South Yorkshire low carbon energy supply chains: Hydrogen sector summary

January 2022

1. INTRODUCTION

This sector summary focuses on the potential and challenges for the hydrogen sector. Whilst the focus is on opportunities in South Yorkshire, the emerging nature of the hydrogen economy, and limited number of firms engaged in hydrogen development across the whole of the UK, necessitates an analysis of stakeholders from across the country. The report sets out existing UK policy on hydrogen and outlines the current state of the sector, before exploring supply chain, employment and skills issues. It is based on findings from a review of policy literature and in-depth interviews with 14 hydrogen industry stakeholders, primarily from private sector businesses but also training and consultancy.

Findings are based on a review of policy literature, existing research and interviews with 10 industry stakeholders (including installers, manufacturers, accreditation and industry bodies). This summary forms part of a wider study of six energy sectors (carbon capture and storage, insulation, heat networks, heat pumps, hydrogen and small-scale nuclear). An outline of overarching findings from the study is published alongside these sector summaries and can be found here [hyperlink to summary report].

We found that whilst there is only a limited number of hydrogen focused firms in South Yorkshire there is clear growth potential for jobs with these firms expanding rapidly and being world leading in the industry. This status provides an opportunity to better integrate the supply chain by attracting new firms to the region. This is bolstered by expertise from the University of Sheffield's Advanced Manufacturing Research Centre and planned National Hydrogen Research, Innovation and Skills Academy.

As with CCUS, a primary value of hydrogen is the ability to secure jobs in some of South Yorkshire carbon intensive industries, in particular steel, with a number of firms exploring the market potential for producing 'green steel'. However, to realise these opportunities better support is needed around promoting and exporting hydrogen products, and infrastructure needs to be upgraded, to ensure industrial scale electrical supplies.

2. SECTOR SUMMARY

2.1. Overall market trends

Hydrogen has been used for many decades and has been applied in a variety of ways and industries. It is increasingly viewed as a viable alternative fuel that can play an important role in net zero pathways. Hydrogen can be produced by a range of methods but is predominantly generated via the following:

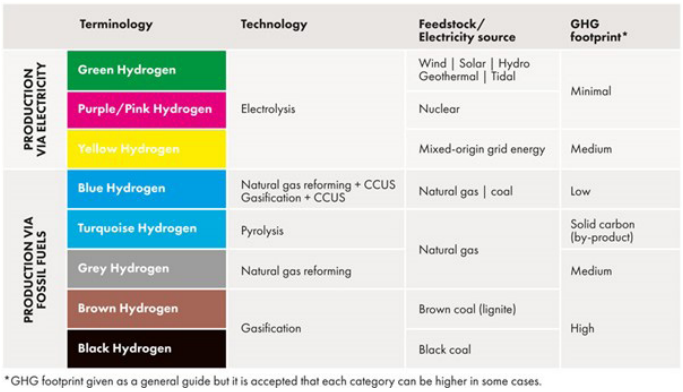
- Steam methane reforming, known as grey hydrogen when the resulting CO2 is released into the atmosphere and 'blue' hydrogen when it is captured using Carbon Capture, Utilisation and Storage (CCUS).
- Gasification of materials including coal, biomass, and even waste plastics, sometimes known as 'black' or 'brown' hydrogen.
- Electrolysis, where electricity is used to split hydrogen from water. When the electricity is renewably produced then this is known as 'green' hydrogen.

A palette of different 'colours' of hydrogen continues to emerge as Research and Development (R&D) progresses. These colours are summarised in Figure 1.[1] Hydrogen is primarily used in industry, for purposes such as oil refining, producing ammonia

1 Giovannini, S. (2020) 50 shades of (grey and blue and green) hydrogen. Available at: https://energy-cities.eu/50-shades-of-grey-and-blue-and-green-hydrogen/

and methanol, and manufacturing steel.[2] There is also scope for its use in transport (e.g., powering vehicles including cars and buses), heating buildings (e.g., blending with natural gas for use in existing boilers), and in storing power generated by renewable methods.

Figure 1: The hydrogen colour spectrum



	Terminology	Technology	Feedstock/ Electricity source	GHG footprint*
PRODUCTION VIA ELECTRICITY	Green Hydrogen	Electrolysis	Wind | Solar | Hydro Geothermal | Tidal	Minimal
	Purple/Pink Hydrogen		Nuclear	
	Yellow Hydrogen		Mixed-origin grid energy	Medium
PRODUCTION VIA FOSSIL FUELS	Blue Hydrogen	Natural gas reforming + CCUS Gasification + CCUS	Natural gas | coal	Low
	Turquoise Hydrogen	Pyrolysis	Natural gas	Solid carbon (by-product)
	Grey Hydrogen	Natural gas reforming		Medium
	Brown Hydrogen	Gasification	Brown coal (lignite)	High
	Black Hydrogen		Black coal	

*GHG footprint given as a general guide but it is accepted that each category can be higher in some cases.

Source: GEI (2021) Hydrogen – data telling a story. Global Energy Infrastructures, available online at https://globalenergyinfrastructure.com/articles/2021/03-march/hydrogen-data-telling-a-story

The market for hydrogen is not a new one. There has been a supply and demand for hydrogen for many decades. Crucially, the interest and demand for hydrogen appears to be on the increase as the range of potential applications continues to accelerate and the political appetite for it scales up as the demand for energy alternatives becomes ever more pressing. The move towards hydrogen is reflected in the creation of high-level net zero strategies by national governments. For example, the recent publication of a 'Ten Point Plan for a Green Industrial Revolution' by the UK government included a step to "drive the growth of low-carbon hydrogen" as part of efforts to deliver on net zero commitments.[3]

Interviewees spoken to as part of this research repeatedly stressed that the sector is very much at a tipping point with a significant upscaling of production anticipated to meet growing demand across a range of applications.

2.2. Drivers and barriers of market growth

The overall market trend for hydrogen is of growth across the sector, both in the UK but also abroad. Government strategies identifying hydrogen as a potential solution to challenges of delivering net zero are driving much of this. At present, it is still very much a niche sector but – as one interview put it – *"it's now going to ramp up from niche to the industrial very quickly if these strategies are to be believed."* (H2 03)

A reflection of the increasing ambition the UK government has around hydrogen is the readiness to fund R&D. Several firms that we spoke to for this work had received funding from government (for example, through Innovate UK) to develop proof of concepts, foster collaborations, and begin to scale up technologies related to hydrogen. This included a firm based in the region.

A factor that was frequently cited by the interviewees we spoke to was that the sector was very much in a 'chicken and egg' position, an analogy repeated across the UK Hydrogen Strategy. Specifically, whilst the technological innovation to enable widespread uptake has largely taken place, the demand remains relatively low. Yet uptake is restricted by a lack of both the underpinning infrastructure (for example, sufficient hydrogen refuelling stations for vehicles) and a supply chain that can support more widespread upscaling of production related to hydrogen. One industry expert reflected on where they felt the sector was in this regard:

> "everybody's talking about hydrogen, too many at the moment so it's getting a bit overheated with not necessarily the supply chain activity underpinning that's needed." (H2 03)

2.3. Policy and regulatory landscape

The broader policy landscape is one that appears committed to a substantial expansion of the market within the UK. The 2020 'Ten Point Plan for a Green Industrial Revolution' positions hydrogen as a core element of the government's efforts to deliver on net zero commitments whilst also seeking to help the country recover from the Covid-19 pandemic. The Ten Point Plan targeted publishing a Hydrogen Strategy for the UK in 2021.[4] This was originally

2 IEA (2019) The Future of Hydrogen. International Energy Agency. Available at: https://www.iea.org/reports/the-future-of-hydrogen
3 BEIS (2020) Ten Point Plan for a Green Industrial Revolution. Department for Business, Energy & Industrial Strategy. Available at: https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution
4 BEIS (2021) UK Hydrogen Strategy. Department for Business, Energy & Industrial Strategy. Available at: https://www.gov.uk/government/publications/uk-hydrogen-strategy

slated for Spring 2021 but was subsequently delayed, with the government criticised for this because of the uncertainty created and delays to planned investments from the private sector.[5] It was ultimately published in August 2021[6] outlining how the UK will utilise both green and blue hydrogen as part of its low-carbon strategy. The proposed reliance on blue hydrogen, of which there is a weaker low-carbon potential, did prompt some criticism[7] and the resignation of the Chair of the UK Hydrogen and Fuel Cell Association.[8]

The Energy White Paper, published in December 2020, also highlights the ambitions of the government for hydrogen to form part of the energy mix in the future. By 2030, there is an aim to achieve production capacity of 5GW of low-carbon hydrogen. Hydrogen is seen as having potential to help ensure the UK's energy security, for example, the ability to capture renewable power and store it to help meet demand peaks.

From a regulatory perspective, the sector is highly regulated due to safety concerns around hydrogen. One interviewee, who produces components that are used in hydrogen vehicles described one of the processes they go through:

> "Any component that's in that vehicle which sees hydrogen…has to pass a [series of] component… tests called EC79 and this is carried out by third party bodies who are certified to do that. They basically take three of those products, we have to give them three items and they put them through a battery of test from cycling tests, thermal tests, freezing tests and there's a whole series of tests they have to go through and also chemical compatibility with hydrogen. So all the materials that are in there from the polymers all the way through to the metal." (H2 06)

With continuous innovation taking place (for example, making components smaller and at lower cost) certification costs and requirements remain high as products are required to be if they deviate too far from the original certified design.

3. HYDROGEN SUPPLY CHAINS

3.1. Perspective on the UK supply chains

The hydrogen supply chain can be broadly grouped into (1) production/conversion, (2) movement/ distribution, (3) storage, and (4) application. There are also existing hydrogen supply services, for example providing certification, training, health & safety services.[9]

The supply chain mapping exercise conducted as part of this research identified a range of firms that are operating within this sector. Some firms are small, independent operators seeking to work within a small niche delivering a product or service. Others are large, multinational corporations who are diversifying into the hydrogen market. Many firms operate solely within one aspect of the supply chain, for example, building self-contained electrolysers to produce hydrogen cleanly (Clean Power Hydrogen Group in South Yorkshire), whereas others work across multiple aspects of the supply chains. For example, BOC, the multinational supplier of a range of gasses and associated infrastructure and equipment. A summary of the firms identified is included in Table 1.

5 https://www.spglobal.com/platts/en/market-insights/latest-news/electric-power/072321-uk-government-misses-latest-hydrogen-strategy-deadline
6 https://www.gov.uk/government/publications/uk-hydrogen-strategy
7 https://www.h2-view.com/story/blue-hydrogen-could-have-large-climatic-consequences-increasing-the-need-for-green-hydrogen-now-says-report/
8 https://www.h2-view.com/story/uk-hydrogen-strategys-focus-on-blue-hydrogen-sees-chris-jackson-step-down-as-uk-hfca-chair/
9 Pale Blue Dot Energy (2018) Hydrogen Supply Chain Mapping Report. Available at: https://northsearegion.eu/media/9569/hydrogen-supply-chain-mapping-report-40.docx

Table 1: UK operating firms by their supply chain role

Primary supply chain role	Firm
Production/conversion	• Ames Goldsmith Ceimig • Auriga Energy • Bayotech • Cadent Gas • Ceres • **Clean Power Hydrogen Group Ltd** • Diffusion Alloys • EMEC • HIIROC • **ITM Power** • Johnson Matthey • Low Dee • Marubeni • Net Zero Energy Developments • Northern Gas Networks • Petrofac • Power House Energy Group • TFP Hydrogen Products • TP Group
Movement/distribution	• HYDAC • JRE Precision • Logan Energy • Nanosun
Storage	• **Chesterfield Specialist Cylinders** • Luxfer Gas Cylinders • Northern Valve & Fitting Company Ltd • **Pressure Technologies** • SAFI • Swagelok
Application	• FAUN • Fuel Cell Systems • **Liberty Steel** • ULEMCo LTD

Note: Names in **bold** are based within South Yorkshire.

While this review focused on firms operating within the UK, it also captured the international reach of the hydrogen supply chain. Many firms we spoke to have supply chains that stretch to countries in mainland Europe and to China. This includes sourcing components and products, but also in supply their own products to customers. There are also links to the United States (for example, Swagelok).

The close relationships between firms within the supply chain was also notable. Several firms we spoke to named other firms that had been identified in the supply chain mapping exercise as existing clients or suppliers who they had developed close relationships with. Others named firms as potential clients or suppliers.

3.2. Where the jobs are

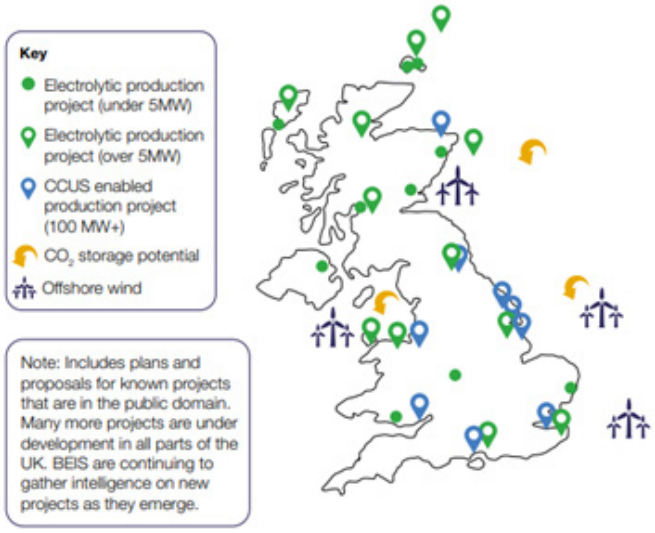
There are several established or emerging hydrogen clusters in the UK. These are predominantly located around existing industrial sites or where there is significant potential for CCUS. Established or emerging clusters include:

- North West
- Humberside
- Southampton
- South Wales
- Teesside
- Grangemouth

These established clusters are where larger scale application of hydrogen is taking place, for example the HyNet programme in the North West. In October 2021, the government announced the first stage of its CCUS cluster sequencing programme,[10] confirming that Hynet, along with a joint cluster between Teesside and Humberside (The East Coast Cluster), had been chosen to lead development of CCUS. This means such clusters are the focus of attention and job creation. However, activity in the hydrogen sector is not exclusive to these locations. The Sheffield City Region, Midlands, and London are also examples where firms, or small agglomerations, exist and are seeking to expand.

The UK Hydrogen Strategy (published in August 2021) provides some detail on where further clusters might emerge, as shown in Figure 2.

Figure 2: Proposed UK electrolytic and CCUS-enabled hydrogen production projects



Source: UK Hydrogen Strategy (2021)

10 https://www.ccsassociation.org/ccsa-news/significant-milestone-for-net-zero-as-uk-announces-first-ccus-clusters/

Some firms (including within the Sheffield City Region) keep much of their work in house, with very little external input. Other firms relied on outside expertise or had subcontracted certain elements of their operations owing to constrained capacity. Some firms had very close, and exclusive relationships with manufacturers to supply their products to the UK. For example, the Northern Valve & Fitting Company Ltd are exclusive suppliers to the UK of a high pressure valve manufacturer based in the EU. The extent of this relationship is such that they can commission the manufacturer to produce bespoke products on demand for customers.

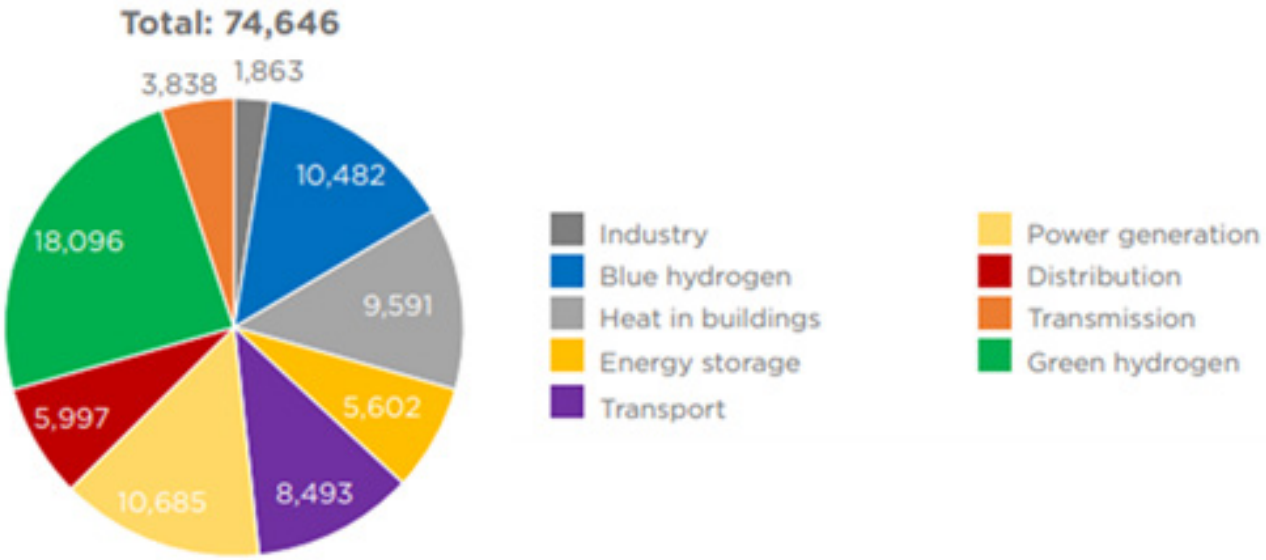
3.3. Employment and Skills

The diversity of activities in the hydrogen sector means that there are a range of job roles that exist. As with other high-tech industries, these can be divided into the specialised engineering roles and the underpinning management and administration roles. Specialist roles mentioned by the firms we spoke to included engineers in the fields of mechanical, chemical, electrical, production, design, and structural. Given the strict safety regulations for the hydrogen sector, there were a high number of health and safety roles. More management focused roles ranged from sales to office administration, and human resources to web design.

It is argued there is significant potential for job creation in this sector with the correct investment. An Economic Impact Assessment published by the Hydrogen Taskforce in 2020 provided estimates for the potential employment opportunities in the sector in the coming decades. It calculated that there is the potential for 75,000 additional jobs by 2035, with many of these located in the North West and East of England. The similarities between the hydrogen sector and oil and gas means that it is anticipated that there will be a notable transfer across as the oil and gas sector diminishes (owing to the need to transition to net zero).

These jobs are spread across the different sub-sectors of hydrogen, which includes production, distribution, and storage, amongst others. In the region, the two notable employers highlighted in the previous section operate primarily in the green hydrogen (ITM Power) and storage (Pressure Technologies). These sub-sectors are estimated to generate 18,000 and 5,600 jobs respectively across the UK by 2035. A full breakdown of the potential jobs by sub-sector is available in Figure 3.

Figure 3: Estimated jobs by sub-sector by 2035 in the UK



Source: Hydrogen Taskforce (2020).

The attainment of such employment figures by 2035 relies on several factors. One such factor is the ability of firms to recruit employees with the correct skills. As has been outlined, the hydrogen sector requires several different highly skilled engineering roles. Some interviewees argued there was a significant skills gap for the current generation of graduates coming into the sector (or into associated sectors, for example, oil and gas), which is exacerbated by the retirement of the existing senior generation who hold much of the skills and knowledge.

Whilst other firms acknowledged this skills gap, they attributed it to the nascency of the hydrogen sector and the highly specialised nature of the work. Many of the required skills are not yet being taught to graduates because of this. The solution firms are finding is to deliver additional, specialised 'in-house' training to their new employees. This issue was summarised by one interviewee from a large energy services firm expanding into the hydrogen sector:

> "we're going to have to do that [hydrogen specific foundation level training] ourselves in-house and then I think what we'll do is move people up through the expertise layers, perhaps externally do masters in that type of thing. So the universities are a bit spotty in terms of what they're doing, they're not sure what to offer and what those courses need to be." (H2 10)

3.4. Location decision-making and firm mobility

The existence, and further expansion, of hydrogen clusters is likely to attract firms seeking the benefits of agglomeration, particularly firms focused directly on the production of hydrogen. However, given the relative nascency of such clusters and the sector, the extent of location decision making being driven by this remains to be seen. In fact, of the different firms we spoke to across the wider supply chain, there were no apparent trends in where they were locating. There were numerous examples where the location of the firm was due purely because the owner was already located there, or because they had diversified into the hydrogen sector within the last few years and their location was already fixed based on their previous activities.

For some, location decision making may come down to the facilities and infrastructure available. For instance, industrial processes linked to hydrogen production can place substantial requirements on the electrical grid. Sufficient supply is essential and if this is not available then a firm may need to look at other locations, particularly as they seek to scale up supply to meet the anticipated demand. One interviewee from a growing firm spoke of this:

> "…we would like to have a bigger facility with a bigger electrical supply. What is lacking is electrical supply, so grid supply at the big 33 kV substations in and around South Yorkshire and Humber. If you go to the northern grids you can download the heat maps and nearly every substation is oversubscribed so really we need to be looking at how we can have more substations or that grid connection [is] more [readily] available." (H2 01)

3.5. Barriers to market entry

Several of the firms spoken to were at pre-market stage with their efforts focused on innovation of products. Other firms were seeking to expand or preparing for a rapid increase in demand for hydrogen or products that support hydrogen production, storage, and use. A frequent issue mentioned was that the market remains at a 'chicken and egg' stage, with demand for hydrogen products remaining relatively low, yet this is in part due to the lack of infrastructure and supply. The publishing of the UK Hydrogen Strategy and increasing demand for energy sources that can support a net zero transition means that such barriers might reduce.

However, as was outlined in Section 2.4, barriers to market entry can also include insufficient infrastructure required to scale up manufacturing. It is apparent that the provision of high-quality and well-supplied industrial sites to support the growth of hydrogen production will be important to start-up firms seeking to move into this market.

A final note on barriers to market entry relates to the fact that the low-carbon, or net zero, field is becoming increasingly congested. For instance, several firms in the hydrogen sector are seeking to expand into the transport market. However, it is arguable that the competition for transforming the transport sector, for private transport at least, has been won by electric vehicle manufacturers. Similarly, heat pumps are a well-tested and increasingly affordable option for home heating, yet hydrogen firms are seeking to expand into this market also.

4. Opportunities for Sheffield City Region

4.1. Firms in the region

Several firms operating within the hydrogen sector already exist with the Sheffield City Region. We identified Chesterfield Specialist Cylinders, Clean Power Hydrogen Group (CPHG), Pressure Technologies as firms with significant commercial activity directly contributing to the hydrogen sector. We also anticipate there may be other local firms working more tangentially to the sector or exploring entry to the hydrogen market.

ITM Power is a key firm in the region producing electrolysers. They are the largest regional employer in this sector, employing approximately 230 staff at their site in Sheffield, with the recruitment of a further 80 engineers announced in March 2021, and a recent confirmation of a second site to be built in Sheffield, in partnership with the AMRC and including plans for a National Hydrogen Research, Innovation and Skills Academy.[11] CPHG, who also produce electrolysers is a considerably smaller enterprise currently employing 19 staff. Firms such as Chesterfield Specialist Cylinders (who employ 90 staff) and Pressure Technologies are heavily involved in the market but are existing firms operating in the broader oil and gas sector.

In terms of the types of jobs these firms create, they can range from engineers (of several different specialisms), manufacturing, sales, administration, Human Resources, and research and development. ITM Power and CPHG appear to keep much of their work in-house, further increasing the diversity on roles within the firm.

4.2. Key investments and projects

ITM Power

The most notable investment in the region is the ITM Power Gigafactory at Bessemer Park. This is a 'high capacity, semi-automated PEM electrolyser manufacturing facility' with the capacity to manufacture electrolysers that can collectively produce 1GW of hydrogen power supply annually. As outlined in Section 3.1 this has led to the creation of at least 80 new jobs at their Sheffield site with the Gigafactory opening at the start of 2021 and a second planned to be operational by the end of 2023.[12]

ITM Power produce a small range of electrolysers. This includes a smaller, self-contained PEM electrolyser 'stack', known as the HGas1SP, which produces ~264kg of hydrogen per 24 hours.[13] The range of products extends to a larger 'modular' system that can support large-scale hydrogen production. The HGasXMW can produce up to 4,050kg of hydrogen per 24 hours.[14]

Whilst the specific components and supply chains surrounding their products are not publicly available, it is understood that ITM keep much of their operations and engineering 'in-house'. However, the range of jobs associated with the new Gigafactory gives and indication of the extent of this. Roles include those listed in Table 2, below.

Table 2: Roles recruited at the ITM Power Gigafactory2035 in the UK

Roles
Technical project managers
Compliance
Electrical engineers, including system design, systems integration and control systems
Chemists, including polymer chemists and electrochemists
Manufacturing engineers, including assembly of intricate pressurised gas systems
Manufacturing process automation engineers
Field engineers, including people with experience of installation, commissioning and servicing

Source: ITM Power.[15]

Clean Power Hydrogen Group

CPHG are operating at a much smaller scale to ITM Power and are still at the pre-market stage as they continue to undertake development of their products. CPHG differ from ITM Power in that their electrolysers are 'membrane free'; these are also built into standard shipping containers (20 or 40 foot) that are converted to their specifications.

11 https://www.bbc.com/news/uk-england-south-yorkshire-59235719
12 BBC (2021) Sheffield 'green hydrogen' plant plan announced. Available online at https://www.bbc.com/news/uk-england-south-yorkshire-59235719
13 https://www.itm-power.com/hgas1se
14 https://www.itm-power.com/hgas10mw
15 https://www.itm-power.com/news/itm-power-is-recruiting-80-engineers

Whilst still operating at a small scale, the manufacturing process for CPHG is identifiable. The converted containers are equipped with the electrolyser using components sourced by CPHG from across the supply chain. These are installed by their on-site engineers to their design and specifications. The specialist jobs involved include mechanical, chemical process, and electrical engineers.

5. POLICY RECOMMENDATIONS

5.1. The prospects for the sector in the region

The overall message from those spoken to, which included firms within the region and experts looking in, was that there is clear potential for the hydrogen sector to grow in the region. Much is dependent on what route the UK government (and other governments) go down in terms of energy strategy. One interviewee summarised this:

> "It depends which way the three [hydrogen] strands go, if it's going to go down the green route, which is what Europe favours, you're looking at electrolysers…, no-one better than Sheffield, you're at the global front, you've got the biggest factory in the world so what an achievement". (H2 03)

The publication of the UK Hydrogen Strategy in August 2021 indicated preference for a 'twin-track' approach for UK hydrogen demand with green and blue hydrogen taking centre stage. This presents a valuable opportunity for the region to foster a green hydrogen cluster, underpinned by the presence of ITM Power (and CPHG). Whilst green hydrogen production has the potential to be undertaken anywhere, the actual manufacture of such production facilities remains highly specialised. ITM Power are an established leader in this respect and therefore present an ideal opportunity for the region to establish itself as a leader in this sector.

5.2. Opportunities and barriers to growing the sector

Given the increasing recognition of a role for green hydrogen in net zero transition and the existence of some established firms, there are several opportunities for growing the sector in the region.

- **There is clear growth potential for jobs in the region**. ITM Power have recruited approximately 80 engineers in 2021 and CPHG are expanding and anticipating recruiting for a further 200 jobs at their new Doncaster site.[16]
- **The region is home to a range of different heavy industries and manufacturers. Hydrogen is seen as an option to help transition such industries to low carbon**, for example, Liberty Steel have expressed interest in utilising hydrogen for their production processes in the region. This technique has recently been successful in Sweden with the world's first 'green' steel being produced without coal.[17]
- Whilst still a limited number of firms exist in the region, **there are opportunities to better integrate the supply chain within the region**. This includes attracting new firms to the region to enhance the types of firms based here. There is an existing supply chain link between Chesterfield Specialist Cylinders and ITM Power but opportunities for such links to be increased and expanded.
- The region is home to two Universities, several training colleges, and the Advanced Manufacturing Research Centre, which all have **significant potential for supporting regional based training and education around this emerging** sector. It is also the site for the planned National Hydrogen Research, Innovation and Skills Academy.

Despite these opportunities, there are several barriers to growing the sector:

- Whilst there are some supply chain links within the region, these are limited and need to be supported to expand.
- Interviewees felt that there was insufficient support around promoting and exporting hydrogen products.
- The facilities and infrastructure available, for example sufficient industrial scale electrical supplies, can be a barrier to attracting and growing firms.

16 https://www.cph2.com/news/new-production-facility-for-clean-power-hydrogen/
17 https://www.theguardian.com/science/2021/aug/19/green-steel-swedish-company-ships-first-batch-made-without-using-coal

5.3. Support from the MCA

- **Creating a business environment that fosters start-ups within the region and attracts inwards investment.** Helping to provide the infrastructure to support the market, for example, providing more innovation or incubation hubs that can allow small hydrogen businesses to grow and support those that are beginning to establish to find larger facilities to help them expand. This might include exploring financial incentives for firms to locate in the region.
- **Marketing the region as a location to invest in for hydrogen.** One local interviewee cited the MCA's strength at attracting inward investment but felt more could be done for the hydrogen sector. Whilst high profile firms such as ITM Power are based here it was felt that this should be promoted more widely to showcase the region as a potential hub for hydrogen.
- **Help create the demand for hydrogen by investing in regional infrastructure such as hydrogen refuelling stations.** Although ITM Power and Chesterfield Specialist Cylinders are both involved in this area of the sector a current lack of such stations outside of London limits the potential for growing the demand.
- **Provide support to help unite the local (and wider Northern) supply chain more.** This includes working with other local partners (e.g., Northern Powerhouse) to establish what other mapping work has been undertaken and to plan strategically how the broader supply chain can be grown.
- **Help establish a specialist training centre** that will help train the next generation of engineers in the hydrogen sector and help meet growing demand for specialists in the region. The existence of existing education centres, such as the two Universities, Training Colleges, the Advanced Manufacturing Research Centre, and the proposed National Hydrogen Research, Innovation and Skills Academy provide strong foundations for this.
- **Support the SCR Hydrogen Network to grow.** The network, which was created in 2019 but has made limited progress in expanding its membership and activities. Whilst the Covid-19 pandemic is likely to have impacted upon this, the existing work that has gone into setting up this network should be built upon.

Other Reports

- Low Carbon Energy Supply Chains, Employment and Skills in South Yorkshire: Headline Findings
- South Yorkshire low carbon energy supply chains: Carbon Capture, Utilisation and Storage (CCUS) sector summary
- South Yorkshire low carbon energy supply chains: Heat Networks sector summary
- South Yorkshire low carbon energy supply chains: Heat Pumps sector summary
- South Yorkshire low carbon energy supply chains: Insulation sector summary
- South Yorkshire low carbon energy supply chains: Nuclear sector summary

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