West Midlands Combined Authority

UK Hydrogen Strategy Summary

03/09/2021

Summary of UK's Vision

The UK Government on the 17/08/21 published their first national hydrogen strategy.

The UK's vision is that by 2030, the UK is a global leader in hydrogen, with 5GW of low carbon hydrogen production driving decarbonisation.

- Huge potential for the growth and scale up of hydrogen, with the high hydrogen scenario possible leading to 100,000 jobs and £13 billion GVA by 2050
- Their principles are long term value for money (taxpayers and consumers), decarbonising while achieving economic growth, secure strategic advantages for the UK, minimise disruption and cost for the consumers and be adaptable to the developing market
- Challenges to overcome: the cost of hydrogen relative to existing high carbon fuels, technological, policy and regulatory uncertainty, need for infrastructure and supply and demand coordination, and a need for "first-of-a-kind" and "next-of a kind" investment and deployment
- Outcomes by 2030: decarbonisation of existing UK hydrogen supply, lower cost of production, end-to-end hydrogen system with a range of users, emissions reduced under Carbon Budgets 4 and 5, prepared for a ramp up beyond 2030 - on a pathway to net zero and evidence-based policy development

Key Commitments

National	***Regional view***
5GW of low carbon hydrogen production capacity by 2030	*Most large scale low carbon hydrogen production is outside of West Midlands region*
£240 million net zero hydrogen fund	*This is being seen as lower than expected*
£60 million low carbon hydrogen supply	*Most large scale low carbon hydrogen production is outside of West Midlands region. Some opportunities for small scale modular generation.*
UK standard for low carbon hydrogen	*This is crucial to ensure that hydrogen is produced by net zero carbon energy, and not produced with carbon producing energy sources*
Hydrogen business model, production strategy and twin track approach	*Make sure infrastructure can provide both high power electrification capabilities as well as hydrogen facilities and let the market decide (not yet developed)*
Call for evidence on the future of the gas system, review systemic hydrogen network and storage requirements, £68 million Longer Duration Energy Storage Demonstration	*Whether our local gas infrastructure can be repurposed to accommodate hydrogen. Cadent and WPD are working with Energy Capital on a 'Decarbonisation pathway' for the West Midlands which will look to clarify this issue regionally*

National hydrogen use cases, in relation to our regional ambition:

Key areas where the role of hydrogen will impact on our work include the Regional Energy Strategy and circular economy programme and the importance of industrial decarbonisation in the region.

- **Industry**: commitments to the use of hydrogen-ready industrial equipment, phase out of carbon intensive hydrogen production, £315 million Industrial Energy Transformation Fund (applications currently closed for phase 1 and phase 2 set to launch in 2021, Industrial Energy Transformation Fund - GOV.UK (www.gov.uk)), £55 million Industrial Fuel Switching 2 competition (expression of interest 04/10/2021, Industrial Fuel Switching competition: scope of competition - GOV.UK (www.gov.uk)), hydrogen neighbourhood by 2023, hydrogen village by 2025 and potential pilot hydrogen town by 2030
- **Power sector**: aim to achieve a fully decarbonised power system by 2050 (*Energy White Paper*), this requires a largely decarbonised sector by mid-2030s. Low carbon hydrogen provides a flexible technology to work alongside renewables to meet electricity demands
- **Buildings**: 20% hydrogen blend within the existing gas network (it is likely electricity will be the dominant energy source), there may be an industrial opportunity in the production of hydrogen-ready domestic appliances, but a strategic decision won't be made until 2026
- **Transport**: £23 million for Hydrogen for Transport Programme, undertake R&I to focus on difficult to decarbonise transport, Zero Emission Bus Regional Areas (ZEBRA) to provide £120 million to begin delivery of 4000 new zero emission buses (hydrogen or electric), invest up to £20 million (this financial year) to design trials for electric road systems, hydrogen fuel cell HGVs and run a battery electric trial to establish the feasibility, deliverability, costs and benefits of these to the UK

Remaining challenges (to the government)

- Create a hydrogen market by establishing a revenue mechanism which will provide funding for the Business Model
- Establish a Hydrogen Regulators Forum
- Assess market frameworks and regulatory barriers to drive investment and deployment of hydrogen
- Complete assessment of the value for money case for blending 20% hydrogen into the existing gas network

Although hydrogen has the potential to fulfil 20-35% of the UK energy consumption (by 2050), the success of hydrogen depends on the cost and availability of hydrogen and hydrogen-ready technology relative to alternatives (electrification, biomass and CCUS with fossil fuels). Hydrogen development heavily relies on public and private sector industry supporting the transition of infrastructure across every scale.

Realising economic benefits for the UK

Key commitments: prepare a Hydrogen Sector Development Action Plan, Early Career Professionals Forum, hydrogen will be a priority in the £1 billion Net Zero Innovation Portfolio, produce a hydrogen technology R&I roadmap (working with Hydrogen Advisory Council Research & Innovation Working Group) and deliver as a co-lead on Mission Innovation's new Clean Hydrogen Mission, ensure the UK is competitive within the low carbon hydrogen industry with use of the Net Zero Hydrogen Fund (consultation closed 25/10/2021 Designing the Net Zero Hydrogen Fund - GOV.UK (www.gov.uk)), and provide leadership to the market in developing new technologies and in scaling up early-stage technologies with help from the UK Infrastructure Bank.

Implications for the West Midlands

Unlike some other regions, the West Midlands is not naturally endowed with assets giving it a comparative advantage in the production of hydrogen, such as large-scale renewable energy generation and geological assets.

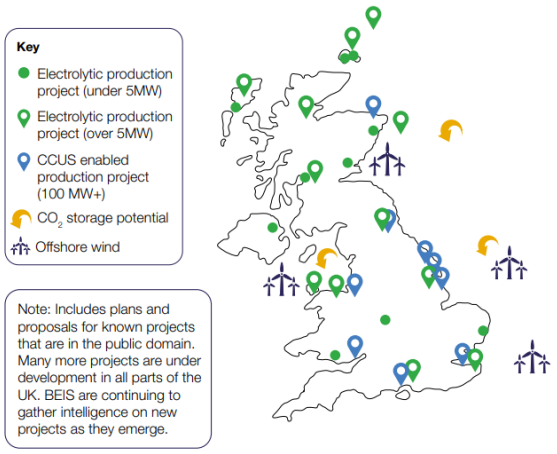

Figure 1: Proposed large scale hydrogen production clusters are primarily coastal (UK Hydrogen Strategy (publishing.service.gov.uk), page 11)

The West Midlands is also not made up of large-scale energy intensive industry with no option but to decarbonise with the use of hydrogen. However, the West Midlands is engaging with a lot of hydrogen related infrastructure detailed in the *Midlands Engine: Hydrogen Technologies Strategy* (under continued development). The aim is to align with the government's *Hydrogen Strategy*, while demonstrating the Midlands readiness to spearhead the delivery of low carbon hydrogen.

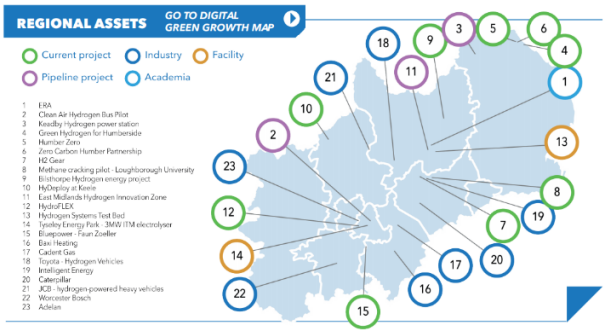

Figure 2: Regional Hydrogen Assets as identified by Midlands Engine (Ten-Point-Plan-for-Green-Growth-in-the-Midlands-Engine_V1.pdf (midlandsengine.org), page 41)

Taking these assets into account, where there is a wealth of activity, capability, and innovation it is clear the Midlands as a collective region can provide a strong ecosystem of linking hydrogen production with end users. The strength of the East Midlands will be in the heavy industries and transmission scale low carbon generation in offshore wind assets. **The strength of the West Midlands will be in the demand side of the hydrogen system, if we can show a compelling business case for investing in the assets needed to accept hydrogen as a fuel in a variety of use cases.** Midlands Engine are keen to promote a "Hydrogen Technologies Valley" across the Midlands wide area, where several hydrogen projects and infrastructure are centrally located (geographically), the Midlands Engine will enable partner organisations to establish, and further develop the enablers of a hydrogen supply chain from production to end use.

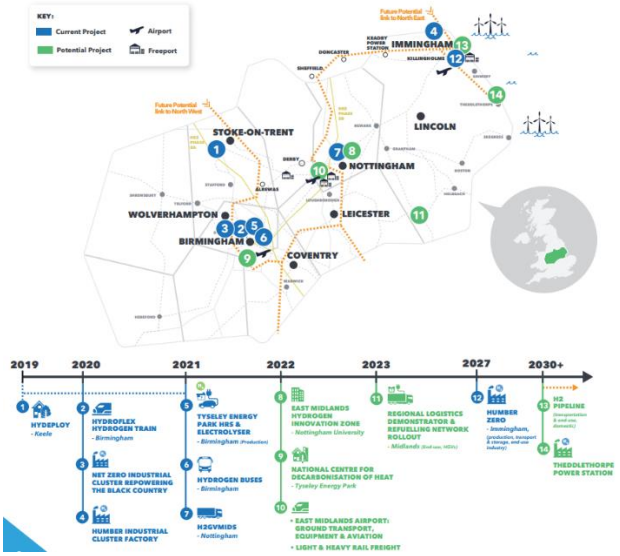

Figure 3: Hydrogen Technology Valley (unpublished: Preliminary Midlands Engine Hydrogen Technologies Strategy, 06/08/2021)

The strongest use case for hydrogen in the West Midlands is for transport, particularly of heavy freight vehicles. Included in this is new funding for the University of Birmingham Hydrogen transport project, as well as the regional presence of companies such as JCB, Toyota and Caterpillar who are committed to making hydrogen vehicles. The strong presence of this sector is bolstered by Adelan and Intelligent Energy, who are fuel cell engineering companies. Further use cases for hydrogen in the Midlands is centred on Cadent Gas' gas networks, and

the commitment of Baxi Heating and Worcester Bosch to provide hydrogen fuelled heating appliances. Energy Capital is working with Cadent and other partners on heat in buildings, building retrofit and local area energy planning.

Recent work undertaken in the RESO project looks at designing a Smart Local Energy System for Coventry and considers what is in effect a 'High Hydrogen' as well as a 'High Electricity' scenario. With the RESO project implemented (Governance structure in place, local markets operating, low carbon technical solutions applied) the modelling showed both achieve net zero, but the 'High Electricity' scenario is at less cost. Cadent however hold a strong view for the potential success of hydrogen penetration into the gas network. Coventry households are ready for a 20% hydrogen blend by 2025, and by 2030 98.3% of households could be connected to 100% hydrogen with only marginal further investment needed. This work is currently being finalised and results should not be used to determine strategic decisions at this stage, the project was completed in January 2022.

Energy Capital are also in the process of putting together the Infrastructure for Zero Emission Vehicle (IZEV) strategy to support zero emissions vehicles throughout the West Midlands.

How the West Midlands should be looking to respond:

Transport:

- The West Midlands has a central channel for freight transport within the UK, as well as regional industrial transport strengths
- The government have invested £20 million (this year) in a combined electric and hydrogen fuel cell road system to establish the feasibility, deliverability, costs, and benefits of these technologies. Coventry has already won funding for a stage 1 feasibility study from DynaCov for an inductive charging trial
- We should be looking to explore the £315 million Industrial Energy Transformation Fund. We already have a successful Innovate UK sponsored project in the Black Country, so should be looking to build on the strengths of this (Industrial Energy Transformation Fund - GOV.UK (www.gov.uk))
- £55 million Industrial Fuel Switching 2 competition (expression of interest closed 04/10/2021, Industrial Fuel Switching competition: scope of competition - GOV.UK (www.gov.uk))
- Transitioning to zero emission buses and the infrastructure needed for this (West Midlands Combined Authority have been selected to progress to Phase 2 of the fast track, Zero Emission Bus Regional Areas (ZEBRA) scheme - GOV.UK (www.gov.uk))

Research & Innovation:

- Use the Net Zero Hydrogen Fund to support West Midlands based low carbon hydrogen industry (consultation closed 25/10/2021 Designing the Net Zero Hydrogen Fund - GOV.UK (www.gov.uk))
- Midlands must be recognised as having a place in the hydrogen technology R&I roadmap (working with Hydrogen Advisory Council Research & Innovation Working Group)
- Ensure the West Midlands is part of the conversation when the government brings together the existing and emerging businesses critical to enabling the hydrogen economy across all relevant sectors
- Where applicable use leadership provided to develop new technologies and scale early-stage technologies for market (UK Infrastructure Bank)

Further reading

Other summaries and responses to the Hydrogen Strategy that have been published:

- Early responses from green/sustainable industry and economy 'Key to triggering investment and buy-in': Green economy reacts to UK's Hydrogen Strategy (edie.net)
- H2 View analysis: UK's hydrogen strategy raises more questions than gives answers (h2-view.com) (H2-View are the leaders in global hydrogen publications)
- Cadent Gas' response to the UK Hydrogen Strategy, Cadent's response to Hydrogen Strategy | Cadent (cadentgas.com)
- Thinktank response from E3G UK Hydrogen Strategy release: E3G experts respond - E3G %

Further Information	
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