

**MIDLANDS
ENGINE**

Midlands Engine Energy Security White Paper Supporting Evidence Base

January 2024

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- The geographic definition of the Midlands Engine is 65 Local Authorities (LA) covering the West Midlands ITL1 region, the majority of the East Midlands ITL1 region (other than Northamptonshire), and 2 local authority areas within the Yorkshire and Humber ITL1 region (North Lincolnshire and North East Lincolnshire). Where possible, data has been collected at this 65 LA level, but where unavailable or for simplicity, Midlands data is collected as East Midlands ITL1 + West Midlands ITL1. This is indicated on specific slides depending on the metric.
- Related to Section 2, energy and low carbon activities are difficult to define for statistical analysis, and activities also overlap with other parts of the economy. We have used three principal sources for attempting to quantify the economic contribution of the energy / low carbon sector (and individual parts of it) to the Midlands:
 - Standard Industrial Classification (SIC) code data from the Office for National Statistics.
 - A previously Midlands Engine commissioned piece of work to kmatrix: <https://kmatrix.co/midlands/>
 - Outputs from our [“Exploring the Investment Potential of Midlands Clusters”](#) project and its underlying data via The Data City: <https://thedatacity.com/>. *The cluster project / Data City data findings should be taken with some caution and be read in context of the full snapshot reports linked and the approach used in the Midlands Engine Clusters project and by data partners The Data City.*

It should be noted that none of these sources individually are likely to provide a totally accurate quantification of the Midlands' energy sector, but considering findings of them all provides a decent overview of the industry's economic weight and future opportunity areas.

- *All the information provided is correct (as far as possible relevant to each individual source) as of January 2024.*
- *For further information or to discuss any of the intelligence provided, please contact Midlands Engine Observatory via the Midlands Engine project team overseeing the Energy Security White Paper development.*

1. Midlands Engine Energy Overview

TOTAL ENERGY CONSUMPTION IN THE MIDLANDS ENGINE

Domestic and non-domestic electricity consumed in the Midlands Engine, 2021

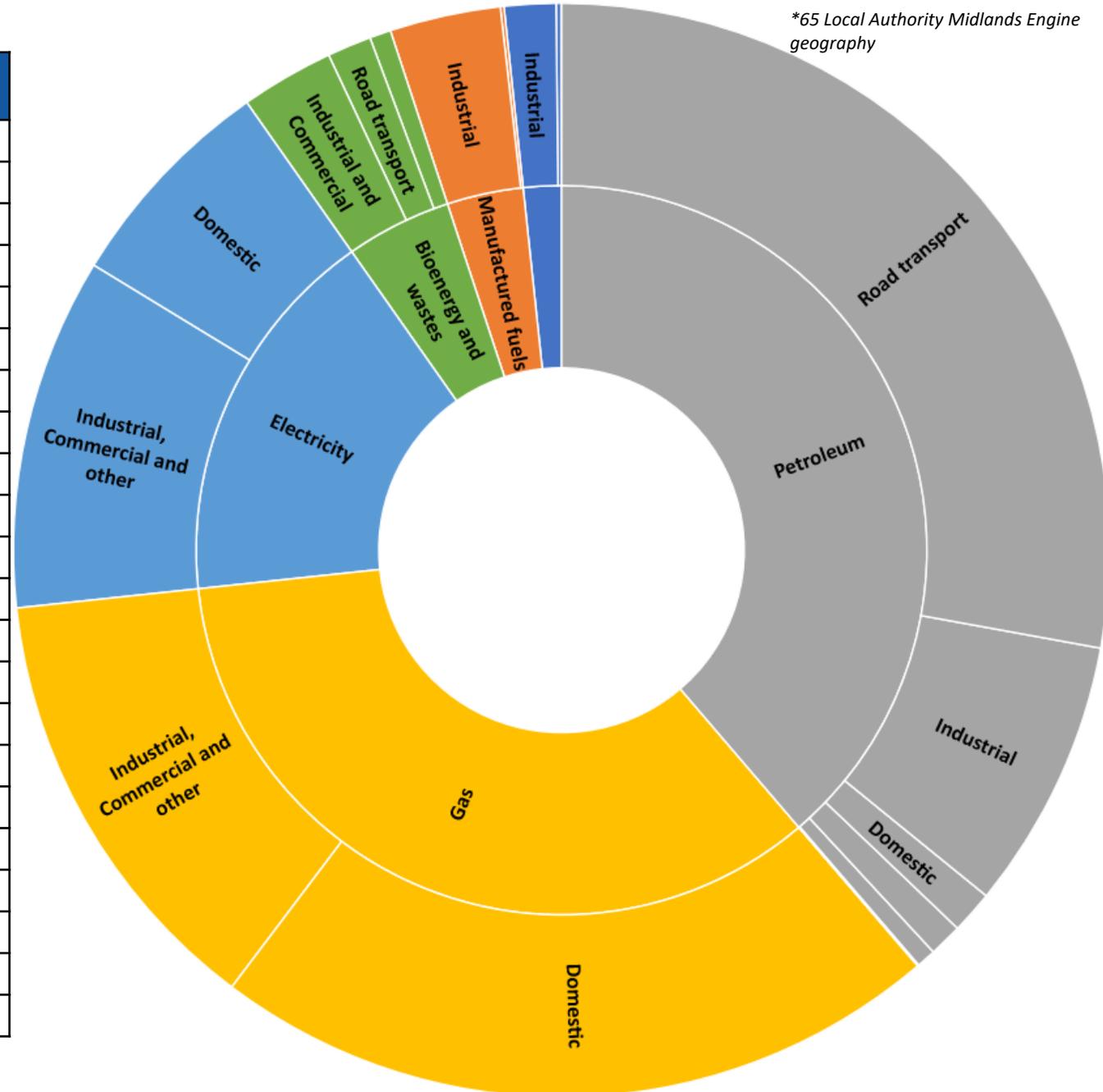
	Domestic GWh	Non-domestic GWh	Total GWh
East Midlands	7,538	12,166	19,704
West Midlands	8,981	13,334	22,315
Midlands Engine*	15,766	25,094	40,860
Great Britain total	102,397	158,572	260,969
% Midlands of GB	15.4%	15.8%	15.7%

Domestic and non-domestic gas consumed in the Midlands Engine, 2021

	Domestic GWh	Non-domestic GWh	Total GWh
East Midlands	24,686	15,227	39,913
West Midlands	29,224	15,802	45,026
Midlands Engine*	51,901	31,429	83,329
Great Britain total	315,391	178,986	494,377
% Midlands of GB	16.5%	17.6%	16.9%

TOTAL ENERGY CONSUMPTION IN THE MIDLANDS ENGINE

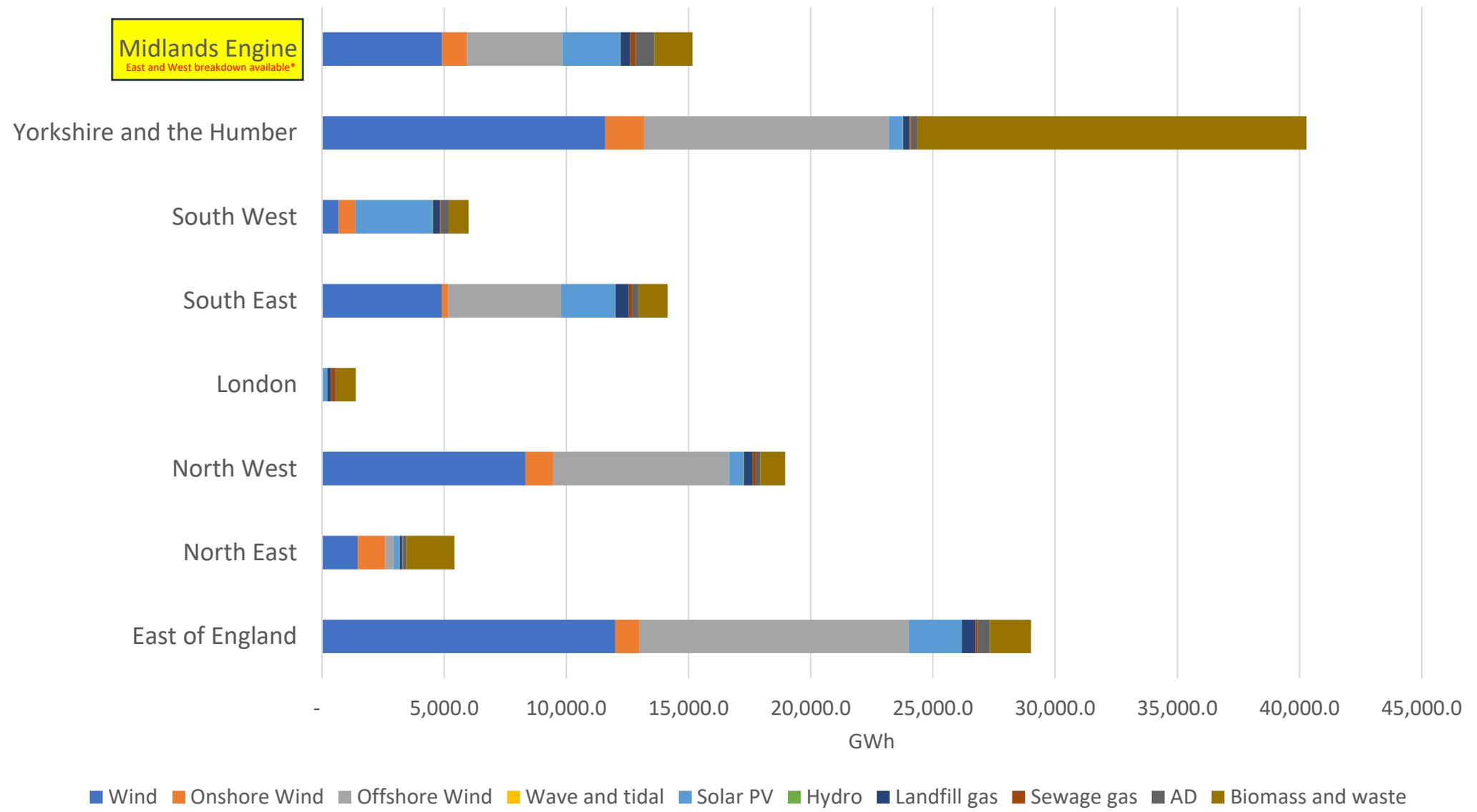
Fuel	Sector	ktoe	% of total
Coal	Industrial	315	1.50%
	Commercial	1	0.00%
	Domestic	29	0.10%
	Rail	1	0.00%
	Public sector	1	0.00%
	Agriculture	0	0.00%
Manufactured fuels	Industrial	678	3.30%
	Domestic	22	0.10%
Petroleum	Industrial	1,662	8.00%
	Commercial	6	0.00%
	Domestic	261	1.30%
	Road transport	5,776	27.90%
	Rail	118	0.60%
	Public sector	4	0.00%
	Agriculture	204	1.00%
Gas	Domestic	4,463	21.50%
	Industrial, Commercial and other	2,702	13.00%
Electricity	Domestic	1,356	6.50%
	Industrial, Commercial and other	2,158	10.40%
Bioenergy and wastes	Domestic	130	0.60%
	Road transport	270	1.30%
	Industrial and Commercial	570	2.80%



*West Midlands ITL1 + East Midlands ITL1 geography

TOTAL RENEWABLE ELECTRICITY GENERATED BY REGION

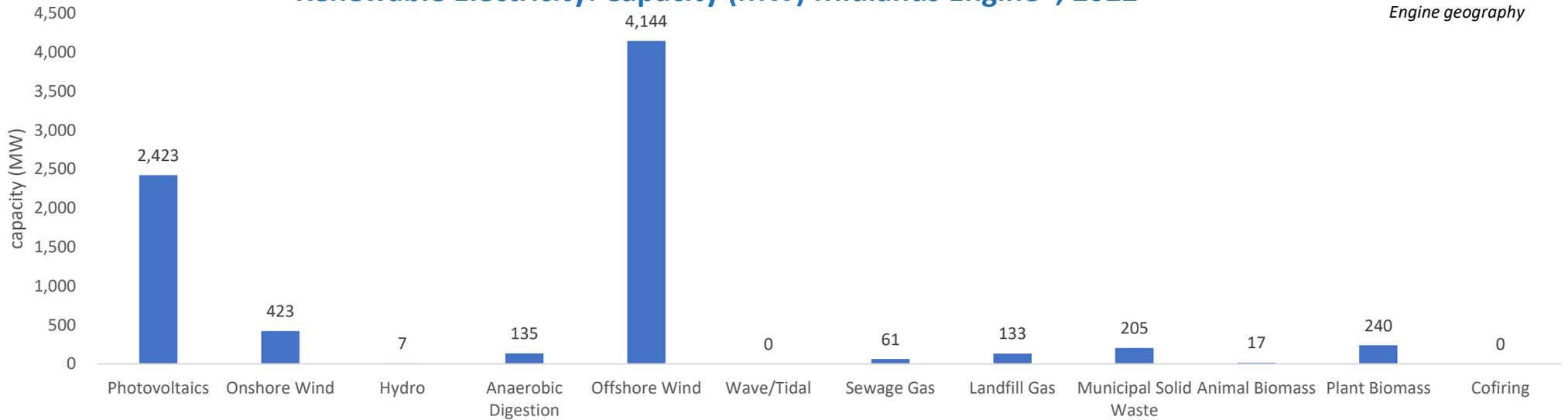
Total electricity generated from renewable sources by region, 2022



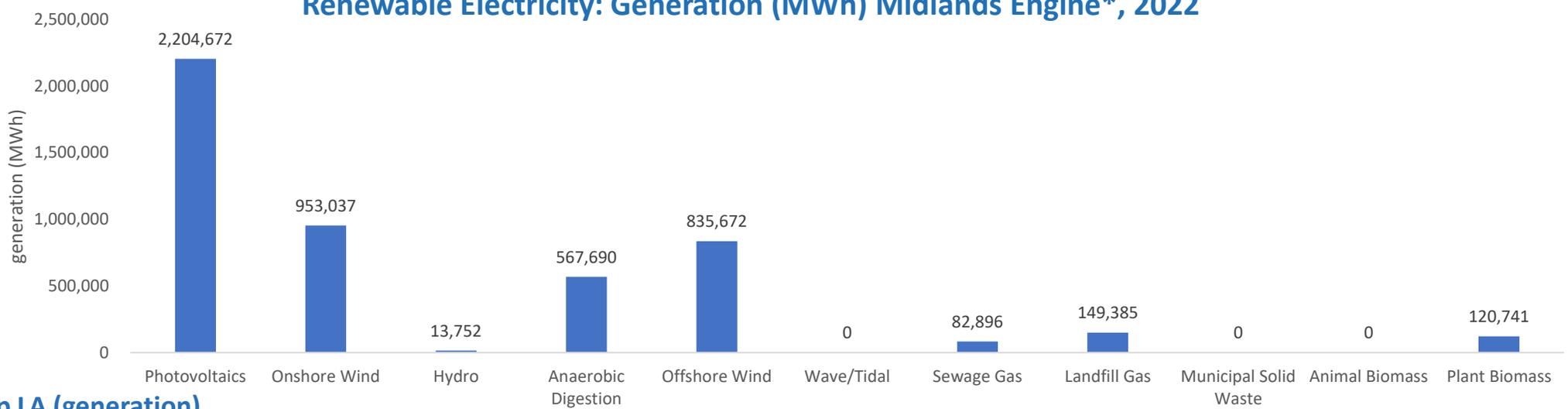
TOTAL RENEWABLE ELECTRICITY GENERATED BY LOCAL AUTHORITY

Renewable Electricity: Capacity (MW) Midlands Engine*, 2022

*65 Local Authority Midlands Engine geography



Renewable Electricity: Generation (MWh) Midlands Engine*, 2022



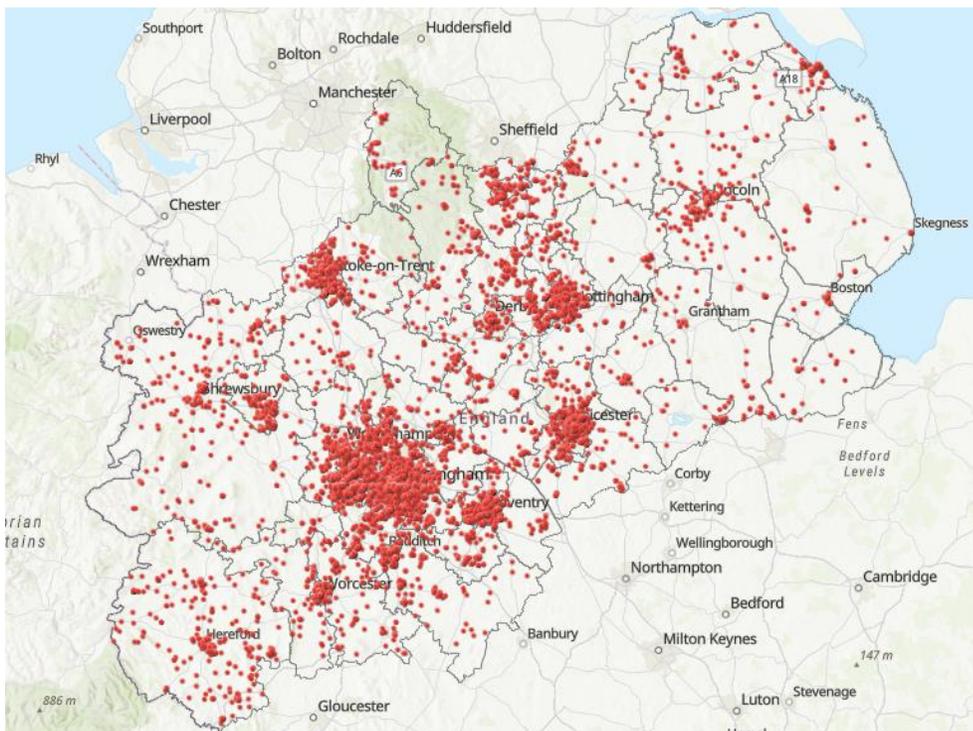
Number of Sites + Top LA (generation)

Photovoltaics	Onshore Wind	Hydro	Anaerobic Digestion	Offshore Wind	Wave/Tidal	Sewage Gas	Landfill Gas	Municipal Solid Waste	Animal Biomass	Plant Biomass	Cofiring	Total
197,439	615	52	170	7	1	38	64	16	1	81	0	198,484
Shropshire	North Lincolnshire	High Peak	Shropshire	North East Lincolnshire	-	Birmingham	North Lincolnshire	-		Staffordshire Moorlands	-	

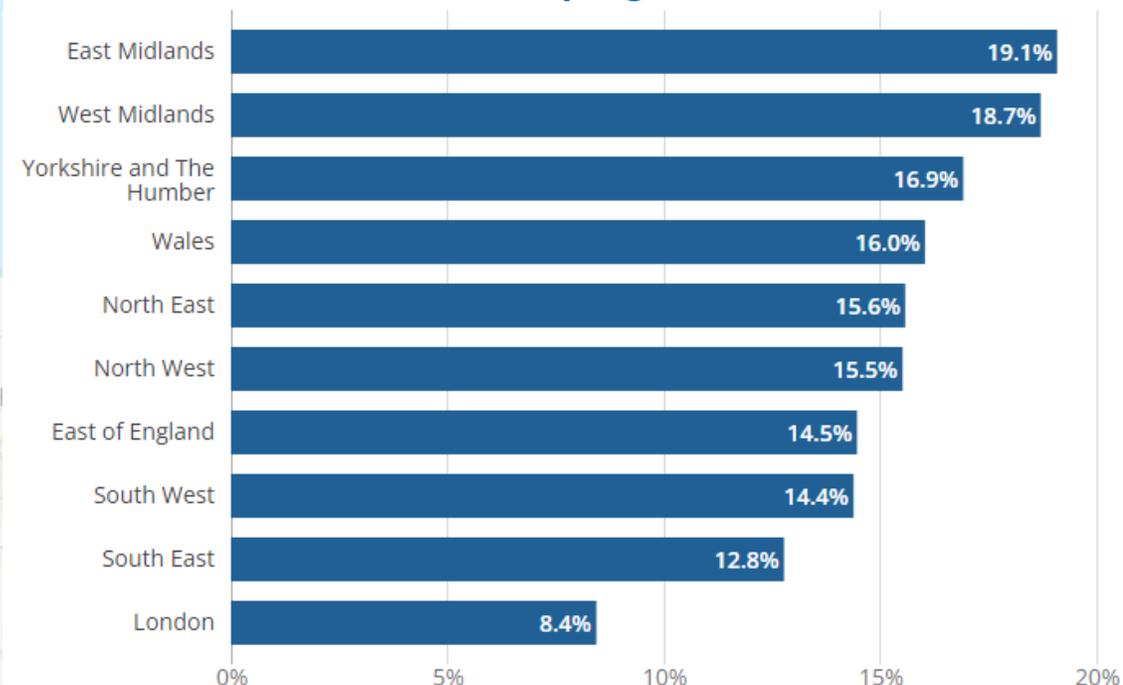
2. Midlands Engine Business & Energy Overview

PROPORTION OF 'ENERGY INTENSIVE' BUSINESSES IN REGION

Energy Intensive Businesses in the Midlands Engine, 2022



Percentage of workers in high-emissions industries by region, 2021



The Midlands Engine has a concentration of GVA in certain sectors with high energy demand, such as manufacturing, transport and storage, and wholesale and retail trade of vehicles. These 3 sectors alone account for 32% of the Midlands Engine GVA. Energy price rises severely damage competitiveness of UK SME manufacturers, disproportionately impacting the Midlands given our industry base.

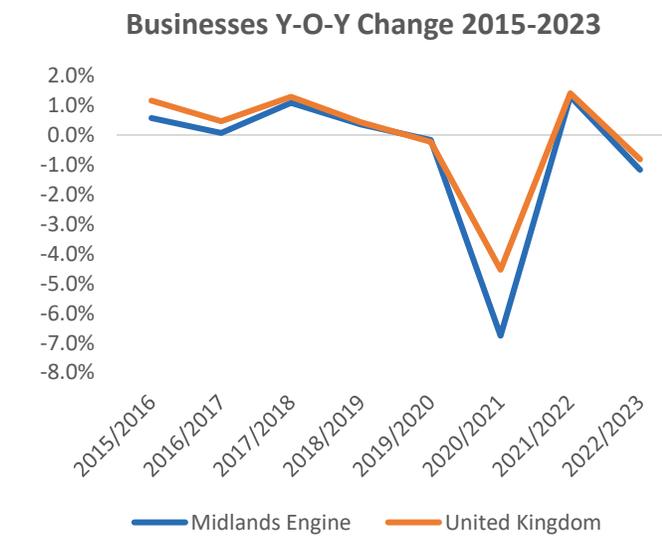
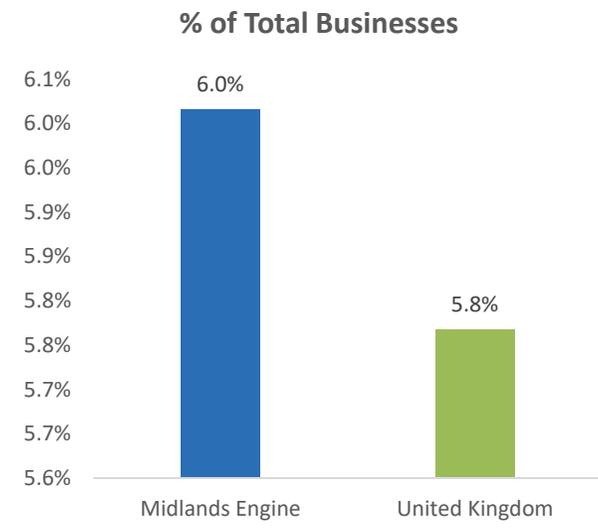
Around one in five workers living in either the East Midlands and West Midlands were employed in the UK's highest-emitting industries in 2021 - that means these two regions had a higher proportion of workers employed in those industries than the rest of England and Wales.

ENERGY AND LOW CARBON TECHNOLOGIES ECONOMY SECTOR

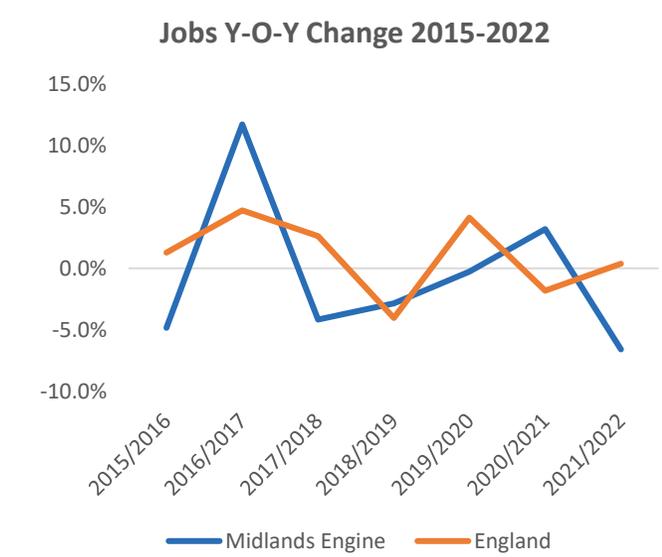
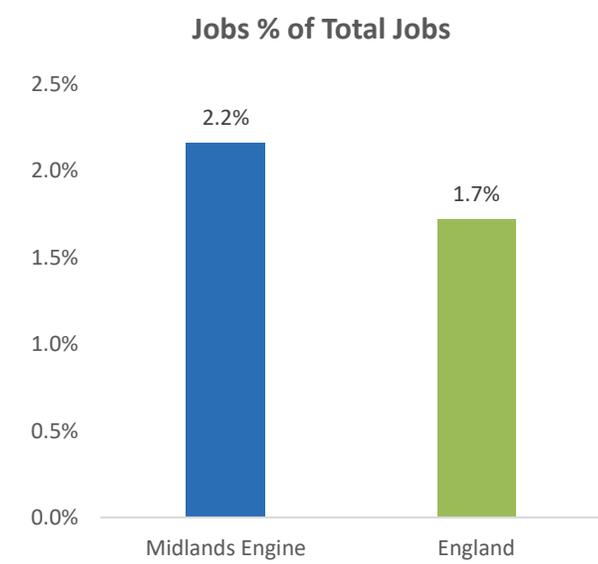
- **£13.3 billion** of Midlands Engine* GVA is attributed to Energy and Low Carbon Technologies, 5.3% of the whole economy, compared to 4.5% at UK level.
- **22,735 businesses work in this sector** - 6.0% of all businesses in the area – a higher percentage than the national avg. of 5.8%.
- **99,370 people work in this sector** - 2.2% of overall employment – higher than the national avg. of 1.7%.

	Jobs	GVA	Businesses
kMatrix	195,000	£26.6bn	10,500
ONS	99,370	£13.3bn	22,735

Businesses (ONS) Current: **22,735** **-4.9% change** since 2015



Jobs (ONS) Current: **99,370** **-4.9% change** since 2015



• Value (Sales) 2021



- £26.6bn
- 4.8% of Economy Total

• Jobs (2019)



- 195,000 jobs
- 1.5% of Economy Total

• Businesses (2019)



- 10,500 businesses
- 0.5% of Economy Total

- **Potential for nearly 200,000 jobs in low-carbon sectors** by 2050 across the Midlands. Equating to 16.4% of low-carbon jobs in the UK.
- The Low Carbon and Environmental Goods and Services sector in the MEH's region **grew year on year since 2017/18**. In 2017/18 total sales in the sector were worth **£23.8bn**, and **£26.6bn in 2019/20**.
- **The sector in the ME region grew by 5.2%** during the financial year 2017/18 to 2018/19 and **5.9%** during 2018/19 to 2019/20. Slower than the UK average for the same period (10.0% and 8.1% respectively).
- **Employment in the sector in 2019/20 was 195,817**, up from **176,395** in 2017/18. Annual growth rate in employment was **5.7%** between 2017/18 and 2018/19 and **5.0%** between 2018/19 and 2019/20. This rate of growth is slower than the UK average for the same period (9.4% and 7.3% respectively).
- **The number of companies in the ME's Low Carbon and Environmental Goods and Services sector in 2019/20 was 10,559**, up from **9,531** in 2017/18. This rate of growth is slower than the UK average for the same period (9.3% and 10.3% respectively).

Please refer to Notes page for explanation of sources used

kMatrix Summary Statistics

REGIONAL SPECIALISATION

Key Assets via [ME Green Innovation Report](#)

High Value Manufacturing Catapult					National organisations based outside the region
Manufacturing Technology Centre (MTC)	Warwick Manufacturing Group (WMG)	Manufacturing expertise, SME support programmes	Nuclear AMRC (Derby)		
Energy Systems Catapult					
Expertise in energy systems and policy	Support for local authorities and business	SME support programmes; Energy Launchpad			
Universities and colleges					
Energy Research Accelerator (ERA)	Midlands Enterprise Universities	SME support programmes	R&D expertise and facilities	Skills and training	
Horiba-MIRA					
Support for automotive sector	Test track and test facilities	Focus on hydrogen and electric	Innovation centre		
Energy Capital					
Embedded in WMCA	Projects: NZN, RESO, Rugeley	Energy Innovation Zones	Tyseley Energy Park	Innovation Accelerator pilot	
Power stations and freeports					
Freeports: East Midlands and Humber	Ratcliffe: Emerge Energy-from-Waste Development	West Burton: STEP Fusion Plant	Rugeley: Zero Carbon Rugeley	Drakelow: Energy-from-Waste Development	
Other regional innovation-support organisations					
Sustainability West Midlands	Midlands Net Zero Hub	Local Enterprise Partnerships	East Midlands Development Corporation	Midlands Connect	

Midlands Low Carbon and Environmental Goods and Services (LCEGS) sector

Regional - Midlands Energy Hub (MEH) aggregated

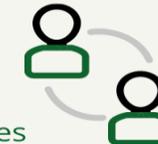


LCEGS sector worth £26.6bn in 2019/20



195,817 people were employed in the sector

Sales generated by **10,559** businesses



5.9% annual growth



Wind is the largest regional sub-sector

687,204 jobs required to deliver net zero by 2050

National organisations based outside the region
Connected Places Catapult
Nuclear AMRC (HQ in Sheffield but with R&D facility in Derby)
Offshore Wind Catapult (HQ in Glasgow but with O&M Centre of Excellence at Grimsby)
UKRI, Innovate UK and EPSRC
National Nuclear Laboratory
National Physical Laboratory

SUB-SECTOR STRENGTHS

According to the kMatrix Commission: The five largest sub-sectors in the Low Carbon and Environmental Goods and Services sector by sales account for 64% of the MEH's total sales and are made up of:

- **Wind (£4.4bn)** – this includes control systems development and manufacture, drive train development, manufacture and systems integration, consulting houses and companies providing power firming systems and services, maintenance services and grid integration services
- **Building Technologies (£4.0bn)** - this includes head office functions, building systems design and consultancy and building systems providers and installers
- **Alternative Fuels (£3.8bn)** – this includes R&D functions, alternative fuel providers, designers and consultancy, process implementation, sales and accounting and application development specialists
- **Photovoltaic (£2.8bn)** - this includes head office functions, systems developers, providers and installers
- **Water & Waste Water Treatment (£2.0bn)** - development and implementation by utilities along with supply, consultancy and implementation by independent consulting engineers

*Also, the recent **Midlands Engine Cluster Project** has identified several clusters relevant to the energy sector in the Midlands as growth opportunities. These are highlighted on the following pages, although the data findings should be taken with some caution and be read in context of the full snapshot reports linked and the approach used in the Midlands Engine Clusters project and by data partners The Data City. This initial list of identified cluster strengths may also not be exhaustive.*

Modern and Low Carbon Utilities

The Midlands modern and low carbon utilities cluster, involving utilities such as electricity, gas and water, is largely defined by significant business and employee populations in the West Midlands Combined Authority area, Warwickshire and Nottinghamshire. Bolstered by strong graduate retention and a pipeline of 12,000 relevant HE and FE graduates each year, the sector is strong in these key locations.

The Midlands saw an increase in market share of investment post-pandemic, it still under performs, with an opportunity to take a bigger share of the forecast \$15.7bn UK FDI Capex in 2025 in renewable energy. <https://midlandsengine.org/wp-content/uploads/2023/11/ME-Cluster-Snapshot-MODERN-AND-LOW-CARBON.pdf>

Offshore Wind

A target of major direct investment in the UK, the major cluster location for offshore wind & related supply chain is around the Humber Offshore Wind Cluster in North East Lincolnshire, with Department for Business and Trade allocating it a 'High Potential Opportunity'. Although the cluster is smaller than others, it is experiencing high growth. Already home to eight operational offshore wind farms, including the world's largest at Hornsea 2, a further seven wind farms are in development or under construction. The cluster has seen a 126% increase in business count since 2013, and these innovative enterprises regularly utilise Catapult centres and accelerators (17 of 24 High Growth Companies identified by Beauhurst have engaged with accelerators). Notably North East Lincolnshire hosts a significant location quotient of employees in the cluster, i.e. it is a key industry in the area. Current major investment opportunities include the £3.5bn (GDV) ABLE Marine Energy Park. Announced in April 2023, the biggest offshore wind 'living lab' in the world will be created off the Grimsby coast through the development of a 5G Testbed that includes Grimsby Port and the Lynn and Inner Dowsing wind farm. This project is driven by the Offshore Renewable Energy (ORE) Catapult and bringing together the expertise of Microsoft, Vilicom, JET Connectivity, XceCo, Associated British Ports (ABP), Accelleran and Satellite Applications Catapult. <https://midlandsengine.org/wp-content/uploads/2023/07/ME-Cluster-Snapshot-OFFSHORE-WIND.pdf>

Nuclear

This is a growing cluster centred around Derby and with significant activity also in greater Birmingham, Stoke and Leicester. Nuclear expertise and businesses in the Midlands are set to see growth through the new Small Modular Reactor (SMR) scheme being delivered by Rolls-Royce; while other future opportunities exist in nuclear fusion following the successful bid for the government's Spherical Tokamak for Energy Production (STEP) project to be located at West Burton (Nottinghamshire). Existing expertise is spread across a number of organisations most notably the Nuclear Advanced Manufacturing Research Centre in Derby. Investment figures in this cluster unknown, however, with approximately 15% of the UK's nuclear workforce located in the Midlands, and a remarkable 29% growth rate of the sector in the region compared to a national average of 2.9% (as reported by kMatrix), the cluster is poised to expand significantly. The 2023 report, "Review of Nuclear & Related Industries in the Midlands", dives into more detail on the region's Nuclear cluster. <https://midlandsengine.org/wp-content/uploads/2023/08/ME-Cluster-Snapshot-NUCLEAR.pdf>

Circular Economy

This is a new cluster of activity across the region that progresses the Midlands towards a more circular economy: companies, across all sectors, transforming current processes of production and waste management aiming toward net-zero outcomes. The Department for Business & Trade has allocated circular economy activities are increasingly embedded in regional industrial activity such as at Smart Parc, Derby, and Tyseley Energy Park, Birmingham. The West Midlands Combined Authority has an active programme of work in this area built around its Circular Economy Routemap published in 2021. Academic and business-led networks across the Midlands also support the momentum on this critical endeavour such as, Circular Economy clubs, university-led support programmes and strong research credentials at Birmingham, Nottingham, Loughborough and Leicester. <https://midlandsengine.org/wp-content/uploads/2023/08/ME-Cluster-Scorecards-CIRCULAR-ECONOMY.pdf>

Net Zero Transport

Cutting across the Advanced Manufacturing clusters is a focus on Net Zero Transport Technologies - a truly pan-regional cluster with regional networks and initiatives to drive innovation framed by the national Net Zero strategy. These include the Energy Research Accelerator, Coventry Very Light Rail, and internationally significant sites such as the MIRA Technology Park and UK Battery Industrialisation Centre. With a pipeline of some 25,000 relevant HE and FE graduates annually (including high levels of postgraduates) matched by strong graduate retention and employment outcomes, this specialised focus on net zero transport is particularly present through business, employee and company growth in the West Midlands Combined Authority area, as well as Rugby and near Nottingham. With such a base for R&D and innovation, this cluster competes with the Golden Triangle and has capacity to attract greater investment, especially with the exceptional growth in businesses across the region: 252% since 2013. Potentially significant developments such as the possible West Midlands Gigafactory could catalyse greater inward investment and talent pooling. <https://midlandsengine.org/wp-content/uploads/2023/06/ME-Cluster-Scorecards-NET-ZERO.pdf>

Business Ecosystem

- **774 Total Cluster Business Count.** 17% of UK; largest region outside of London and the South East. 68% growth since 2013.
- **22 £100m+ Turnover Companies.** 25% of all in the UK have a Midlands location.
- **65 High Growth Companies.** 15% of all in the UK have a Midlands location.
- **204 Incorporations between 2017-22.** 11% of UK utilities incorporations between 2017 and 2022 have a Midlands location.
- **12% Foreign-owned enterprises.** 96 are known to be foreign-owned; same proportion of foreign-owned than national average.

Talent Ecosystem

- **22,754 Estimated Employees.** 13% of national: largest region in UK outside of London & SE.
- **Average salary £34,530.** National average £36,613 (5.7% lower in Midlands).
- **8,670 Further Education Leavers.**
- **Relevant HEI High-Ranking Department:** Universities of Nottingham; Birmingham; Warwick; and Loughborough.
- **4,260 University Graduates.** 3% of Midlands university graduates studied relevant subjects to utilities.
- **100% Graduate Retention change over 3 years.** Overall exact balance, suggesting full retention.

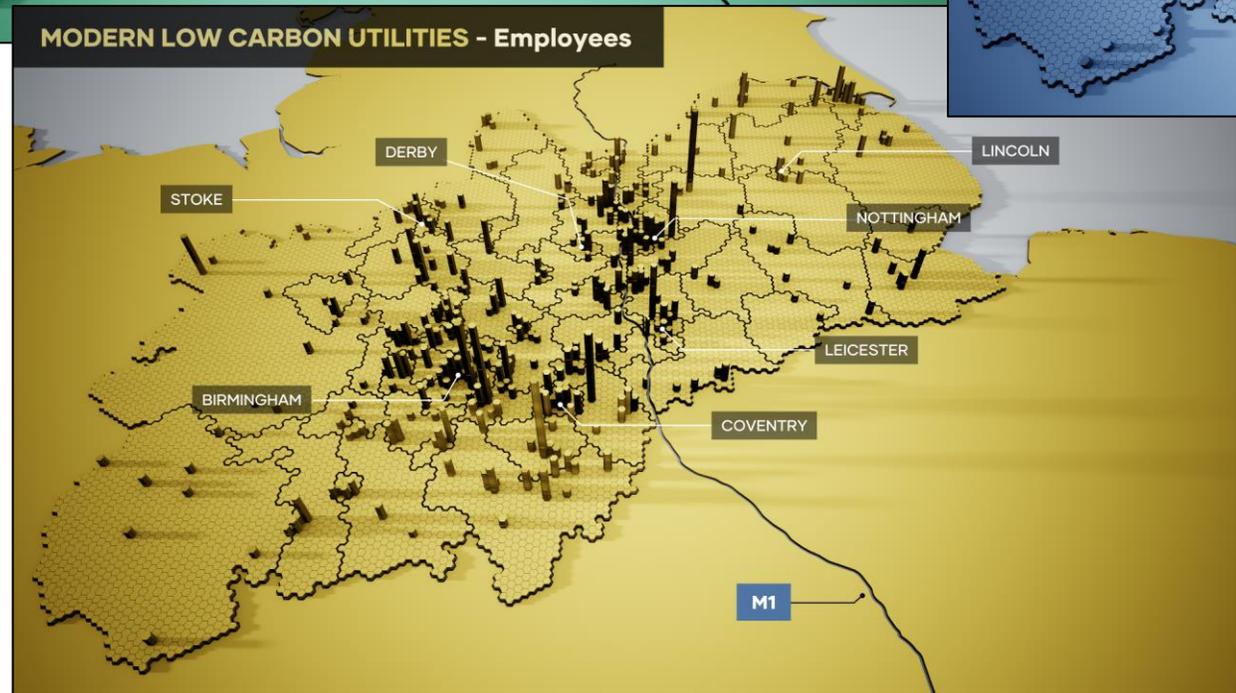
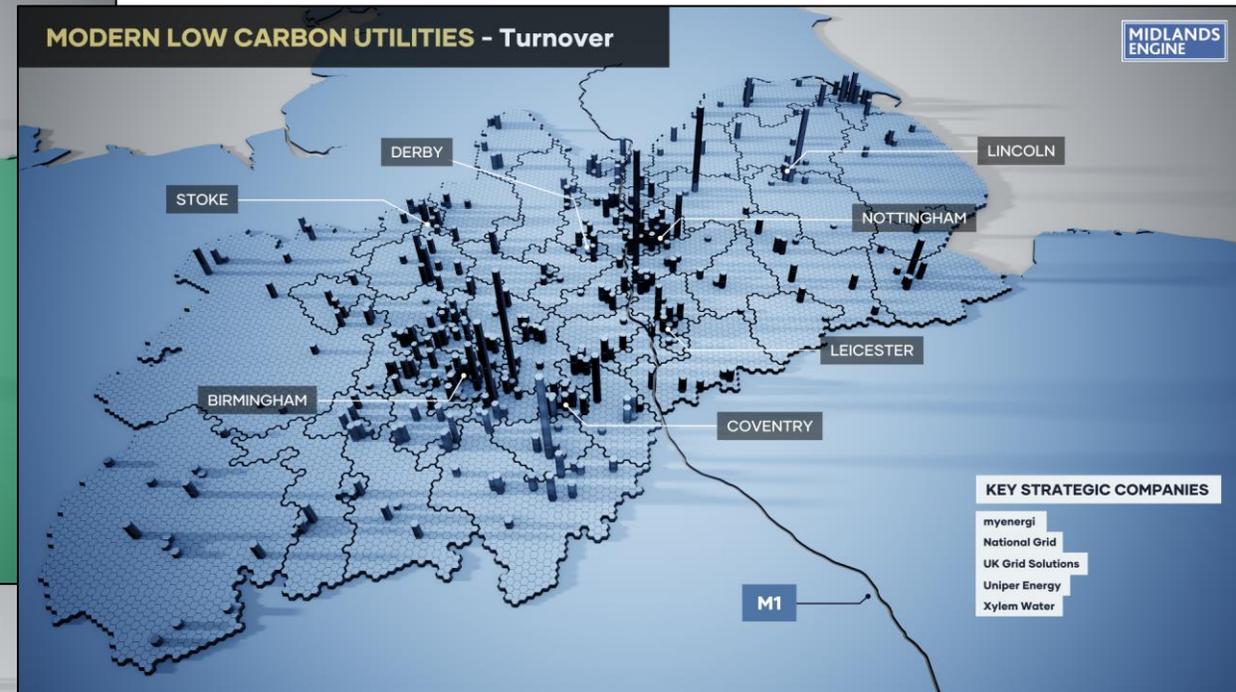
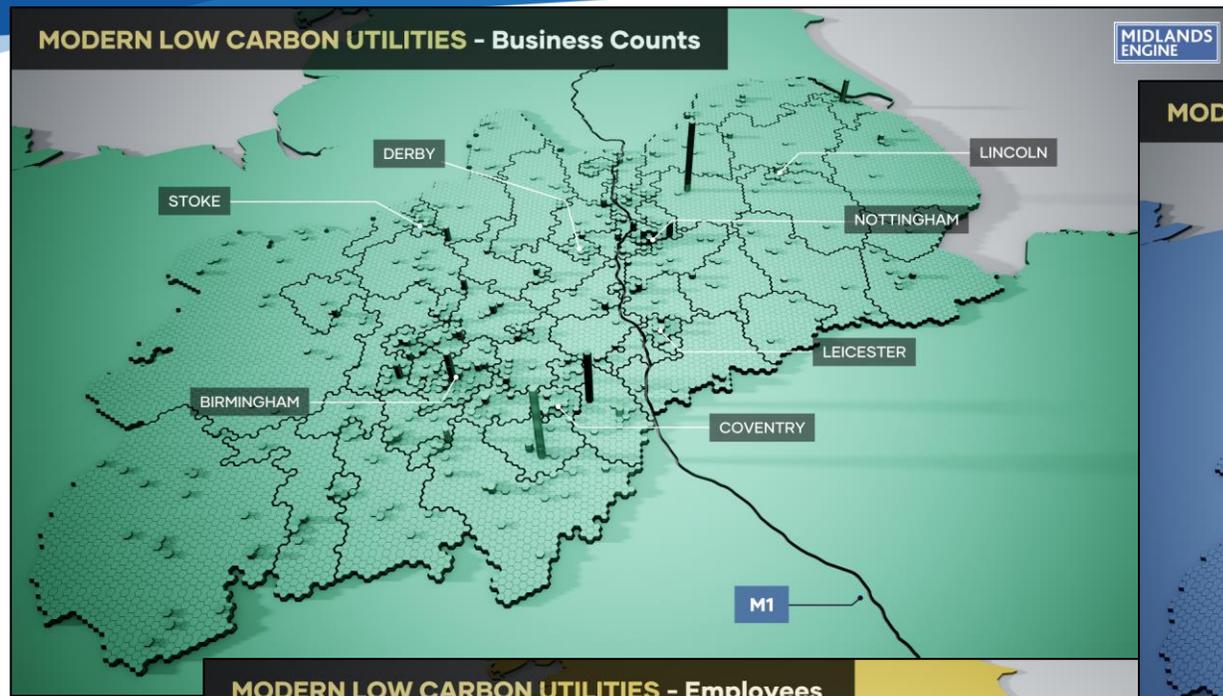
Innovation Ecosystem

- **6 high growth companies which utilised accelerators.**
- **Relevant Cluster Organisations:** the Energy and Utilities Alliance; Energy UK.
- **Relevant high performing HEI research:** Universities of Birmingham; Keele; Leicester; Loughborough; Nottingham; Warwick.
- **Significant Innovation Hubs include** the Energy Research Accelerator.
- **1 High Growth Company Grant.**
- **£75m Innovate UK Funding since 2005;** 19% of Innovate UK funding to utilities had a Midlands location.

Investment Ecosystem

- **20% FDI into High Growth Companies.** 5 of 25 investments in High Growth Companies.
- **\$2.57bn FDI Capex 2017-21.** 4% of UK total.
- **\$710.25m DDI Capex 2017-21.** 7% of UK total.
- **651 FDI Jobs 2017-2021.** 8% of UK total.
- **915 DDI Jobs 2017-2021.** 16% of UK total.
- **4 FDI Projects 2017-2021.** 3% of UK total.
- **15 DDI projects 2017-2021.** 18% of UK total.
- **Mean av. £499k fundraising investment.** £10.4m in 25 investments (inc. £325k across 15 seed investments; £10.1m across 4 venture investments).

MODERN AND LOW-CARBON UTILITIES



Business Ecosystem

- **61 Total Cluster Business Count.** 7% of UK; 126% growth since 2013.
- **0 £100m+ Turnover Companies.**
- **7 High Growth Companies.** 13% of all in the UK have a Midlands location.
- **17 Incorporations between 2017-22.** 8% of UK utilities incorporations between 2017 and 2022 have a Midlands location.
- **10% Foreign-owned enterprises.** 6 are known to be foreign-owned; Lower proportion of foreign-owned than national average (21%).

Talent Ecosystem

- **369 Estimated Employees.** 5% of national.
- **Average salary £34,530.** Energy national average £38,280 (9.8% lower in Midlands).
- **18,550 Further Education Leavers.**
- **Relevant HEI High-Ranking Department:** Universities of Nottingham; Birmingham; Warwick; and Loughborough.
- **10,320 University Graduates.** 7% of ME graduates studied relevant subjects to offshore wind.
- **89.2% Graduate Retention change over 3 years.** Net loss of graduates working in utilities - other regions perform slightly better but numbers are small.

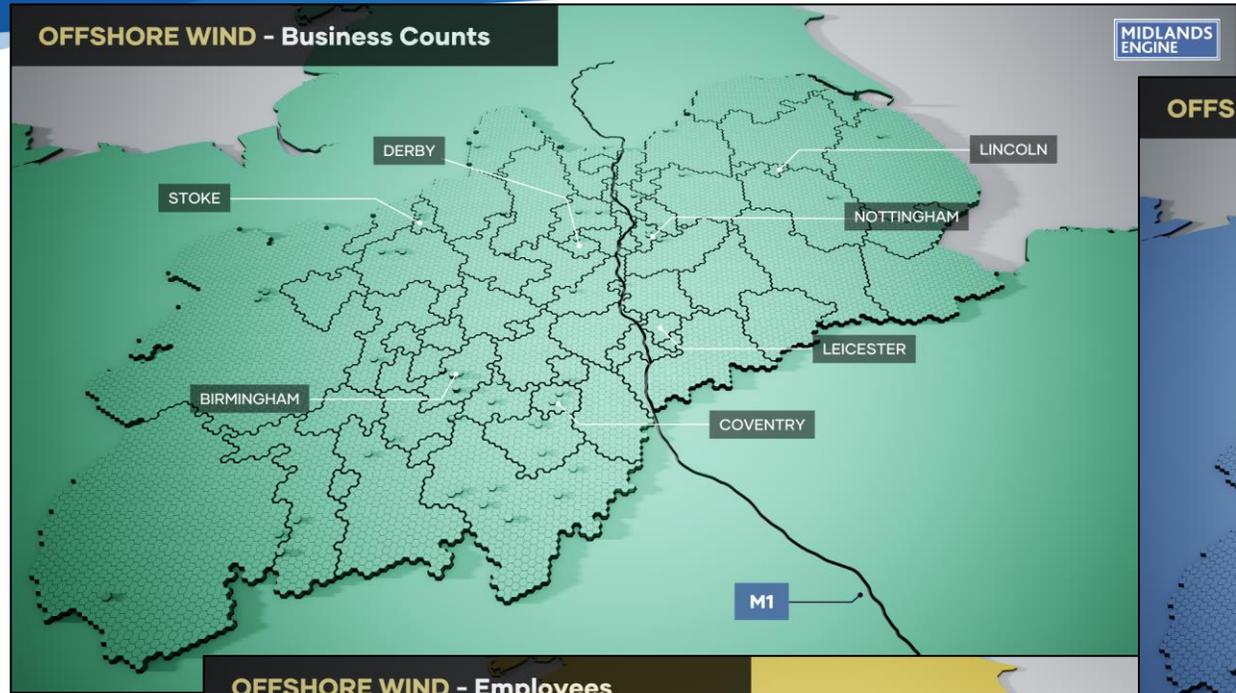
Innovation Ecosystem

- **17 high growth companies which utilised accelerators.**
- **Relevant Cluster Organisations:** Humber Offshore Wind Cluster; RenewableUK; Energy Research Accelerator.
- **1 Relevant Spinout.**
- **Relevant high performing HEI research:** Universities of Birmingham; De Montfort; Keele; Leicester; Loughborough; Nottingham; Nottingham Trent; Warwick.
- **Significant Innovation Hubs:** Energy Research Accelerator; Energy Systems Catapult; Humber Offshore Wind Cluster; Offshore Renewable; Energy Catapult.
- **14 High Growth Company Grant.**
- **£3.7m Innovate UK Funding since 2005;** 42% of Innovate UK funding to offshore wind businesses had a Midlands location.

Investment Ecosystem

- **36% FDI into High Growth Companies.** 30 of 84 investments in High Growth Companies.
- **\$2.5bn FDI Capex 2017-21.** 6% of UK total.
- **Unknown DDI Capex 2017-21.** 1 project, value unknown..
- **382 FDI Jobs 2017-2021.** 6% of UK total.
- **30 DDI Jobs 2017-2021.** 3% of UK total.
- **1 FDI Projects 2017-2021.** 1% of UK total.
- **1 DDI projects 2017-2021.** 17% of UK total.
- **Mean av. £1.7m fundraising investment.** £102.3m in 60 investments (inc.£50.3m across 33 seed investments; £40m across 15 venture investments).

OFFSHORE WIND



Business Ecosystem

- **79 Total Cluster Business Count.** 27% of UK; the second largest number of any region. 55% growth since 2013.
- **2 £100m+ Turnover Companies.** 33% of all in the UK have a Midlands location.
- **4 High Growth Companies.** 26% of all in the UK have a Midlands location.
- **15 Incorporations between 2017-22.** 26% of UK utilities incorporations between 2017 and 2022 have a Midlands location.
- **20% Foreign-owned enterprises.** 16 are known to be foreign-owned; same proportion of foreign-owned than national average (11%).

Talent Ecosystem

- **2,020 Estimated Employees.** 15% of UK total.
- **Average salary £34,530.** Energy national average £38,280 (9.8% lower in Midlands).
- **18,630 Further Education Leavers.**
- **Relevant HEI High-Ranking Department:** Universities of Nottingham; Birmingham; Warwick; and Loughborough.
- **14,480 University Graduates.** 10% of Midlands university graduates studied relevant subjects to nuclear.
- **89.2% Graduate Retention change over 3 years.** Net loss of graduates working in utilities (the wider relevant sector) - other regions perform slightly better but numbers are small.

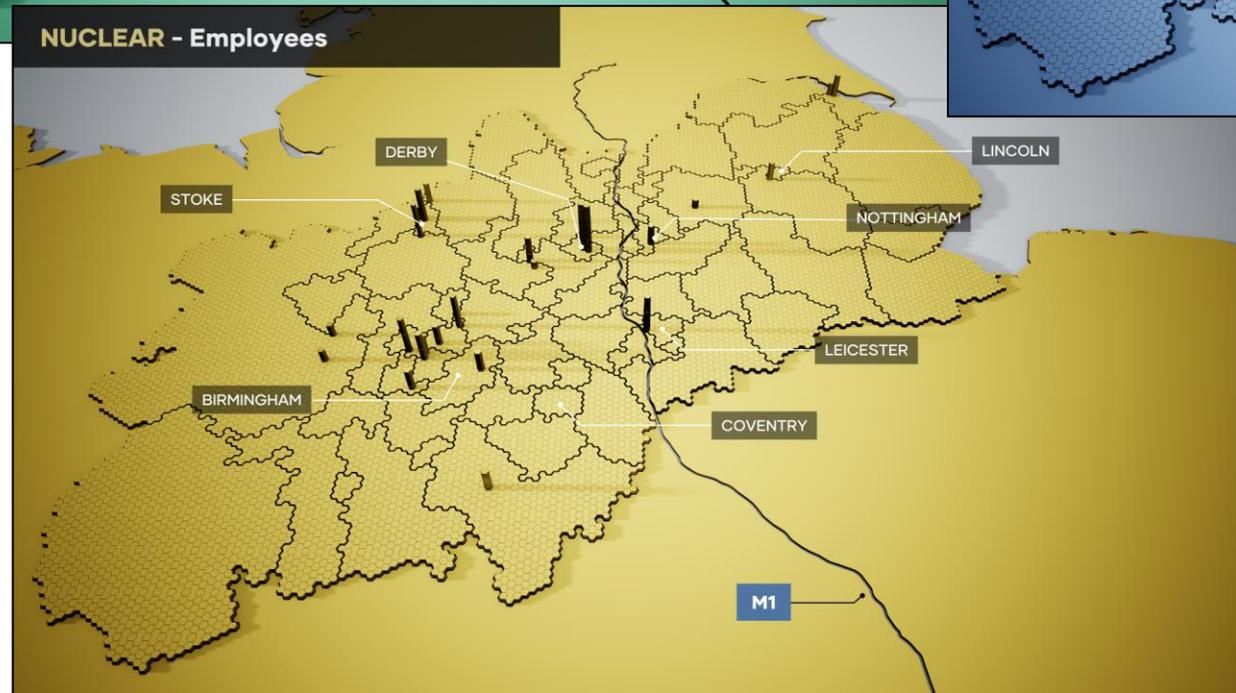
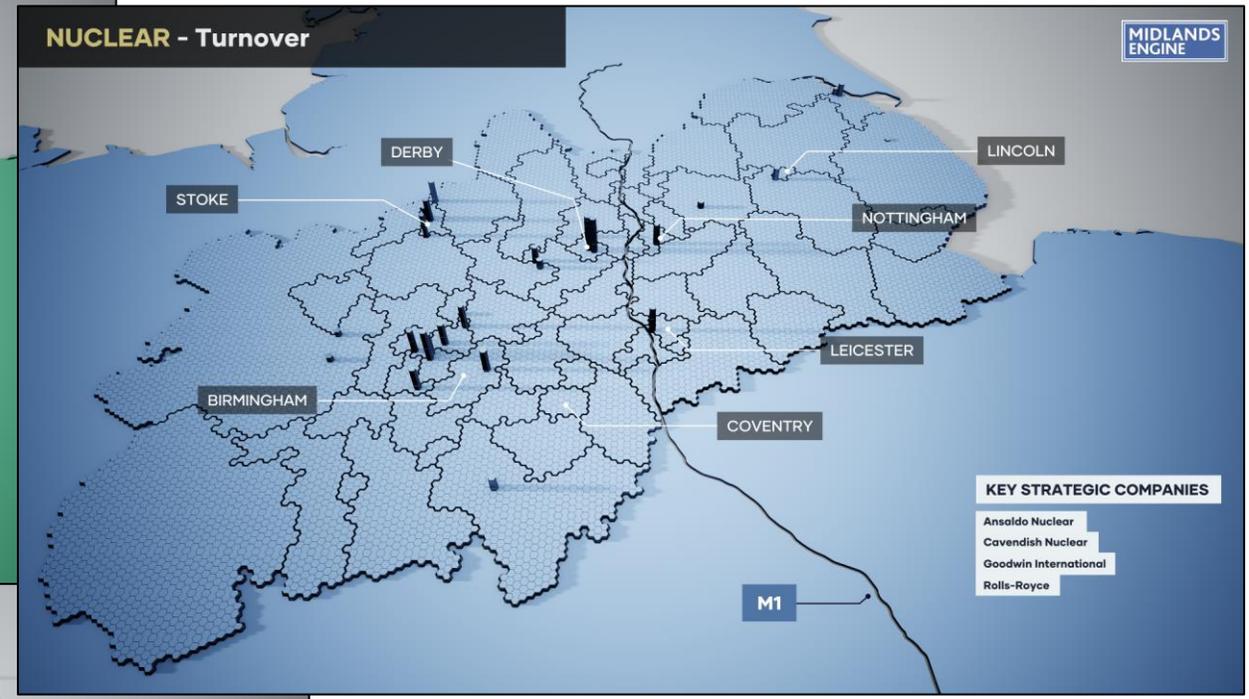
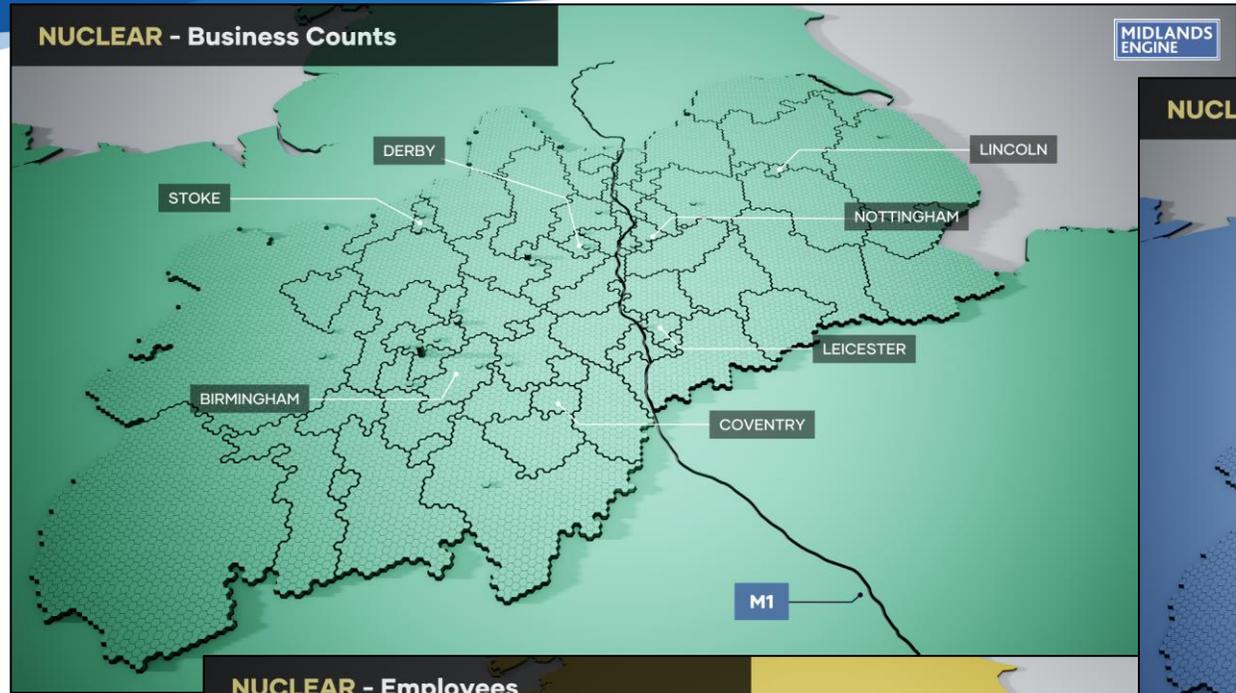
Innovation Ecosystem

- **17 high growth companies which utilised accelerators.**
- **Relevant Cluster Organisations:** the Nuclear Industry Association; Nuclear Advanced Manufacturing Research Centre; Midlands Nuclear.
- **1 relevant spinout.**
- **Relevant high performing HEI research:** Universities of Birmingham; Coventry; De Montfort; Keele; Leicester; Loughborough; Nottingham, Nottingham Trent; Warwick.
- **Significant Innovation Hubs include** Nuclear Advanced Manufacturing Research Centre; Infinity Park Derby; Energy Research Accelerator.
- **14 High Growth Company Grant.**
- **£1.1m Innovate UK Funding since 2005;** 28% of Innovate UK funding to nuclear businesses had a Midlands location.

Investment Ecosystem

- **36% FDI into High Growth Companies.** 30 of 84 investments in 'energy' High Growth Companies.
- **Mean av. £2m fundraising investment.** £168.8m in 84 investments 'energy' (inc. £7.1m across 40 seed investments; £51.4 across 23 venture investments).

NUCLEAR



Business Ecosystem

- **3,555 Total Cluster Business Count.** 18% of UK; 83% growth since 2013.
- **96 £100m+ Turnover Companies.** 27% of all in the UK have a Midlands location.
- **251 High Growth Companies.** 15% of all in the UK have a Midlands location.
- **1,089 Incorporations between 2017-22.** 15% of UK circular economy incorporations between 2017 and 2022 have a Midlands location.
- **16% Foreign-owned enterprises.** 566 are known to be foreign-owned; higher proportion of foreign-owned than national average (9.9%).

Talent Ecosystem

- **83,697 Estimated Employees.** 11% of national.
- **Average salary £33,436.** National average £34,854 (4.1% lower in Midlands).
- **Relevant HEI High-Ranking Department:** Universities of Nottingham; Birmingham; Warwick; and Loughborough.
- **1,810 University Graduates.** 1% of Midlands university graduates studied relevant subjects to the circular economy.
- **91.7% Graduate Retention change over 3 years.** In relevant industries - manufacturing and construction - the West Midlands has a strong record of retaining graduates and attracting them from other parts of the country. There is a net positive intake of 10% of graduates to these industries.

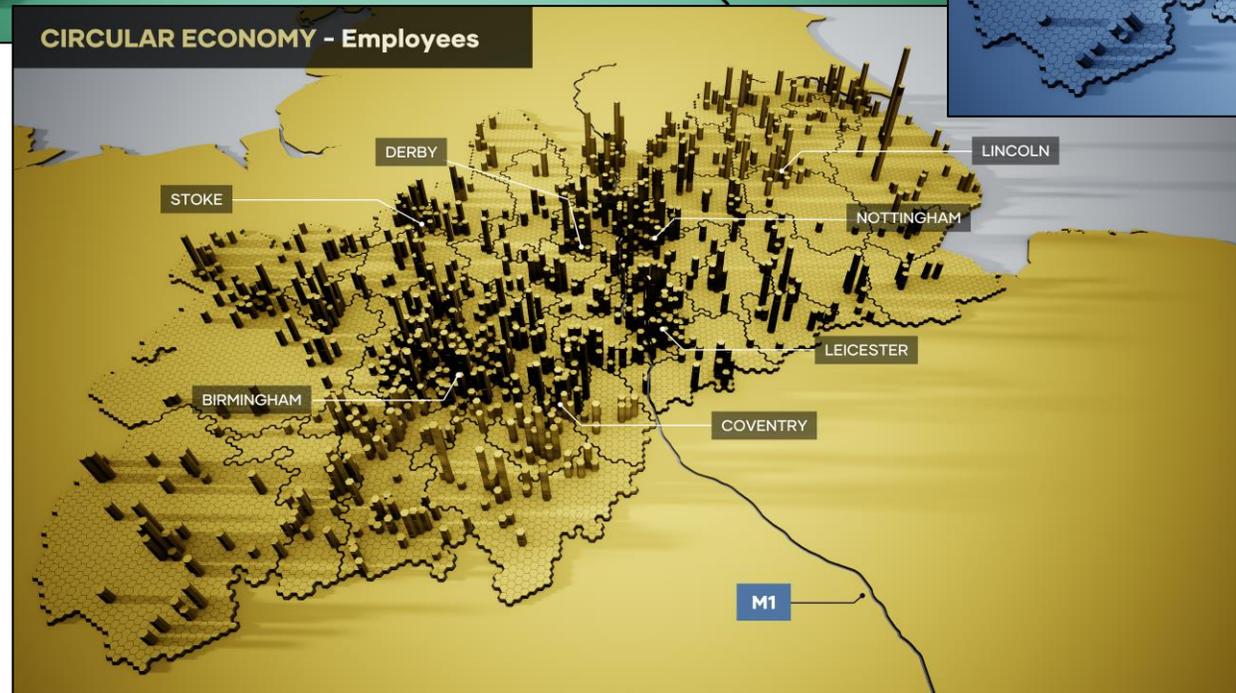
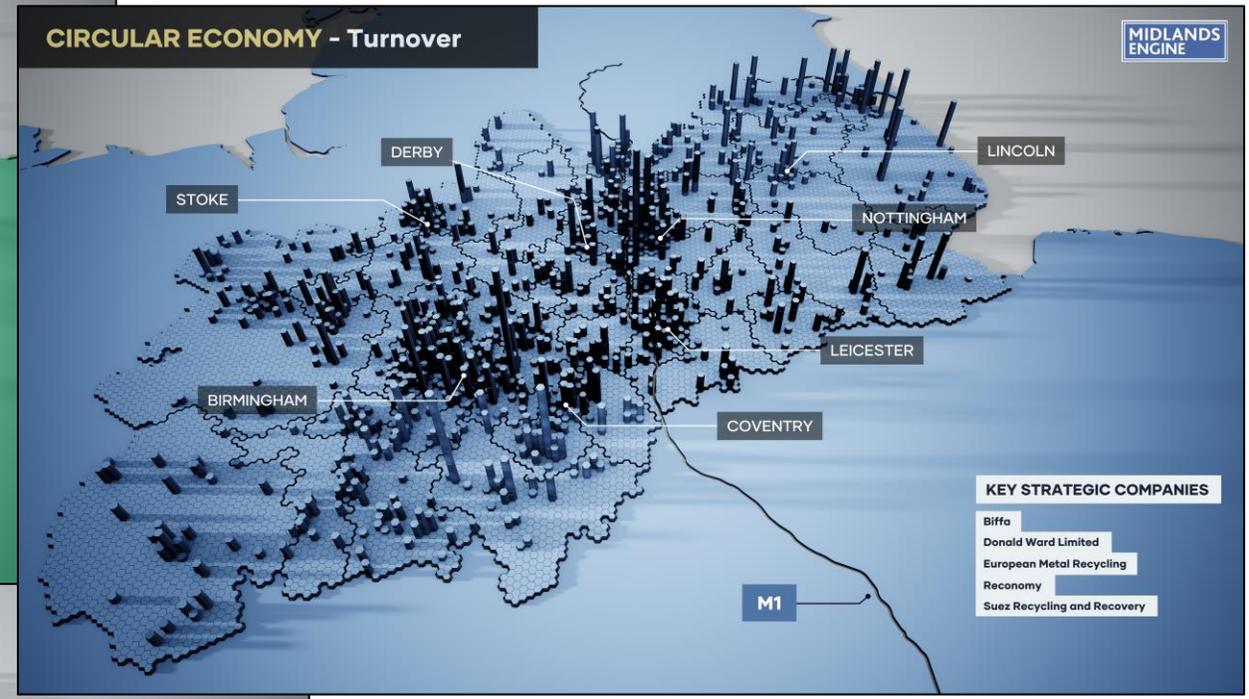
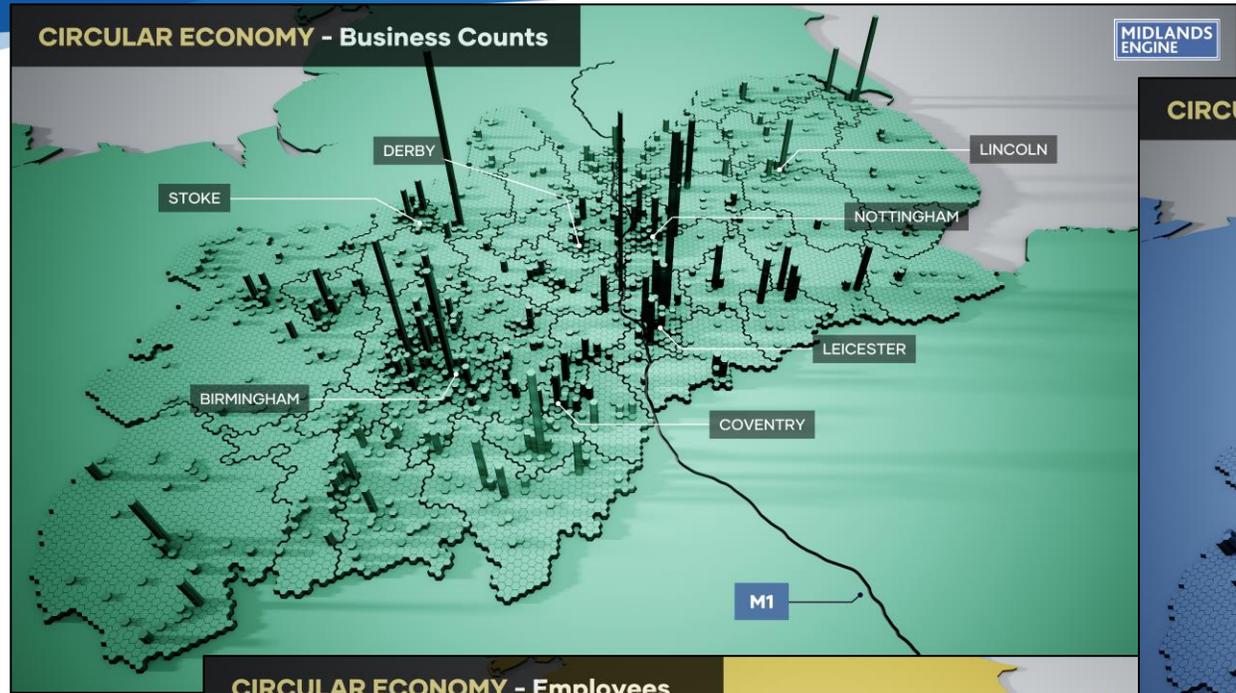
Innovation Ecosystem

- **Relevant Cluster Organisations:** Sustainability West Midlands; Circular Economy Club; Innovation Alliance for the West Midlands.
- **Relevant high performing HEI research:** Universities of Birmingham; Loughborough; Nottingham; Leicester; Nottingham Trent; De Montfort.
- **Significant Innovation Hubs include** Warwick Manufacturing Group; Circular Economy Research Network (CERN); Energy and Bioproducts Research Institute (EBRI); Centre for Circular Economy and Advanced Sustainability (CEAS); Environmental Technologies and Resource Efficiency Support Services (EnTRESS); Centre for Materials Research; Loughborough University's Centre for Sustainable Manufacturing and Recycling Technologies .
- **£518m Innovate UK Funding since 2005;** 42% of Innovate UK funding to circular economy businesses had a Midlands location.

Investment Ecosystem

- **\$63.6m FDI Capex 2017-21.** 11% of UK total
- **\$33.14m DDI Capex 2017-21.** 19% of UK total.
- **152 FDI Jobs 2017-2021.** 22% of UK total.
- **150 DDI Jobs 2017-2021.** 13% of UK total.
- **5 FDI Projects 2017-2021.** 3% of UK total.
- **21 DDI projects 2017-2021.** 8% of UK total.

CIRCULAR ECONOMY



Business Ecosystem

- **215 Total Cluster Business Count.** 17% of UK; 252% growth since 2013.
- **4 £100m+ Turnover Companies.** 50% of all in the UK have a Midlands location.
- **17 High Growth Companies.** 59% of all in the UK have a Midlands location.
- **128 Incorporations between 2017-22.** 16% of UK net zero transport incorporations between 2017 and 2022 have a Midlands location.
- **4% Foreign-owned enterprises.** 14 are known to be foreign-owned; higher proportion of foreign-owned than national average (1%).

Talent Ecosystem

- **3,882 Estimated Employees.** 22% of national.
- **Average salary £41,986.** National average £43,556 (2% higher in Midlands).
- **Relevant HEI High-Ranking Department:** Universities of Nottingham; Birmingham; Warwick; Loughborough
- **9,530 University Graduates.** 7% of Midlands university graduates studied relevant subjects to net zero transport.
- **97.3% Graduate Retention change over 3 years.** In relevant industries - manufacturing – the West Midlands has the strongest manufacturing retention outside of London and the East regions.

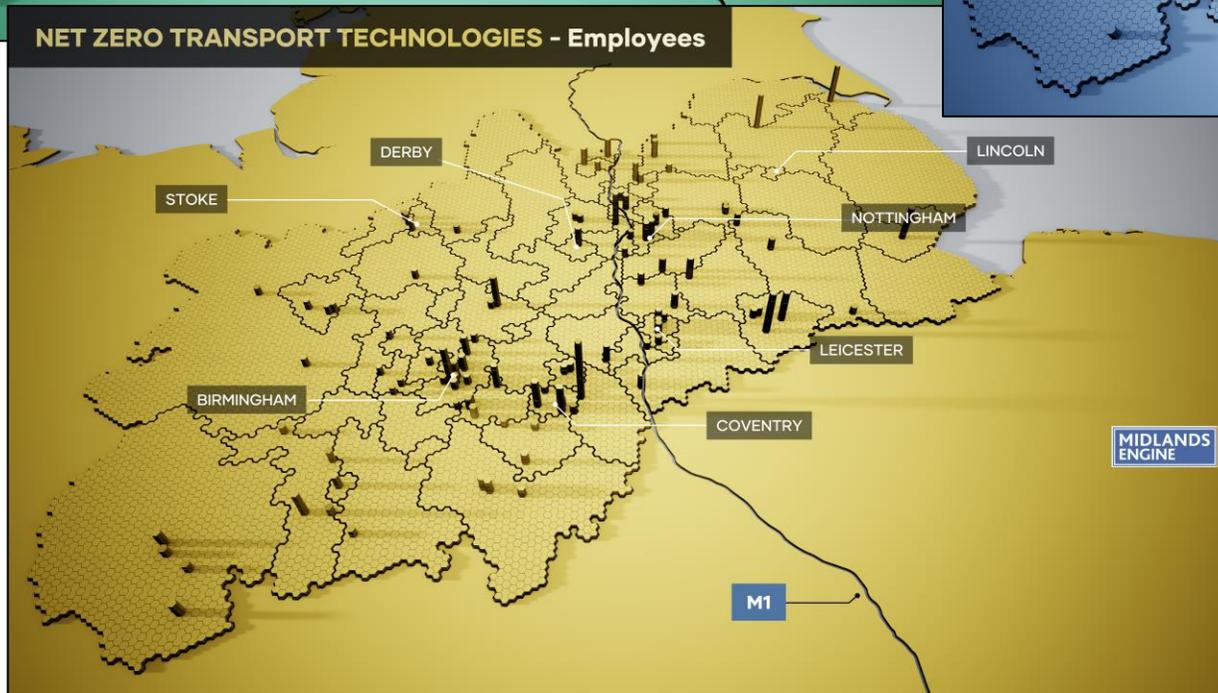
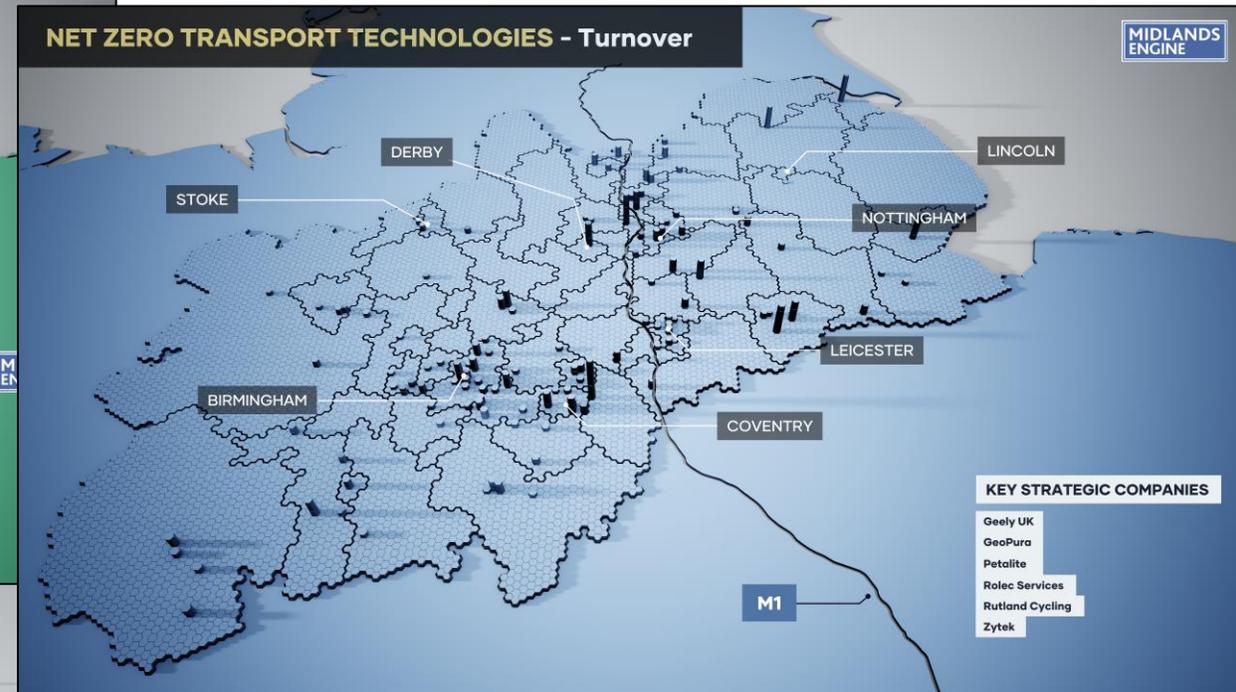
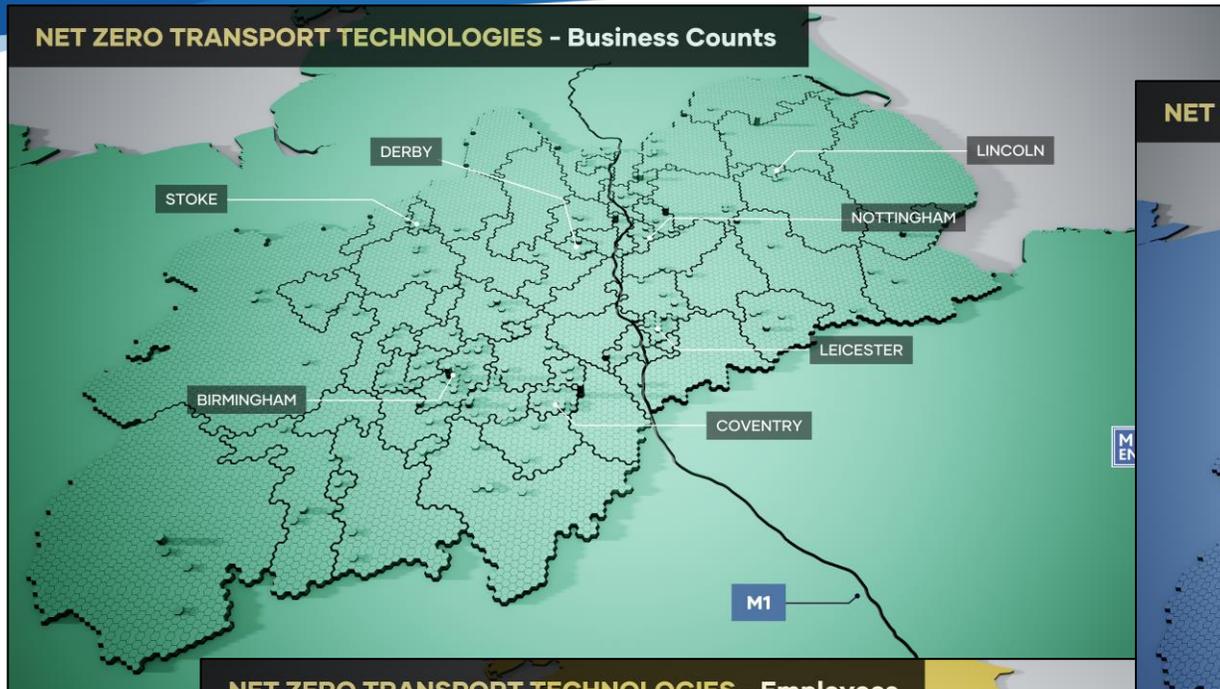
Innovation Ecosystem

- **38 high growth companies which utilised accelerators.**
- **Relevant Cluster Organisations:** MakeUK; Society of Motor Manufacturers and Traders; Midlands Aerospace Alliance; Energy Research Accelerator; Innovation Alliance for the West Midlands
- **17 relevant spinouts.**
- **Relevant high performing HEI research:** Universities of Keele; Loughborough; Nottingham Trent; Birmingham; Leicester; Nottingham; Warwick
- **Significant Innovation Hubs include** MIRA Technology Park; Manufacturing Technology Centre; Warwick Manufacturing Group; UK Battery Industrialisation Centre; Loughborough University Science & Enterprise Park; Energy Research Accelerator, H2GVMids; Advanced Propulsion Centre; National Transport Design Centre (NTDC); Power Electronic and Machines Centre Nottingham University
- **86 High Growth Company Grants.**
- **£27m Innovate UK Funding since 2005;** 28% of Innovate UK funding to net zero transport businesses had a Midlands location.

Investment Ecosystem

- **48% FDI into High Growth Companies.** 15 of 36 investments in High Growth Companies.
- **\$2.67bn FDI Capex 2017-21.** 7% of UK total
- **\$710.25m DDI Capex 2017-21.** 49% of UK total.
- **651 FDI Jobs 2017-2021.** 6% of UK total.
- **951 DDI Jobs 2017-2021.** 51% of UK total.
- **4 FDI Projects 2017-2021.** 11% of UK total.
- **15 DDI projects 2017-2021.** 22% of UK total.
- **Mean av. £1.4m fundraising investment.** £333.5m in 235 investments (inc. £69.6m across 116 seed investments; £96.6 across 73 venture investments).

NET ZERO TRANSPORT TECHNOLOGIES



Universities and Zero Carbon technologies in the Midlands – major R&D assets

Key:

- University
- Hydrogen
- Renewable energy
- Nuclear
- Biomass energy
- Battery technology and energy storage
- Electrics and grid technology

WOLVERHAMPTON

- University of Wolverhampton

BIRMINGHAM

- Energy Systems Catapult
- Energy Research Accelerator
- Midlands Nuclear
- University of Birmingham
- Tyseley Energy Park
- Birmingham Energy Institute
- Birmingham City University
- Birmingham Energy Innovation Centre
- Birmingham Centre for Energy Storage
- Reusing and Recycling Energy Technologies
- Birmingham Centre for Nuclear Education and Research
- Aston University
- Energy and bioproducts research Institute (EBRI)
- Supergen Bioenergy Hub

STOKE-ON-TRENT

- Keele University
- HyDEX
- HyDeploy
- Smart Energy Network Demonstrator
- Staffordshire University

DERBY

- High Value Manufacturing Catapult East Midlands (Nuclear AMRC)
- University of Derby

HEREFORD

- University of Worcester

WORCESTER

COVENTRY

- MIRA Technology Park and Institute
- UKBIC
- Advanced Propulsion Centre
- West Midlands Gigafactory
- Coventry University
- University of Warwick Wellesbourne Campus
- Driving the Electrification Revolution Centres
- Energy Innovation Centre

NOTTINGHAM

- Ratcliffe-on-Soar Power station
- West Burton fusion reactor
- Trent Basin demonstrator (Community Energy demonstrator)
- British Geological Survey
- CDT in Sustainable Hydrogen
- CDT in Sustainable Electric Propulsion
- CDT in Biotechnology and Biological Sciences
- CDT in Resilient Decarbonised Fuel Energy Systems

- Nottingham Trent University
- University of Nottingham
- Energy Technologies Building
- Power Electronics and Machines Centre
- Research Acceleration and Demonstration Building
- East Midlands Hydrogen Innovation Zone
- Electrical lab
- UK GeoEnergy Test Bed Platform

LINCOLN

- Spalding battery energy storage
- ABLE Humber Port – ABLE Marine Energy Park
- University of Lincoln

LEICESTER

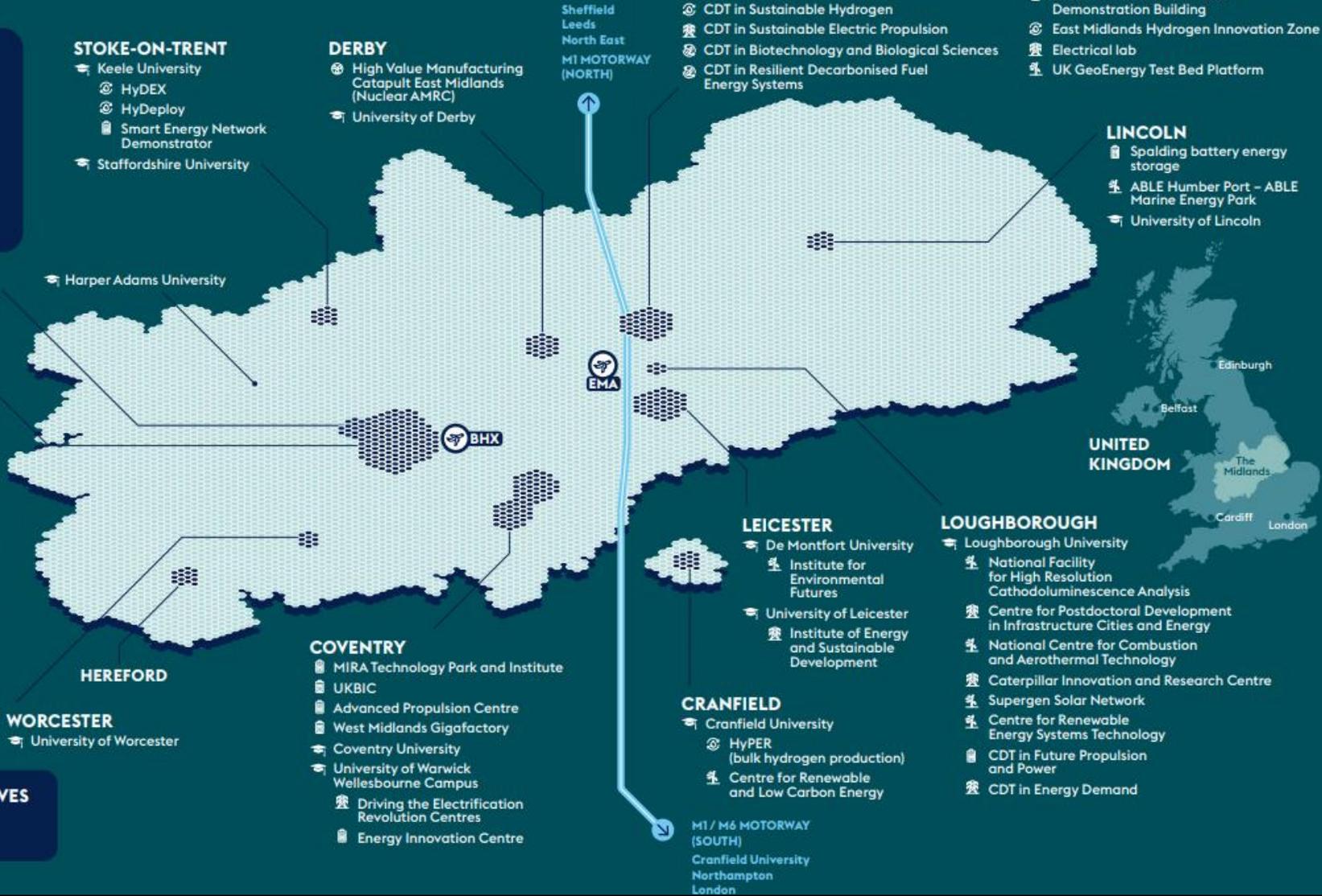
- De Montfort University
- Institute for Environmental Futures
- University of Leicester
- Institute of Energy and Sustainable Development

LOUGHBOROUGH

- Loughborough University
- National Facility for High Resolution Cathodoluminescence Analysis
- Centre for Postdoctoral Development in Infrastructure Cities and Energy
- National Centre for Combustion and Aerothermal Technology
- Caterpillar Innovation and Research Centre
- Supergen Solar Network
- Centre for Renewable Energy Systems Technology
- CDT in Future Propulsion and Power
- CDT in Energy Demand

CRANFIELD

- Cranfield University
- HyPER (bulk hydrogen production)
- Centre for Renewable and Low Carbon Energy



UNITED KINGDOM



REGION WIDE INITIATIVES

- Nuclear Institute, Midlands Branch

Biomass

- Tyseley Energy Park (TEP) (Birmingham)
- Webster and Horsfall (Birmingham)
- Birmingham Energy Innovation Centre (BEIC) (Birmingham)
- Energy and Bioproducts Research Institute (EBRI) (Birmingham)
- Supergen Bioenergy Hub (Birmingham)
- Centre for Doctoral Training (CDT) in Resilient Decarbonised Fuel Energy Systems (Nottingham)

- Biomass generates the same amount of electricity each year as four Sizewell B nuclear powerplants – over 12% of UK generating capacity
- Biomass generating capacity at the Tyseley Energy Park generates sustainable power equivalent to the needs of 17,000 local homes.
- The Supergen Bioenergy Hub recently received £5m to further its pioneering research into sustainable bioenergy systems that support the UK’s transition to an affordable, resilient, low-carbon energy future.

Nuclear

- Nuclear Advanced Manufacturing Research Centre (AMRC) (Derby)
- Energy Research Accelerator (Midlands-wide)
- National Centre for Nuclear Robotics (Birmingham)
- West Burton A power station (Nottinghamshire)
- Nuclear Skills Academy (Derby)
- Midlands Nuclear (Birmingham)
- Rolls Royce nuclear cluster (Derby)
- Assystem (Derbyshire)
- Cavendish Nuclear (Leicestershire)
- Goodwin International (Stoke-on-Trent)
- Ansaldo Nuclear (Wolverhampton)
- Kuka Systems UK (Birmingham)
- Birmingham Centre for Nuclear Education and Research (Birmingham)

- The world’s first nuclear fusion plant could be built in the East Midlands;
- Almost 5,000 people work in the civil nuclear sector in the Midlands.
- Rolls Royce are developing the world’s first Small Modular Reactor, supported by £210m from the Advanced Nuclear Fund.

Hydrogen

- Worcester-Bosch, Baxi and Vaillant (hydrogen boilers and heating solutions)
- Cadent (gas distribution network)
- East Midlands Hydrogen Innovation Zone
- Intelligent Energy, Ballard and Adelan (fuel cells)
- Porterbrook and Alstom (hydrogen trains)
- Toyota (hydrogen vehicles)
- Caterpillar, Faun Zoeller and JCB (heavy vehicles)
- Luxfer Gas Cylinders (hydrogen storage)
- ITM (hydrogen generation)
- Energy Research Accelerator (Midlands-wide)
- HyDEX & HyDeploy (Keele University, Staffordshire)
- Humber industrial cluster (The Humber)
- The Hydrogen Works (Loughborough)

- The Midlands Engine Hydrogen Technologies Strategy could deliver: 167,000 new or safeguarded jobs
- £10bn of additional Gross Value Added (GVA) and a 29% reduction in CO 2 (17m tonnes).
- Transport for West Midlands aims to have over 120 hydrogen fuelled buses on the road by 2024.

Renewables

- ABLE Marine Energy Park (Immingham)
- SUPERGEN Supersolar Hub (Loughborough)
- National Facility for High Resolution Cathodoluminescence Analysis (Loughborough)
- Centre for Renewable Energy Systems Technology (CREST) (Loughborough)
- Institute for Environmental Futures (Leicester)
- UK GeoEnergy Test Bed Platform (Loughborough)

- Solar power on rooftops in the Midlands alone could reduce greenhouse gas emissions by 187 kilo-tonnes of CO2 .
- The UK’s offshore wind fleet is due to more than treble in size by 2030. Based on existing deployment, this could mean that over 3 million homes in the Midlands are powered by offshore wind by 2030, reducing emissions by 4.2 megatonnes of CO2 .
- Lincolnshire hosts the world’s biggest offshore windfarm, generating 18% of England’s renewable generating capacity.

Battery technology and energy storage

- UK Battery Industrialisation Centre (UKBIC) (Coventry)
- Birmingham Centre for Energy Storage (Birmingham)
- Reusing and Recycling Energy Technologies (Birmingham)
- West Midlands Gigafactory (Coventry)
- Energy Innovation Centre (Coventry)
- Research Acceleration and Demonstration Building (Nottingham)
- Smart Energy Network Demonstrator (Keele University, Staffordshire)
- Advanced Propulsion Centre (APC) (Coventry)
- MIRA Technology Park and Institute (Nuneaton)
- Spalding Battery Energy Storage (Lincolnshire)
- Trent Basin demonstration (Birmingham)

- 30% of renewable electricity generated in the Midlands comes from wind, and 25% from solar.
- The UK Battery Industrialisation Centre is a £130m, 20,000m² facility supporting battery manufacturing in the UK.

Smart grid technology

- Smart Energy Network Demonstrator (SEND) (Horwood Energy Centre, Keele University)
- West Midlands Regional Energy System Operator (RESO) (Coventry)
- Trent Basin (Nottingham)
- Power Electronics and Machines Centre (PEMC) (Nottingham)
- Driving the Electric Revolution Industrialisation Centre – Midlands (DER Midlands Industrial Centre)

- With a steady deployment of smart grids by 2050, the Midlands could see:
- A reduction of approximately 80% of CO₂ emissions compared to 1990 levels.
 - Up to £9bn in cost savings.
 - Additional GVA of £1.5bn.
 - 1,400 new jobs.

Electrics and Grid Technology

- Driving the Electrification Revolution (Coventry)
- Electrical Lab (Nottingham)
- Institute of Energy and Sustainable Development (Leicester)
- Power Electronics and Machines Centre (Nottingham)
- CDT in Sustainable Electric Propulsion (Nottingham)

Innovation

The University of Warwick and the University of Nottingham are both in the Top 5 recipients of the £885m of Innovate UK Funding allocated across the UK in the last 10 years.

Talent

Home to 20 universities, the Midlands hosts over 350,000 students and 100,000 graduates a year. Our universities will work in partnership with local economic growth organisations to develop tailored skills and training package.

Midlands Mindforge

Midlands Mindforge - £250m patient capital fund combining the spinout portfolios of eight leading UK universities.

Midlands Mindforge is an ambitious, patient capital investment company aiming to transform ground-breaking science and technology into successful businesses with the potential to positively impact our world and accelerate the commercialisation of research from its partner universities - Aston, Birmingham, Cranfield, Keele, Leicester, Loughborough, Nottingham, and Warwick.

EMERGING OPPORTUNITIES

The activity identified in our Ten Point Plan will have a fundamental impact on the people, places and businesses of the Midlands.

By 2041 we will achieve:

PEOPLE



MORE THAN

**196,000
JOBS**

PLACES



**36% CO₂
REDUCTION**
= 20.8 MILLION TONNES

PROSPERITY



MORE THAN

**£24.2
BILLION GVA**

**THE IMPACT OF LOW CARBON
OPPORTUNITIES COULD BE WORTH AN ESTIMATED...**



**+39,000
JOBS**



**+£4.2
BILLION
GVA**

...TO THE MIDLANDS BY 2030

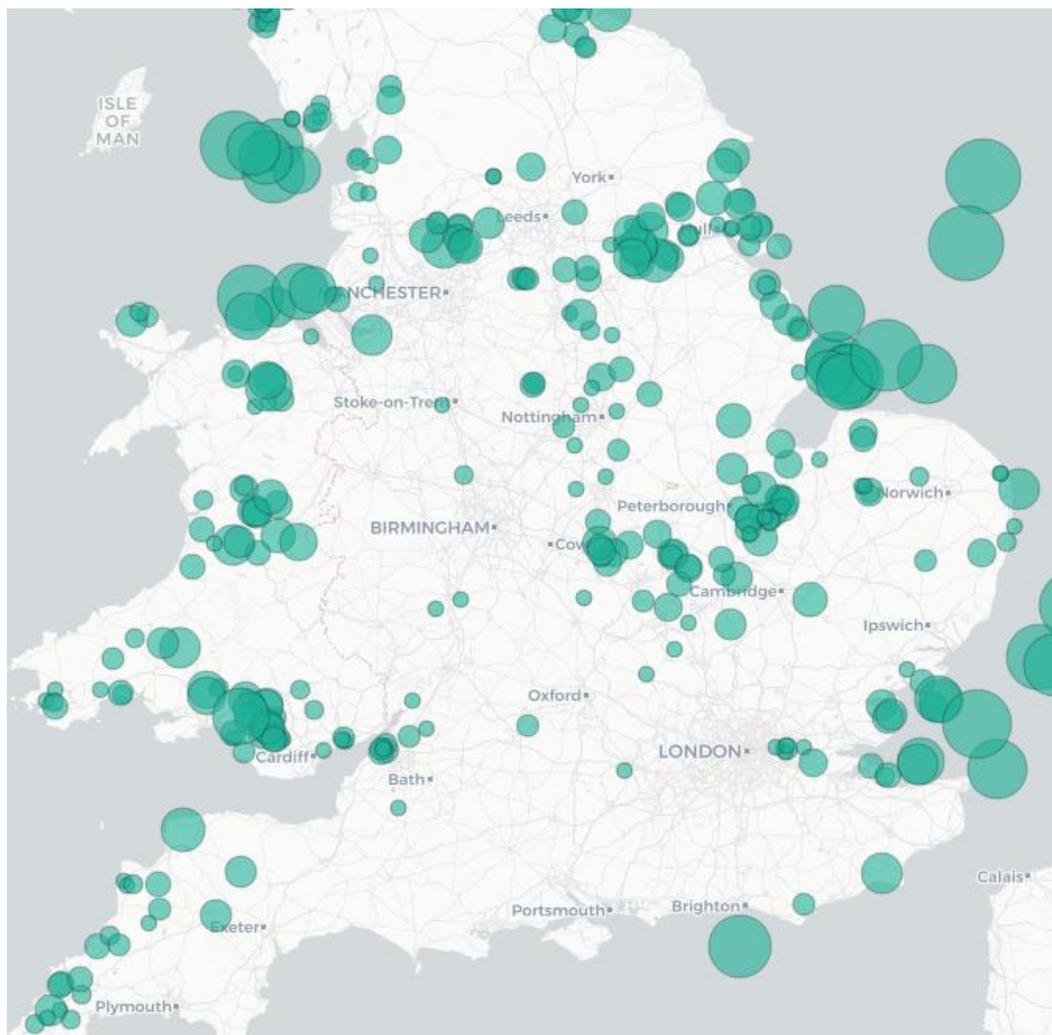
What Could be Made in the Midlands?⁷³

The table shows the developments that might take place in the Midlands Engine to meet higher demands for low carbon goods, and the impact this has on the economy and the environment

Area	Capability	Opportunity and Potential 2030 Impact
Wind	Control systems development	<ul style="list-style-type: none"> - Higher demand for electrical components, sensors, and expertise - Better energy management and efficient use - Consumers could save >£1b a year by 2030 through smart energy management
Energy management		
Smart grids		
HS2 tracking		
Hydrogen	Hydrogen pumps, boilers	- Development of the region as a national leader in hydrogen technology
	Hydrogen vehicles - trains, buses, cars, excavators	
	Hydrogen generation	
Electric Vehicles and batteries	Batteries - production and recycling	<ul style="list-style-type: none"> - Leader in circular economy, supporting SMEs, Coventry Gigafactory - Diverse supply chain, more jobs, regional production, reduce greenhouse gas emissions
	Car and battery components	<ul style="list-style-type: none"> - Higher demand for generic components - Lower carbon emissions in supply chain, supporting region, up to an additional 11,500 jobs by 2050
Wind	Energy generation	- Increased demand in a diverse range of energy sources to meet future need
Solar		
Nuclear		
Biomass and Anaerobic digestion		

3. Midlands Energy Vectors

Operational Wind Energy Sites



Key Docs: [Offshore Wind Snapshot](#)

The sector was worth £4.4bn in 2020 (kMatrix figures)

A target of major direct investment in the UK, the major cluster location for offshore wind & related supply chain is around the Humber Offshore Wind Cluster in North East Lincolnshire. With various research centres and innovation hubs across the Midlands Engine; ORE Catapult, the Energy Research Accelerator and Energy Systems Catapult are three notable networks to engage with in exploring investment opportunities.

Wind Energy sub-sector includes all activities that convert wind power into usable energy. This includes wind farm systems, large and small wind turbines. The sub-sector is divided by size of turbine rather than location (onshore and offshore) because it is easier to differentiate and map supply chain activities in this way. It includes:

- **Wind farm systems** - manufacture, supply, installation, operation and maintenance of integration, power plant, power control, grid entry equipment and systems and electrical and mechanical componentry.
- **Small wind turbines** - manufacture, supply, installation, operation and maintenance of small turbine systems (blades, towers, fixing structures, cowlings, enclosures, gear boxes and drive trains), componentry and research.
- **Large Wind Turbines** - manufacture, supply, installation, operation and maintenance of large turbine systems (blades, towers, fixing structures, cowlings, enclosures, gear boxes and drive trains), componentry and research.

Operational Solar Energy Sites



The sector was worth £2.8bn in 2020 (kMatrix figures)

Analysis by kMatrix suggests that clusters of Solar PV businesses in the Midlands Engine include:

- Shrewsbury and Hadley in Telford (Marches LEP)
- central Nottingham, Corringham, Greasley (D2N2 LEP)
- Shirley, Solihull and Hampton in Arden (GBS LEP)
- Peterborough (GL LEP)

Photovoltaic Energy sub-sector includes all activities that help to convert solar radiation into useable energy. It includes:

- **Chemicals** - production and supply of solar chemicals and solar pond salt.
- **Systems & equipment** - manufacture, supply, installation and maintenance of active and batch systems, clerestory windows, light shelves and tubes, solar box cookers, solar combi-systems and solar lighting design.
- **R&D** - solar power and solar car research.
- **Photovoltaic cells** - manufacture, supply, installation and maintenance of photovoltaic modules, mounting systems, ancillary components, cells and cell materials.
- **Other equipment & chemicals** - manufacture, supply, installation and maintenance of glass houses, convection towers, heliostats, parabolic collectors, turbines, trough collectors, towers and solar trackers.

HYDROGEN

Within this context, it is estimated that partners' actions which will be driven forward from this strategy have the potential to deliver:

PEOPLE



167,000
NEW OR SAFEGUARDED JOBS

PLACES



£10bn GVA

PROSPERITY



29% CO₂ REDUCTION
= 17 MILLION TONNES

Focus area	Jobs creation	Carbon impact	Economic impact (GVA)
1. PRODUCTION, STORAGE & SUPPLY	85,800	21% CO ₂ reduction against current levels = 12.2m tonnes per year	£6,729 million
2. POWER GENERATION, HEAT & DECARBONISATION OF INDUSTRY	14,107	21% CO ₂ reduction against current levels = 12.2m tonnes per year	£1,044 million
3. HYDROGEN FOR TRANSPORT	67,334	8% CO ₂ reduction against current levels = 4.6m tonnes per year	£2,135 million

There is an opportunity for the Midlands to play a significant role in the roll out of hydrogen, including opportunities linked to three core areas of the Hydrogen Technologies strategy:

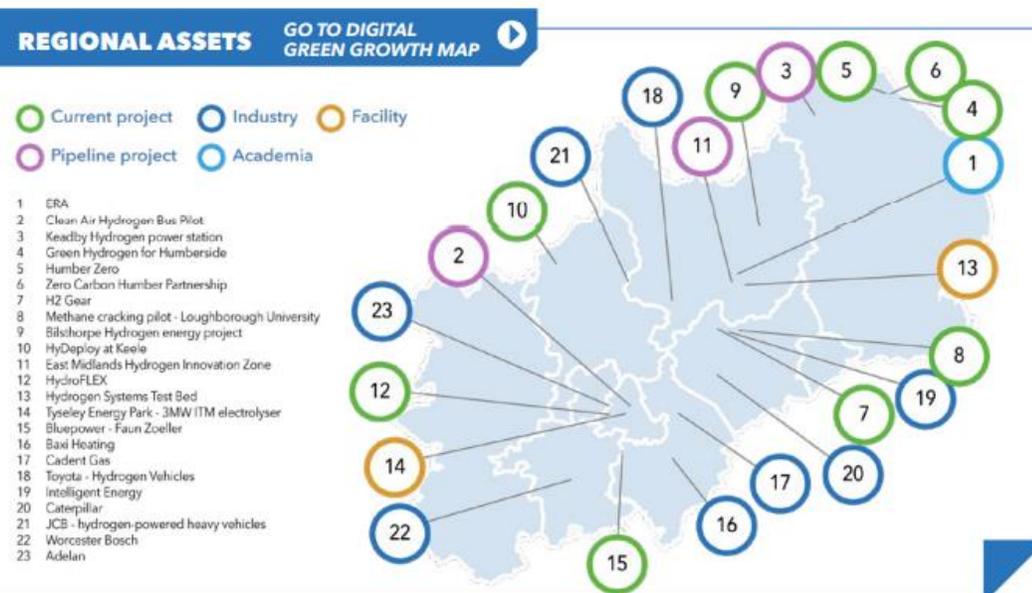
- 1) Hydrogen production and distribution (+85,800 jobs and +£6.7bn GVA)
- 2) Power generation and heat applications (+14,100 jobs and +£1.0bn GVA)
- 3) Transport applications (+67,334 jobs and +£2.1bn GVA)

Key Docs

Factsheets: [Hydrogen Technologies](#)

Reports: [Hydrogen Technologies Strategy](#); [Green Innovation](#)

Regional Hydrogen Assets



19% OF ENGLAND'S HYDROGEN VEHICLE AND INFRASTRUCTURE JOBS BY 2030

ESTIMATED HYDROGEN JOBS TO QUADRUPLE BY 2050

10+ HYDROGEN FUEL CELL DEVELOPMENT PROJECTS ONGOING

The UK Government has committed to a Net Zero Strategy by 2050. The Midlands Engine partnership have translated these national goals into regional objectives with the 2021 Ten Point Plan for Green Growth and the 2022 Midlands Engine Hydrogen Technologies Strategy. To assess progress of these plans, measurement of green jobs is needed, with a focus on hydrogen-related jobs.

Under the report's framework, green jobs can be categorised into three types:

- 1. New and emerging:** occupations that have come into existence as a direct result of the growth and development of the green economy and can be thought of as 'pure' green jobs;
- 2. Enhanced skills and knowledge:** occupations subject to significant changes in work and worker requirements, and;
- 3. Increasing demand:** occupations with an increase in employment demand levels without significant changes in the job requirements.

Key Findings:

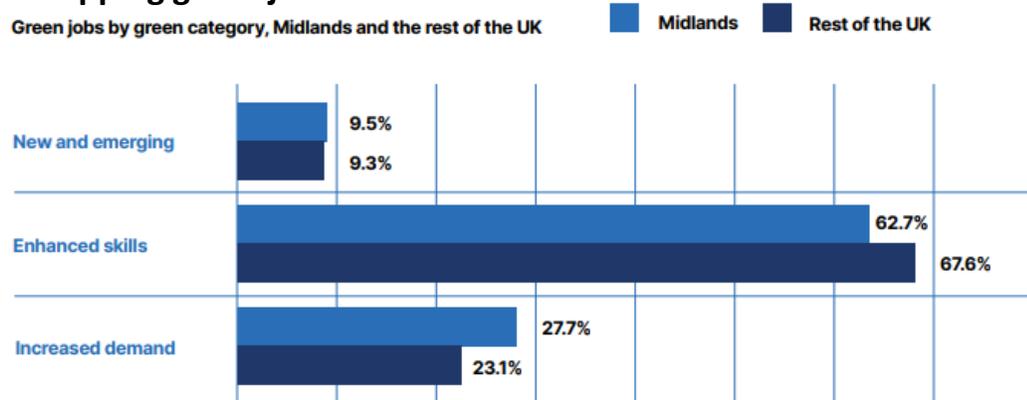
- **Up to 41% of employment in the Midlands region were in occupations classified as green** (that is, either contributing to green activities, and those that are considerably influenced by the green economy), while up to 44% of online job vacancies can be categorised as green.
- **2% of both employment and job vacancies were in occupations classified as new and emerging hydrogen jobs**, whilst over the period 2014- 2022 0.08% of job vacancies mentioned hydrogen, up to 9.5% of employment could be considered as occupations that could contribute to a green hydrogen economy.
- **Of all vacancies that mentioned hydrogen in the UK since end-2020, on average, 17% of these were in the Midlands.** However, compared to total number of job vacancies in the Midlands, the share that explicitly mentioned hydrogen was low and only accounts for 0.08%.
- Green employment in occupations either related to the production, utilisation, or advancement of hydrogen, or in another green occupation which supports the hydrogen industry (**collectively termed green Hydrogen occupations**) **accounted for up to about 10% of employment in the Midlands**, with this share slowly increasing over time.
- Hydrogen employment is mainly revolved around skilled and technical occupational roles, with **about 50% of hydrogen jobs concentrated in manufacturing (21.7%), construction (15.6%), and professional, scientific, and technical sectors (10.7%).**
- Based on vacancy data, **median advertised wages are higher in green jobs than in non-green jobs in the Midlands (£30,600 vs £26,500).** The same is true for the rest of the UK (£33,000 vs £27,750). Median wages are highest for Enhanced Skills and Knowledge jobs (£35,000 in the Midlands vs £37,000 in the rest of the UK), likely driven by the fact that this type includes more senior occupations.

Four categories of jobs are recognised in estimating green jobs:



Mapping green jobs

Green jobs by green category, Midlands and the rest of the UK



In the 2014-22 period, **New and Emerging green jobs accounted for an average 9.5% of all green jobs** – marginally higher than the UK average (9.3%). The Midlands had a lower share of Enhanced Skills green jobs than the rest of the UK (62.7% vs 67.6%) but a higher share of Increased Demand green jobs (27.7% vs 23.1%) changing little since 2014.

Green jobs by SOC2010 major occupational group, Midlands and the rest of the UK (%)

Occupational group	Midlands	UK	Difference
Managers, directors and senior officials	11.8	12.4	-0.6
Professional occupations	27.5	33.1	-5.7
Associate professional and technical	12.4	13.5	-1.1
Administrative and secretarial	2.7	2.9	-0.2
Skilled trades occupations	19.5	18.3	1.3
Caring, leisure and other service	0.1	0.1	0.0
Sales and customer service	4.6	4.4	0.2
Process, plant and machine operatives	14.5	10.8	3.6
Elementary occupations	7.2	4.6	2.5
	100	100	

Top twenty skills demanded in vacancy data by type of green job

New & Emerging	Enhanced Skills	Increased Demand
Communication	Communication	Communication
Attention to detail	Customer service*	Customer service*
Customer service*	Work as a team	Logistics
Work as a team	Attention to detail	Attention to detail
Energy management/energy solutions	SQL*	Work as a team
Electronics	Accounting	Quality standards
Control systems	JavaScript*	Work independently+
Mechanical engineering*	Logistics	Contact customers*
Project management*	Energy management/energy solutions	Lead a team
Civil engineering	Lead a team	Manage a team
Personal development	Project management*	Meet deadlines
Quality standards	SQL Server*	Use IT tools
Lead a team	Manage a team	Follow written instructions
Maintenance and repair	Quality standards	Manage time+
Logistics	Computer science	Adapt to change+
Electrical engineering	Cyber security*	Assist customers*
Chemistry	Risk management	Provide information
Hydraulics	Financial management	Use hand tools
Pneumatics	Work independently+	Communicate with customers
Physics		Work in teams+

Policy recommendations to boost green and hydrogen jobs:

1. Encourage the greening of jobs in nongreen sectors.
2. Working towards more inclusive green employment.
3. Routine monitoring of the green economy and green employment.
4. Unblocking constraints in employment in green and hydrogen industries.

Operational Nuclear Energy Sites



Key Docs

Factsheets: [West Burton Fusion Factsheet](#); [Nuclear](#); [Nuclear Cluster Snapshot](#)

Reports: [Nuclear and Related Industries](#)

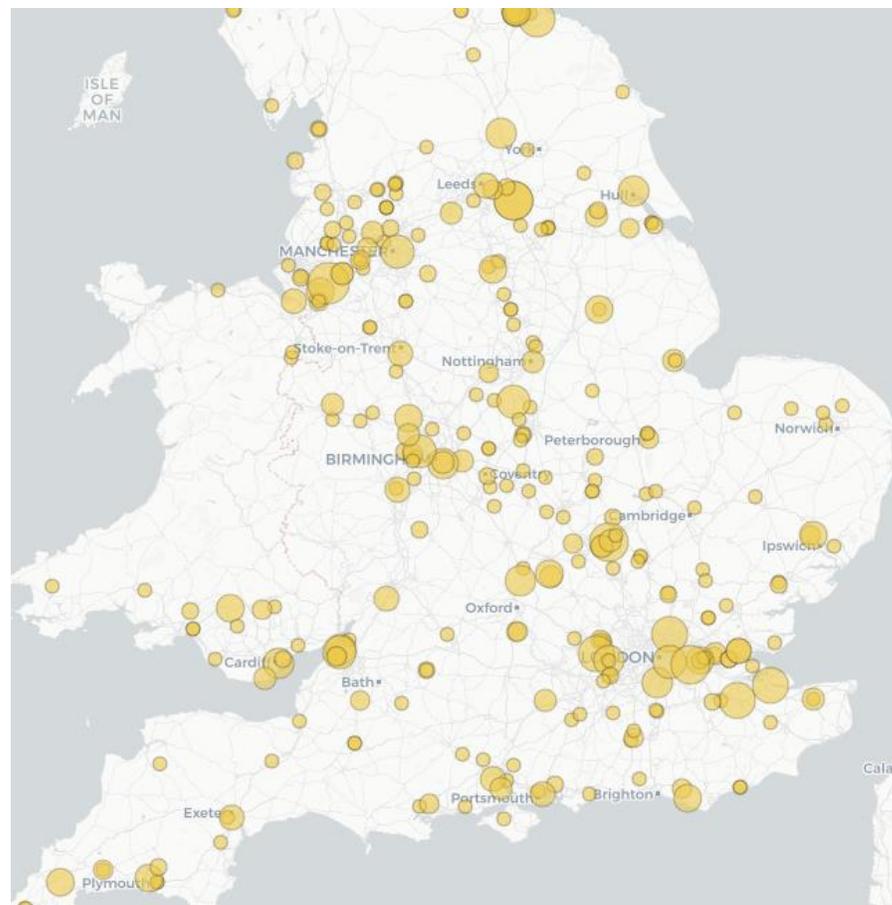
Future investment in nuclear fusion could bring a multitude of benefits to communities in the Midlands, such as:

- Increase in volume of UK fusion and materials research
- Development of Adjacent Technologies
- Spinouts from fusion research
- Creation of direct employment (e.g. researchers and other staff)
- Spill over benefits to UK industry (e.g. via knowledge transfers, etc.)
- Contribute to UK economic growth by providing clean energy technology for export
- Create a greener and sustainable environment with cleaner energy sources
- Strengthen capability and growth in the UK nuclear fusion sector and adjacent technological sectors
- Establish a supply chain and product that can be sold to a global market
- Secure substantial inward and private investment into UK science towards 2.4% of GDP target

Nuclear Power sub-sector includes all activities that relate to the generation of nuclear power, excluding decommissioning of nuclear sites. It includes:

- **Nuclear safety engineering services**, regulatory compliance, reactor management, fail-to-safety engineering.
- **Nuclear power plant operations management**, engineering and PR.
- **Nuclear cooling equipment** - manufacture, installation and maintenance.
- **Construction of plant and equipment** - site development, reactor and buildings and power plant/equipment construction.
- **Commissioning engineering services** - cooling & thermal control, engineering maintenance, instrumentation, power distribution, reactor & plant commissioning.
- **Sampling & testing services** - thermal control testing, remote monitoring, back-up plant monitoring and effluent discharge testing.
- **Nuclear scientific services** - research, laboratory testing and fuel management.

Operational Energy from Waste Energy Sites



Key Docs

Cluster Factsheet: [Circular Economy](#)

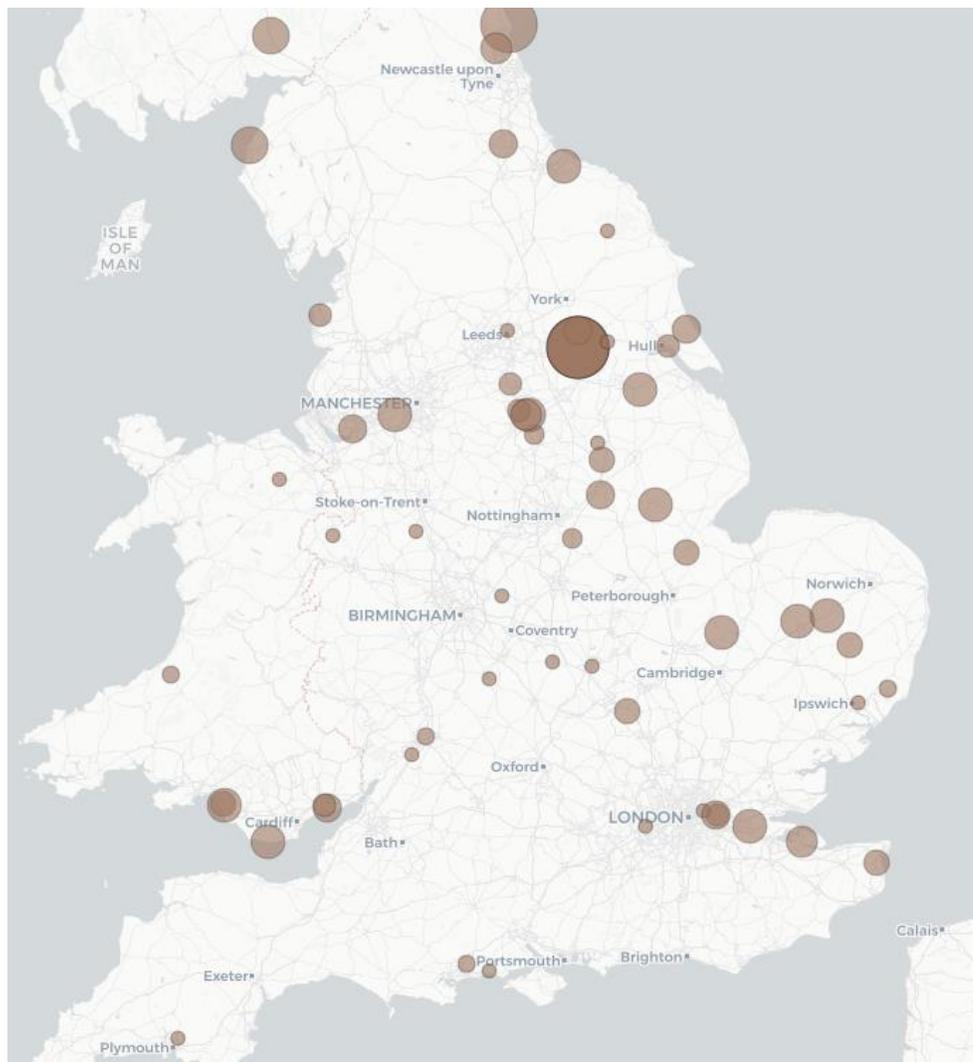
Recovery & Recycling sub-sector includes all activities relating to the collection and processing of domestic and industrial waste products. It includes:

- **Waste collection** - manufacture, supply, installation and operation of equipment and services for collection of household, industrial and hazardous waste, treatment of waste prior to landfill and supply of pre-treated recyclates.
- **Engineering & equipment** - engineering services and process control for the complete range of recycling stock
- **Consulting & training** - collection and processing consultancy and training, publishing, legal & insurance advice.
- **R&D** - metals recovery, pyrolysis, bio-based systems, new recyclable materials, new collection & processing technologies.
- **Recycling stock** - recovery, recycling, processing, sorting, supply and packaging of rubber, plastics, paper, oil, electrical, electronics, glass, composting, construction & demolition, automotive, wood and textiles stocks.

Waste Management sub-sector includes the treatment/management of domestic and industrial waste that cannot otherwise be recycled. It includes:

- **Construction & operation of waste treatment facilities** for anaerobic digestion, composting, incineration, landfill, waste to energy conversion and the supporting engineering services.
- **Equipment for Waste treatment**, manufacture, supply, installation and maintenance of bio filters, bio reactors, collection equipment, grease traps, oil interceptors, materials processing equipment, monitoring & control equipment and nightsoil & landfill leachate treatment.
- **R&D** - incineration technologies, energy from waste systems, cleaner processing & treatment technologies, disposal of hazardous waste and other materials processing technologies.
- **Consultancy and training** - books, periodicals & publications, specialist consulting and training for asbestos, hazardous materials and other waste management systems.

Operational Biomass Energy Sites



The sector was worth £1.9bn in 2020 (kMatrix figures)

Key Docs

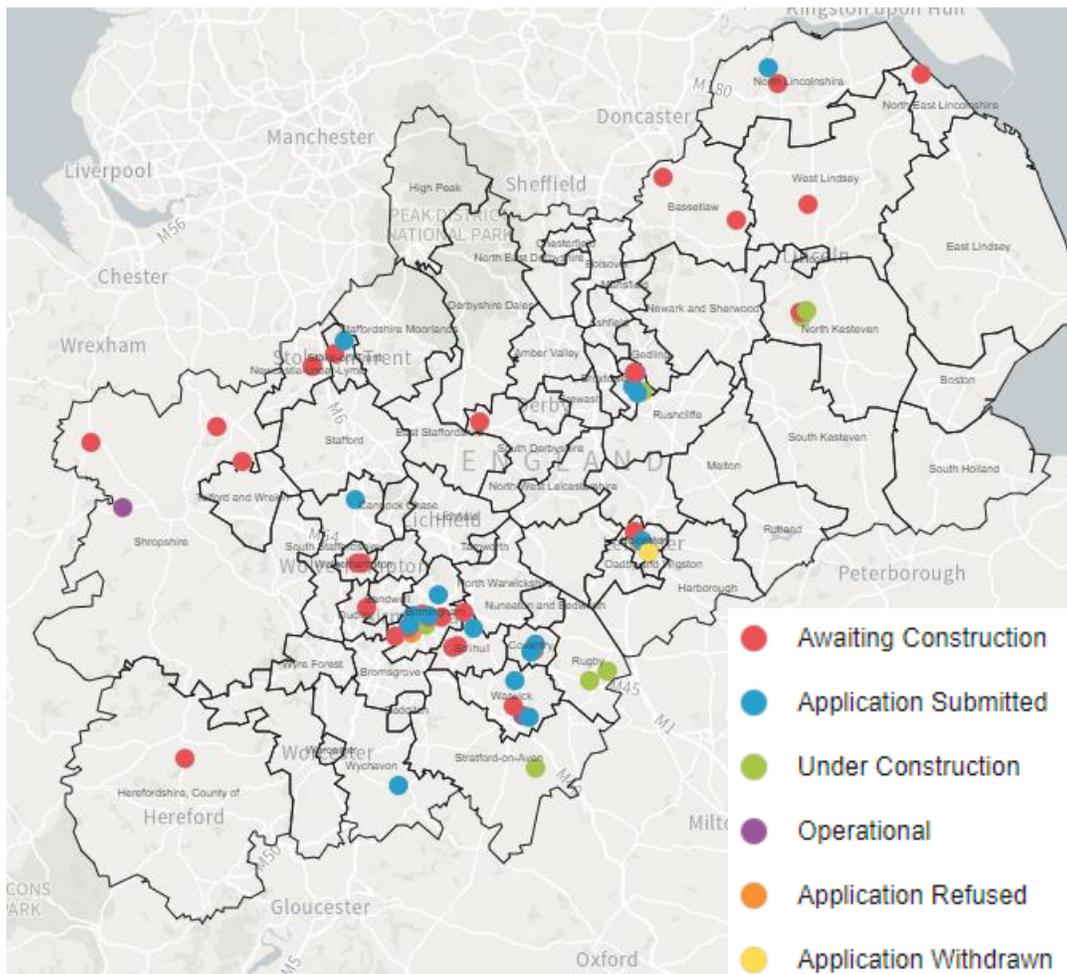
Cluster Factsheet: [Circular Economy](#)

Biomass Energy sub-sector includes all activities that convert biomass into energy but excludes biomass materials. It includes:

- **Biomass furnace systems** - manufacture, supply, consulting, design, installation, engineering and other services for domestic, industrial and community applications.
- **Biomass energy systems** - manufacture, supply, consulting, design, installation, engineering and other services for domestic, industrial and community applications.
- **Manufacture of biomass boilers and systems** including boilers, cogeneration, heat exchange and packaged power systems for domestic, industrial and community applications.
- **Biomass boilers and related systems** including supply, consulting, design, engineering, installation and other services for boilers, cogeneration, heat exchange and packaged power systems for domestic, industrial and community applications.
- **Technical and operational consulting.**

HEAT NETWORKS

District and Communal Heat Networks Sites



The UK Climate Change Committee recommends that around 18% of UK heat should come from heat networks by 2050 as part of a least cost pathway to meeting net zero. Heat network development is a demand-led process, prioritising heat demand density and anchor loads (i.e., high demand properties such as hospitals, industrial sites, or schools), primarily due to the costs of heat transmission infrastructure. Constraining factors are associated with the generation technology, such as biomass or heat pumps, although there are specific district heating constraints such as flood risk, infrastructure barriers (e.g., railways) and topography (e.g., hills) which may affect heat transmission routes. Heat networks may be centralised, with a single or multiple heat generation energy centres, or decentralised, such as those with distributed heat pump systems fed by a communal heat source.

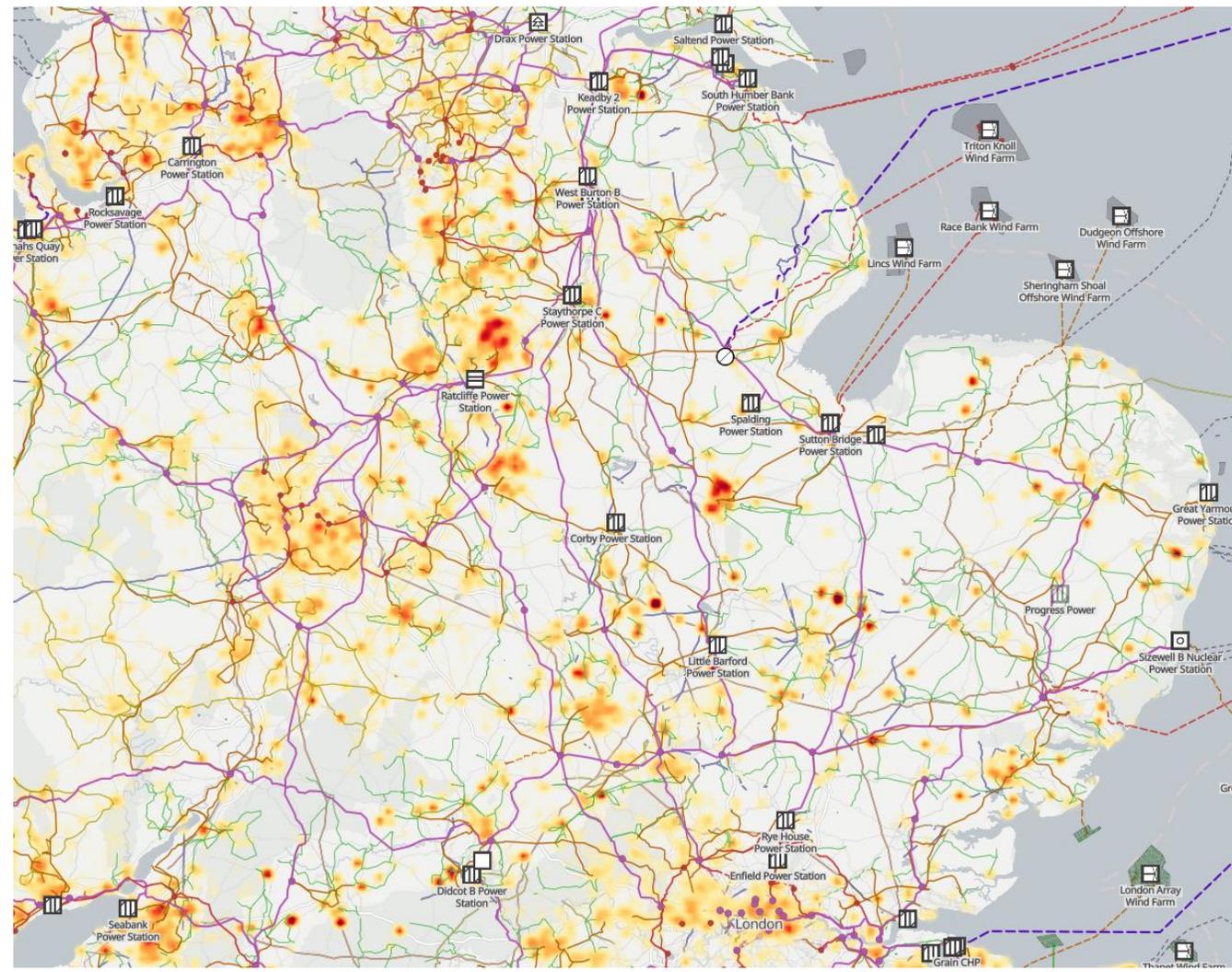
Priority areas of development include:

- **New housing developments**, where infrastructure may be integrated into site design from the outset.
- **High demand centres**, including high density urban areas, industrial parks, hospitals, etc.
- **Locations with accessible heat resource**, including water-source, ground-source, or waste heat potential.

4. Midlands Energy Systems

Power Generation Map

POWER GENERATION



Key		Power Generators	
Power Lines		Wind Turbine	
≈ undefined kV		Solar Panel	
≈ 10 kV		Other Power	
≈ 25 kV		Tower/Pylon	
≈ 52 kV		Transition Tower	
≈ 132 kV		Pole	
≈ 220 kV		Transition Pole	
≈ 310 kV		Transformer	
≈ 550 kV		Switch	
HVDC		Compensator	
Traction (<50 Hz)		Converter	
Underground		Telecoms	
Line Reference		Cable	
Power Plants		Tower/Mast	
Coal		Datacenter/Exchange	
Geothermal		Petroleum	
Hydro		Oil	
Nuclear		Gas	
Oil		Petroleum Intermediate	
Gas		Fuel	
Diesel		Hydrogen	
Solar		CO2	
Wind		Other	
Biomass		Petroleum Facility	
Waste		Water	
Battery		Fresh Water	
		Hot Water	
		Steam	
		Wastewater	

Energy Storage Sites

Key Docs

Reports: [Smart Energy, Opportunities for Smart Energy Systems](#)

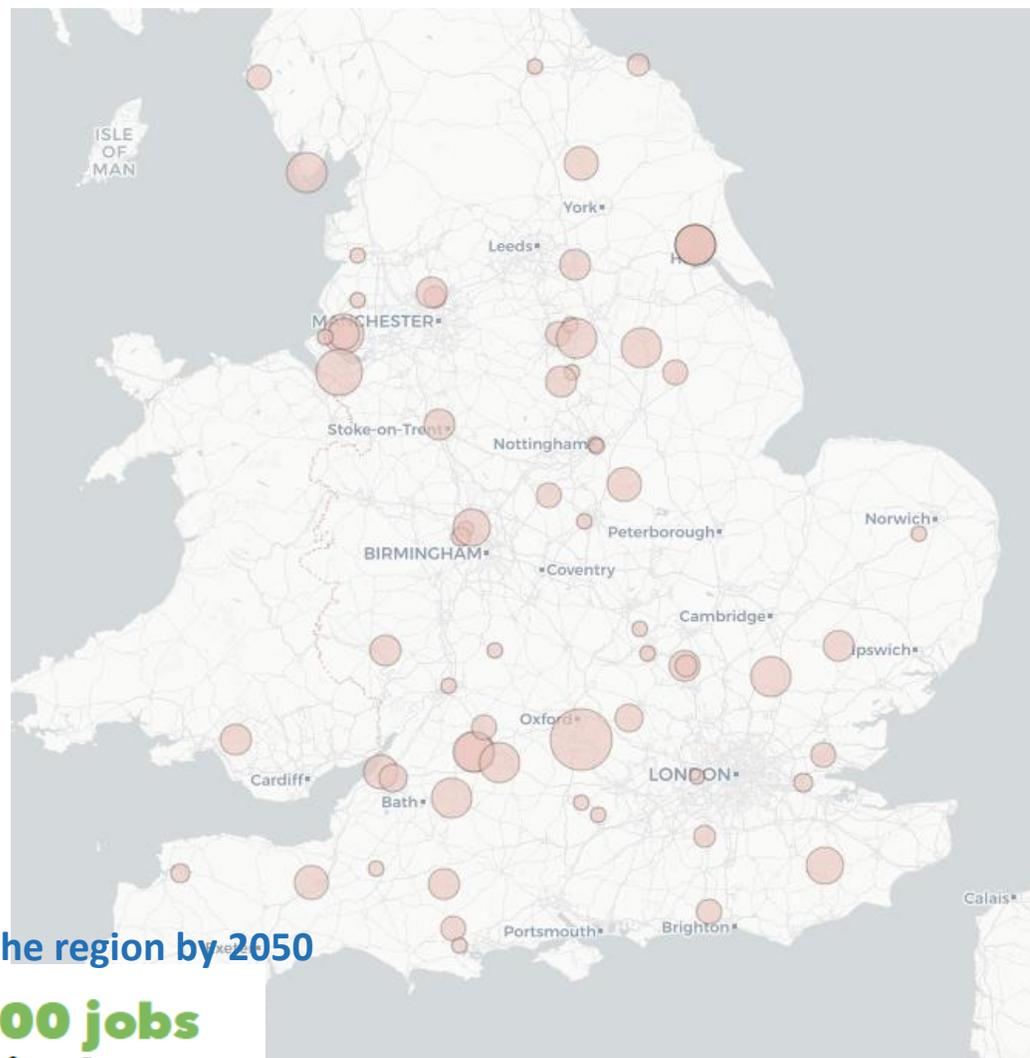
A Smart Energy system is an approach which utilises new and emerging digital technologies, artificial intelligence, and machine learning, to actively monitor and balance energy needs across connected energy networks, of all scales, by making real-time autonomous interventions empowering energy users and companies and ensuring costs are reduced, energy networks are resilient, and the energy system transitions to net zero.

SMART ENERGY IN THE MIDLANDS TODAY...

There are already several pioneering projects in the smart energy sector in the Midlands:

- The Smart Energy Network Demonstrator (SEND) project is the largest of its kind in Europe. The University of Keele is working in partnership with Siemens and Engie/ EQUANS to create a smart energy network of energy generation, distribution and storage across different energy sources at the university campus.
- The Trent Basin project in Nottingham is a housing development focused on local smart energy systems.
- The Regional Energy Systems Operator project in Coventry has examined new ways of managing energy at a local level.
- Plans for the University of Birmingham and Siemens to create a smart campus with 38,000 sensors linking to a smart energy system.

SMART ENERGY



Potential for the region by 2050

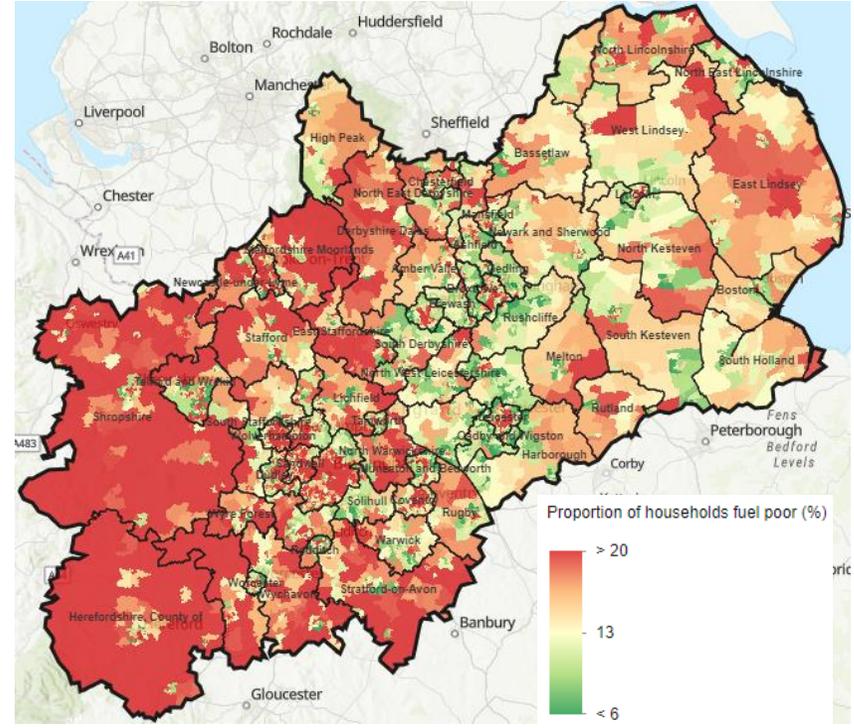


7,000 jobs
sustained per year



£70bn
of energy savings

Proportion of households in fuel poverty



Fuel poverty

- 16.6% (728,024) of households in the Midlands Engine area were fuel poor compared to 13.1% England-wide in 2021.

Green Homes Grant Local Authority Delivery Scheme

- In the Midlands, local authorities are delivering schemes with the support of local coordinators using local knowledge and regional expertise to identify those households which are most likely to require support, and which would best benefit from energy efficiency upgrades

Home Upgrade Grant

- a £2.5bn manifesto commitment to provide energy efficiency upgrades and low carbon heating to low income households that are living off-gas grid in England to tackle fuel poverty and reach net zero ambitions.

Social Housing Decarbonisation Fund

- In the Midlands, SHDF aims to upgrade homes to meet an Energy Performance Certificate (EPC) Band C standard through a worst-first, fabric-first approach using measures such as external wall, loft, cavity wall, and underfloor insulation. Some properties will also receive renewable technologies such as solar photovoltaic panels or air source heat pumps, moving away from reliance on fossil fuels to power and heat these buildings.

Proportion of properties by EPC band

Country or region name	Band A	Band B	Band C	Band D	Band E	Band F	Band G
England	0.3%	14.9%	31.4%	38.4%	12.4%	2.1%	0.6%
East Midlands	0.3%	15.4%	29.3%	39.1%	13.2%	2.3%	0.5%
West Midlands	0.3%	13.4%	28.9%	40.2%	14.1%	2.5%	0.7%

Sources

- [Subnational total final gas consumption](#), UK, 2005 to 2021
- [Subnational total final electricity consumption](#), UK, 2005 to 2021
- [Subnational total final energy consumption](#), UK, 2005 to 2021
- [Renewable electricity - generation by region](#) 2003 – 2022
- [Renewable electricity - generation by region](#) 2003 – 2022
- ONS [Environmental Accounts](#), released December 2023
- [kMatrix reports](#)
- [ME Green Innovation Report](#)
- [Midlands Engine Ten Point Plan for Green Growth Plan](#)
- [Midlands Engine Clusters Project](#)
- [Modern and Low Carbon Utilities Cluster Snapshot](#)
- [Net Zero Transport Cluster Snapshot](#)
- [Nuclear and Related Industries Report](#)
- [Offshore Wind Cluster Snapshot](#)
- [Circular Economy Cluster Snapshot](#)
- [Green and Hydrogen Jobs in the Midlands Report](#) & [Insight Summary](#)
- [Midlands Manufacturing Opportunities Report](#)
- [Invest in UK R&D – Zero Carbon Energy Brochure](#)
- [Energy Dashboard](#)
- [Hydrogen Technologies Factsheet](#)
- [ME Hydrogen Technologies Strategy](#)
- [ME Green Innovation Report](#)
- [West Burton Fusion Factsheet](#)
- [Nuclear Factsheet](#)
- [BEIS: Heat Networks Planning Database](#)
- [Department for Energy Security and Net Zero](#)
- [EPC in England and Wales](#)
- [Smart Energy - An Energy System for the 21st Century](#)
- [Opportunities to Lead the Way in Smart Energy Solutions](#)
- [Open Infrastructure Map](#)

Additional Reading Material:

- [Humber Industrial Cluster Plan](#) (March 2023)
- [The Humber Offshore Wind Cluster Prospectus](#) (Nov 2020)
- [Powering Growth in a Changing World - West Midlands Industrial Taskforce](#) (June 2023)
- [West Midlands Net Zero Five Year Plan](#) (March 2021)
- [East Coast Hydrogen Feasibility Report](#) (Nov 2021)
- [Hydrogen Valley Feasibility Report](#) (May 2023)
- [National Grid Business Plan 2023-28](#)
- [Innovation Caucus Energy/Propulsion in the East Midlands](#)
- [Government is soon to launch a “Civil Nuclear Roadmap” for industry](#) (the roadmap has not been published as of 11/01/2024 AM)
- [Towards net-zero: exploring the current state of low carbon supply chains in the Midlands](#)
- [Demand and Supply of Green Finance](#)
- [Green Growth Storymap \(arcgis.com\)](#)
- For broader context:
 - [Midlands Engine State of the Region 2023](#)
 - [Midlands Engine State of the Region 2023 Executive Summary](#)
 - [Midlands Engine State of the Region 2023 Factsheet](#)

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