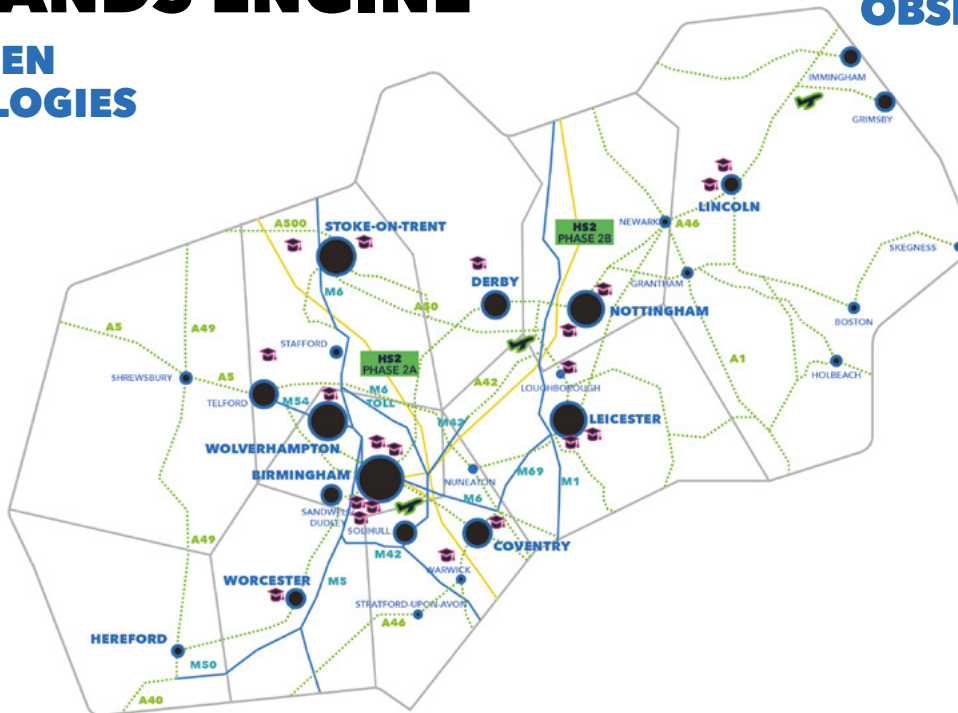


MIDLANDS ENGINE

HYDROGEN TECHNOLOGIES

OBSERVATORY



THE VISION, OPPORTUNITIES AND POTENTIAL

- Midlands Engine published a **Hydrogen Technologies Strategy** in December 2021
- The strategy is underpinned by a vision of a Midlands Hydrogen Technologies Valley. As an ecosystem linking hydrogen production with end users, the vision is based on **industrialising hydrogen technologies at scale enabled through academic and supply chain development support**
- The strategy could deliver **167,000 new or safeguarded jobs, £10bn Gross Value Added (GVA) and a 29% reduction in CO₂ (17m tonnes)**
- This is reflected in the region's **blend of strengths** which brings together industry backed by academic expertise and established partnerships
- The capabilities and strategic intent are in place for the region to develop and industrialise a broad range of **hydrogen technologies for power generation and heat and transport applications, as well as extending hydrogen operations across the Midlands**
- The Midlands' world-leading universities have joined forces through the **Energy Research Accelerator (ERA) collaboration**. They provide exceptional thought leadership and spearhead next generation hydrogen technologies.

PROJECTS, PRODUCTS AND MARKETS

- **Tyseley Energy Park** in Birmingham provides **green hydrogen for hydrogen-powered buses** via a 3 MW electrolyser fed by a biomass plant. The facility is exploring scaling up hydrogen production to cater for several hundred trucks through a 35 MW plant with 350 MWh of storage
- Birmingham is soon to become home to **Western Europe's largest hydrogen bus fleet**. With already 20 hydrogen buses in operation, Transport for West Midlands recently was successful in acquiring both public and private funding for a further 124 hydrogen buses to come on line in 2024
- The **UK's first hydrogen-powered train** was developed by the University of Birmingham in collaboration with Porterbrook as part of the HydroFLEX project
- **Hydrogen refuelling infrastructure plans** are being developed in key locations in the Midlands including Worcester, Derby and Lincolnshire
- The **UK's hydrogen economy** is led by Midlands Engine businesses with international reach. They include Worcester-Bosch, Baxi and Vaillant (hydrogen boilers and heating solutions), Cadent (gas distribution network), 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) and ITM (hydrogen generation)



- Cadent is exploring the possibility of a **100% hydrogen local transmission pipeline** for the blending of hydrogen into the natural gas network
- The **Humber industrial cluster is developing a range of low carbon hydrogen production projects** including the Oyster Project (Grimsby), Gigastack Project (Immingham), Project Mayflower (Immingham) and Humber Hub (Killingholme)
- The **20-tonne JCB 220X excavator powered by a hydrogen fuel cell** is a **world first** for the region
- **Hydrogen injection into the gas grid** has been pioneered at Keele University through the HyDeploy project
- The University of Nottingham is developing the East **Midlands Hydrogen Innovation Zone** focusing on three heavy transport hydrogen demonstrators in road, rail and aviation
- The H2GVMids Project is developing a design for a **44t HGV** and a plan for **H2 refuelling station distribution**. The project will also evaluate the skills needed to underpin H2 freight programmes and deliver a Green Book-ready business case for a demonstrator. It is headed by EDF Energy and supported by a consortium including Cenex, the Energy Research Accelerator and Midlands Engine
- The **potential of hydrogen for gas turbine operation** is being explored by power generators in the Midlands include SSE, Siemens Energy, Uniper and Neptune Energy. The **power plant** at Keadby in North Lincolnshire, will be one of the **UK's first to run on 100% blue hydrogen**.

NEXT STEPS AND CHALLENGES

- Future uses of hydrogen include oil refining, ammonia production, methanol production and steel production via clean hydrogen within **industry**
 - In **transport**, uses include hydrogen fuel cell cars, shipping and aviation
 - In **buildings**, hydrogen blended into existing natural gas networks (with the highest potential in multi-family and commercial buildings) via hydrogen boilers or fuel cells
 - In **power generation**, hydrogen is one of the leading options for storing renewable energy
- The **government's UK Hydrogen Strategy** (August 2021) and later **Energy Security Strategy** (April 2022) describe hydrogen as having a critical role to play in the UK's transition to net zero. The strategies also detail how the hydrogen economy will be scaled up¹
- There are opportunities for the Midlands to play a more significant role through three core areas of the UK Hydrogen Strategy. These include:
 - **Hydrogen production and distribution (+85,800 jobs and +£6.7bn GVA)**

- **Power generation and heat applications (+14,100 jobs and +£1.0bn GVA)**
- **Transport applications (+67,334 jobs and +£2.1bn GVA).**

However...

- **Hydrogen is not a silver bullet** and production of low-carbon hydrogen at scale will rely on deployment of carbon capture and storage
- The Climate Change Committee viewed hydrogen as "best used selectively", particularly in sectors where "the alternative is continuing to burn unabated fossil fuels or where there are limits to feasible electrification. **Hydrogen is also currently expensive to produce**"²
- Many hydrogen technologies only exist as **prototypes or trials and need investment** and support to move to replication and growth. This includes support for the manufacturing of hydrogen technologies to establish a vibrant supply chain.

CENTRES OF EXCELLENCE

- The **Energy Research Accelerator** collaboration hosts national training programmes associated with doctoral-level training for hydrogen and fuel cells. They have also pioneered hydrogen for heating, hydrogen microcabs, trains, houses and boats and hydrogen generation and storage systems
- The **Engineering and Physical Sciences Research Council (EPSRC) Sustainable Hydrogen Centre for Doctoral Training (CDT)** delivers high-quality transdisciplinary training and industry-ready doctorates, nurtures entrepreneurial mindsets through innovation opportunities and co-creates research ideas
- **Tyseley Energy Park** is focused on producing low and zero carbon transport fuels including hydrogen and incubating companies that will shape the future of hydrogen production
- **East Midlands Hydrogen Innovation Zone** is connecting industrial, regional and national stakeholders to connect with regional initiatives around green growth plans
- A proposal is in place to develop a **Hydrogen Skills Academy** at the East Midlands Freeport, which would be the UK's first practical, industry-based training centre associated with production, handling, storage and use of hydrogen. It could open as early as November 2023.

¹Department for Business, Energy & Industrial Strategy, UK Hydrogen Strategy, last updated July 2022 and HM Government, British Energy Security Strategy, released April 2022.

²House of Commons Library, the future hydrogen economy, released June 2022.

