Greenbank

Greenbank Review
Unlocking a net zero future

Our 26th Annual Investor Day 2023

Contents

If you have any comments on this publication, please let us know.
enquiries@greenbankinvestments.com

The views expressed are those of the speakers and do not necessarily reflect the views of Greenbank.

If you would prefer to receive your copy of the Greenbank Review in electronic format, please let us know by emailing
enquiries@greenbankinvestments.com

This and previous Reviews can also be downloaded from our website at
greenbankinvestments.com/publications

The recording of the Investor Day 2023 is available on our website:
greenbankinvestments.com/knowledge-and-insight/investor-day-2023-unlocking-net-zero-future

Welcome to the Investor Day 2023 edition of the Greenbank Review

Climate change poses an existential threat to society and the planet on which we depend. I'm sorry for a rather stark introduction to the 2023 edition of the Greenbank Review but if it sounds like hyperbole, it is worth noting that seven of the World Economic Forum's top ten, ten-year risks, are climate change related. So we clearly have a problem.

Greenbank has focussed on the theme of climate change for many years and we have a long history of climate-aligned investing. The theme of our 2023 investor day, "Unlocking a net zero future", is closely aligned with our own net zero ambition – to become a net zero emissions investor by 2040.

At this, our 26th annual Investor Day, our speakers outlined the challenge of climate change and explored some of the technological innovations driving the change needed in our energy system to help meet the climate crisis head on. Advances in technology are critical in delivering the much-needed 'greening' of our energy system to meet the requirements of the Paris Agreement, which commits nation state signatories to a range of climate mitigation goals, including limiting the increase in global average temperature to 1.5 degrees above pre-industrial levels.

During the day, Kate Elliot, our head of ethical, sustainable and impact (ESI) research, explained the term 'net zero' and how, through engagement with our investee companies, Greenbank can hold companies to account. Kate explained how this might be simply through open and constructive dialogue, or more forceful investor tools such as voting on or filing shareholder resolutions. Kai Johns, a senior researcher in the Greenbank ESI research team highlighted how we monitor the alignment of all Greenbank holdings in relation to net zero and how this intersects with the eight sustainable investment themes that underpin our portfolios. And we were delighted to welcome our guest speakers: Catherine Raw (Managing Director of SSE Thermal), David Bryon (Chief Financial Officer of First Light Fusion), and John Flaherty (Managing Director of Grid Scale Energy Storage, SMS Plc) all giving an insight into how their businesses are playing a part in the path to a cleaner energy system and net zero future.

As you will read, despite some extraordinary technological innovation, there was no sense from our speakers that all is yet in hand. Whilst solutions are being developed and gradually implemented, they need to be delivered at scale and pace if we are to address the climate crisis. And time is not on our side. Recent research from the CCC (Climate Change Committee, an independent non-departmental public body) described UK government efforts to scale up climate action as "worryingly slow." The UK is not alone. There is a clear need for innovation and action, but this must be backed up by global policy development and implementation.

The Greenbank team remains at the forefront of the drive for sustainable development and investment. Our team continues to grow – as does our service proposition (please visit our website greenbankinvestments.com to learn more). Our drivers remain constant – the desire to help our clients invest in line with their values and in a way that has a positive impact for both people and planet. We share our clients' commitment to see investment capital as a driver of positive change in a world facing a broad range of challenges, and we are delighted to be of service.

I hope you enjoy reading this issue of the Greenbank Review and we look forward to our Investor Day 2024.

John David
Head of Greenbank

Kate Elliot
Head of Ethical, Sustainable and Impact Research, Greenbank

Kate oversees the development and implementation of the team's sustainability assessment framework, analysing investments against a range of environmental, social and governance criteria. She also monitors emerging sustainability themes, sets priorities for Greenbank's stewardship and engagement activities and has developed the team's systems for measurement and reporting of portfolio sustainability and impact performance. She joined Greenbank in 2007 after graduating from the University of Bristol with a Masters in Philosophy and Mathematics.

Mitigating and adapting to the effects of climate change is perhaps the single greatest challenge humanity will face over coming years and decades. Experts at the Intergovernmental Panel on Climate Change have repeatedly stressed the economic, environmental, and social harm that will result from continued inaction on climate change. In May, the World Meteorological Organization announced that it's now more likely than not that global temperatures will rise to 1.5 degrees above pre-industrial levels at least once in the next five years. Extreme weather events like the recent wildfires in North America are likely to occur more often as a result, and be more acute.

We hear a lot about the need to reduce greenhouse gas emissions and the necessity of a net zero pathway for global governments and businesses, but what does net zero mean and how does an investment house like Greenbank help drive the required transition?

Essentially, net zero is the point at which the total volume of greenhouse gasses (GHGs) released into the atmosphere is balanced out by the effect of carbon capture and nature-based solutions being used to remove GHGs from the atmosphere. Beyond this point, it is then possible to move towards a period of negative emissions. The time and scale of decarbonisation will vary for countries, industries, or individual companies, but it's important to note that a net zero pathway requires a combined strategy of emissions mitigation first and foremost and then removal of atmospheric GHGs to balance out the residual emissions that are too difficult or too costly to avoid.

Greenbank invests in companies prioritising reduced emissions ahead of offset or removal strategies. This follows the concept of a mitigation hierarchy where avoidance comes ahead of minimisation, restoration, and offsets as a means to control negative environmental impacts. Such a strategy makes financial sense as removal technologies tend to be costly and are largely unproven. It also demonstrates good common sense to pursue a reduction strategy from the outset: if your house is too warm, you'd try turning down the heating before investing in air conditioning.

Net zero portfolios

There are two key factors we look at to assess net zero progress in investment portfolios. First, we make a top-down calculation of a portfolio's carbon intensity, usually measured by the level of emissions per million pounds invested. The result can be reached in a variety of ways, but essentially considers the underlying carbon intensity of everything invested in, and aggregates that up to a portfolio level. The portfolio figure can then be mapped against the overall market and relevant decarbonisation pathways to assess how well investments are aligned to a net zero pathway. Secondly, we look bottom-up at individual investments within portfolios to assess their alignment to net zero.

Over time, we track progress across the top-down and bottom-up scenarios until we reach the point where 100% of underlying investments in a portfolio are net zero aligned.

We're investing in companies on a low-carbon trajectory as part of our 2040 net zero target, using engagement to hold companies to account and accelerate the change needed to realise global climate ambitions. However, there is a gap between ambition and national policy commitments needed to drive the low carbon transition.

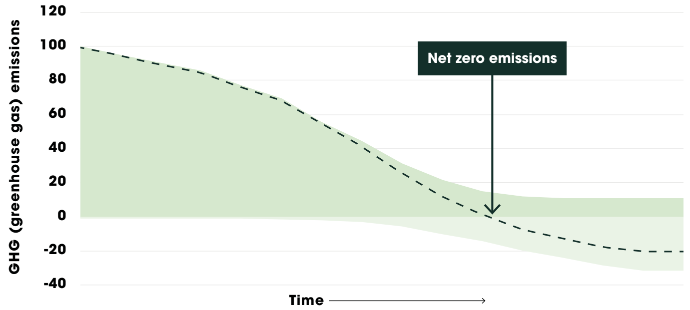
In 2019, the UK government committed to reaching net zero by 2050. Through the Climate Change Act (2008), it developed a Carbon Budget Delivery Plan outlining five-year statutory caps on CO2 emissions. These reduce in each five-year cycle between 2008 and 2037 in line with the country's overarching climate ambition. A 2022 assessment by the Climate Change Committee of the gap between ambition and action in the UK makes for interesting reading. Credible funded plans were in place for only 39% of required emissions cuts by 2037. A further 24% were covered by well-developed policies but faced risks from implementation or timescale issues. Around 33% of cuts were still restricted by policies in development and 5% were assessed as having inadequate or non-existent delivery plans.

This view was confirmed by a High Court ruling in July 2022 that found the UK's net zero strategy breached obligations in the Climate Change Act concerning legally binding decarbonisation targets. An updated report from the Climate Change Committee, published in June 2023 found that, even with a series of new announcements and policies, the UK government cannot credibly be said to be delivering on its climate commitments.

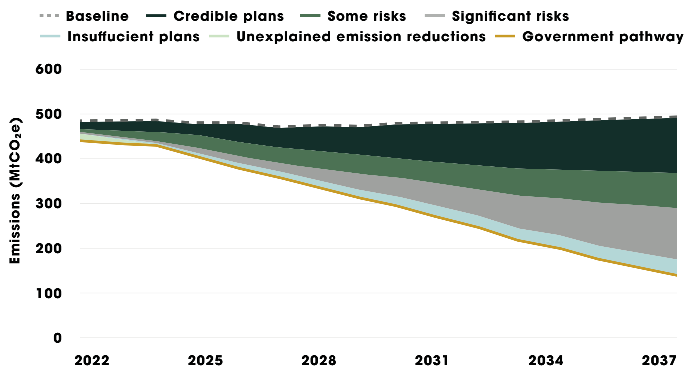
A day of multiple green economy announcements by the government in March 2023 (dubbed 'Green Day') saw the publication of almost 3,000 pages of policy statements, consultation reports and planned external reviews. Of note were announcements detailing emissions cuts between 2021 and 2035. Around 58 million tonnes of CO2 reductions are expected in the transportation sector, driven largely by an uptake in electric vehicles. Industry comes a close second with a reduction of around 54 million tonnes due to carbon capture and storage and an increasing shift away from fossil fuel use. In the same period, power generation is expected to deliver a 46 million tonne reduction through increased renewables capacity and an uptake in nuclear and hydrogen alternatives. Across multiple industries, energy storage is recognised as key to ensuring energy system flexibility and resilience whilst helping to reduce the peak volume of generated capacity needed to meet demand.

The challenges to net zero are significant and will require a multitude of clean energy innovations and changes to the business-as-usual economic model and mindset. Greenbank will continue to advocate for positive change and support actions bringing us closer to a net zero economy.

What is net zero?



Assessing the UK's net zero plans



Source: Climate Change Committee, Progress in Reducing Emissions — 2022 Report to Parliament

Catherine Raw
Managing Director, SSE Thermal

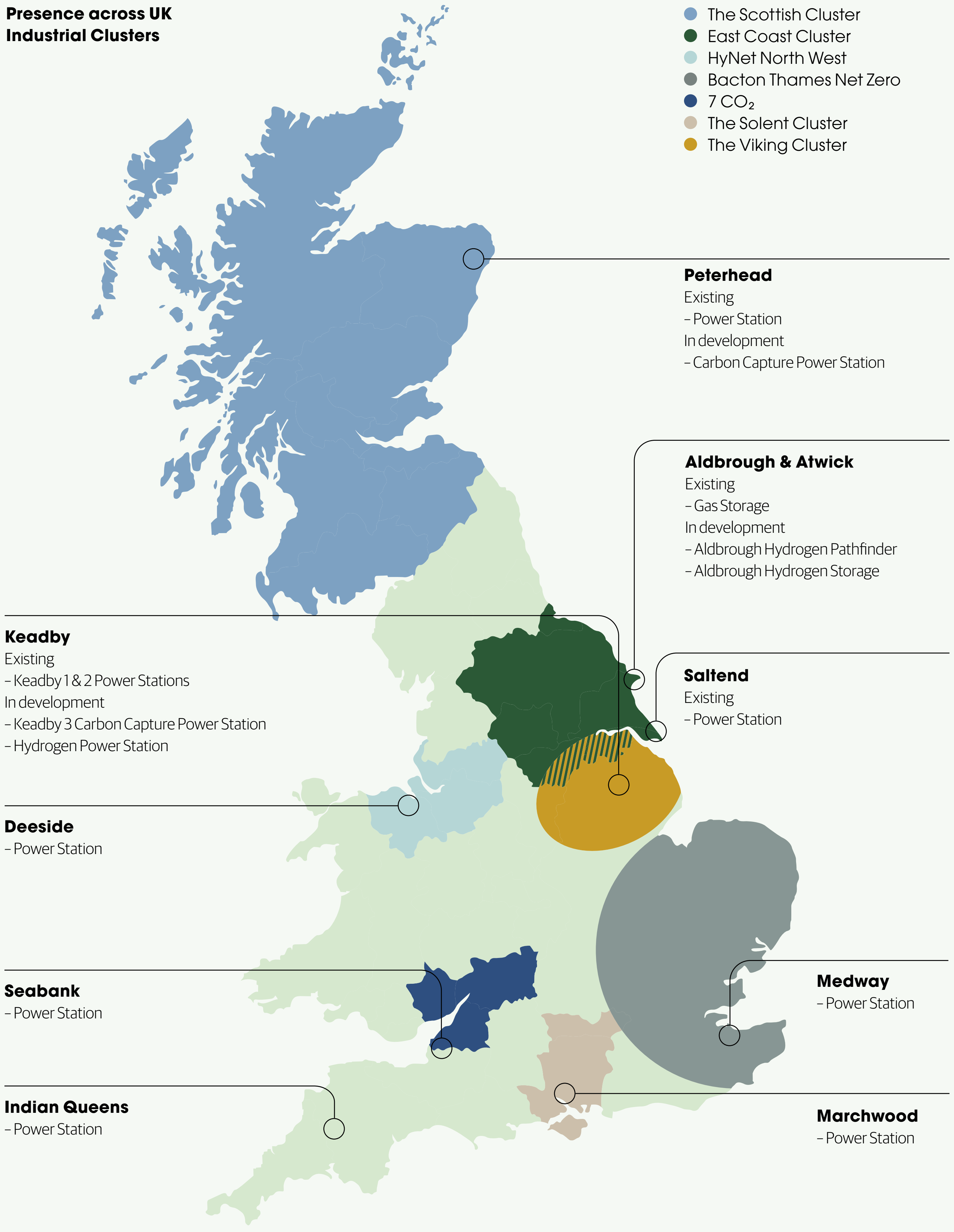
Catherine joined SSE Thermal in April 2022 with extensive operational and commercial experience, having served as both Chief Operating Officer for North America and Chief Financial Officer for international metals and mining firm, Barrick Gold. Prior to this, she was a managing director and fund manager at BlackRock, the world's largest fund management company. Moving into the energy sector, Catherine brought her vast expertise in operational and financial performance, as well as specialised knowledge of natural resources, commodity markets and investment management. She holds an MA in Natural Sciences from Downing College, University of Cambridge, an MSc in Mineral Project Appraisal from Imperial College London and is a CFA charterholder.

SSE Plc's business model is a microcosm of the UK's energy system, focusing on smart and flexible renewable and thermal energy technologies and the networks needed to satisfy consumer and business needs. We are positioning ourselves as the clean energy champion for the UK and Ireland and aim to expand internationally with a strategy to build, operate and invest in electricity infrastructure driving the transition to a net zero economy.

To deliver net zero energy to the power system and consolidate the UK's position as a world leader in clean energy innovations, SSE has set out ambitious plans to invest in net zero technologies to accelerate the transition to cheaper, cleaner and more secure homegrown energy. We're increasing our planned investments to £18 billion by 2027 and could commit as much as £40 billion by 2032, creating around 1,000 clean energy jobs a year. This will see the company ramp up its deployment of renewable energy, the vital network infrastructure to connect and transport it around the UK, and the flexible power sources to back it up when the wind isn't blowing and the sun isn't shining. SSE Thermal's role is to provide low-carbon flexible, dispatchable power generation at scale. With a renewables-led system, we help maintain the security of supply.

The last 18 months have introduced new challenges for European energy markets. The post-pandemic energy crisis was exacerbated by Russia's invasion of Ukraine, leading to soaring energy prices largely driven by the cost of international gas; a record number of the French nuclear fleet were taken offline; and sustained periods of still, dry weather tested the resilience of Europe's energy system. Wind output was also low during this period, but our existing fleet of gas-fired power stations and salt cavern storage assets were able to balance the system. Ongoing economic, political, and environmental risks to energy provision demonstrate why we need to increase flexible capacity and efficiency and build a strong network of defences against future supply and price volatility, while simultaneously decarbonising.

The Climate Change Committee (CCC) reported earlier in the year that 12-20 GW of low-carbon flexible power will be needed to deliver a decarbonised power system by 2035 – by then, the CCC anticipates only 2% of flexible power will derive from unabated gas. Not only does the target indicate a significant increase in the required volume of low-carbon flexible capacity, but it also assumes that the critical infrastructure needed to achieve it by 2035 will be established. To ensure the future renewables-dominated power system is reliable and resilient, the government must focus as much on low-carbon flexible solutions as it does on existing renewable and nuclear options.



Investor Day Review 2023

"Ongoing economic, political, and environmental risks to energy provision demonstrate why we need to increase flexible capacity and efficiency and build a strong network of defences against future supply and price volatility, while simultaneously decarbonising."

To achieve low-carbon flexibility at scale, SSE Thermal is focusing on two core technologies: carbon capture and storage (CCS) and hydrogen. CCS takes post-combustion flue gasses from gas-fired power stations, removes the CO2, then pipes it to a sub-sea saline aquifer or depleted gas field store. Over time, it lithifies and stores permanently in the Earth's crust. This process could still potentially use fossil fuels, so an alternative option is hydrogen, a pre-combustion technology. In this instance, there are two low-carbon hydrogen options: blue hydrogen and green hydrogen. Blue hydrogen is created when natural gas is split into hydrogen and CO2 by a reforming process. The carbon is captured and stored while the hydrogen is kept for power and other industrial uses. Green hydrogen is produced by splitting water through electrolysis into hydrogen and oxygen. Again, the hydrogen can be reserved for power while the oxygen can be vented harmlessly into the atmosphere.

More work needs to be done, across industry and government, to prove the concept of hydrogen to power, including the integration of production, storage and offtake. Early projects like the Aldbrough Hydrogen Pathfinder that SSE is developing can help the UK learn these lessons; SSE is seeking to unite green hydrogen production, salt cavern hydrogen storage and 100% hydrogen-fired power station on the same site by the middle of the decade.

Multiple technologies will be needed to deliver a net zero power system, and we continue to track a range of solutions. These include Hydrotreated Vegetable Oil (HVO) fuels produced by processing waste oils to create a fossil-free alternative to diesel in accordance with EU sustainability standards.

With the need for investment in new infrastructure to support technologies like hydrogen and CCS, alongside the existing electricity and gas networks, the locations of these new projects are likely to be clustered with other potential users of shared pipelines and storage facilities. It's no coincidence that SSE's existing power stations and future plans are rooted in the country's carbon intensive industrial heartlands. In the Humber, for example, beyond the Aldbrough Hydrogen Pathfinder project we are developing large scale hydrogen storage facilities with our partner Equinor. With an initial expected capacity of 320 GWh, the facility would be the largest of its kind in the world.

We're also developing our Keadby 3 Carbon Capture Power Station in partnership with Equinor. With the government announcing its ambition to become a world leader in CCS technology, Keadby 3 is expected to capture at least 1.5MT CO2 emissions per annum - 5% of the Government's 2030 target.

Through projects like these, and with partnerships spanning the energy and industrial sectors, we are creating ecosystems for CCS and hydrogen and establishing the infrastructure needed to decarbonise the UK economy. The Humber, alongside other industrial areas in the UK, can be lighthouses for investment in low-carbon economies.

David Bryon
Chief Financial Officer, First Light Fusion

With diverse industry and spinout experience, David brings deep hands-on financial, commercial, and operational expertise to First Light Fusion. Tech start-ups are a natural fit for his skills, where his insights and leadership allow his teams to make hard things possible. Following a career in both large corporates and SMEs, David held the Chief Financial Officer and Chief Executive Officer roles in an Oxford University spin-out. He has also run a consultancy, Right Brain Finance, supporting technology start-ups as they raised money and grew their businesses. First Light Fusion was one of these clients, where he joined the Board in 2015 and has since been deeply involved in all non-technical aspects of the business, from the fundraising to the challenges of scale up. David holds a BA in Geography, MSc in Psychology and is a CIMA associate.

Fusion could be a key technology in the future generation of global clean energy. The world needs a clean base load power supply operating at scale and fusion can safely and effectively meet that need. First Light Fusion's unique amplifying targets have been developed to deliver energy at scale with simplicity at the heart of its process. Simple is cost effective, simple is deployable, and fusion should be powered by the simplest machine possible.

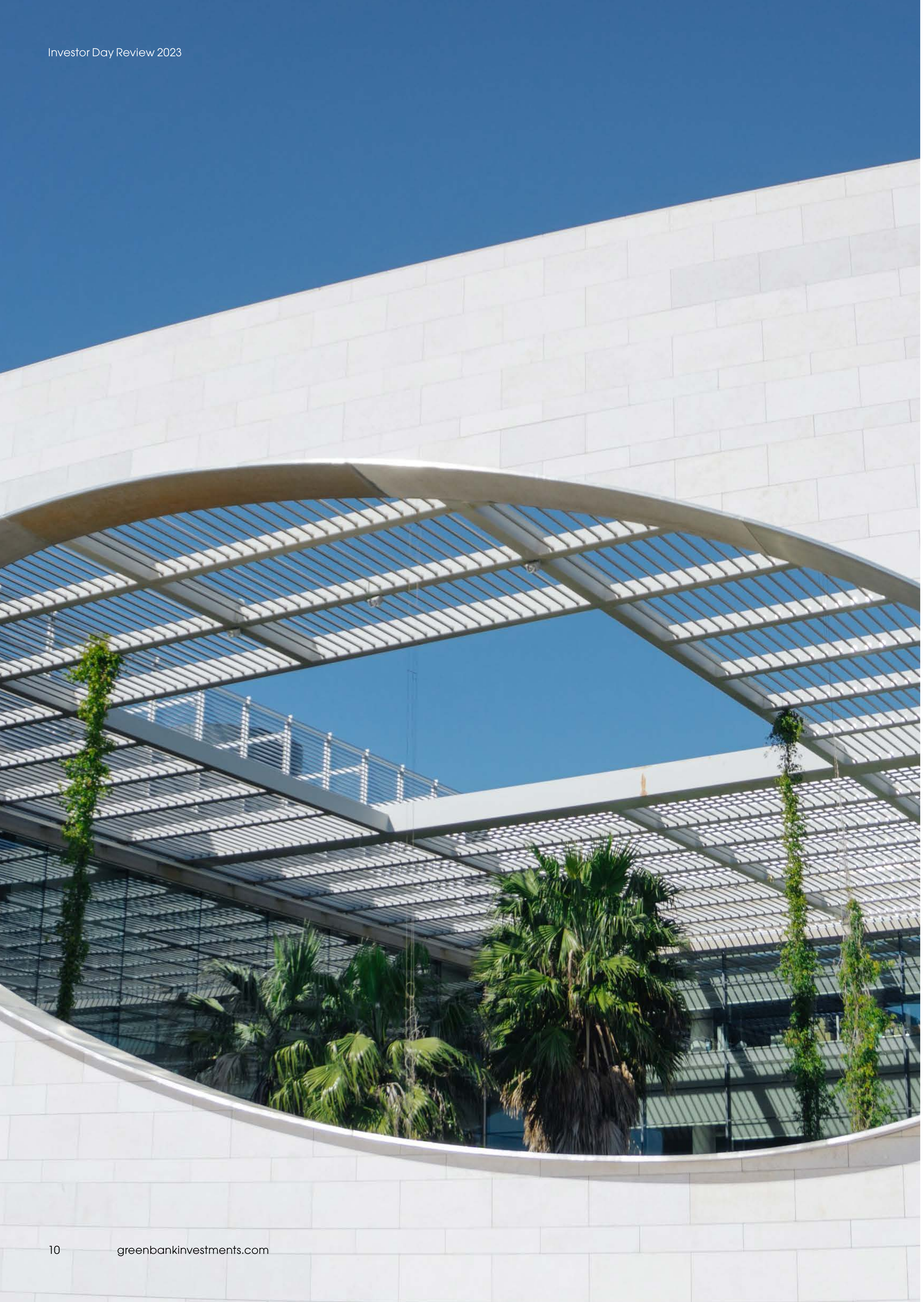
First Light Fusion is Oxford University's fusion energy spin-out. We have a fabulously talented team developing and building world-class shock physics and diagnostic capabilities. In 2022, we successfully demonstrated our nature-inspired amplifier targets using a unique projectile firing method to generate fusion – our approach was subsequently verified by the UK Atomic Energy Authority. Most importantly, we write and run simulation codes that simulate every aspect of our work in the field, allowing us to use best-in-class machine learning to optimise our systems and designs. In a research field where progress often takes decades to achieve, we're able to move forward with speed and agility.

Our inertial fusion concept is simple and direct. We use a large gas gun or pulsed power launcher to fire a small projectile – around 10g to 100g in weight – at hyper-velocities towards a fuel capsule. The projectile delivers kinetic energy to our amplifier which absorbs the incoming shockwave, rapidly collapses the fuel capsule, and creates the conditions necessary for fusion.

Fusion is the energy process that powers the universe. Without fusion, there would be no life on Earth. Our light and warmth are a consequence of fusion reaction in the Sun's core where light elements fuse into heavier elements and release huge stores of energy. Many elements can be fused, but the easiest reactions derive from deuterium and tritium, both of which are isotopes of hydrogen. Of all the potential fuels, these require the lowest temperatures and produce the highest energy yields. Fusion fuel has the highest energy density of any fuel – deuterium is naturally abundant in the Earth's oceans and a single cup of water contains enough to power a home for a year.

This is important because as we decarbonise, we need to electrify. The transition is happening and moving at pace, but we need to accelerate it and power it with clean energy – forecasts indicate that global electrical demand will increase exponentially in the coming decades. Of course, we should deploy as much renewable energy provision and storage as we can as quickly as we can, but we don't see that as the whole solution.

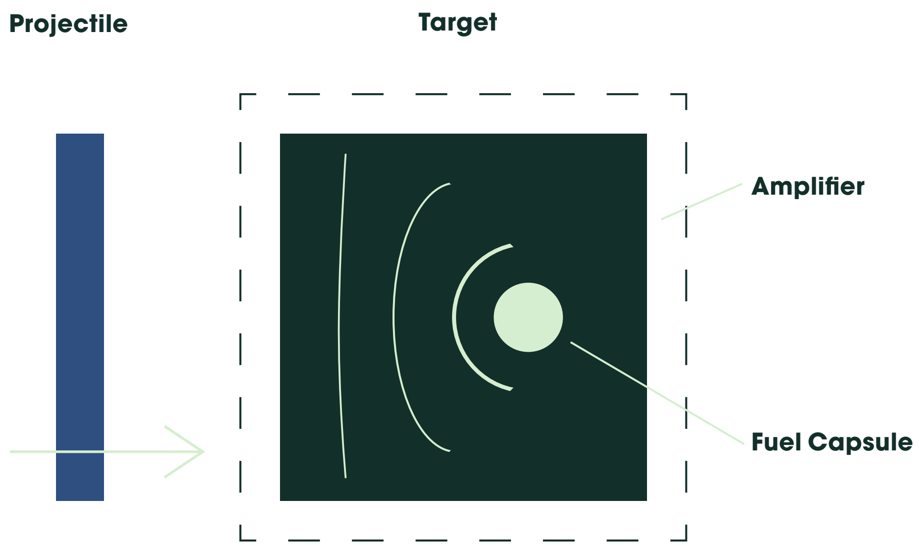
Investor Day Review 2023



Intermittent renewables technologies have limitations in deployment rates and costs. We think there'll be a clean energy gap by 2050 and if we rely solely on existing technologies, carbon-based fuels may return to fill that gap. We don't think that should happen and so the obvious support choices for clean base load power are fission – traditional nuclear – or fusion. Fission is expensive, hard to build, and comes with a problematic history and a legacy of public fear and distrust. Fusion doesn't share these technical or social drawbacks. Fusion is intrinsically safe, there's no risk of meltdown, and there's no threat of long-term radioactive waste or weapons usage. We think fusion can deliver the clean base load power to fill the energy gap.

Importantly, the core physics of inertial fusion has been proven. Last year, the National Ignitions Facility (NIF) in California demonstrated target gain from inertial fusion, extracting more energy from the process than they expended. NIF's research is too complicated and expensive for reactors, but we can use our unique amplifier technology with their fuel to create functioning power plant technology. Our amplifiers can help create energy outputs many times higher than initial inputs. They harness shockwaves to generate the same spherical collapse pattern of fuel capsules observed during the NIF tests. Crucially, however, our shockwave comes from only one side, massively simplifying the process and allowing the system to bypass the major engineering challenges. We overcome high operating costs with a cheap source of accumulated, high-intensity energy called pulsed power. This is significantly cheaper than a laser-driven shockwave system and easier to build: fusion by the simplest machine possible. Additionally, our power plant designs provide fuel generation and component protection solutions within a single technology. All this results in a clean power plant model that can be built mainly with existing technologies.

Investment is important to the continued development of fusion technologies as the business opportunity for the market has a forecast value of around $1.6 trillion annually in 2050. Working with partners will enable us to achieve maximum scalability. We plan to manufacture and supply the fuel – the targets – to be consumed in the future fusion reactors. Our partners will deliver the pulsed power machines, the reaction vessels and the balance of plant, all of which can be built from existing supply chains and existing or adjacent technologies. With this business model, the companies building power plants today will be well placed to build the clean energy plants of tomorrow.



"We use a large gas gun or pulsed power launcher to fire a small projectile...towards a fuel capsule. The projectile delivers kinetic energy to our amplifier which absorbs the incoming shockwave, rapidly collapses the fuel capsule, and creates the conditions necessary for fusion."

Investor Day Review 2023

John Flaherty

Managing Director of Grid Scale Energy Storage, SMS Plc

A qualified chartered accountant, John spent more than a decade in financial services working for major global institutions in the UK and Europe before moving into the energy sector. Within the energy industry his experience spans senior roles within conglomerates and start-ups across finance, customer service, and commercial, through which he has made notable contributions to energy innovation over the past ten years. He now heads up the Group's Grid-scale Energy Storage division.

SMS Plc are using smart, low-carbon energy infrastructure to build, operate and trade grid-scale electrical energy storage. Our inaugural 50MW battery energy storage site (BESS) in Cambridgeshire was opened in early 2022 and two other BESS projects have since become fully operational. With other sites under construction or in the early stages of development, our current forecast anticipates around 860MW of future battery storage capacity across the UK by 2026. All our BESS projects commit to sustainable development principles, and we protect natural habitats, implement a range of biodiversity improvements, and engage and work closely with local communities on each of our sites.

Just as it's clear there's no single solution for the transition to net zero, there's no single solution with battery storage either. The large battery plants we've built have demonstrated how quickly we can deliver energy storage at scale. They're compatible with most consumer and business activities, supply clean power at all times of the day and in all conditions, and help bridge the gaps in the functioning of essential networks and services. Storage facilities are also dynamic which means they can react quickly to address situations where there's too much or too little energy provision. With the energy system moving further away from fossil fuel dependence, batteries are a flexible solution vital to the protection and stabilisation of the grid.

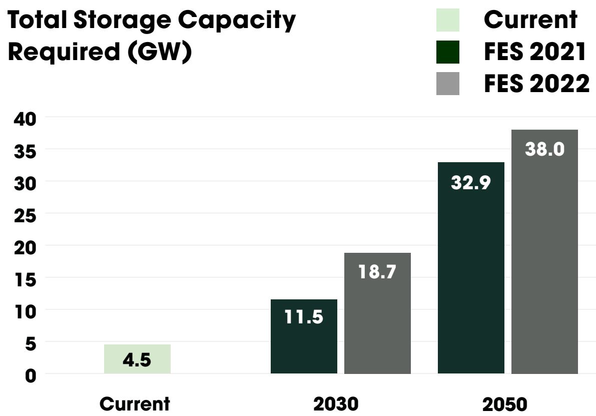
Variable demand and differing usage types and volumes require a range of behind-the-meter solutions. These solutions need to cover anything from small-scale industry to a battery-powered family home, from complementing a solar energy system to maintaining an uninterruptible power supply system at an industrial site. These solutions are often dismissed as being too complicated, too dispersed and incapable of generating sufficient supply at scale. Last winter, however, we saw through the National Grid's Demand Flexibility Service (DFS) that there are real possibilities for behind-the-meter solutions at scale. The DFS granted access to additional peak wintertime energy capacity and incentivised consumer and commercial users to voluntarily flex their electricity usage. The initial DFS roll-out was rather more expensive than the alternatives and there was a degree of consumer scepticism, but participation levels were still reasonable and there was at least one occasion where more than 100MW of additional capacity was delivered on demand. It demonstrated that this kind of behind-the-meter storage and delivery technology could be used to keep the system running and help to suppress rising prices elsewhere in the market.

Deploying these solutions at scale means keeping them benign. Consumers shouldn't have to continue planning in advance for low-energy activities or usage times. Flexible supply should instead reach consumers without them being aware and be consistent and efficient for their variable energy needs.

The National Grid are continually increasing their future energy scenario estimates of how much energy storage will be required across a range of facility types. At the end of last year, their storage estimate was 4.5GW of which roughly a third was grid-scale battery storage. By 2030, that estimate increases to 18.7GW with grid-scale batteries providing close to 75% of storage capacity. Other storage methods and behind-the-meter innovations are expected to take a greater role up to the next significant estimate increase in 2050, but grid-scale batteries are still expected to cover around 52% of storage capacity.

Storage is an amazing complementary asset to everything powering the energy system, but it's absolutely crucial for future solutions to maintain a supporting balance. People without a background in electrical engineering may not appreciate that power supply has to be managed within a very specific set of harmonics and other process parameters in order for the energy system to function efficiently – we can't simply demand a watt of power, receive a watt of power, and expect everything to work.

When we had an exclusively thermal system with lots of identical turbines turning with relative synchronicity, we had inertia which made for stable frequencies. Like a single pebble in a pond, the resulting ripples – from an engineering perspective – were consistent and controlled. The system we have now contains a greater number of energy inputs, especially renewables which create disjointed frequencies coming from different generators – solar is particularly problematic in this regard. This is more akin to throwing a handful of pebbles into a pond where the ripples vary in size, intersect, and look far less controlled. Battery storage systems play a fundamental role in regulating the variable frequencies of renewable energy sources, helping to improve long-term frequency stability and control across the grid.



Storage requirement has been rising in National Grid's Future Energy Scenarios (FES) for the past few years but it is not a single type of storage which is going to fulfil the need

+73%

Storage requirement met by grid batteries in 2030

52%

Whilst absolute grid battery scale increases by 2050, other methods like electric vehicles and domestic 'before the meter' storage take a greater role post 2030

Kai Johns
Senior Ethical, Sustainable and Impact Researcher, Greenbank

Kai conducts analysis of investments against a range of environmental, social and governance criteria for both new ideas and companies in Greenbank's investment universe. He uses a range of data sources and integrates them into the Greenbank research process. Kai's focus is on climate impact and risk assessment across the investment portfolios Greenbank manages and his areas of interest include climate solutions, net zero and smart cities. Kai joined the ethical, sustainable and impact research team in March 2019 after graduating from the University of Cambridge with a BA in Law.

The value of investments and income from them may go down as well as up and you may not get back what you originally invested.

When investing in net zero solutions and tracking the development and uptake of the necessary transitional technologies, a useful tool to help us understand where our investments could achieve maximum impact is the S-Curve of innovation.

From a product perspective, the S-Curve shows the development and marketing lifestyle of a product over time. The inflection points on that curve indicate where adoption, peak interest and eventual phasing out occurs. At the beginning is the investment stage where there are high upfront costs, associated with research and development and minimal rollout, as well as relatively flat sales. The first inflection point occurs where the product enters a growth phase which increases until it achieves mass adoption in its market. Eventually, the curve levels out and the product enters into a fade phase when it reaches full market penetration or is replaced by a superior product.

Many of the net zero transition technologies we're discussing are in that initial investment and development phase, moving towards the growth inflection point. Renewable energy technologies like solar and wind have already advanced some way into the growth phase and experienced a positive learning rate, which is when increased adoption positively affects production capacity, efficiencies, and costs. The adoption and growth of lithium-ion batteries in the last two decades, for example, demonstrated how unit costs were significantly reduced by increased production and demand.

Solar PV technology has also benefitted from moving into a growth phase. For years, the International Energy Agency (IEA) have been revising their forecasts for total installed global solar capacity. While these bi-annual forecasts have increased exponentially, the reality of solar adoption over time showed that forecasters consistently underestimated the true level of growth. The IEA improved its forecasting after 2017 when solar technology became more mature, but it demonstrates how difficult it can be to predict when inflection points are likely to be reached. What makes prediction harder still is that throughout the history of industrial and economic transitions, the time between each phase of the curve has been decreasing.

With less certainty about what might happen, and when, one thing we can do to track progress as investors is follow the money. To realise the transition to net zero, the IEA estimates that annual global investments to 2030 will have to increase to $4 trillion. The current annual figure is around $1.1 trillion which means we'll have to more than treble our collective investments to meet the IEA's target. What's interesting, however, is how annual investment has increased year-on-year since 2004 and how investment levels accelerated after 2019. It suggests that we may have reached the growth inflection point for global investment in the energy transition.

Two major pieces of recent legislation support that hypothesis: the 2020 European Green Deal and the 2022 US Inflation Reduction Act. Both initiatives contain clean energy grants and subsidies totalling hundreds of billions of dollars over the next decade. The EU plans to finance its Green Deal by mobilising at least €1 trillion in public and private investment with the majority financed through a dedicated portion of the EU budgets. The Inflation Reduction Act is the largest piece of federal legislation created to mitigate climate change. It contains huge provisions for energy security, hundreds of billions of dollars of tax incentives, and room for additional spending if demand necessitates it.

Once early-stage technologies move into the growth phase and begin to benefit from the learning rate that occurs as they reach scale, the unit economics start to work independently, and the subsidies can be scaled back. When we see solutions achieving mass adoption, how do we translate and integrate them into the company level and into our client portfolios?

At Greenbank, we've created an integration framework that breaks it down into four key areas. The first is opportunity: what is the total market for this product or solution, what is the level of demand, and what other learning rates could it benefit from? The second is an assessment of positive impact: what is a subject company doing to accelerate decarbonisation and how much could it potentially deliver? Third is the cost factor which is considered in two ways. How much will it cost the company to fully decarbonise and power its progress to net zero, and is it exposed anywhere to physical risks such as flooding or weather extremes, or risks associated with changing sites or locations? Finally, we assess operational alignment – whether the company has a viable net zero business model, a plan to implement it, and the potential to deliver that plan.

This is how we take the big-picture development of net zero aligned solutions and turn them into focal points to help drive future investment in the transition to carbon-neutral clean energy.

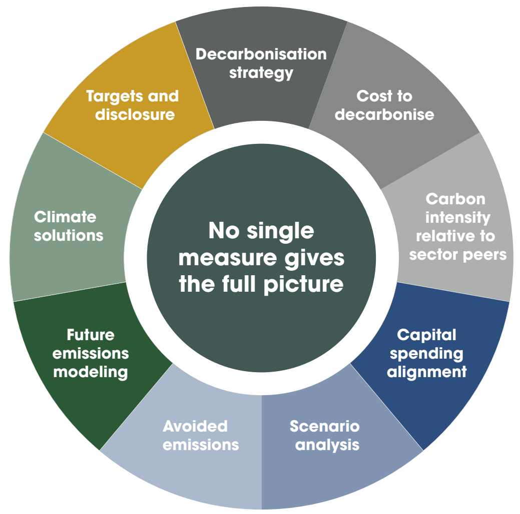
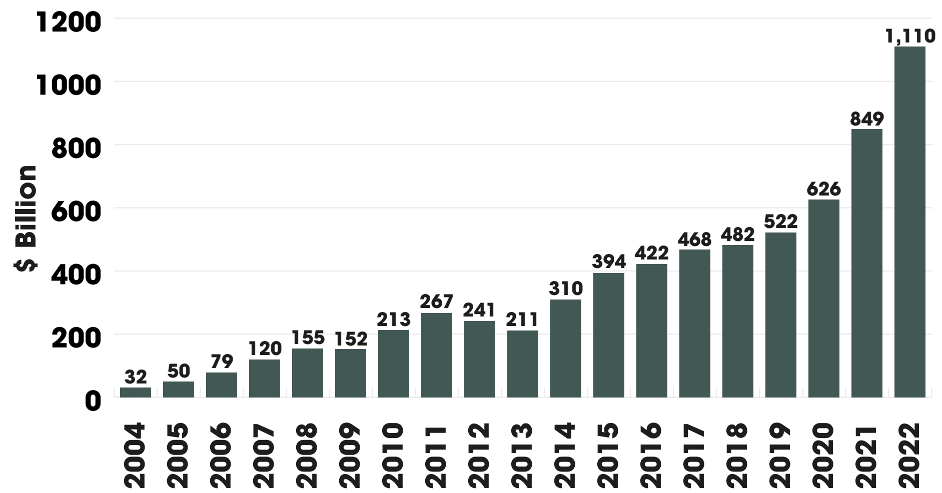


Figure 1: Global investment in energy transition



Source: BloombergNEF

Q&A

Q Despite the number of viable solutions to climate change, there are still significant barriers to implementing them at scale. What would be on your wish list to help remove those barriers and accelerate progress?

DB Climate change needs to be depoliticised as it affects everyone regardless of their politics. That would certainly help us better understand the global situation and get our facts straight. We need more collective action, and we need large-scale investment initiatives like the Inflation Reduction Act in the USA. Without that level of investment and incentive, the UK's going to suffer in the long run as the development of that ecosystem of viable solutions – including fusion energy – is going to take longer.

CR We need policy, legislation, and pace. The UK's been good at articulating its climate ambitions and establishing legally binding decarbonisation targets by 2035. What's lacking currently are the policies and funding mechanisms to support them – progress is too linear. We've seen a £20 billion commitment to CCS infrastructure to kickstart investment in low carbon technologies, but we need more speed and flexibility in our collective approach.

JF On a more granular level, we're finding that progress is being slowed by a serious skills shortage. There are currently too few people with the necessary training to implement and manage these solutions for commercial or domestic consumers. If we don't accelerate our training programmes, we could end up with insufficient expertise to support ready solutions.

Q What is the deployment timeline for fusion, and will it cease to be a viable solution for net zero if that timeline is delayed?

DB Recent announcements of aggressive and implausible rollout timelines have created some unrealistic expectations around fusion readiness. Realistically, we think a viable pilot plant will be operating by the early 2030s. Clearly that misses helping the world to reach 2030 targets, but we believe fusion will play a major part in achieving longer term decarbonisation goals.

Q How will collaborations and partnerships accelerate the transition to net zero?

CR One major benefit of the government's approach to decarbonisation at the industrial level was to identify industrial clusters and engage with all parties to work towards solutions that could deliver significant emissions reductions. This forced market competitors to collaborate and share information to attract government support – our own Keadby 3 Carbon Capture Power Station is being delivered in partnership with Equinor and will plug into CO2 infrastructure being supported by multiple companies. Collaborations and partnerships also help to accelerate change by de-risking first-stage technologies. Having partners to share development and cost burdens means you're able to do more in a shorter timeline.

Q If a company offers a viable decarbonisation solution but is weak on other sustainability issues, is it still considered for investment?

KE Greenbank looks at companies holistically, gauging where they are now and the positive and negative impacts they present. We assess their potential trajectory across a range of sustainability factors, look at their long-term commitments and ambitions, and check their progress through any short- and medium-term targets. We also ensure that their ambitions are backed up by their business strategies and capital expenditure plans. Where companies have a credible pathway to net zero but need support to make the next step, we look at what measures they could take to achieve it and engage with them. How companies respond operationally and strategically to these measures informs how we assess their performance from a climate risk and opportunity perspective.

Investor Day Review 2023

Q Will the grid be able to cope with the deployment of the ecosystem of technologies required to meet net zero goals?

JF Recent assessments of the effects of batteries on the network have been very positive in determining how complementary they could be once they're connected. This should also help speed up the access and storage of other renewable energy sources. The rise in electric vehicle usage is posing problems for the grid, however, as there's potentially no limit to the demand for charging capacity. There is a real need to increase investment in this area.

CR We see challenges for the grid both in terms of transmission and distribution. Despite huge investments in renewable energy capacity, we probably need more. We need to be making anticipatory investments, not reactive ones. We need to reform the connections in the grid and separate the viable renewable and low-carbon solutions waiting to join it from the projects that aren't worth progressing. Improved dialogue between the government, network operators and industry regulators will also help ensure the grid is able to adapt to and cope with these challenges.

Q Just how safe are fusion and hydrogen-based solutions?

DB It's an interesting question when we've been happy to drive for decades with tanks filled with flammable petrol! Obviously, there are problems with public perception when it comes to anything hydrogen or nuclear-related, but barriers are also put up by politics and general resistance to change. The problems with fission technology are why we don't have an extensive fleet of nuclear power plants. Fusion is intrinsically safe, and we're better able to stabilise and utilise hydrogen. Perhaps the bigger question is how safe is our planet without these solutions?

CR One of the ways to manage hydrogen is to start with industrial rather than domestic use. We're used to dealing with the safety side of combustible fuels, but we recognise the need to gradually familiarise consumers with their use. There's already an enormous amount of hydrogen being used in industry – albeit not low-carbon – and it's generated very little public debate. If we prove the safety of low-carbon hydrogen at the industrial level, we can begin to accelerate wider adoption.

Q What reasons do you have to be optimistic about the transition to net zero?

JF It's abundantly clear that money can't wait to be thrown at transitional projects and technologies. If we can fix some of the issues regarding skill sets, connectivity, and public perception, we'll have good investment potential to make big things happen quickly.

DB We have a tremendous capacity for innovation. Last year's energy crisis demonstrated how quickly we can respond to complex issues – Germany in particular was able to build a liquified natural gas terminal in an astonishingly short time, helping to secure vital energy supplies. Once the motivation takes hold and the money follows, things will move a lot faster.

CR Policies, subsidies and important national-level decisions may be slow in coming through, but they have at least started. The wheel is turning in the right direction and as long as we maintain pressure on picking up the pace, there's a good chance we'll get to an acceleration point in that S-Curve growth phase.

KE If I compare the type of dialogue we had with companies on climate change ten, or even three, years ago to the conversations we are having now, they are worlds apart in terms of the level of commitment, awareness of risks and willingness to respond to investor concerns. While that change arguably hasn't happened fast enough, it does provide a foundation for investor action to help accelerate progress towards a net zero world.

For further information on the services we provide,
or to arrange a meeting, please contact us.

Call us on
0117 930 3000

Or email
enquiries@greenbankinvestments.com

For more information, please visit
greenbankinvestments.com

@GreenbankInvest

Greenbank Investments

Our UK offices
London
Bristol
Edinburgh
Glasgow
Liverpool

INVESTMENT WEEK
SUSTAINABLE INVESTMENT AWARDS 2023
WINNER
Best Sustainable Investment Wealth Manager/ DFM Group