

Redwheel-Turquoise ClimateTech Strategy

Theory of Change



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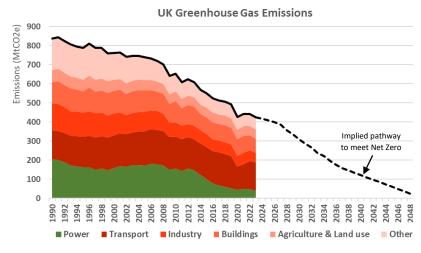
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The UK has been a leader in decarbonisation for decades...

The UK's greenhouse gas (GHG) emissions have halved since 1990ⁱ - the fastest reduction in the G7ⁱⁱ It was the first country in the world to set economy-wide emissions targets to 2050 in law, alongside the creation of an independent watchdog – the Climate Change Committee – to publicly track progress and hold Government to account. The 2050 target was later upgraded to Net Zero by 2050 – another world first.



Almost half the **UK emissions** reductions achieved so far has been delivered by the power sector. In 2010, coal produced a third of the UK's electricity, while solar and wind were negligible. This picture has now completely reversed.ⁱⁱⁱ

While the growth in renewables marches onward, it is expected that the **UK electricity will be entirely coal-free after 2024**.

Data Source: CCC (2024) Progress in reducing emissions: 2024 Report to Parliament. Graphic created by Greenwheel. Forecasts and estimates are based upon subjective assumptions.

This dramatic shift in technology has been driven by clear UK political and policy support, including for low-carbon technology, or 'ClimateTech', innovation. For example, the UK was instrumental in innovating to drive down costs in offshore wind^{iv}, and now has the largest deployment in the world after China. It also targets a further 4x growth by the end of the decade.^v



...but pushing further needs a larger pool of climate technologies

Decarbonisation has so far been driven by just a few, easy-to-deploy technologies. In the power sector, solar and wind power have driven most emissions reductions. They can be mass produced, deployed at different scales, plug into grids alongside existing power plants, and due to innovation and economies of scale now provide the cheapest electricity that has ever existed in most parts of the world. Consumers also don't see any difference in the electricity they receive.

Deeper decarbonisation will require a slew of other technologies that may be more difficult to deploy. For example, transport emissions have remained stubbornly flat for decades, and are now greater than any other sector by far. Electric cars must become cheaper, have greater range and access to convenient and rapid chargepoints if they are to reach mass adoption. They must interact with the electricity system using new infrastructure and software. Technology must also drive decarbonisation in largely untouched transport segments (e.g. road freight, shipping, aviation), open alternative forms of low-carbon mobility, and help find efficiencies in route planning and logistics.

Even sectors where substantial progress has already been made - like electricity generation **– can't decarbonise completely without other technologies**. When solar and wind generation falls away, sometimes for days or weeks at a time, a range of other technologies will need to step in. This includes different forms of low-carbon energy generation, energy storage technologies and demand-response options. Balancing the technologies must happen in real-time, with software and infrastructure across an increasingly complex system.

Energy and resource efficiency play a key role. Improving energy efficiency reduces the scale of the decarbonisation challenge, and addressing the remainder will be resource intensive – making resource efficiency crucial. **Resource and energy efficiency in the UK's manufacturing sector represents the country's single largest emissions reduction opportunity to 2050. VII**

Demand for new climate technologies is growing, and poised to accelerate

Although the UK's low-carbon sector grew 9% in 2023^{viii}, following significant growth since 2021,^{ix} the UK is significantly off-track to meet its ambitious future decarbonisation targets. Although emissions continue to decline, by mid-2024 credible policies were in place to deliver just one third of the additional emissions reductions required by 2030.ⁱ

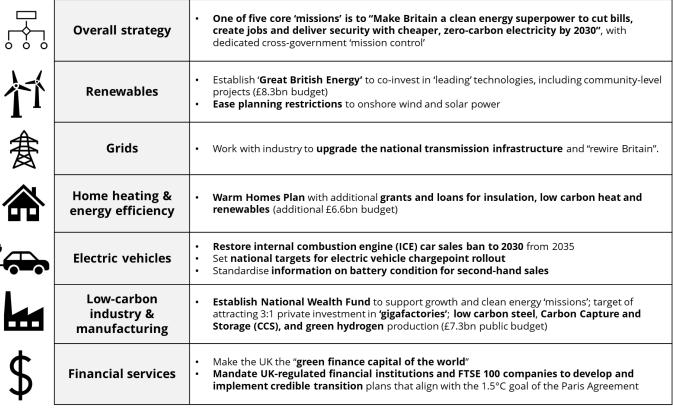
However, the new UK government promises a step-change in policy commitment that builds on existing policy to provide new and stronger support across different domains, that may quickly accelerate demand for new ClimateTech across the UK economy.

This may unlock significant further opportunities. Aligning to a Net Zero pathway means annual investment in ClimateTech deployment must more than double in the UK^x to around £50 billion a year from the late 2020s. The initial focus would be electricity supply, transport and buildings, with manufacturing, construction and network infrastructure then taking greater share.



It is estimated that global investment in ClimateTech must also grow 2.5x if the global economy is to align with Net Zero, to over \$4 trillion a year by 2030.^{xi} Although the gap is closing, countries must update their Nationally Determined Contributions (NDCs) to the Paris Agreement by the end of 2025, which may drive further acceleration in investment in new ClimateTech.

Government plans for additional policy



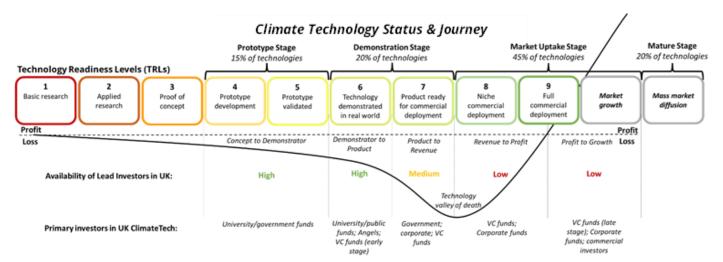
Information Source: 2024 UK Labour Party Manifesto. Graphic created by Greenwheel.

Just one in five of the technologies needed to meet Net Zero is fully mature

Of the technologies required to reach Net Zero global emissions, 35% remain at prototype or demonstration stage, while 45% are in early commercialisation or early growth where design, performance and cost improvements may still be needed before they can achieve maturity and widespread adoption.^{xii}

To reach revenue, profit and eventually growth, businesses developing these technologies must traverse the technology 'valley of death', where losses accumulated through product development combine with market risk to prevent many traditional investors (such as banks and infrastructure funds) from providing sufficient investment to drive further growth.



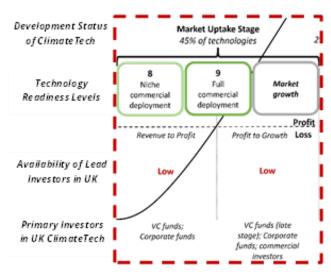


Data Source: IEA (2023) Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach. Graphic created by Greenwheel. The information shown above is for illustrative purposes.

Venture capital (VC) is crucial for helping ClimateTech businesses to successfully transition from technology and product development to business success and growth. The risk appetite, investment horizon and ability to help nurture nascent businesses means venture capital can play a role that government funds or more traditional investors - which dominate the early and late stages of ClimateTech development, respectively – cannot.

The UK is a global hub for venture capital, and ClimateTech in particular - accounting for nearly 20% of all VC investment in the UK in 2023. This compares to just 2% of global VC investment. However, most VC investors in the UK - including in ClimateTech - focus on the early stages of technology and business development. This results in low valuations and premature exists in some cases. Many of those that do invest in late-stage ClimateTech, such as corporate investors, do not lead investment transactions.

How will the Strategy tackle this challenge?



The Redwheel-Turquoise ClimateTech Strategy aims to fill this gap in lead latestage VC investment in UK ClimateTech.

Drawing on Turquoise's deep experience in UK ClimateTech, it will invest to take leading positions in companies in later stages of development, to drive additional value creation and decarbonisation impact.



The Strategy has a clearly defined investment approach, theme orientation, financial and impact objectives, and impact definition.

Redwheel-Turquoise ClimateTech Strategy

Target Size: £100-250 million

How will we invest?



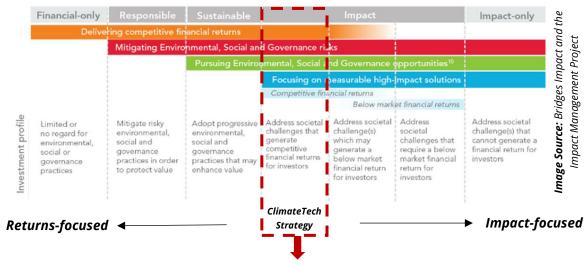
C.10 to 15 investments in total £2-5m initial fund investment Influential minority holdings Target hold period 35 years Ordinary / preferred equity or convertible debt Either lead investor or coinvestor alongside other experienced investors Active board representation

In which themes will we invest?



How will we balance financial and impact objectives?

We will only invest in companies that can **deliver both competitive returns** and deliver positive and significant **progress toward decarbonisation**



How do we define financial and impact objectives?

Target return of 20%+ net IRR

Achieve at least £1 worth of CO₂e emissions savings per £1 invested

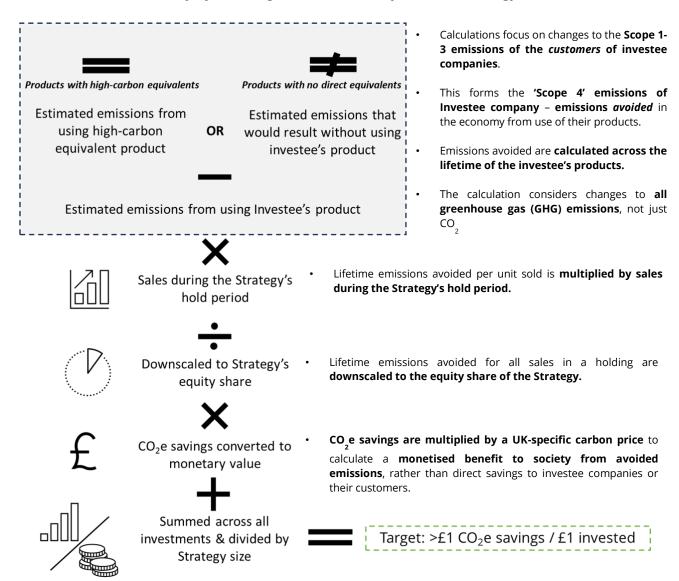
No investment strategy or risk management technique can guarantee returns or eliminate risks in any market environment.



How do we measure impact?

Progress against the impact objective will be calculated by the University of East Anglia (UEA), a leading centre in carbon footprinting methodologies, using their Carbonlytics product benchmarking methodology.

University of East Anglia (UEA) Carbonlytics methodology



This method will be conducted independently by UEA, for each year of the Strategy's operation. The results – both quantity of emissions avoided and their monetary value – will be made available to investors in the Strategy.

As this method calculates emissions avoided from investee sales during the time of the Strategy's holding only, the catalytic role of the Strategy's investment means avoided emissions in the longer-term would be significantly larger.



What makes this Strategy unique?

Demand for ClimateTech both in the UK and around the world is growing, and poised to accelerate – but delivering them remains a challenge. The Redwheel-Turquoise ClimateTech Strategy is ideally positioned to help tackle this challenge, aiming to generate real-world decarbonisation impact alongside competitive returns for investors.



The Strategy Team

- Redwheel, as Strategy manager, will have overall responsibility for the Strategy, including
 oversight of the portfolio manager, regulatory compliance, client on-boarding, audits and
 portfolio valuation process, reporting and investor relations, custody, drawdowns and
 returns. Redwheel will also assist by providing the portfolio management team with access
 to its Greenwheel research, and guidance on relevant matters such as IPO conditions.
- Turquoise, as portfolio manager, will be responsible for deal origination, due diligence, valuation, structuring and negotiation, syndicate formation, deal completion, and board representation and monitoring, including leading on funding and exit plans. Turquoise will operate pursuant to the instructions of the investment committee and oversight of the Strategy manager.
- The **investment committee (IC)** is responsible for making final decision on all investment proposals. The IC is chaired by Prof. Loughhead, previously a Chief Scientific Advisor for the UK Government Business and Energy Ministry. Other IC members include two Managing Directors of Turquoise with leadership responsibility for the Strategy, and Redwheel's Clean Economy specialist.





A proven track record of creating value and driving impact

Turquoise has completed over 140 ClimateTech transactions across sectors and industries since it was founded in 2002.

The four case studies below exemplify Turquoise's ability to identify exciting UK-based opportunities with the potential to deliver measurable impact and generate strong financial returns.

Four Case Studies

CONNECTED ENERGY

The Challenge

Connected Energy ("CE") tackles a number of ClimateTech challenges in one go:

- 1) Batteries of electric vehicles (EVs) have to be retired after they have lost about 30% of their capacity.
- 2) Renewable energy is usually intermittent and needs to be accompanied by energy storage (increasingly in the form of large battery banks) to balance supply and demand.
- 3) Electricity distribution networks often cannot support the large surges of power required by EV charging stations, necessitating the use of energy storage alongside EV charging stations.
- 4) New batteries are expensive to make, with a heavy carbon footprint.

The Portfolio Company's Solution

CE takes retired batteries of electric vehicles, puts them together and controls them with proprietary software capable of handling batteries from different makers and in different states of health.

This makes EVs more affordable because their batteries can have a second life before they have to be recycled, and more useable by allowing EV charging stations to be located even in areas with weak electricity distribution networks.

CE's solution also supports wider spread of renewable energy, because the associated energy storage systems can be cheaper and cleaner.

It is projected that the volume of retired EV batteries could cover demand for battery energy storage systems from mid 2030 onwards, allowing new battery production to be dedicated to applications which require higher energy densities offered by new batteries.



Turquoise's Role

Turquoise funds initially participated in a £5m CE fundraising round, and Turquoise also helped bring in Sumitomo as new investor.

The company progressed well and Turquoise funds led a new £15m round. Turquoise also helped bring in new investors Volvo, Caterpillar, Hinduja and Mercuria.

Turquoise is very active at Board meetings, helping for example with developing and reviewing the company's funding and exit plan, introductions to potential suppliers and customers, review of potential mergers & acquisitions opportunities, dealing with potential conflicts of interest amongst board-represented shareholders, and designing the format of Board reports.

The Portfolio Company Today

CE's current commercial product is a 360kW to 2MW unit aimed at helping large customers manage their own renewable energy generation in order to minimise the need to buy electricity from the grid. CE is now working on gradually scaling and demonstrating this product at larger scales, eventually reaching the 20MW scale needed for co-location with large solar and wind farms in order to smooth their otherwise intermittent output.

The company is working proactively with its corporate investors Volvo, Caterpillar and now also Hinduja, who are acting as suppliers and customers. For example Volvo is commissioning CE energy storage systems made from retired Volvo truck batteries, and using them to build charging stations for its fleet of electric trucks and truck distributors.

How The Strategy Could Help To Add Value

Soon CE will be looking for funding to expand its operations, to make bigger systems, and to potentially develop energy storage projects of its own. With potential funding requirement of £20m to £50m, this could be of interest to the Strategy.

ADVANCED ELECTRIC MACHINES

The Challenge

Most electric motors use permanent magnets which are made from rare earth metals (REMs). Extracting REMs is a polluting process, and regulations regarding their disposal makes recycling of retired electric motors difficult and costly. Also, China is the main supplier of REMs, leading to concerns about supply chains at times of growing geopolitical rivalry.

The Portfolio Company's Solution

Advanced Electric Machines (AEM) has developed novel electric motors that replace permanent magnets with sophisticated electromagnets. The result is a machine that is more efficient, easier to recycle and has fewer supply chain dependencies.



Turquoise's Role

Turquoise was approached by AEM during a fundraising process that had by then dragged on for over a year, resulting in financial distress for the company. Turquoise prior expertise in such technologies allowed it to assess the potential of the company within a few weeks and put together a bridge funding proposal. This in turn allowed the company to complete a £20m round led by Barclays and Legal&General. Subsequently, the Board has asked the Turquoise board representative to take the position of chairman.

The Portfolio Company Today

AEM has a combination of niche commercial opportunities accessible to it now and longer-term and larger market opportunities that require more product development. It also needs to develop its supply chain and manufacturing partnerships. In other words, a typical company transitioning from technology development to commercialisation.

How The Strategy Could Help To Add Value

If the company develops sufficiently, the Strategy would be interested in helping it go from its current revenues to early profits, and/or from early profit to growth.

TERAVIEW

The Challenge

Production line quality assurance can help identify faulty manufacturing as it occurs, avoiding whole runs being scrapped in post-production testing. This is particularly true for high value products whose manufacture involves very small components and/or very thin coatings. Production line wastage can account for a significant quantity of carbon emissions, particularly where carbon-intensive materials and processes are involved, such as in semiconductor manufacturing and application of automotive paints.

The Portfolio Company's Solution

Terahertz penetrates into materials like X-rays, but provides much higher resolution and accuracy allowing even very small scale faults to be identified. Teraview is the world's leading manufacturer of Teraherz production line scanners, with applications so far in manufacture of silicon chips, battery electrodes, and car paint.

Turquoise's Role

Turquoise made a seed investment in Teraview some years ago. Turquoise also helped bring in co-investors such as Nordson Dage (a US industrial scanning equipment manufacturer) and Samsung (a Korean conglomerate). More recently Turquoise led a bridge round of funding aimed to support preparations for a proposed IPO in Korea, being led by Samsung Securities.



The Portfolio Company Today

Teraview has gone from a deep-tech R&D unit in Cambridge to a supplier of essential equipment to the likes of Samsung, Intel, Nvidia, Ford and Tesla.

How The Strategy Could Help To Add Value

The rationale of an IPO in Korea is that the Korean stock exchange investors have a better understanding of two of Teraview's core markets (silicon chips and batteries) and therefore would value Teraview more highly at any given time. However arguably Teraview and its current shareholders would be better served if the IPO could happen a few years later, when Teraview's sales history is more established. The Strategy could offer companies like Teraview the option of staying private a few years more, adding more value before exit. A side benefit of this strategy for the UK is that the company would create more jobs in the UK, and that due to their sheer number those jobs would be more likely to stay in the UK.

GREEN ENERGY OPTIONS

The Challenge

Emissions from residential buildings account for about 20% of greenhouse gas emissions in the UK^{XV}.

The Portfolio Company's Solution

Green Energy Options (GEO) seeks to give households information about their use of energy (electricity and heat) and to enable them to better control and optimise it.

GEO is already UK's largest supplier to utilities of In Home Display units (IHDs) that utilities must provide households when they install smart meters as part of the government smart-meter roll-out programme. Government studies^{XVI} suggest that by giving live information to households about their energy use, smart meters and IHDs reduce emissions by about 3%.

GEO is now going a step further by making their IHDs smarter so that they can act (along with readily available smart plugs and smart thermostats) as low-cost Home Energy Management (HEMs) systems, allowing usage of key energy uses in the household (e.g. dishwasher, washing machines, boiler) to be automatically monitored and if appropriate shifted to times when electricity prices are lower (which is usually when renewables form a higher share of generation).

Turquoise's Role

Turquoise initially made a seed investment in GEO. Then Turquoise co-led a fundraising that also brought in Schneider Electric, and subsequently introduced an acquisition target to the company which has become an important revenue generator for the company. Most recently Turquoise led negotiations for conversion of an outstanding convertible loan in parallel to the company's latest fundraising. Turquoise is an active board member.



The Portfolio Company Today

Having concluded extensive testing, the company is now working with several utilities to prepare the launch of its Home Energy Management product around Q4 of 2024. The company will then have to decide whether to fund growth through a further fundraising or a trade sale (to a utility, data management company or meter manufacturers).

How The Strategy Could Help To Add Value

If GEO is successful with its HEMs launch, the Strategy could offer to lead a growth capital round, allowing the company to add further value before seeking a trade sale.

Key Information

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References

- i CCC (2024)
- ii DESNZ (2024a)
- iii DESNZ (2024b)
- iv Jennings et al (2020)
- v UK Labour Party (2024)
- vi IEA (2024)
- vii UKRI (2023)
- viii ECIU & CBI Economics (2024)
- ix ONS (2024)
- ^x Around £23 billion was invested in low-carbon technologies in 2022 (Source: <u>DESNZ (2023)</u>)
- xi <u>IEA (2024)</u>
- xii IEA (2023)
- xiii HSBC (2023)
- xiv Pitchbook (2024)
- xv House of Commons Library (2024)
- XVI DESNZ (2023)



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