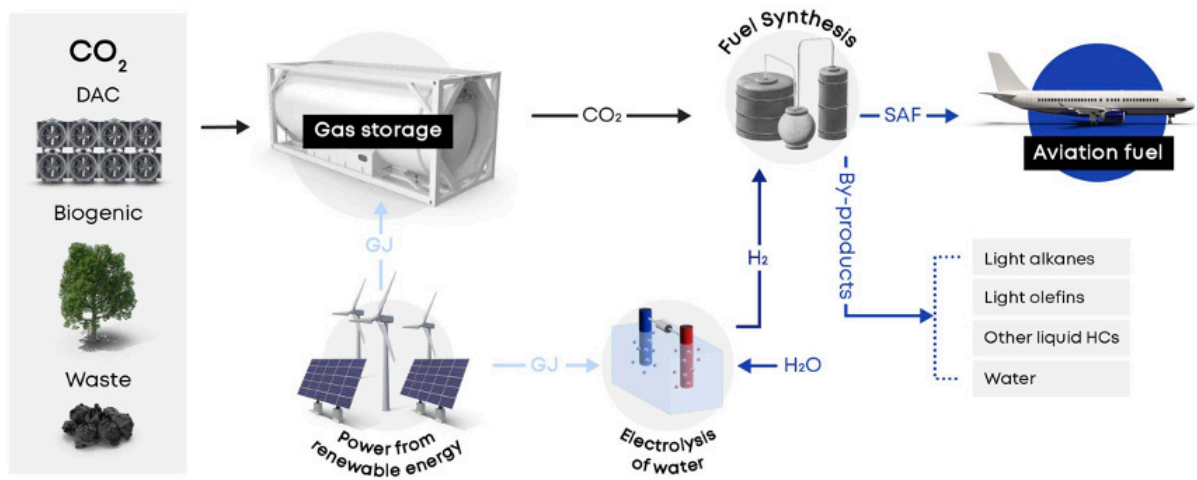


FIGURE 17: OXCCU FUEL PRODUCTION OVERVIEW

# Investor news

UK-based financial investors remained active in the cleantech space, though often with a thematic focus and global or regional strategy. AP Ventures which primarily invests in hydrogen and related technologies made several investments including UK-based hydrogen storage innovator, Immaterial. Meanwhile, 2150 which primarily invests in technologies for the built environment made an investment in UK-based energy efficiency provider, Hometree. The Clean Growth fund remained one of the most active investors for UK start-ups with investments across the cleantech spectrum including FA Bio, Kamma, Arda Biomaterials and HydRegen, along with Green Angel Ventures with investments including Lind Ltd and Oceanium and Future Planet Capital, with investments including TwigBio and Tokamak Energy.

A small number of UK Corporates have Corporate Venture arms and played and contributed significantly to the investment landscape. BP Ventures was one of the most active with investments in EV Charging, hydrogen and fuels technologies. Octopus Ventures invested across a number of cleantech sectors including water, solar carbon management and EV charging.

Despite the challenging economic environment, investors continued to raise funds focused on cleantech. Just Climate raised \$1.5 billion for its Climate Assets Fund I which will invest in the highest impact solutions that can radically reduce or remove emissions, while generating attractive risk-adjusted financial returns. The UK Innovation & Science Seed Fund, (UKI2S), managed by Future Planet Capital, reached £100m, making it among the largest UK pre-seed and seed deeptech funds. It focuses on lots of deeptech areas, but specifically Nuclear Fusion and EngBio including Industrial Biotech. Other fund managers which raised funds focused on climate included: A/O, Ocean 14 Capital, IQ Capital Partners, Giant Ventures and Zero Carbon Capital.

# Policy



# 2023 was politically turbulent

Amidst the backdrop of a cost-of-living crisis, rising geopolitical tensions, and an increasingly discontented electorate, coupled with the looming spectre of the 2024 election, we witnessed a surge in opportunities to politicise critical issues like climate change. The two main political parties have leveraged their positions on climate change commitments as a means of driving a wedge between them. This dynamic has compelled both parties to scale back their ambitions, resulting in confusion among voters and creating an uncertain environment for investment. Developments such as the Prime Minister's net-zero speech in September 2023, and government decisions to go ahead with a new coal mine and to license out new oil and gas production in the North Sea, have shaken investor confidence and contributed to a perception that the UK is backpedalling on its climate goals. Such investor concerns are furthermore not alleviated by the Opposition backpedalling on prior net zero investment pledges.

Early 2023 started with a plethora of climate related policy documents. After the government's previous net zero strategy was found by the High Court to breach the Climate Change Act 2008 because it didn't provide enough detail on how emissions cuts could be delivered – the government was ordered to inform parliament how it would deliver its proposed emissions reductions. The documents published in March makes up the compliance with that court order and outlined the government's strategy for energy and net zero growth. They detailed:

- The government's aim to attract £100 billion of private investment by 2030, with £4.2 billion earmarked for net zero research and innovation by 2025
- The introduction of Great British Nuclear (GBN) to drive new nuclear projects
- The launch of schemes like the Floating Offshore Wind Manufacturing Investment Scheme
- The extension of the Energy Company Obligation scheme,
- Consultations on sustainable aviation fuel and hydrogen infrastructure,
- Plans for accelerating investment in the grid and reducing transmission network project development times.

They also committed to:

- Publishing a Net Zero and Nature Workforce Action Plan
- Delivering a regulatory framework for heat networks.

Whilst these documents did contain more information, it was deemed by the claimants that the documents still failed to comply with the Climate Change Act, so they are taking the UK government back to court.<sup>4</sup>

In addition to the policy documents, further commitments were made in the spring budget 2023 including:

- Government pledged to invest £20 billion in low-carbon energy initiatives over the next two decades, with an emphasis on carbon capture and storage. However, this money was not formally costed in the policy costings, suggesting government intends to raise this money through levies
- For investment purposes, nuclear energy was classified as environmentally sustainable, with additional public funding promised.
- The government has unveiled £6 billion in funding allocated for the years 2025-2028, on top of the £6.6 billion designated for energy efficiency spending during the current parliamentary term.

Later in the year, the Autumn Statement successfully addressed many concerns from the power sector. This was achieved via measures including:

- Planning reform
- Reforming the rules around connecting to the National Grid
- More generous R&D tax credits
- Permanent full expensing, providing tax deductions to qualifying expenditure
- £4.5 billion to unlock investment in strategic manufacturing sectors
- A new growth fund to give pension funds access to investment opportunities.



In addition to these policy commitments, the government has also taken a big step forward in joining up and helping people to navigate the cleantech landscape by publishing an [innovation clusters map](#). The interactive tool will help investors to identify companies and understand the landscape better. It will also facilitate more collaboration between companies and clusters.

## What does the future hold?

The Covid-19 pandemic and its continued macroeconomic reverberations have been the background noise to much of the discussion around the potential of cleantech innovation to grow over the past few years. 2024 will be the first year that we get a glimpse into the “next normal” – the coming era of seeing today’s innovation succeed or fail in the mainstream. In our opinion, the following areas are going to make significant progress and will be ones to watch in 2024:

- **Electrolysers are set to scale to meet demand for green hydrogen. Electrolyser composition will become increasingly optimised to balance performance, cost and materials constraints.**
- **Industrials are increasingly coming into the limelight. Green steel and cement innovation needs to scale quickly to address these high emitting sectors.**
- **Battery innovation will continue to lower costs and enable faster role out of electric vehicles. Innovations which maintain or improve battery performance against while considering materials constraints will gain traction.**

The UK has potential to contribute to all these sectors, yet high capital requirements will necessitate appropriate policy support which could increase UK competitiveness and accelerate emissions reduction.

Further, the impact and benefits of AI at the R&D stages of new materials and early technologies will not be trivial, and savvy innovators that integrate specialized AI throughout their processes are likely to end up with both proprietary hardware and software products on their hands.

Regrettably, little policy progress has been made in addressing the funding gaps at demonstration and first-of-a-kind stages for cleantech projects, which we first identified in our inaugural report. We are also still waiting for the much-anticipated energy market reform that has been promised for several years.

Against this backdrop, and while there were promising policy developments in 2023, a large number of outstanding questions remain, which are likely to be put on hold until after the next General Election.

# Detailed recommendations

We advocate the implementation of the following high-priority recommendations for an incoming government to swiftly catalyse private investment in cleantech. This will not only foster company growth and scalability but also accelerate the UK's progress towards its climate targets.

## **1. Finance:**

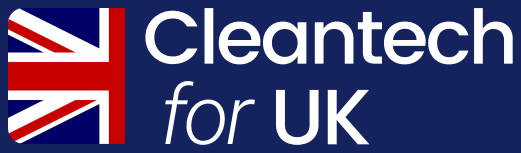
The government should employ public funding to attract private investment during critical stages of project development, such as the FOAK phase. Innovative strategies may involve blended finance options, a simplified loan program, an accessible application process for financial products, and the mobilisation of institutional capital.

## **2. Regulatory Agility:**

The government must keep up with the fast-paced evolution of cleantech innovation by establishing agile regulatory frameworks that respond swiftly to emerging technologies and market shifts. This includes enabling quick connections to the electricity grid and building essential new infrastructure alongside reinforcing existing ones for the transition. By fostering regulatory flexibility and collaboration among policymakers, industry stakeholders, and innovators, we can rapidly adopt and scale cleantech solutions, driving our transition to a sustainable economy.

## **3. Equity in the Transition to a Low-Carbon Economy:**

A just transition is non-negotiable. As we embark on the journey towards a low-carbon economy, we must ensure that no one is left behind. Political leaders must safeguard the livelihoods of workers in carbon-intensive industries, providing retraining opportunities, and investing in communities disproportionately affected by the transition. Additionally, addressing affordability concerns is crucial, necessitating innovation and scalable deployment of clean technologies to drive down costs. Temporary measures may be required to support those unable to afford the transition, ensuring equity and inclusivity throughout the process.



# Thank you

Feel free to contact us with any questions you have

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