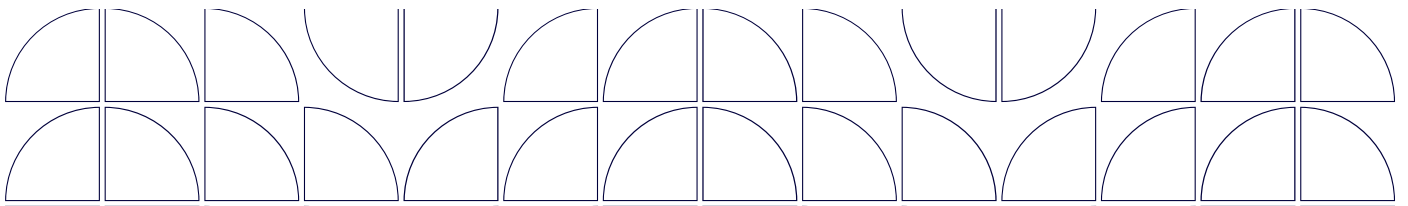


Hydrogen Skills Gap Study Landscape Review **Executive Summary**

Energy Institute
CATCH

November 2022



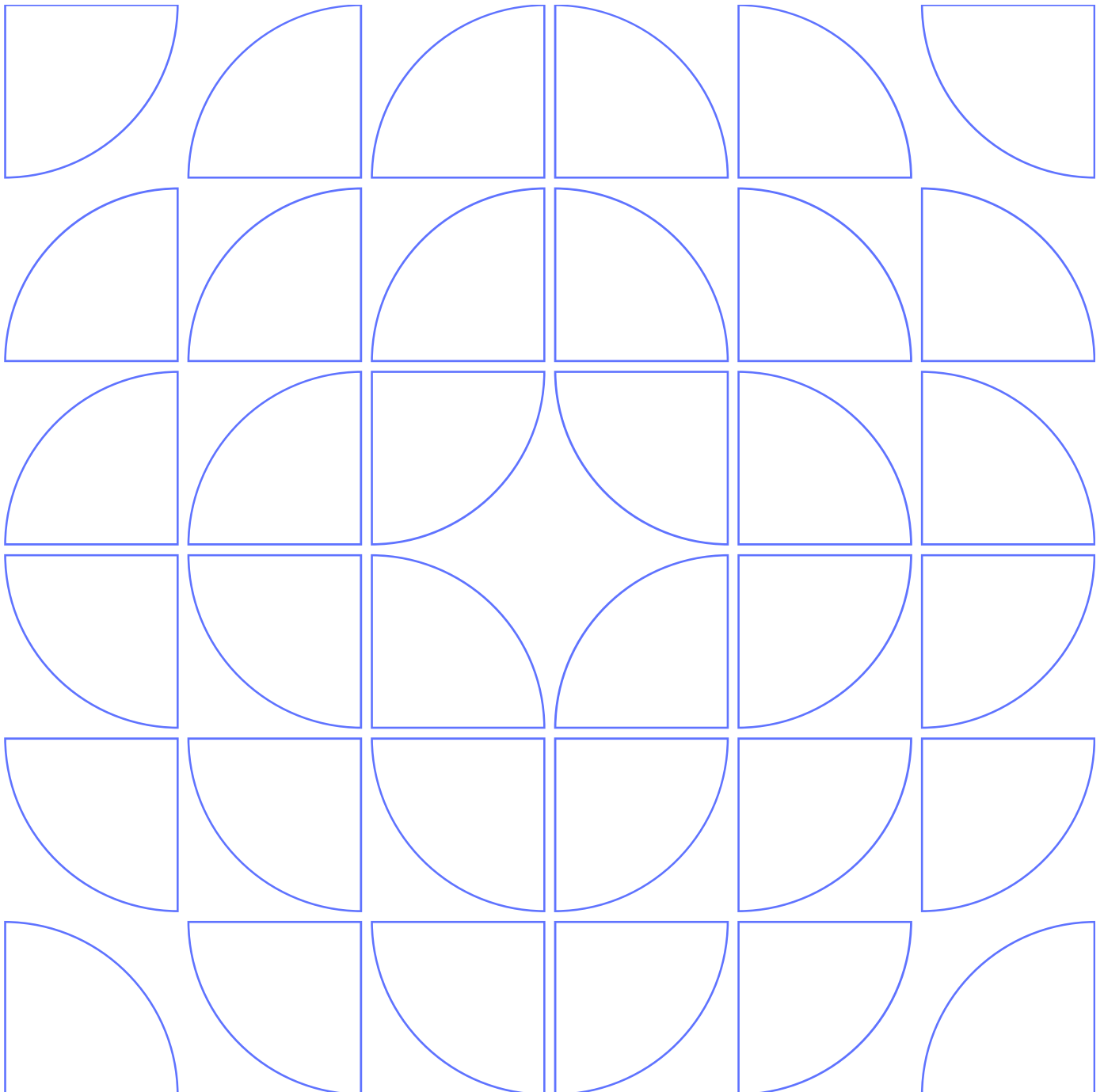
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This work was supported by the UKRI ISCF Industrial Challenge, through the UK Industrial Decarbonisation Research and Innovation Centre (IDRIC) award number: EP/V027050/1, under the Industrial Decarbonisation Challenge (IDC).

This report is an output from IDRIC project 9.4 'Development of competence, skills and training for the transition to hydrogen'



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Executive summary

This landscape review of skills has been commissioned by the Energy Institute (EI) as Phase 1 of a three-phase programme to identify the skills needs for a future hydrogen economy. The report refers throughout to ‘skills’ needs for brevity, but this should be understood to mean skills and/or new/contextualised knowledge required to meet industry needs unless otherwise specified. These may be new skills or repurposed existing skills and capabilities found in oil & gas, refining and petrochemicals and thermal power generation for future application in the emerging hydrogen economy.

The aim of this report is to provide a skills perspective in support of the transition to a hydrogen-based energy economy. It provides an analysis and review of the hydrogen skills landscape, from production through storage and transmission, and highlights priority areas of focus for the subsequent project phases. It specifically does not extend to domestic use, the merchant market or mobility. It will also not present the solution to the skills needs as that will be considered in Phases 2 and 3, although it will make recommendations for additional areas of focus to support the development of that solution. The landscape review investigated the possibility of skills transfer, and the need for upskilling and/or new skills for professional-engineering, Data Scientists, Specialist Fabricators, Managerial, Professional other, and technician roles in the in the areas of the value chain illustrated in Figure 1.

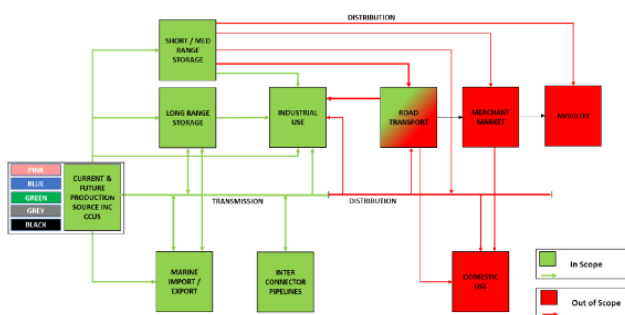


Figure 1: Energy value chain included in application scope

The report sets the scene in terms of current and future hydrogen production and storage, and the associated skills, before moving on to look at skills needed for design, operation, fabrication and inspection, a review and summary of wider industry skills needs based on desk-research and

some limited primary research. This is followed by conclusions and recommendations. A survey was carried out resulting in eleven responses from industry and four from academia. In addition, three industry representatives and one academic were interviewed in more depth. Although no significant conclusions can be drawn from the data, it provides useful additional insights to illustrate the findings of the desk-based review.

What is emerging is a picture of an industry which needs the clearest possible direction on what a hydrogen transition strategy will look like for the industry to inform the skills strategy – but this is challenging as that picture is still emerging. With some exceptions for specific new skills, what is needed from a skills plan is something that will remain responsive to continuing professional development needs whilst attracting new engineers to the industry - an approach through which accessible, just in time learning opportunities for people already working in it. However, the biggest skills challenge is the loss of skilled and experienced workers through an ageing workforce, and a lack of corresponding entrants to fill those gaps even to service known job roles.

Skills attrition resulting from an ageing workforce coupled with an insufficient number of new recruits. The industry needs to combine a skills pipeline with a review of how to make the industry increasingly attractive to potential entrants. As one interviewee states:

‘...industry perception must be changed, from the “demise of Oil and Gas” to a leveraged view of energy mix (where hydrogen plays an important role) with improved measures to manage and reduce CO emissions from O&G application, where for sure some of the by-products from O&G will play a part (IR3)’.

National Grid has identified the need to build a Net Zero workforce by 2050 and has stated that there is a need to recruit for 400,000 jobs, from which 260,000 will be new roles and 140,000 will be replacing those who have left the workforce. Wider industry issues such as the shortage of HGV drivers reported after lockdown and the impact this may have on scalability if there is to be a reliance on road transportation of hydrogen until demand has increased sufficiently to justify sector investment in additional infrastructure.

The tables in section 3, which provide a detailed analysis of the skills profiles of key job roles relating to safety (design and operation), design principles, operational requirements, fabrication and inspection, compliance and audit, and transportation and delivery are based on reports issued in the last two to three years, some of which state that specific elements – such as the future role of data scientists – will need to be further investigated to support the identification of skills needs. This work – and decisions based upon it – needs to have taken place to inform detailed skills needs in this specific area.

In relation to strategic direction, there are decisions to be made about the sustainability of certain technologies, such as the storage of liquefied hydrogen, (5.6.2) as choices will have a direct impact on the approach to upskilling the workforce. If the basis for the transition to hydrogen is driven by environmental considerations, pushing the production of blue over grey hydrogen, and the accompanying carbon capture technologies (5.3.2) may influence the content of the skills strategy. The main findings of the skills reviews show that whilst transfer and upskilling will be sufficient for most roles, new skills will be needed by specialist fabricators in the areas of marine import/export, short/medium range storage and industrial use of hydrogen. In addition, some current and future production sources of hydrogen may require differing skillsets based on the level of maturity of the technologies used or proposed.

In addition to investment in hydrogen manufacture, it is essential that a transmission and storage infrastructure is established across the UK. The repurposing of the existing network for hydrocarbon distribution has been considered as a potential opportunity to enable large scale distribution, however challenges remain. These include, integrity and material compatibility issues, boundary/liability definition (where a transmission line starts and interconnector finishes, and vice-versa), as well as the need for potentially complex schemes of control and monitoring (from an operational and safety point of view, as well as metering and quality), thus highlighting a clear upskilling requirement for the workforce currently operating interconnector pipelines.

Other recommendations

Update existing provision including standards and qualifications, and degree courses, with a clear indication of where funding will come from for (re)development, training and certification/licensing.

Provide support for the wider workforce.

Forecourt workers who will receive hydrogen transported by road, for example, must understand the safety implications of the activity taking place within their working area, such as electric vehicles charging close to where hydrogen being discharged. In HE and FE, additional teachers may be needed, particularly in regions of high demand such as the North East. A detailed analysis of predicted skills needs and the need to update knowledge to allow application of existing skills in the context of hydrogen production, storage and transmission under each of these categories, may be found in the tables and content in section 6.

Several other factors influencing the design and delivery of future skills training in the industry need to be considered alongside the detail of what is needed for individual job roles.

Increase the variety of potential routes for trainees and sector entrants, such as the schools' pipeline including STEM teaching and projects; school leavers, apprentices, fully qualified and occupied industry workers; fully qualified industry workers whose roles – or parts of them – are becoming redundant and who need to repurpose their training and experience; experienced physicists and data scientists, for example, who may currently be in other industries or academia but are potential future employees in the hydrogen industry. Demand for data scientists has grown exponentially in the wider economy therefore the energy industry must find ways to attract them to it. A skills strategy will need provide a coordinated approach linking all these potential routes.

Enable easy access to contextualised knowledge training (e.g. online, on the job, in partnership with local providers) allowing application of existing skills will address many needs will be necessary for those already working in the industry and who may neither qualify for, nor need, lengthy courses such as apprenticeships or T-levels, Higher Nationals, or degree courses. It is recommended that regardless of the level of training needed, the

scope, delivery mechanism and funding should be addressed for each type of potential trainee identified above.

Ensure timely and straightforward recognition of skills acquired to enable experienced workers to quickly meet the emerging needs of, and continue to work within, the industry

Provide multiple opportunities for continuing professional development (CPD). The uncertainty around elements of the energy strategy such as the feasibility of small modular reactors and the production of pink hydrogen via this route, mean that in addition to specific skills for new and current employees, a programme of easily accessible CPD will need to be available to keep the industry responsive to upcoming skills needs.

Identify and create provision to support emerging skill areas such as cybersecurity, machine learning and “big data” are being used to drive improvements in specific areas of businesses and are yet to reach maturity. There are opportunities to further integrate green hydrogen production with energy management concepts like smart grids, by enabling these emerging skills to develop new approaches for leveraging the available loading from wind/solar/hydro technologies in conjunction with the other types of hydrogen production (e.g. pink, blue) and ensure a safe and sustainable operation of the necessary assets. This is likely to continue to highlight the need for data scientists, IT/OT and systems thinking disciplines coupled with the need to promote for better cross-discipline understanding.

Drive up demand for hydrogen from consumers. This will encourage industry to invest in new technologies and the skills.

Next steps

As a result of this report it is recommended that ahead of phase 2 of the project, which is aimed at developing specific engineering and technical skills, and related capability and competency frameworks, that the EI considers carrying out a phase 1a project which will be a piece of desk-based research. This will evolve from this Phase 1 landscape study and will:

- Reflect on the impact of the ageing workforce, and how the resulting skills gap is going to be plugged in a sector landscape in which there are insufficient new entrants to replace them. How will the sector make itself attractive to new entrants, including existing data scientists and engineers working in other sectors?
- Examine the detailed skills gap, pulling all extant research together to investigate key needs over the next 10 years, not just the skills needed in the immediate future.

Phase 2 will then need to include:

- a deep dive into the new skills needs identified, for example, for the role of pipeline fabricators, as well as what will be needed for those whose skills are transferable but may need updating
- a strategy to ensure standards, qualifications and assessments remain responsive to an on-going emerging transition strategy
- a plan to create accessible, consistent and financially viable CPD (the industry could do to lobby for levy funding to be used for this as well as to attract new apprentices at all entry levels).

More detailed findings and recommendations are made in Section 5 of the report.

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