GMCA GREATER MANCHESTER COMBINED AUTHORITY

Manchester Metropolitan University

Greater Manchester Hydrogen Strategy 2025-2030

together we are GREATER MANCHESTER

About GMCA

The Greater Manchester Combined Authority (GMCA) is made up of the ten Greater Manchester councils and the Mayor of Greater Manchester, who work with other local services, businesses, communities and other partners to improve the city-region. The GMCA gives local people more control over issues that affect their area by speaking with one voice for the region, making a strong case for resources and investment.

About Manchester Met

Manchester Metropolitan University (Manchester Met) is making an impact on Manchester, the UK and beyond, with a driving ambition to discover and disseminate knowledge, and make higher education accessible and beneficial to all those with the passion and ability to succeed. The University, which celebrated its 200th anniversary in 2024, is home to 44,000 students with an alumni network of more than 350,000 graduates. 90% of its research is rated as 'internationally excellent' and it has been rated in the top five most sustainable universities in the UK for the past 11 years. Manchester Met's internationally recognised work is delivered in collaboration with businesses and public sector bodies to drive sustainability in technology, practice and policy delivered through its key research groups, which include the Manchester Fuel Cell Innovation Centre that is cited within governments new national industrial strategy as a national asset for the UK.

Contents

Scope:

This Strategy is focused on enabling and accelerating the deployment of low carbon hydrogen solutions and technologies across Greater Manchester, as well as supporting broader North West ambitions. As a strategic document, its intent is to present a regionally tailored approach that supports local deployment, translating the high-level ambitions of the Greater Manchester Five-Year Environment Plan (5YEP) into a more detailed and actionable delivery framework based around three key pillars: Research and Innovation, Skills and Supply Chain, and Production, Distribution and Usage. It does not intend to provide detailed technical explanations of hydrogen technologies, nor associated risks or regulatory frameworks, as these are comprehensively covered in existing literature. By coordinating efforts and fostering robust multi-stakeholder collaboration, the Strategy aims to align with the UK Hydrogen Strategy and enable actions listed in the Greater Manchester 5-Year Environment Plan. Ultimately, it is intended to guide potential investors, inform future development and activities, support relevant regional stakeholders, and serve as a tool for tracking progress and ensuring accountability.

Terms to note:

Low Carbon Standard Hydrogen: The aims of this strategy pertain to the production, distribution, and use of Low Carbon Standard Hydrogen[1]. The standard for this is set nationally, and support of production facilities through the Hydrogen Production Business Model is contingent on meeting this standard:

For a Consignment to be considered compliant with the Standard, the Consignment shall:

- Have a Final GHG Emission Intensity that is less than or equal to the GHG Emission Intensity Threshold of 20 grams of carbon dioxide equivalent per megajoule of Hydrogen Product, using Lower Heating Values (20.0 gCO_2e/MJLHV Hydrogen Product); and
- Be produced by a Hydrogen Production Facility which satisfies all of the Conditions of Standard Compliance.

Manchester Baccalaureate (MBacc)[2]: The Mbacc aims to guarantee every young person growing up in our city-region has a clear path and line of sight to the good jobs and training opportunities, here in Greater Manchester.

This will be driven by a system that values technical education as a prestigious route and connects young people to employers through seven MBacc sector gateways — helping them understand the skills they need and how to reach opportunities in our fastest-growing sectors.

GM Investment Plan[3]: This is an ambitious ten-year plan to encourage growth and deliver tens of thousands of new jobs and homes for GM residents.

The city-region already has the fastest growing economy in the UK and has attracted more foreign direct investment than any other UK region, which GM will expand on by pioneering a new way of delivering large-scale development and transformative regeneration.

[1] UK Low Carbon Hydrogen Standard: Greenhouse Gas Emissions Methodology and Conditions of Standard Compliance
[2] The Greater Manchester Baccalaureate (MBacc) - Greater Manchester Combined Authority
[3] Greater Manchester sets out trailblazing plan to kickstart a new decade of growth - Greater Manchester Combined Authority

Proposals will see the whole Greater Manchester system mobilised to deliver £1billion of investment every year for the next decade and build homes on a scale and at a pace not seen in the past 20 years.

At the heart of the plan is the creation of a single pipeline for growth, which would target investment at six Growth Locations across Greater Manchester – nationally significant sites with the highest potential to boost the regional economy and bring benefits to all 10 boroughs.

Each location has land earmarked and shovel-ready for the creation of new housing and employment sites, which would spread the benefits of economic success across the city-region.

Chapter 1: Context

1.1 - The role of hydrogen in meeting carbon neutrality

Mitigating climate change in Greater Manchester, and the wider UK, involves reducing and decarbonising the energy consumed. As the UK electricity grid continues to decarbonise, electrification has been highlighted as a key pathway to reducing emissions, an approach that is particularly effective in sectors such as light transport and building heating[4]. However, electrification alone cannot address all areas of energy demand, and a diverse mix of energy sources is essential.

Hydrogen can offer a low-carbon alternative to natural gas, providing a viable solution for decarbonising sectors that are more challenging to electrify, such as high-temperature industrial processes and heavy-duty transport, where high power output is essential (see more in section 2.3). Although hydrogen reduces emission of other pollutants, the impact on NO*X* concentrations, particularly under real-world operating conditions, are not yet fully characterised due to limited empirical data. Further research is required to quantify these impacts, and robust mitigation strategies, including emission control systems and optimised combustion parameters, may be needed to minimize NOx exposure and safeguard air quality, when hydrogen is to be considered as a combustion fuel[5].

Hydrogen to Power (H2P) is a low-carbon technology class that offers a viable solution for inter-seasonal energy storage while supporting the transition away from unabated gas. By generating electricity from low-carbon hydrogen, H2P plays a critical role in decarbonising the energy system and balancing electricity supply and demand. Unlike batteries, hydrogen can store energy over long periods with minimal losses, alongside its dispatchable nature of hydrogen[6]. Therefore, it can increase the resilience and reliability of energy supply, particularly in answer to the intermittency of renewable generation. As such, H2P is expected to be a key component of the future energy system, reducing reliance on fossil fuels and enhancing grid resilience. Additionally, hydrogen fuel cells are particularly promising for heavy transport, aviation, and backup power, where batteries may be too heavy or slow to recharge. Fuel cells offer the further benefit of only releasing oxygen as a biproduct, minimising their impact on air quality.

Hydrogen Update to Market 2025[7] highlights hydrogen's transformative potential to drive economic growth, create thousands of new jobs, and revitalise the UK's industrial heartlands. Alongside electrification, hydrogen can position the UK as a Clean Energy Superpower, reducing reliance on volatile fossil fuel markets and enabling a transition to clean, secure, and domestically controlled energy.

This Strategy has been developed with careful consideration of both national and regional contexts to ensure Greater Manchester adopts the most effective pathway to carbon neutrality, grounded in the latest evidence. It focuses on enabling and accelerating the deployment of hydrogen technologies across the region, recognising hydrogen's critical role in decarbonising sectors such as industry, heavier transport, and power generation and storage.

By advancing low carbon hydrogen adoption, the Strategy supports the growth of a resilient hydrogen economy that delivers wide-ranging environmental, economic, and social benefits.

[4] End the fossil fuel age for a secure and prosperous future. - Climate Change Committee

[5] Optimising air quality co-benefits in a hydrogen economy: a case for hydrogen-specific standards for NOx emissions

[6] The Seventh Carbon Budget – Climate Change Committee

[7] Hydrogen update to the market: July 2025

These include job creation, inward investment, improved air quality, and enhanced energy security.

The following section explores these benefits and strategic priorities in alignment with key national and regional policies, including the UK Hydrogen Strategy[8], the Clean Power 2030 Action Plan[9], Greater Manchester's 5-Year Environment Plan (5YEP[10]), and Local Area Energy Plans (LAEPs)[11].

1.2 - Context and Opportunities:

1.2.1 – National

Department for Energy Security and Net Zero

The UK Government has consistently supported the development and deployment of hydrogen as a key technology to decarbonise the energy system and meet its Net Zero target by 2050. The initial target of 5 GW of low-carbon hydrogen production capacity by 2030 was doubled to 10GW in the 2021 Hydrogen Strategy[12], at least half of which is expected to come from low carbon hydrogen. Figure 2 shows the intention for expansion of the UK Hydrogen Economy, in line with this target.

Figure 1 - Hydrogen Economy 2020s Roadmap, UK Hydrogen Strategy

[8] UK Hydrogen Strategy

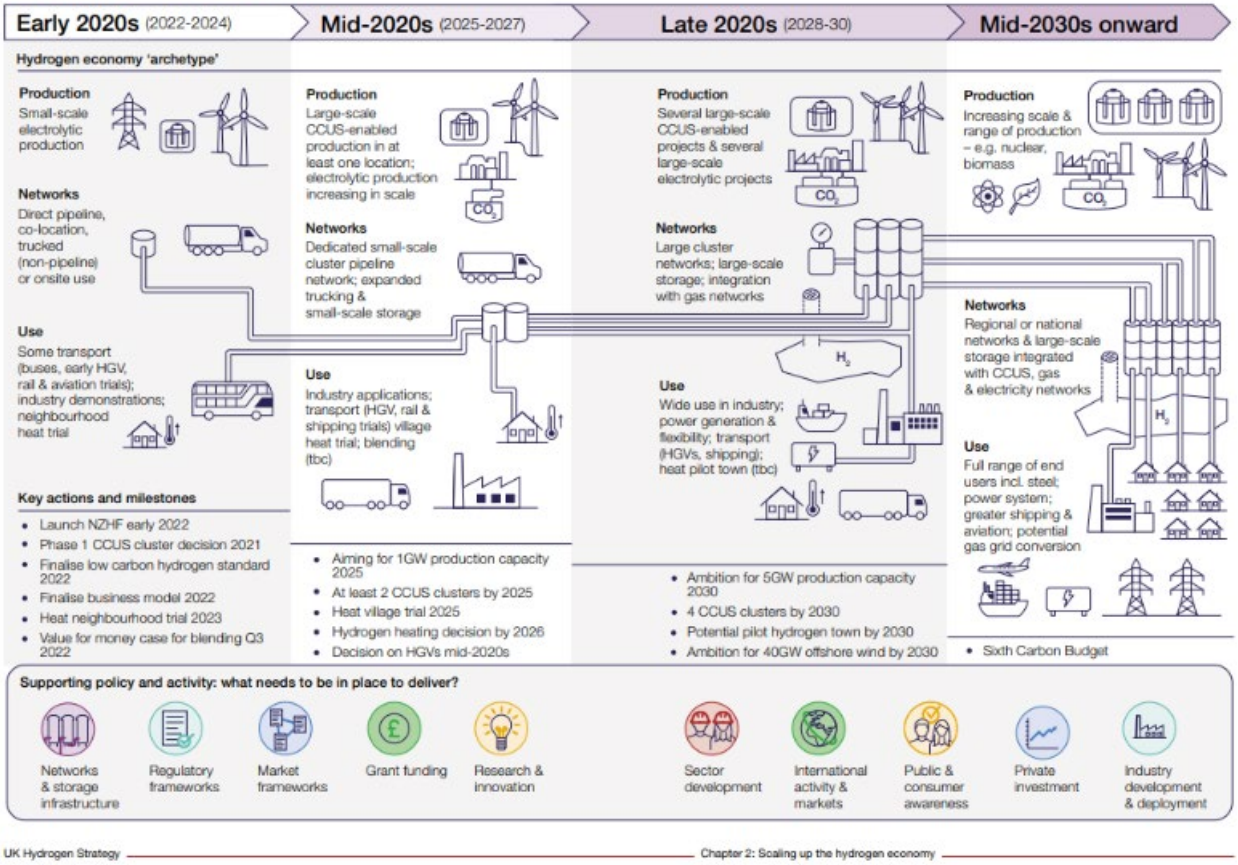
[9] Clean Power 2030: Action Plan: A new era of clean electricity

[10] Greater Manchester Five-Year Environment Plan 2025–2030

[11] Local Energy Market - GM Green City

[12] UK Hydrogen Strategy

Figure 2.1: Hydrogen economy 2020s Roadmap



DESNZ has identified the UK as uniquely positioned to capitalise on the benefits of a hydrogen economy and emerge as a global leader in hydrogen production and deployment. This is underpinned by the UK's sizeable renewable energy resources, and a highly skilled workforce.

National strategies present a clear vision for hydrogen's role in achieving net zero. The 2024 Clean Power 2030 Action Plan[13], reaffirmed hydrogen as a critical flexibility technology, a commitment further supported in the 2025 Spending Review, which allocated over £500 million to hydrogen infrastructure. Additionally, the Action Plan confirmed that the National Wealth Fund will invest at least £5.8 billion in carbon capture, low-carbon hydrogen, gigafactories, ports, and green steel over this Parliament. Complementary investment will also be delivered through Great British Energy, including a new £1 billion Clean Energy Supply Chain Fund, aligned with the Clean Energy Industries Sector Plan.

To support the development of low-carbon hydrogen, the Department for Energy Security and Net Zero (DESNZ) introduced the Low Carbon Hydrogen Standard and a Hydrogen Certification Scheme to verify production credentials. These initiatives complement the Low Carbon Hydrogen Production Business Model, underpinned by the Low Carbon Hydrogen Agreement (LCHA), which provides long-term revenue support to producers through competitive Hydrogen Allocation Rounds[14]. The goal of these projects is to establish a robust hydrogen economy, with the first electrolytic projects becoming operational and a goal to achieve 1GW of electrolytic hydrogen in construction or operation by 2025. The Government reaffirmed its commitment to

[13] Clean Power 2030: Action Plan: A new era of clean electricity
[14] Hydrogen Allocation Rounds - GOV.UK

these rounds in the 2025 Industrial Strategy, alongside plans to launch a new Hydrogen to Power Business Model in 2026.

The first round, Hydrogen Allocation Round 1 (HAR1), concluded in December 2023, with contracts signed and published in mid-2025. In Greater Manchester, Carlton Power's Trafford Green Hydrogen project was awarded a HAR1 contract, with a production capacity of 10.5 MW. Projects under HAR2 have since been announced, with contracts currently being finalised. Future rounds, HAR3 and HAR4, are expected to launch in 2025 and 2026 respectively.

DESNZ is also developing business models for hydrogen transport and storage infrastructure to address current limitations. The forthcoming Hydrogen to Power Business Model, expected in 2026, will adopt a Dispatchable Power Agreement-style mechanism to mitigate investment risks associated with first-of-a-kind technologies and the emerging hydrogen network. This will support the deployment of hydrogen-to-power plants while ensuring value for money.

A major milestone was reached with the UK Government's approval for construction of HyNet[15], a flagship project aiming to transform North West England and North Wales into a world-leading low-carbon industrial cluster. Located in Ellesmere Port, HyNet has secured £33 million from UK Research and Innovation (UKRI) through the Industrial Decarbonisation Challenge (IDC) fund, matched by £39 million from consortium partners. The project aims to bring hydrogen to Trafford in the 2030s via pipeline infrastructure.

This is supported by North West Clean Power Plan[16] which commits to scaling up action to leverage government investment to achieve a net zero economy. This includes utilising public investment cited in the 10 Year Infrastructure Strategy and the Modern Industrial Strategy for investment in major infrastructure projects in the NW, including in Transport, CCUS, hydrogen, long duration storage and nuclear. This will include unlocking the necessary private investment too.

Hydrogen distribution is also being advanced by National Grid's Project Union, which will repurpose existing gas transmission pipelines and construct new ones to form a UK-wide hydrogen backbone[17]. Both HyNet and Project Union will deliver hydrogen to Trafford Low Carbon Energy Park, a key site in Greater Manchester's hydrogen cluster and the city-region's first low-carbon hydrogen hub.

The National Energy System Operator (NESO) has developed two decarbonisation pathways for the power grid:

- New Dispatch: Projects low-carbon dispatchable power (CCUS gas and hydrogen) generating ~11 TWh by 2030.
- Further Flex & Renewables: Envisions a limited role for dispatchable power, with only ~0.34 TWh from hydrogen and CCUS gas, relying heavily on wind energy expansion.

In both scenarios, hydrogen plays a vital role in grid stability by converting excess electricity into storable hydrogen for later use, reinforcing its importance both before and beyond 2030. This Strategy acknowledges that low-carbon hydrogen is electricity-intensive and must complement other low-carbon energy sources.

[15] HyNet North West

[16] North West Clean Power - Position Paper, Summer 2025

[17] Project Union | National Gas

Aligning with national ambitions has been central to shaping this city-regional hydrogen strategy. Rather than duplicating national efforts, Greater Manchester aims to translate national frameworks into a place-based approach that stimulates local hydrogen markets and supports regional decarbonisation goals.

As highlighted by the Royal Society and the Royal Academy of Engineering (2024)[18], identifying local opportunities and challenges, particularly around demand and supply matching, will be essential. Collaboration with local authorities, coordinated by NESO and aligned with national hydrogen goals and Local Area Energy Planning, will be key to building a hydrogen economy at pace.

1.2.2. – Regional

The 2025 UK Industrial Strategy[19] highlighted that Clean Energy is one of Greater Manchester's strengths, and highlighted Manchester Met's Hydrogen Fuel Cell Innovation Centre, as being a national asset. In 2021, Manchester Met supported GMCA in their publication of Greater Manchester's first Hydrogen and Fuel Cell Strategy[20], which detailed assessment of the contemporary policy and technological landscape of hydrogen and fuel cells, the ways in which they could assist in decarbonisation, and how this potential could be realised in the region and beyond (further detail found in section 1.4).

This initial strategy was for the period 2021-2025, and whilst Greater Manchester has made advancements in hydrogen innovation, infrastructure, and planning over recent years, evolving national (*see section 1.2.1*) and regional ambitions, technology developments, and a changed policy landscape necessitate a refreshed, place-based hydrogen strategy.

5-Year Environment Plan

The Greater Manchester Five-Year Environment Plan 2025-2030 is the governing policy document for GMCA's work in addressing climate change, and provides the pathway needed over the next five years to aim towards carbon neutrality by 2038. Therefore, it has been a priority to translate the hydrogen targets captured in the Plan into a strategic document to turn ambition to action.

The GM 5YEP 2025-2030 outlined a provisional target to deliver 800GWh of Hydrogen Power by 2030. This was set following the Net Zero North West Investment Case: Delivering the Decarbonisation of the North West Industrial Sector[21]. Since setting this target, hydrogen's use cases and feasible projects for the city-region over the next five years have become clearer (explained further in section 2.3 – Targets). Therefore, the focus of this strategy will be to translate the high-level actions into a more detailed delivery plan, and minimising the high costs associated with many enabling actions through coordinated efforts and robust multi-stakeholder collaboration.

[18] Towards a green hydrogen roadmap for the UK | A summary report | The Royal Society | September 2024
[19] The UK's Modern Industrial Strategy
[20] 08 Greater Manchester Hydrogen and Fuel Cell Strategy 2021-2025.pdf
[21] NZNW_Investment_Case_FINAL_Report_April_2023_50c8081126.pdf

Table 1 -Greater Manchester 5-Year Environment Plan 2025-2030: Actions Table

Objective: Increase installed capacity and use of low carbon hydrogen					
Direct Actions	*Lead*	*Enabling Actions*	*Lead*	*Cost*	*Impact*
Support the generation, distribution and usage of low carbon hydrogen, following the 'hydrogen use hierarchy'	*Business, Greater Mancheste rCA, LAs*	*Support the development of a pipeline of low carbon hydrogen demand for Phase 1 of Trafford Energy Park*	*Greater Manchester CA, LAs*	*£*	*L*
		Investigate, identify and support the development of suitable test sites for low carbon hydrogen off-take usage	*Greater Manchester CA, Business, LAs, H2 suppliers*	*£££*	*L*
		Promote, support and encourage the roll out of low carbon hydrogen infrastructure and supply, subject to viability tests	*Greater Manchester CA, LAs*	*££££*	*L*
		Investigate and support feasibility pilots for hydrogen fuel cell deployment on suitable sites and assess the feasibility for wider roll out	*Greater Manchester CA, Business, Universities, MIDAS*	*££££*	*L*

The referenced 'hydrogen use hierarchy' that both the 5YEP and this strategy are guided by is as follows:

1. Reducing overall energy demand through a heightened emphasis on eliminating energy-intensive activities that can be avoided or limited
2. Optimisation (enhancing energy efficiency and refining existing systems)
3. Electrification
4. Green fuels (including. hydrogen, e-fuels, and biofuels)
5. Further measures, such as carbon capture and storage (CCS) or other removal technologies.

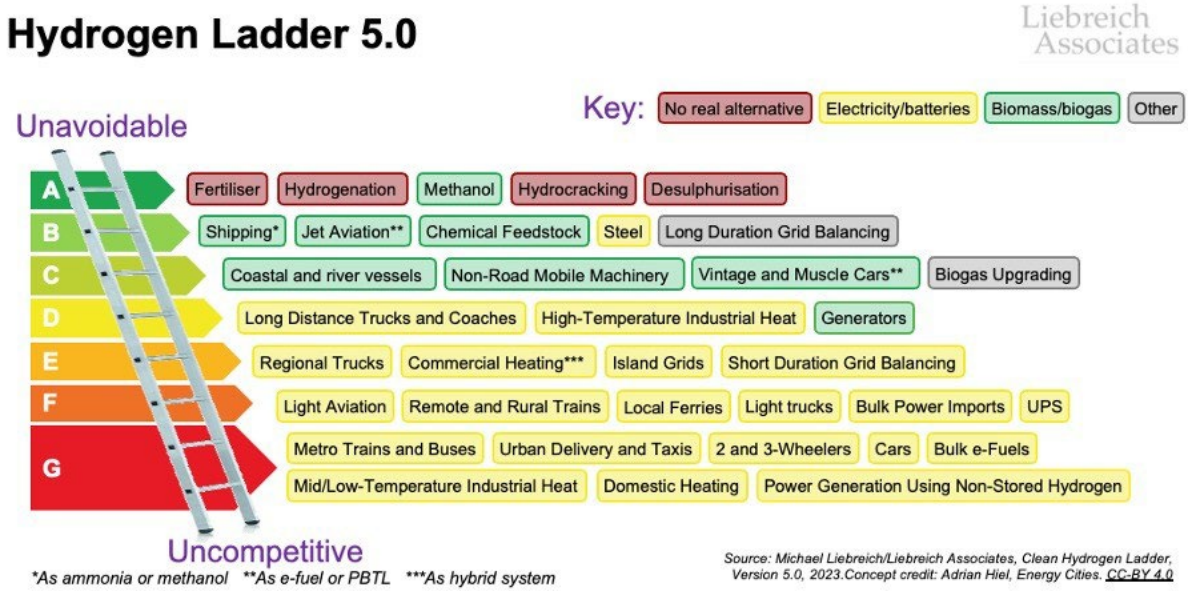


Figure 2 - Hydrogen Ladder (Michael Liebreich Associates)

This hierarchy has been determined through both the Greater Manchester Local Area Energy Plans (detailed in the following section), the current availability of hydrogen in the North West,

and the evidence bases from the Climate Change Committee (CCC). The CCC's evidence base[22]underscores that hydrogen will play a small but crucial role, particularly in industrial sectors like ceramics and chemical production that are difficult to electrify. They also note that that low-carbon dispatchable generation, such as hydrogen, should be utilised alongside renewables. This is essential for ensuring a reliable supply of electricity, even during adverse weather years. The CCC also finds no role for hydrogen in building heating and sees at most a very niche role for hydrogen in surface transport.

Further supporting this approach is the Distribution Future Electricity Scenarios (DFES) by Electricity North West[23]. The DFES includes six modelled scenarios for reaching net zero in the North West, including a 'Best View' which outlines highest certainty assumptions in demand and generation forecasts up to 2030. Best View considers high levels of electrification with hydrogen used for industrial process and heating close to industrial clusters.

Sectors where hydrogen can be of significant value for decarbonisation, such as industry gas and transport, can be seen to be contributing significantly to Greater Manchester's overall emissions (see Figure 1). This highlights the attraction of hydrogen's use in targeted decarbonisation approaches.

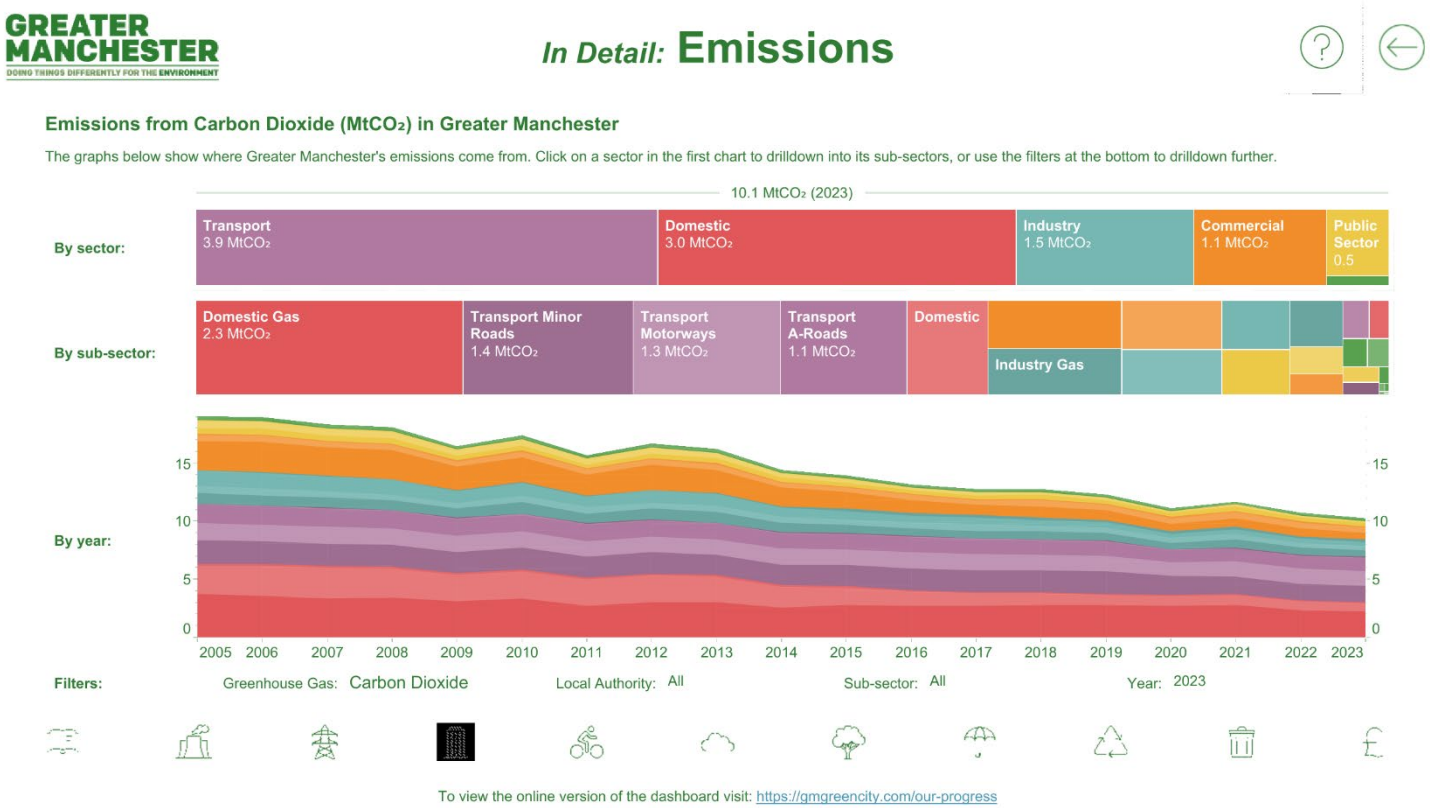


Figure 3 - GM Emissions Data

Local Area Energy Planning

[22] The Seventh Carbon Budget
[23] DFES 2024 - v2

Local Area Energy Plans (LAEPs) are strategic, data-driven plans developed to guide the transition of an area or region towards a low-carbon, smart, and resilient energy system. In 2022 10 LAEPs were completed for each Greater Manchester district, as well as an overarching report with insights into how GM meets its carbon budgets and 2038 carbon neutrality target. This report outlined two key scenarios for decarbonising the region's energy system, the 'primary' and 'secondary' scenarios.

The primary scenario emphasises electrification, complemented by a targeted deployment of hydrogen. In this scenario, hydrogen is primarily allocated to support energy-intensive industrial users expected to connect to Phase Two of HyNet. It also highlights the potential of hydrogen fuel cells as a decarbonisation solution for larger vehicles, including HGVs. Additionally, heat networks with centralised hydrogen boilers are identified as a "low regret" option, as this approach reduces the need to retrofit gas pipework in streets and buildings, which would otherwise be required to accommodate hydrogen.

A secondary scenario considers the availability of hydrogen for residential and non-domestic heating from 2030 onwards, aligned with HyNet Phase Three. However, this pathway is contingent on national policy decisions and the readiness of supporting infrastructure. While hydrogen has been recognised as a possible heating option in specific areas, challenges with implementation, air quality issues associated with combustion and limited supply suggest hydrogen will likely be prioritised for industrial clusters.

As reflected in the 5YEP, the LAEP also underscores the importance of demonstration projects and pilot initiatives to build local capacity and deepen understanding, particularly in areas where hydrogen could be a viable solution.

The national decision regarding the use of hydrogen for domestic heating is anticipated in 2026. If green-lit, use of hydrogen in homes will necessitate substantial retrofitting of grid infrastructure and household appliances, resulting in significant upfront costs prior to viable implementation. Additionally, the supply of hydrogen is not expected to be significant for some time, and there remains a cost differential compared to electric heating.

Therefore, it is assumed that the Primary Scenario is the more viable pathway. As such, the Strategy will focus efforts on targeted use to address industry emissions, some heavier transport, and hydrogen to power projects that can increase electricity network resilience.

Broader Context

The UK Hydrogen Strategy recognises the North of England as a key region for developing a decarbonised hydrogen economy. The UK Industrial Strategy: Invest 2035[24] strategy also reinforces this view, highlighting the vast potential of the North, and specifically Greater Manchester, as a burgeoning centre of modern industry, and flourishing clean energy industries. Within this context, Greater Manchester stands out as a region with a unique combination of assets that position it to lead in hydrogen innovation, deployment, and commercialisation.

The city-region benefits from:

[24] Invest 2035: the UK's Modern Industrial Strategy

- A thriving industrial and manufacturing base (see section 2.3), providing a strong demand-side foundation for hydrogen applications, as well as the capacity to manufacture components associated with hydrogen production and distribution.
- The capability to re-skill and upskill its existing workforce to meet the needs of a low-carbon economy (see section 2.1). The GMCA's focus on good, technical education through the MBacc will further compliment this.
- A track record of successful collaboration across local authorities and city-regions.
- Natural assets and infrastructure advantages in key areas such as hydrogen and energy storage, with significant potential for scaling (see section 2.3).
- A well-established research and innovation ecosystem that has already laid the groundwork for hydrogen sector growth (see section 2.2).
- A reputation for successful and productive public-private partnerships.

To fully realise the city and wider regional potential, coordinated action and strategic direction are essential to align stakeholders, attract investment, and maximise impact, which is what this strategy aims to achieve.

1.3 - What has been achieved since the last strategy

The previous iteration of the Hydrogen Strategy played a pivotal role in shaping the conversation around hydrogen development in Greater Manchester. It proposed a phased approach to delivery:

- Phase 1 (2020–2025): Establish the transport supply chain and build confidence in broader hydrogen applications.
- Phase 2 (2026–2030): Prepare for the availability of large-scale hydrogen supply.
- Phase 3 (2031–2038): Establish a CO_2-free hydrogen supply system, focusing on large-scale deployment to support the transition to a hydrogen economy.

While the Strategy outlined a least-regret pathway, its implementation was influenced by evolving national policy and external factors. Notably, a decision on the use of hydrogen for domestic heating remains to be made, expected in 2026. Additionally, national delays in hydrogen availability, including delays with successful projects from Hydrogen Production Business Models reaching point of FID, has prompted a shift toward electrification.

Despite these shifts, the national Strategy and GM regional strategies overarching objectives have been actively pursued. These include:

- Alignment with the North West region and Northern Powerhouse agenda
- Supporting the North West's ambition to become the UK's first Low Carbon Industrial Cluster
- Acting as a roadmap for a comprehensive research programme, fostering collaboration among stakeholders

Key Activity

The following section describes projects that the previous Hydrogen and Fuel Cell Strategy helped to initiate by aligning support to build relationships, and instilling investor confidence on regional ambitions.

Carlton Power: Trafford Green Hydrogen – [also mentioned in section 2.3]

Established relationships and a propensity for good relationship working has enabled success in projects like Trafford Green Hydrogen which was successfully selected for Hydrogen Allocation Round 1 (HAR1) and is one of the largest opportunities for the region under the first round of the programme.

The previous Hydrogen and Fuel Cell Strategy was instrumental in galvanising relationships across the Greater Manchester (GM) ecosystem, fostering a collaborative environment that laid the groundwork for ambitious projects such as Trafford Green Hydrogen. By aligning strategic support with the region's existing strengths in research, innovation, and industry, the strategy brought together developers, technology companies, academic institutions, and public sector bodies under a shared vision for decarbonisation and economic growth.

Trafford Green Hydrogen is one of the region's most significant opportunities selected for Hydrogen Allocation Round 1 (HAR1). Led by Carlton Power and supported by a local consortium, including Manchester Metropolitan University, Greater Manchester Combined Authority (GMCA), Trafford Council, Cadent Gas, and Electricity North West, the project exemplifies the ecosystem's capacity to turn strategic ambitions into tangible action.

The Trafford Green Hydrogen project, led by Carlton Power, will host the UK's largest green hydrogen production facility. Located at Trafford Energy Park, the site also features the world's first commercial-scale Cryo-Battery using liquid air. The project has secured the UK Government's support through HAR1 funding to build a green hydrogen hub at the Trafford Low Carbon Energy Park in Greater Manchester. The 200MW facility, the largest consented green hydrogen project in the UK, will meet the needs of local industry and transport operators who wish to make the switch from fossil fuels. The first phase of the Trafford project (15-20MW) through the Hydrogen Business Model process aims to stimulate the growth of the hydrogen economy across the UK.

Carlton plans to start construction of its Trafford Green Hydrogen project in late 2025, and for it to enter commercial operation in 2027. It will produce and store hydrogen at scale and help integrate renewable energy on a regional scale through the storage of solar and wind energy.

The first phase of the Trafford Green Hydrogen scheme is likely to create around 200 construction jobs and up to 10 full-time operational jobs, with future phases to be constructed in response to demand for hydrogen in the region.

Hydrogen and Fuel Cell Centre at Manchester Metropolitan University

Established in 2018, the £4.1 million Hydrogen and Fuel Cell Centre was created to advance hydrogen fuel cell technologies for transport, energy storage, and industrial applications. Since its inception, the Centre has consistently pursued the ambitions outlined in the regional fuel strategy, working closely with businesses to provide R&D, technical support, and prototyping.

As the UK's first Fuel Cell Centre of Excellence with a dedicated focus on serving industry and business, it has become a central hub for hydrogen innovation in the region. Welcoming international delegations from across the globe, the Centre is now recognised as a key global hub for hydrogen research and development, and the facility was recently mentioned in the UK industrial Strategy as a key asset of the region[25]

[25] Invest 2035: the UK's Modern Industrial Strategy

By collaborating across the region and aligning on shared priorities in several interrelated technology areas, the Centre is instrumental in supporting Greater Manchester's goal to become a net zero city region by 2038. Its place-based approach to hydrogen, cited by the Royal Society and Royal Academy of Engineering as a UK exemplar, enables regional, national, and international businesses to benefit from world-class academic expertise and access to state-of-the-art facilities.

Since 2018, the Centre has also played a pivotal role in establishing and leading innovation accelerator programmes, such as the £6 million Greater Manchester Electrochemical Hydrogen Cluster (GMEHC). These initiatives support the national ambition for the UK to lead in the development and deployment of hydrogen technologies.

Greater Manchester Electrochemical Hydrogen Cluster (GMEHC)

The GMEHC cluster, funded through the Greater Manchester and Innovate UK - Innovation Accelerator programme[26], is a collaborative initiative involving the Manchester Metropolitan University, the University of Manchester, the Henry Royce Institute, the National Physical Laboratory together with private sector partners.

The Greater Manchester Electrochemical Hydrogen (GMEHC) project is dedicated to advancing electrochemical technologies. By improving the performance, durability, and price of these technologies by resolving challenges with manufacturing processes, design, and materials, the project aims to support the UK's Hydrogen Strategy and deliver national supply chain resilience for clean energy solutions.

Hydrogen to Power project collaboration with Panasonic

In 2024, GMCA signed an exploratory partnership agreement alongside representatives from Panasonic Corporation, SSE Energy Solutions, Electricity North West, Manchester Metropolitan University and Carlton Power, supported by MIDAS and Deloitte. The agreement enables the exploration of opportunities to harness low carbon hydrogen and Panasonic's fuel cells to supply the chosen site with 100 percent renewable electricity, supporting Greater Manchester's ambition to be carbon neutral by 2038.

By tapping into the wealth of expertise available in Greater Manchester through its universities, businesses, and sector-based agencies, Panasonic has identified emerging markets for the "Panasonic HX" technology, a hydrogen-based energy solution, and leveraged the partnership to build a longlist of sites in Greater Manchester who would be interested installing the technology. Ultimately two sites have been identified to pursue initial demonstrator applications, including an NHS facility to test healthcare applications.

By building on both UK and Japanese capability in the deployment of H2P solutions and enabling local supply chains of innovators and suppliers, this partnership is de-risking investment in UK manufacturing, enabling international investment, as well as supporting scale-up for international companies like Panasonic.

[26] Greater Manchester's Innovation Accelerator

1.4 - High level strategic vision and delivery framework

This Strategy is key to accelerating action towards decarbonisation in Greater Manchester and capitalising on the growth opportunities presented by the hydrogen sector. Ultimately, it aims to:

- Translate national ambitions into local delivery
- Provide clarity to businesses, investors, and education providers
- Coordinate infrastructure, innovation, and skills development
- Identify priority sectors and geographies for hydrogen deployment

To support this, key 'Opportunity Areas' have been identified to outline where and why targeted action is needed. These areas, Skills and Supply Chain, Research and Innovation, and Production, Distribution and Usage, were selected to reflect national hydrogen ambitions and emerging business models. They also build logically on Greater Manchester's existing strengths and were shaped through consultation with industry experts.

The final section of this Strategy presents the aims for the 2025-2030 period of each Opportunity Area, accompanied by a list of actions, along withs a detailed list of actions and the stakeholders responsible for delivering them.

To ensure effective implementation and delivery of these actions, a Delivery Group will be established - Hydrogen GM. This group will be comprised of key industry stakeholders, including those who have been involved in shaping this Strategy and those assigned specific actions. It will meet quarterly to collaborate on driving the sector, monitor progress, and report on outcomes, to achieve the Strategy's goal of unlocking a thriving hydrogen economy in Greater Manchester. Hydrogen GM will also be key in developing a spatial plan and shaping targets pertaining to hydrogen for the city-region.

Following the Strategy period (2025-2030), a comprehensive outcome evaluation will be conducted. This will assess the Strategy's success in driving regional decarbonisation through hydrogen and in increasing hydrogen-related employment and growth.

While Greater Manchester has the capacity to drive local demand and foster innovation in hydrogen technologies, the successful development of large-scale hydrogen infrastructure also relies heavily on national supply chains and policy frameworks. Consequently, several actions outlined in this Strategy fall within the jurisdiction of national and governmental bodies. To ensure alignment with national objectives and to support shared ambitions, GMCA and Manchester Met have engaged closely with the Department for Energy Security and Net Zero throughout the Strategy's development.

Chapter 2: Opportunity Areas

2.1 – Skills and Supply Chain

Whilst there are a limited number of production projects currently anticipated within GM, GM's skilled workforce and established supply chains are expected to be critical in delivering hydrogen projects across the North West, particularly given the ambition to build on these with a focus on collaboration with industry. This chapter highlights where existing strengths in the Greater Manchester skills market and in supply chains can be utilised to expand the hydrogen economy, and how the city-region can capture as much of the investment and employment opportunity as possible.

Current Greater Manchester position

Greater Manchester has nationally recognised strengths in the Low Carbon sector, being home to home to a strong base of pioneering businesses, leading research institutions, and a supportive policy environment, all of which are critical for scaling hydrogen solutions and realising the ambitious target of carbon neutrality by 2038. Furthermore, as one of the UK's most devolved English regions, Greater Manchester is uniquely positioned to respond swiftly and strategically to emerging industrial demands. As work on the GM Investment Plan is shaped, outlining how the Devolution Deal will support economic growth in the region, there is an opportunity to engage directly with local supply chains, labour markets, skills providers, and innovation ecosystems providing a distinct advantage in mobilising the city-region for hydrogen deployment.

Additionally, the region is recognised nationally for its economic dynamism, shown by high start-up rates, a strong presence of Unicorn businesses, and rapid growth in key sectors [27] [28]. This innovative environment underpins Greater Manchester's strategic focus on four frontier sectors identified in the Greater Manchester Local Industrial Strategy 2019 [29] and the Greater Manchester & Cheshire East Science & Innovation Audit[30] . These sectors will be the core focus of development strategies in the coming years, three of which are particularly complementary to a hydrogen economy:

- Advance Materials & Advance Manufacturing
- Digital, Cyber & AI
- Low Carbon Goods & Services

Despite a national decline in manufacturing, the sector remains a cornerstone of the Greater Manchester economy. Greater Manchester has a highly skilled manufacturing workforce of nearly 114,000 people, working in areas including electronics systems, software engineering and transport, all of which are complementary to hydrogen technologies. In addition to 20% lower operating costs than in London and outstanding quality of life for employees[31], the region offers an attractive place for expanding industry.

[27] Manchester Independent Economic Review
[28] Greater Manchester Independent Prosperity Review.
[29] GREATER MANCHESTER Local Industrial Strategy
[30] Greater Manchester & Cheshire East Science & Innovation Audit
[31] Adv_Manufacturing_Factsheet_2025_b659449e-da7e-49e7-b304-7493a7732b6b.pdf

According to the Greater Manchester Local Industrial Strategy and data from the Office for National Statistics[32], manufacturing in Greater Manchester contributes significantly to regional Gross Value Added. In particular, the region is host to clusters of graphene and advanced material manufacturers[33], complemented by the University of Manchester's world leading research. Materials such as graphene and advanced composites, play a vital role in enabling lightweight and efficient hydrogen transport and storage. Strengths in production of advanced coatings, polymers, and composites, which enhance the efficiency and durability of fuel cells, further reinforce the region's competitive edge.

Advanced manufacturing techniques are particularly crucial for the development of hydrogen infrastructure and Greater Manchester's manufacturing sector is also evolving to meet the demands of the green economy. The integration of Industry 4.0 technologies[34], such as automation, digital twins, and data-driven production, is helping firms with a GM footprint remain competitive and sustainable. These capabilities in precision manufacturing are essential for producing components like fuel cells, storage systems, and play a significant role in the design, operation, and optimisation of electrolysers.

Greater Manchester's digital capabilities also support the growth of a hydrogen economy, especially in the development of control and monitoring systems. These systems are necessary for regulating key parameters such as voltage, temperature, pressure, and flow rates, ensuring optimal performance and safety across hydrogen technologies. Digital modelling and AI will also help to inform city-region energy models, which can build the strategic business case for hydrogen deployment, including focus areas of predicted highest demand.

The city-region also possesses a robust and diverse skill base that provides a strong foundation for the scaling of hydrogen associated markets. According to a 2024 CBI Economics report, Greater Manchester hosts one of the UK's largest Net Zero clusters in terms of business activity, employment, and economic output[35]. According to Hydrogen Safe's Hydrogen Skills Framework for Greater Manchester[36], the region already benefits from a well-established skills base that is largely adaptable to hydrogen-related industries.

Consultancy and professional services are also an important component to the growth and resilience of hydrogen-related industries, and Greater Manchester is particularly well-served in this regard, having a substantial base in these sectors[37]. From engineering consultancies offering expertise in advanced materials, system integration, and hydrogen infrastructure, to legal, financial, and environmental advisory firms skilled in navigating the evolving regulatory and investment landscape, the city-region provides businesses with access to a broad spectrum of support services. These consultancies will be essential for collaboration with manufacturers, technology developers, training providers, and public sector stakeholders, helping to ensure that hydrogen projects are designed, financed, and managed to global best practice standards. The diversity of Greater Manchester's professional services sector not only

[32] Nomis - 2021 Census Area Profile - North West Region
[33] Advanced Materials Manufacturing in GREATER MANCHESTER (MIDAS)
[34] MIDAS: Industry 4.0
[35] CBI Economics - The UK's Net Zero Economy (2024)
[36] Hydrogen Safe- Hydrogen Skills Framework Brochure
[37] labour-market-and-skills-intelligence-report-financial-business-and-professional-services.pdf

underpins the region's competitive advantage for a hydrogen economy but also fosters innovation, knowledge transfer, and workforce development.

The region's high population density and status as a top travel-to-work area create a fertile environment for industrial growth and for an essential role in wider North West decarbonisation efforts. Firms benefit from shared infrastructure, a skilled workforce, and knowledge spillovers, conditions which are ideal for scaling capabilities in sustainable manufacturing and hydrogen technologies.

These sectors not only represent areas of competitive advantage but also offer significant potential for job creation, inward investment, and export growth. By leveraging these strengths, Greater Manchester will be well positioned to become a national hub for hydrogen innovation and deployment, supporting the region and the UK's transition to a high-value, low-carbon economy.

Growth Opportunities

Realising the full potential of a hydrogen economy in Greater Manchester will require both a workforce equipped with the right skills, and a robust, scalable supply chain capable of meeting future demand. It is also recognised that skills development can be time-phased, focusing initially on construction, followed by operations and maintenance.

As previously mentioned in the previous section (2.1.1), the city-region already benefits from adaptable skills-base for hydrogen-related industries[38]. While some reskilling and upskilling will be necessary, including in areas like facilities management, fleet management and finance, the existing workforce is well-positioned to transition as opportunities arise. The Hydrogen GM delivery group will be tasked with maintaining engagement with industry and employers to ensure CPD occurs in line with market needs. There will also need to be careful consideration of retainment of skills as those in the workforce approach retirement; initiatives such as Retention of Critical Knowledge (ROCK) mentorship programs can support with this work – which will again be a focus of the delivery group.

The delivery group will also be tasked with continuing to attract new entrants into the sector, for which a communications programme will be essential to demonstrate the opportunity to learners, as well as training providers. One promising initiative is the delivery of a Hydrogen Safety Apprenticeship's in local colleges in the region, an innovative step that provides a pathway into Hydrogen careers. This programme not only addresses a skills gap but also offers a valuable opportunity to engage directly with industry partners. Stakeholders have noted a lack of coordinated employer engagement in this area, suggesting the need to convene employer and educator groups to better understand and respond to industry requirements, and to stimulate uptake of such programmes.

There also remains some hesitation around investment in hydrogen supply chains and skills, largely due to the requirement of a national decision on hydrogen deployment and subsequent investment priorities. Employers have expressed uncertainty about the sector's readiness for commercial deployment, which has also led to cautious engagement from training providers, and although one Greater Manchester-based hydrogen company has approached colleges to promote qualifications, uptake has been limited. Some institutions have embedded hydrogen-related content into existing qualifications, but widespread adoption is seen as premature.

[38] Hydrogen Safe- Hydrogen Skills Framework Brochure

Whilst it is expected that this strategy will provide some of the assurance needed from training providers and employers, there will be a continued need for wider engagement with both groups as the industry develops.

There is also still a need for clear, consistent messaging about the planned and supported expansion of the hydrogen sector from national government. This communication must reach both businesses and prospective learners to ensure that skills development keeps pace with industry growth, which Greater Manchester will continue to encourage. Noting that decisions must be timely to remove uncertainty which ultimately impedes investment.

While Greater Manchester retains a strong manufacturing base, individuals without university degrees have been disproportionately affected by the decline of traditional manufacturing. This underscores the importance of formalised pathways such as the Greater Manchester Baccalaureate (MBacc), as well as T-levels, which can support a broader range of learners, including those who want to take a technical route. Aligning such qualifications with industry needs will be another key step for the delivery group to driving the green transition in manufacturing.

Coordinating training programs in partnership with industry also presents a compelling opportunity for attracting investment to the region. There is a strong track record across GM of successful collaboration between industry and training providers in other sectors, demonstrating the effectiveness of public-private partnerships. The GMCA maintains close relationships with both industry stakeholders and education providers, communicating these successes (as highlighted in Section 2.1.3) alongside the region's existing strengths, will be crucial in showcasing the investment opportunity to expand GM's hydrogen sector.

These initiatives will be aligned closely with the UK Government's 2025 Industrial Strategy, which commits over £100 million over three years to support the development of engineering skills. This work will be delivered in partnership with Skills England, higher and further education institutions, and apprenticeship providers. It will also be supported by capital investment from the Skills Mission Fund, with a focus on expanding access to courses and pathways that lead into priority occupations for young people. In parallel, the DESNZ is working to embed skills standards and supply chain requirements into contracts and procurement processes. This includes collaboration with Electricity Network Operators (ENOs) and Ofgem to identify key skills needs and co-design curriculums with industry.

It will be key to maintain close engagement with relevant departments as this work progresses, leveraging GMCA's connections with local industry to support implementation and ensure alignment with regional needs. Particularly, given the similarities between these initiatives and the MBacc framework, there will be significant opportunities for knowledge exchange and joint working.

2.2 – Research and Innovation

A substantial driving force behind Greater Manchester's hydrogen ambition lies in the collective strength and diverse capabilities of its core academic partners; Manchester Metropolitan University, the University of Manchester, the University of Salford, and The Henry Royce Institute.

Hydrogen technologies are still evolving, and research institutions play a critical role in developing more efficient, cost-effective, and scalable solutions. Innovation can help overcome current limitations such as high production costs, energy losses, and infrastructure challenges. Investing in hydrogen R&D in the region can position Greater Manchester as leaders in the global hydrogen economy. This, in turn, attracts investment, talent, and partnerships, strengthening the local innovation ecosystem.

Innovation-led hydrogen activity also supports the creation of high-skilled jobs in engineering, science, and digital technologies; and is key in driving the development of education and training programmes, ensuring the local workforce is prepared for emerging opportunities. Furthermore, innovative hydrogen solutions can contribute to a more resilient and diverse energy system, helping to integrate hydrogen with renewables, storage, and grid systems, supporting long-term sustainability goals.

This chapter outlines the current strengths held in Greater Manchester in research and innovation and highlights an appropriate expansion plan for these activities.

Current Greater Manchester position

Greater Manchester is establishing itself as a leading centre for hydrogen innovation, supported by a robust ecosystem of academic institutions, industrial partnerships, and strategic initiatives. GM universities have acted as catalysts for collaboration between academia, local and national government, and industry. These partnerships (referenced below) have accelerated the translation of research into commercial applications, pilot projects, and infrastructure development.

Manchester Metropolitan University

Manchester Metropolitan University has been central to enhancing regional hydrogen innovation and workforce development and was also behind the region's previous Hydrogen and Fuel Cell Strategy. Their Fuel Cell Innovation Centre is renowned for research and development of both as fuel cells and electrolysers[39], being cited in the UK Industrial Strategy[40] as a national asset, and experts from the centre lead in conversations on hydrogen and clean power at a national level. Manchester Met also recently collaborated with Hydrogen Safe on their Greater Manchester Hydrogen Skills Framework (as referenced in section 2.1), addressing the growing need for a skilled hydrogen workforce.

Manchester Met have capabilities to develop next-generation materials and devices for the conversion of renewable energy into sustainable chemicals and fuels. This work is underpinned by materials science, chemistry, and engineering in addition to advanced coating methods to improve components including end plates, current collectors, bipolar plates and porous transport layers, spanning fundamental through to applied research. Through this expertise

[39] Manchester Fuel Cell Innovation Centre | Manchester Metropolitan University

[40] Industrial Strategy: Clean Energy Industries Sector Plan

they concepted and lead the Greater Manchester Electrochemical Hydrogen Cluster (GMEHC) in collaboration with The University of Manchester (UoM), National Physical Laboratory, and the Henry Royce Institute (more information included in the case study – section 2.2.3). This cluster, funded by the Innovation Accelerator[41], is advancing hydrogen technologies and infrastructure to support the region's low-carbon transition by helping firms access expert knowledge, research and facilities to develop new products and technologies, create new supply chains, build collaborations and train their staff. Manchester Met partnership with Bosch aims to increase innovation readiness in the region with the view of introducing new products, services and concepts to market. Bosch are also looking for North West-based SMEs that are interested in finding out more about the potential of hydrogen and fuel cell technologies, and to potentially become part of their supply chain to build the region's first electrolyser stack.

The University of Manchester

The University of Manchester (UoM) also plays a significant role in hydrogen research and innovation through its Industrial Hub for Sustainable Engineering, which focuses on sustainable innovation, including pilot-scale green hydrogen experimentation and the development of alternative fuels. The university's Faculty of Science & Engineering leads research in hydrogen,[42] electricity and power systems, carbon capture, and industrial decarbonisation.

The RECYCLE project (Rethinking low Carbon hydrogen production by Chemical Looping reforming) will construct and test a fully integrated innovative hydrogen production pilot unit at UoM. The technology is based on chemical looping reforming using fixed bed reactors which allow modular units and cost-effective solutions for hydrogen production using different feedstocks, with inherent carbon dioxide capture and separation at high purity.

The Henry Royce institute

The Henry Royce institute is the UK's national institute for advanced materials research and innovation. The Institute leads the Hydrogen Accelerator (RHA) which has been designed to tackle materials challenges which are constraining the hydrogen supply chain. It will bridge the gap in the existing innovation landscape between lab-based materials research and proven technologies executed at scale. And it will coalesce a network of key voices from government, industry, academia and investment.

The University of Salford

The University of Salford also valuably contribute to the hydrogen research and innovation landscape in the region. Their Physics and Materials Research Group have conducted research into hydrogen storage, and PhD projects have explored high-pressure hydrogen generation, storage, and use. These projects aim to shape the future of clean energy and are often part of collaborative efforts with industry and other academic institutions.

The Graphene Institute

[41] Innovation Greater Manchester | Innovation Accelerator

- Hhigh temperature nuclear processes (latter particularly relevant for nuclear), utilising Solid Oxide Electrolyser Cell (SOEC) technology could improve nuclear business case, minimise use of other renewables for electrolysis - Introducing hydrogen production and electricity creates a way to make the output flexible, rapid changes in renewable output can be accommodated by turning the hydrogen production up or down

The Graphene Institute, an advanced facility in Manchester, is dedicated to the fundamental research of graphene and 2D materials, and the development of cutting-edge devices that harness their exceptional properties. By providing such a unique environment for precision research and innovation including around green hydrogen technologies, they are part of the GM research and innovation ecosystem supporting industrial challenges.

The Energy Innovation Agency

The Energy Innovation Agency, a public-private-academic partnership founded between GMCA, Growth Company, University of Salford, University of Manchester, Manchester Metropolitan University, Bruntwood, SSE Energy Solutions and Hitachi Europe, was established to identify the most promising UK and global low carbon innovations, accelerate the commercialisation of technologies and leverage the partnership's networks to deploy innovations at scale in Greater Manchester. The Agency is well-placed to ensure start ups and university spin-outs in the hydrogen economy are well supported, and avoid the barriers to rapid growth that face many young businesses in the UK.

Hydrogen Innovation Challenge

The Hydrogen Innovation Challenge, led by Sustainable Ventures and the Centre for Process Innovation (CPI), is accelerating the growth of hydrogen startups in the North West by providing resources and market access to ten high-potential companies.

Growth Opportunities

The momentum generated through significant research and pioneering pilot projects focused on infrastructure development, fuel cells, electrolysers, and commercial applications, has laid a robust foundation for sustained growth in the hydrogen economy. These efforts are not only advancing technological capabilities but also contributing to the region's position as a leader in the national and international hydrogen transition. Key drivers in continuing this momentum will be growing collaboration between universities, as well as continued investment.

Greater Manchester is emerging as a dynamic and collaborative hub for hydrogen innovation. The collective success of its universities and innovation programmes positions the region as a national leader in this space. In this context, plans are underway to establish a dedicated Hydrogen Centre of Excellence, led by Manchester Metropolitan University, in partnership with the University of Manchester, the Henry Royce Institute, the University of Salford, and the National Physical Laboratory, supported by the Greater Manchester Combined Authority. The Hydrogen Technology Electrolysis and Cell Hub (HYTECH) aims to support manufacturers of all sizes by providing cutting-edge research, testing, and development facilities, strengthening the much-needed partnerships between academia and industry. This initiative is designed to deliver both regional and national benefits, offering a new scale of capability for the UK.

The stakeholder engagement that was completed to support the shaping of this Strategy has also recognised the need for HYTECH, as well as industry experts and broader regional stakeholders, to explore innovative financial mechanisms that can incentivise the growth of the hydrogen market. As outlined in section 1.2, hydrogen production costs have exceeded initial expectations. It was also outlined that to address this challenge and support market expansion, it will be essential for HYTECH and other GM research institutions to consider competitive and alternative financing models that can help reduce costs over the long term. Industry-led approaches are encouraged to identify and design effective programmes and incentives that

can de-risk investment, support infrastructure development, and ensure financial models align with long-term sustainability and market uptake. This institution will enable more demonstrator applications, building on successful models like the Hydrogen Innovation Accelerator and Matcellorate Zero[43], which consulted stakeholders highlighted as key for addressing market difficulties and failures.

There is also a need to support businesses that currently lack connections with academic institutions, which limits their access to emerging talent pipelines and innovation support. Addressing this gap could involve strengthening partnerships with further education (FE) colleges, leveraging the expertise and resources of Innovate UK in collaboration with the GMCA Skills Team, and utilising the Growth Hub to provide tailored support and guidance.

The delivery group will build on the recommendations established in this strategy to advance progress across the hydrogen value chain. By focusing on the areas outlined above, Greater Manchester aims to establish an environment conducive to collaboration for academic research, innovation, and industry involvement.

[43] Matcelerate Zero – A unique partnership to accelerate climate solutions

2.3 – Production, Distribution and Usage

Managing the production, distribution and usage of hydrogen will form a vital component in the journey to carbon neutrality, and a tenable route forward for existing energy assets and skills. Coordination of this will be essential both to instil confidence among stakeholders across the value chain and encourage investment. At this stage, the strategy aims to provide a framework for prioritisation of specific areas for distribution, considering the current maturity of infrastructure and drawing a pathway of least regret. This framework will serve as the foundation for work by the delivery group to establish a target that is both practical and well-reasoned.

This chapter outlines the current strengths in Greater Manchester pertaining to production, distribution and usage of hydrogen and suggests a logical pathway for expansion. A spatial pathway is yet to be developed, building on this strategic foundation to identify the most suitable use cases.

Current Greater Manchester Position

In line with the UK Industrial Strategy, Greater Manchester is well-positioned to benefit from and contribute to the UK's network of industrial clusters, where businesses co-locate to leverage benefits. These capabilities are reinforced by a growing portfolio of hydrogen and clean energy projects in Greater Manchester and across the wider North West.

The Trafford Green Hydrogen[44] project is the largest consented green hydrogen facility in the UK, with a planned capacity of up to 200MW. Developed by Carlton Power, the project is designed to meet the needs of local industry as they transition away from fossil fuels. Its first phase, a 15–20MW electrolyser, is scheduled to begin commercial operation in 2027 and will also support renewable energy integration through hydrogen storage. This project was designed as a consortium (Trafford Council are partners in the project, alongside the Greater Manchester Combined Authority, Manchester Metropolitan University, Cadent and Electricity North West.)

Greater Manchester's efforts are further complemented by regional partnerships and programmes such as Net Zero North West, industry-led cluster accelerating for industrial decarbonisation and clean growth projects in the region[45], and the Liverpool City Region's Hydrogen Economy Programme, which includes HyNet[46]. HyNet will position the North West as leading the way in the UK's decarbonisation journey, with the possibility of saving more than one million tonnes of carbon dioxide emissions a year, equivalent to taking more than 600,000 cars off the road.

In April 2025, the project was given the go-ahead from the UK Government to start construction, which will begin in 2028. The initial pipeline is anticipated to be in operation from late 2030 onwards and will bring HyNet as far as Carrington in what is called the 'Phase 2' network. Supply beyond Carrington and further into Greater Manchester will be via the Phase 3 network, scheduled for the mid-2030s, bringing hydrogen to key industries into Manchester, as well as towards Preston and into North Wales. It is anticipated to create 6,000 local jobs and generate £17bn in value for the North West economy.

[44] The Project — Trafford Green Hydrogen
[45] Home | Net Zero North West
[46] HyNet North West

Another pipeline anticipated to make its way to the city-region is National Gas's Project Union, which aims to repurpose existing gas transmission pipelines and build new infrastructure to create a 'national hydrogen backbone'[47], connecting industrial clusters like Teesside and Humberside. This integration will support the transportation and storage of hydrogen at scale, regional stakeholders supporting in coordination and enabling ensures the region is well-positioned to benefit from and contribute to this evolving network.

As shown in Table 2, there are several examples of production in the North West, and whilst pipelines are not anticipated to reach the city-region, there is scope to use tankers to distribute (detailed in following section).

Table 2 - Hydrogen Production Across the North West

Name	Type	Organisation/owner
Trafford Green Hydrogen	Hydrogen	Carlton Power
Invest Net Zero Cheshire	Industrial cluster	Consortium
HyNet	Hydrogen & CCS	Consortium
Protos Energy Park	Industrial cluster	Consortium
Project Vanguard	Hydrogen	Storengy
HySecure	Hydrogen	Storengy; INEOS
Centurion	Hydrogen & CCS	Storengy

Distribution

Currently, plans for dedicated hydrogen distribution pipelines in Greater Manchester are not expected to materialise until the early 2030s, with the initial phase likely to serve only a single landing point at Carrington. In the interim, distribution solutions will focus on readily deployable options, which Carlton Power anticipates will initially be conducted by tanker. This approach allows for early adoption and localised rollout of hydrogen technologies, effectively bridging the gap until further pipeline connectivity is established.

Usage

Hydrogen-to-power (H2P) represents a crucial step in the decarbonisation of Greater Manchester's energy system, offering a flexible and scalable means to transform renewably produced hydrogen into electricity at times when demand is high or renewable output is low.

The consortium project with Panasonic[48], has been pivotal understanding both immediate use cases and the broader implications in deploying H2P technologies. Central to the success of

[47] Project Union | National Gas

[48] Greater Manchester signs agreement with Japanese tech giant Panasonic to accelerate net zero transition - Greater Manchester Combined Authority

this hydrogen-to-power initiative in Greater Manchester is partnership collaboration, SSE Energy Solutions, Electricity North West, Manchester Metropolitan University and Carlton Power. In particular, Electricity North West (ENW) as the Distribution Network Operator (DNO), stand to understand in detail how H2P can enhances grid resilience as we move towards a higher electrified energy scenario. The learning gained from this project will help to clarify technical requirements, economic considerations, and the necessary adaptations to regulatory frameworks. It also highlights the importance of a robust supply chain and the need for flexible, reliable hydrogen storage and delivery.

Targets

The GM 5YEP 2025-2030 outlined a provisional target to deliver 800GWh of Hydrogen Power by 2030. This was set following the Net Zero North West Investment Case: Delivering the Decarbonisation of the North West Industrial Sector[49]. Since then, provisional Hydrogen production projects in Greater Manchester have not been successful in securing funding to make the projects viable in previously anticipated timeframes. The various national strategies outlined above (section XXX) have also shifted our understanding of what makes a suitable and realistic target for hydrogen in the city-region. In developing a revised target, we want to make sure we set a challenging, but deliverable level of ambition, something which is technological and financial possible, but that requires coordination and commitment to achieve.

Following the publication of the GM Hydrogen Strategy, the Hydrogen Steering Group will take responsibility for confirming a new target that clearly articulates the ambition for hydrogen to support industrial decarbonisation within GM.

To support the work of the Steering Group, this Strategy sets out various options for targets that might be considered for ongoing development and monitoring. These targets draw upon national projections, the Climate Change Committee's seventh carbon budget, as well as further local insight from the region's Gas Network Operator, Cadent.

In line with the ambition set out in the National Hydrogen Production Delivery Roadmap[50], possible targets include:

- Support delivery of 15MW of hydrogen production through HAR-1 allocation at Trafford Park.
- Support applications to HAR3 and HAR4, to leverage part of the 1.5 GW national allocation (N.B to be revised once known outcomes of HAR3 and 4).

Alternative targets could look to cover:

- Readiness of the gas network for hydrogen (e.g. Plasticisation rate of gas network).
- Reduction in industrial gas demand across the city-region.
- Increase in (industrial) hydrogen demand across the city-region.
- Other targets will be considered once we have reviewed possible data sources (via Cadent).

[49] NZNW_Investment_Case_FINAL_Report_April_2023_50c8081126.pdf
[50] Hydrogen production delivery roadmap - GOV.UK

Growth Opportunities

To fully capitalise on the assets and ambition for hydrogen production, distribution and use in GM and the wider North West, an initial spatial pathway for hydrogen infrastructure will be developed by the delivery group, HydrogenGM.

Our focus will be on building out from Trafford Energy Park and hydrogen landing points, such as Carrington, and considering the deployment of electrolysers in large industrial settings. HydrogenGM will continue to refine this, focusing on the most suitable use cases, particularly those who cannot electrify, using the hydrogen hierarchy as a guide for this process. By adopting this least-regret approach, prioritising electrification wherever feasible, Greater Manchester will establish a future-proofed scenario, whilst also being adaptable to evolving national plans and local needs. This coordinated approach is essential to building confidence among stakeholders and encouraging investment across the hydrogen ecosystem.

Whilst outlining the priority areas where hydrogen can play a role in decarbonisation will be essential for instilling investor confidence, there remains several key challenges to address. One of these being to ensure that supply will be met reliably by off takers, which will be critical in unlocking the full potential of hydrogen in the region. One core aspect of this will involve targeted communication with business and industry, developed by the delivery group, to ensure appropriate off takers are prepared for hydrogen integration, and to support in the development of necessary infrastructure. This will involve establishing where hydrogen-ready energy systems are already in place, and to encourage deployment of hydrogen-ready energy systems where possible, as well as to support in navigating planning and regulation.

Another core responsibility of the delivery group will be in supporting the reduction of risk associated with the production of hydrogen. Hydrogen production currently involves high costs, and there is a risk that off-takers may withdraw from contracts. Mechanisms such as the Hydrogen Allocation Round (HAR) help address this, but stakeholder engagement through the development of this strategy highlighted that concerns remain. It was suggested that Power Purchase Agreements (PPAs), and off-takers of last resort could form a component of this de-risking activity.

As highlighted above, distribution will initially rely on tankers within the region, followed by pipeline development. Given the high cost of distribution, it will be important to prioritise sites located near future pipeline routes as potential off takers. Furthermore, storage will be essential to compliment this increased distribution. Hydrogen to power projects will also need further support and roll out in scenarios deemed as a priority by DNOs. Detail will emerge in 2026 on the first national Transport and Storage Business Models, and the Hydrogen-to-Power business model is expected in 2026. Remaining attuned to these developments will be essential in developing the Greater Manchester capability, and previous experience in the region has shown the advantages of working collaboratively to take full advantage of these programs (see section 3.3.3).

The delivery group will be tasked with building on the recommendations already set out in this strategy, to build momentum across the hydrogen value chain. By prioritising areas with the greatest potential impact and aligning with national infrastructure plans, Greater Manchester is laying the groundwork for a low-carbon future that supports both local and national objectives.

3.3 Tracking progress

The delivery group, HydrogenGM, will be at the heart of efforts to coordinate, accelerate, and de-risk the development of hydrogen infrastructure across Greater Manchester and the wider North West. As outlined in section 1.4, collaboration is fundamental to the approach, leveraging partnerships between public and private sectors, working closely with academic and technical experts, and fostering strong links with local authorities. The insights gained from these ongoing discussions with these institutions during the consultation period will shape the priorities and recommendations in this section, ensuring that the strategy remains both ambitious and fully aligned with the evolving needs and opportunities of the region's hydrogen ecosystem.

Pertaining to which Chapter	Aim	Actions	Owner(s)
Skills and Supply Chain	**To encourage a coordinated approach and messaging around hydrogen at a national and local level**	To encourage a national decision on hydrogen for domestic heat to be made as soon as possible to understand requirements for infrastructure development and training provision	GMCA
		Leverage local networks to proactively highlight forthcoming developments in the hydrogen sector and establish a targeted communications strategy to inform and engage stakeholders about upcoming opportunities and initiatives.	GMCA, LAs
	To create and support Education Pathways to facilitate a Hydrogen Economy	To develop guidance to ensure education providers have awareness and clarity on which qualifications to invest in, considering a phased approach prioritising skills that will be required first as a hydrogen economy develops	GMCA, Industry
		GMCA and Local Authorities to allocate specific funding for upskilling and retraining	GMCA, LAs
		To facilitate collaboration with educational institutions across value chain and regions needed to create clear career pathways and initiatives to support the hydrogen sector, bringing together employer groups, those selling qualifications, and educators	GMCA LAs, Educational Institutions
		To work alongside educational institutions across value chain and regions needed to create clear career pathways and initiatives to support the hydrogen sector, creating a 'Shared Vision' to map this development	GMCA LAs, Educational Institutions
		Ensure the integration of hydrogen skills development with T Levels and MBacc - supporting pathways into good jobs	GMCA LAs, Educational Institutions
R&I	**To facilitate the creation and innovation of commercial and financial mechanisms to reduce costs associated with hydrogen**	Support links between industry and academia to identify appropriate financial support programmes and incentives,	GMCA LAs, Educational Institutions
		Encourage R&I in alternative financing for hydrogen projects; including business cases needed for different use classes	Universities, R&I institutions
	To support the advancement of hydrogen technology for industrial applications and enable the transition to hydrogen	Support links between industry and academia to identify suitable solutions to enable a cost-effective hydrogen transition	Universities, R&I institution, GMCA, Industry
	To facilitate research into hydrogen technology for vehicles to establish a suitable level of hydrogen transport	Develop research and demonstration of hydrogen-powered trains and freight vehicles, to assess feasibility and promote adoption within the transport sector.	Universities, R&I institution, Industry

	To facilitate the development of research facilities in the region	Support and facilitate the development and deployment of proposed national Hydrogen Technology Electrolysis and Cell Hub (HYTECH) in Greater Manchester	GMCA, Industry, Universities, R&I institution,
		Support the development of university and industry testing facilities	GMCA, Industry, Universities, R&I institution,
		Encourage and support the deployment of more demonstrator projects across the region	GMCA, Industry, Universities, R&I institution,
	To support links between businesses and academia for research, innovation and access to skills	Develop a communications plan to build connections and highlight the advantages of linking businesses and academia	GMCA, Industry, Universities, R&I institution,
		Utilise networks, such as Innovate UK and the Growth Hub to connect business solutions providers and academia	GMCA, Industry, Universities, R&I institutions,
Production, Distribution and Usage	**To support Greater Manchester and North West hydrogen production by establishing infrastructure and stable demand to utilise anticipated supply**	Support businesses in understanding the implications of Hydrogen Production Business Models as details emerge from government, supporting with applications where appropriate.	GMCA, Industry
		Identify priority off-takers according to potential decarbonisation impact and hydrogen landing locations in the region, develop a communications strategy for engagement, and provide support to help off-takers prepare for hydrogen adoption	GMCA, Industry
		Anchor investments by developing investor-ready projects.	Industry
		Support wider North West networks, making use of ability to leverage industrial hydrogen clustering	GMCA, Industry
		Support the development of hydrogen pipelines and production through regulatory and planning support where appropriate.	GMCA, Industry
		Consider, where possible, planning for large emitters such as data centres to be located alongside sources of hydrogen and renewable energy.	GMCA, Industry
	To support Greater Manchester and North West hydrogen usage by facilitating the development of hydrogen storage capacity regionally	Support businesses in understanding implications of Hydrogen Storage Business Models as detail emerges from government, supporting with applications where appropriate.	GMCA, Industry
		Consideration and further mapping of hydrogen storage options, recognising that not all production will be local.	GMCA, Industry
		To consider using hydrogen as an energy store to prevent renewable curtailment	Industry

	To support Greater Manchester and North West hydrogen distribution by facilitating the development of hydrogen transport systems and pipelines regionally	Support businesses in understanding implication of Hydrogen Transport Business Models as detail emerges from government, supporting with applications where possible	GMCA, Industry
		Facilitate interim hydrogen distribution by supporting off-takers and planning authorities' understanding of utilising tube trailers; consider where establishing localised pipeline may be an appropriate solution following 2030.	GMCA, Industry
	To facilitate hydrogen adoption in Greater Manchester and the North West by advancing communications, providing guidance, and supporting reconsideration of regulations	Establish clear guidance for businesses, planners understand hydrogen feasibility and safety .	GMCA, Industry
		Encourage the review and potential revision of regulations that may affect deployment.	GMCA, Industry