



Department for
Energy Security
& Net Zero

Price-based competitive allocation for low carbon hydrogen production

Call for evidence on the future policy
framework for allocation of the Low Carbon
Hydrogen Production Business Model

Closing date: 11 August 2023 (extended from 2 August 2023)



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Any enquiries regarding this publication should be sent to us at: H2.competitiveallocation@beis.gov.uk

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Executive summary

References to moving to price-based competitive allocation in this document are in relation to electrolytic projects, and potentially other specified non-CCUS projects (to be determined at a later stage). Contracts for CCUS-enabled production will continue to be awarded under the cluster sequencing process. The position on treating these technologies separately will be reviewed over time and may change as CO₂ T&S infrastructure becomes more widespread. See Chapter 1 for further information.

The Powering Up Britain Energy Security Plan and Net Zero Growth Plan recently re-affirmed the critical role of low carbon hydrogen in delivering net zero by 2050. To achieve net zero, it is essential that the government introduces a set of long term, transparent policies that work together to provide industry with the certainty needed to transform the UK to a low carbon economy.

The low carbon hydrogen production business model (the "Low Carbon Hydrogen Agreement" also referred to as the "LCHA"),¹ is a fundamental mechanism to support the deployment of low carbon hydrogen. Initial contracts are expected to be awarded to electrolytic hydrogen projects through the first Hydrogen Allocation Round (HAR1)² and to CCUS-enabled projects through Track-1 of the Cluster Sequencing process. These government-led processes, based on assessment of multiple evaluation criteria and bilateral negotiations, are suitable for a low carbon hydrogen market in its nascency. However, we are considering how the allocation process could best evolve over time to scale up deployment of low carbon hydrogen production at the lowest cost necessary, whilst supporting the development of the low carbon hydrogen economy and wider energy system.

The LCHA is planned to be a 15-year private law contract between low carbon hydrogen producers and a government counterparty³. Similar to the Contracts for Difference (CfD) contract⁴, the LCHA would provide long term price certainty through a variable premium mechanism that accounts for the cost difference between low carbon technology costs and a reference price, based on output (MWh). Whilst CfDs have been hugely successful in driving down low carbon electricity generation costs through the implementation of an auction regime, from their first price-based allocation round (AR1) to today, we want to understand more about the implications of such downward pressure on the development of the low carbon hydrogen economy. This includes how best to design an allocation mechanism that works alongside a wider suite of policy mechanisms to support broader outcomes beyond cost reduction, as set

¹ <https://www.gov.uk/government/publications/hydrogen-production-business-model>

² <https://www.gov.uk/government/publications/hydrogen-business-model-and-net-zero-hydrogen-fund-electrolytic-allocation-round-2022>

³ We anticipate that the Low Carbon Contracts Company (LCCC) will be the LCHA counterparty, subject to the successful completion of administrative and legislative arrangements.

⁴ <https://www.gov.uk/government/publications/contracts-for-difference/contract-for-difference>

out in this document: harnessing electricity system benefits; economic benefits and supply chain development; and security of supply of hydrogen.

The purpose of this document is to gather evidence to understand more about:

- market conditions needed for the UK to transition to price-based competitive allocation;
- the extent that price-based competitive allocation could incentivise projects to support broader outcomes beyond cost reduction of low carbon hydrogen production; and
- how price-based competitive allocation rounds should be designed.

The evidence we receive will help us develop future allocation policy for the LCHA beyond the second Hydrogen Allocation Round (HAR2) and inform the development of wider policies. A decision on how allocation policy should evolve from government-led bilateral negotiations will be taken on the basis of various factors including the evidence received, market conditions, and value for money considerations in particular cost to levy payers. Any proposed decision to move to price-based competitive allocation will be subject to a public consultation.

General information

Call for evidence details

Issued: 17/05/2023

Respond by: 11/08/2023 (extended from 02/08/2023)

Enquiries to: H2.competitiveallocation@beis.gov.uk

Call for Evidence reference: Call for evidence on the future policy framework for allocation of the Low Carbon Hydrogen Production Business Model

Audiences: The government welcomes responses from anyone with an interest in the policy area. We envisage that the call for evidence will be of particular interest to those considering the development of new low carbon energy projects in the United Kingdom, those participating or interested in participating in the supply chain, businesses and trade bodies operating in the low carbon hydrogen sector including producers, financial institutions, academics, prospective investors or investment bodies, and environmental groups.

Should you wish to be involved in any future stakeholder events in connection with this call for evidence, please contact us by email at H2.competitiveallocation@beis.gov.uk. Please set out areas in relation to the call for evidence that you would like to engage on. We will look to conduct engagement during the time period that the call for evidence is open.

Territorial extent: The call for evidence extends to the United Kingdom (UK).

How to respond

Your response will be most useful if it is framed in direct response to the questions posed, and with supporting evidence wherever possible. Further comments and wider evidence are also welcome. When responding, please state whether you are responding as an individual or representing the views of an organisation.

We encourage respondents to make use of the online e-consultation wherever possible when submitting responses as this is the government's preferred method of receiving responses. However, responses via email will also be accepted. Should you wish to submit your main response via the e-consultation platform and provide supporting information via email, please be clear that this is part of the same response to this call for evidence.

Respond online at: <https://beisgovuk.citizenspace.com/industrial-energy/hydrogen-competitive-allocation-call-for-evidence/>

or

Email to: H2.competitiveallocation@beis.gov.uk

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

Confidentiality and data protection

Information you provide in response to this call for evidence, 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 will 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

If you have any complaints about the way this call for evidence has been conducted, please email: beis.bru@beis.gov.uk

Chapter 1: Deployment of low carbon hydrogen production

Low carbon hydrogen is expected to play a key role in the UK's transition to net zero by 2050, as well as delivering greater energy security and economic growth. Government set out its vision for the expected growth of the UK hydrogen economy in the UK Hydrogen Strategy, published in August 2021. For low carbon hydrogen production, it envisages a transition from small-scale low carbon hydrogen production facilities co-located with demand, through to larger-scale and lower cost production serving multiple end uses, with transport and storage infrastructure developing alongside this to facilitate the matching of supply and demand over greater distances. Analysis published by the Department for Business, Energy and Industrial Strategy (BEIS) for CB6 suggests 250-460TWh of hydrogen could be needed in 2050, making up to 20-35% of UK final energy consumption, similar in scale to current electricity use.

Low carbon hydrogen is expected to play an important complementary and enabling role alongside clean electricity in decarbonising our energy system and support meeting our commitment to decarbonise the electricity system by 2035, subject to security of supply. It is suited for use in a number of sectors where electrification is not feasible or is too costly, and other decarbonisation options are limited. Hydrogen is expected to be critical to helping vital British industries transition away from fossil fuels, and can provide greener energy for power, transport and potentially heating buildings. It may also provide a secure, home-grown source of low carbon energy, providing flexibility and energy storage that will be especially valuable for energy security and independence.

In 2022 we doubled our low carbon hydrogen production capacity ambition to up to 10GW by 2030 in the British Energy Security Strategy (BESS), subject to affordability and value for money, with at least half coming from electrolytic hydrogen. We also set out our aim to hold annual allocation rounds for electrolytic hydrogen, moving to price-based competitive allocation by 2025 as soon as legislation and market conditions allow, which is the focus of this call for evidence.

Since the BESS we have continued to design and deliver the policies that will support the expansion of the UK hydrogen economy, including the production of electrolytic hydrogen. In the recent Energy Security Plan and Net Zero Growth Plan, we announced a shortlist of projects for the first hydrogen allocation round (HAR1) that we intend to enter due diligence with, with the aim to award contracts in Q4 2023. We have also announced the aim to launch a second hydrogen allocation round (HAR2) in Q4 2023, as set out in the [HAR2 Market Engagement document](#) published alongside this call for evidence.

Funding support for low carbon hydrogen production

As the UK hydrogen economy develops in line with our ambitions, policy and funding programmes will need to adapt to reflect advances in hydrogen technology and increasing commercialisation.

HAR1 focuses on supporting initial electrolytic hydrogen production projects which will support early growth and demand in the hydrogen economy. HAR2 is considering if the scope should be broadened to any non-electrolytic hydrogen production technologies, including biomass or waste gasification and pyrolysis to hydrogen. From 2025, we envisage a developing hydrogen market where low carbon hydrogen production projects are scaling up and there is a sufficient project pipeline to allow for a transfer to a price-based competitive allocation mechanism for future hydrogen funding rounds. We are now seeking evidence to inform this move to more price-based competitive allocation.

By 'price-based competitive allocation', we mean determining the project(s) that will receive support based upon bids against a single criterion (price, reflective of the producer's unit cost of production) or multiple objective criteria, where price is a criteria of majority weighting.

Price-based competitive allocation has potential benefits over other types of competition for both government and the market in this next stage of development of the hydrogen economy. It has the potential to drive cost reductions (addressing a key barrier to deployment), enable price discovery, and provide value for money to levy payers following the introduction of a hydrogen levy, subject to consultation and legislation being in place.

We are now seeking to gather evidence to inform the design of a future price-based competitive allocation mechanism.

Carbon Capture and Storage (CCUS) enabled low carbon hydrogen production routes

Whilst government is committed to supporting CCUS-enabled low carbon hydrogen production, its position is to keep the allocation mechanism for such technologies separate to an allocation mechanism for electrolytic projects, and potentially other non-CCUS enabled low carbon hydrogen production projects. We recognise the need to co-ordinate future CCUS-enabled hydrogen allocation processes with the evolution of the CCUS cluster sequencing process. We will consider further policy development on competitive allocation for CCUS-enabled hydrogen alongside the different carbon capture sectors of the CCUS programme.

As set out in the Executive Summary, references to moving to price-based competitive allocation in this document are in relation to non-CCUS low carbon hydrogen production technologies that will be in scope of the allocation rounds (to be determined at a later stage).

Chapter 2: Consideration of objectives for future price-based competitive allocation rounds

As the 2020s progress, we expect the landscape for electrolytic hydrogen to be evolving in the UK. To maximise the benefits of the hydrogen economy, we would expect successful projects during the 2020s to increasingly be those that are:

- learning to reduce the levelised costs of hydrogen produced
- increasing in scale, to support both cost reductions and to provide the UK with the volume of hydrogen necessary to meet expected demand on the pathway to net zero
- situated in locations that can best take advantage of electricity that would otherwise be curtailed, relieve electricity network constraints, and support grid decarbonisation
- situated in locations that are aligned with future infrastructure plans, such as hydrogen transport and storage networks
- configured to make use of hydrogen storage, where doing so minimises system costs
- providing measurable economic benefits
- demonstrating the effective application of a range of different production technologies and pathways, supporting security of supply and increased emissions reduction

We will also continue to expect projects to contribute to the UK's broader transition to a net zero future and take into account any wider environmental impacts of the growing hydrogen economy, through ongoing compliance with the Low Carbon Hydrogen Standard (LCHS) and the evolving regulatory landscape. The evolution of hydrogen allocation policy should be seen within this context.

As laid out in the Powering Up Britain package publication of 30 March 2023, we will continue to work with industry with a view to developing a hydrogen production delivery roadmap by the end of 2023⁵, which will provide greater clarity to investors and developers on scaling up hydrogen production and supply chain growth across the decade. In November 2022 we consulted on a range of issues related to hydrogen transport and storage infrastructure, including the need and potential approaches for strategic planning. We will set this out in more detail over the course of 2023, starting with the government response to the consultation in Q2 2023, and with further details to align with the production roadmap.

In the context of this wider work, we need to consider the objectives of a price-based competitive allocation mechanism for the LCHA.

⁵ <https://www.gov.uk/government/publications/powering-up-britain/powering-up-britain>

Primary objectives for price-based competition

Looking to precedent in the renewable energy sector, price-based competitive allocation mechanisms have often been effective in delivering cost reductions by driving competitive tension and scaling up deployment of renewable assets. They also have the potential to be flexibly designed to try to influence applicants to deliver on a range of other outcomes beyond cost reduction, and we want to understand the extent price-based competition could be effective to support LCH production projects to deliver on outcomes vital for the development of the hydrogen economy and wider energy system.

Currently, we think there is merit in the design of price-based competitive allocation being underpinned by two primary objectives: cost reduction; and deployment at scale. At the same time, we are keen to also explore to what extent we are able to, and should, design the mechanism to support broader outcomes.

Cost reduction

Drive down the cost of low carbon hydrogen production between each allocation round.

It is vital that the levelised cost of low carbon hydrogen reduces over time to enable the UK to transition towards a self-sustaining market and reduce the need for subsidy in the longer term.

The Department's Hydrogen Production Costs report⁶ set out that the main drivers of cost reductions of hydrogen are global technological learning, learning-by-doing, and economies of scale. For electrolysis, it set out that the main cost reductions for CAPEX and electrolyser OPEX through efficiency improvements over time are driven by global technological learning, which is driven by demand for and uptake of electrolysis. Reduction in the costs of renewable electricity supply will also be an important driver of wider cost reductions. Therefore, we think there is merit in exploring the design of a mechanism that can best facilitate this objective.

For electrolytic projects, energy input cost (electricity) is the main driver, but this differs across different configurations. We anticipate that accessing grid electricity (and therefore paying the retail price for it) will be more expensive than using dedicated low carbon electricity sources or electricity that would otherwise be curtailed, although these latter options are limited by the availability of electricity supply and may result in lower electrolyser load factors. Where electrolysers import grid electricity, a further consideration is how electrolysers are exposed to electricity market signals so that electricity is used when wholesale market prices are low. We want to understand more about how introducing price-based competition could impact producer electricity sourcing strategies.

⁶ <https://www.gov.uk/government/publications/hydrogen-production-costs-2021>

Deployment at Scale

Enable deployment at scale of low carbon hydrogen production capacity in the UK to meet government ambitions and net zero targets.

Low carbon hydrogen is considered critical for the UK's transition to net zero, and therefore, deployment of low carbon hydrogen production at scale is a key priority for government. This will require setting a clear pathway to mass deployment of hydrogen across the economy, moving from small scale localised projects to larger scale, integrated plants that can produce greater quantities of low carbon hydrogen.

An allocation mechanism should facilitate the UK scale up hydrogen production capacity, encourage market participation from existing stakeholders and new entrants, and maximise realisation rates of successful projects in each allocation round. Price-based energy competitions have in other sectors been effective in enabling this objective, being scalable models that are able to facilitate delivery of large volumes of capacity. In the context of low carbon hydrogen, allocation rounds could also have a role in supporting the buildout of enabling low carbon hydrogen infrastructure to facilitate deployment at scale, e.g. pipelines and large scale storage. As set out above, we expect incentivising an uptake in production will help drive cost reductions overtime.

Other potential broader outcomes for the allocation mechanism

Whilst government is seeking evidence to inform the design of price-based competitive allocation policy, we want to understand the potential role of a price-based competitive allocation mechanism in supporting three broader outcomes, as set out below.

We have not determined that a price-based competitive allocation mechanism will or should be designed to support these outcomes at this stage, nor that it should be the only lever to do so. However, we want to understand more about the appropriateness and potential for an allocation mechanism in doing so. These outcomes are:

- Harnessing electricity system benefits
- Economic benefits and supply chain development
- Security of supply of hydrogen

Harnessing electricity system benefits

To ensure that electrolytic hydrogen producers play a positive role in the functioning of the wider electricity system.

In the BESS, we set out our ambition to deliver up to 50GW of offshore wind by 2030 in tandem with increasing our electrolytic hydrogen production capacity ambition to at least 5GW. We recognise that electrolytic hydrogen producers can provide wider electricity system benefits and can play a positive role in the functioning of the wider electricity system. Electrolysers could play the following roles to achieve this outcome (noting these roles are not necessarily mutually exclusive):

- **Helping to not exacerbate or ideally to reduce overall electricity network constraints:** electrolysers could help alleviate network constraints by locating behind network constraints and / or by operating in a way where they are utilising generation that would have otherwise been curtailed due to the constraint, helping to not add to, or at best to reduce, constraint costs and emissions. For further information on impacts of electrolysers on the electricity system in Great Britain in different locations, please refer to Figure 1 below, noting that use of the map for HAR2 and future allocation policy is subject to market engagement and further policy development.
- **Supporting electricity sector decarbonisation by using ‘additional’ electricity:** projects that use additional electricity (as defined in the *Hydrogen Business Model and Net Zero Hydrogen Fund: Electrolytic Allocation Round: Application Guidance Document*⁷) will be optimal from an overall emissions perspective as they do not divert low carbon electricity from other grid users and could help bring forward new dispersed low carbon generation. To note, we are proposing to clarify the meaning of purpose-built new generation under HAR2 guidance ([see HAR2 Market Engagement document for further information](#)).
- **Operating flexibly to help balance the electricity system:** projects that can ramp up operations when renewables are abundant / there is excess low carbon electricity and ramp down when there are less renewables / there is higher demand, will reduce system costs and emissions relative to projects that do not change their behaviour in response to electricity market conditions. For example, by not running at times when high-cost, high-carbon generators are the marginal plant. This may include participation in balancing services⁸.
- **Utilising curtailed electricity which is excess and would otherwise be wasted:** electrolysers that utilise curtailed electricity can produce hydrogen for decarbonisation of end use sectors and can help power the grid when needed (if integrated with hydrogen

⁷ <https://www.gov.uk/government/publications/hydrogen-business-model-and-net-zero-hydrogen-fund-electrolytic-allocation-round-2022>

⁸ For further information on balancing services, please see: <https://www.nationalgrideso.com/industry-information/balancing-services> and <https://www.sem-o.com/markets/balancing-market-overview/>

to power or storage). This helps improve the efficiency of the whole system and the utilisation of renewables.

This document seeks evidence to understand the potential for a price-based competitive allocation mechanism to incentivise electrolytic production projects to support ‘harnessing electricity system benefits’, including what existing incentives there currently are, to what extent a price-based competitive allocation mechanism from the mid-20s should incentivise such behaviours through its design, and how. We recognise that not all projects will be able to deliver electricity system benefits, but we want to understand more about the potential to support this outcome.

Figure 1: Impact of the location of electrolyzers on the electricity system in Great Britain

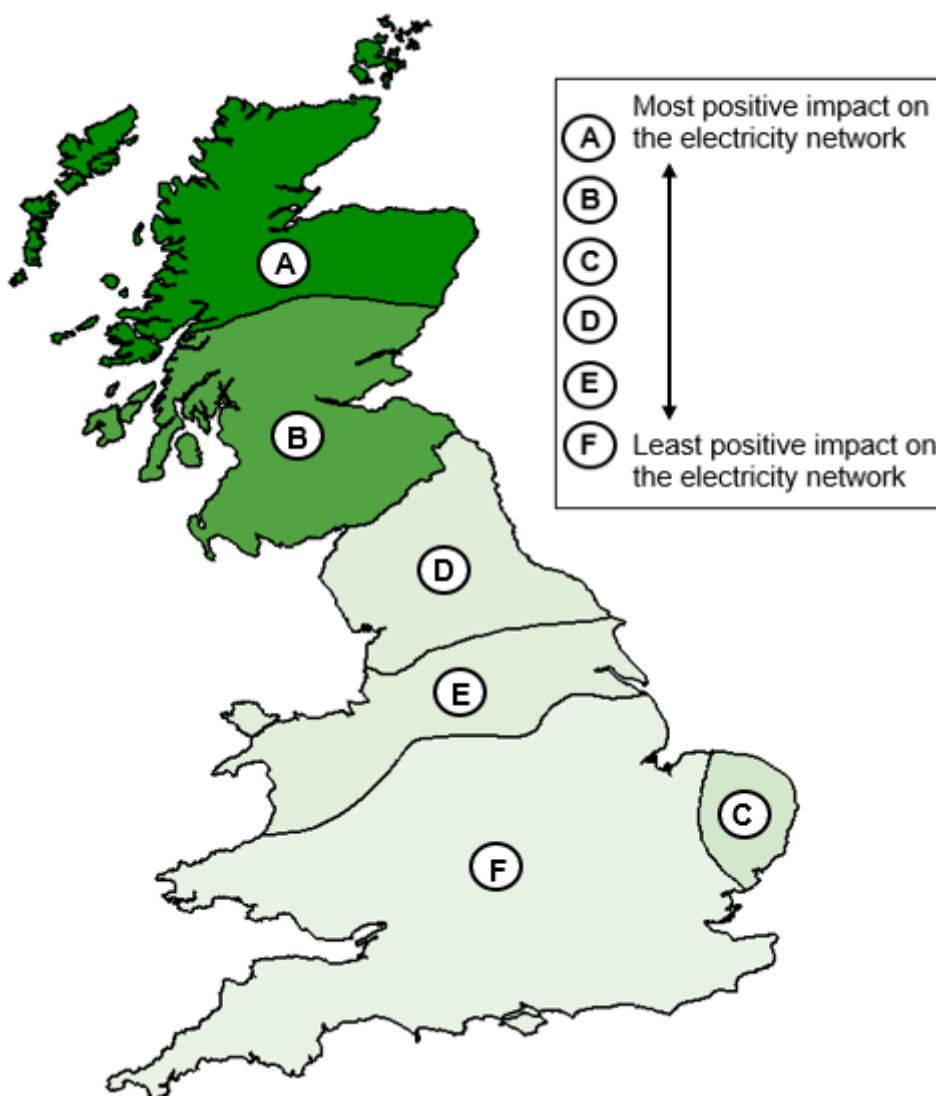


Figure 1 shows the impact of electrolyzers on the electricity system in Great Britain in different locations. This has been developed with National Grid ESO and is based on estimated curtailed electricity volumes from constraints analysis undertaken on the output of the Network

Options Assessment 21/22⁹ Refresh, using the Future Energy Scenarios for each zone between 2023-2042. The data used to produce this map may be updated when National Grid ESO publish the Transitional Centralised Strategic Network Plan¹⁰ in December 2023. Northern Ireland has a separate electricity system to Great Britain, and under HAR2, we are working with the relevant stakeholders to understand whether the electricity system in Northern Ireland would also benefit from scoring based on location.

Economic benefits and supply chain development

The contribution the hydrogen plant will make to the economy and the development of hydrogen supply chains (proposed definition for HAR2).

Beyond HAR2, government wants to ensure that opportunities are captured to develop low carbon hydrogen supply chains when transitioning to a steady state low carbon hydrogen economy. As set out in the Hydrogen Strategy we will draw on the expansion of other low carbon sectors, such as offshore wind, where early opportunities for UK investment, regional growth and job creation were not built in and capitalised on from the start, even while the UK has become a world leader in deployment.

There are a number of actions government is undertaking with industry. In July 2022, we published the Sector Development Action Plan (SDAP)¹¹ to highlight the nature and scale of opportunities across the hydrogen economy in the UK. It focuses on four key areas – investment; supply chains; jobs and skills; and exports – and sets out actions in those areas being taken by government and industry to maximise the benefits from scaling up the UK hydrogen economy.

In March this year the Hydrogen Champion Report was published¹². This report re-stated the significant growth opportunity that hydrogen presents and made a series of recommendations to government and industry. Three recommendations to industry were: evaluate the scale of the economic opportunity of hydrogen; work closely with government to formulate a supply chain strategy that builds on UK strengths; and support a delivery workstream on skills. In the Net Zero Growth Plan, part of the Powering Up Britain package, government committed to work with industry over the course of 2023 to develop a supply chain strategy for hydrogen, and evaluate what additional intervention, if any, might be required.

This document seeks evidence to understand more about how new electrolytic projects, and potentially other non-CCUS enabled low carbon hydrogen production projects, could support ‘economic benefits and supply chain development’, the potential impacts on moving to price-based competitive allocation in the mid-20s on supply chains, and how a price-based competitive allocation mechanism from the mid-20s could incentivise such outcomes through its design.

⁹ <https://www.nationalgrideso.com/research-publications/network-options-assessment-noa>

¹⁰ <https://www.nationalgrideso.com/research-publications/etys/etys-and-the-network-planning-process>

¹¹ <https://www.gov.uk/government/publications/hydrogen-sector-development-action-plan>

¹² <https://www.gov.uk/government/publications/accelerating-the-growth-of-the-hydrogen-sector-uk-hydrogen-champion-recommendations>

Security of supply of hydrogen

To ensure a continuous supply of hydrogen is available for end users from a diverse range of technologies.

Energy security is a key departmental priority¹³ and for the wider government in the short and longer term. This issue has come into sharper focus following Russia's invasion of Ukraine and the impact this has had on global energy markets. We want to understand how a price-based competitive allocation mechanism could support delivery of a resilient energy system that guarantees a continuous supply of hydrogen to end users. The UK's strategic approach has been to focus on incentivising domestic hydrogen production from a range of technologies to help achieve this objective, whilst developing a range of wider mechanisms to bring forwards demand and a mature market.

An allocation mechanism could have a role in supporting a secure supply of hydrogen, for example, by incentivising the development of a diverse industry and supporting the coordinated buildout of enabling low carbon hydrogen infrastructure. It is important to ensure we have a range of production pathways at our disposal to meet net zero, including those technologies that may be commercially viable in the future but not at lowest cost today, if they could play a strategically important role in our future energy system. The price-based competitive allocation has the potential to draw upon design approaches of renewable price-based competitions, where policy has supported the development of multiple technologies using a range of feedstocks and geographical conditions eligible for support while enabling competitive tension to drive down costs.

This document seeks evidence to understand more about the potential for electrolytic and other non-CCUS enabled low carbon hydrogen projects and the wider value chain to support energy security, and to what extent a price-based competitive allocation mechanism from the mid-20s could support security of supply through its design.

Trade offs

In achieving the above objectives and outcomes, there will inevitably be trade-offs, and these will need to be managed carefully. Receiving input from those in the sector will help government understand these trade-offs in more detail and strike the right balance in policy design.

¹³ <https://www.gov.uk/government/organisations/department-for-energy-security-and-net-zero/about>

Chapter 2 questions:

Overarching:

1. What should be the strategic objectives of future hydrogen allocation rounds beyond HAR2? Do you agree with the descriptions of the primary objectives and broader outcomes as set out in Chapter 2?
2. To what extent, and how, should a hydrogen allocation mechanism be designed to support the primary objectives and broader outcomes as set out in Chapter 2?
3. How would introducing a price-based competition in 2025 for electrolytic projects, and potentially other non-CCUS low carbon hydrogen projects, impact projects investment decisions?

Harnessing electricity system benefits:

4. Under what arrangements will electrolytic projects purchase electricity? How would introducing a price-based competition in 2025 impact this, and are these arrangements likely to change over time?
5. Which current and future electricity markets do electrolytic projects seek to participate in? How could changes to electricity markets or signals impact this?
6. How could electrolytic projects look to configure themselves and operate to deliver 'harnessing electricity system benefits' as set out in Chapter 2? Do you think these configurations/operating models could be feasible and commercially viable, and if not, why?
7. Do you have evidence on potential demand for low carbon hydrogen production in locations in the UK that are optimal from an electricity system benefits perspective? Please refer to the map in Chapter 2 ('Figure 1').

Economic benefits and supply chain development:

8. How would introducing a price-based competition in 2025 for electrolytic projects, and potentially other non-CCUS low carbon hydrogen projects, impact economic benefits and supply chain development?
9. How should economic benefits and supply chain development be measured and how could this be incorporated into price-based competitive allocation?
10. How would introducing price-based competition affect developers' decisions on where and how to invest in supply chains?

Security of supply of hydrogen:

11. In a price-based competition, how could pots be designed to best support the 'security of supply of hydrogen'?

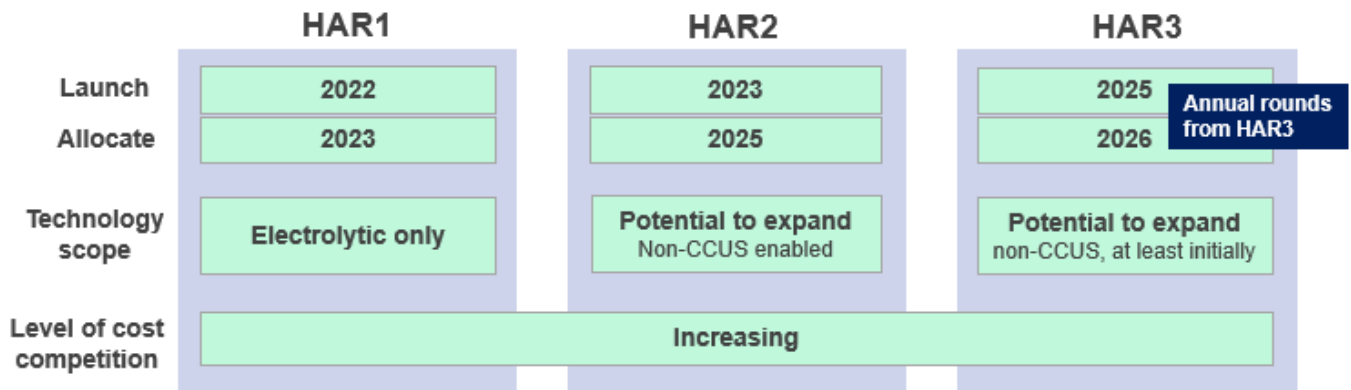
Call for evidence on the future policy framework for allocation of the LCHA

Please use evidence to support your answers.

Chapter 3: Transitioning to price-based competitive allocation

Evolving from HAR1

Figure 2: A potential evolution from HAR1:



The first Hydrogen Allocation Round (HAR1)

HAR1 was open to electrolytic projects only and was developed to kick start our ambition of up to 1GW hydrogen production capacity in construction or operation by 2025 and ensure that first projects can contribute towards the delivery of a wide range of benefits by 2030, including:

- Progress towards the 2030 ambition for 10GW of low carbon hydrogen production capacity, at least half of which is electrolytic
- Emissions reduction under Carbon Budgets 4 and 5
- Decarbonisation of existing UK hydrogen supply
- Lower cost of hydrogen production, driven by learning from early projects, more mature markets, and technology innovation
- End to end hydrogen system with a diverse range of users
- Provide electricity system benefits
- Promote economic growth and opportunities, including jobs

For HAR1, eligible projects were able to apply for revenue support through the LCHA and also CAPEX co-funding through the Net Zero Hydrogen Fund (NZHF) to reflect the early state of the market and projects. The process for allocating the LCHA for electrolytic projects through HAR1 is administered by the Department for Energy Security and Net Zero ('DESNZ'). Applications which met the eligibility criteria and the minimum deliverability score were assessed and scored against a set of defined evaluation criteria. Projects were assessed on:

Criteria	Definition
Deliverability	The level of confidence government has in the delivery plan put forward by the project and the date at which the Project can, credibly, be operational by.
Carbon Emissions and Environmental Factors	The extent to which the Project uses the lowest carbon and most efficient production pathways and considers and mitigates wider environmental impacts resulting from the production of hydrogen.
Costs	Whether the Project will deliver cost-effective hydrogen.
Economic benefits	The contribution the hydrogen plant will make to the economy.
Market development and learning	The extent to which the Project offers growth and learning opportunities in the production and use of hydrogen.
Additionality of Electricity Source	Whether a Project's low carbon electricity source is met by new low carbon generation and does not divert low carbon electricity from other users to avoid negative impacts on wider decarbonation.

Following evaluation, 20 projects were shortlisted¹⁴ and have been invited to proceed to the first step of the Agreeing an Offer stage, consisting of due diligence and value for money assessment, but does not guarantee progress to negotiations or contract award. Subsequently, there will be a stage of due diligence and negotiations between government and projects, in respect of project-specific information for the front end agreement of the LCHA and possible award of grant funding under the NZHF.

This approach to allocation for the first allocation rounds is deemed appropriate given the first of a kind (FOAK) nature of projects and the nascency of the low carbon hydrogen sector.

The second Hydrogen Allocation Round (HAR2)

As set out in the [HAR2 Market Engagement document](#), HAR2 aims to streamline the allocation round process in order to deliver up to three times the capacity ambition of HAR1, up to 750MW, enabling the UK to have up to 1GW of electrolytic hydrogen in operation or construction by 2025, subject to affordability and value for money.

¹⁴ <https://www.gov.uk/government/publications/hydrogen-production-business-model-net-zero-hydrogen-fund-shortlisted-projects/hydrogen-business-model-net-zero-hydrogen-fund-shortlisted-projects-allocation-round-2022>

Government's intention is for HAR2 to be the bridge between assessment-based competition and price-based competitive allocation from HAR3 onwards, and to be underpinned by the following strategic objectives:

- Kickstart the low carbon hydrogen economy, helping meet the ambition of up to 1GW of electrolytic hydrogen capacity in operation or construction by 2025, and by doing so help grow hydrogen supply chains.
- Support projects to deploy at scale, advancing government's ambition to deploy up to 10GW of low carbon hydrogen production capacity by 2030, subject to affordability and VfM, with at least half from electrolytic hydrogen production capacity.
- Establish the frameworks to put the market on a pathway to deliver cost reductions and VfM, supporting the market to transition to a future price-based competitive allocation regime.
- Deliver carbon savings to allow us to stay on track to meet Carbon Budget 5, Carbon Budget 6 and other net zero commitments.

Whilst the design of HAR2 will be determined through market engagement with industry and further policy development in 2023, the intention is for HAR2 to also be administered by DESNZ. Projects are expected to be assessed and scored on a number of criteria but with greater emphasis on cost compared to HAR1.

Evolving from bilateral negotiations

Department-led bilateral negotiations have been viewed by government and industry as an appropriate mechanism to kickstart the hydrogen economy when the hydrogen market is in its nascency. This was reflected in the government response to the consultation on a Low Carbon Hydrogen Business Model in April last year.¹⁵

Beyond HAR2, government wants to understand how the current Department-led allocation model needs to evolve over time, in order to advance the low carbon hydrogen economy to deploy up to 10GW of low carbon hydrogen production capacity by 2030, subject to affordability and VfM.

Market conditions for moving to price based competitive allocation

Government set out in the British Energy Security Strategy (BESS)¹⁶ in April 2022 the ambition to move to price competitive allocation by 2025 as soon as legislation and market conditions allow. Whilst the initial market for low carbon hydrogen is likely to be localised with low carbon hydrogen predominantly sold directly between producer and end-user, we expect that the next decade will see the move towards a more liquid low carbon hydrogen market with large scale hydrogen infrastructure enabling a maturing of supply and demand, with hydrogen traded

¹⁵ <https://www.gov.uk/government/consultations/design-of-a-business-model-for-low-carbon-hydrogen>

¹⁶ <https://www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy>

across regions, and the potential for the development of a market benchmark price for low carbon hydrogen. This section seeks views on the timing of introduction of a price-based competitive allocation mechanism to enable the UK to make such a transition.

In October 2021, DESNZ's *consultation on a business model for low carbon hydrogen*¹⁷ considered factors needed for introducing an auction-based process. It was noted in the government response that whilst many respondents agreed with the minded to position of transitioning to a more competitive allocation process, such as an auction, in the longer term, the majority of those in support caveated the need for a more mature hydrogen market with a sufficient project pipeline before making a transition, with allocation based on a standardised set of terms and conditions.

Since then, government has been monitoring the development of the production pipeline and developing vital policy and regulatory mechanisms to support the development of a UK low carbon hydrogen economy, including the LCHA and LCHS. Government is further considering market conditions that might need to be in place to introduce price-based competitive allocation include, and considers that they include:

- Sufficient number of projects in the pipeline: a strong production pipeline is essential for introducing a price-based competitive allocation process to drive down costs. Based on our understanding of the pipeline of projects that could come forward during the 2020s, and through HAR1, it is likely there will be a sufficiently competitive pipeline from the mid-20s.
- Sufficient availability of private investment: the availability of private capital for producers is important for moving to competitive allocation and enabling effective competition. We expect HAR1 and HAR2, and an established revenue support framework to support the unlocking of private investment and deployment. In particular, industry will need to have confidence in the following mechanisms:
 - LCHA: well understood standard terms and conditions are essential to enable projects to compete primarily on objective factors. Familiarising investors and financial institutions with the risk profile of the contract will enable sufficient capital to flow to the UK market. DESNZ has been and will continue to engage with industry to enable allocation of the initial LCHA during 2023, with the expectation that the standard terms and conditions of the LCHA are published in Q3 2023 for initial projects, with an aim for the first awards made in Q4 2023.
 - Low Carbon Hydrogen Standard (LCHS): to enable effective price competition, projects and the wider value chain need to understand how to meet the LCHS. Version 1 of the UK LCHS was published last year, being recently updated by Version 2¹⁸, to provide industry with clarity on what constitutes 'low carbon hydrogen' at the point of production for the purposes of certain government schemes. Government is also committed to setting up a certification scheme for

¹⁷ <https://www.gov.uk/government/consultations/design-of-a-business-model-for-low-carbon-hydrogen>

¹⁸ <https://www.gov.uk/government/publications/uk-low-carbon-hydrogen-standard-emissions-reporting-and-sustainability-criteria>

low carbon hydrogen by 2025 so that end users can have confidence in the low carbon credentials of their hydrogen¹⁹.

- Funding mechanism: government will need to ensure that appropriate funding mechanisms are in place to underpin the LCHA's that are allocated to projects. The Energy Bill contains provisions that would enable government to establish a levy to fund the LCHA. The decision to introduce a levy will take into account wider government priorities and policies – including considerations related to the affordability of energy bills.
- Sufficient conditions to incentivise hydrogen demand: it is essential that offtakers have the confidence to invest in cost effective hydrogen. Implementation of supply side mechanisms, and a range of wider policy levers, should provide the conditions to bring forward demand. This includes allocation of the LCHA to incentivise offtakers to purchase low carbon hydrogen over the fossil fuel counterfactual, and incentives aimed at moving away from high carbon fuels, such as introducing targets and regulations for phasing out fossil fuels across sectors, setting carbon prices through the UK ETS and extending its scope, as well as funding to support further research, innovation and demonstration at scale. Our regular Hydrogen Strategy Updates to Market²⁰ set out our progress across these demand-side activities.

Government will continue to review the development of the low carbon hydrogen economy and wider energy market and is seeking input on the nature of the market conditions needed for moving to price-based competitive allocation.

Chapter 3 questions:

12. What market conditions need to be in place for introducing price-based competitive allocation? Do you think these market conditions will be in place by 2025?

13. When considering market conditions and the primary objectives/broader outcomes as set out in Chapter 2, what would be the impacts and likely outcomes of introducing a price-based competition in 2025?

14. If market conditions are not in place by 2025 for price-based competitive allocation, how should further allocation rounds beyond HAR2 be designed?

Please use evidence to support your answers.

¹⁹ <https://www.gov.uk/government/consultations/uk-low-carbon-hydrogen-certification-scheme>

²⁰ <https://www.gov.uk/government/publications/uk-hydrogen-strategy>

Chapter 4: Non-price factors and further design considerations for price-based competitive allocation

Design considerations for evolving to price-based competitive allocation:

- **Price vs non-price factors**

For HAR1 there are six criteria with Costs criterion at 20% weighting. For HAR2, we are proposing to have four criteria and to increase the Cost criterion weighting to 35%, subject to the outcome of the market engagement exercise.

For price-based renewable energy competitions, eligible projects that pass qualification requirements typically either go on to compete solely on price, or predominantly on price but with some weighting or adjustment to account for factors beyond price, known as non-price factors. Non-price factors can be used in price-based competitions with the aim of incentivising projects to support broader strategic outcomes beyond cost reductions, by providing the opportunity for projects to be compensated for the additional costs they would incur for supporting those outcomes, whilst being competitive.

There are a number of ways non-price factors can be designed through a price-based competition to incentivise projects to commit additional investments, for example, through re-ranking of strike price bids, making it possible for a project scoring sufficiently highly on non-price factors to win a CfD ahead of another project bidding into the auction at a lower price but scoring poorly on non-price factors. Projects could be ranked on both price and NPFs, for example, 85% on price, and 15% on another (or multiple) criterion.

Government is considering the role of non-price factors more broadly in energy auctions, and potential design approaches are considered in the *Call for Evidence on Introducing non-price factors into the Contracts for Difference Scheme*²¹ consultation, published on 17 April 2023.

When considering how to incorporate non-price factors within a price-based competition, there are a number of principles that should be adhered to. These include:

- ensuring non-price factors are quantifiable and can be objectively measured, ensuring good value for money;
- limiting the number of non-price factors to reduce administrative burden; and
- ensuring that non-price factors are feasible to implement within a reasonable period of time.

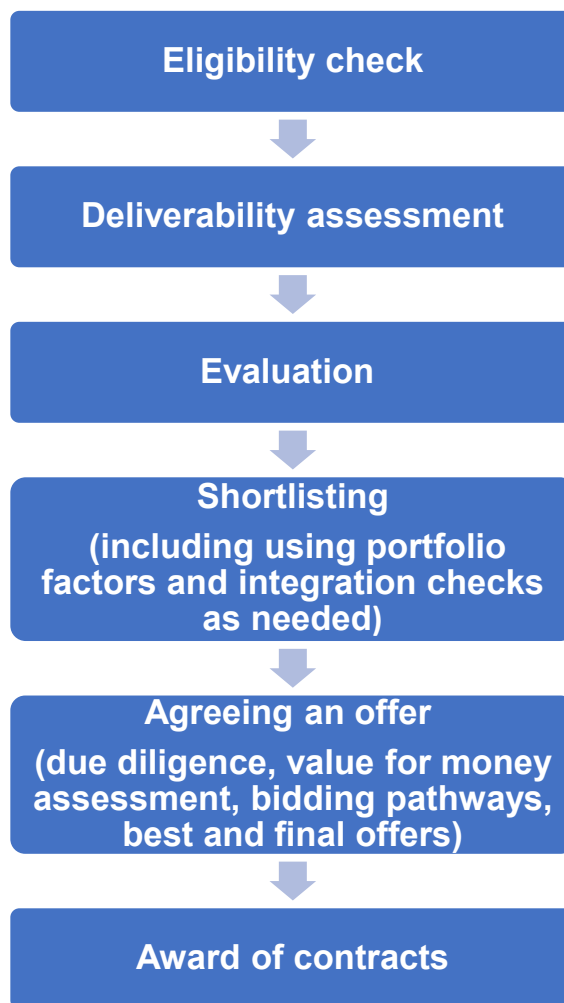
²¹ <https://www.gov.uk/government/consultations/introducing-non-price-factors-into-the-contracts-for-difference-scheme-call-for-evidence>

Within the context of the low carbon hydrogen economy in the UK, we would like to explore the potential role of using non-price factors to support objectives and broader outcomes beyond price, if the allocation process for non-CCUS low carbon hydrogen production evolves to a price-based competitive allocation model.

- **Frequency and structure of allocation rounds:**

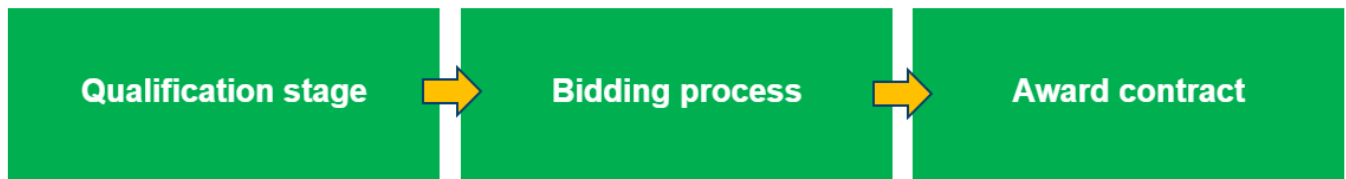
Due to the early stage of the low carbon hydrogen economy, it is necessary that HAR1 and HAR2 rounds have been structured to be delivered over a longer timeframe than typical price-based competitions due to the level of assessment required.

Figure 3: HAR1 and HAR2 structure:



Price-based renewable energy competitions are typically completed within a year, enabling rounds to be launched on a frequent, cyclical basis. They generally have a simpler structure than HAR1 and HAR2, where projects are assessed on pass/fail criteria at qualification stage. Those that qualify then go on to directly compete by bidding on objective factors, rather than through a combination of assessment on objective factors and bilateral negotiations.

Figure 4: typical high-level structure of a price competitive energy competition:



For CfD allocation rounds, the Department reviewed their frequency and there was overwhelming industry support for more frequent and increased certainty on allocation round timing. The Department announced in February 2022 that the frequency of auctions for funding through the Contracts for Difference (CfD) scheme will change to every year rather than every 2 years from March 2023²².

Beyond HAR2, we are seeking responses to inform the structure and design of future allocation rounds and understand whether rounds should move to a more predictable, annual frequency from 2025.

- **Deliverability**

Through the design of an allocation mechanism, we want to be confident that the projects which are awarded the LCHA have the capability and capacity to deliver successfully and on time. For HAR1, as set out above in Figure 3, projects that were successful at the eligibility stage were then assessed at evaluation stage on Deliverability, and those that passed Deliverability were then assessed on the remaining evaluation criteria.

The Deliverability criterion involved a detailed assessment of projects plans to deliver, including: the hydrogen production plant; arrangements with their planned off-takers and those off-takers' viability; electricity and water sources arrangements and viability, with projects scored against three key indicators. As the first hydrogen allocation round, this level of assessment was essential due to the infancy of the market and uncertainty on the development stage of the projects applying.

For HAR2, we do not currently propose any fundamental changes to the deliverability criteria, however, we are considering making improvements to and streamlining criteria for applicants and assessors. For further information on HAR2, please see the HAR2 Market Engagement document.

For price-based renewable energy competitions, projects are not typically scored on deliverability, but instead they must pass certain eligibility requirements. Such requirements can include the submission of required evidence such as planning permission and connection agreements, with the exact design of the criteria reflecting the level of development and commitment that is expected of projects at application stage. We are seeking evidence to inform our approach to supporting deliverability for future allocation rounds beyond HAR2.

²² <https://www.gov.uk/government/news/government-hits-accelerator-on-low-cost-renewable-power#:~:text=These%20auctions%20are%20run%20in,since%20they%20began%20in%202014>

- **Delivery years**

HAR1 guidance included an eligibility criterion for projects to achieve their Commercial Operational Date (COD) by the end of 2025. Feedback from HAR1 evidenced the need, particularly for larger scale projects, for longer timeframes to allow for delivery and deployment. We therefore intend to adopt a different approach for HAR2, in light of our aim to support projects at scale by allowing longer for project delivery. For HAR2, we are proposing to introduce the concept of delivery years as we move away from Commercial Operational Dates (COD). To meet HAR2 eligibility criteria, projects will need to demonstrate that they are able to be operational within one of three delivery years, between 31st March 2026 – 31st March 2029.

We want to understand the extent that this approach might need to evolve if we moved to price-based competitive allocation in the mid-20s, and how delivery years could be designed alongside other key design considerations, such as Deliverability requirements.

- **Allocation body**

HAR1 is a government-led allocation round, with the evaluation of projects and subsequent negotiations being carried out by the Department with support from technical and commercial advisors. For HAR2 we expect to take a similar approach.

For price-based competition, we are considering if the scheme should be administered by an independent allocation body. The current version of the Energy Bill²³ contains provisions that would give Secretary of State the power to appoint an allocation body who could be responsible for administering the competitive allocation process. The decision on the allocation body would be at the Secretary of State's discretion but we are interested in gathering considerations on what factors should be taken into account when appointing an allocation body. We set out below more detail on the factors that the Secretary of State may consider when appointing a body. Factors currently under consideration include:

1. Deliverability: to consider ease of implementation of the allocation body to ensure timely delivery and the ability of that body to deliver price-based competition effectively.
2. Independence, actual/perceived bias and conflicts of interest: the body needs to be sufficiently independent such that it can perform functions free from bias or a reasonable perception of bias or conflict of interest.
3. Experience: experience in running competitions, in particular, regular price-based competitive rounds, would be desirable.
4. Economies of scale: centralisation of functions could bring with it economies of scale, lowering the cost of implementation and operations.
5. Technical proficiency: the body would need to have strong technical and commercial knowledge appropriate to the type of competition it is running.

²³ <https://bills.parliament.uk/bills/3311>

The factors are non-exhaustive and the Secretary of State could consider any relevant factors/indicators at the time of the decision.

- **Technology scope and funding structure:**

For HAR1, electrolytic hydrogen production projects are in scope. For HAR2, government is reviewing this position, which will depend on a number of factors. For further information on HAR2, please see the HAR2 Market Engagement document.

Price-based renewable energy competitions often support more than one technology, for example, by using different funding pots to support specific technology pathways. This has resulted in significant cost reductions whilst enabling diverse technologies to develop, with potential for future cost reductions. We want to seek evidence to inform how funding pots could be structured. Whilst to date, pots are typically grouped based on technology type in energy auctions, we are interested to understand more broadly how they could be most effectively used to achieve the objectives and outcomes set out in this document.

- **Winner selection process**

For HAR1, eligible projects were able to apply for potential capex support from the NZHF as well as for LCHA support. Project-specific information for the front end agreement of the LCHA and possible award of grant funding under the NZHF for the selected projects can be agreed through negotiations between projects and government. For HAR2, we are reviewing the potential role of CAPEX.

In price-based renewable energy competitions, projects usually directly compete in a bidding process on objective factors, which are often based on standard terms of a subsidy instrument. Regard must be had to parameters such as load factors, strike price, volume cap, and the quantity that projects can bid. We want to obtain evidence to inform how a price-competitive process could be designed and the role of auction parameters in the bidding process.

Chapter 4 questions

15. Do you have views on how the design considerations as set out in Chapter 4 should evolve beyond HAR2? Are there any missing?

16. In a price-based competition, how would you design and value non-price factors to support any of the above objectives and broader outcomes as set out in Chapter 2, noting the above non-price factor design principles in Chapter 4?

17. Are there other more appropriate approaches for supporting these objectives and broader outcomes than through implementing non-price factors?

18. From the mid-20s, what types of companies do electrolytic projects, and potentially other non-CCUS projects, expect to have as potential end users? Do you expect them to be geographically fixed, or flexible?

19. For selecting an allocation body to administer price-based competitive allocation, do you agree that these are the right factors to be included in the Secretary of State's decision?

20. If a price competitive process adopted the concept of 'Delivery Years', similar to the CfD regime, how should we approach designing Delivery Years for non-CCUS low carbon hydrogen projects? Please set out, with evidence, if certain types of projects might require longer lead-in times?

21. For HAR1, there was a minimum size eligibility threshold for projects of 5MW. Do you think this threshold should increase for allocation rounds launching from the mid-20s, and if so, to what value? Should the same threshold apply to all non-CCUS enabled production technologies?

Please use evidence to support your answers.

This publication is available from: www.gov.uk/government/consultations/price-based-competitive-allocation-for-low-carbon-hydrogen-call-for-evidence

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