



Creating a new hydrogen economy in the Midlands

POLICY BRIEF ON HYDROGEN IN THE MIDLANDS

Creating clean energy and jobs through
the development of the regional
hydrogen economy





Photos in this brochure depict hydrogen research taking place at Midlands universities



The Midlands has huge potential to be a powerhouse of the future hydrogen economy.

The region is home to thriving businesses and cutting-edge technology, but government support, both in terms of long-term strategy and short-term incentives, is essential to make the most of the opportunity.

Support that strategically links production and utilisation of hydrogen could deliver huge benefits for the region and the UK as a whole.

In particular, investment in hydrogen production, road and rail transport, construction and agriculture could yield great returns and help achieve the UK's net zero goals.



Introduction

The Midlands region has played a unique role, to date, in the development of the hydrogen economy. It is home to a number of important hydrogen-related developments (see map below), driven by its world-leading tech businesses and the expertise represented in its' universities.

Hydrogen will play a crucial part in the UK's efforts to achieve Net Zero over the next 25 years. But to make the most of this opportunity, the UK government needs to take strategic approach and support regional development – identifying where there is greatest potential to achieve economies of scale and to integrate production and utilisation of this key resource.

This briefing paper shows why the Midlands is a natural home for development of the hydrogen economy and sets out the steps Government can take to support the region to make the most of this immense opportunity and ensure the UK reaches its Net Zero targets.



Figure 1: key hydrogen-related developments in the Midlands region



Why the Midlands?

The Midlands is a key location of commercial innovation associated with hydrogen. It is home to companies such as Worcester-Bosch, Baxi and Cadent (hydrogen boilers and gas networks), Intelligent Energy (fuel cells), Porterbrook (hydrogen trains), Toyota (hydrogen vehicles), Horiba-MIRA (vehicle test and host of R&D cluster), Caterpillar, Faun Zoeller and JCB (heavy vehicles), DVNGL, BSI, Cenex (established low carbon transport consultancy), Equans (District Heating Networks), SSE, Progressive Energy and adjacent to ITM Power and Motive (hydrogen generation and transport respectively). Siemens and ENGIE are also working closely with regional partners in next-generation hydrogen production and storage.

The region can also draw on active and visionary leadership from the Midlands Engine. The pioneering Midlands Engine Hydrogen Technologies Strategy has been co-created by partners from right across the region to crystallise and champion the pivotal role the Midlands can play in low carbon hydrogen, to achieve government ambitions to expand the UK hydrogen economy and drive sustainable growth.

The Midlands has a high potential demand for hydrogen use in its cities and businesses, for transportation and decarbonising industrial and domestic heat. The Midlands has a diffuse set of industrial users of energy that need to find ways to decarbonise; it has high freight transport taking place in the region and its cities need to find ways for homes and businesses to divert from using natural gas, particularly for heating.

The Midlands also needs to find ways to replace “lost” energy generation following the closure of its coal fired power stations, otherwise it risks being left behind and having to import energy from other regions, incurring additional costs. The use of hydrogen in the region for electricity production (e.g. via energy from waste facilities producing hydrogen), for heavy transport and as an energy storage method could:

- reduce demand for electricity being produced from other sources, particularly those routes that lead to greenhouse gas emissions
- act as a way of storing energy for use in peak periods, either to create electricity
- reduce electricity demand for transportation, particularly in the heavy vehicle sectors
- replace gas being used in industrial processes
- replace gas being used for heating, for example via its use in district heating systems.

Opportunities and challenges

While the potential for hydrogen in the Midlands is enormous, the region also faces challenges in making the most of this opportunity. Over the next few pages is a summary of some of the key areas of development and the main challenges that the region, through collaboration with partners and with a supportive policy environment, will need to overcome.



Area	Current status	Opportunities	Challenges
Hydrogen production and supply	<p>Much of the existing investment in industrial coastal clusters is based on offtake plans with local industry, hence it is unclear how much hydrogen will be available for places outside of these clusters wanting to rapidly transition.</p> <p>Cadent and National Gas Transmission's recently launched Hydrogen Valley proposal to pipe hydrogen into the region from the coastal industrial clusters is one solution, however the timeline for this infrastructure is unclear and may not arrive into the centre of the Midlands until 2040.</p>	<p>The region will need a significant supply of hydrogen to meet needs if it is utilised in heavy vehicles and machinery and utilised in heavy industry.</p> <p>Cadent and National Gas Transmission's Hydrogen Valley project is an East-West corridor that encompasses Norfolk in the East to Shropshire in the West. The proposal could safeguard and create 34,000 jobs in the region, reduce CO₂ emissions by 12.9 million tonnes and attract up to £28 billion in private capital investment as well as protecting consumers from volatile prices. The project is supported by more than 30 regional stakeholders, including PEPSICO, Birmingham Airport, CEMEX, British Sugar, RWE, West Midlands Combined Authority, and others from across the private and public sector.</p> <p>The East Midlands may also benefit from East Coast Hydrogen developments or via industrial clusters in Teesside and Humber and/or with local H₂ production at Ratcliffe.</p> <p>Birmingham may benefit from National Gas provision via Bacton.</p>	<p>Production of hydrogen in the region is currently limited to small electrolyzers, such as those at Tyseley Energy Park, Keele University and MIRA, which will only provide limited quantities of hydrogen.</p> <p>Along with other energy investments such as nuclear and off-shore wind being largely focused outside the region there is concern about the region's own energy security following the closure of fossil fired power stations and investment focused outside the region. This is heightened by the current consultation on locational pricing for electricity which has the real potential to increase energy prices in the Midlands and push energy intensive industry out of the region, leading to job losses.</p> <p>None of the hydrogen projects in the Round 1 successful applications to the Net Zero Hydrogen Fund was focused on the Midlands¹, and only one of the twenty shortlisted projects under the Hydrogen Business Model/Net Zero Hydrogen Fund is based in the region².</p>
Industrial decarbonisation	<p>The region, particularly in the West Midlands, is home to a diffuse cluster of heavy industry, including steel processing and ceramic manufacturing. In addition, the East Midlands has significant potential hydrogen demand around the East Midlands Freeport Zone. Decarbonisation of these sectors is necessary to support regional decarbonisation and to support jobs in the region. Hydrogen is the main option available for many of these heavy industries.</p>	<p>Linking hydrogen production to old coal power station/brownfield sites, which could form the basis for future industrial clusters.</p>	<p>Retaining manufacturers in the region –</p> <p>The Midlands' large range of heavy industry is diffusely located across the region, making it, unlike the coastal industrial clusters, and harder to decarbonise.</p>

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Transportation	<p>Due to its central location, the Midlands has about 1/3 of the UK's freight pass either into or through the region and hence it is vital to focus on decarbonising freight in the Midlands utilising key road and rail routes. Due to the weight of heavy goods vehicles and the loads that they carry the most promising fuelling solution for the transition of this sector is hydrogen.</p> <p>The region is home to two major airports, East Midlands (the 2nd largest freight airport in the UK) and Birmingham, both of which need to find ways to decarbonise their operations, but also provide solutions for decarbonising flights, with hydrogen being a potential solution.</p>	<p>As well as having significant levels of freight moving through the region, the Midlands has a strong automotive tradition and could be central to the production of new hydrogen vehicles, with facilities such as Horiba-MIRA providing a platform for those wanting to establish and grow in the sector.</p> <p>Given the high freight loads there is an opportunity to demonstrate the use of hydrogen in rail, HGVs, etc.</p> <p>Hydrogen HGVs and refuelling infrastructure could be established to decarbonise key transport routes. Supermarkets, vehicle manufacturers and aggregate companies in the region need to find a way to decarbonise the transport of their components/products.</p> <p>Identifying rail routes for hydrogen and demonstrating hydrogen trains could help the region decarbonise, but could also support hydrogen rail manufacturing in the region, with centres in Derby and Porterbrook and Alstom.</p> <p>The regions airports would make an ideal demonstration facility for hydrogen flight, especially given their connectedness and types of flights.</p>	<p>There are limited refuelling options available for the HGV and truck sector across the region.</p> <p>Ongoing development work is needed for the transition to hydrogen flight to take place and this will require a major source of hydrogen in the Midlands if one of the airports is to become a demonstration site, or hydrogen is a component of rail decarbonisation.</p>
Agriculture and rural areas	<p>Options exist to decarbonise the farming and agricultural sectors, rural industrial clusters and heavy rural transport which tends to have longer travel distances, for example for bus routes and waste collection.</p>	<p>The Midlands has significant regions of agriculture and rural areas. Many farmers already have wind and PV systems which could be used to produce hydrogen by electrolysis. In addition, there are a large number of waste processing facilities which could be used to produce hydrogen from organic waste. Developing rural networks which produce and use hydrogen could help these areas transition to low carbon.</p>	<p>There are limited examples of hydrogen demonstrators in rural areas that encompass the farming, agriculture, rural transport and/or heating. Networks of producers and users need to be supported to develop in these areas which have, to date, received limited funding. More hydrogen fuelled vehicles need to be developed for the farming sector.</p>

¹ <https://www.gov.uk/government/publications/net-zero-hydrogen-fund-strands-1-and-2-successful-applicants/net-zero-hydrogen-fund-strands-1-and-2-summaries-of-successful-applicants-round-1-april-2022-competition#mcru-integrated-hydrogen-delivery-for-a-fuel-cell-van-fleet-pilot>

² This is a project by JG Pears based in Newark: <https://jgpears.com/>

Area	Current status	Opportunities	Challenges
Innovation	The Midlands is home to cutting-edge research and development on hydrogen with a network of universities bound together through the Energy Research Accelerator (ERA). ERA is leading in next-generation hydrogen technologies and ERA institutions have been pioneers in hydrogen in the gas network (Keele), hydrogen transport (Birmingham), hydrogen production (Cranfield, Loughborough, Warwick and Aston) and hydrogen storage (Nottingham).	The region is also supported by the UKRI-funded HyDEX programme led by Keele University, and by the Energy Research Accelerator which aims to support the development of the hydrogen economy in the region. The universities in the region have a long-established expertise in hydrogen production, storage, utilisation and in fuel cells. The HyDEX project has enabled the development of demonstration projects at the universities involved and has led to significant engagement with the sector. In addition facilities such as Tyseley Energy Park and Horiba-MIRA provide clusters for innovation to develop across the region.	The HyDEX programme is due to finish in December 2024 and it is unclear what ongoing support there will be in the region after this finishes. Innovation funding has tended to go outside the region to the hydrogen production clusters.
Skills	The ERA partners host nationally and EU-funded training programmes associated with doctoral level training for hydrogen combustion (Keele) and fuel cells (Nottingham, Loughborough, Birmingham). A hydrogen skills academy is being developed in the East Midlands associated with the Freeport.	The region has an established skills base relevant to hydrogen. This includes a suite of Masters' level training, PhD and post-doctoral level training is supported by the ERA skills programme, the Centre for Postdoctoral Development in Infrastructure, Cities and Energy (C-DICE) and the Sustainable Hydrogen and Fuel Cells and their Fuels CDT programmes [insert link to Skills Hub]. Furthermore, through the HyDEX programme the skills needs for developing a hydrogen economy are being evaluated and interventions developed to train the current and future workforce in the transition to a Hydrogen economy. In doing this, HyDEX is supporting the region to solve challenges relating to the development of the hydrogen economy, ensuring that we can grasp opportunities from the investment in hydrogen in the region.	

Actions needed for the Midlands

The Midlands would benefit from a strategy that links hydrogen production and utilisation, taking a wider regional hydrogen economy perspective in providing support. The following have particular potential to have a great impact on the Midlands' Net Zero ambitions:

- 1. Midlands-based hydrogen road-freight schemes.** The Midlands has the largest throughput of freight and is at the centre of the automotive sector in the UK. It is essential that we start to deploy solutions to decarbonise heavy transport and it is essential we hold onto and develop a hydrogen vehicle sector. As such, there is a need to i) develop a network of hydrogen refuelling stations ii) develop the hydrogen freight sector by deployment of hydrogen trucks, but also iii) development and test facilities, and iv) provide a skilled workforce to support this activity.
- 2. Deployment of Midlands hydrogen rail.** Deployment of the hydrogen rail solutions developed in the region has the potential to link up key manufacturing areas including freeports, to decarbonise freight and for significant job creation in manufacturing. We are currently developing a business case for Midlands hydrogen rail.
- 3. Hydrogen production.** We need to incentivise both small and large-scale green hydrogen production and storage so that hydrogen is available, particularly for transport and heavy industry. Support for a large-scale production of hydrogen would support the region's industrial base as well as serving transport needs. Longer-term solutions such as hydrogen produced from new-nuclear including Small-Modular-Reactors (and new nuclear to produce electricity) may provide much-needed energy supply.
- 4. Construction and agriculture.** There is significant interest from both sectors for hydrogen demonstration and deployment projects. This includes the establishment of networks of hydrogen producers and end-users in hard-to-reach areas.

Work with us

HyDEX represents a collaboration of the leading Universities in the Midlands region, who between them offer unparalleled technological expertise. We are keen to work with Government and industry to ensure that the Hydrogen economy can reach its full potential. To discuss the issues raised in this document, contact faye.mcanulla@era.ac.uk.





Contact us

To find out more about our facilities, demonstrators and research services that we can offer please get in touch:

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