



Llywodraeth Cymru  
Welsh Government

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Welsh Government

Consultation – summary of response

## **Hydrogen in Wales**

### **A pathway and next steps for developing the hydrogen energy sector in Wales**

June 2022

Mae'r ddogfen yma hefyd ar gael yn Gymraeg.

This document is also available in Welsh.

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## **Overview**

The Welsh Government published the Hydrogen in Wales; A pathway and next steps for developing the hydrogen energy sector in Wales consultation on 18 January 2021. The consultation closed on 9 April 2021. This document provides a summary of the responses to the consultation along with outline conclusions and next steps.

## **Action Required**

This document is for information only.

## **Further information and related documents**

Large print, Braille and alternative language versions of this document are available on request.

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## **Additional copies**

This summary of response and copies of all the consultation documentation are published in electronic form only and can be accessed on the Welsh Government's website.

Link to the consultation documentation: <https://gov.wales/developing-hydrogen-energy-sector-wales>

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## Introduction

The consultation entitled “Hydrogen in Wales – A Pathway and next steps for developing the hydrogen energy sector in Wales” ran for 12 weeks from 18 January to 9 April 2021. The consultation set out a proposed Pathway and next steps for developing the hydrogen energy sector in Wales. A total of 79 valid responses were received. A breakdown of organisations that provided a response is provided below.

Type	Response Count	Response Percentage (%)
Academic	3	3.8
Business	33	41.8
Individual	13	16.4
Local Authority	5	6.3
Other Public Body	8	10.1
Trade Organisation	17	21.6
Total	79	100

Respondents had the opportunity to answer 11 questions. This document summarises the response received to each question and sets out the Welsh Government’s intended next steps.

## Summary of Responses

### Question 1

**Public and private sector representatives are developing a hydrogen Pathway for Wales based on evidence that hydrogen will be required to play a part in the future energy mix if we are to meet our climate change aspirations. Do you agree this activity is needed to ensure Wales is well positioned to take advantage of potential opportunities arising from use of hydrogen? If not, why? Do you have any evidence to support these views?**

Most respondents (94.5%) agreed that the development of a hydrogen Pathway was a necessary activity, with only 2 respondents disagreeing and 2 respondents neutral on the matter.

Several reoccurring ideas were expressed throughout the answers received. Multiple respondents indicated that the upscaling of hydrogen production and its use should not perpetuate dependence on fossil fuels i.e. hydrogen should be produced from renewable / low carbon sources of electricity, particularly from wind, tidal and nuclear energy.

Several businesses and individuals suggested that the Pathway itself should be more ambitious and Wales should push for early adoption of hydrogen. Evidence was given for example which suggested Wales lagged behind the rest of the UK in the uptake of hydrogen buses, and that the Welsh Government (WG) should bring forward its targets accordingly. It was also repeatedly suggested that the deployment

of hydrogen buses (among other fuel cell electric vehicles (FCEVs) should be developed in clusters to reduce financial risk.

Respondents suggested that the Pathway and any future work must consider the nature of production, storage and transport of hydrogen to understand if this may differ across Wales according to geography and access to infrastructure. South Wales and the importance of the South Wales Industrial Cluster (SWIC) was also referenced by multiple respondents, as well as the potential to partner with cross-border hydrogen projects such as being done with HyNet.

Only two individuals did not agree the proposed activities were necessary. One suggested that a hydrogen-focused strategy would be more expensive and less efficient than an electrification pathway for heating and surface vehicles but did not comment on the use of hydrogen in other applications.

Other respondents also expressed that achieving cost competitiveness with alternative energy sources should be a key aim of the Pathway, across all sectors. It was suggested that public funding would be important in enabling the development of hydrogen. The risk from stranded assets was also highlighted.

Multiple respondents stressed the need for regular review of any proposed Pathway to remain valid over the timeframe proposed given the uncertainty surrounding the future of hydrogen technologies.

## **Question 2**

**Why are you supportive / not supportive of Wales pursuing hydrogen opportunities? If supportive, what actions can you / your organization, take to contribute towards the development of the hydrogen sector in Wales (and under what conditions)?**

Nearly all respondents (98.6%) to this question were supportive of Wales pursuing hydrogen opportunities.

Respondents expressed the view that hydrogen was an important energy vector, and that hydrogen could play a vital role in balancing electricity production from intermittent renewables, with renewables alone being insufficient to achieve the target of net-zero by 2050 as set out by WG. In addition, it was suggested that domestic hydrogen production could improve energy security and reduce future energy imports.

A common theme across responses was to express support for both electrification and hydrogen Pathways as necessary for effective decarbonisation, whilst requesting that care be taken to select the appropriate technology for each application, favouring hydrogen where a practical electrification solution does not exist.

The importance of hydrogen in industry was also a recurring theme across responses to question 2, with development of hydrogen opportunities described as

an essential activity if Wales is to maintain manufacturing. Utilisation of green hydrogen in manufacturing to replace Steam Methane Reformation (SMR) systems was referenced, with use in steel and cement production highlighted in particular. Another respondent also suggested that unless carbon capture, shipping, and storage is developed in South Wales, the region might risk losing its industrial activities to other areas of the UK.

One respondent proposed the development of a hydrogen transmission pipeline for South Wales, linking industrial sites together. The pipeline could bring the opportunity to provide hydrogen to the urban developments located between industrial sites<sup>1</sup>.

Multiple respondents outlined in response to Q2 a number of **conditions** under which a) they felt the hydrogen opportunity was likely to be delivered successfully and b) their organisation was willing to engage with hydrogen development. Conditions included improvements in electrolyser manufacturing and design, lower electricity input costs and achieving economies of scale. There was also concern that green hydrogen projects will not be viable with capex grants alone, and that revenue support models should be made available. The development of a “sustainable and supportive business environment with a clear demand profile” was also cited as a requirement for investment in hydrogen production facilities.

Although respondents were broadly supportive of pursuing hydrogen opportunities, there were mixed responses in relation to the use of hydrogen for heating buildings. Those favouring electrification for decarbonisation proposed that improvements to electricity transmission infrastructure should be prioritised over the development of hydrogen infrastructure to enable increased use of heat pumps and electric vehicles.

### **Question 3**

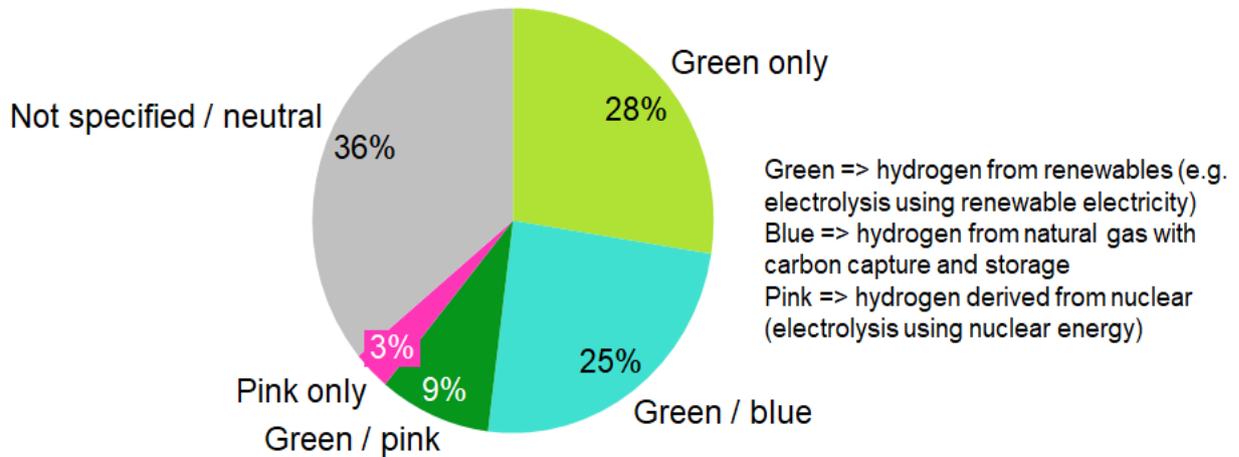
**Do you have any evidence on the best sources of energy for low carbon / renewable hydrogen production? Should Wales seek to generate hydrogen within the country or seek import opportunities, or pursue both options?**

The pie chart below shows the breakdown of respondents’ support for green, blue and pink (from nuclear) hydrogen production.

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<sup>1</sup> Note: the development of a UK hydrogen backbone (which would link industrial sites across South Wales) is being explored in other projects, such as the National Grid-led [Project Union](#).

## Proportion of respondents favouring different forms of low carbon / renewable hydrogen production for Wales



Overall, the majority of respondents favoured domestic production, but many supported exploring import opportunities where this could ensure security of supply. It should be noted that a distinction must be made between import from elsewhere in the UK, and import from further afield; one respondent, for example, expressed support only for import from Northwest England.

Multiple respondents referred to the issue of low utilisation factors for electrolyzers connected to a single renewable asset and advocated for the definition of green hydrogen to include hydrogen produced from grid-connected electrolyzers which increase / decrease production according to renewable output across the whole network. Others requested greater flexibility on this issue, promoting the use of non-renewable electricity to power electrolyzers where necessary in order to accelerate production and maximise electrolyser load factor.

Concerning the source of energy for hydrogen production, suggestions were put forward in addition to electrolytic green hydrogen and blue hydrogen using CCS, including pink hydrogen from nuclear electricity, and “non-electrolytic sources of green hydrogen” such as hydrogen production from biomethane.

No respondents supported only blue hydrogen production. Significant support was expressed for hydrogen production from Wales’ untapped renewable resources. Four respondents made specific reference to hydrogen from offshore wind. Multiple respondents suggested expanding blue hydrogen production as a short-term solution to allow the development of the hydrogen economy, with the aim of displacing with green hydrogen production capacity as renewable output increases.

No party was in favour of seeking exclusively to import hydrogen. The broad consensus was that hydrogen production should either be entirely indigenous to support energy security and Welsh industry, or that priority should be given initially to the development of hydrogen production in Wales before exploring import options. The development of distribution infrastructure was highlighted as a factor determining the degree of domestic production. A combination of both imports and indigenous production was proposed as a means of securing future fuel supply, and

to accelerate production at scale. Nine respondents stated that Wales should look to produce hydrogen for export in the future, both to England (e.g. Merseyside) and outside of the UK. Germany and the Netherlands were raised as potential export markets, both countries having expressed their intention to import hydrogen in the future.

#### **Question 4**

**In your view, does the proposed hydrogen Pathway complement on-going and planned hydrogen initiatives across the UK? What other actions should be considered in the hydrogen Pathway that would further distinguish Wales, or support other UK activities? Do you have any evidence to support these views which you can share?**

Almost two-thirds of respondents (63.3%) agreed that the Pathway complemented other hydrogen initiatives across the UK. Around a quarter did not agree with this statement, while circa 15% of respondents were neutral on this question. Several respondents noted that it was difficult to make a definitive comparison given the absence at the time of response of an official hydrogen strategy from the UK Government. Several respondents suggested that the Pathway lacked detail / ambition in some areas in which hydrogen is expected to play a role in the energy system in the long term: decarbonisation of industry, for heating buildings, and as an energy storage solution allowing increased use of intermittent renewables.

Responses relating to road transport included a suggested review of existing schemes, such as the Renewable Transport Fuel Obligation (RTFO) to encourage the switch to hydrogen and other alternative fuels. Scotland's Ultra-Low Emission Bus Scheme, and England's National Bus Strategy were also referenced. One respondent requested that the WG "positions Wales within this context", warning that many bus and coach operators work across the UK, meaning actions by WG will determine whether investment priorities are in Wales or elsewhere. Several suggestions were made concerning additional support for the use of hydrogen in aviation. The potential to use hydrogen / hydrogen derivatives such as ammonia in marine applications was also raised, as was the option to develop the use of hydrogen in agriculture.

Five respondents drew specific attention to the Pathway's limited proposals for the use of hydrogen in industry, including in high-temperature processes and as an alternative fuel to replace natural gas. A few respondents also mentioned that further support and consideration should be given to heating and conversion of the gas grid to hydrogen.

One respondent proposed the introduction of incentives and regulation for converting industrial production processes from fossil fuels to hydrogen and suggested that "Hydrogen Valleys" be established around sites such as Milford Haven, Port Talbot and Wrexham with the aim of "connecting producers, consumers, local authorities and academia to create a learning network around the production, distribution and use of hydrogen".

The South Wales Industrial Cluster (SWIC), with Milford Haven in particular were mentioned by multiple respondents as an important location for the development of hydrogen. One suggested that Milford Haven would be “the ideal location to focus support for the development of a green hydrogen economy”. Another suggested that Wales could further distinguish itself by considering export opportunities for hydrogen from Milford Haven (as well as Holyhead) to EU member states.

While there were mixed responses in regards to Carbon Capture & Storage (CCS), several respondents advocated greater support for green hydrogen production. One respondent suggested that WG follow the example of the Scottish Government by commissioning a detailed assessment of onshore and offshore wind resources. Another suggested that Welsh Government should be proactive in the definition of clear targets and objectives for hydrogen production and use in Wales.

## **Question 5**

### **Are there other areas where you believe hydrogen and fuel cell technologies have a role to play in Wales in the short term (period to 2025)?**

Two thirds of respondents provided detailed suggestions for the role of other technologies in the hydrogen Pathway. The use of hydrogen in rail applications was repeatedly mentioned, despite the plans outlined in the Pathway to begin trials of hydrogen fuel cell (HFC) trains. This could indicate that this information was not emphasised sufficiently in the Pathway, or that there is a desire for greater ambition for HFC trains.

There were also multiple suggestions for hydrogen to be utilised in other applications. Suggestions included, but were not limited to; coaches, heavy goods vehicles (HGV), Non-Road Mobile Machinery (NRMM), materials handling (e.g. forklifts), maritime / shipping, aviation, hydrogen turbines (power generation), combined heat and power generation, domestic and non-domestic heating, emergency back-up generators, green hydrogen for industry, agriculture, and Power-to-X (for production of ammonia and other chemicals / synthetic fuels). One individual suggested installing hydrogen refuelling stations at each service station along the M4. Another suggested hydrogen powered floodlighting, giving the example of use in local council roadworks.

Establishing a “Hydrogen Hub” in a relatively densely populated part of Wales was also suggested, to create a small area within which the supporting infrastructure to deliver hydrogen to users should be developed. On the transport side this would “allow concentrated involvement by car manufacturers – Honda / Hyundai / Toyota to establish a proper market footprint and gain user feedback and acceptance”. It was also suggested that a critical mass of houses within the hub area could also be built/ retrofitted which use hydrogen for heating. Several other respondents also mentioned hydrogen has a role to play in domestic heating in the short term, with others calling for use in non-domestic heating such as in industry.

## Question 6

### **Do you believe the Pathway strikes the right balance between being ambitious yet proposing actions which can be delivered?**

Here, responses were evenly split between those who agreed and disagreed that the Pathway proposed an appropriate balance between level of ambition and deliverability. It was found that 40.5% of respondents agreed, 39.2% disagreed and 20.3% were neutral or did not comment.

Regarding transport, a range of viewpoints were shared. A couple of respondents noted the Pathway's lack of targets on items such as refuelling stations. Several respondents agreed that the Pathway appropriately identified a deliverable strategy for hydrogen use in transport, but also suggested that a more ambitious proposal should develop further opportunities for hydrogen use in fuel switching, heating and power generation. It was recognised that these areas all require bulk hydrogen production.

Several thought the actions and deadlines are realistic in the short term, but the Pathway lacks detail as to how these will be achieved. Commitment of funding / grants and regulatory support must be confirmed. It was also suggested that further action will be required to transition from the 10MW to GW-scale electrolyser capacity. One respondent suggested that a specific ambition should be set for 2030 e.g., 500 MW of electrolysis for industry and transport.

It was noted that clarity around regulatory and legislative support measures must be made and that funding / grant opportunities made available by WG must be confirmed. Particular mentions included the need to support Welsh industry<sup>2</sup> through this transition to avoid the relocation of Welsh industry to other regions in the UK / beyond, the development of green hydrogen and pilot projects with a focus on rural Wales.

Concerns were also raised around the risk of an over-emphasis on green hydrogen in the early deployment phase hampering technology roll-out by limiting hydrogen supply. It was suggested that the WG provide more detail to define the role of CCUS projects, to provide a better understanding of how such projects will interact with wider infrastructure and enable supply chains and local communities to scale up investment in relevant skills and services. The WG could work with active projects such as SWIC to determine the most efficient approach for deploying CCS and hydrogen.

A couple of responses suggested that the Pathway was not ambitious enough, stating that Wales is falling behind the rest of the UK and that the Pathway was not sufficient from an emissions standpoint. Sentiments included: the proposed activities are necessary but insufficiently ambitious and comprehensive from an overall

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<sup>2</sup> Note: The Welsh hydrogen Pathway consultation was run before the publication of the UK hydrogen strategy and consultation on hydrogen business models occurred.

emissions point of view and that meeting the net zero challenge will require larger scale action – actions taken to 2030 should be regarded as preparatory for more significant deployment in the 2030s.

### **Question 7**

**In addition to the points set out in the objectives, are there any other “no regrets” actions that you believe Welsh government / Industry should take in the short term to develop the hydrogen sector in Wales? Do you have any evidence you can share in support of this view?**

A large majority (nine in ten) of respondents made suggestions in response to this question. Recommendations varied across all aspects of the developing hydrogen economy and infrastructure.

One recurring recommended action was to establish refuelling infrastructure across Wales at existing fuelling stations. Supporting the demand and adoption of hydrogen HGV / Light Commercial Vehicles (LCV) was also suggested. A trade organisation within the automotive industry suggested that [vehicle] OEMs would wish to be associated with green hydrogen as part of their branding and image. It was further proposed that there would therefore be scope to intensify the approach and capability to produce indigenous green hydrogen, with ensured commitment to associated and realistic infrastructure.

A couple of respondents also suggested that maritime opportunities should be considered. It was suggested that port infrastructure for hydrogen transportation and distribution should be developed, including the use of ammonia as a transport medium.

It was also proposed that the WG include key milestones for low-carbon production facilities to make the pathway more accessible to end users. Further comments suggested that without such milestones it is unclear to local producers and consumers who would receive the initial volumes of low-carbon hydrogen.

Respondents also commented that more could be done to engage with the rest of the UK administrations and BEIS in the development of an overarching hydrogen agenda and the associated commercial models for hydrogen. In regards to other CCS projects the Welsh Government should engage with cluster projects across the UK to ensure a) there is capacity to import hydrogen from other UK CCS clusters for use in Wales and b) a CO<sub>2</sub> storage site which can be accessed by Welsh domestic CO<sub>2</sub> capture from industry and hydrogen production should be developed<sup>3</sup>.

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<sup>3</sup> Note: the consultation was held before the announcement of the CO<sub>2</sub> storage project in Liverpool Bay for the North West England and North Wales industrial cluster.

## Question 8

**What are the key barriers, risks and challenges to realise the opportunities described? In your view, what measures would help to overcome these and what are the key enabling factors?**

Nine in ten respondents supplied analyses of opportunities and measures. Most notably, around 60% of respondents noted economic concerns in their responses. Of these responses, 25 mentioned the importance of government policy or directly called for further funding/ subsidies to be made available. Particular comments were made that government subsidy is required to kick-start the transition, and that the costs of hydrogen infrastructure and production equipment were high. The high price of electricity was also raised, and it was suggested that use of renewable Power Purchase Agreements (PPAs) / Green Guarantees of Origin should be made to minimise the cost of renewable electricity for electrolytic hydrogen production. One respondent also noted the uncertainty around whether generators with Contracts for Difference or Renewable Obligation Certificates can be co-located with an electrolyser and still receive their support payments from government.

The difficulty in ensuring that hydrogen production matches hydrogen demand, both in terms of scale and location was also noted as a challenge by multiple respondents. A couple of respondents also suggested that incrementalism would be a risk. It was suggested that activity should not be spread too widely and thinly. This echoes the suggestions in response to this question and others that hydrogen hubs should be developed.

Beyond funding, other concerns relating to the government were raised in terms of policy and regulations. Several respondents noted that clear policy is required to enable industry to move forward with developing hydrogen projects. Consultees also noted concerns with the planning regime, and that long planning timescales can cause major delays to the commissioning of larger scale projects, adding unnecessary additional risk. A bias towards electric vehicles was highlighted.

It was also noted that safety is a key enabler, and that full authorisation of hydrogen for home heating by the HSE is still required. The lack of industry / process safety standards was also mentioned as a barrier to hydrogen opportunities.

Public perception of hydrogen was raised as a barrier. Several respondents mentioned that safety concerns from the public would need to be overcome if it is to become a mainstream option, and that as consumers are at the heart of the hydrogen economy, they will drive demand. One respondent noted that the number of national or regional studies evaluating public perception and social acceptance of hydrogen seem limited at the moment. Respondents suggested that education, continuous community engagement, local job creation, and ensuring that benefits are kept local as much as possible would help overcome negative public opinion.

Consultees provided mixed responses in regards to blue hydrogen and CCS, with one suggesting that the WG should stay technology neutral, another that blue hydrogen should be used as an early enabler for the hydrogen economy and another

that there is risk of over-emphasis on blue hydrogen, which would lead to a dampening effect on lowering the cost of green hydrogen price trajectory. Other respondents also acknowledged that full consideration of where the CO<sub>2</sub> from blue hydrogen production would be stored is needed.

### **Question 9**

**We would like to know your views on the effects that ‘Hydrogen in Wales’ and the next steps for developing the hydrogen energy sector in Wales would have on the Welsh language, specifically on opportunities for people to use Welsh and on treating the Welsh language no less favourably than English. What effects do you think there would be? How could positive effects be increased, or negative effects be mitigated?**

Around two thirds of respondents answered this question, many of which indicated that they believe signage and guidance should be in both English and Welsh.

Several respondents stressed that the government should ensure that hydrogen developments take place so that they safeguard opportunities to retain young people in their locality and to attract young people back to a Welsh-speaking area: “The hydrogen sector could have a positive impact on the Welsh Language locally by creating high-value employment opportunities with Welsh language skills requirements at the construction and operational phases which could provide work for local Welsh speakers, especially young people, encouraging them to stay living [in the region] and reducing

g the out-migration of young people from the area. In the same vein, the hydrogen sector has the potential to attract back Welsh speaking people and their families who have moved away to return also attracted by the jobs on offer from the hydrogen sector and other planned projects could increase the number of Welsh speakers and alter its demographic profile which is critical for the longer term”.

Several expressed that they did not feel that Welsh language considerations were relevant in this context. One respondent put forward that technical expertise should be prioritised over language skills to ensure roles and projects are allocated to “the best-qualified and highest trained experts”. Others suggested that stakeholders and some expertise required to develop Hydrogen in Wales will come from beyond Wales and maybe beyond the UK, where Welsh is unlikely to be spoken. It was felt that it will be difficult to mitigate against this, especially as it is not required by private sector developers to develop Welsh language schemes by law.

## Question 10

**Please also explain how you believe the proposed opportunities could be formulated or changed so as to have positive effects or increased positive effects on opportunities for people to use the Welsh language and on treating the Welsh language no less favourably than the English language, and no adverse effects on opportunities for people to use the Welsh language.**

Just over half of respondents answered Question 10. Several businesses and local authorities reiterated their support (expressed in responses to Question 9) for bilingual documentation and signage. Support should be given to education packs, courses, training and other resources should be fully bilingual. Dŵr Cymru Welsh Water has engagement already in the Rhondda Fach to promote jobs creation and upskilling, which was highlighted as a model to present the opportunities provided by hydrogen.

Some respondents argued that Welsh-speaking job applicants should only be favoured if both they and a non-Welsh-speaking (English-only-speaking) applicant have otherwise identical qualifications. It is felt that any other restrictions would be counter-productive for the quality and results of a project.

Several were of the view that it was not relevant to the context, repeated or felt that the question had been answered in their response to Question 9.

## Question 11

**If you have any related comments which we have not specifically addressed in this consultation, please respond under question 11, supported by any relevant evidence.**

Two thirds of respondents added comments in response to this question, several of which were expansive statements which covered all bases of the consultation in general terms or repeated comments made in response to previous questions.

Several respondents highlighted hydrogen's importance in reaching Net Zero, with one suggesting that hydrogen is the only real-world alternative to fossil fuels. Another respondent noted that the Welsh Government (WG) appears to lag behind the UK in hydrogen development, stressing the need for the WG to support Welsh industries to attract UK Government money. They also suggested that smaller manufacturers (e.g. in the food processing industry) were identified as requiring government assistance with funding applications if they are to embrace the Net Zero transition. Multiple respondents noted that they felt that the Pathway only covered short-term goals and should be more ambitious. It was felt that while the Pathway was good, a long term strategy is required to enable the roll out of the hydrogen economy and build a long term market for low carbon projects.

A few respondents mentioned that an economy-wide carbon policy should be established, suggesting a more effective carbon price should be implemented. It was suggested that this would drive further uptake of low carbon hydrogen.

It was noted by one respondent that health and safety is completely missing from the Pathway. One respondent stated “It is critical that process safety be built into the requirements from the start, to ensure we develop infrastructure and projects that meet modern safety standards and manage the risks involved in line with latest practices”.

Several expressed support for the use of small modular nuclear reactors (SMRs) to supply baseload electricity of the type manufactured by Rolls-Royce, proposing that Wales should be involved in projects using this technology. One respondent specifically called for the development of a Small modular reactor (SMRs) at Trawsfynydd.

One individual suggested that the Pathway fails to adequately take into account the challenges of hydrogen over electrification for heating and transport applications. Regarding the gas grid, they cited that for blends exceeding 20% hydrogen, complete replacement of steel piping and existing gas boilers is required, and suggest that funds directed towards improvements to the electricity grid, and promotion of heat pumps and electric vehicles would deliver better outcomes for heat and transport. Another individual suggested that the challenges of storing hydrogen make hydrogen an unviable option for Wales. Along with another respondent, there were calls to expand the Pathway and consider other storage and fuel options.

## **Conclusions and high-level update on progress against Pathway objectives**

A good level of response to the consultation on the Pathway for hydrogen development in Wales was received, with a wide range of supportive, informed, and constructive feedback. The vast majority of respondents supported the concept of developing hydrogen in energy applications in Wales. The fact that equal proportions of consultees agreed and disagreed that the Pathway was sufficiently ambitious while proposing deliverable actions suggests that an appropriate balance was achieved. It is important to recall that the objective of the Pathway was to define a set of short-term objectives, focusing on actions and projects that can be implemented in the early part of the 2020s. The document is not (and was not intended to be) a comprehensive strategy for hydrogen in Wales, rather it sought to define a set of no regrets actions to position Wales to take advantage of the range of benefits that increased uptake of hydrogen can bring. Several respondents to the consultation advocated the use of hydrogen in elected applications, especially those where direct electrification is not feasible or practical. This is a view shared by Welsh Government: hydrogen is recognised as a necessary part of achieving net zero (e.g. hydrogen and hydrogen-derived fuels offer the only option to decarbonise certain applications based on today’s technology), but it is not a silver bullet, a view reflected in the Net Zero Wales publication (October 2021).

Since the consultation closed (in April 2021), Welsh Government and external parties have continued to progress with a wide range of activities relating to the Pathway objectives. A high-level overview of progress against each of the ten Pathway objectives is given below:

- **Deploy 200 FC buses** – opportunities to deploy fuel cell buses are being explored in multiple locations across Wales. For example, there is a relatively mature project underway in Swansea and opportunities to deploy fuel cell buses on the TrawsCymru network (run by Transport for Wales) are being explored.
- **Wales as an early market for FCEVs** (especially heavy duty vehicles) – there has been relatively limited progress against this objective, largely as the availability of vehicles remains a constraint. Welsh Government will continue to monitor developments and opportunities in this area (e.g. under the upcoming DfT-funded Zero Emission Road Freight Trial).
- **FCEV OEM and supply chain in Wales** – Riversimple has grown in size despite the challenges presented by the pandemic and the company is working on designs for a vehicle production facility in mid-Wales, and developing other vehicle models (in addition to the Rasa).
- **New automotive industry activity to Wales** (e.g. vehicle integrators) – although at the time of writing there are no (known) firm plans for vehicle integrators or other automotive supply companies to set up new bases in Wales, there has been some progress against this objective. For example, several of the companies working on Welsh Government funded HyBRID projects are well placed to establish new activities in Wales.
- **Fuel cell train demonstration and testing** – there has also been some progress against this objective (two rail-based feasibility studies being undertaken as part of the HyBRID programme) but not firm plans for deployment as of Q1 2022.
- **Establish a 10MW+ renewable hydrogen production facility by 2023/24** – several feasibility studies for hydrogen production in Wales at around this scale are underway / being considered, covering various sectors (road transport, aviation, industry, etc.). Given the time required for planning and construction, for a facility to be operational in 2023/24, an investment decision is likely required before the end of 2022.
- **Plan large-scale clean hydrogen production** – work is underway on concepts for large-scale off-shore renewable hydrogen production. For example, in December 2021 RWE announced a feasibility study for a 100MW electrolyser to produce green hydrogen as part of its Pembroke Net Zero Centre.<sup>4</sup> In March 2022, ERM Dolphyn and Source Energie announced plans to develop gigawatt scale green hydrogen floating wind sites in the Celtic Sea. The first site (“Dylan”) is c.60km off the Pembrokeshire coast and has a target deployment date of 2027/28.<sup>5</sup>
- **Support industrial decarbonisation via skills development and R&D** – skills requirements is a topic being considered by Industry Wales and a number of universities.
- **“Place-based” approach** – the place-based approach is the concept of considering the local context and engage with the wider community in

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<sup>4</sup> <https://www.rwe.com/en/press/rwe-generation/2021-12-17-rwe-is-driving-hydrogen-plans-forward-in-wales>

<sup>5</sup> <https://www.erm.com/news/erm-dolphyn-and-source-energie-announce-plans-to-develop-gigawatt-scale-green-hydrogen-floating-wind-sites-in-the-celtic-sea/>

deployment projects. This is a key feature of many of the projects delivered / under development in Wales (e.g. the HyBRID SBRI Phase 1 projects and hydrogen hubs under development in Milford Haven, Holyhead and Deeside).

- **Engage with other hydrogen initiatives** – there has been on-going engagement with HyNET throughout the study and this is one of the projects selected as a “Track-1 cluster” by the UK Government (as announced in November 2021<sup>6</sup>). Welsh Government has also continued to engage with UK Government representatives (BEIS officials) to understand relevant developments relating to support schemes and policy. HyCymru, the Welsh hydrogen trade association, also provides an excellent platform for communication and knowledge-sharing and the Welsh Government continues to engage with and support HyCymru.

Overall, progress is being made against most of the objectives, albeit with relatively limited additional deployment activity involving hydrogen over the past two years given the pandemic and lack of clarity on UKG funding. Welsh Government is pleased, despite the difficult conditions, to have enabled trials and supported hydrogen initiatives in Wales through various stages of planning, from early feasibility studies / concept design through to more detailed engineering work. Multiple projects have matured with some securing funding for further feasibility or even deployment (e.g. the Holyhead hydrogen hub was awarded £4.8m by the UK Government, subject to business case approvals).

Welsh Government recognises the need to support and enable more hydrogen projects in Wales, from a long and growing list of announced projects and initiatives at various stages of desk-based development, through to and beyond investment decisions. Further clarity on the available support (e.g. in the case of the UK via the Net Zero Hydrogen Fund / Hydrogen Business Models) is required for many projects to proceed into a delivery phase.

Welcome clarity has been achieved on investment approaches and the availability of funding in the UK for the short term for example through the Net Zero Hydrogen Fund and the Hydrogen Business Models. These will be essential for many Welsh hydrogen projects to proceed into a delivery phase and develop markets.

## **Next steps**

Welsh Government remains convinced that hydrogen will have an important role to play in meeting net zero, and that Wales is well-placed to be at the forefront of this developing sector. We will therefore continue to support the hydrogen energy sector in Wales by:

- Providing seed funding and other support to hydrogen energy projects in Wales to ensure they are well-positioned to access additional finance from up-coming UK Government funding schemes and European programmes.

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<sup>6</sup> <https://www.gov.uk/government/publications/cluster-sequencing-for-carbon-capture-usage-and-storage-ccus-deployment-phase-1-expressions-of-interest/october-2021-update-track-1-clusters-confirmed>

- Seeking opportunities for public sector bodies (such as Transport for Wales) to help create anchor demands for renewable hydrogen that will unlock investment in a new production facility at a scale of around 10MW in Wales in the 2023-24 period.
- Exploring opportunities to leverage public funding against private sector investment in order to secure training and development opportunities for Welsh workers transitioning from traditional industries to roles within the low carbon / renewable energy sector, and building new green skills.

We will maintain close links and collaborate with specific hydrogen stakeholders and projects:

- The HyNet project and exploring options for maximising the benefits of the project to Wales.
- The South Wales Industrial Cluster and Net Zero Industry Wales, exploring economic growth opportunities, developing a Circular Economy, and attracting further investment in the low carbon energy sector. Welsh Government is supporting Net Zero Industry Wales with financial support of £450,000 over the next three financial years.
- Green hydrogen hubs under development in Holyhead, Milford Haven and Deeside and other areas, which support local projects and place-based approaches.

We will continue to engage and collaborate with other hydrogen initiatives such as:

- Projects investigating hydrogen boilers and hybrid heat pumps.
- International organisations and governmental bodies to explore opportunities for investment in hydrogen energy projects in Wales.
- National representatives of industry and academia to gain insights into planned deployment activities, barriers to using hydrogen as an energy vector, and the role that Welsh Government can play in maximizing the opportunities in the hydrogen sector for Wales.
- Initiatives seeking to generate low carbon / renewable at scale in Wales, for example by understanding the key barriers to deployment and working in a collaborative way to overcome all issues identified to facilitate deployment in a timely fashion.

We will also continue to monitor developments in the hydrogen sector generally within Wales, elsewhere in the UK, and internationally.