



Department for  
Energy Security  
& Net Zero

# Market Engagement on the second Hydrogen Allocation Round

May 2023



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# Introduction

In March 2023, we confirmed our ambition to support up to 250MW of electrolytic hydrogen projects through the first hydrogen allocation round (HAR1), subject to affordability and value for money and we announced a shortlist of 20 projects that will proceed to the next stage of the HAR1 process<sup>1</sup>. Building on this, we are now intending to open applications for the second Hydrogen Allocation Round (HAR2) in Q4 this year, with an aim to support up to 750MW of capacity in 2025, subject to affordability and value for money (VfM). This would help achieve our aim of up to 1GW of electrolytic hydrogen production projects to be in operation or construction by 2025, as set out in the British Energy Security Strategy. In turn, this will help us meet our ambition of up to 10GW of low carbon hydrogen production capacity by 2030, with at least half coming from electrolytic projects.

This Market Engagement document sets out our proposed approach to the second Hydrogen allocation round process for low carbon hydrogen projects (HAR2). This includes proposed changes from the first Hydrogen Allocation Round (HAR1) and an indicative timeline. HAR2 will allocate revenue support via the Hydrogen Production Business Model (HPBM). We are seeking industry views on the role of CAPEX (capital expenditure) support within this round (see Section 3).

Moving forward, we aim to move to an annual price-based competitive allocation regime by 2025 as soon as legislation and market conditions allow. We expect that allocation of support will transition from a bilateral process to a price-based competitive model in the mid 2020's, driving down the cost of hydrogen production, and creating a sustainable and competitive market. More information can be found in the Call for Evidence on the future policy framework for allocation of the Low Carbon Hydrogen Agreement (LCHA), that has been published alongside this document.

In December 2022, Heads of Terms for the Low Carbon Hydrogen Agreement were published. These Heads of Terms are draft terms for the agreement for the HPBM (the 'Low Carbon Hydrogen Agreement'). We are engaging with interested parties on the full draft form LCHA during Q2 2023 and aim to publish the final LCHA for initial projects from Q3 2023.

Engagement with industry on our proposed second allocation round will take place over six weeks from 17 May to 30 June and stakeholders can submit views by attending a workshop or online via Citizen Space. See the 'How to respond' section of this document for further information on how to feed into this Market Engagement exercise.

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<sup>1</sup> [Hydrogen Production Business Model/Net Zero Hydrogen Fund: shortlisted projects](#)

# General Information

## Why we are engaging

The purpose of this Market Engagement exercise is to seek views on our proposed approach for HAR2 to support new low carbon hydrogen production. Industry views will form a part of designing and shaping our proposals ahead of HAR2's intended launch in Q4 2023.

Proposals outlined in this document will take into account any Market Engagement responses, as well as ongoing policy developments within government. We are aiming to publish a response to the Market Engagement document in Autumn 2023, ahead of the round launching.

Please note, nothing in this document creates any basis for any form of expectation or reliance. Government reserves the right to amend or discontinue any proposed process at any time for any reason.

## Market Engagement details

Issued: 17/05/2023

Respond by: 30/06/2023

Enquiries to: [HAR2@beis.gov.uk](mailto:HAR2@beis.gov.uk)

Audiences: Developers and investors in potential low carbon hydrogen projects.

Territorial extent: The scope of this Market Engagement is UK-wide. Our preferred approach is to allocate support on a UK-wide basis to support decarbonisation across the UK. We will continue to work with the devolved administrations as we develop future allocation processes.

## How to respond

### Attend a workshop

Engagement with industry on our proposed HAR2 process will take place over six weeks with three workshops, which stakeholders can attend to submit views.

To attend Workshop 1, taking place on Thursday 8 June 2023, stakeholders should complete [this expression of interest form](#). To attend Workshop 2, taking place on Tuesday 13 June 2023, stakeholders should complete [this expression of interest form](#). To attend Workshop 3, taking place on Tuesday 20 June 2023, stakeholders should complete [this expression of interest form](#). Stakeholders should complete an expression of interest form by 11:59pm on 2 June 2023 to register their interest in attending one of these workshops.

The forms ask for basic information about the project and whether the project coordinators would be interested in applying, to help the Department for Energy Security and Net Zero plan resourcing for HAR2. These workshops will follow a similar format, you should only attend one, and each organisation/project should be represented by a single individual. The department reserves the right to limit attendance where workshops are oversubscribed.

## Submit a written response through Citizen Space

If stakeholders would like to provide a written response please respond online at:

[beisgovuk.citizenspace.com/industrial-energy/second-hydrogen-allocation-round/](https://beisgovuk.citizenspace.com/industrial-energy/second-hydrogen-allocation-round/)

Please note that responses will not be accepted after the Market Engagement exercise closing date of 30/06/2023.

## Confidentiality and data protection

Information you provide in response to this Market Engagement exercise, 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

This Market Engagement exercise has been carried out in accordance with the government's consultation principles.

If you have any complaints about the way this Market Engagement exercise has been conducted, please email: [beis.bru@beis.gov.uk](mailto:beis.bru@beis.gov.uk).

# The proposals

Within this document, we will outline proposals for the overall design and delivery of HAR2, which build on lessons learned from HAR1 and aim to streamline, where applicable, the application and assessment process for potential new low carbon hydrogen projects. We aim to gather industry views on these proposals, gauging support for proposed amendments to the design of the round.

## Section 1: Strategic objectives for HAR2

We have set the following strategic objectives we aim to achieve during the second allocation round:

- 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.

The strategic objectives of HAR2 are built upon those outlined in the first allocation round but have been updated in light of the changing context of HAR2. The notable change is the addition of our aim to introduce cost reductions. This places greater emphasis on cost in order to deliver VfM, positioning HAR2 as a transitional round to a more price-based competitive allocation mechanism from 2025, with a longer-term aim in bringing down the Levelised Cost of Hydrogen (LCOH).

## Section 2: Proposed funding allocation process and timeline

### Indicative timeline

This section sets out the indicative timings for HAR2. We intend to open the application window in Q4 2023 and after contracts are offered to successful HAR1 projects. This should allow projects who had been unsuccessful in HAR1 time to submit a new application, where appropriate. In response to HAR1 feedback, we are also minded to keep the application window open for longer than in HAR1, allowing projects additional time to develop their applications and submit these before the deadline. We are also moving to a longer, more flexible approach of delivery of these projects, allowing potential projects to select a delivery year between March 2026 until March 2029. This is a key change from HAR1 and moves away from the use of Commercial Operational Dates (see section 4 for further detail).

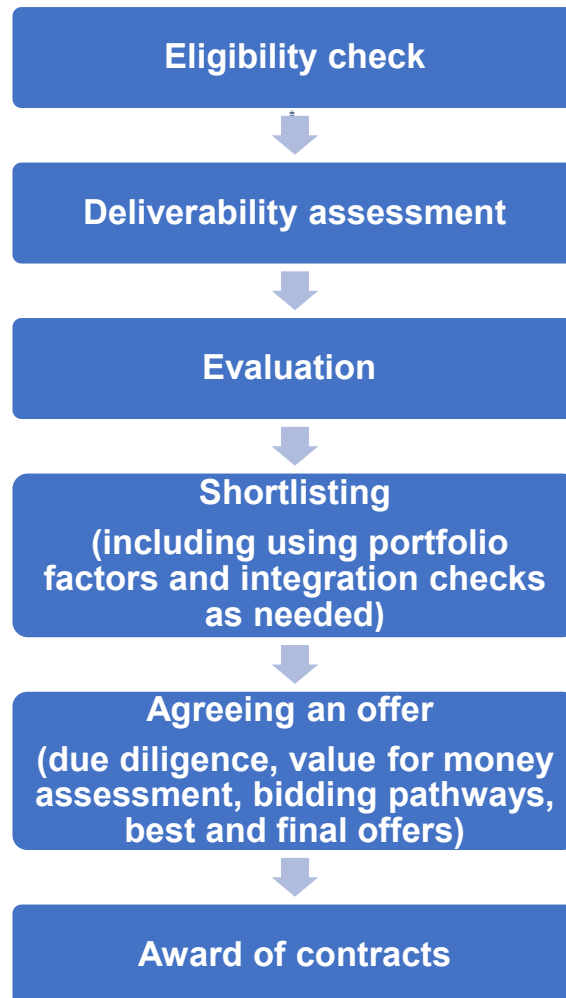
A high-level indicative timeline for each stage of the allocation process is set out below. Please note that all dates are subject to change and further details will be provided in the application guidance document.

- Application window opens Q4 2023 and closes Q2 2024. As with HAR1, we expect this to include an Expression of Interest (EOI) stage as part of the application process.
- Confirm shortlist of projects for due diligence and VfM assessment and commence negotiations with selected projects: Late 2024.
- Award of contracts: from 2025.
- Projects to take a final investment decision within three months from award of contracts.
- Projects in operation: from between March 2026 – March 2029.



## Proposed HAR2 process

We are minded to use the following process, building on the approach for HAR1:



- Eligibility check – Assessors will confirm the application meets the defined eligibility criteria (see section 4). Those that are considered to meet the eligibility criteria will proceed to the deliverability assessment.
- Deliverability assessment - Applications which pass the initial eligibility check will move on to the deliverability assessment, to ensure projects meet the minimum deliverability score before going on to full assessment against a set of evaluation criteria.
- Evaluation – Applications will be assessed against the remaining criteria (see section 5). These criteria will recognise the costs, and wider benefits and impacts of a hydrogen project. Projects will receive a total weighted score, including the deliverability score, with the highest scoring projects ranked first.

- Shortlisting – In the event of oversubscription to this Allocation Round, government may limit the number of shortlisted projects. This decision will be made based on weighted scores, the application of portfolio factors and/or integration checks as appropriate.
- Agreeing an offer – Shortlisted projects will be invited to proceed to the due diligence and value for money assessment as part of the agreeing an offer stage. This stage consists of different steps including due diligence, value for money assessment and contract negotiation. Projects who do not meet the standard required at the due diligence or value for money assessment will not move to the negotiations stage.
- Award of contract – Successful projects will be awarded a LCHA, and possibly NZHF grant funding. This is subject to application of any final portfolio factors and integration checks.

More information on the process will be shared in the guidance for applicants document which will be published alongside the launch of HAR2.

For HAR2, we propose a business will be able to lead on up to six applications, which must be materially different, and can be included as a collaborator, or project partner, in a further six applications. Please note, as with HAR1, successful applicants will require one counterparty to be subject to a LCHA contract.

This is an increase from HAR1 reflecting the increased objective to support 750MW. We believe a limit of 6 strikes a balance between protecting project resource in the nascent hydrogen market, whilst ensuring projects select their most mature projects to be put forward for funding.

## Section 3: Project requirements

### The role of Net Zero Hydrogen Fund (NZHF) CAPEX

We recognise that projects see HPBM support as the main factor driving decisions towards Final Investment Decision (FID). However, some projects may also require NZHF capital co-funding to lower the quantum of upfront costs and risks, and lower financing costs. This could result in a project requiring less HPBM support overall. Therefore, we launched an integrated HPBM and NZHF application process for HAR1 which allowed projects to apply for NZHF CAPEX grant support alongside HPBM revenue support. For HAR1, projects were able to apply for up to 20% co-funding support.

Feedback gathered via the HPBM and NZHF consultations in 2021, and stakeholder engagement since, indicated that a significant number of electrolytic projects wished to apply for both capital support through the NZHF and revenue support through the HPBM<sup>2</sup>.

We are working to understand the need for CAPEX support for this round, therefore, we are inviting views from industry on whether they would require NZHF CAPEX funding, should it be available, and the underpinning rationale. This will help us understand whether a CAPEX grant is necessary, and if so, the optimal CAPEX offer, working to balance project needs and the affordability. The £240m announced funding for the Net Zero Hydrogen Fund only extends to 2025, therefore, we will need further funding to support HAR2 projects, if the evidence base suggests there is a requirement for upfront capital support.

Beyond HAR2, sufficient availability of private capital for projects is important for moving to price-based competitive allocation. We expect HAR1 and HAR2 to support the unlocking of private investment and deployment, enabling future allocation rounds to move away from a capital co-funding model and instead, to be based solely on the allocation of market-based revenue support.

### Dual support from Renewable Transport Fuel Obligation (RTFO) and HPBM

As in HAR1, we recognise that some projects may want support through both the HPBM and the RTFO. We propose that producers in receipt of HPBM support will be allowed to participate in the RTFO. Volumes produced will be allowed to be claimed under the RTFO, subject to meeting the RTFO's eligibility criteria, but claiming under both the HPBM and RTFO for the same volumes of hydrogen will not be permitted. Work is ongoing to develop administrative arrangements and an enforcement regime enabling dual participation and guarding against producers claiming under both schemes for the same costs. Specific details will be set out in the LCHA.

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<sup>2</sup> The HPBM may support CAPEX costs associated with limited hydrogen transport and storage infrastructure. The provision of such support will be negotiated on a project-by-project basis, and further details will be set out in the LCHA.

Projects seeking support under both the RTFO and HPBM, will be required to submit a letter, confirming eligibility for RTFO support, through the HAR2 application process. RTFO assessments can take over a month and no guarantees can be made for HPBM applicants, so please engage early to avoid disappointment.

### **Questions**

1. Should it be available, would you look to seek CAPEX co-funding in HAR2? Yes/No/Don't know. Please explain your answer. If yes, please provide a summary of the reasons for seeking CAPEX support and the impact of not receiving CAPEX support would have on your project.
2. In HAR1, NZHF support was made available for up to 20% of eligible CAPEX costs. If your organisation is likely to apply for NZHF CAPEX co-funding support in HAR2, if possible, please provide the estimated size of bid required to support the deployment of your project. Please present this bid as a percentage of your overall costs.

## Section 4: Proposed eligibility criteria

This section sets out the proposed eligibility criteria for projects applying for HAR2.

HAR1 eligibility criteria were successful in discouraging speculative applications and provided clarity to those projects wishing to receive financial support, whilst ensuring projects selected supported our strategic aims. Subsequently, HAR2 eligibility requirements will largely build on HAR1, although we will consider improving evidence requirements for specific criteria.

Listed in the table below are the proposed eligibility requirements for HAR2 that we are not proposing to change from HAR1. The remainder of this section will focus on the updated eligibility criteria we are proposing for HAR2, notably the introduction of delivery years and the consideration of opening HAR2 funding to other non-CCUS enabled hydrogen production technology types beyond electrolysis, and a decision on eligible and ineligible offtakers.

The table below shows application criteria which we propose remain unchanged from HAR1.

Criteria	Definition
Project location	Project plant located entirely in the United Kingdom and the Project Representative's business being registered in the UK.
Technology Readiness	Using core technology that has been tested in a commercial environment, with a Technology Readiness Level (TRL) of 7 or more. TRL 7 is defined as 'Integrated Pilot System Demonstrated: Prototype near or at planned operational system, requiring demonstration of an actual system prototype in an operational environment' <sup>3</sup> .
New build production facility	New build hydrogen production facilities (with same exemptions for Net Zero Innovation Portfolio and Energy Innovation Portfolio programmes).
Identified offtaker	Project detailed within application has engaged with at least one qualifying offtaker.
Identified electrolyser supplier	Project detailed in application has engaged with an electrolyser supplier(s).

<sup>3</sup> Please see Annex for definitions of Technology Readiness Levels 1 to 9 for reference and for the purpose of this document.

Criteria	Definition
Hydrogen production capacity	Minimum hydrogen production capacity of 5MW H2 HHV <sup>4</sup> .
Low Carbon Hydrogen Standard	Meets the requirements of the Low Carbon Hydrogen Standard (LCHS) <sup>5</sup> .
Financial access	Can demonstrate access to finance.

## Ineligible offtakers

In HAR1, we confirmed that sales to certain hydrogen offtakers would not qualify for HPBM support in order to meet our strategic aims. We are proposing to keep the same categories of ineligible offtakers as used in HAR1<sup>6</sup>. A list of non-qualifying offtakers is detailed below:

- Risk taking intermediaries as offtakers
- Export offtake
- Gas blending as an offtaker

However, government is planning to take a strategic policy decision in 2023 on whether to seek to enable the blending of hydrogen in the existing gas distribution network. Further details will be provided this year including through the government response to our consultation on hydrogen transport and storage infrastructure, which we aim to publish in Q2 2023.

As above, gas grid blending is not currently included as an eligible offtaker for HAR2, but we will review this position once a strategic decision on blending has been announced and confirmed.

## Delivery Years

For HAR2, we are proposing to introduce the concept of delivery years as we move away from Commercial Operational Dates (COD). 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.

<sup>4</sup> When considering hydrogen production capacity, we care about the maximum MW of hydrogen output of the facility in high heating value terms, before load factor or plant availability are taken into account.

<sup>5</sup> The LCHS is subject to review and may be updated from time to time. The version of the LCHS that will be applicable to HAR2 will be detailed in the application guidance and the relevant LCHA.

<sup>6</sup>[Hydrogen Business Model and Net Zero Hydrogen Fund: Electrolytic Allocation Round Application Guidance Document](#)

To meet HAR2 eligibility criteria, projects will need to demonstrate that they are able to be operational within one of three delivery years, between 31 March 2026 – 31 March 2029. Projects will be asked to specify which delivery year they plan to be operational. This change is intended to help us meet our strategic aim of supporting up to 750MW low carbon hydrogen capacity through HAR2, subject to affordability and VfM.

### Non-electrolytic low carbon hydrogen production technologies

The UK Hydrogen Strategy, published in 2021, set out the UK's ambition to support a range of production technologies where they can significantly contribute to our hydrogen production ambitions and support broader energy policy. In line with this position, we are considering expanding eligibility criteria to fund other non-Carbon Capture and Storage (CCUS) enabled low carbon hydrogen production routes<sup>7</sup>.

Hydrogen production from advanced gasification of biomass and/or waste and pyrolysis to hydrogen and solid carbon are two routes that could have strategic potential, with pipeline analysis suggesting projects in development in the UK. While showing promise, we need further evidence to ensure these technologies can meet HAR2 eligibility criteria. The following section sets out further detail on these technologies and the evidence we are seeking from industry.

We are also considering how eligibility and assessment would need to be adjusted if we decide to expand eligibility of funding to other technology types. For an example, we would require an equivalent for the 'identifying an electrolyser supplier' eligibility criterion.

### Biomass and/or Waste Gasification

Gasification uses heat to break down a feedstock material (such as wood or unrecyclable plastics) in the presence of limited oxygen to produce a hydrogen rich syngas that can then be cleaned and separated into its constituent gases. Strategically, we are interested in the gasification of biomass material, given its potential to deliver negative emissions alongside CCUS infrastructure. However, not all potential projects will have ready access to CCUS transport and storage infrastructure, therefore, we are seeking views on the value of supporting this technology even if CCUS transport and storage infrastructure is not available from the outset, but where production can still meet the LCHS.

Biomass and waste are limited feedstocks, therefore, we need to consider whether hydrogen production using these feedstocks should be funded. For waste specifically, we need to consider government targets to reduce residual waste<sup>8</sup>.

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<sup>7</sup> CCUS-enabled hydrogen projects are expected to be supported through the cluster sequencing process (i.e. the recently announced Track 1 Expansion and Track 2 Programmes) and non-CCUS technologies are expected to be supported through the Hydrogen Allocation Rounds.

<sup>8</sup> For England, the [government target](#) is ensure that the total mass of residual waste (excluding major mineral wastes) for 2042 does not exceed 287kg per person, which is the equivalent to a 50% reduction in residual waste arising from 2019 levels. The Welsh Government's Beyond Recycling target is for zero residual non-recycled

In order to consider funding this technology, we need to be confident that it can meet HAR2 eligibility requirements. Gasification of biomass and waste to produce hydrogen is still a novel technology which has not yet been widely used. A government report reviewing gasification suggested that this technology was at TRL 6, below the minimum requirement to be eligible for HAR2<sup>9</sup>. Therefore, we are seeking evidence from projects interested in funding to consider whether this technology can meet HAR2 eligibility requirements.

## Pyrolysis to hydrogen and solid carbon

This process uses heat and/or an electrical field to split methane (or another hydrocarbon) in the absence of oxygen, producing hydrogen and a solid carbon by-product, with no carbon dioxide produced in the process. The potential to produce low carbon hydrogen from natural gas without the need for enabling CCS infrastructure is a potential benefit of this production pathway.

We are aware of companies looking to take this production route forwards in the UK and of innovation funding<sup>10</sup> supporting these projects. However, as this is a new technology there is little available evidence on factors such as TRL, cost and size. Therefore, as above, we are seeking evidence from projects interested in funding to consider whether this technology can meet HAR2 eligibility requirements.

Pyrolysis to hydrogen and solid carbon production is being considered as a potential new pathway to be added to the LCHS' eligible production pathway list, with a decision on this expected this year. Questions remain as to the most appropriate accounting methodology that the LCHS should apply to this production route and how this would influence an operational facility. We are also considering the potential environmental implications of carbon black and how to avoid unintended consequences arising from the subsequent use of carbon black.

## Questions

3. Do you agree with the proposed eligibility criteria for HAR2? Yes/ No/ Don't know. If not, please explain why.

4. We are seeking information from biomass or waste gasification and pyrolysis to hydrogen, and solid carbon production projects interested in HAR2 funding, should it be available. We are asking these projects to provide information on the following:

- Projected hydrogen production capacity of individual projects (MW H2 HHV) and estimated date of commercial operation.
- Expected load factors for production facilities of these technologies.

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waste by 2050, the Scottish Government has a target to reduce waste arisings by 15% against 2011 levels by 2025, and the Northern Irish Government is working to reduce waste arisings and move resources further up the waste hierarchy.

<sup>9</sup> DESNZ (2021) [Advanced gasification technologies: review and benchmarking](#)

<sup>10</sup> [DESNZ Industrial Hydrogen Accelerator Programme](#) and [Net Zero Technology Centre](#).



- Fuel input requirements (energy input required to produce a unit of hydrogen output), and proposed source of feedstock.
- Cost (expected capital and operational costs of producing hydrogen using these technologies).
- Evidence that these technologies meet TRL 7 or more.
- Potential for wider environmental impacts from these routes, including consideration of air quality impacts and water requirements.
- Details of any residues produced by these processes and how these will be managed.
- For pyrolysis to hydrogen and solid carbon production technologies only, plans for carbon black usage or disposal, and evidence of the environmental impacts associated with this.

5. Are there any other non-electrolytic hydrogen production technologies that we should be considering funding in this round? Yes/No/Don't know. If yes, please provide information on the technology and how they meet eligibility criteria and strategic aims for the round and any information on relevant points listed in question 4.

## Section 5: Proposed evaluation criteria

This section sets out the proposed evaluation criteria for HAR2 which will be used to assess projects who have passed the eligibility check.

We have looked for opportunities to streamline the evaluation criteria, building on lessons learnt from the HAR1 process. Projects will first be assessed against the deliverability criterion. Only those that meet a minimum threshold to pass the deliverability assessment will move on to a full assessment against the remaining three criteria which are set out below alongside their respective descriptions and proposed weightings.

Each of the proposed HAR2 criteria will be assigned a weighting which will reflect the importance of each criterion in relation to our strategic aims, thus enabling a fair and transparent scoring process. Projects' overall score will be calculated using their final scores against each criterion, which are then combined according to the associated weightings.

In line with committing to a fair, objective, and transparent process, we have set out our proposed weightings for each of the four evaluation criteria in the below table. The proposed weightings reflect the increased focus on costs, positioning HAR2 as a transitional round as we move towards price-based competitive allocation in the future, and the expanded scope of the additionality and wider systems impacts criteria.

Criteria	Definition	Proposed Weighting
Deliverability	The project's capability and capacity to deliver successfully by the selected delivery year.	35%
Costs	Whether the project will deliver cost-effective hydrogen.	35%
Economic benefits and supply chain development	The contribution the hydrogen plant will make to the economy and the development of hydrogen supply chains.	20%

Criteria	Definition	Proposed Weighting
<p>Wider electricity system benefits:</p> <ul style="list-style-type: none"> <li>• Additionality of electricity source</li> <li>• Project location and electricity network constraints</li> </ul>	<p>Additionality: 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 decarbonisation.</p> <p>Network constraints: Whether projects are located in areas that will help alleviate electricity network constraints.</p>	10%

## Deliverability & Costs

We do not currently propose any fundamental changes to the deliverability or costs criteria. Both criteria remain a crucial and important element of the assessment process to ensure we deploy projects in support of our strategic aims and deliver VfM to government. However, we are considering making improvements to and streamlining criteria for applications and assessors, for example, streamlining templates and improving evidence requirements. Further detail will be provided in the application guidance.

## Economic benefits & supply chains

As set out in the Hydrogen Strategy, we want to see opportunities for the supply chain, businesses, technologies, and people to benefit from the growth of the hydrogen economy. In July 2022, we published the Sector Development Action Plan (SDAP) 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 published. This report re-stated the significant growth opportunity that hydrogen presents and made a series of recommendations to government and industry. Three of the four 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
- 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. In this context, we are minded to re-frame the economic benefits criterion to include a greater focus on the low carbon

hydrogen supply chain, ensuring developers are offering fair opportunities to develop the wider supply chain. This could include providing information on how projects plan to contribute towards developing the supply chain. Given the importance of economic benefits, we intend to continue to gather information on jobs numbers and skills and training data by role to feed into wider value for money assessments of projects, but this data will not be scored at assessment stage. As set out in Heads of Terms for the LCHA<sup>11</sup>, it is proposed that there will be a requirement for producers to report against economic benefits and its supply chain throughout the duration of the contract which we may decide to mirror.

## Wider electricity system benefits

For HAR2, we are proposing to expand the ‘additionality of electricity source’ evaluation criterion to include incentives for projects locating in beneficial areas for electricity network constraints. Therefore, to reflect the expansion of the criterion, we are proposing to rename the criterion to ‘wider electricity system benefits’, and the weighting will be increased to 10% of the total score for the evaluation criteria. Further information on these changes are detailed in the section below.

If eligibility is expanded to provide support to non-electrolytic hydrogen projects, we recognise these use less electricity and so contribute less to system benefits in their siting decisions. However, electricity use by these technologies is not insignificant so they could be rewarded in the same way electrolytic projects would be.

## Additionality

We will continue to incentivise projects that use additional sources of electricity in low carbon hydrogen production. Projects that use additional electricity (as defined by our principles of additionality) will help to reduce electricity system impacts and may help to bring forward new generation that wouldn’t otherwise have been available, or to use excess electricity that would otherwise be wasted.

Lessons learned from HAR1 indicated there would be benefit in more clearly articulating our definition of purpose-built new generation under our principles of additional electricity (all other principles of additionality will remain in place). Therefore, we intend to clarify in the HAR2 guidance that to meet this specific principle, projects must prove that hydrogen production is, or will be, a decisive factor in the specific asset being built (purpose built for hydrogen production). Applications that intend to link to new build electricity generation assets that would otherwise have gone ahead anyway will not meet our definition. As with HAR1, projects that do not meet any additionality principles are not required to provide evidence through the application process, but, in turn, will not be given a score for additionality.

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<sup>11</sup> [Low Carbon Hydrogen Production Business Model: Heads of Terms](#)

## Project location and electricity network constraints

We are minded to expand this criterion beyond additionality to also incentivise and reward projects that deliver wider system benefits by locating in a beneficial area for electricity network constraints.

The electricity network becomes constrained when it is unable to transmit power to electricity users because the maximum capacity of the network is reached. The Electricity System Operator (ESO) manages network constraints by paying generators to turn-down (curtail) in locations where the network is constrained and paying generators to turn-up closer to electricity users. This is costly for electricity consumers and increases emissions. Constraint costs are estimated to increase from between £0.5-1bn per year in 2022 to between £2-4bn per year by 2030.<sup>12</sup>

Network constraints will be an increasing challenge as we transition to net zero because renewable generation is typically located further from electricity users, meaning the network must transmit power further leading to congestion. For example, a high proportion of wind is located in Scotland, yet most electricity demand is in the south of England.

Government is committed to accelerating the building of new transmission network infrastructure to reduce constraints, but flexible solutions can help to reduce the amount of network infrastructure required. Electrolysers could help alleviate network constraints by locating behind network constraints and utilising the generation that would have otherwise been curtailed due to the constraint. Therefore, we propose to score projects based on the impact of their location on the electricity system. Projects that locate behind common network constraints and close to renewable generation will score most highly, whilst projects that locate in front of network constraints and close to large centres of electricity demand will score least highly under this criterion – see figure 1 below. We recognise locating optimally from an electricity system perspective will not be possible for all projects, with many projects needing to prioritise locating close to off-takers and hydrogen transport and storage networks. This is reflected in the proposed weighting of the criteria.

Figure 1 shows the impact of electrolysers 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 21/22<sup>13</sup> 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 Plan<sup>14</sup> in December 2023. We propose that scoring will be based on this map, but the detailed scoring methodology is still under development. We are minded to score projects that have no grid connection at the

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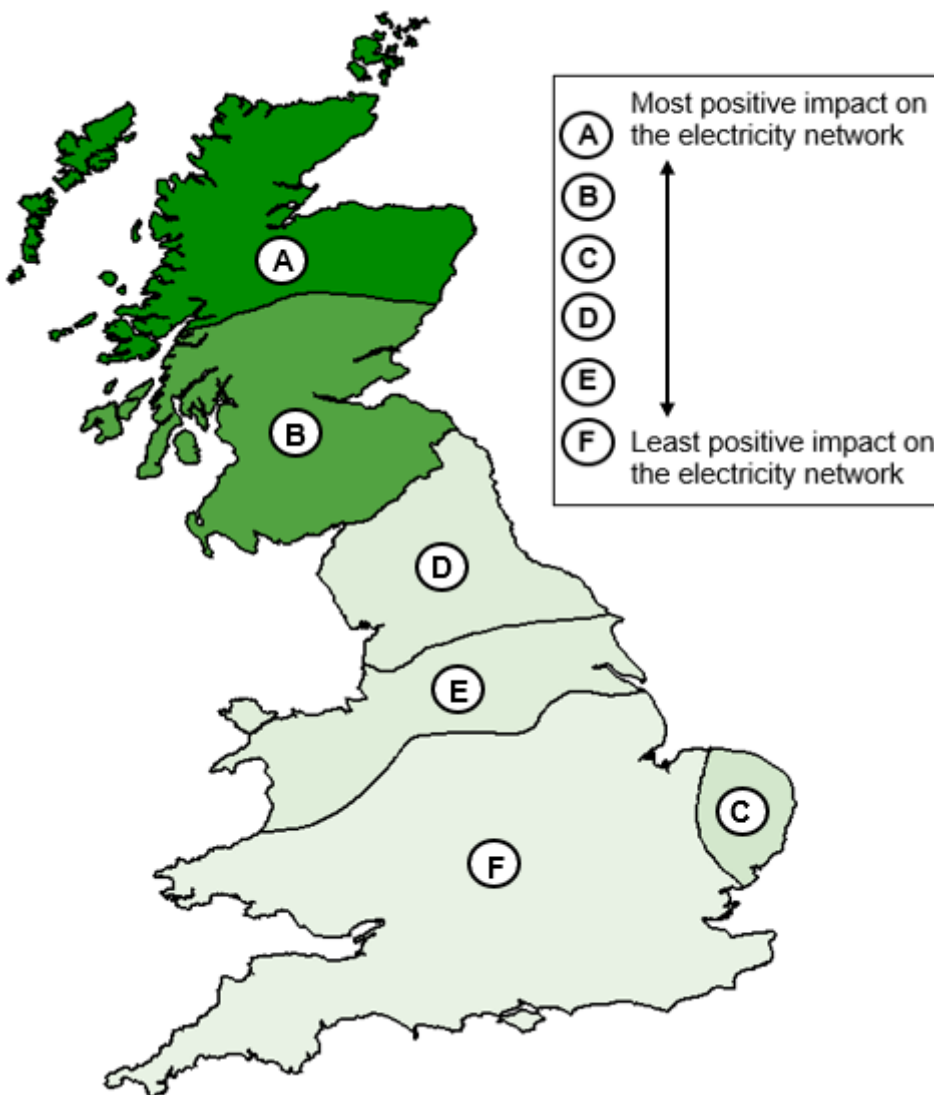
<sup>12</sup> National Grid ESO, 2022, Modelled constraint costs, Figure 1, <https://www.nationalgrideso.com/document/266576/download>

<sup>13</sup> National Grid ESO, 2021/22, Network Options Assessment (NOA), <https://www.nationalgrideso.com/research-publications/network-options-assessment-noa>

<sup>14</sup> National Grid ESO, 2022, ETYS and out future Network Planning Process, <https://www.nationalgrideso.com/research-publications/etys/etys-and-the-network-planning-process>

highest band for locational factors, as they do not exacerbate network constraints and therefore will not have a negative impact on the electricity network. Northern Ireland has a separate electricity system to Great Britain, and we are working with the relevant stakeholders to understand whether the electricity system in Northern Ireland would also benefit from scoring based on location. This is still under development and will be shared at a later date. Note, whilst projects will be scored more highly for this criterion if they locate in a beneficial area for electricity network constraints, projects deploying anywhere in the UK may still apply for HAR2.

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



## Key changes from HAR1

As part of our efforts to streamline the assessment process and following lessons learned from HAR1, we are proposing to remove Carbon Emissions and Environmental Factors and Market Development and Learning as standalone criteria. We remain committed to ensuring that only projects that make a meaningful contribution to the UK's net zero transition and regard environmental impacts are supported, and are confident that the LCHS component of our eligibility criteria will ensure that we only select low carbon projects. We intend to collect information on and assess some elements of these criteria elsewhere within the assessment process, or at later stages of the application process. For example, we intend to ask projects for details on wider environmental risks and mitigations and on plans for future integration into hydrogen infrastructure as part of the deliverability criteria. We also remain interested in projects' commitments to knowledge sharing, and intend to ask projects that are successful in being shortlisted for HAR2 to provide knowledge sharing plans after the shortlisting stage, and we are considering knowledge and information sharing requirements as part of the LCHA.

## Questions

6. Do you agree with the proposed evaluation criteria for HAR2? Yes/No/Don't know. If not, please explain why.
7. Do you agree that we should reward project locations that provide wider electricity system benefits, as set out above, as well as additionality? Yes/No/Don't know. Please explain your answer.

## Section 6: Delivery, Agreeing an offer and Portfolio Factors

As with HAR1, government intends to retain the option to subdivide the shortlist of HAR2 projects into two or more groups, each group entering a separate pathway to agreeing an offer, depending on:

- the number and the makeup of the portfolio of shortlisted projects, with consideration of factors including but not limited to the size (capacity or hydrogen production) of the projects, technology types, their FID and COD, the cost of a project, the deliverability score, the project's ranking at the evaluation stage, and the operating and business models; and
- whether the choice of pathways would enable the government to meet strategic objectives of the round.

Given we are tripling our ambition from HAR1 to support up to 750MWs of capacity via HAR2, we are also considering whether it would be preferable to take a combination of different approaches and timelines to assess and shortlist projects at other stages of the assessment process. This could help streamline the process while ensuring we are able to compare like-for-like projects throughout. We are considering options for delivery of the assessment process which include, but are not limited to:

- grouping projects into pathways from application to contract award, considering the same factors listed above for subdividing projects in the agreeing the offer process
- requiring projects to bid into pre-determined pathways at the point of application. This could include pathways based on the delivery year projects plan to be operational.

### Portfolio factors

In addition to the evaluation process, government will consider how the shortlist of projects perform in combination as a portfolio in order to ensure the appropriate portfolio of low carbon hydrogen projects are taken forward to the next stage. In the course of this process, evaluation scores will remain the key determinant of which projects are shortlisted, however, in specific circumstances, we may decide to select a lower-scoring project where this better achieves the government's objectives (see Section 1) for this allocation round. Portfolio factors may be used across two stages of the allocation round. These are the shortlisting stage and during the agreeing an offer stage.

We do not propose any changes to the list of portfolio factors used for HAR1. The following portfolio factors may be used:

- Size – HAR2 aims to support the production of up to 750MW of low carbon hydrogen production at affordable costs by harnessing economies of scale. Therefore, we may use a project size portfolio factor, for example, to ensure at least some larger scale projects are considered.



- Diversity of end use and electricity source/operating model – We recognise it may be necessary to take steps to address excessive risk in only selecting the highest scoring projects. This portfolio factor would allow assessment of diversity of end uses within the portfolio spread across transport, heat, industry and power generation. It could also assess whether there is a suitable spread of electricity sources from across different providers.
- Location - HAR2 aims to play an important role in supporting and deploying low carbon hydrogen production across the UK. Therefore, this portfolio factor would allow an assessment of locations of different projects to ensure there is a suitable spread across the projects being considered.

## Questions

8. Do you agree with our proposed delivery approach? Yes/No/Don't know. Please explain your answer.

## Section 7: Co-locating with a Government-subsidised renewable electricity source

A large proportion of renewable electricity generators are in receipt of government subsidy through the Contracts for Difference (CfD) and Renewables Obligation (RO) schemes. Low carbon electricity is a key input for low-carbon hydrogen production, therefore, some hydrogen projects may want to purchase electricity from generators supported under these government schemes. Projects are permitted to use electricity produced by generators supported by the CfD or RO schemes, subject to generators meeting respective scheme requirements.

We understand some projects may be planning to ‘co-locate’ the hydrogen production facility with generators, which could potentially help producers reduce costs and facilitate compliance with the LCHS<sup>15</sup>. For the purpose of this document, co-location is where a generator supplies electricity to an electrolyser through a private wire connection. Projects wishing to co-locate with CfD and RO-subsidised generators will need to meet the requirements in the CfD and RO guidance documents. CfD and RO scheme guidance have been updated to ensure applicants have a clear understanding of the requirements that need to be met. Links to these guidance documents can be found below.

The Private Wire CfD guidance will be published shortly here:

<https://www.lowcarboncontracts.uk/index.php/publications/private-network-agreement-generator-guidance>

The CfD co-location guidance is being updated, will be published shortly and will be found here: <https://www.lowcarboncontracts.uk/index.php/publications/cfd-co-location-generator-guidance>

The RO co-location guidance has been updated and published here:

<https://www.ofgem.gov.uk/publications/guidance-generators-co-location-electricity-storage-facilities-renewable-generation-supported-under-renewables-obligation-or-feed-tariff-schemes-0>

However, we want to further understand why projects may choose to co-locate, and identify if there are any barriers to co-locating with a CfD or RO subsidised generator. Therefore, we are seeking information from projects to help us understand the benefits and risks of co-location with a government-subsidised renewable electricity source.

### Questions

9. If you are a project looking to apply for funding for this allocation round, are you planning on sourcing electricity from a CfD or RO-subsidised generator? Yes/No/Don't know.

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<sup>15</sup> Renewable generators emit little to no GHG emissions, helping to meet the LCHS, which requires GHG emissions intensity of 20gCO<sub>2</sub>e/MJLHV or less.

10. If yes, are you planning to co-locate your hydrogen production facility with a CfD or RO-subsidised generator, what do you consider the main benefits and risks of co-location, and what is your project archetype e.g. co-location via private wire connection?

## Section 8: Financing low carbon hydrogen

Multiple funds and partnerships have been established in the UK and EU to accelerate the growth of the hydrogen sector. Here are a few examples<sup>16</sup>:

- Breakthrough Energy Catalyst is a partnership of companies, philanthropists and governments that provides low-cost equity, grants and product purchase commitments to low carbon infrastructure projects. Catalyst and the UK government announced a partnership to support commercial-scale projects in four sectors including clean hydrogen in October 2021.
- HydrogenOne Capital Growth Plc is a publicly listed fund specialising in clean hydrogen, democratising private equity for public shareholders. It was launched in 2021 through an initial public offering (IPO) on the London Stock Exchange (LSE) with mandate to invest for growth across the Organisation for Economic Cooperation and Development (OECD).
- HyCap is a private equity fund that invests across the UK hydrogen value chain. It is backed by a number of large industrial groups including JCB, Ballard, Northern Gas Network, Vedra Partners and Andrew Forest.
- Hy24 is a clean hydrogen infrastructure investment platform. It was created by Ardian and FiveT Hydrogen to accelerate hydrogen's potential for industrial and mobility uses via impact investments.
- The UK Infrastructure Bank (UKIB) is a government-owned policy bank, focussed on increasing infrastructure investment to help to tackle climate change and promote economic growth in the United Kingdom. The bank has identified low carbon hydrogen as one of its investment opportunities in its first strategic plan, published June 2022. It has £18 billion of private sector financial capacity and will provide corporate and project finance and invest across the capital structure, including senior debt, mezzanine, guarantees and equity.

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<sup>16</sup> Please note this is provided for informational purposes only. This does not constitute investment advice and is not an endorsement or recommendation of any funds or their terms and conditions. Please also note that the information is correct as of 3 May 2023, and may be subject to change without notice.

## Summary of Market Engagement questions

1. Should it be available, would you look to seek CAPEX co-funding in HAR2? Yes/No/Don't know. Please explain your answer. If yes, please provide a summary of the reasons for seeking CAPEX support and the impact of not receiving CAPEX support would have on your project.
2. In HAR1, NZHF support was made available for up to 20% of eligible CAPEX costs. If your organisation is likely to apply for NZHF CAPEX co-funding support in HAR2, if possible, please provide the estimated size of bid required to support the deployment of your project. Please present this bid as a percentage of your overall costs.
- 3 Do you agree with the proposed eligibility criteria for HAR2? Yes/ No/ Don't know. If not, please explain why.
4. We are seeking information from biomass or waste gasification and pyrolysis to hydrogen, and solid carbon production projects interested in HAR2 funding, should it be available. We are asking these projects to provide information on the following:
  - Projected hydrogen production capacity of individual projects (MW H2 HHV) and estimated date of commercial operation.
  - Expected load factors for production facilities of these technologies.
  - Fuel input requirements (energy input required to produce a unit of hydrogen output), and proposed source of feedstock.
  - Cost (expected capital and operational costs of producing hydrogen using these technologies).
  - Evidence that these technologies meet TRL 7 or more.
  - Potential for wider environmental impacts from these routes, including consideration of air quality impacts and water requirements.
  - Details of any residues produced by these processes and how these will be managed.
  - For pyrolysis to hydrogen and solid carbon production technologies only, plans for carbon black usage or disposal, and evidence of the environmental impacts associated with this.
5. Are there any other non-electrolytic hydrogen production technologies that we should be considering funding in this round? Yes/No/Don't know. If yes, please provide information on the technology and how they meet eligibility criteria and strategic aims for the round and any information on relevant points listed in question 4.
6. Do you agree with the proposed evaluation criteria for HAR2? Yes/No/Don't know. If not, please explain why.

7. Do you agree that we should reward project locations that provide wider electricity system benefits, as set out above, as well as additionality? Yes/No/Don't know. Please explain your answer.

8. Do you agree with our proposed delivery approach? Yes/No/Don't know. Please explain your answer.

9. If you are a project looking to apply for funding for this allocation round, are you planning on sourcing electricity from a CfD or RO-subsidised generator? Yes/No/Don't know.

10. If yes, are you planning to co-locate your hydrogen production facility with a CfD or RO-subsidised generator, what do you consider the main benefits and risks of co-location, and what is your project archetype e.g. co-location via private wire connection.

## Next Steps

The purpose of this Market Engagement exercise is to seek a broad range of views on the government's proposed approach to HAR2 process.

Projects can contribute to this Market Engagement exercise by responding online via Citizen Space or by attending a workshop. The workshops will take place on Thursday 8 June, Tuesday 13 June and Tuesday 20 June.

We will use the responses to this Market Engagement exercise to help shape the proposed design of the allocation round, with a view to launching the allocation round in Q4 this year, as per the indicative timeline set out in Section 2 of this document.

A publication in the Autumn, setting out a response to this Market Engagement document, will be accompanied by a summary of the responses received to this Market Engagement exercise.

## Annex: Technology Readiness Level (TRL) – Definitions of Levels 1-9

TRL	Definition
TRL 1 – Basic Research	Scientific research begins to be translated into applied research and development.
TRL 2 – Applied Research	Basic physical principles are observed, practical applications of those characteristics can be 'invented' or identified. At this level, the application is still speculative: there is not experimental proof or detailed analysis to support the conjecture.
Applied research and development	
TRL 3 – Critical Function or Proof of Concept Established	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
TRL 4 – Laboratory Testing/Validation of Component(s)/Process(es)	Basic technological components are integrated - Basic technological components are integrated to establish that the pieces will work together.
TRL 5 – Laboratory Testing of Integrated/Semi-Integrated System	The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment.
Demonstration	
TRL 6 – Prototype System Verified	Representative model or prototype system is tested in a relevant environment.



TRL	Definition
TRL 7 – Integrated Pilot System Demonstrated	Prototype near or at planned operational system, requiring demonstration of an actual system prototype in an operational environment.
Pre-commercial deployment	
TRL 8 – System Incorporated in Commercial Design	Technology is proven to work - Actual technology completed and qualified through test and demonstration.
TRL 9 – System Proven and Ready for Full Commercial Deployment	Actual application of technology is in its final form - Technology proven through successful operations.

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This publication is available from: [www.gov.uk/government/consultations/hydrogen-allocation-round-2-market-engagement](https://www.gov.uk/government/consultations/hydrogen-allocation-round-2-market-engagement)

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