

# HYDROGEN COMPETENCY FRAMEWORK REPORT



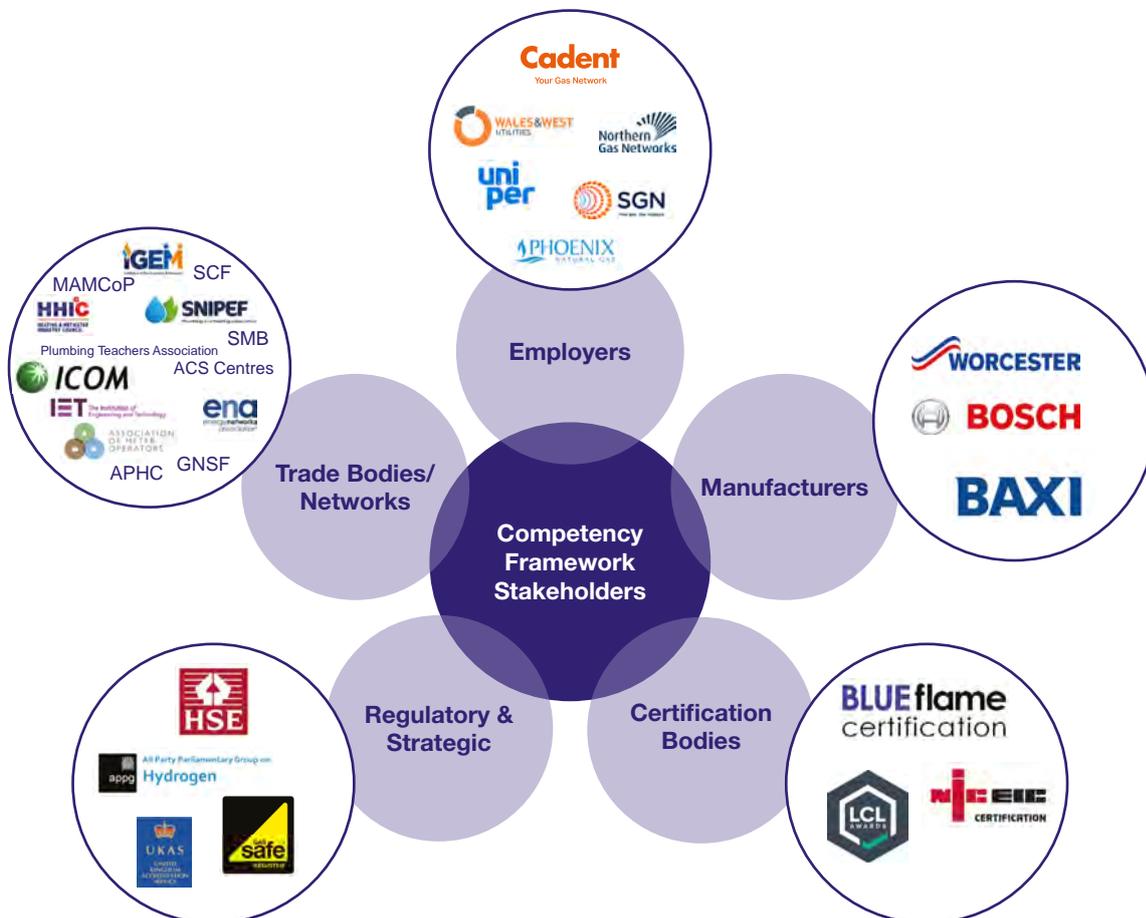
# EXECUTIVE SUMMARY

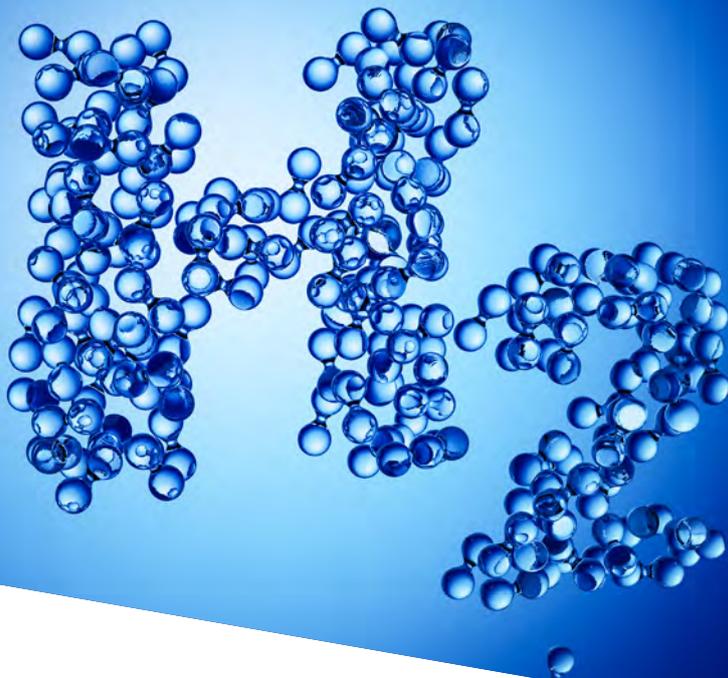
In 2020 the Department for Business, Enterprise and Industrial Strategy (BEIS) commissioned Energy & Utility Skills to develop and deliver a Hydrogen Competency Framework.

The successful completion of this work was underpinned by three key pillars:

1. **Collaboration** – Driving growth in engagement levels across the industry
2. **Scalability** – Designing the framework for both initial trials and any future national rollout
3. **Safety** – The framework, once implemented, will help ensure engineers have all the required skills, knowledge and understanding they need

The Hydrogen Competency Framework establishes a series of sequential components designed to ensure any future work done to install and maintain new hydrogen appliances will be completed safely, to the highest standards, and will only be carried out by hydrogen competent, Gas Safe Registered engineers.





To facilitate this, Energy & Utility Skills established a broad-based stakeholder consultation group, able to provide technical insights, additional information, comments and feedback at each stage. This included a technical panel of seventeen contributors with recent hydrogen expertise, plus a much larger stakeholder group of almost two hundred informed individuals with a wide range of knowledge relating to hydrogen, competence, training and assessment.

The resulting outputs of the design development stages are:

1. A **Comparative Analysis** of Hydrogen and existing hydrocarbon gases
2. A **Skills Matrix** that translates the analysis into skills, knowledge and understanding
3. An Interim **Hydrogen Technical Standard** that defines acceptable parameters and requirements for hydrogen installation work
4. A **Hydrogen Training Specification** that will enable training course consistency and facilitate industry recognition
5. An independent **Hydrogen Assessment Module** that will facilitate the addition of a hydrogen competence category on the Gas Safe Register

# INTRODUCTION

In April 2021 the UK government announced it intends to set the world's most ambitious climate change target into law, committing to reduce emissions by 78% by 2035 compared to 1990 levels. If achieved, this would bring the UK more than three-quarters of the way to reaching its target of net zero by 2050.

Approximately 85% of UK households (nearly 24 million homes) and 65% of non-domestic buildings currently use natural gas for heating, with many households also using that fuel for cooking. Heating accounts for over a third of the UK's greenhouse gasses and is the largest single source of emissions.<sup>1</sup> One potential solution for increasing sustainability and reducing carbon emissions is a move from natural gas to hydrogen boilers to heat homes across the UK.

The energy and utilities sector responds to the challenges of net zero through the strategic direction of the Energy & Utilities Skills Partnership (EUSP). Established in 2016, the EUSP Council comprises CEOs of 28 leading sector organisations. In June 2020, this group published the sector's Workforce Renewal and Skills Strategy 2020–2025 which set out three themes, divided into six strategic priorities:

Sector attractiveness, recruitment and workforce diversity:

1. Reflect the population that the sector workforce serves
2. Inspire the next generation to a career within the energy and utilities sector

Maximising investment in skills:

3. Deliver the competencies and skills we need
4. Build public recognition of the sector

Targeted action – to address anticipated skills gaps and shortages:

5. Support a successful UK economy and society outside the EU
6. Contribute to a sustainable and resilient UK

The sector needs to use the career opportunities these new technologies generate to inspire the next generation to green jobs in energy and utilities, working to meet the net zero target. The sector must also understand the competencies and skills needed and deliver against them. Finally, such projects help ensure the sector continues to work to make the UK more sustainable.

The need for gas engineers to be competent is well understood by the industry, the Health & Safety Executive (HSE) and Government. For any transition to hydrogen as a replacement for natural gas, that requirement is absolute and critical.

The engineers who install and maintain the millions of natural gas appliances in use are all skilled, competent and recognised by the Gas Safe Register, as required by legislation. The processes that govern this system are well established, robust, and have contributed to high levels of consumer confidence in the use of gas in their homes. Retaining that confidence as the gas industry takes the first steps into a new age of hydrogen-fuelled appliances is paramount.

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<sup>1</sup> [Clean Growth - Transforming Heating \(BEIS report, December 2018\)](#)

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## WHAT IS COMPETENCE?

True competence depends upon multiple factors including training and experience. The essence of competence is the ability to understand a situation or set of circumstances and be able to carry out a task in accordance with technical and safety standards. To achieve this level of competence, a robust assessment that incorporates both an examination of knowledge and understanding, together with a learner's demonstration of skills, is essential.

Current legislation requires that all gas engineers involved in gas work within domestic or commercial premises must be included on the Gas Safe Register in the categories of work they are deemed competent to carry out. Furthermore, every five years, each engineer must demonstrate that they have maintained that competence in matters of gas safety. This regular re-assessment is well established and provided a good template for the addition of competences needed in respect of hydrogen.

In 2017, the industry established a new Standard for Training in Gas Work (IGEM/IG/1) that required training providers to obtain industry recognition for courses they deliver. This process covers the course content, duration, facilities, equipment and trainer capabilities. Again, it provides an ideal mechanism to ensure any future hydrogen training is of good quality and is fit for purpose.

Both of these existing processes were integrated within the Hydrogen Competency Framework and provide the means to scale up implementation as required, even up to a full national conversion programme if and when necessary.

With the potential change to 100% hydrogen becoming more likely if the UK is to achieve the net zero carbon targets set by Government, the development of a safe, competent workforce will be essential. In future, existing apprenticeships and qualifications will enable a new generation to become skilled engineers of the hydrogen age. In the meantime, while trials take place and prove viability, the Hydrogen Competency Framework will help ensure all engineers working on hydrogen trials do so safely and hold the relevant gas safe registration.

# FRAMEWORK DEVELOPMENT ACTIVITIES

## Comparative analysis of hydrogen and natural gas

Design of the Hydrogen Competency Framework began with a simple question: “Hydrogen is a different gas, so what are the implications for how a competent natural gas engineer operates now?”

A comprehensive answer was necessary as a prerequisite to any development of the framework. Energy & Utility Skills prepared a comparative analysis of hydrogen and the current hydrocarbon gases used for heating and cooking in the UK. The analysis was designed to review, consider, and then document, all significant differences between hydrogen and the more familiar hydrocarbon gases, from the perspective of a competent Gas Safe Registered engineer. Engagement with IGEM was established on this specific activity and the Institution provided a copy of the document IGEM/H/1 Draft Reference Standard for Low Pressure Hydrogen Utilisation, which had been produced and agreed by the five IGEM Technical Committees with an interest in this matter.<sup>2</sup> This document provided an excellent basis for the necessary comparative analysis required.

Additional technical information was sourced from key appliance manufacturers, who have continued to undertake research and testing of appliances in preparation for their installation in the trials.

The initial draft comparative analysis report was circulated to the stakeholder group on 9 June 2020, with feedback and comments received two weeks later. Online virtual meetings were also held with specific stakeholders and sub-groups to discuss the Competency Framework project as a whole and the report in particular.

Feedback was positive and constructive, helping to enhance the final report. Energy & Utility Skills also worked with a technical representative from Hy4Heat project advisers KIWA to review the final document and, as appropriate, incorporated into a second draft of the report, which was again circulated to the stakeholder group for consideration.

The resulting report concentrated on the effect and impact that the change to hydrogen would have on the standard work activities carried out by an engineer, including personnel involved in appliance maintenance, fault finding, repair and emergency response.

## Skills matrix

Once the comparative analysis exercise was complete, the next component stage was the production of a Skills Matrix, which took the information derived from the analysis and defined the content into differences that required additional skills, and those that necessitated additional knowledge and understanding.

Prior to delivery of the comparative analysis report, the widely shared opinion of many in the gas industry was that there would be relatively few additional skills required by existing natural gas competent engineers moving to work on hydrogen. However, it was thought highly likely that there would be a much greater need for significant and substantial additional knowledge and understanding of hydrogen.

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<sup>2</sup> These are the Technical Co-ordinating, Gas Transmission and Distribution, Gas Utilisation, Gas Measurement and Hydrogen Committees.

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The comparative analysis supported this assumption, and highlighted that some current, long-established work practices would need to change, due primarily to the properties and characteristics of hydrogen. It was recognised that this requirement itself would reinforce the need for experienced natural gas engineers to develop a full understanding of hydrogen, simply to appreciate why some common work practices had to be changed.

As was the case for each of the Competency Framework components, the draft Skills Matrix was issued for consultation to the industry stakeholder group, with a revised document produced following feedback.

### **Interim Hydrogen Technical Standard**

Energy & Utility Skills and IGEM worked together to enable a swift response to this pressing need and work commenced in November 2020 to establish a joint IGEM/Energy & Utility Skills technical group able to produce a Standard for the hydrogen installations.

It soon became apparent that, despite the amount of research and testing previously completed, some gaps still remained and further work would be needed to finalise a definitive Standard. However, it was possible to produce an Interim Hydrogen Technical Standard that enabled, once the usual stakeholder consultative process had been completed, the reference mapping of the Hydrogen Training Specification and Assessment Module.

### **Hydrogen Transition Training Specification**

The skills matrix was used to inform the next component of the framework, the Hydrogen Transition Training Specification. Early work on the comparative analysis report had revealed a need for additional technical research and testing on some aspects of hydrogen installations. Examples included the types of pipe and fittings materials that would be acceptable for use with hydrogen, whether existing installed pipework could be repurposed, and details of the pipe sizes needed for hydrogen installations.

To clarify these questions and identify any other significant gaps, the case for the production of a definitive Hydrogen Technical Standard became imperative. Such a document would enable the planned Training Specification to be mapped against it and also facilitate the development of the final competence assessment, necessary for Gas Safe Register acceptance.

### **Hydrogen Assessment Module**

The Hydrogen Competency Framework was signed off in March 2021 through the industry governance process, which involves industry representatives, certification bodies, Gas Safe Register and the HSE, and was delivered to BEIS on time and on budget. This project provides an essential platform to ensure the competence of all gas engineers involved in hydrogen installation work.



## PROJECT OUTPUTS

The Hydrogen Competency Framework consists of five integrated components:

1.	A <b>Comparative Analysis</b> of Hydrogen and existing hydrocarbon gases	<a href="#">View here</a>
2.	A <b>Skills Matrix</b> that translates the analysis into skills, knowledge and understanding	<a href="#">View here</a>
3.	An <b>Interim Hydrogen Technical Standard</b> that defines acceptable parameters and requirements for hydrogen installation work	<b>Coming soon</b>
4.	A <b>Hydrogen Training Specification</b> that will enable training course consistency and facilitate industry recognition	<a href="#">View here</a>
5.	An independent <b>Hydrogen Assessment Module</b> that will facilitate the addition of a hydrogen competence category on the Gas Safe Register	<a href="#">View here</a>

# CONCLUSIONS

The energy sector will need to see dramatic change between now and 2050, with significant investment in new green jobs and technologies. The need to keep people warm remains an essential factor. The most effective solution to achieve this for existing properties is the replacement of natural gas central heating boilers with those that burn hydrogen.

Hydrogen appliances are already being produced and the first trials in the community are planned for 2023. Hydrogen is a clean gas that can be produced using green electricity, produces no carbon (the only output is water), and has potential to make a significant contribution to a net zero UK.

But, if the transition to hydrogen is to be achieved safely and enable the gas industry to maintain the confidence of the public built up over decades, a competent workforce is vital.

When the Hydrogen Competency Framework is implemented it will help ensure all engineers involved in the installation and maintenance of hydrogen systems and appliances are fully trained to robust standards. It will also facilitate an independent assessment of hydrogen competence, against established safety criteria, and provide a certificate that will be accepted by the HSE and Gas Safe Register. Only existing Gas Safe Registered engineers competent to work on natural gas installations will be able to access the hydrogen framework, ensuring that all work is completed to the highest safety standards.

The development of a Hydrogen Competency Framework is a significant success for the UK Gas Sector. This scalable framework will evolve and expand as the roll out of hydrogen into larger commercial applications occurs, ahead of Hydrogen Apprenticeships becoming a reality. In the meantime, it delivers the means to ensure the competence of engineers who will pioneer the transition to a hydrogen-fuelled gas industry.



## NEXT STEPS

Energy & Utility Skills continues to liaise separately with the Gas Distribution Networks to ensure their personnel are also hydrogen competent for the roles they carry out. Gas distribution personnel were outside of scope for the original BEIS-led Hy4Heat Hydrogen Competency Framework development because they are not required to be Gas Safe Registered and the focus has been purely on down-stream activities. Energy & Utility Skills recognises it will be critical that up-stream activities are developed for all Gas Distribution Network companies. There are numerous specialist roles which would require cross-skilling in the short to mid term during the energy transition and therefore Energy & Utility skills recommends that these should be in scope of any future work on the Competency Framework development.

With the framework now created, steps must be taken to see it implemented. This is dependent upon further assessment of research and evidence gaps to finalise a definitive Technical Standard before establishing training providers and assessment centres able to offer courses designed to meet the hydrogen specification. An existing Certification Body will provide quality assurance of the assessment process and upload the certification to the Gas Safe Register. Energy & Utility Skills is well placed to be at the forefront of the cross-industry collaboration required to see the Hydrogen Competency Framework fully operational to support future hydrogen trials.

### For more information, please contact:

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