Business Growth Hub

HYDROGEN SUPPLY CHAIN OPPORTUNITIES

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In partnership with NORTHERN POWERHOUSE

European Union
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EXECUTIVE SUMMARY

GC Business Growth Hub (GC BGH) in Greater Manchester commissioned Gyron LLP (Gyron) to research and prepare a report about hydrogen supply chain opportunities, with a focus on Greater Manchester businesses. The national context for hydrogen is presented first, including economic data on current UK hydrogen activities.

The UK energy sector is undergoing significant change which is being driven by the need to meet climate change and renewable energy targets. Greater Manchester has set its own targets to contribute to the national effort and aspires to be a Green City Region.

Since 47% of power and more than 90% of heat and transport energy consumed nationally was produced from fossil fuel sources in 2017[1], achievement of targets requires fossil fuels to be phased out of our energy systems. This creates problems, for example in balancing the demand and supply of power.

Hydrogen, which is the solar system's most abundant element and the most heat-generating part of natural gas, is emerging as a leading alternative to replace fossil fuels based on five key attributes:

- It can release high levels of useful energy without any harmful atmospheric emissions;
- It can be used to generate heat, power or propulsion at short notice;
- It is storable and distributable in the same way as gas, diesel and petrol;
- It provides a tenable route forwards for existing energy assets and skills; and
- It can be produced at scale today via several methods.

In the short-term, cost-effective and scalable methods of generating Hydrogen already exist in the chemical and energy industries but in the longer term newer methods are already in the market or nearing commercialisation.

The Hydrogen Economy has been defined as an emerging sector by Gyron and measured by its data partner, kMatrix Ltd. The eleven sub-sectors that make up the Hydrogen Economy are shown in Figure 1, below, which reports UK sales performance in 2017-18.

The UK Hydrogen Economy already contributes £4.5 billion (sales) to the national economy through the activities of 8,100 companies. It is a net exporter (£1.74bn versus imports of £1.06bn) and has a forecast total growth rate of more than 50% over the next five years.

In Greater Manchester and the North West region 123 companies were identified across at least nine of the eleven sub-sectors of the Hydrogen Economy. (See Appendix B of the main report. This is not an exhaustive list of companies.) Projects such as Cadent Gas Ltd's "HyNet North West" in which CCUS infrastructure and hydrogen pipelines will be implemented across sites in Liverpool, Manchester and parts of Cheshire, could play a large part in helping the regional sector to grow by creating SME supply chain opportunities. (See Section 3.2 of the main report for a case study.)

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[1] See BEIS Digest of UK Energy Statistics (DUKES) for 2018, Chart 5.3 page 117 and especially page 155 at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/736148/DUKES_2018.pdf

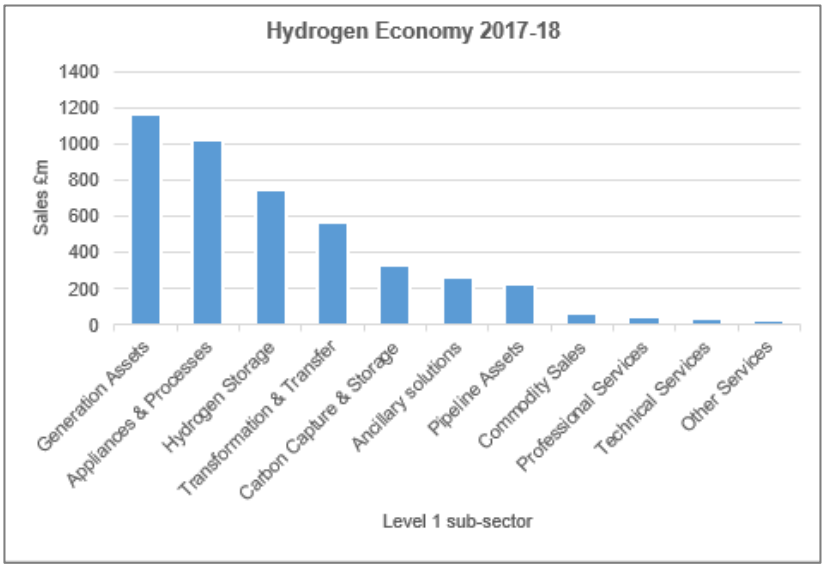

FIGURE 1 - UK HYDROGEN ECONOMY SALES £M BY SUB-SECTOR, 2017-18

Generation Assets in the region have existed for some time within the traditional chemicals industry (centred on Runcorn in Cheshire) and at the UK level this sub-sector contributed the most to UK exports in 2017-18 together with the *Appliances & Processes* sub-sector (combined £853m).

To achieve rapid decarbonisation of the UK's heating and transport sectors alongside continued decarbonisation of the power sector, a range of hydrogen production techniques based on Steam Methane Reforming of natural gas with Carbon Capture, Usage and Storage (CCUS) are seen as the most cost-effective approach in the short-term, although newer techniques based on renewable and low carbon sources are in the commercialisation stage or reaching maturity, including through electrolysis of water.

Appliances & Processes include combustion appliances, fuel cells and catalytic burners and is the largest UK sub-sector by companies (2,200) and full time equivalent employees (11,950). Regionally, there is likely to be a significant number of SMEs including appliance manufacturers and suppliers, Gas Safe registered installers and the automotive / transport sector supply chain who could diversify into this sub-sector to meet future demand for suitable appliances and processes.

The largest number of companies (55) identified in the region are from the *Technical Services* sub-sector, reflecting the very strong regional presence of project planning and technical engineering skills including industry leading companies such as Arup, Jacobs, Ricardo and Wood plc. At the UK level, 12% of sales in this sub-sector are attributed to engineering services, representing £4.9m of sales and exports in excess of £1m. Companies in this sub-sector are likely to have opportunities arising from most of the other sub-sectors discussed.

The *Pipeline Assets* sub-sector has the second highest forecast growth rate for the UK of 53.1% over the next five years (after *Professional Services* – 55.2%). This sub-sector will benefit from activities to re-purpose or replace part of the current gas distribution system, which will be essential work to enable full deployment of hydrogen in the UK's energy systems.

Hydrogen Storage is one of the most important aspects of the Hydrogen Economy and a large number of storage methods of different scales and for different purposes are being explored, developed and commercialised currently, whilst existing storage methods are formalised with standards and industry best practice development activities. This sub-sector will benefit from investments in energy storage which businesses are likely to make alongside power generation projects in response in response to concerns about future security of energy supply[2], increasing energy costs[3] and the introduction of more time-of-use tariffs for power which would otherwise increase their costs or force operational changes.

National and industry research bodies have confirmed the case for hydrogen as a future fuel for power, heat and transport, based around its ability to provide flexible power production to counter intermittent renewables and to diversify the fuel types, assets and skills that can be used to transition the UK's energy systems to a low carbon future. Wide-scale deployment is being explored through several government-funded programmes, projects and industrial initiatives.

The four sub-sectors described above have been prioritised as important for Greater Manchester based on a match between regional sector strengths and likely market opportunities. It is recommended that the next steps for GC Business Growth Hub and its partners should be to provide business support to SMEs and larger companies currently active or with the potential to diversify into these sub-sectors.

RECOMMENDED BUSINESS SUPPORT ACTIONS

Sub-Sector	Market Opportunity	Type of SME / Business	Business support action
Appliances & Processes using Hydrogen	Hydrogen replaces natural gas in the national gas network and its use as an alternative fuel in some classes of vehicles increases	• Manufacturers and suppliers of hydrogen appliances • Supply chain of automotive / transport sectors	Support businesses to gear-up to manufacture and supply hydrogen appliances, equipment or conversion kits for fossil fuel equipment and transport.
		• Gas-fitters and installers • Technical engineers (see below)	Support businesses to up-skill to be able to install and maintain domestic and SME hydrogen appliances, and equipment and conversion kits.
Pipeline Assets	Significant programme of re-purposing work to prepare national and private industrial gas pipelines for hydrogen	• Components suppliers and manufacturers • Construction main and sub-contractors • Civil engineering businesses	Assist local sector companies to meet any minimum requirements to enter the supply chain for national pipeline projects.

[2] A number of large power generating assets are either being closed earlier than expected (e.g. EDF Energy closing the coal-fired Cottam plan) or development of new power plants being abandoned or halted (e.g. Moorside Cumbria and Wylfa, Anglesey's nuclear plants) raising security of supply concerns
[3] http://www.greenintelligence.org.uk/article/are-we-facing-energy-cost-double-whammy

		• Specialist underground asset surveying businesses • Project planning consultants	Encourage and support new techniques or technical innovations to come forward that will help to speed up the repurposing work.
Hydrogen Technical Services	Wide-scale adoption of hydrogen to replace gas and its use as an alternative fuel in some classes of vehicles increases	• Energy consultants with relevant skills • Process monitoring and control systems consultants • Technical engineers (industrial, gas) • Gas health & safety specialists • Geological and other types of surveying specialists • Project planning consultants	Raise awareness of hydrogen as a storable fuel with commercial and industrial businesses. Support local SMEs with appropriate gas skills and services to diversify into the hydrogen market to provide design, feasibility, specification, installation and maintenance services for SME / large businesses.
Hydrogen Storage Assets	Hydrogen storage is deployed as a means to support renewable power generation revenues and to help balance local power supply and demand	• Manufacturers and suppliers of hydrogen storage solutions e.g. portable hydrogen storage vessels, storage racks and monitoring systems • Technical engineers (see above) • Energy consultants with relevant skills • Renewable power generators of all sizes	Help sector businesses enter the supply chain for hydrogen storage projects (all scales). Raise awareness with renewable power generation assets owners of opportunities to reduce energy costs and earn income by storing energy.
	Diesel generators for standby and off-grid applications phased out (e.g. to comply with air quality standards)	• Suppliers of hydrogen storage solutions e.g. portable hydrogen storage, storage racks and monitoring systems • Suppliers of hydrogen fuel cells and combustion plant.	Encourage and support businesses across many industries to consider hydrogen storage as part of an alternative option to the use of diesel / gas generators.

Greater Manchester Combined Authority should consider investments in the following categories of project to benefit local energy consumers and businesses:

- Production of hydrogen from renewable power generation assets (e.g. on the public sector estate)
- Grid-scale storage of hydrogen for the region to improve the opportunity for local businesses and public services to produce and store hydrogen in order to participate in the local DNO market for balancing services
- Research, development and commercialisation of techniques to generate hydrogen from renewable power and from renewable and low carbon sources. E.g. biophotosynthesis, gasification of waste plastics
- Projects aimed at making the above techniques more efficient, cost effective and competitive with Steam Methane Reforming with CCUS

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