



UK Government

Flexibility in electrolytic hydrogen production and use

A Call for Evidence on the commercial and technical aspects of flexibility in electrolytic hydrogen production and use.

Closing date: 6 July 2026



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General information

Why we are calling for this evidence

We are seeking evidence to understand how flexible operation of electrolyzers can be technologically and commercially delivered from the perspective of both producers and end users. Flexibility has the potential to unlock significant electricity system benefits, including reducing curtailment, alleviating grid stress, and improving overall efficiency of the power system. The Hydrogen Production Business Model (HPBM) has been designed to incentivise low carbon hydrogen production across a range of technologies. Electrolytic projects need to meet the requirements of those off takers to be commercially viable. Current evidence indicates that operating only during periods of surplus renewable generation is not commercially viable under existing business models. The objective of this Call for Evidence is to explore what policy changes could incentivise electrolyzers to respond more dynamically to price signals, while identifying any technical constraints that may limit such flexibility. We therefore request industry insight on technical constraints, optimal operating patterns, and commercial structures that balance flexibility with reliable hydrogen supply (potentially utilising large scale hydrogen storage) and investor confidence. This evidence will inform future policy design, including future Hydrogen allocation rounds ensuring electrolyser deployment supports both electricity system resilience and long-term decarbonisation goals.

Issued: 28th May 2026

Respond by: 6th July 2026

Enquiries to:

Demand and Systems Team
Department for Energy Security and Net Zero

3-8 Whitehall Place
London
SW1A 2AW

Email: hydrogen.demand@energysecurity.gov.uk

Call for evidence reference: Flexible Electrolyser Call for Evidence

Audiences:

We are seeking the views of the energy industry, project developers, original equipment manufacturers, consumer groups, academia, think tanks and other organisations with an interest in the subject.

Territorial extent:

United Kingdom

How to respond

Responses should be provided online where possible at:

<https://energygovuk.citizenspace.com/energy-security/flexibility-in-electrolytic-hydrogen-production>

or

Email to: hydrogen.demand@energysecurity.gov.uk

Write to:

Demand and Systems Team
Department for Energy Security and Net Zero 3-8 Whitehall Place
London
SWA 2AW

When responding, please state whether you are responding as an individual or representing the views of an organisation.

Your response will be most useful if it is framed in direct response to the questions posed, though further comments and evidence are also welcome.

Confidentiality and data protection

Information you provide in response to this consultation, including personal information, may be disclosed in accordance with UK legislation (the Freedom of Information Act 2000, the Data Protection Act 2018 and the Environmental Information Regulations 2004).

If you want the information that you provide to be treated as confidential please tell us, but be aware that we cannot guarantee confidentiality in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not be regarded by us as a confidentiality request.

We will process your personal data in accordance with all applicable data protection laws. See our [privacy policy](#).

We may summarise all responses and publish this summary on [GOV.UK](#). The summary will include a list of names or organisations that responded, but not people's personal names, addresses or other contact details.

Quality assurance

This call for evidence has been carried out in accordance with the [government's consultation principles](#).

If you have any complaints about the way this consultation has been conducted, please email: bru@energysecurity.gov.uk.

Introduction

Low carbon hydrogen has an important role to play in achieving the Government's Clean Energy Superpower and Growth Missions and supporting the UK's clean energy transition. It is vital for the decarbonisation of hard-to-electrify industrial sectors and heavy transport and will help to deliver new clean energy industries which can support good jobs, across various sectors, in our industrial heartlands and coastal communities. This Call for Evidence is part of the effort to transition to a decarbonised energy system largely powered by intermittent renewables, where we expect low-carbon hydrogen to play a vital role in complementing variable renewables and enabling low carbon dispatchable generation.

We are considering a whole system approach that integrates hydrogen production, storage, transport and end use to provide flexibility, strengthen electricity security and support economic growth.

The 10 Year Infrastructure Strategy announced that the government is providing over £500m for hydrogen infrastructure to enable the development of the first regional hydrogen transport and storage network. This will enable hydrogen to reach priority sectors and support low carbon dispatchable power generation "hydrogen to power" (H2P).

Government support through the Hydrogen Production Business Model (HPBM) has already accelerated electrolytic capacity. Projects that were successful in Hydrogen Allocation Round 1 (HAR1) are now moving through to the final investment decision, construction and operation phases, with the first HAR1 project, HyMarnham Power, beginning commercial operations in April 2026. HAR2 shortlisted 27 projects in April 2025 and we aim to announce successful HAR2 projects in 2026. We will be seeking feedback on the proposed design and delivery of HAR3 through a market engagement exercise soon.

Flexibility is the ability of an electrolyser to vary its operation in response to changes in power system conditions. Flexible electrolysers have the potential to absorb excess renewable generation, reduce curtailment and reduce system costs. Flexibility can support effective coordination between the electricity and hydrogen systems helping to maintain electricity security while enabling the UK hydrogen sector to grow.

This Call for Evidence seeks to understand the commercial and technical aspects of flexibility, which in turn will help improve our understanding of the power system benefits of flexible hydrogen production, including its potential contribution to system resilience and efficiency. While hydrogen security of supply is important, the primary aim here is to explore its role in supporting a renewables-based power system. This Call for Evidence contributes to the UK's Clean Energy Superpower Mission by promoting stronger policy alignment across energy vectors and enabling a more integrated, flexible energy system. It seeks industry input on the commercial and technical aspects of operating electrolysers flexibly. Evidence gathered will inform future policy design, ensuring electrolyser deployment supports system resilience, affordability, and long-term decarbonisation.

Electrolytic Hydrogen Production

Electrolytic hydrogen is produced using electrolyzers, of which there are two main types: Alkaline and Proton Exchange Membrane (PEM). Alkaline electrolysis is generally more durable and relatively low cost but requires a large amount of space and has lower energy efficiency compared to other methods. PEM electrolysis can operate at higher current densities, making it suitable for applications where space is limited. It also has a faster response time and can handle variable power inputs, which is beneficial for integrating with intermittent renewable energy sources. However, PEM electrolyzers are more expensive due to the use of precious metals like platinum and iridium as catalysts. There are also less common forms of electrolysis, including, but not limited to: Solid Oxide Electrolysis, which can produce large volumes of hydrogen very efficiently when coupled with a high temperature heat source like a nuclear reactor, and Anion Exchange Membrane electrolysis, which is in development. Projects that have progressed through HAR1 and 2 have all used either Alkaline or PEM technology, though projects using other electrolyser types will continue to be eligible in future rounds.

The UK is building global leadership in electrolyser technology through innovation and industrial capability. ITM Power, a world leader in PEM electrolysis, is integrating rapid-response hydrogen systems into projects across Europe, including Norway, Germany, and Austria. ITM's product range includes Poseidon, a scalable 20 MW module for large projects and Neptune V, a 5 MW containerised electrolyser plant. ITM received £7.7 million from DESNZ's Low Carbon Hydrogen Supply 2 Competition to accelerate development of its fourth-generation electrolyzers and scale manufacturing¹. Ceres Hydrogen is pioneering modular Solid oxide Electrolysis Cell (SOEC) technology, collaborating with Shell on a 1 MW demonstrator in India and licensing its technology globally to accelerate deployment. Johnson Matthey provides critical catalyst components and recycling services for electrolytic hydrogen production and fuel cells, alongside CCUS-enabled hydrogen technologies, supporting UK projects such as HyNet and partnering internationally with Plug Power in the US. Other UK innovators include CPH2, developing membrane-free electrolyzers to simplify design and reduce costs, and Oort Energy, advancing high-efficiency PEM technology for scalable hydrogen production. These case studies demonstrate the UK's strengths in electrolyser innovation, manufacturing capability, and global partnerships.²

As the UK transitions toward a cleaner electricity system, renewable generation is expected to provide most of the electricity supply. Since wind and solar output fluctuates, balancing the electricity system will require flexibility measures such as storage, flexible generation and demand-side response to manage temporal imbalances between supply and demand. We think it is important to have a whole-system approach and are therefore developing our understanding of optimal electrolyser operating patterns that minimise overall energy system costs while ensuring power system reliability and meeting the needs of hydrogen off takers.

¹ [Hydrogen Europe](#)

² [Shell - Ceres MW Scale Electrolyser Project Produces First Hydrogen - Ceres Power Holdings plc](#)

Simultaneously, we would like to better understand the impact flexible hydrogen production and supply would have on end users (particularly industrial sites), and the technical and commercial feasibility for hydrogen demand to operate flexibly.

Electrolytic production can help balance the power system by increasing hydrogen output when renewable electricity is abundant and scaling back demand during peak periods to alleviate grid stress. We also want to understand the potential for enabling more dynamic operation across different network contexts, including access to hydrogen storage, and policy changes that could support optimal load-following behaviour. In addition, we are interested in whether current electricity market arrangements, including day-ahead and intraday trading, balancing services, and Distribution Network operator (DNO)-led flexibility markets are suited for electrolysers to operate dynamically. Such approaches can help minimise negative impacts on the power system while supporting security of supply and optimising overall system costs.

Call for Evidence Questions

Supply Questions

Supply-side evidence is crucial to identifying the technical and commercial enablers for flexible electrolyser operation, ensuring projects remain viable while supporting system efficiency. It will inform policy design and the development of investment frameworks that promote flexibility while maintaining investor confidence.

Technical

From a technical perspective, increased flexibility introduces additional operational complexities. Electrolysers must be capable of rapid ramping, frequent cycling, and partial load operation which could degrade stack life, compromise hydrogen purity or reduce hydrogen production efficiency. PEM technology offers advantages in dynamic response, but frequent start-stop cycles can affect degradation rates and stack lifetime. Integration with grid services, real-time price signals, and hydrogen storage systems could require innovation, for example in stack and system design. Information on these technical constraints and innovations is essential to understand to what extent flexibility could reduce reliability or increase lifecycle costs.

1. Please describe the type and flexibility characteristics of your electrolyser system (if you operate or develop different systems, please answer as appropriate), including:
 - a. the maximum load
 - b. minimum operating load
 - c. ability to operate at various load factors. Are there any limitations or trade-offs when operating between the maximum and minimum load?
 - d. ramp rate (% / second). Please include details of factors which influence this.
 - e. how is performance affected by frequent cycling and flexible operation, including start-stops and partial loads, with reference to changes in-stack lifetime, degradation, H₂ purity, H₂ production rate per unit of energy input, maintenance?
 - f. What changes in control and design may mitigate these impacts?
2. Can your electrolyser system operate dynamically in response to real-time or day-ahead electricity prices, and is it technologically capable of participating in grid-services like demand response or the balancing mechanism?
3. How do you manage hydrogen quality and output stability during variable production? Can your system integrate with different types of surface and subsurface storage or blending infrastructure to handle fluctuating supply?

4. Please explain any additional health and safety impacts associated with start stop operation.
5. Is reversible operation being considered (e.g. both electrolyser and fuel cell generation modes on one system), and what are the limitations and what could be the impact of this on lifetime and performance?
 - a. Will the electrolyser system be integrated with an external heat source and how does this impact the ability to operate flexibly?

Commercial

From a commercial perspective, electrolytic hydrogen production faces challenges around cost competitiveness and revenue certainty. Electrolysers are capital-intensive, and their economics depend heavily on utilisation rates as well as electricity prices. Operating flexibly by ramping up during periods of surplus renewable generation and reducing output during peak and residual demand could reduce operating costs but reduce utilisation. This generates a need to understand commercial factors, including how investors will view costs and risks, and the potential role for government mechanisms such as revenue support.

6. What are the key commercial opportunities and drivers for investing in or operating electrolysers in a flexible manner? What could best unlock these benefits to drive long-term investment and commercial and financial viability?
7. How would flexible operations affect your cost recovery strategy?
 - a. What sort of risks are posed to your investment through flexible operations and what could help mitigate those risks? Please include details of how warranty and performance guarantees interact with flexible operation.
 - b. What internal changes (e.g. business models or operational practices) would be needed to adapt?
8. What broader policy measures or market arrangements would make flexible hydrogen production commercially viable and investable and how do you expect these needs to evolve over time?
 - a. How could existing subsidy mechanisms (e.g., Hydrogen Production Business Model) be adapted to support flexible hydrogen production?
 - b. What other forms of government or non-government support could help make flexible hydrogen production commercially viable?
 - c. How do the requirements of the Low Carbon Hydrogen Standard (LCHS) influence your ability to operate flexibly and remain commercially viable?
 - d. How do electricity procurement arrangements, such as Power Purchase Agreements (PPAs), affect your ability to operate flexibly while maintaining cost certainty? What are the

barriers to moving away from fixed price contracts and what support could be provided to overcome them?

e. In addition, how does current electricity market arrangements work for flexible hydrogen? (e.g. track day-ahead and intraday price signals, participate in balancing markets or demand-side response (DSR) services etc)?

f. How should the system best balance the trade-off between minimising storage and maximising the use of low-cost electricity, while also managing the commercial, technical and offtake risks arising from daily, weekly and seasonal fluctuations.

9. What is your estimated Levelised Cost of Hydrogen (LCOH) under different utilisation scenarios (e.g. 85% vs. 40%), and how sensitive is it to electricity price volatility? Please assume that lower load factors would allow access to lower electricity prices (e.g. by operating during periods of surplus renewable generation).

a. How would operating under such utilisation scenarios impact the estimated demand profile you seek to meet and how do you expect this to change over time?

Demand Questions

As electrolytic hydrogen production becomes more flexible to align with renewable generation, understanding demand-side flexibility across different end uses will be important. We would like to understand to what extent different demand sectors and processes can accommodate hydrogen supply variability and leverage storage, whilst maintaining commercial viability.

Technical

10. Please describe your expected use of low carbon hydrogen, such as your sector, site/process and product.

11. To what extent can your site and processes respond to variable hydrogen supply and/or interrupted supply (e.g. are there certain combustion properties that mean some processes are better suited to flexibility than others, does the load profile allow for flexibility where processes are batch or continuous or seasonal or more baseload, how would this work where hydrogen is used as a feedstock or as part of a hybrid solution with other decarbonisation technologies)?

12. Please describe how your site and processes could operate flexibly (e.g. through on-site storage or other supporting infrastructure, onsite hydrogen blending/dual fuel, scheduling operations to align with variable hydrogen supply or other). Are there any safety or regulatory constraints?

13. How quickly and easily can your site and processes respond to variable hydrogen supply and/or interrupted supply?

14. Please describe your long-term plan for using hydrogen and the impact this may have on the ability to respond to variable hydrogen supply (e.g. scaling up to 100% hydrogen use

where partial blends are being considered initially may reduce flexibility unless storage is leveraged).

Commercial

15. Please describe the commercial impact of operating flexibly in response to variable hydrogen supply (e.g. increased carbon cost from fossil fuel use, increased costs from storage, other equipment or site level and operational changes, impact on product, production rate or equipment). To what extent might these impacts influence whether hydrogen is the most cost-effective decarbonisation route for your site?

16. What solutions could be implemented to help reduce or mitigate these potential commercial impacts?

This publication is available from: www.gov.uk/government/calls-for-evidence/flexibility-in-electrolytic-hydrogen-production-and-use

Any enquiries regarding this publication should be sent to us at:
hydrogen.demand@energysecurity.gov.uk

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