



## The Hydrogen Energy Association's response to the Department for Energy Security and Net Zero call for evidence: Innovative H2P Projects'.

**May 2025**

### Opening remarks

This submission from the Hydrogen Energy Association (Formerly the UK Hydrogen and Fuel Cell Association) is in response to DESNZ's call for evidence on 'Innovative Hydrogen to Power Projects'. The Hydrogen Energy Association (HEA) is the leading pan-UK trade body in the hydrogen energy sector, with a mission to support the growth of our members and the sector, and to ensure that the right policy framework is in place. Our 100 plus member companies represent over 200,000 employees globally, with combined revenues over £400 billion, and cover the entire value chain from raw material sourcing, to supply chain and components, financing, professional services, B2B and consumer facing solutions.

With over 15 years of experience, the HEA is a leader in advocating for and accelerating the transition to Net Zero in the UK through the deployment of hydrogen & fuel cell solutions. We promote and represent our members' interests across the hydrogen space, and campaign for the best policy outcomes for the industry across the full range of applications and opportunities.

### Summary

To deliver clean power by 2030 the UK will increasingly rely on a renewables-led power system supported by low carbon, long-duration flexible generation. Low carbon flexible technologies must be able to respond to more rapid variations in renewable output, thus replicating system services traditionally provided by fossil fuel generation. Hydrogen to power (H2P) facilities offer dispatchable and synchronous generation, and with system services similar to that of unabated gas plants, it can help to ensure the grid remains secure and balanced at all times.

In order to maximise the grid-balancing potential of hydrogen powered generation, projects must be accompanied by large scale hydrogen transport and storage infrastructure so as to absorb fluctuations in renewable energy output. The HEA welcomes the decision to develop a Hydrogen to Power Business Model (H2PBM), and we urge that its delivery is a leading priority. In the absence of such infrastructure prior to 2030, H2P projects will likely comprise small to medium scale, innovative facilities. In order to satisfy future demand of as much as 40-50 GW of dispatchable and long-duration flexible power generation capacity by 2030<sup>1</sup>, the government will need to introduce an end-to-end support mechanism in the interim period to make H2P more financially attractive and thus deliverable by 2030.

*Question 1: What scale, configuration and other H2P plant characteristics do you consider most likely to achieve the ambition for H2P plant operation by 2030?*

*Question 2: What technical and other findings from operation of such a plant could be applied to widescale H2P deployment?*

Giving the time constraints of clean power by 2030, it is likely that the majority of deliverable projects in that timeframe will be small to medium scale (20-60 MW) H2P projects aimed at developing fully functioning and demonstrable hydrogen supply chains. The economics of larger H2P facilities combined with a more centralised hydrogen production are arguably more feasible, yet in the absence of regional hydrogen infrastructure, it is important to assess existing technology and assets in order make proactive decisions in a logical way.

In this respect, most projects likely to start production by 2030 will be hydrogen generation facilities that are co-located with renewable energy facilities and off-taker demand. For instance, using purpose-built or existing windfarms and solar parks solely to supply an on-site electrolyser will be one of the fastest ways to produce large quantities of hydrogen needed to generate dispatchable power. In the absence of large-scale hydrogen storage, co-locating hydrogen storage and circuit turbines with demand will be key to limiting the cost of wheeling power through the grid. To avoid any unforeseen constraints or overreliance, the government must strategically plan the distribution of localised hydrogen production so as to avoid any issues with water resources, particularly amid a changing climate. Projects that can identify and capitalise on the most bankable and efficient use of electrolysers will be those that are deliverable in the shortest timeframe.

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<sup>1</sup> <https://assets.publishing.service.gov.uk/media/6761915126a2d1ff18253493/hydrogen-strategy-update-to-the-market-december-2024.pdf>

That said, there are cases where renewable assets designed to power the national grid offer opportunities for H2P projects, including the case of potential excess from curtailed wind. There is currently widespread buildout of substations for large offshore windfarms in order to bring the electricity onto land and tie it into the grid. There is the opportunity to integrate electrolyzers into the construction of these substations so that the curtailed wind can be used to create hydrogen, which could then be used to produce power and balance the grid rather than burning fossil fuels. There is a need to act now, as retrofitting will be more costly and potentially less efficient. Again, the constraint here is storing hydrogen rather than the production capacity afforded by curtailed wind. Scale is also a factor, as there would need to be enough renewable generation capacity to maximise the efficiency of the electrolyser. The viability of each project, be it via curtailed wind or a dedicated renewable facility, will vary on a case-by-case basis depending on access to hydrogen storage.

Ammonia is increasingly part of the dialogue in hydrogen production pathways, and with a number of ammonia projects emerging in the UK pipeline, there is every reason to suggest that the UK could draw on this existing expertise to produce clean power derived from hydrogen. Whether the ammonia is used directly as a fuel, is cracked to produce hydrogen, or is utilised as a vector, its favourable properties for transportation and storage compared to hydrogen, means it should be factored into any discussion about clean and dispatchable power. In the absence of a hydrogen transport and storage network, ammonia could be key in economically transporting energy to sites where it is needed for power. The HEA sees a role for both hydrogen and ammonia in future H2P projects and the two should be seen as complementary technologies that can support one another if needed, thus increasing the robustness of the UK energy system.

Projects that could start production by 2030 may also target a specific industry where there is a concentration of activity, and thus the opportunity for co-located production and offtake. Such an example would be the Speyside Hydrogen project by Storegga, which aims to decarbonise whisky distilleries in Scotland via green hydrogen. More than 50 of Scotland's 151 distilleries are located in Moray, which account for almost 45% of the total fossil fuel demand in the region. Such industries, which require an innovative solution to decarbonise their power supply, and where demand is concentrated, are perhaps ideal candidates for an end-to-end H2P project.

It should be emphasised that sufficient and on demand availability of hydrogen is critical for H2P projects, and thus it is important to support a diverse range of hydrogen production pathways in a technology-agnostic manner.

**Question 3:** *Do you have plans currently under development to implement innovative H2P plants which could be delivered using 100% low carbon hydrogen by 2030?*

**Question 4:** *For any plans identified in Question 3, please outline:*

- a. The current stage and key future milestones.*
- b. The anticipated plant capacity (in MW).*
- c. The number of hours operation per year that your planned configuration can enable.*
- d. The anticipated cost categories in the plans and any details.*
- e. The status of your planned hydrogen supply, including any planned hydrogen production, storage and transport arrangements.*

**\* For individual company responses to Questions 3 and 4 please see Annex \***

**Question C:** *What is your assessment of supply chain risks associated with the delivery of your planned projects? How do you plan to manage these?*

It is important to draw on learnings from previous consultations and calls for evidence regarding hydrogen projects and the supply chain risks that could impede the delivery of H2P projects by 2030. The risks associated with delivering hydrogen projects of all kinds, including those that applied for HAR funding, will be very similar to those of a H2P project in that the technology is there but stimulating a functional end-to-end supply chain is challenging.

As outlined in the HEA's response to the DBT green paper on the UK industrial strategy<sup>2</sup>, supply chain risks of note include:

- Technology Readiness Level: in the absence of concrete market certainty surrounding hydrogen, and specifically H2P, investment into technology research and development is risky.
- Demand for hydrogen: companies are hesitant to invest in scaling up the production of supply chain components until there is more clarity of market demand.
- Skills: there is a growing gap in the skilled workforce available to design, service and operate future H2P projects.<sup>3</sup>
- Competition: procurement lead times for projects are exacerbated by overseas competition for manufacturing capacity.

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<sup>2</sup> <https://acrobat.adobe.com/id/urn:aaid:sc:eu:e848cca7-5b7c-441b-a4d6-62cbc021d85c>

<sup>3</sup> [https://cogentskills.com/wp-content/uploads/2025/01/Hydrogen\\_Skills\\_Alliance\\_Plan25\\_final.pdf](https://cogentskills.com/wp-content/uploads/2025/01/Hydrogen_Skills_Alliance_Plan25_final.pdf)

As outlined in the HEA's response to the Green Industries Growth Accelerator,<sup>4</sup> there are many gaps in the hydrogen supply chain and in order for full UK supply chain benefits to be realised, funding packages must be defined in the broadest sense to include all of the significant Balance of Plant (BoP) components and supporting infrastructure. This includes equipment such as transformers, rectifiers, and power electronics, which are seeing increasingly long manufacturing lead times. When allocating support to these packages, it is crucial that it is done so at all scales in order to ensure that hydrogen projects of all sizes can benefit from supply chain support.

In a more general sense, there is the risk that the UK hydrogen supply chain will become too constrained and lack the diversity needed to ensure a stable and resilient supply of hydrogen. This means remaining as technology agnostic as possible when it comes to support mechanisms and the surrounding policy framework; overly prescriptive policy surrounding production technologies will hinder the rapid deployment of hydrogen projects.

*Question 7: What additional external, non-financial, factors do you consider significant risks to delivering innovative H2P plants by 2030 and how do you plan to mitigate these risks?*

Although specifically excluded from the question, it should be noted that financial factors do pose the most significant risk to H2P projects by a considerable margin. Whether it is funding eligibility or accessibility, inability to secure long-term offtake contracts, or fluctuating input costs, the long-term financial viability for investors in projects appears to be far more of an issue than technical considerations. It is challenging for developers to mitigate financial risks which are largely out with their control, and there are a number of ways in which government can play such a role (see Question 8).

Planning has been repeatedly mentioned as a sticking point for the majority of hydrogen projects coming through the UK pipeline. As mentioned in the HEA's Action Plan for Electrolytic Hydrogen,<sup>5</sup> the lack of hydrogen-specific planning legislation or guidance often causes an overcomplicated and elongated planning process for hydrogen projects. While this may not necessarily pose a risk to a H2P facility reaching and positively passing a Financial Investment Decision (FID) gate, it will reduce the likelihood of starting production by 2030.

It cannot be overstated how detrimental delays such as planning complications or another aspect of the development phase, can be to H2P projects, as well as the industry more generally. Specifically, uncertainty surrounding policy and the delivery of funding mechanisms reduces private sector confidence and delays FIDs. It is hard to assess the impact of delays on the

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<sup>4</sup> <https://acrobat.adobe.com/id/urn:aaid:sc:EU:3760dc4f-35c9-4b9b-b9de-778e22f4d0de>

<sup>5</sup> <https://acrobat.adobe.com/id/urn:aaid:sc:EU:e1aaa99b-2dfa-49e7-98c2-57edd444d4a7>

development of the hydrogen economy, and the H2P sector specifically, but we feel sure that for some projects it will mean FID is never reached.

In the interest of achieving the delivery of any H2P projects by 2030, it is imperative that some form of support is deployed by government while the H2PBM is under development. This will reinforce policy messaging on the strategic role of H2P in the future UK energy system outlined in the recent hydrogen strategy and the government response to the consultation of H2P market intervention.<sup>6</sup> Investing in H2P must be made more attractive with ambitious targets that are not missed or changed by new budgets. Failure to implement a support mechanism may still mean that H2P is rolled out in the future, but it would be unlikely to see many operational facilities within the 2030 clean power timeline.

Other considerations that also pose a significant risk to the timely delivery of H2P projects include volatile energy prices, timely grid connections, and safety. In a nascent market, health and safety is always going to be a challenge, so for hydrogen it is crucial to use the existing knowledge and expertise of the well-established gas industry in the UK to ensure high safety standards among nascent producers and distributors.

*Question 8: Do you have any views for the role government can play in accelerating the delivery of innovative H2P plants by 2030, in addition to existing and committed to policies?*

In the broadest sense, the government can accelerate the delivery of innovative H2P plants by 2030 by ensuring:

- A. delivery for the whole of the UK – spreading investments, projects, supply chains and hydrogen skills across all four nations;
- B. coverage of the full range of low carbon hydrogen production routes to deliver concurrently against net zero, regional growth, and economic security and resilience goals;
- C. attractive financial viability long term (e.g. defining the funding / support framework for hydrogen production beyond Hydrogen Allocation Round 4) – so providing reassurance to private investors of the Government’s commitment; and
- D. alignment with other key initiatives such as Great British Energy, the National Wealth Fund, the planned Infrastructure Strategy etc.

As mentioned above in answering Question 7, government support will be critical in achieving deliverability of H2P projects by 2030. Accelerating the rollout of the H2PBM should be a leading priority.

In the meantime, it is fundamentally important that the government implements an interim funding

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<sup>6</sup> <https://assets.publishing.service.gov.uk/media/6752e17620bcf083762a6caf/hydrogen-to-power-consultation-response.pdf>

mechanism that offers end-to-end support for H2P projects. As we have seen with the HARs, and other hydrogen applications across the UK, revenue support focused solely on production inadvertently places all the risk on the producer and often fails to stimulate a robust end-to-end supply chain. End-to-end support would de-risk the question of who is going to use the power. While the national-scale H2PBM is being finalised, funding should champion any projects that provide the most strategic benefit to local and regional H2P supply chains. As mentioned in answering Question 1, co-located renewable resources, hydrogen power generation, and off-taker demand are optimal for creating specialised supply chains. This could be approached on an industry-by-industry basis where there is a concentration of demand, and requires substantial future planning, particularly when it comes to allocating renewable energy resources specifically for H2P generation.

While certain industries should be identified as strategic for stimulating H2P generation, prioritising these areas must not come at the expense of constraining off-taker interest from other geographic areas or use cases which may be hard to abate. But rather it should be open-ended to maximise the potential investment and supply chain development for H2P applications.

We strongly advise adopting an outcome-based strategy, to create further inland hydrogen hubs that can build on the success and knowledge generated by projects such as Bradford's Low Carbon Hydrogen project. Such inland hydrogen hubs, which can combine different user types and sizes, bring together demand with local production, and mitigate the reliance on long-distance transportation and national pipelines. By aggregating users, it is possible to decouple production from demand and deliver a smoother overall demand profile, thus reducing risk and allowing producers to operate more economically. Ultimately, end-to-end H2P projects that form inland hydrogen hubs would help provide more demand certainty for the hydrogen sector as a whole, thus rendering production facilities with better offtake prospects less risky in the eyes of private sector investors. Investing in inland hydrogen hubs is part of the recommendations for acceleration demand outlined in the HEA's recent action plan for Building Hydrogen Demand.<sup>7</sup>The inclusion of risk-taking intermediaries within any financial support mechanisms would also help to significantly de-risk early H2P projects.

In the interest of growing hydrogen demand to make clean power by 2030 more achievable, the government should also consider implementing more clean energy mandates. This would stimulate market movement for power generators, such as gas plants, to move towards low carbon technologies such as H2P.

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<sup>7</sup> <https://acrobat.adobe.com/id/urn:aaid:sc:EU:140c1c16-53b8-46e0-a4cf-2f749be0f093>

End-to-end government support would provide a statement of intent that the private sector values, demonstrating that H2P is an integral part of the government's future plans. Government leadership of this kind would encourage investors to enter the market sooner for the relatively smaller-scale projects that are more likely to be deliverable by 2030, instead of waiting for larger opportunities. It is critical though for these smaller projects to demonstrate consistency and profitability in order to develop confidence in H2P.

Mentioned in our answer to Question 7, planning is an area which poses a risk to the delivery of H2P projects by 2030. The HEA welcomes the government's commitment to streamline the planning process for infrastructure projects,<sup>8</sup> and urges that amendments to the planning process benefit first-of-a-kind hydrogen projects. This removal of planning blockers would mean a speedier application process, allowing developers, investors, and the government alike to gain a more accurate knowledge of delivery timelines.

Amid all of these considerations, the HEA sees the potential in GBE to act as an enabler in the deployment of hydrogen projects. The extent to which GBE can support H2P will likely have a bearing on how many projects are deliverable by 2030. As mentioned in HEA's [building demand action plan](#), GBE energy could take on the role as a risk-taking intermediary to de-risk production, whilst ensuring the government retains maximum value for money.

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<sup>8</sup> <https://www.gov.uk/government/publications/planning-reform-working-paper-streamlining-infrastructure-planning/planning-reform-working-paper-streamlining-infrastructure-planning>

# Annex

## Annex 1: Luxfer Group

Part of Luxfer's current and future market position is linked to Hydrogen to Power (H2P) projects through supplying UK designed and manufactured mainly portable Hydrogen Storage Equipment. Although our activity is peripheral to the questions posed, the economic effect is significant. Although they are more difficult to quantify than large projects, the first and arguably those with the largest long term economic effect are the myriad smaller projects. This is due to their ability to be employed in diverse applications and deployed quickly in often difficult to reach places.

Through Luxfer's innovative development centred at our Nottingham facility and leverage of our market-leading position, we plan to take a significant share of this emerging global market.

In Nottingham Luxfer have developed a range of lightweight, high capacity and easily transportable GStorPro Bundle fuel storage pods. The considerably lower footprint of the Luxfer design means that much larger quantities of Hydrogen can now be transported safely on small vans and trucks and unloaded on site by forklift vehicles and on truck cranes. This new technology replaces the heavy, low capacity and expensive to handle current hydrogen storage solutions with equipment supplied from outside of the UK from countries like China and regions like Eastern Europe.

Luxfer have supplied a number of GStorPro Bundles for applications in the UK including this one (see photo below) to UK company PlusZero using it for H2P at a Balfour Beatty site for a Hydrogen H2P trial in Scotland.

We plan to manufacture a number of such units in the next few months creating employment for our Nottingham workforce and enabling us to optimise our manufacturing facility. An example of where and how these will be used is a leading UK plant hire equipment manufacturer requiring many units over the next year to support their newly purchased Hydrogen Power Units for hire.

