MIDLANDS ENGINE

ENERGY SECURITY WHITE PAPER

The Midlands: Powering the UK's clean energy revolution

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Scan here to learn more about our partners who have contributed to this White Paper and read regional case studies.

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SIR JOHN PEACE,
Chairman of the Midlands Engine Partnership

FOREWORD

The Midlands has long been the industrial heart of the UK, a region shaped by the grit, vision and innovation that powered the Industrial Revolution. Today, that same pioneering spirit drives the Midlands' response to one of the most significant challenges of our time: the clean energy transition. With its unique strengths and strategic assets, the Midlands is positioning itself at the forefront of the UK's journey towards secure, sustainable power, setting an example for regions across the nation.

Our Midlands Engine Partnership, through its Ten Point Plan for Green Growth, has laid a solid foundation for this transformation. Built on the expertise and insights of over 300 partners, this comprehensive plan underscores the region's unrivalled capabilities in clean energy and innovation. In collaboration with the Midlands Energy Security Taskforce, led by Lord Ravensdale, this White Paper is both a bold vision and a call to action. It highlights why the Midlands is critical to the UK's energy future and provides a roadmap for unlocking opportunities that will benefit businesses and communities alike.

The Midlands is already a powerhouse in clean energy, with one in five of England's energy and low-carbon jobs located here. Its advanced manufacturing clusters, industrial capacity and skilled workforce provide the expertise needed to lead the UK's transition to a cleaner, more resilient energy future. The scale of the opportunity is immense, with over £20 billion in planned investment for renewable energy projects. From expanding clean energy generation to advancing energy technologies, the region is primed to drive economic growth while addressing energy security challenges.

The White Paper is a rallying call for unity across the Midlands, urging collaboration among local leaders, businesses, academic institutions and Government. It serves as a roadmap for achieving clean energy transformation, showcasing how the Midlands can help secure a sustainable and prosperous future for its communities and the UK as a whole. Central to this vision is the need to accelerate the development of the infrastructure, skills and investment required to realise the region's potential.

Energy security is more than a regional priority - it's a national imperative. The Midlands is home to 21% of the UK's electricity generation capacity, including significant renewable energy assets such as offshore wind. At the same time, the region's communities face significant challenges, including high rates of fuel poverty and reliance on energy-intensive industries. The clean energy transition provides an opportunity to address these challenges head-on, creating a more equitable and resilient energy system.

This White Paper calls for immediate action to overcome barriers such as grid infrastructure limitations, planning and licensing delays and workforce shortages. By unlocking investment, scaling innovative technologies and fostering community engagement, the Midlands can catalyse a shift that benefits both urban centres and rural areas.

The Midlands' ambition is clear: to be a leader in clean energy transformation. By leveraging its industrial heritage, world-class research institutions and collaborative spirit, the region can drive change that supports energy independence, boosts productivity and creates high-value jobs. Together, we can honour the Midlands' legacy of ingenuity and secure a sustainable, prosperous future for generations to come. This White Paper is a testament to what can be achieved when partners unite behind a shared vision, turning bold ideas into transformative action .

LORD RAVENSDALE,
Chair of the Midlands Engine Energy Security Taskforce

FOREWORD

Energy security has never been higher up the agenda. With the UK exposed to huge energy price rises in a volatile world, a transition to home-grown, low-carbon energy would unlock greater national security, economic competitiveness and growth.

To achieve this, we need to work in partnership - across Government, industry, academia and the third sector. This is why the Midlands Engine Partnership was established, and this White Paper does just that. It draws on the incredible wealth of expertise across our region, from our energy producers and networks, through our researchers at the cutting edge of new technology, to our incredible manufacturing base and end-users of energy. By drawing all of these organisations together, we have a clear roadmap for how we can get there.

This White Paper, though, goes further. It tells the story of the central role that the Midlands is playing in helping the UK to achieve not only energy security, but how to secure our energy future and the UK's place at the forefront of this next industrial revolution. Nowhere epitomises both the challenges and opportunities that lie before us like the Midlands.

Home to a quarter of the UK's fossil fuel generation capacity, a high concentration of energy-intensive industries, and with England's highest regional rate of fuel poverty, the transition to a secure, low-carbon energy system is a critical issue for the Midlands economy, businesses and communities, and the region's role in driving UK trade and investment.

Through its energy innovation ecosystem and assets, the Midlands is playing a key role in establishing UK global leadership in clean energy technologies – such as hydrogen machinery and equipment, which is being exported across the world from the Midlands.

That is why this White Paper is so crucial in highlighting to national policy and decision-makers the importance of the Midlands to achieving energy security and the Government's clean energy superpower mission. It sets out regional partners' ambitions for the future and how, by working together and with Government, they can help accelerate, strengthen and position the UK – and the Midlands – as a global leader in low-carbon and secure energy.

What is outlined in this document is a path to prosperity that tackles the fundamental issues of our time. Energy security - so that the UK isn't exposed to the market forces of global conflicts. Transitioning from fossil fuels to low-carbon energy on a journey towards net zero - to tackle the climate crisis. Plans for billions of investment and the creation of hundreds of thousands of new, well-paid jobs - to make the Midlands wealthier and more prosperous.

The opportunity ahead is substantial, and leveraging every aspect of what is possible is the responsibility of leaders at all levels. If there is one call to action within these pages it is this - all of what is proposed is possible, but it needs the commitment, collaboration and investment of Government and sector and place-leaders to make this ambition a reality.

The Midlands: Powering the UK's clean energy revolution

The Midlands is at the forefront of the UK's clean energy transformation, driving innovation, energy security and resilience. As a leader in clean energy, the region is well-positioned to support the Government's ambition of making the UK a clean energy superpower, enhancing energy resilience, and boosting productivity across industries. With its industrial strength, advanced manufacturing base, and a thriving ecosystem of innovators, the Midlands plays a critical role in ensuring affordable, sustainable energy for the UK's future.

Energy security in the UK

Energy security is critical to the UK's national security and economic growth. High-cost imported energy poses an existential threat to many industrial firms and national ambitions in advanced manufacturing. It could also derail the opportunity to rapidly scale domestic clean energy and technology, providing new high-value jobs.

The Midlands is at the forefront of the UK's clean energy transformation, driving innovation, energy security and resilience

The 2022 energy crisis has had a lasting effect on businesses and communities. It has highlighted that the clean energy transition required to achieve net zero must set the UK on a path to greater energy independence, with reliable and resilient energy supplies, more affordable energy costs and industry supported to transition away from fossil fuels.

Energy security and the Midlands

Energy security and the clean energy transition has a particular significance for the Midlands – the UK's largest regional economy outside London and the South East, and its industrial heartland.

- Energy-intensive sectors, including advanced manufacturing, and transport and distribution, account for nearly a third of economic output in the Midlands
- Midlands communities experience the highest regional rate of fuel poverty – nearly a fifth of households in the West Midlands and the third highest rate in the East Midlands
- The Midlands is the UK's hub for energy generation and transmission infrastructure, with 21% of UK electricity generation capacity – 25% of UK fossil fuel generation capacity and 13% of installed renewable energy generation capacity, including 27% of offshore wind production.

Delivering energy security and the clean energy growth opportunity

The Government is progressing its mission to make Britain a clean energy "superpower" with the launch of Great British Energy – a publicly-owned energy company with an explicit purpose to enable UK energy independence by investing in, accelerating and scaling domestic energy generation. In addition, a National Wealth Fund will have a mandate to invest in and catalyse private finance for clean energy, including green hydrogen, carbon capture and gigafactories.

EXECUTIVE SUMMARY

National policies are also beginning to shape a more coordinated national, regional and local approach to delivering an energy-secure system, including Regional Energy Strategic Plans (RESPs) that consider national goals and local needs. However, to resolve the uncertainty that has prevented an at-scale market response to date, these functions must be rapidly implemented and tasked with creating a detailed routemap for individual energy vectors, or carriers, and the energy system as a whole.

Furthermore, there is a need for targeted action, at pace, on a number of barriers to the energy transition and energy security:

- Upgrades to grid infrastructure – both transmission and distribution infrastructure
- Resolution of planning and licensing delays
- Repurposing of pipeline infrastructure for new fuels
- Integrated infrastructure planning – including with supporting utilities, particularly water
- Action to unlock the major capital investment required – both public and private – with an estimated capital investment requirement of around £900 billion by 2050
- Workforce development – with an estimate of 54,000 new net zero workforce roles in the Midlands alone
- Community and business engagement including action to resolve local barriers such as weaknesses in digital connectivity
- More substantial energy efficiency and demand-side management policy measures and investment to support energy-intensive sectors, along with local decarbonisation solutions for dispersed industrial clusters for which solutions such as carbon capture and storage are not commercially viable
- Supply chain development measures built around specific clusters and opportunities in the Midlands.

The Midlands' ambition, offer and 'ask' of Government

Through this White Paper, Midlands industry, local Government and wider public sector and academic partners are focused on a strengthened and accelerated approach to energy security and the clean energy transition growth opportunity.

The White Paper highlights to national policymakers the importance of a Midlands perspective in national energy security policy and the particular assets that the Midlands brings to strengthen the national approach:

- Energy system leadership and collaboration across industry, local Government and wider public and academic sectors, driving integrated energy and industrial planning
- Leading energy sector, skills and technical expertise
- Renewable and low-carbon generation, and battery and storage assets and opportunities
- Strategic industrial clusters committed to decarbonisation and clean technologies
- Leading R&D assets and a large-scale, diverse testbed for a range of solutions - urban and rural
- New investment vehicles including a Midlands Green Bond.

EXECUTIVE SUMMARY

Midlands partners invite Government and its agencies to work with them to accelerate the delivery of an integrated, place-based approach to energy security and the clean energy transition opportunity – an approach that unlocks economic growth and high-value job opportunities, benefitting communities and businesses across the region and UK.

A roadmap for collaborative partnership action

The White Paper sets out a detailed roadmap for collaborative action over the next 24 months for short, medium and longer-term impact – by 2030, 2040 and 2050 – which is designed to complement and inform the early priorities and investments of GB Energy. This is focused on two main areas of action:

1. **Scaling clean energy projects in the Midlands, across a range of mature and new energy vectors**

2. **Establishing six 'critical enablers' of the clean energy transition opportunity:**
   - Integrated regional energy system governance and planning
   - Planning regulation
   - Finance and investment
   - Skills and workforce
   - Supply chain development
   - Grid infrastructure

By pursuing this roadmap together, and with Government and its agencies, the Midlands can:

1. **Be an 'early adopter' region of the new Regional Energy Strategic Plan (RESP) function** to develop integrated regional energy system governance that is bottom-up, placed-based and vision-led – based on principles of:
   - Voice, insight and input from all energy-intensive industries, the energy sector and supporting utilities, including water
   - Bottom-up input from Local Area Energy Plans (LAEPs), where these are in place, and Local Growth Plans
   - Greater consistency in the LAEP method to enable a robust local evidence base
   - Ability to manage inter-dependencies and opportunities between regions
   - Appropriate representation from local and combined authorities
   - Financial and technical support for local and regional energy planning.

2. **Scale and invest in clean energy – including by:**
   - **Accelerating leasing and planning approvals for new offshore wind development**
   - **Using insights from Local Area Energy Plans to develop a pipeline of viable sites for renewables and low-carbon generation** that have community support
   - **Prioritising sites for grid upgrades and investments in transmission and pipeline infrastructure**, including integration of battery and energy storage systems
   - **Prioritising large and small projects and sites requiring accelerated planning and exploring spatial models of delivery** with planning powers, incentives and community-representative governance
   - **Bringing forward community-led small to medium and larger-scale solar projects** on viable sites that do not conflict with wider strategic objectives
   - **Accelerating the Midlands' two Gigafactory propositions** – at Greenpower Park in Coventry and the East Midlands Freeport – to build a next-generation battery cluster
   - **Designing and mobilising large-scale energy efficiency and demand-side management programmes** across industrial, commercial and residential sectors, with robust financial incentives industrial, commercial and residential sectors, with robust financial incentives
   - **Accelerating the development of local heat networks** in urban areas and large housing developments
   - **Developing a pipeline of future nuclear licensable sites** for Small and Advanced Modular Reactors
   - **Identifying potential sites for longer-term fusion energy development**
   - **Accelerating financing mechanisms and innovative energy business models,** including a Midlands Green Bond and a public-private investment consortium for behind-the-meter solutions for industrial and commercial sites
   - **Bringing forward feasibility studies, trials and demonstrators** including for transitioning fossil fuel-powered plants using carbon capture, co-firing and other innovative solutions; energy storage solutions including long-duration at salt strata sites; smart grid solutions; alternative fuel transmission networks; next generation wind; and hydrogen-derived sustainable transport fuels with carbon capture

3. **Ensure a skilled workforce – including by developing and scaling new models of skills provision** that address the technical gap in clean energy and manufacturing sectors such as skills hubs, based on collaboration between education (schools, FE and HE), industry and local communities

4. **Develop supply chains around specific clusters and generation opportunities** in the Midlands – including manufacture of nuclear components, smart energy systems and next generation wind.

By delivering this roadmap together, with Government and its agencies, the Midlands can fulfil its potential in ensuring the integrated, independent and resilient energy system needed to realise the region and UK's ambitions for net zero carbon growth.

Defining energy security – the smooth transition to abundant low carbon energy, setting the UK on a path to greater energy independence, enhancing national security through reliable and resilient energy supplies.

Consumer security

reducing energy bills, maintaining affordability, and achieving as low as possible wholesale electricity prices.

Climate security

supporting industry in transitioning away from costly and polluting fossil fuels towards sustainable and clean energy technologies.

Physical security

transitioning to a more diverse energy system with greater co-location with high energy demand centres and reduced transmission required. This system will be less exposed to external threats and more resilient to cyber-attacks that are increasing in today's geopolitical context.

Economic security

driving down inflation, boosting productivity and economic growth, creating highly skilled jobs, and ensuring the equitable benefits from clean growth across all sectors, including avoiding and mitigating for job losses in the transition.

The Midlands: Powering the UK's clean energy revolution

The Midlands' economy and energy

£277.2bn GVA

Toyota

32%
GVA in energy intensive sectors

13%
of total UK planned renewable pipeline

>25%
of England's manufacturing jobs

1 in 5
of England's energy and low-carbon jobs

Midlands energy innovation

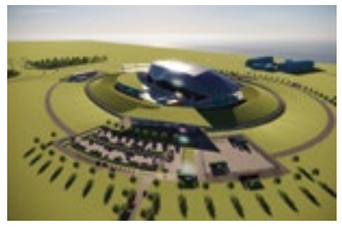
The UK's largest concentration of energy R&D infrastructures

1,500 academics and researchers working in energy-related fields across Midlands universities

Smart Energy Network Demonstrator, Keele

Nationally-significant demonstrators for:

localised and integrated energy systems planning
CCUS
smart energy and local heat networks
H2
fusion
nuclear
industrial decarbonisation
community energy
alternative fuels
fossil fuel transition
batteries and storage
clean heat networks



Rolls-Royce Small Modular Reactor

Spherical Tokamak for Energy Production (STEP)

UK energy generation capacity in the Midlands

19%
of England's installed renewable energy capacity

21%
of total UK electricity generation capacity

27%
of UK offshore wind production

25%
of UK fossil fuel generation

Hornsea One

Killingholme

Strategic industrial clusters committed to decarbonisation and clean energy technologies

Repowering the Black Country

Keadby Hydrogen, Humber 2030 Vision

Decarbonising the Midlands Aerospace Cluster

Energy Security Taskforce

"In 2021 the Midlands Engine Partnership, through its Green Growth Board, developed a 'Ten Point Plan for Green Growth in the Midlands' with input from more than 300 regional leaders. This set out the actions that partners would take together to accelerate the UK and the Midlands' path to net zero. Many of these actions have since been progressed, including the establishment of a Midlands Green Innovation Network and a Midlands Forest Network, publication of a Midlands Hydrogen Technologies Strategy and nuclear industries and smart energy opportunities reviews and the launch of Midlands Nuclear. Since the publication of the Partnership's Ten Point Plan, energy security has moved up the policy agenda and, building on this earlier work, this Energy Security White Paper sets out a focused route-map for pan-regional collaboration to harness the Midlands, assets and strengths, which are of national significance.

Prof. Martin Freer – CEO, The Faraday Institution and Chair, Midlands Engine Green Growth Board

"The White Paper underscores the ambition of partners across the Midlands to collaborate with the Government to enhance energy security and the clean energy transition as part of a shared growth mission. An unparalleled set of characteristics and assets exist in the Midlands which, with focused Government support, can accelerate the delivery of UK energy security. The Midlands Engine analysis sets out a plan to address critical enablers to leverage unique clean energy projects like STEP fusion and Rolls-Royce SMR. This White Paper is the culmination of a pan-Midlands partnership focused on energy security as a crucial driver of productivity and growth, benefiting both local communities and businesses across the UK.

Adrian Smith – CEO, Nottinghamshire County Council

"Gas networks currently sit at the heart of energy security, ensuring that the lights stay on and industry has the energy that it needs for manufacturing our everyday goods. At Cadent, we see the Midlands Engine region as the perfect place to grow a thriving hydrogen economy that can replace the natural gas that we use today, whilst delivering carbon emissions savings and allowing industries to continue to operate, thrive and grow in the region. It's wonderful to be at the centre of this opportunity with projects such as the East Midlands Hydrogen and Hydrogen Valley.

Dr. Angela Needle – Director of Strategy, Cadent

"E.ON is delighted to support the Midlands Energy Security White Paper, and the recommendations set out will help to improve outcomes for communities right across the region and beyond. By harnessing the power of green technologies and data in our homes and businesses, we can deliver innovative, affordable and secure low-carbon energy solutions which will help drive down energy bills for everyone and improve our international competitiveness to attract new inward investment. We are committed to working in partnership with national and regional Government, regulators, businesses and communities to help deliver the energy transition and create new well paid skilled jobs.

Brian Tilley – Head of External Affairs, E.ON UK

"Sustainable, affordable, reliable and secure energy supply is fundamental to the nation's economic prosperity. Low-carbon energy should be a key pillar of the Government's industrial strategy plans due to the role it will play in driving UK growth and creating jobs. Every region has its unique strengths, reinforcing these to the benefit of the UK can be done by directly connecting local and national energy planning and delivery. The Midlands region is a UK industrial powerhouse that can play a key role in UK growth and energy security.

David Cole – Operations and Services Director, EDF Energy

"As one of the biggest suppliers to the UK energy industry, and as a company with strong roots in the Midlands including manufacturing sites in Lincoln, Warwick and Worcester, we welcome this Energy Security White Paper. The use of new technologies, such as carbon-capture and clean hydrogen, will be accelerated if we harness the innovative potential of the region and if we invest in the skilled workforce based here. The White Paper provides a route-map for how the private and public sector can work together in the Midlands as part of the UK's mission to deliver clean power, and we look forward to making our contribution to achieving its objectives.

Dr. Ghenadie Bulat – Head of New Technologies, Siemens Energy

"We are on the cusp of great change when energy transitions and technological advances will reshape our thinking and redefine our economy. Across the Midlands, we are at the forefront of this change with the many advantages this region has to offer. From a transport perspective, our unique position in the UK's strategic transport network, and strong presence of major global transport manufacturing and logistics companies, provides a unique opportunity to scale and accelerate green growth. This White Paper sets out a clear roadmap for how Midlands partners can work together across sectors and geographies for faster, fairer and more far-reaching energy transitions in this great region and beyond.

Maria Machancoses – CEO, Midlands Connect

"Energy Systems Catapult is delighted to have been involved in the development of this White Paper. The Midlands is at the heart of Great Britain's electricity system; geographically, industrially and intellectually. Through its location it links power generation in the north with demand for energy in the south. Its industry manufactures much of the equipment used across the energy system. And alongside the Catapult, it is the location for the National Energy Systems Operator and many energy companies and academic institutions leading delivery of the transformation needed to provide the clean, secure and affordable energy system of the future.

Jon Saltmarsh – CTO, Energy Systems Catapult

Grid infrastructure is a critical enabler of the energy transition, and the White Paper highlights the importance of electricity network upgrades for economic growth, energy security and our transition to Net Zero. There is huge potential for Midlands partners to work with Government to attract investment and drive green growth, and we look forward to playing our part, working with local and regional stakeholders, to accelerate the energy transition in the Midlands – integrating the future of our energy system with the needs of local economies and communities.

Phillipa Slater – Director Asset Management and Operational Support, National Grid Electricity Distribution

The Midlands has a unique opportunity to deliver an energy system that meets the needs of tomorrow's industry and in particular, to demonstrate that we can transition from a fossil-fuelled system to a clean energy system without losing skilled jobs and global competitiveness. We have more to lose than many regions, because our regional economy was built on coal. Simply replacing the energy security these coalfields supplied with renewable energy would be horrifically expensive and destroy jobs. We need to be much more imaginative and think about the skills we have as a region and how we might apply these and compete effectively in the global economy of the future. This report is the first step on that path.

Matthew Rhodes – Director, Black Country Industrial Cluster

The Midlands has for centuries been the beating heart of UK industry and Staffordshire is proud to continue and grow its economic contribution. Building on our inherent strengths and capitalising on our strategic location, investment and innovation are driving our region towards a dynamic and exciting future. Our ambitious plans for next generation industrial growth place the need for clean, reliable and resilient energy at its core. Security of supply and distribution will not only help to deliver our transition and decarbonisation agenda but be a vital ingredient to the confidence and investment needed to guarantee our industrial reputation into the future.

Pat Flaherty – CEO, Staffordshire County Council

Energy Capital welcomes the report of the Energy Security Taskforce especially coming at a time of unprecedented change in the national and regional energy systems. The emphasis that the Energy Security White Paper places on local and regional energy planning and the recognition of the importance of effective regional governance in the energy transition are certainly apposite. The further appreciation of the importance of people, in terms of skills and employment opportunities as well as the imperative of acknowledging and tackling fuel poverty, and the importance of the Midlands' supply chain, make the report a useful and valuable building block for future discussions with Government and partners.

Gordon Telling – Delivery Manager – Local Area Energy Planning, Energy Capital

At Uniper we plan to invest across the low-carbon energy landscape, with potential projects in the wider Midlands region that include low-carbon power generation and hydrogen production. We welcome the recommendations in this White Paper for action to reduce the barriers and strengthen the incentives for investment, as this is crucial to bringing forward projects that can help deliver the UK's climate targets. With support from Government across critical enablers such as planning, financing, and grid infrastructure, the Midlands can deliver significant economic benefits and carbon savings.

Simon Balmer – Director of Flexible Energy Gas Turbines, Uniper

The Humber is the pre-eminent energy cluster within north west Europe. It offers both opportunity in delivering the new along with challenges in de-carbonising - leading to the creation of new markets and innovation. The Humber will soon host the world's first carbon capture and 100% hydrogen-generated power stations. It is home to the largest offshore wind farms and operations and maintenance port in the world. It has over 100 PhD students in offshore wind and AI alone. All this helps to broaden and deepen the Cluster and the Humber Freeport is catalysing delivery through financial incentives, sites, brokerage and an innovation theme.

Simon Green – CEO, Humber Freeport

Signals from Government, including its Invest 2035 Industrial Strategy, and the increasing acknowledgement of the need to support placed-based investment, provide great opportunities for the Midlands Engine. To capitalise on the Midlands' strengths across industry and research capabilities, we need long-term and stable policies at a national level, underpinned by planning reform and support for robust supply chains. Crucially, energy security that comes via whole-systems thinking – where there is a vision for local, regional and national energy infrastructure to support electrification of industry – will be vital. It's this that will accelerate adoption of the technologies that can fundamentally make businesses and society more competitive, resilient and sustainable.

Stephen Goldspink – Head of Business Development, Siemens

HSBC welcomes the publication of this White Paper. We know from our deep roots in the Midlands that the region's existing expertise in sectors like energy generation, manufacturing and technology mean it can play a huge role in delivering energy security, high-quality jobs, and long-term economic growth. With the right support from government to enable and de-risk investment, we can accelerate the flow of finance into the companies and projects which can help the region seize these opportunities.

Tim Lord – Head of Climate Change, HSBC UK

Thank you to our partners and other stakeholders

Building on the work on our Ten Point Plan for Green Growth which has involved over 300 leading voices across the Midlands, over 60 organisations across industry, local Government, the wider public sector and academia – including Taskforce members and members of the Midlands Engine Green Growth Board – have been specifically involved in the development of this White Paper – contributing valued insights and intelligence and expert advice.

Oil refinery plant from industry zone in Immingham, UK

ENERGY SECURITY IN THE UK

Where are we now with energy security in the UK?

Between 2021 and 2022, the price of gas, electricity, oil and other fuels experienced a rapid increase across Europe, driven by the Russian invasion of Ukraine and the lasting impacts of the pandemic.

The escalation in wholesale energy prices resulted in a 54% increase in the energy price cap in April 2022, with Ofgem planning to increase it further by 80% in October 2022. To mitigate the impact on consumers, the Government introduced various interventions, including direct cash payments, discount schemes, and the Energy Price Guarantee, which covered the excess cost of energy above the Ofgem price cap.

Whilst immediate consumer-focused interventions reduced the potential extent of the impact of energy price rises on vulnerable households, the energy crisis exposed the important and interconnected relationship between an affordable, independent and stable energy supply, our economic prosperity, and our ability to meet 2050 net zero obligations. Without a reliable, low-cost and low-carbon supply of energy, industries across our economy cannot continue to grow, thrive, and compete on the global stage.

Energy security has therefore become core to the UK's net zero and economic growth goals.

National policy changes have already begun to shape a more coordinated national, regional and local approach to delivering an energy-secure system. This includes the introduction of Regional Energy Strategic Plans (RESPs) working with local Government and gas and electricity networks.

The RESPs will create plans for developing local energy systems to meet net zero targets, considering national goals, local needs, and the most appropriate approaches for each area. Some areas are already meeting this need, by developing Local Area Energy Plans (LAEPs) supported by the five Government-funded Net Zero Hubs. However, a lack of funding and resources in local authorities for the production and maintenance of LAEPs is a significant limiting factor.

The new Government has made rapid progress in setting out its approach to delivering its mission to make Britain a clean energy superpower. In its first week in office, the Government made amendments to the National Planning Policy Framework to remove the conditionality tests for onshore wind developments to address the stalled construction of this mature domestic generation source.

Furthermore, Great British Energy, a new publicly owned energy company, has been launched with the explicit purpose of enabling UK energy independence through investing in, accelerating and scaling domestic energy generation. In addition, the new National Wealth Fund has been established with a mandate to invest in and catalyse private finance for clean energy including green hydrogen, carbon capture and gigafactories.

BARRIERS TO ENERGY SECURITY

What are the current key barriers to achieving energy security?

The Government has been active in making early progress towards delivering energy security and the net zero transition. This positive commitment and development at pace has been broadly welcomed by the public and private sectors. However, there are a series of long-standing barriers – some or all of which may soon be addressed by further policy development – which the Midlands is keen to play its part in helping to overcome.

Energy planning

Positive steps have been taken towards a more robust and planned whole-systems approach to the UK's energy transition, such as the creation of a National Energy Systems Operator (NESO) and the Regional Energy Strategic Plans. (RESPs)

To resolve the uncertainty that has prevented an at-scale market response to date, these functions must be rapidly implemented and tasked with creating a detailed route map for individual vectors and the overall energy system.

An example particularly relevant to the Midlands, relates to fossil fuel transition, where the target decommissioning date is yet to be accompanied with plant-level planning support to change use and new plants are still being approved.

Delays caused by the planning system and lack of licensing have also been long-standing barriers to progress on energy security and are holding back the private sector's willingness to invest in local clean power alternatives.

Grid infrastructure

The energy transition will require significant upgrades to the electricity grid – both transmission and distribution networks – to support a much larger number of generators, with complexities from additional storage and intermittency of generation.

These upgrades will take time to fully implement and result in a suboptimal grid in enabling energy security and transition until they are in place.

Furthermore, the 2023 Skidmore Review found that potential investors are deterred from investing in renewables projects due to constraints connecting to both transmission and distribution networks.

Challenges with grid infrastructure at the transmission and distribution levels may require a range of solutions. As with energy planning, reform must be implemented at pace to ensure no further delays to critical grid and generation development.

- **Transmission level:** Upgrading transmission networks involves reinforcing high-voltage infrastructure to manage long-distance electricity transport, ensuring it can handle increasing capacity from renewable generation sites (e.g. offshore wind farms).

  Key levers include investment in new high-capacity lines, accelerating the approval process for Nationally Significant Infrastructure Projects (NSIPs), and enhancing inter-regional coordination through the National Energy Systems Operator (NESO) to manage load-balancing and prevent bottlenecks.

- **Distribution level:** At the distribution network level, the challenges lie in integrating decentralised energy resources, such as small-scale renewables and storage systems, while maintaining local grid stability.

  The solutions here focus on deploying smart grid technologies, enhancing the flexibility of local grids, and facilitating faster connection processes for smaller energy generators.

  The use of Local Area Energy Plans (LAEPs) and the involvement of Regional Energy Strategic Plans (RESPs) are critical in aligning local energy generation with grid capacity.

  A more flexible demand-side approach can also play a vital role in helping to balance local grids in a cost-effective way and minimise the amount of grid reinforcement required to alleviate congestion on the network.

Pipeline infrastructure

In addition to electricity grid constraints, the region's pipeline infrastructure presents its own set of challenges for energy security during the transition to a low-carbon economy.

As unabated fossil fuel power plants are phased out, the existing natural gas pipeline networks – many of which currently serve these plants – may become underutilised. Repurposing these assets for hydrogen or other clean fuels introduces complexities that need to be addressed, such as ensuring compatibility with new energy vectors and identifying the areas where infrastructure upgrades or replacements will be required. The role of pipelines in transporting clean fuels, such as hydrogen, will be critical for the Midlands' energy security and decarbonisation efforts, but their integration into regional and national infrastructure plans remains a significant barrier.

Ensuring that pipeline infrastructure can support the transition, while managing the decommissioning or repurposing of natural gas networks, is a strategic challenge that must be resolved in parallel with electricity grid upgrades.

Water supply

Water supply and wider water security is a critical factor, particularly for clean hydrogen production and future nuclear energy projects. The planning and development of water infrastructure are being explored separately by the Midlands Engine. Partnership, which recognises the importance of aligning water and energy infrastructure planning to support the region's long-term energy security goals.

Finance

It is well understood that the energy transition will require the mobilisation of extensive amounts of capital - public and private. DESNZ estimates that since 2010, the UK has seen £300bn of public and private low-carbon investment, and that a further £100bn of private investment is expected for the UK's energy transition by 2030.

Other estimates suggest that as much as £900bn of capital investment will be needed by 2050. Early Government signals such as the new National Wealth Fund are an encouraging contribution to crowding in private investment, and further action on grid infrastructure and energy system planning will be required quickly to unlock the finance barrier.

Skills

The Midlands is projected to create 196,000 new jobs by 2041 in green growth sectors, accounting for 4.3% of current regional employment. This represents a significant opportunity and challenge as businesses need to recruit and train workers for the long-term energy transition. According to the National Grid, 54,000 new roles, including clean gas experts and carbon capture scientists, are required in the Midlands to help the UK achieve net zero by 2050.

There is a variation in skill levels required across different energy technologies and 30-40% of current skills in the national energy sector are expected to become obsolete over the next decade due to the shift from fossil fuels to renewables. Despite an increase in engineering graduates, the sector still relies on overseas talent due to a domestic skills shortage.

These insights paint a complex picture of the skills requirements for energy security. The recently announced Skills England is a positive step in creating a more responsive skills system, but more will be required locally to ensure skills supply meets demand from the clean energy sector. Apprenticeships in particular will play a vital role in helping to grow the region's skills capability to help deliver the energy transition.

Engagement

Challenges around community and industry engagement also pose barriers to delivering energy security, with concerns about deep opposition from communities and politicians for new large-scale development such as onshore wind.

Stakeholders report frustration amongst businesses with uncertainty and delays in the current transition approach.

Furthermore, to make energy efficiency improvements to support energy security in the shorter term will require community and business consensus, and explicit resolution of tangible, local barriers to change, such as poor digital connectivity.

Community energy projects can help to improve engagement by giving people a greater stake in the energy transition.

Energy efficiency

The industrial core of the Midlands economy requires a more efficient use of energy to achieve energy security and ensure higher productivity and competitiveness.

However, currently, there is no policy or programme in place to support this, at a national or regional level. The opportunity exists to improve business processes in energy-intensive firms, using tried and tested technology. Some clusters in the Midlands, such as the Black Country Industrial Cluster, have made good progress towards this with initiatives like advisory services and capital grants.

However, more substantial policy measures and investments are needed.

Greenpower Park, Coventry

THE MIDLANDS' AMBITION AND OFFER TO THE GOVERNMENT

The Midlands' ambition

Through this White Paper, regional partners in the Midlands have come together to strengthen and accelerate the UK's approach to delivering energy security and the Government's clean energy mission, in support of national economic growth and net zero goals, and sustainable, inclusive growth in the Midlands.

The Midlands shares the Government's ambition to speed up the transition away from fossil fuels towards home-grown clean energy – and the Government's desire to create a long-term plan to achieve this.

The region's high concentration of energy-intensive sectors means that a secure supply of affordable energy is critical to realising the Midlands' —and the UK's — ambitions for productivity and growth.

Furthermore, with the highest regional rate of fuel poverty – affecting nearly a fifth (19.6%) of households in the West Midlands and 15.1% in the East Midlands – energy security is important for Midlands communities who are vulnerable to energy price shocks.

With research demonstrating that energy security is a key driver of industrial competitiveness, innovation, and job creation, expanding clean energy generation and advancing energy technologies in the Midlands offers a substantial growth opportunity for the region and UK as a whole.

Through this White Paper, we demonstrate how our uniquely intertwined economy of energy supply and demand, industrial strengths, strategic sites and clusters and leading energy innovation ecosystem, skills and testbed offer, position the Midlands as a leader and 'early adopter' region for the Government's clean energy mission.

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What the Midlands offers the Government

- **Energy system leadership and integrated energy system planning**
- **Leading energy sector, skills and technical expertise**
- **Renewable and low-carbon generation, battery and energy storage**
- **Strategic industrial clusters committed to decarbonisation and clean technologies**
- **Leading R&D assets and a large-scale, diverse testbed for a range of solutions**
- **New investment vehicles including a Midlands Green Bond**

Energy system leadership and integrated energy and industrial planning

The Midlands is a uniquely intertwined economy of energy supply and demand primed for designing, implementing and governing a whole-system, integrated approach to energy and industrial planning.

This relationship between energy, prosperity and net zero is particularly crucial for the Midlands. The region's economy is driven by high-productivity, energy-intensive industries, including advanced manufacturing clusters across aerospace, automotive and space and a nationally critical logistics sector and transport network.

The energy system leadership in the Midlands is composed of ambitious leaders in the private, public and academic sectors who are ready to do more, particularly given the region's large proportion of current fossil fuel generation.

Our community of technical energy practitioners are leading innovation in key elements of energy system planning.

Examples include the Regional Energy System Operator and Planning Regional Infrastructure in a Digital Environment (PRIDE) projects led by Energy Capital and National Grid in the West Midlands, and work done on Local Area Energy Plans (LAEPs) by the Midlands Net Zero Hub.

Examples of where integrated energy and industrial planning is taking place in the Midlands are the A50/A500 Midlands Growth Corridor and the East Midlands Freeport.

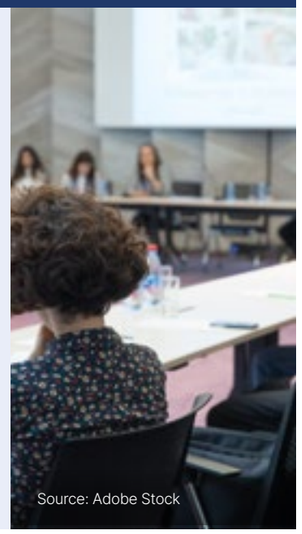
Cromford Water Wheel, Derbyshire

CASE STUDIES

CASE STUDY

Energy Capital, West Midlands

Energy Capital is the regional energy partnership for the West Midlands, bringing public, private and community sectors together to deliver place-based energy solutions through the West Midlands Combined Authority. Their flagship innovation, the West Midlands Regional Energy System Operator project, developed a city-wide energy system model, integrating local low-carbon energy generation, storage and management, and mobility assets, able to generate £720 million in savings, jobs and local benefits. Energy Capital is trailblazing a smarter, fairer energy system, with the UK's first Smart Energy System Cluster and a groundbreaking project with National Grid and NESO to establish digital whole-system energy planning. Energy Capital is leading a new approach to place-based retrofit, including a blended finance mechanism for net zero energy projects, co-created with communities, establishing the UK's first net zero neighbourhoods.

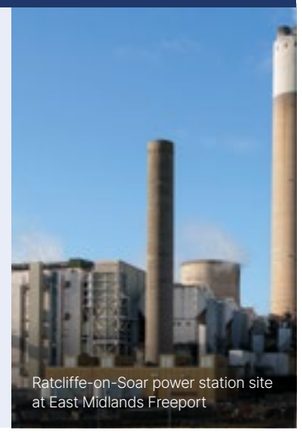


Source: Adobe Stock

CASE STUDY

East Midlands Freeport

The East Midlands Freeport is the UK's only inland Freeport and features three strategically connected main sites: the East Midlands Airport and Gateway Industrial Cluster in Leicestershire; the Ratcliffe-on-Soar Power Station site in Nottinghamshire, and the East Midlands Intermodal Park in Derbyshire. The Freeport has a strategic vision and a rich portfolio of projects aiming to accelerate growth, decarbonisation and green innovation. Notable projects include Uniper's work to transform the Ratcliffe-on-Soar site into a zero-carbon technology and energy hub, and energy and transport innovation led by Midlands Connect under project Wider Integrated Solutions for Energy, Rail, Road (WISERR).

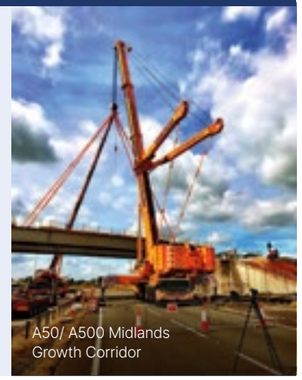


Ratcliffe-on-Soar power station site at East Midlands Freeport

CASE STUDY

A50/A500 Midlands Growth Corridor

The A50/A500 road network spans 90km, stretching from east to west, connecting Cheshire and Staffordshire to Derby and Nottingham. The Corridor is already home to JCB, Toyota, Rolls-Royce and Alstom, and there are plans for further development, with congestion and emissions already an issue on the route. A strategic industrial alliance of the public sector, businesses and academics have formed an investment plan to tackle these issues and transform the road into a corridor that accelerates decarbonisation of industry and transport, and deliver jobs and economic growth in green technology and beyond.



A50/ A500 Midlands Growth Corridor

Leading energy sector, skills and technical expertise

The Midlands is a base of operations for flagship energy companies including EDF, E.ON, Cadent, National Grid, Siemens, Siemens Energy, SSE and Uniper.

These world-class companies manage a large range of traditional and low-carbon generation assets and technologies and are already investing in clean energy solutions and research.

They are working in close collaboration with regional and local Government to deliver energy security, affordability and net zero, through partnerships such as those between Coventry City Council and E.ON and between the West Midlands Combined Authority and SSE.

One of the results of this strategic energy cluster is a highly skilled energy workforce, already supporting UK and regional economic and energy security and well-placed to make an even greater contribution.

Industry training initiatives in the Midlands including Rolls-Royce Submarine's Nuclear Skills Academy, Uniper Engineering Academy, E.ON's Net Zero Training Academy and CATCH are leading the development of the energy workforce.

Organisations including the Energy Systems Catapult, the Manufacturing Technology Centre and Warwick Manufacturing Group provide critical support to companies to develop their energy products and services.

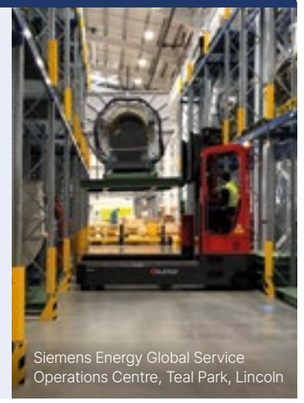
CATCH training facility, Lincolnshire

CASE STUDIES

CASE STUDY

Siemens Energy Global Service Operations, Lincoln

As a leading employer in the Midlands, in 2018, Siemens AG opened a Global Service Operations Centre (GSOC) at Teal Park, Lincoln to deliver shipping parts, engines and tooling to over 90 countries worldwide. This facility brings together innovation and sustainability, with 10 KARDEX shuttle systems for fast moving parts, and LEO locative robots for moving parts within the facility. The facility also strives towards sustainable packaging, using recyclable materials and eliminating plastic at every opportunity, and employees are offered a range of low-carbon and active travel options to further reduce emissions


Siemens Energy Global Service Operations Centre, Teal Park, Lincoln

CASE STUDY

Nuclear Skills Academy, Derby

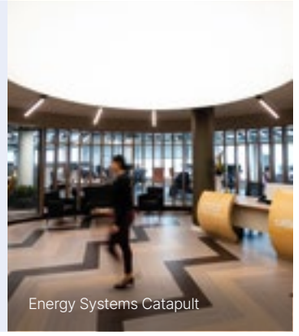
The Nuclear Skills Academy opened in 2022 in Derby as the first institution of its kind, striving to sustain nuclear capability within the UK's submarines programme by creating a dedicated pipeline of early career talent. Rolls-Royce Submarines is looking to build on over 60 years of powering the Royal Navy's nuclear submarines from its Derby base with the Academy. As the business grows to meet the demands from the Royal Navy and the increase in work as a result of the AUKUS trilateral agreement, the academy aims to sustain the UK's in-demand nuclear capability long into the future.


Rolls-Royce Submarine's Nuclear Skills Academy, Derby

CASE STUDY

Energy Systems Catapult

Energy Systems Catapult is an independent research and technology organisation (RTO) based in Birmingham. The Catapult's mission is to accelerate net zero energy innovation. It has a team of over 260 with technical, engineering, consumer, commercial, incubation, digital, and policy expertise, and draws on sector-leading test facilities, modelling tools, and data collected from over 500 research projects. It uses its 'whole energy' system capability to support innovative companies of all sizes to test, trial and scale new products and services and grow the UK's clean energy sector.


Energy Systems Catapult

Renewable and low-carbon generation and battery and storage assets and opportunities

The Midlands energy sector features a broad range of renewable and low-carbon generation and battery and storage assets and opportunities.

3.9 GW of the UK's energy from offshore wind is produced in the region, 27% of total UK production, primarily at the Humber Offshore Wind Cluster. This cluster hosts the world's largest offshore wind farm with investment from global firms like Ørsted and RWE Renewables.

The Midlands renewable energy sector is already set to grow, with more than 14 GW of planned additional renewable capacity already in the planning system, 13% of the total UK planned renewable pipeline, with potential to generate more than £20 billion of new capital investment into the region.

Battery and storage assets and opportunities in the Midlands, including the planned West Midlands Gigafactory at Greenpower Park, offer specific opportunities to balance the energy system to ensure grid stability, and to power the electric vehicle rollout.

Innovation and expertise in the Midlands could also be leveraged to integrate the ample supply of food waste held by local authorities in the region into bioenergy and anaerobic digestion. Waste heat produced by industry and commerce could also provide a vital fuel source for future low-carbon heat networks.

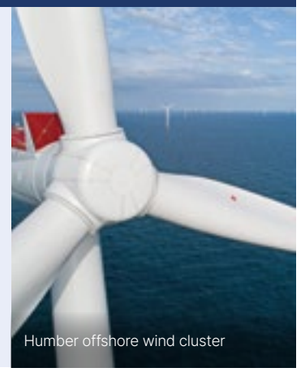
Source: Adobe Stock

CASE STUDIES

CASE STUDY

Humber offshore wind cluster

The Humber offshore wind cluster is developing to provide 35% of the UK's total offshore wind capacity – with an ambition to deliver at least 13.8 GW by 2030. The cluster already has eight operational wind farms, with another seven in development, hosting global firms like Ørsted, RWE, and Siemens Gamesa Renewable Energy, which have invested in blade manufacturing, training and load-out. The cluster has grown rapidly over the last decade, with supply chain, education and training provision, infrastructure and innovation all flourishing, including the world's biggest offshore wind "living lab" in Grimsby.

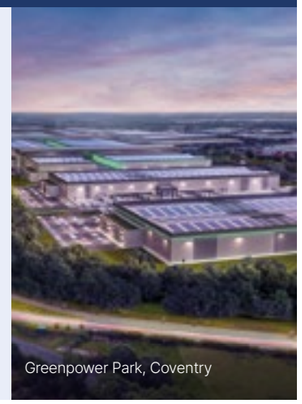


Humber offshore wind cluster

CASE STUDY

Greenpower Park, Coventry

Greenpower Park is a trailblazing centre of excellence for electrification, battery technology and manufacturing. This ground-breaking 309-acre site is located at the heart of the UK's automotive industry in the West Midlands and is the only site in the UK which has secured planning permission for a Gigafactory and battery recycling facility. It is the first of its kind, offering an all-in-one solution for battery research, industrialisation, manufacturing, testing, recycling and electrified logistics, and has the strongest pipeline of future talent in the country with more than 210,000 students studying relevant degrees.



Greenpower Park, Coventry

CASE STUDY

Tyseley Energy Park, Birmingham

Tyseley Energy Park is an energy innovation hub, seeking to test and shape the way infrastructure is developed for renewable heat and power, energy storage, clean transport fuels and advanced waste processing. Key investments include a £47 million 10MW waste wood biomass power plant, which diverts 72,000 tonnes of waste wood from landfill each year, and the low and zero-carbon refuelling station situated in a strategic location between the city centre and Birmingham Airport. With innovation and scale-up support, the site is also where CleanTech firms can collaborate and grow their businesses.

Tyseley Energy Park, Birmingham

Strategic industrial clusters committed to decarbonisation and clean technologies

With the Midlands industrial sector both a key beneficiary of UK energy independence and a key contributor to achieving it, the region's industrial clusters are mission critical to the national industrial strategy and energy strategy.

With large and small firms in manufacturing, engineering, digital and logistics, enabled by a nationally critical transport network, no other region has the same level of industrial activity as in the Midlands. This sector is comprised of a range of strategic clusters of advanced manufacturing firms in automotive, aerospace, rail, defence, materials and metals, and extractive industries and agri-food.

High and variable energy costs driven by reliance on foreign energy pose a major challenge to the global competitiveness of these clusters. The Midlands therefore has a large cohort of industrial actors committed to the goal of energy independence, willing to test and scale up new sustainable fuels and industrial energy efficiency solutions.

This is demonstrated by industry-led initiatives including Humber 2030 Vision, Repowering the Black Country and Decarbonising the Midlands Aerospace Cluster.

The dispersed nature of firms means that large infrastructure projects currently prioritised in national policy, such as carbon capture and storage, cannot economically decarbonise the region's industrial clusters and there is a need for more local solutions – for which the Midlands can be a UK testbed.

Furthermore, these clusters have untapped potential to increase UK content in clean energy supply chains, building on the region's historical track record of supporting supply chain adaptation to new markets.

West Burton Cooling Towers

CASE STUDIES

CASE STUDY

Humber 2030 Vision projects

The Humber industrial cluster, the Midlands portion of which is located in North Lincolnshire, emits more CO_2 than any other UK industrial cluster – 50% more than the next largest. The Humber Energy Board is delivering a shared vision to reduce emissions by 80%, with £15 billion in private investment. This will safeguard 1 in 10 regional jobs and has the potential to create more than 50,000. The Humber Freeport is core to this, centred around the ports of Hull, Goole, Immingham and Grimsby, responsible for 17% of UK trade with the potential to secure global green energy investment.

Keadby Hydrogen, Humber

CASE STUDY

Repowering the Black Country

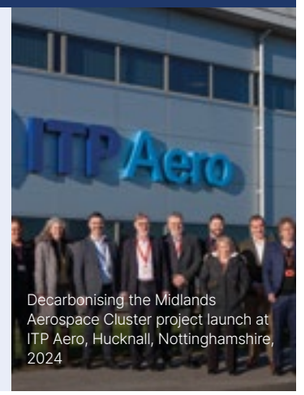
'Repowering the Black Country was one of six industrial cluster decarbonisation projects funded through UKRI's Industrial Decarbonisation Challenge. It resulted in industry establishing the Black Country Industrial Cluster – comprising over 3,000 manufacturing companies employing more than 50,000 people. The Cluster has since been expanded to cover the whole of the West Midlands Combined Authority area. Four zero-carbon industrial hubs will be created to reduce industrial carbon emissions by around 1.3 million tonnes over the next 10 years, sustaining more than 26,900 jobs. The cluster has also secured £35 million funding for energy efficiency programmes, matched by private investment.

Robinson Brothers Ltd., West Bromwich

CASE STUDY

Decarbonising Midlands Aerospace

The Midlands aerospace cluster is one of the largest in the world and hosts one in five of all UK aerospace sites, sustaining over 100,000 jobs in the region. Funded by DESNZ and Innovate UK, the project is creating and developing the first credible place-based industrial decarbonisation plan for an aerospace manufacturing cluster. Working with Tier 1 and SME aerospace firms, this involves engagement across aerospace supply chains in the Midlands to identify the key manufacturing processes and operations that contribute to greenhouse gas emissions, before leveraging local expertise to support assessment and implementation of decarbonisation solutions.



Decarbonising the Midlands Aerospace Cluster project launch at ITP Aero, Hucknall, Nottinghamshire, 2024

Leading R&D assets and a large-scale, diverse testbed for a range of solutions – urban and rural, including innovation solutions for hard-to-reach populations

As identified by UKRI, the Midlands has the greatest geographical concentration of R&D infrastructures in the energy sector across the UK.

As well as training the energy workforce of the future, Midlands industry, R&D-focused universities and other research and innovation organisations are driving forward new ideas and technology across a huge range of energy system components ranging from battery technology to energy software, hydrogen fuel and bioproducts.

In the hydrogen space, Midlands universities are delivering exemplar pilots including Keele's HyDeploy project for hydrogen heating, the University of Birmingham's Hydroflex project for hydrogen-powered trains, and Cranfield's HyPER project is developing new hydrogen production technologies.

The East Midlands Hydrogen partnership and Cadent and National Gas Transmission's Hydrogen Valley project are pioneering innovative ways to utilise hydrogen energy as a cleaner alternative to natural gas.

At East Midlands Freeport and Midlands Connect is testing sustainable transport solutions.

Frontier innovation is taking place at strategic sites across the region such as Tyseley Energy Park, with a large-scale operational biomass power plant and a commercial low-carbon refuelling station including hydrogen and electric chargers co-located with the Birmingham Energy Innovation Centre. Humber Freeport features a range of projects including developing the UK's first carbon capture power station to the world's first 100% hydrogen-fuelled power station.

The Midlands is the location for leading advances in fusion technology with the UK Atomic Energy Agency's STEP prototype fusion energy plant, and for next generation nuclear technologies development with the Rolls-Royce SMR (Small Modular Reactor) programme.

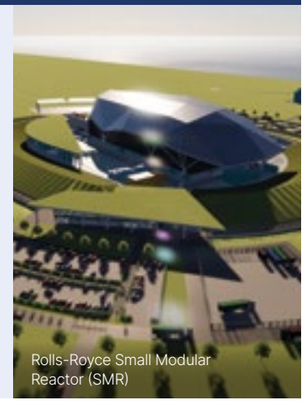
HyDeploy at Keele University

CASE STUDIES

CASE STUDY

Rolls-Royce Small Modular Reactor (SMR)

Rolls-Royce has begun development of Small Modular Reactors at their Derby business. SMR is a factory-built nuclear power plant solution with the potential to deliver clean affordable energy for all. It is a solution that can be constructed and made operational at a consistent and predictable rate, something that conventional nuclear design and build technology has struggled with. It offers the potential to lower costs, reduce uncertainty and increase developer confidence – allowing countries to more quickly access low-cost, low-carbon energy. The model is entirely scalable, with potential to generate export values in excess of £250 billion.



Rolls-Royce Small Modular Reactor (SMR)

CASE STUDY

Spherical Tokamak for Energy Production (STEP)

The potential of fusion energy to provide a virtually limitless source of low-carbon energy is of growing interest to policymakers. The Midlands is the location for UK Industrial Fusion Solutions' prototype fusion power plant which will be built at the former coal-fired power station site at West Burton in Nottinghamshire. With a more compact, efficient and potentially lower-cost model, not only will this pave the way to the commercial viability of fusion energy generation, but also for enormous opportunities for new business investment, supply chain opportunities and regeneration in the region.

STEP fusion programme, West Burton, Nottinghamshire

CASE STUDY

Hydrogen Valley

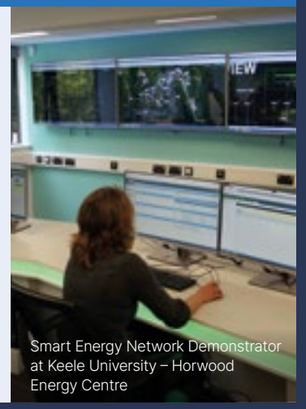
Cadent and National Gas Transmission are collaborating on an innovative regional industrial hydrogen proposition: Hydrogen Valley – stretching from Norfolk to Shropshire – a landlocked region with limited access to renewable energy for green hydrogen production. The programme aims to catalyse the region's hydrogen economy, investigating the role of hydrogen in the future energy mix across a number of sectors, and identifying infrastructure requirements, ensuring a decarbonisation pathway for industry.

Source: istock.com

CASE STUDY

Smart Energy Networks Demonstrator (SEND), Keele

Keele University's Smart Energy Network Demonstrator (SEND) is the largest project of its kind in Europe. It has been combined with the Low-carbon Energy Generation Park (LCEGP), the only site in the UK where solar, wind and battery assets are located together. With 12,300 solar panels, two wind turbines and an industrial-sized battery, SEND generated 5.99GWh of renewable energy in 2022. 5.39GWh of this was used to directly power the university, reducing reliance on the grid and saving 41% of carbon emissions in the process, creating a blueprint for other UK places, such as small towns.



Smart Energy Network Demonstrator at Keele University – Horwood Energy Centre

CASE STUDY

East Midlands Hydrogen

East Midlands Hydrogen is the UK's largest inland hydrogen cluster, aiming to accelerate the decarbonisation of industry, mobility and power generation. Using existing high-voltage electrical transmission lines and water from the River Trent, combined with imported renewable energy, could enable the development of a hydrogen production heartland at Gigawatt-scale, with multiple forecasts predicting a total production capacity of 500MW. Furthermore, with Cadent planning a 100% hydrogen pipeline to transport low-carbon hydrogen from the Humber to East Midlands industry, there is an opportunity for substantial fuel-switching.

Source: istock.com

CASE STUDY

Manby Biorefinery, Lincolnshire

Manby is a large-scale biorefinery planned for construction on a 27-acre site at the former RAF Manby Airfield in Lincolnshire. The biorefinery is centred around an advanced anaerobic digestion system that converts organic matter to biogas. The project is designed to utilise livestock manures and crop residues, like straw, to produce biomethane, food-grade biogenic CO_2 and a low-carbon organomineral granular fertiliser. The biomethane will be enough to heat a city the size of Lincoln for a year, or to fuel 1,000 gas-powered trucks every day for a year – replacing large volumes of imported fossil fuels.

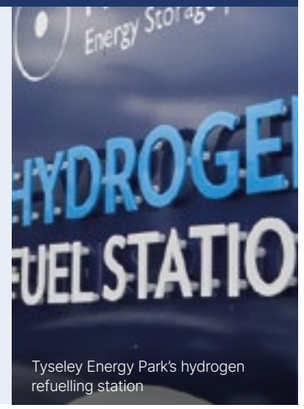
Aerial of Manby biorefinery, Lincolnshire

CASE STUDIES

CASE STUDY

H2GV Mids

With the support of EDF, Midlands Engine and Cenex and working with Arcola Energy, Toyota, Intelligent Energy and ITM Motive, the Energy Research Accelerator (ERA) led a feasibility study for a demonstration programme for a green hydrogen-fuelled 44-tonne truck. ERA is a partnership of eight research-intensive Midlands universities plus the British Geological Survey. The feasibility study included analysis of the fuel requirements and fuel efficiency critical for decarbonising the Midlands freight sector. It also modelled logistics routes and worked with logistics organisations to develop a plan for the optimal distribution of hydrogen refuelling stations and hydrogen generation.

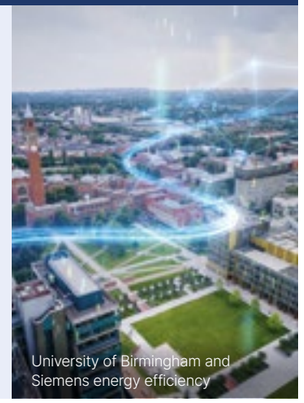


Tyseley Energy Park's hydrogen refuelling station

CASE STUDY

University of Birmingham and Siemens energy efficiency

The University of Birmingham and Siemens have formed a partnership focused on collaboration on smart infrastructure, mobility, energy and health to make the University's Edgbaston campus amongst the smartest, most intelligent and sustainable globally. As part of this partnership, the University became the first in the world to roll-out Internet of Things technology at scale, with 23,0000 sensors across the University estate to measure and manage energy efficiency. Siemens is also delivering a 10-year bureau for Energy and IoT services, ensuring that the University is able to reap the full potential of both the technology and industry expertise.



University of Birmingham and Siemens energy efficiency

CASE STUDY

Coventry City and E.ON partnership

Coventry City Council and E.ON announced the launch of an unprecedented 15-year strategic energy partnership. Together, they have agreed a programme of local works and training that are driving local growth and decarbonisation. The partnership aims to increase the city's energy supply from local low-carbon sources to reduce the exposure of residents and businesses to global market pressures; establish Coventry as a sustainable, energy-resilient and investable future city for business and development; and provide programmes to develop local green skills and a strong local supply chain, and use Coventry as a 'living laboratory' through which innovative solutions can be tested.

Coventry City Council and E.ON strategic partnership

New investment vehicles including a Midlands Green Bond

There is a need for a fundamentally different approach to financing the clean energy transition, that invests ahead of need with confidence to de-risk and crowd in private investment and does not ask consumers to bear the cost.

Consultation has highlighted that confidence amongst businesses and landowners to make informed decisions about energy-related investment is the main issue above access to finance, given disincentives such as cost and interest inflation, and a lack of viable revenue streams.

There is an opportunity to leverage the Midlands scale and confirmed project pipeline to develop new investment vehicles, including a Midlands Green Bond to encourage public sector investment, and spatial incentives and mechanisms such as those currently part of the Investment Zone and Freeports programmes to secure private sector finance.

Midlands Mindforge patient capital investment vehicle, an initiative of Midlands Innovation universities, address investment barriers facing Midlands spinouts and other early-stage IP-rich businesses, including those operating in clean technologies.

There is also potential to develop a Midlands public-private investment consortia of private sector energy infrastructure providers and investors to invest in: behind-the-meter solutions at scale, such as those being developed at Smart Parc SEGRO Derby for the food industry, with regional and local Government identifying and facilitating viable sites; and multi-technology energy projects through the establishment of a collaborative blended financing mechanism as part of Energy Capital's Net Zero Accelerator programme.

Keadby Hydrogen, Humber

CASE STUDIES

CASE STUDY

SmartParc SEGRO Derby

SmartParc SEGRO Derby is a 110-acre new food business park, providing a behind-the-meter solution for its tenant businesses in the £32bn GVA Midlands agri-food industrial cluster. SmartParc is based on access to shared energy, workforce and expertise to create modern, highly efficient facilities for food manufacturers and supply chain tenants. SmartParc uses a shared energy platform using sustainable sources to deliver 11MW of cooling duty across the park and energy cost savings of 30%+. It also offers efficient shared solutions for water and effluent.

Energy Centre at SmartParc SEGRO Derby

CASE STUDY

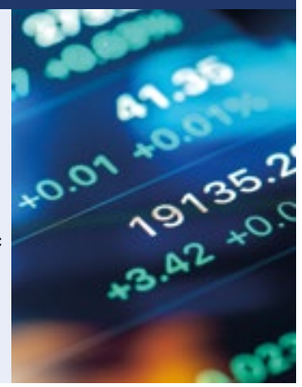
Midlands Mindforge

Midlands Mindforge is an ambitious patient capital investment company co-founded by eight research-intensive universities in the Midlands. Mindforge is working with university spinouts and IP-rich companies to realise the full potential of the world-class science taking place in the region. Statistics show that, despite the traditional dominance of the 'golden triangle' universities, those in the Midlands are on a par for research excellence across many subjects, including 'tough tech' sectors with profound growth trajectories. Mindforge exists to help unlock this economic impact, providing much needed patient growth investment in the Midlands. Over the next 7 years, Mindforge plans to invest £700m and gain an additional £2.7bn in co-investment.

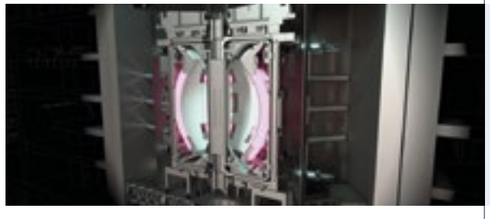
CASE STUDY

Midlands Green Bond

The Midlands Engine is working with partners to develop a new green finance initiative that utilises public sector support to unlock significant, affordable private sector finance. Bonds are a tried and tested mechanism that can have great impact at scale, but also as a mechanism through which pension funds, insurers and other institutional investors can invest in local places. The Midlands Green Bond will pilot pooling public sector borrowing needs in a bond issue to finance public sector capital projects with a positive environmental impact. Long-term there could be potential to lend to private sector actors to fund green programmes.

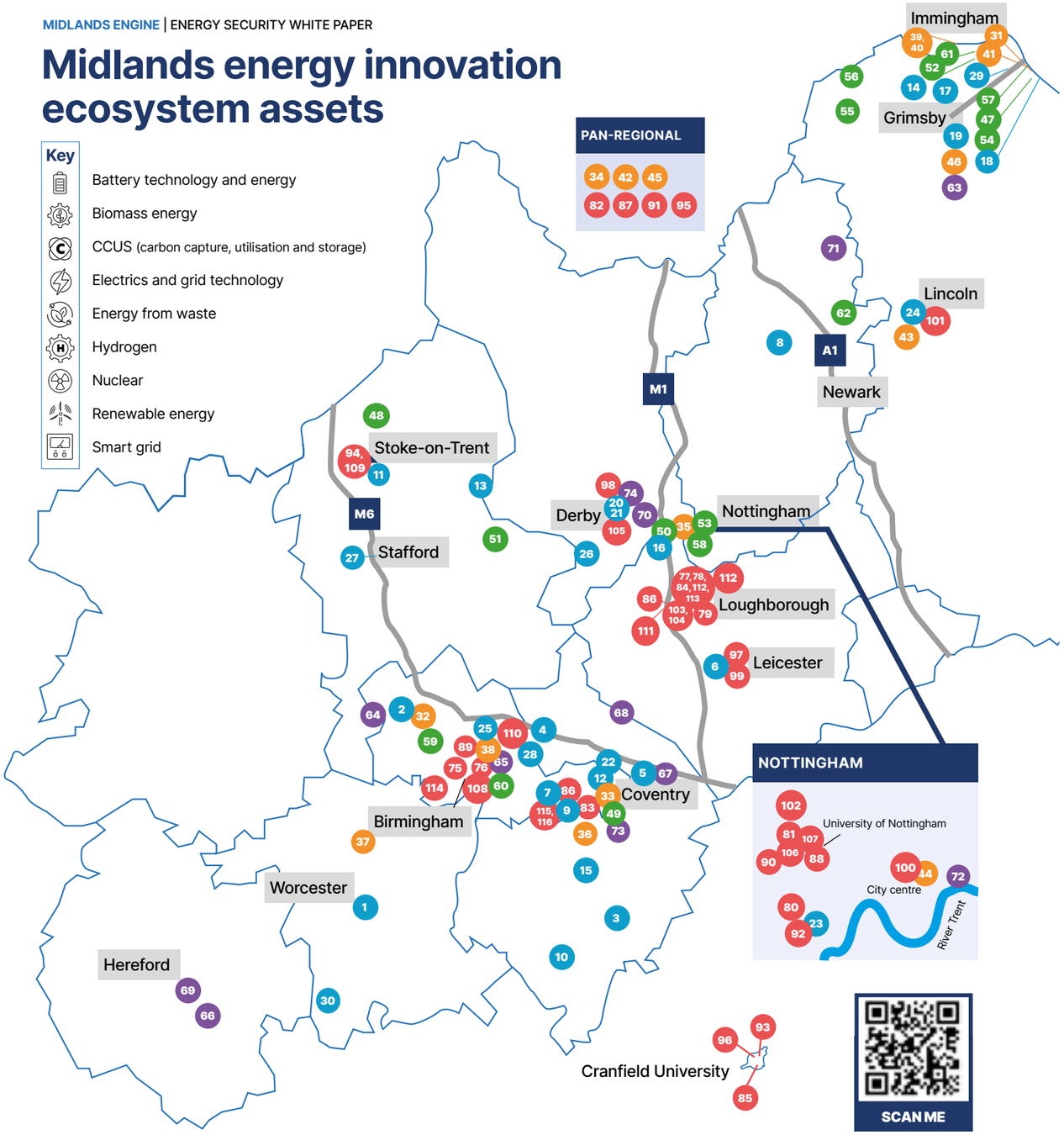


Midlands clean energy technology strengths, opportunities and asset examples

	MIDLANDS STRENGTHS & OPPORTUNITIES	ASSET EXAMPLES
Offshore Wind	• 3.9 GW of energy produced - 27% of UK total • +126% business growth since 2013 • 42% of Innovate UK offshore wind funding since 2005 • $2.5bn of foreign capital investment 2017-2021 • Potential for ten-fold jobs growth by 2030 • Over 3 million Midlands homes powered by 2030 • 4.2MtCO_2 emission reduction by 2030	• Humber Offshore Wind Cluster, including world's largest offshore wind farm (Hornsea One) • ABLE Humber Port • ORE Catapult Offshore Wind living lab • Humber Freeport
Hydrogen	• 10+ hydrogen fuel cell development projects ongoing • £111m of capability, facilities and demonstrators • UK's largest inland hydrogen cluster • The world's first 100% H2-fired power station at Keadby • Potential to deliver 167,000 jobs, £10bn GVA and a 29% reduction in CO_2 • +£3.3bn potential GVA growth and 14,000 jobs by 2035	• HyMarnham Power • Tyseley Energy Park • Hydrogen to Humber (H2H) Production 2 • Humber H2ub • Keadby Hydrogen Power Station • Ratcliffe-on-Soar Power Station site • East Coast Hydrogen & Hydrogen Valley pipelines • Immingham Green Energy Terminal • East Midlands Freeport
Nuclear	• 27% of UK nuclear and nuclear-related businesses • 15% of UK nuclear jobs and important nuclear skills base • +55% nuclear sector growth since 2013 • >28% of Innovate UK nuclear funding since 2005 • £2.3bn nuclear R&D investment (2019-20)	• Rolls-Royce SMR • Rolls-Royce Submarines • Nuclear Skills Academy • Midlands Regional Hub for Nuclear • Midlands Nuclear
Fusion Energy		• UK's prototype fusion energy plant (STEP) at West Burton, Nottinghamshire
Solar	• >1.5GW of installed solar generation capacity • 6.8 GW new generating capacity in the pipeline • 25% of UK solar energy sales • £830m of photovoltaic R&D investment (2019-20) • 187ktCO_2 emission reduction by 2041	• Low-carbon Energy Generation Park (at Keele University) • Supergen Solar Network at Loughborough University

	MIDLANDS STRENGTHS & OPPORTUNITIES	ASSET EXAMPLES
Smart Energy	• Europe's largest smart energy networks demonstrator • £1bn+ energy savings by 2030, supplying 50k users with carbon-neutral energy • Up to 106,000kt CO_2 emission reduction by 2050 • Up to £600k exports	• Smart Energy Network Demonstrator (SEND) at Keele University • University of Birmingham smart campus and living lab in partnership with Siemens • West Midlands Smart Energy System Cluster • Zero Carbon Rugeley Project • Trent Basin Community Energy Scheme
Batteries and Energy Storage	• 1,752 GWh of battery storage • 49,056GWh of planned battery storage in the pipeline	• UK Battery Industrialisation Centre • Greenpower Park and West Midlands Gigafactory • East Midlands Freeport Gigafactory proposition • Salt strata sites in North Lincs and North Staffs • Large-scale battery storage systems in operation in Sandwell, Coventry, Derby-shire, Leicestershire and Lincolnshire
Clean Heat and Local Heat Networks	• 1,177 communal heating and district heating networks	• Clean heat networks at Keele University • National Centre for the Decarbonisation of Heat • Stoke-on-Trent District Heat Network using geothermal energy • Abandoned mine workings
Localised Energy System Planning		• Regional Energy Systems Operator project • E.ON Coventry Strategic Energy Partnership • Midlands Net Zero Hub •Energy Capital's Project PRIDE using LAEP+
Carbon Capture and Storage	• Humber Zero plan for carbon capture • Peak Cluster - CCUS project to decarbonise 40% of UK cement & lime industry	• Viking CCS • Keadby 3 Carbon Capture Power Station
Alternative fuels	• Biofuels • Sustainable Aviation Fuels (SAF) • Energy from sewage	• Supergen Bioenergy Hub and Energy and BioProducts Research Institute (EBRI) at Aston University • Manby Biorefinery, Lincolnshire • Sustainable Aviation Fuel at Philips 66 Humber Refinery

Midlands energy innovation ecosystem assets



Strategic Companies

1. Air Products	**9.** EDF	**17.** Ørsted	**25.** SSE
2. Ansaldo Nuclear	**10.** FuturEnergy	**18.** Phillips 66	**26.** Toyota
3. Aston Martin	**11.** Goodwin International	**19.** RES	**27.** UK Grid Solutions
4. BMW	**12.** Jaguar Land Rover	**20.** Rolls-Royce	**28.** Uniper
5. Cadent	**13.** JCB	**21.** Rolls-Royce SMR	**29.** VPI
6. Cavendish Nuclear	**14.** myenergi	**22.** RWE Renewables	**30.** ZX Lidars
7. E.ON	**15.** National Energy Systems Operator	**23.** Siemens	
8. Eclectic Energy	**16.** National Grid Electricity Distribution	**24.** Siemens Energy	

Strategic Energy Partnerships and Clusters

- **31.** Altalto
- **32.** Black Country Industrial Cluster
- **33.** Coventry City Council and E.ON Strategic Partnership
- **34.** East Coast Hydrogen
- **35.** East Midlands Hydrogen
- **36.** Energy and Utilities Alliance
- **37.** Energy for Waste Worcestershire
- **38.** Energy Capital
- **39.** Humber 2030 Vision for Industrial Decarbonisation
- **40.** Humber Offshore Wind Cluster
- **41.** Humber Zero
- **42.** Hydrogen Valley
- **43.** Lincolnshire Energy from Waste
- **44.** Midlands Net Zero Hub
- **45.** Midlands Nuclear
- **46.** ORE Catapult Offshore Wind Living Lab

Infrastructure Assets and Investible Opportunities

- **47.** ABLE Humber Port
- **48.** Chatterly Whitfield
- **49.** West Midlands Gigapark
- **50.** East Midlands Freeport
- **51.** fifty500 Midlands Growth Corridor
- **52.** Humber Freeport
- **53.** Hydrogen Liquefaction Plant
- **54.** Immingham Green Energy Terminal
- **55.** Keadby Carbon Capture
- **56.** Keadby Hydrogen
- **57.** NewLincs Energy-from-Waste
- **58.** Ratcliffe-on-Soar power station site
- **59.** Bustleholme Battery Storage
- **60.** Tyseley Energy Park
- **61.** Viking CCS
- **62.** HyMarnham Power

Other R&D assets, Training Centres and Accelerators

- **63.** CATCH National Net Zero Training Centre and Industry Hub
- **64.** E.ON Net Zero Training Academy
- **65.** Energy Systems Catapult
- **66.** Low-carbon Technology Training Centre
- **67.** Manufacturing Technology Centre
- **68.** MIRA Technology Park and Institute
- **69.** New Model Institute for Technology and Engineering
- **70.** Nuclear Advanced Manufacturing Research Centre (AMRC)
- **71.** STEP fusion
- **72.** Trent Basin Community Energy Demonstrator
- **73.** UK Battery Industrialisation Centre (UKBIC)
- **74.** East Midlands Institute of Technology

University-Based Research and Training Centres, Demonstrators and Accelerators

- **75.** Birmingham Centre for Nuclear Education and Research
- **76.** Birmingham Energy Innovation Centre/Birmingham Energy Institute
- **77.** Caterpillar Innovation and Research Centre
- **78.** CDT in Energy Demand
- **79.** CDT in Future Propulsion and Power
- **80.** CDT in Resilient Decarbonised Fuel Energy Systems
- **81.** CDT in Sustainable Electric Propulsion
- **82.** CDT in Sustainable Hydrogen
- **83.** Centre for Advanced Low-carbon Propulsion Systems
- **84.** Centre for Postdoctoral Development in Infrastructure Cities and Energy (C-DICE)
- **85.** Centre for Renewable and Low-carbon Energy
- **86.** Centre for Renewable Energy Systems Technology (CREST)
- **87.** Driving the Electric Revolution Industrialisation Centres (DER-IC)
- **88.** East Midlands Hydrogen Innovation Zone
- **89.** Energy and Bioproducts Research Institute
- **90.** University of Nottingham Electrical Lab
- **91.** Energy Research Accelerator (ERA)
- **92.** Energy Technologies Building and Energy Institute
- **93.** Global Research Airport and Hydrogen Research Network
- **94.** HyDeploy
- **95.** HyDEX
- **96.** HyPER
- **97.** Institute for Environmental Futures
- **98.** Institute for Innovation in Sustainable Engineering
- **99.** Institute of Energy and Sustainable Development
- **100.** Integrated Energy Grids Laboratory
- **101.** Lincolnshire Institute of Technology
- **102.** Low-carbon Energy and Resources Technologies Research Group
- **103.** National Centre for Combustion and Aerothermal Technology
- **104.** National Facility for High Resolution Cathodoluminescence Analysis
- **105.** Nuclear Skills Academy
- **106.** Power Electronics and Machines Centre
- **107.** Research Acceleration and Demonstration Building
- **108.** Reusing and Recycling Energy Technologies
- **109.** Smart Energy Network Demonstrator (SEND)
- **110.** Supergen Bioenergy Hub
- **111.** Supergen Solar Network
- **112.** The Hydrogen Works
- **113.** UK GeoEnergy Testbed Platform
- **114.** University of Birmingham Smart Campus
- **115.** Warwick Energy Innovation Centre
- **116.** Warwick Manufacturing Group

OUR ROADMAP FOR COLLABORATIVE ACTION

Our roadmap for collaborative action

Our roadmap for collaborative action sets out how by working together, and with the Government and its agencies, over the next 24 months, we will strengthen and accelerate the UK's approach to delivering energy security and the Government's clean energy mission, in support of national economic growth and net zero goals, and sustainable, inclusive growth in the Midlands.

This is not just a roadmap for energy security but also, crucially, a roadmap for economic growth.

Although there are somewhat differing challenges and opportunities as regards energy security and the energy transition between the East and West of the region, taking a pan-Midlands perspective is an added-value opportunity to remove barriers and harness the full potential of assets across the whole region.

Over the next 24 months we will work together, with Government and its agencies, on targeted actions to:

1. Scale and co-invest in domestic low-carbon energy generation in the Midlands using mature and new technologies, for short-term (to 2030), medium- term (to 2040) and longer-term impacts (to 2050)

2. Establish six 'critical enablers' of the future energy system and economic growth opportunity

Together, these actions comprise a roadmap towards energy security and economic growth in the Midlands and the wider UK. It complements and informs the early priorities and investments of Great British Energy, making a significant contribution to the Government's approach.

Collaborative actions for short-term impact to 2030 – scaling clean energy projects using mature technologies.

Alignment with GB Energy's priorities and functions:

- ☑ Scale and accelerate mature technologies
- ☑ Scale up municipal and community energy
- ☑ Project development
- ☑ Local Power Plan

Develop new offshore wind	**Context**	The Humber offshore wind cluster is already an anchor for a growing offshore wind workforce and supply chain expertise that can be mobilised at pace to deliver new offshore wind.
	Action	Building on the new partnership with Great British Energy and the Crown Estate, we will work together to accelerate leasing and planning approval of new offshore wind development areas off the East Midlands coast, exploring the options of repurposing former fossil fuel power grid connections on the Midlands transmission network. Local Government, National Grid, and the National Energy Systems Operator will work together to explore and prioritise future grid connectivity for offshore projects within the Midlands to maximise the benefits both for energy security and for revenue generation through business rates.
Scale up community -led Solar	**Context**	Great British Energy's Local Power Plan in the Midlands and Local Area Energy Plans.
	Action	We will undertake early and collaborative implementation of GB Energy's Local Power Plan to bring forward community-led small-to-medium, and larger-scale solar energy projects – informed by community feedback and current and future Local Area Energy Plans, to identify sites that do not conflict with wider strategic objectives for housing and commercial development, agriculture, or protecting natural spaces and are therefore viable for delivery to 2030.
Scale up battery production	**Context**	Existing and growing regional strengths in battery manufacturing, including the Greenpower Park adjacent the UK Battery Industrialisation Centre in Coventry and wider university and research network.
	Action	We will leverage the region's strengths in battery manufacturing to accelerate the region's two Gigafactory propositions, at Greenpower Park in Coventry and at the East Midlands Freeport. Specifically, this would focus on a joint inward investment effort to secure new businesses at each site and build a next-generation battery cluster that should be aimed at supporting both electric vehicles and battery energy storage systems.
Develop new onshore wind	**Context**	Unlike other regions, the Midlands currently has no onshore wind projects in planning or in the pipeline, indicating untapped potential for new project development and delivery.
	Action	We will work together to assess and identify viable sites for onshore wind development, potentially co-locating with energy storage, using the Midlands as an early adopter of the new approach signalled by the Government's recent planning changes for onshore wind – using insight from LAEPs and local stakeholders to develop a pipeline with community consensus.
Scale up energy efficiency and demand-side management incentives	**Context**	Energy efficiency and demand-side management are crucial pillars in strengthening energy independence. The region's significant industrial base, alongside its residential and commercial sectors, places considerable demand on the energy grid. By reducing energy demand through efficiency and demand-side management measures, the region can alleviate pressure on the grid and reduce the need for new generation capacity. This would help manage energy supply more effectively during periods of peak demand or when infrastructure capacity is limited or being upgraded. By reducing energy demand across industrial, commercial and residential sectors, we can alleviate pressure on the grid, lower energy costs, and enhance the resilience of the energy system.
	Action	We will work together to design and mobilise large-scale energy efficiency and demand-side management programmes, building on successful models such as those at the University of Birmingham and the findings and lessons learned from the Black Country Industrial Cluster energy efficiency pilot. These programmes should include ambitious targets, robust financial incentives for energy-saving investments including low-cost finance and targeted tax incentives and business-to- business working. The promotion of demand-side management strategies, such as time-of-use tariffs, and exploring load-shifting concepts in industrial clusters and behind-the-meter solutions to optimise grid efficiency should also be core parts.


Siemens and University of Birmingham

Accelerate the development of local heat networks	**Context**	Heat networks represent an important solution for decarbonising domestic and commercial heating, offering an efficient alternative to individual gas boilers. By centralising heat generation and distributing it to homes and buildings, heat networks can reduce the UK's reliance on natural gas, particularly in densely populated urban areas. The Midlands, with its significant industrial base, offers strong opportunities to utilise waste heat from industrial processes to power these networks, and can move at pace following the introduction of new heat network zones in 2025.
	Action	In the short term to 2030, we will explore opportunities to prioritise heat networks in the Midlands in urban areas and large housing developments. This could involve: • Deploying new heat networks and expanding existing schemes in our large cities, where infrastructure development can deliver low-carbon heat at scale • Integrating heat networks into local energy plans, ensuring alignment with broader decarbonisation efforts. • Leveraging public-private partnerships to attract investment and accelerate the transition to low-carbon heating solutions.
Carbon capture at fossil fuel plants	**Context**	In the short-term to 2030, the Midlands' existing fossil fuel plants will continue to play a crucial role in maintaining energy supply and system resilience as we transition to a low-carbon, renewables-led economy.
	Action	This period presents a strategic opportunity to install and test carbon capture technologies at these sites, ensuring these assets contribute to a low-carbon future. Additionally, exploring co-firing (hydrogen, biomass, or waste) and other innovative solutions at these sites could pave the way for new technologies, with the Midlands positioning itself a leader in the development and deployment of low-carbon generation and decarbonisation solutions.

Source: istock.com

Collaborative actions for medium-term impact to 2040 - co-investing in new technologies and further scaling mature technologies

Alignment with GB Energy's priorities and functions:

- ☑ **Co-investing in new technologies**
- ☑ **Project development**
- ☑ **Project investment and ownership**
- ☑ **Great British Nuclear**
- ☑ **Supply chain**

Behind-the-meter solutions and storage	**Context**	Behind-the-meter solutions are an emerging suite of technologies that enable site-specific energy generation, resulting in a removal of reliance on the electricity grid.
	Action	We will collaborate to develop a Midlands public-private investment consortium of private-sector energy infrastructure providers and investors to invest in behind-the-meter solutions at scale across industrial and large commercial sites and parks, with Great British Energy, regional and local Government collaboratively identifying and facilitating viable sites. We will also seek to test and finance early approaches to long-duration energy storage at salt strata sites in North Lincolnshire and North Staffordshire, to scale this technology to enable better grid balancing.
SMRs and AMRs	**Context**	Siting studies demonstrate that there are several locations in the Midlands that would be suited for future nuclear development.
	Action	With Great British Energy and Great British Nuclear, we will work together to develop a pipeline of future nuclear licensable sites that can host future Small Modular Reactor and Advanced Modular Reactor technology. This could start with a testing or demonstrator site, but with scope for full implementation as needed, ideally using existing industrial locations. We will also carry out joint work to explore how the UK can maximise the opportunity for the manufacture of nuclear components (e.g., pumps, valves, vessels), much of which could be done in the Midlands, and building on the region's manufacturing strengths.
Strategic repurposing of fossil fuel assets	**Context**	To deliver the clean energy superpower mission, the UK will require solutions that provide power during extended periods of low renewables generation. Gas fired power stations, many located in the Midlands, provide this capability today; only hydrogen is expected to be able to deliver an alternative low-carbon solution at acceptable cost in the future.
	Action	The Midlands, through work at Keadby power station, is well placed to provide a first of a kind demonstration of a hydrogen power station to deliver reliable clean power at times of peak demand. Moreover, the Midlands with its central location, its many former power stations with existing grid connections, and geology perfect for creating hydrogen storage caverns in the salt strata of the Humber region, has the potential to be the centre of the UK's long duration storage capability.
Alternative fuel transmission networks	**Context**	The gas network should be seen as an asset in testing and delivering solutions for energy security, building on innovation and development being led in the Midlands by Cadent amongst others.
	Action	With Great British Energy we will work together with regional energy infrastructure operators to deliver a comprehensive pan-regional feasibility study on pipeline infrastructure. This would focus on innovation in areas such as biomethane, hydrogen, and methanation technologies and identify projects for investment at strategic sites, e.g. Ratcliffe, which can then be scaled up.

Collaborative actions for longer-term impact to 2050 – delivering new technologies at scale

Alignment with GB Energy's priorities and functions:

- ☑ Co-investing in new technologies
- ☑ Project development
- ☑ Project investment and ownership
- ☑ Great British Nuclear

Next-generation wind (onshore and offshore)	**Context**	The next generation of wind energy will combine advancements in both onshore and offshore technologies, driving the UK's transition to a low-carbon future. This includes the development of larger, more efficient turbines – exceeding 20MW for offshore installations – and the integration of innovative solutions like floating wind platforms, hydrogen production, and energy storage systems. Onshore wind, with its lower costs and quicker deployment, complements offshore developments by providing a reliable and scalable renewable energy source. Together, these will significantly enhance the capacity, flexibility and resilience of the energy grid.
	Action	The Midlands, with its robust industrial base is well-positioned to lead in the innovation, design, manufacturing and deployment of these technologies across the UK, contributing to both regional economic growth and national energy security. The partnership should collaborate to develop a proactive industrial plan to harness this opportunity.
Fusion energy	**Context**	Fusion represents the next frontier in clean energy, offering the potential for a virtually limitless and low-carbon power source. Unlike nuclear fission, fusion produces minimal radioactive waste and carries lower safety risks. The Midlands is at the forefront of this technology through the STEP programme in Nottinghamshire to build the UK's first prototype fusion powerplant and to create a UK-led fusion industry. As this moves closer to commercial viability, fusion energy could revolutionise the energy landscape, providing a stable and sustainable alternative to traditional energy sources and further establishing the Midlands as a leader in advanced energy innovation.
	Action	We will work with the Government to identify future potential sites for longer-term development.
Hydrogen-derived sustainable transport fuel with carbon capture, utilisation and storage	**Context**	The Midlands is the UK's centre for transport and logistics and transport technologies including automotive, rail and aerospace.
	Action	Great British Energy and the Midlands' private sector and investors should co-invest in hydrogen production with carbon capture, utilisation and storage to produce hydrogen-powered freight and rail technology and sustainable aviation fuel (SAF), using sites in the East Midlands Freeport and the Humber Freeport. The Midlands' nationally significant transport network and logistics sector should be leveraged to test, capture demand, and scale-up new fuels and Midlands Connect to support the integration of hydrogen and refuelling stations into regional and national transport networks.

Action on six critical enablers of the future energy system and economic growth opportunity

1. Integrated regional energy system governance and planning

Context

We welcome NESO's decision to establish Regional Energy Strategic Plans. A bottom-up, place-based, vision-led and proactive approach to energy system planning – that takes advantage of the opportunities presented by devolution – is critical to enabling the Midlands to scale up and accelerate its generation capacity. The Midlands particularly welcomes the whole-system approach principle, across vectors but also all sectors of the regional economy, industry and energy, supporting utilities, including water and transport. There will be a need to manage interdependencies between regions, to embed the right input of information from LAEPs and the right role for regional and local Government. The Midlands' community of technical energy practitioners is already leading innovation in key elements of energy system planning, such as using digital visualisation of the energy system in the West Midlands (PRIDE beta) and Coventry's strategic partnership with E.ON – this progress and learning can inform a better approach to developing LAEPs. There is an opportunity to develop LAEPs and RESPs in parallel in the Midlands, optimising both planning processes as well as maximising synergies and minimising the data collection effort.

Action

We will collaborate with NESO as an early adopter of the RESPs function, based on the following principles:

- Voice, insight and input from all energy intensive industries in the regional economy as well as the energy sector and supporting utilities such as water
- Bottom-up input from LAEPs, where these are in place, and/or local industrial strategies
- Greater consistency in the LAEP method to enable a robust local energy evidence base
- Ability to manage inter-dependencies and opportunities between regions
- Appropriate representation from local and combined authorities
- Financial and technical support for local and regional energy planning.

2. Planning regulation

Context

Government has already set out intentions to improve the National Planning Policy Framework and reform the Nationally Significant Infrastructure Projects (NSIPs) consents process. For energy independence to be achieved at pace, a fully streamlined planning system is required around priority sites and critical infrastructure.

Action

Linked to the Midlands (East and West) Regional Energy Strategic Plan, we will as part of the partnership with the Government prioritise large and small projects and sites that require accelerated planning to unlock new energy generation. Our partnership should also explore spatial models, inspired by investment zones, freeports and development corporations, with planning powers, incentives and community-representative governance to stimulate locally led energy investment and delivery.

3. Finance and investment

Context

There is a need for a fundamentally different approach to financing the clean energy transition that invests ahead of need with confidence to de-risk and crowd in private investment and does not ask consumers to bear the cost. Consultation has highlighted that confidence amongst businesses and landowners to make informed decisions about energy related investment is the main issue above access to finance, given disincentives such as cost and interest inflation and a lack of viable revenue streams.

Action

We will support Great British Energy and the National Wealth Fund by bringing forward a pipeline of investible propositions in mature and newer energy technologies as part of the proposed partnership. As set out later in this section, this pipeline will be comprehensive across short-, medium- and long-term impacts on the clean energy system.

We will also work with Government to accelerate further financing mechanisms and innovative new energy business models:

- Leverage regional scale and confirmed project pipeline to develop new investment vehicles, including a Midlands Green Bond to encourage public sector investment, and spatial incentives and mechanisms such as those currently part of the Investment Zone and Freeports programmes to secure private sector finance
- Developing a Midlands public-private investment consortium of private sector energy infrastructure providers and investors to invest: in behind-the-meter solutions at scale, with regional and local Government identifying and facilitating viable sites ; and multi-technology energy projects through the establishment of a collaborative blended financing mechanism as part of Energy Capital's Net Zero Accelerator programme.

4. Skills and workforce

Context

To enable the Midlands energy sector and supply chain to grow, there is a need for continuous skills and workforce development and attracting new talent.

Action

We will be an early adopter region of the new strategic approach to local skills development signalled by Skills England and commits to working with this new body to develop and scale up new solutions. For example, learning from and building on the success of initiatives such as the Manufacturing Technology Centre in Coventry, CATCH in North East Lincolnshire, EON's Net Zero Academy at Kingswinford and the Rolls-Royce Nuclear Skills Academy at the University of Derby, we will collaborate with the Government to test and scale a skills hub approach to address the technical gap in the region's clean energy and manufacturing sectors, intervening where the market currently cannot. These hubs could provide specialised training, school-level engagement, foster innovation, support workforce transition, and encourage collaboration between academia, industry and local communities, leveraging the region's wealth of universities and colleges. As part of the Places for Growth programme, the Midlands proposes that a new head office for the Department of Energy Security and Net Zero is established in the region, instead of Whitehall. This would make the Government a key anchor in the regional employer landscape, attracting and retaining further talent already drawn to major energy firms in the region.

5. Supply chain development

Context

The Midlands industrial base has sizeable potential to play a larger role in the domestic energy supply chain and therefore increase UK content. Consultation has highlighted a range of specific supply chain vulnerabilities and opportunities, including new power assets, distribution, switchgear and factory automation equipment.

Action

As part of developing and implementing the new national industrial strategy, we will collaborate with the Government to take a new, focused approach to supply chain development built around specific clusters and generation opportunities in the region, such as wind and nuclear. This will produce targeted industrial policy interventions that can be scaled and implemented at pace.

6. Grid infrastructure

Context

Challenges with grid capacity and infrastructure pose a major barrier to the Midlands' and UK energy security ambitions – from large-scale hydrogen generation to the development of low-carbon aviation supply chains and overall encouraging market action. This section has so far set out Midlands-specific 'critical enablers' of the clean energy growth potential of the region. However, the need for investment in grid infrastructure is not unique to the Midlands and will be required in all UK regions to provide the capacity to make Britain a clean energy superpower.

Action

As with planning, we will support the Government through the partnership to prioritise sites for grid upgrades. We suggest the following areas of focus at a national level:

- Prioritise investment in reinforcing existing transmission and pipeline infrastructure to support increased capacity from renewable energy sources and emerging clean fuels such as hydrogen and biomethane. This includes upgrading substations, transmission lines, and distribution networks, and existing gas pipelines where they can be repurposed for hydrogen or biomethane transport. Following this, investment in new grid and pipeline infrastructure should be made where necessary to meet future demand from renewable generation and decarbonisation initiatives
- Encourage the deployment of smart grid technologies with a particular focus on the Midlands. Building on national initiatives like the UK Government's Smart Systems and Flexibility Plan and National Grid's Future Energy Scenarios (FES), the Midlands can be a key region to pilot and scale smart grid solutions. This region, with its strong mix of industrial energy demand and renewable energy generation, is well-positioned to showcase how these technologies can balance supply and demand, integrate distributed energy resources, and reduce the need for curtailment payments
- Prioritise integration of battery and energy storage systems in transmission and distribution networks, particularly in the Midlands. With its mix of renewable energy projects, industrial demand, and a supportive innovation ecosystem, the Midlands is ideally positioned to lead the deployment of energy storage solutions. By focusing investments here, the region can act as a testbed for demonstrating how storage systems enhance grid stability, provide backup power during peak demand, and mitigate the impacts of intermittent renewable energy production. This approach would not only improve grid resilience locally but also provide a blueprint for national implementation.

Next steps

The proposals put forward in this White Paper together comprise a roadmap for accelerating and strengthening the UK's approach to delivering energy security, energy transition and economic growth, by leveraging the Midlands' nationally and globally significant energy and industrial assets and opportunities.

The significance of these assets and opportunities reflects the ambition, commitment and collaboration that exists amongst Midlands industry, academia, public and private sector stakeholders and partners – a collaboration which has been enhanced through the White Paper's development. Initial priorities will include:

- Becoming an 'early adopter' region for the new Regional Energy Strategic Plans function, ensuring that they are bottom-up, place-based, vision-led and aligned to wider regional economic opportunities and plans

- Bringing forward a prioritised pipeline of investible propositions and private sector investment aligned to strategic sites and cluster development opportunities and accelerating the development of new financing mechanisms, including a Midlands Green Bond

- Bringing forward targeted industrial policy interventions that can be scaled and implemented at pace to unlock supply chain opportunities around specific clusters and generation opportunities in the Midlands

Through our collaborative approach, including the Government and its agencies, we will complement and add value to existing regional partnership and governance arrangements and the opportunities being created through devolution, to realise the opportunities of the clean energy revolution – for regional and national benefit.

> **"Together, we can accelerate the infrastructure and investment required for clean energy transformation, securing long-term prosperity for our people.**
>
> Sir John Peace, Chairman of the Midlands Engine Partnership

How the white paper has been developed

The White Paper's development has been initiated and led by the Midlands Engine Partnership – a pan-regional partnership (PRP) with a mission to stimulate economic growth for the benefit of the whole region and the wider UK economy through connecting stakeholders to support innovation and drive investment.

By bridging the gap between policy and private sector opportunity, PRPs can foster collaboration and dialogue between policymakers and business leaders. Through initiatives such as policy roundtables, working groups and industry consultations, PRPs can enable policymakers to tailor policy interventions that create an enabling environment for private sector investment and growth.

The Partnership's Green Growth Board has overseen the White Paper's development, building on its work in the Ten Point Plan for Green Growth in the Midlands Engine published in 2021.

This White Paper has been developed with the support and insights of a Taskforce of senior leaders from industry, academia and regional and local Government invested in the Midlands, chaired by crossbench peer Lord Ravensdale, and formed for this purpose.

It is underpinned by a large body of evidence, including 30 regional case studies, and reflects extensive consultation and discussions amongst the Taskforce and wider stakeholders, including through the Midlands Engine Green Growth Board. More than 60 organisations across energy and wider industry, academia, research, education, local Government, wider public and third sectors have been involved in the White Paper's development.

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