Department for Energy Security & Net Zero

Hydrogen production and industrial carbon capture business models

Government response to the consultation on revenue support regulations relating to directions to a counterparty, publication of information and eligibility

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Contents

Executive summary

Low carbon hydrogen and carbon capture, usage and storage (CCUS) have a key role in the UK's Net Zero Strategy[1] and helping meet our legally binding commitment to achieving net zero by 2050.

In April 2022, the British Energy Security Strategy[2] re-stated the government's ambition to deliver CCUS in four industrial clusters and capture and store 20-30 megatonnes of carbon dioxide ($MtCO_2$) per year by 2030, where industrial emissions make up 6 $MtCO_2$ by 2030, increasing to 9 $MtCO_2$ by 2035. We also doubled our hydrogen production ambition to up to 10GW of low carbon hydrogen production capacity by 2030, subject to value for money and affordability, with at least half of this coming from electrolytic hydrogen. The Powering Up Britain publications (Net Zero Growth Plan and Energy Security Plan)[3] published in March 2023 provided an update on how we are delivering against these ambitions.

The introduction of business models for low carbon hydrogen production and industrial carbon capture to unlock private investment and scale up deployment of these technologies will play a key role in delivering the government's ambitions.

In this publication, we summarise the responses received to each of the 21 questions in the consultation on revenue support regulations for the Hydrogen Production and Industrial Carbon Capture Business Models and outline our government position for the regulations.

Secretary of State direction

We outline the approach on the process by which the Secretary of State may issue directions to a counterparty to offer to contract. We confirm that we intend to proceed with our proposals following support from the majority of respondents.

Publication of Information

We outline wide support from respondents to require a counterparty to publish the signed contracts and establish a public register containing key project information. Some concerns were raised with regards to publishing certain components of the hydrogen production strike price which could reveal commercially sensitive information. We confirm that we intend to proceed with our proposals except for removing the requirement to publish the 'Production Cost' component of the Strike Price and the 'Strike Price Deduction' to address the concerns raised, as well removing the requirement to publish the Non-Variable Costs Strike Price.

[1] www.gov.uk/government/publications/net-zero-strategy
[2] www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy
[3] www.gov.uk/government/publications/powering-up-britain

Revenue support counterparty's ability to carry out its functions

We cover proposals for a revenue support counterparty to provide early notification to the Secretary of State if it considers it is, or it is likely to be, unable to fulfil its functions. We clarify that this is in addition to provisions in the Energy Act 2023 to put in place transitional measures to help ensure the smooth transition from one revenue support counterparty to another. We received majority support for this proposal, with respondents agreeing that the importance of a counterparty necessitated a provision of this kind, and we therefore intend to proceed with the proposal.

Low carbon hydrogen producer eligibility

We cover proposals for the approach to determining the eligibility of a low carbon hydrogen producer. We intend to proceed with the proposals to support new production facilities as well as new production capacity added to existing facilities, and to require projects to demonstrate the ability to meet the "live" UK Low Carbon Hydrogen Standard, as it has effect at the time of application.

Carbon capture entity eligibility

We cover the proposals for carbon capture entity eligibility and specifically the proposed exclusions to certain categories of carbon capture entities from being eligible. We intend to take forward the first proposed exclusion relating to certain power generation facilities, with exemptions for combined heat and power and energy recovery generating stations (referred to more specifically in the consultation as energy from waste facilities). We do not intend to proceed with the second proposed exclusion relating to already operational CCS plants, in light of responses received to the consultation highlighting potential unintended consequences of the proposal.

Introduction

Background

Low carbon hydrogen and carbon capture, usage and storage (CCUS) have a key role in the UK's Net Zero Strategy[4] and Net Zero Growth Plan[5] in helping meet our legally binding commitment to achieving net zero by 2050.

The Hydrogen Production Business Model (HPBM) is intended to incentivise the production and use of low carbon hydrogen through the provision of revenue support to overcome the cost gap between low carbon hydrogen and higher carbon counterfactual fuels.

The Industrial Carbon Capture (ICC) and Waste ICC business models (the "ICC business models") aim to incentivise the deployment of carbon capture technology by industrial users and waste management facilities which often have no viable alternative to achieve deep decarbonisation.

The Energy Act 2023 ("the Act"), which received Royal Assent on 26 October 2023, contains provisions to underpin delivery of the hydrogen production and ICC business models.

Section 57 of the Act confers a power on the Secretary of State to make revenue support regulations about revenue support contracts, which include hydrogen production revenue support contracts and carbon capture revenue support contracts.

Revenue support is intended to be delivered through a private law contract between an eligible low carbon hydrogen producer or eligible carbon capture entity and the hydrogen production counterparty or carbon capture counterparty respectively. For the HPBM, the hydrogen production revenue support contract is more commonly known as the Low Carbon Hydrogen Agreement (LCHA) outside of the legislation. Similarly, carbon capture revenue support contracts for the ICC business models are referred to as the Industrial Carbon Capture and the Waste Industrial Carbon Capture Contracts (the "ICC Contracts").

In March 2023, the government published a consultation on legislative provisions considered necessary to be in place to be able to enter into revenue support contracts. The consultation set out proposals on the following matters relating to the HPBM and ICC business models:

- **Direction to offer to contract**: the process by which the Secretary of State may direct a counterparty to offer to contract.
- **Information publication**: requirements that certain information about contracts and projects must be published.

[4] www.gov.uk/government/publications/net-zero-strategy
[5] www.gov.uk/government/publications/powering-up-britain/powering-up-britain-net-zero-growth-plan

- **Eligibility**: the meaning of “eligible” in relation to a low carbon hydrogen producer and carbon capture entity to determine the type of projects that could be supported through the business models.

The consultation ran from 30 March 2023 to 10 May 2023 and received 28 responses.

Working with the devolved administrations

The Department will continue to work with the devolved administrations to ensure that the proposals take account of devolved responsibilities and policies across the UK to facilitate successful deployment.

Next steps

The government is grateful to those who took the time to respond to the consultation. We intend to deliver these revenue support regulations as soon as departmental and Parliamentary timelines allow, enabling business model contracts to be awarded.

Analysis of responses received to the consultation

This government response outlines the consultation proposals, provides a high-level summary of the stakeholder responses to the consultation questions, highlighting some of the key comments from respondents on the proposed revenue support regulations, and the government’s response to each individual question.

Respondents engaged with the consultation in different ways, some responded to the consultation questions through Citizen Space, while others submitted a response via email. Some respondents did not structure their responses around the specific questions posed, therefore the government has sought to consider those responses by reference to the consultation question/position that they are considered most suited to.

Responses to each of the consultation questions were analysed individually, before being grouped into clear themes, then summarised and anonymised. Responses that did not explicitly express their support or disapproval for the specific question were logged but classified as neither supportive nor non-supportive. Where information provided by a respondent related to a different question, we have summarised it under that other question.

Throughout this document we have used the following terminology:

- ‘Majority’ indicates the view of more than 50% of respondents in response to that question.
- ‘Minority’ indicates the view of fewer than 50% of respondents in response to that question.
- ‘About half’ indicates an overall response within a few percentage points of 50% (either way).

- ‘Many respondents’ indicates more than 70% of those answering the particular question.
- ‘A few respondents’ means fewer than 30%.
- ‘Some respondents’ refers to the range in between 30% and 70%.

Consultees

The Act places a statutory obligation on the Secretary of State to consult certain persons in certain circumstances before making revenue support regulations.

Section 85(1) of the Act requires the following persons to be consulted:

- the Scottish Ministers, if the regulations contain provision that would be within the legislative competence of the Scottish Parliament if it were contained in an Act of that Parliament;
- the Welsh Ministers, if the regulations contain provision that would be within the legislative competence of Senedd Cymru if it were contained in an Act of the Senedd (ignoring any requirement for the consent of a Minister of the Crown imposed under Schedule 7B to the Government of Wales Act 2006);
- the Department for the Economy in Northern Ireland, if the regulations contain provision that—
    - would be within the legislative competence of the Northern Ireland Assembly if it were contained in an Act of that Assembly, and
    - would not, if it were contained in a Bill in the Northern Ireland Assembly, result in the Bill requiring the consent of the Secretary of State under section 8 of the Northern Ireland Act 1998;
- such other persons as the Secretary of State considers appropriate.

The consultation ran for six weeks, and the government received 28 responses from organisations (including hydrogen and CCUS trade associations, potential hydrogen producers and carbon capture entities and the wider supply chain), and members of the public, all of which have been considered. For a full list, see ‘List of respondents to the consultation’.

Government response to the consultation

Secretary of State direction to offer to contract

Question 1

1. Do you agree with the proposals relating to the Secretary of State's power to direct a counterparty to offer to contract? Please provide reasons for your response.

Consultation position

The consultation set out the proposed process for how the Secretary of State may issue a direction to a counterparty to offer to contract with an eligible low carbon hydrogen producer or eligible carbon capture entity, including requirements for the direction to be in writing and that it specify a compliance date. The consultation also outlined the proposed scenarios under which a direction would cease to have an effect, including a proposal to also allow the Secretary of State to revoke a direction to offer to contract at any point before an offer to contract has been accepted. We also proposed that a counterparty would not be permitted to modify the specified terms when making an offer to contract unless it has received the prior written consent of the Secretary of State.

The proposals followed a similar approach to regulations 57 to 59 of the Contracts for Difference (Allocation) Regulations 2014 (as amended) and regulations 37 and 39 of the Nuclear Regulated Asset Base Model (Revenue Collection) Regulations 2023.

Summary of stakeholder responses to Question 1

Response summary	#
Agree with overall approach	18
Responded with 'don't know'	2
Did not agree with overall approach	1
Not answered or unclear	7

We received 21 responses to this question where many respondents agreed with the proposals.

The main reason cited by respondents was that they follow a similar approach to other similar regulations, namely those for the Contracts for Difference (CfD) scheme, which is established and well understood by industry and investors. Three respondents welcomed the clarity and transparency that would be provided by regulations setting out the process of how contracts will be awarded to encourage industry to engage with the process. One respondent also supported the flexibility to allow allocation of support outside of any future competitive allocation processes, such as major and/or novel one-off projects.

Four respondents requested further clarification on the proposal for the Secretary of State to be able to revoke a direction to offer to contract; they also asked for detail on the circumstances in which the Secretary of State may choose to revoke such a direction and what the process might be if such a decision were to be challenged (i.e., by the hydrogen producer or carbon capture entity). One respondent felt that the power to revoke a direction presents uncertainty to investors, and argued it is not needed given there may be as little as 20 working days between the offer to contract and deadline to accept. The respondent suggested that the right to revoke should only be executed under specific circumstances, such as a fundamental change.

Two respondents made recommendations on the offer to contract process. One respondent felt that the HPBM should include a process for agreeing 'minor and necessary' changes to allow for project specific circumstances, following the precedent in the CfD regime. Another, who disagreed with the proposal, suggested that there should be a mechanism for the hydrogen producer or carbon capture entity to provide a counteroffer to provide additional flexibility to support project delivery given the interdependencies, for example interconnected contracts with funder/investor involvement (within a Private Finance Initiative structure) for the waste sector.

Government response

With support from the majority of respondents, we consider it appropriate to proceed with our proposals for revenue support regulations relating to the Secretary of State's power to direct a counterparty to offer to contract. It should be noted that we have elected to include an additional requirement that a direction must specify the name of the eligible low carbon hydrogen producer or eligible carbon capture entity (and its registered number if it is a company) with whom a counterparty is required to offer to contract. Whilst it would be implicit that this is required to be included in a direction, this is intended to make it clear.

We note the concerns raised by individuals on aspects of the proposals which are addressed below.

Minor and necessary changes to the contract terms

As set out in the consultation, initial business model contracts are expected to be negotiated between the Secretary of State and the relevant hydrogen production, ICC or Waste ICC project. Once this process is completed and the terms agreed between the parties, the Secretary of State would issue a direction to the relevant revenue support counterparty to offer to contract with the eligible low carbon hydrogen producer or eligible carbon capture entity using the powers in sections 66(1) and 68(1) of the Act.

We recognise the potential need for the terms of the revenue support contract to accommodate bespoke requirements for early and/or novel one-off projects. In such cases, we expect that negotiations between projects and the Secretary of State will take place prior to the offer to contract process, and this is where any amendments to the terms offered could be made. We therefore do not believe it is necessary to include a 'minor and necessary change' process in

revenue support regulations for contracts awarded through the Secretary of State direction process.

A move to a more price-based competitive allocation process is expected to necessitate the standardisation of the hydrogen production and ICC carbon capture revenue support contract terms and conditions, and market participants would need prior understanding of those terms. The Act includes provision in section 78 enabling the relevant counterparty, in accordance with revenue support regulations, to agree minor and necessary modifications to standard terms with applicants on a case-by-case basis before any offer to contract is made further to an allocation notification (see sections 75 and 77).

We are currently reviewing responses to our call for evidence on price-based competitive allocation for electrolytic projects and potentially other specified non-CCUS projects, which closed on 11 August, to inform our next steps. We will consider how to evolve our approach towards more competitive allocation processes for ICC and CCUS-enabled hydrogen projects once market conditions allow.

Power to revoke a direction

The power to revoke a direction is intended to be used to manage unforeseen circumstances that may arise after the issuance of a direction.

For example, if a modification to the contract terms is proposed by government, a counterparty, or a project after a direction has been issued and is considered appropriate to make, the revocation power can help ensure that modification can be made whilst also ensuring only a single, valid direction and offer of contract in respect of a project is in effect at any time.

Whilst this could result in contract terms being changed following an extensive negotiation process, we do not expect to have to use this power in the majority of cases and would not expect changes to be material. We consider setting out a clear process to account for such circumstances outweighs the low risk that it could impact investor confidence. The power to revoke can only be exercised before the offer to contract has been accepted by the eligible low carbon hydrogen producer or carbon capture entity. This follows a similar approach to that taken in regulation 39 of the Nuclear Regulated Asset Base Model (Revenue Collection) Regulations 2023.

Publication of Information

Questions 2 and 3

2. Is there any information not listed in Table 1 you think should be published in a contract register?

3. Is there any information in the contracts you think should not be published?

Please provide reasons to support your responses.

Consultation position

It was proposed that revenue support regulations mandate a counterparty to publish each hydrogen production and ICC carbon capture revenue support contract entered into pursuant to a direction to offer to contract by the Secretary of State, ensuring that any confidential information and personal data is excluded. We proposed that certain terms are not to be treated as confidential information. The consultation also proposed to require a counterparty to establish and maintain a public register that would contain key project information to ensure important information on these contracts are readily accessible, following a similar approach to regulation 12 of the Contracts for Difference (Standard Terms) Regulations 2014 (as amended).

Summary of stakeholder responses to Question 2

Response summary	#
Agree with overall approach (no further information to publish)	17
Responded with ‘don’t know’	1
Did not agree with overall approach (further information to publish)	5
Not answered or unclear	5

We received 23 responses to this question where many respondents said they did not have any further information they'd like to see published in a contract register.

A few respondents requested more clarity on the information to be published to ensure that regulations would not mandate sensitive and confidential information to be published. Five respondents requested additional information to be included in the contract register:

- Outturn volumes i.e., the amount of hydrogen produced, or carbon stored against which payment is made for each contract.
- CO_2 capture rates, CO_2 capture quantity and low carbon hydrogen carbon intensity estimate for low carbon hydrogen projects to have a consistent approach with the ICC business models.

- Contextual information of CO_2 capture rates to provide the relevant circumstances of different capture plants.
- A greater degree of granularity for the initial and current strike price as well as clarity on how frequently the current strike price will be updated.
- Project duration and lessons learnt, and an estimate of the maximum annual CO_2 captured.
- Connection arrangement (e.g., grid connection or co-located) should be included (for hydrogen projects), and a map to show the location of a project.
- Measurement quality statements on the methodology and technology for detecting and quantifying the hydrogen or CO_2 to help ensure measurement data is traceable and best practice is followed.

A few respondents suggested alignment with wider reporting mechanisms, specifically that any publication of CO_2 T&S network fees should be linked to Ofgem data disclosure and reporting to ensure consistency, and how reporting would work with Carbon-14 reporting for Waste ICC Contracts.

Summary of stakeholder responses to Question 3

Response summary	#
Agree with overall approach (no further information to publish)	12
Responded with 'don't know'	1
Did not agree with overall approach (exclude certain information from being published)	10
Not answered or unclear	5

We received 23 responses to this question, where the majority of respondents did not believe there were any information in the contracts that should not be published, however a minority raised specific concerns.

Whilst a few respondents commented on the importance of ensuring transparency, some respondents stated that commercially sensitive and confidential information should not be published. One respondent commented on the importance of giving project developers sufficient opportunity to identify any confidential information before the Secretary of State forms their opinion on what they deem to be confidential. Another added that any information pertaining to project specific commercial arrangements shared as part of the bilateral contract negotiations should not be published. Another suggested that the government should provide guidance for the publication of more detailed information by the projects themselves than what is required for the publicly available contract register.

A few respondents highlighted specific information in relation to the HPBM that they considered to be commercially sensitive and therefore should not be published. These respondents stated that publishing such information could impact the ability of hydrogen

producers to negotiate contracts with offtakers and suppliers. This included the following in relation to hydrogen projects:

- Achieved Sales Price (ASP) should not be published or at least should be anonymised or amalgamated for early projects.
- Return on investment should not be disclosed or alternatively a range could be published, rather than a defined figure.
- Sliding Scale Top Up Amount (SSTUA) should not be disclosed as it could affect negotiations with offtakers during times of low utilisation or when agreeing take-or-pay provisions. It could also prevent price discovery.
- Split of costs within the strike price should not be published, nor the strike price deduction for CCUS-enabled projects in the event of CO_2 T&S outage.

Some respondents requested further clarity on the government's rationale for publishing certain information for hydrogen projects:

- The different treatment of electrolytic and CCUS-enabled projects, specifically publishing input fuel costs only for CCUS-enabled projects, which would leave them more commercially exposed than electrolytic projects.
- Publishing the component parts of the strike prices which differs to the approach of CfDs and could risk disclosure of sensitive information.
- The purpose of disclosing the Strike Price Deduction with an alternative suggestion to publish a total cost as part of the CO_2 T&S information, rather than on project basis, if the aim is to show the cost to the taxpayer of a CO_2 T&S network being down.
- The purpose of disclosing the Production Cap given that the facility may produce more than the cap.
- How the Initial Strike Price and Non-Variable Costs Strike Price are to be defined to determine whether they should be published.

Government response

The aim of the information publication proposals is to provide information and data in a transparent and open way to help ensure the business models are better understood by members of the public, prospective applicants and investors, and wider actors in the energy markets.

Contract publication

We will proceed with our proposal to require a counterparty to publish each hydrogen production and ICC carbon capture revenue support contract once the contract is entered into following a direction from the Secretary of State. As set out in the consultation, when publishing each contract, we are mindful of the need to ensure sensitive information is not disclosed and proposed to align the definition for confidential information with the Contracts for Difference (Allocation) Regulations 2014.

To deliver this objective, we have elected to require a counterparty to redact any parts of a contract which contain personal data and which the Secretary of State by notice in writing requires the hydrogen production counterparty to redact. The Secretary of State may only give a notice where the Secretary of State considers that information constitutes a trade secret, or the disclosure of which would either be likely to be harmful to the commercial interests of any person or would constitute an actionable breach of confidence.

In the consultation, we proposed that confidential information would also be defined to mean information in relation to which it is an initial term of the revenue support contract that it must not be disclosed. We intend to proceed with this proposal for the ICC business models. To deliver this objective for the HPBM, we have elected to require a counterparty to redact any parts of the contract which a term of the contract provides should be redacted from the contract as published.

We intend to proceed with the proposal that regulations make it clear that the Strike Price, Capex Payment Rate and Reference Price[6] would not fall within the definition of confidential information and should therefore be published as part of the contract.

Register of contracts

We will proceed with the proposal to require a counterparty to establish and maintain a public register of contracts to ensure key project information is readily accessible. We do not intend to require publication of the additional information in the register suggested by respondents as we do not consider that level of detail to be appropriate. The register is intended as a reference point to enable essential and up to date key project information to be readily accessible. In reference to specific suggestions made by respondents:

- Lessons learnt, for example, would not be suitable due to the level of detail that would be required for it to be useful.
- We do not intend to require the publication of outturn volumes or CO_2 capture quantity data as this could be considered commercially sensitive.
- We do not intend to require the publication of grid connection arrangements (for hydrogen production projects) as this is considered too detailed for the register, which is intended to only contain key project information.
- We do not intend for the regulations to require CO_2 transport and storage (T&S) fees, for both CCUS-enabled hydrogen and ICC projects, to be published in the contract register. This information is expected to be published separately by the CO_2 T&S Company as required by the CCS Network Code[7] and therefore it is not considered necessary to duplicate the information in the contract register.

Stakeholders raised other information that should be included on the register, for example, CO_2 capture rates and the carbon intensity of low carbon hydrogen produced. Understanding how to include such metrics requires further consideration and we will keep these under review.

[6] The Capex Payment Rate and Reference Price only applies to ICC and Waste ICC contracts.
[7] CCS Network Code Indicative Heads of Terms December 2022

The list of information required to be published (where applicable) in a contract register is set out in Table 1, with some items removed after considering consultation responses (explained further below). For the definition of these terms please refer to the published LCHA[8] and the ICC Contracts[9]. A short description is also provided in the glossary.

The information set out in Table 1 should be considered the minimum information that is required to be published in a register for LCHAs and ICC Contracts. It is intended that the counterparty would have the flexibility to choose to enter onto the register any other information they consider would facilitate the administration of revenue support contracts, subject to the confidentiality provisions of the LCHA and ICC Contracts and other requirements in regulations.

Table 1: Information to be published in a register for LCHAs, ICC and Waste ICC Contracts

Area	Information required
General details	• Unique identifier of the contract, to be assigned by a counterparty • Name of the Facility/Installation, including the geographical coordinates • Applicant name, applicant registered address, and registration number (where applicable)
Contract milestone dates	• Target Commissioning Date • Target Commissioning Window Start and End Date • Start Date (Expected and Actual) • Longstop Date • Termination Date

Payment	• Initial Strike Price
	• Current Strike Price
	• For ICC & Waste ICC projects:
	  ○ Capex Payment Rate
	  ○ Reference Price
	• For HPBM projects (where applicable for an electrolytic or CCUS enabled projects), the following permutations and/or components of the strike price:
	  ○ Hydrogen Transport Infrastructure costs
	  ○ Hydrogen Storage Infrastructure costs
	  ○ Non-Gas Strike Price
	  ○ Gas Reference Price
	  ○ Natural Gas Cost Multiplier

[8] www.gov.uk/government/publications/hydrogen-production-business-model
[9] www.gov.uk/government/publications/carbon-capture-usage-and-storage-ccus-business-models

Area	Information required
LCHA Project Information	• Facility Hydrogen Production Technology • Facility feedstock • CO_2 Transport and Storage Operator • Initial Installed Capacity Estimate • Final Installed Capacity • Initial LCHA Sales Cap • LCHA Sales Cap following determination of Final Installed Capacity commissioned
ICC Project Information	• Installation Capture Technology • Industrial Installation Technology • CO_2 Transport and Storage Operator • Maximum Annual CO_2 Capture Quantity • CO_2 Capture Rate Estimate
Waste ICC Project Information	• Installation Capture Technology • Waste Installation Technology • CO_2 Transport and Storage Operator • Maximum Annual CO_2 Capture Quantity • CO_2 Capture Rate Estimate

We have elected to make minor changes to the information required to be published in a register:

- We will include the name of the Facility/Installation, rather than a description as we think this would be more helpful, and the Facility Hydrogen Production Technology / Installation Capture Technology (and for the HPBM, facility feedstock) are already included separately in the register.
- We will not publish changes to the strike price, as this can easily be calculated using the Initial Strike Price and Current Strike Price.

ICC and Waste ICC Contract Information

Other than the changes mentioned above, we intend to take forward all the other consultation proposals in full for the ICC and Waste ICC contracts.

LCHA Project Information

We proposed to publish the cost components that make up the Strike Price of projects supported under the HPBM to promote transparency on the makeup of revenue support and to highlight the different factors that affect electrolytic and CCUS-enabled projects, to help

potential investors to plan accordingly. Unlike the electricity market, the hydrogen market is still at a very early stage of development. Accordingly, we think that it is in the public interest to give an indication of the drivers of the cost of hydrogen by breaking down the strike price in this way.

The HPBM may support hydrogen transport and storage on a case-by-case basis. Where such support is provided, a counterparty will be required to publish the estimated level of support attributed to hydrogen transport and storage infrastructure as a component of the Strike Price. Without publishing these components of the Strike Price, it may not be apparent why there might be a difference in the strike price of similar projects.

We have taken into account responses related to the HPBM which requested not to publish the Production Cost component of the Strike Price and the Strike Price Deduction[10] (which relates to a project's return on investment) to remove the risk of disclosing commercially sensitive information.

On further consideration we have also decided not to mandate the Non-Variable Costs Strike Price to be included in a public register. The Non-Variable Costs Strike Price represents the fixed costs of a project and is used to inform the Sliding Scale Top Up Amount.[11] The Sliding Scale Top Up Amount would only apply if certain conditions were met, i.e., when there is a significant reduction to offtake/sales volumes as a direct result of a qualifying event. Therefore, we do not consider it to be essential information that needs to be captured in a register. The information can be still accessed in the contract (in the LCHA Front End Agreement) to the extent not subject to redactions.

For CCUS-enabled hydrogen projects, we proposed that the production costs element of the Strike Price would be split by the natural gas cost component (including the agreed proportion of hydrogen to natural gas based on the Facility's design efficiency) and the non-gas (all other costs) component. The natural gas cost component, defined as the Natural Gas Strike Price in the LCHA, is a product of the Gas Reference Price and the Natural Gas Cost Multiplier. To improve transparency, regulations will require the contract register to include both the Gas Reference Price (or the source of information used to determine it) and the Natural Gas Cost Multiplier components so it is clear how the Strike Price for CCUS-enabled hydrogen projects is calculated. These values can easily be used to calculate the natural gas cost component.

The consultation did not propose to publish the SSTUA in the contract register as we consider this to be sensitive information. The consultation also did not propose to publish details of actual costs or payments in the contract register, such as input fuel costs, or the ASP where we are awaiting a higher level of hydrogen market maturity before deciding whether and how to make this information available. We would note that neither the SSTUA nor the ASP are currently stated in the LCHA, which just contains the formulae for calculating them.

[10] This refers to the "CO2 T&S Outage Relief Event Strike Price Deduction" as defined in the LCHA.
[11] The volume support provided to the producer for qualifying volumes of hydrogen sold when offtake volumes fall below 50%.

We have elected to change the name of ‘Production Cap’ to the ‘LCHA Sales Cap’. This has the same meaning and indicates the potential production volumes and maximum revenue support a hydrogen production project could receive.

As per our proposals in the consultation, we intend for regulations to:

- require a counterparty to exclude from publication information on the expected Start Date where a hydrogen producer makes a request in writing, and if a counterparty considers it would be entitled not to disclose in response to a request for its disclosure under the Freedom of Information Act 2000 or the Environmental Information Regulations 2004. A counterparty must give the other party the opportunity to make representations before deciding what information to exclude from publication.
- require a counterparty, so far as it is reasonably practicable, to ensure that entries in the register are accurate. To ensure that entries are accurate and up to date, the Expected Start Date will be required to be updated every quarter (where applicable), in line with the approach taken by CfDs. Regulations for the HPBM will require information on the Strike Price to be updated monthly to reflect how often this value could change. Currently, the LCHA applies an annual indexation to the Strike Price for electrolytic projects and monthly indexation for CCUS-enabled projects.

Revenue support counterparty's ability to carry out its functions

Question 4

> 4. Do you agree with the rationale for including a requirement in regulations on the relevant counterparty to promptly notify the Secretary of State at the point that it considers that it may become unable to carry out its functions (in addition to the formal 3-months' notice period in the Bill)? Please provide reasons for your response.

Consultation position

The consultation outlined the importance of having a consistent flow of revenue support for hydrogen producers and carbon capture entities and the role of a hydrogen production or carbon capture counterparty to administer payment. We therefore proposed that a hydrogen production or carbon capture counterparty should be required by regulations to promptly notify the Secretary of State at any point that it considers it may be, or become, unable to carry out its functions. This would enable the Secretary of State to have early sight of potential issues and could provide additional time to source a replacement, if needed.

This requirement is in addition to the provision in section 81 of the Act that requires a counterparty to provide not less than three months' notice if they wish to withdraw consent to being a designated hydrogen production or carbon capture counterparty. Under the same section, regulations may make provision enabling a person who has ceased to be a hydrogen production or carbon capture counterparty to continue to be treated as such, including provision about the circumstances in which and the period for which they may be treated as such.

This can enable a smooth transition to help ensure projects will continue to receive timely payments.

Summary of stakeholder responses Question 4

Response summary	#
Agree with overall approach	14
Responded with 'don't know'	3
Did not agree with overall approach	2
Not answered or unclear	9

There were 19 responses to this question, where the majority agreed with the proposals. Respondents welcomed the requirement to provide early notification, and for processes to be in place to help ensure the counterparty role is adequately fulfilled to provide a secure and consistent flow of revenue support.

A few respondents felt more detail could be provided on the process, including what happens after a notice is given. One respondent also felt the proposal could go further by setting out monitoring arrangements.

Two respondents felt that the three months' notice period in the Act is too short to provide industry with any certainty given the specific expertise required to manage the contracts. They suggested extending the minimum notice period to six months or incentivising early disclosure by making the obligation to inform the Secretary of State stronger or provide more clarity on the exiting counterparty's obligations and liabilities until a new counterparty is in place.

Government response

We note the strong support from respondents and intend to proceed with our proposed approach for regulations to require a counterparty to provide early notification if it is, or considers that it is likely to become, unable to fulfil its functions as revenue support counterparty.

We have noted concerns raised by respondents to clarify the process after a notification is given and that a three-month notice period is too short to provide assurance to industry. As set out above, the Act already includes a power in section 81 to make provision in regulations about the circumstances in which, and the period for which, a person who has ceased to be a revenue support counterparty would continue to be treated as such a counterparty. Although the Act requires a minimum three-month notice period, this is not necessarily the period within which the revenue support counterparty would cease to carry out their functions. We are not planning to exercise the power in section 81 as part of these regulations but will consider putting in place any further regulations should it be considered appropriate in due course.

We also intend to proceed with our proposal for a counterparty, having notified the Secretary of State of an inability to carry out its functions, to provide any further details as requested by the Secretary of State. We intend to achieve this by requiring a counterparty to provide such assistance as the Secretary of State may require with a view to securing the performance of that function, for example by the provision of information.

Low carbon hydrogen producer eligibility

New facilities built specifically for producing hydrogen

Question 5

5. Do you agree with the proposal that new hydrogen production capacity added to an existing production facility would be eligible for support? Please provide reasons for your response.

Consultation position

The consultation proposed that in addition to new low carbon hydrogen production facilities – that is, a facility which is 'not already operational or under construction' - new production capacity to be added to existing facilities would also be eligible for revenue support. We did not intend to set any production capacity limits or thresholds in revenue support regulations to provide the flexibility to target support to both large- and small-scale facilities, to be determined on an allocation round by allocation round basis.

Summary of stakeholder responses to Question 5

Response summary	#
Agree with overall approach	24
Responded with 'don't know'	0
Did not agree with overall approach	0
Not answered or unclear	4

We received 24 responses to this question and all respondents agreed with the proposal that new capacity added to an existing production facility should be eligible for support.

Where respondents provided further comments, some felt this could deliver better value for money from the utilisation of existing infrastructure and skills, compared with building an entirely new facility. A few respondents mentioned that this approach would allow phased projects to be eligible, noting the challenges associated with building capacity in the first instance, and helping producers to match supply with demand over time.

A few respondents raised the importance of setting out clear criteria and definitions. This included that any definitions for "new" capacity should not include facilities that are partially constructed or those where capital investments have already been made. One respondent stated that any definition of a "facility" should not prohibit the sharing of ancillary facilities, equipment, or transport and storage infrastructure with any new production capacity added to the site.

Other comments included:

- That it may be suitable to treat new production capacity at existing production facilities in its own category, for example in a separate allocation pot.
- That there should be a flexible approach whereby plant extension/refurbishment that does not result in large increases in capacity, and where offtakers remain the same, may be eligible for an ICC Contract.

Government response

We note the strong support from respondents for new low carbon hydrogen production capacity added to existing facilities to be eligible for support and will proceed with this proposal.

As set out in our government response to the design of a business model for low carbon hydrogen consultation[12], existing producers of hydrogen looking to retrofit using CCUS technology will not be eligible for support through the HPBM but may be eligible to apply for support through the ICC business models.

Regulations for the ICC business models will not specifically exclude hydrogen production facilities from eligibility and so they may be eligible for support through the ICC business models, subject to relevant eligibility criteria being met. We will continue to consider the interactions between the hydrogen production and ICC business models. Projects will be considered on a case-by-case basis, subject to individual allocation round requirements.

Producer requirements

Question 6

> 6. Do you agree with the proposals for the type of entities that can be party to a LCHA? Please provide reasons for your response.

Consultation position

We proposed for regulations to build upon the definition in the Act to clarify that a “low carbon hydrogen producer” would include an entity that intends to carry on activities of producing hydrogen in relation to an eligible hydrogen production facility, an entity that intends to operate or to participate in the operation of such an eligible producer’s eligible hydrogen production facility, or an entity that is a corporate body associated with such entities (where “associated” has the same meaning as it has in section 67 of the Energy Act 2008).

[12] www.gov.uk/government/consultations/design-of-a-business-model-for-low-carbon-hydrogen

Summary of stakeholder responses to Question 6

Response summary	#
Agree with overall approach	19
Responded with ‘don’t know’	1
Did not agree with overall approach	0
Not answered or unclear	8

We received 20 responses to this question where many respondents agreed with the proposals on the types of entities that would be eligible for support. One respondent cited that this would encourage a broad range of entities to apply, and another mentioned that this would follow the approach taken by similar, existing regulations.

Government response

The HPBM is designed to provide revenue support to hydrogen producers, delivered through a private law contract (the LCHA) between a counterparty and a hydrogen producer. Contracts are intended to be signed with the organisation responsible for developing and delivering the project.

We have considered our proposals against the definition of a “low carbon hydrogen producer” in the Act, that is “a person who carries on (or is to carry on) in the United Kingdom activities of producing hydrogen which in the opinion of the Secretary of State will contribute to a reduction in emissions of greenhouse gases”.

We consider this to be sufficiently broad to capture persons that intend to carry on activities of producing hydrogen and those who intend to operate or to participate in the operation of a hydrogen production facility. On further consideration we do not consider the definition of "low carbon hydrogen producer" in the Act would allow associated corporate bodies to fall in scope as they would not actually be carrying on activities of producing hydrogen and therefore, we will no longer be proceeding with that specific proposal. However, we do not expect this will materially restrict the type of entities and projects that we expect would be applying for support and expecting to be party to the contracts.

Support a range of hydrogen production pathways

There are a variety of ways to produce low carbon hydrogen including the use of more developed technologies, such as electrolysis and CCUS-enabled methane reformation, or novel approaches currently under development.

The consultation proposed three options for determining the meaning of “eligible” in relation to a “low carbon hydrogen producer” in revenue support regulations in accordance with section 66(4) of the Act. These options were considered to support the aim of the HPBM to support a range of hydrogen production pathways while meeting the definition of a “low carbon hydrogen producer” in the Act:

- Option 1: Set out eligible feedstocks
- Option 2: Set out eligible production pathways
- Option 3: Refer to the UK low carbon hydrogen standard (“the standard”)

Given some of the overlapping considerations and comments across these options, we have provided the government position at the end of this section to address the key themes and concerns raised.

Option 1: Set out eligible feedstocks

Question 7 and 8

7. Do you agree with the advantages and disadvantages set out under option 1? Are there any other considerations for option 1 that we should take into account?

8. If we proceed with option 1, do you agree with the list of proposed feedstocks?

Consultation position

The use of a feedstock is essential in any hydrogen production process and different feedstocks can be used. Under option 1, we proposed to define eligibility based on the type of feedstock used by the facility (whereby “feedstock” means the material or substance used in the production process from which the hydrogen molecules will be produced, excluding where it might be used solely for energy purposes to power the process). We proposed to define four main categories of eligible feedstocks that would allow a broad range of projects to apply: water, biomass, waste and fossil fuel. We also proposed that where a fossil fuel-based feedstock is used to produce hydrogen, and that production process produces carbon dioxide, a complete carbon capture and storage (CCS) system must be installed.

We also set out our position that the use of hydrogen derivatives and carriers to produce hydrogen is not deemed eligible for revenue support and would be excluded from these categories of permitted feedstock, whether by way of revenue support regulations or allocation round guidance.

The advantages of a feedstock approach are that it can support a range of production routes while keeping the regulations somewhat futureproofed, providing a level of certainty for industry. However, emissions from a production pathway are dependent on a number of variables which need to be addressed to have confidence that eligible feedstocks cannot be used to produce hydrogen which does not contribute to a reduction in emissions of greenhouse gases (GHGs).

Summary of stakeholder responses to Question 7

Response summary	#
Agree with the advantages and disadvantages set out	18
Responded with 'don't know'	1
Did not agree with the advantages and disadvantages set out	5
Not answered or unclear	4

There were 24 responses to this question where many agreed with the advantages and disadvantages of option 1. Respondents generally felt this approach could work for a wide range of hydrogen production pathways, provide certainty to industry and is less likely to require frequent amendments to the regulations.

One respondent felt more clarity was needed around the definition of waste as a feedstock to ensure it would incorporate the use of industrial off gases, including flare gas (natural gas produced by the oil and gas industry which is burned and vented straight to the atmosphere). A few respondents did not agree that hydrogen derivatives and carriers should be ineligible for support.

A few respondents highlighted that the key outcome of the policy is to reduce carbon emissions but option 1 would not guarantee actual GHG emissions reductions nor achieve reduction at the pace required. One respondent suggested that evaluating on a project specific basis would mitigate the risk of funding production pathways which have high GHG emissions.

One respondent felt that, in respect of the CCS requirement for fossil fuel feedstocks, it is not enough to have a requirement for CCS to be installed but it also needs to be in operation. Another commented that a complete CCS system may not be specific to each hydrogen project and could be part of the shared infrastructure of a cluster or CO_2 network. They also requested further clarity on whether novel hydrogen production methods using CO_2 in a closed looped system would be eligible (under this option). Similarly, another respondent suggested that hydrogen production pathways where the process CO_2 emissions are used rather than 'disposed' should be eligible.

Summary of stakeholder responses to Question 8

Response summary	#
Agree with overall approach	12
Responded with 'don't know'	0
Did not agree with overall approach	10
Not answered or unclear	6

We received 22 direct responses to this question. The majority of respondents agreed with the proposed list of feedstocks, citing the flexibility this provides to support a range of production pathways currently known and encourages innovation.

Some respondents disagreed with the list of proposed feedstocks. One respondent noted that the list of proposed feedstocks would likely encompass all known forms of producing hydrogen and therefore adds little to what is already set out in the primary legislation.

Two respondents did not think fossil fuels should be included as a feedstock on the basis of not being compatible with government decarbonisation targets even with the use of carbon capture.

Three respondents felt that regulations should set a carbon capture rate, with two suggesting that this should be 95%, in line with the Climate Change Committee's range for hydrogen produced via steam methane reformation (SMR) combined with CCUS in its balanced pathway (also raised in response to Question 10). One respondent agreed with the proposal to not mandate CCS for projects using biomass or waste feedstocks, but encouraged government to consider how these projects would interact with the Decarbonisation Readiness Requirement Proposals consultation (also mentioned in response to Question 11).[13]

Three respondents raised the important role of industrial off gases and that they should be classed as either a residue or waste. One respondent highlighted natural gas that has not met specifications ("off-spec") as another potential feedstock for hydrogen production. Another respondent requested more clarity around the definition of waste as a feedstock.

A few respondents felt that hydrogen 'derivatives/carriers' (e.g., methanol and ammonia) should be included in the list of eligible feedstocks. Four respondents argued that hydrogen production from ammonia should be seen as production, not just 'conversion' given that such installations are materially different from both technical and commercial perspectives and should be treated in the same way as other production methods such as SMR or electrolytic production. One respondent felt the exclusion of hydrogen derivatives and carriers would place undue restrictions on the development of the low carbon hydrogen economy.

Option 2: Set out eligible production pathways

Question 9 and 10

> 9. Do you agree with the advantages and disadvantages set out under option 2? Are there any other considerations for option 2 that we should take into account?
>
> 10. If we proceed with option 2, do you agree with the proposed pathways set out in Table 2?

[13] www.gov.uk/government/consultations/decarbonisation-readiness-updates-to-the-2009-carbon-capture-readiness-requirements

Consultation position

Under option 2, the consultation proposed to define eligibility based on the specific type of pathway used to produce hydrogen. It was proposed that only pathways where emissions are expected to be lower than the counterfactual production method of SMR (the most common production method today) would be eligible, and the use of CCS would be required for pathways using fossil fuel as a feedstock. This more prescriptive approach could provide certainty for investors, but regulations would need to address variables that would impact carbon emissions, including process technology, energy source, type of feedstock, and the carbon capture rate. This could result in complex regulations that need amending regularly and may not reflect project-specific characteristics. The prescriptive approach could also limit the ability of the HPBM to support innovation.

Summary of stakeholder responses to Question 9

Response summary	#
Agree with the advantages and disadvantages set out	17
Responded with 'don't know'	0
Did not agree with the advantages and disadvantages set out	4
Not answered or unclear	7

There were 21 responses to this question. Many respondents agreed with the advantages and disadvantages of option 2 that were set out in the consultation. However, comments from respondents largely highlighted the drawbacks, such as:

- this option is overly prescriptive and/or complex.
- it would be administratively burdensome to update the regulations to include any new technologies which would reduce the pace of decarbonisation.
- it would stifle innovation in the industry.

Two respondents supported specifying a minimum CO_2 capture rate, while two other respondents felt the regulations should opt for the most flexible option that encourages innovation.

Summary of stakeholder responses to Question 10

Response summary	#
Agree with overall approach	11
Responded with 'don't know'	0
Did not agree with overall approach	11
Not answered or unclear	6

There were 22 responses to this question with an equal split between those that agreed with the pathways proposed to be eligible in the consultation and those that did not.

There were a number of pathways respondents felt should also be included if option 2 was pursued, including ammonia cracking, Partial Oxidation (POX) processes, and advanced conversion technologies such as pyrolysis and plasma processes. One respondent also requested biomass power generation and renewable energy supplied via a power purchase agreement (PPA) to be included when considering eligible production pathways.

One respondent commented that the pathways set out in Table 2 of the consultation document are not representative of the whole system emissions associated with each process, while another requested clarity on how new technologies could become eligible or innovative approaches could be supported during development.

Question 11

> 11. If we proceed with option 1 or option 2, do you agree with the proposal to only mandate installation of CCS for fossil fuel feedstocks?

Consultation position

To ensure only processes that are low carbon are eligible, we proposed that where a fossil fuel-based feedstock is used to produce hydrogen and the production process produces carbon dioxide, a complete CCS system must be installed. We proposed to not mandate the use of CCS for projects using biomass or waste feedstocks since these processes are not expected to result in higher emissions than the SMR counterfactual.

Summary of stakeholder responses to Question 11

Response summary	#
Agree with overall approach	12
Responded with ‘don’t know’	1
Did not agree with overall approach	7
Not answered or unclear	8

There were 20 responses to this question, with the majority in support of the proposal to mandate installation of CCS for fossil fuel feedstocks, while only a minority disagreed.

Of those that disagreed, two respondents felt that it would not be practical to define the requirements in the regulations and therefore risks supporting projects that would not generate a true reduction in GHG emissions. Another two respondents felt that the requirement to install CCS should also be applied to biomass and waste feedstocks as they also generate carbon dioxide emissions.

Three respondents felt that CCS should only be required for processes that use fossil fuels as a feedstock and produce meaningful amounts of CO_2 as an output. Two respondents clarified that pathways such as pyrolysis and thermal plasma electrolysis that produce solid carbon should be exempt given that the 'capture' element is inherent in the process.

Two respondents who agreed with the approach to not mandate CCS for biomass and waste feedstocks at this time, felt government should consider how to incentivise the installation of CCS to help drive decarbonisation. It was again suggested that the HPBM should consider how it would align with the Decarbonisation Readiness Requirements.

One respondent requested clarifications on whether it would be sufficient for projects to ensure a complete CCS system is in place for the process, and not necessarily a responsibility to install the CCS system. For example, it may be more common for projects located in hubs to access a service to a CO_2 T&S system.

Option 3: Refer to the UK low carbon hydrogen standard

Question 12

12. Do you agree with the advantages and disadvantages set out under option 3? Are there any other considerations for option 3 that we should take into account?

Consultation position

The intent of the standard is to ensure new low carbon hydrogen production supported by government makes a direct contribution to GHG emission reduction targets under the Climate Change Act. Under option 3, the consultation proposed that projects would need to comply with the standard to be considered eligible. This could either take the form of referencing a fixed version of the standard, or a reference to the live standard, where the regulations would automatically reflect the latest version of the standard.

The consultation set out that this approach would help ensure strong alignment between the regulations and round by round allocation guidance. However, if regulations refer to a fixed standard it could mean potential delays to implementing the latest changes due to the need to go through Parliamentary procedures. If we were to reference the live standard, this would not provide certainty to Parliament or industry as the regulations would be linked to an evolving standard.

Summary of stakeholder responses to consultation

Response summary	#
Agree with the advantages and disadvantages set out	19
Responded with 'don't know'	0
Did not agree with the advantages and disadvantages set out	3
Not answered or unclear	6

There were 22 responses to Question 12, where many broadly agreed with the advantages and disadvantages set out for option 3. A few respondents felt that option 3 would ensure a strong alignment between the regulations and round by round allocation guidance, by providing the most direct link to the low carbon hydrogen standard.

A few respondents disagreed with the disadvantages of the proposal. One respondent did not feel that a reference to a fixed version of the standard in regulations would require significant parliamentary time to reflect changes to the standard. Another respondent felt that the disadvantages of investor uncertainty posed by changes to the standard if the regulations refer to a live version of the standard could be managed by giving long lead times (e.g., 24 months) between the announcement and the application of the new standard.

Some respondents commented on the need for clarity about which version of the standard needs to be complied with and how to manage uncertainty when the standard is updated, providing sufficient time before changes are to be introduced.

One stakeholder proposed that the version of the standard in effect at the point at which an allocation window is announced should apply for the duration of the allocation process, with contracts subsequently signed referring to that version of the standard. Another suggested it should be the version at the time of the agreement being entered into that should be complied with, in alignment with the LCHA.

Two respondents noted the importance of using certification schemes that ensure projects are making a direct contribution to GHG emissions.

Question 13

13. Which of the proposed options to define eligible low carbon hydrogen production pathways do you prefer: i) Set out eligible feedstocks, ii) Set out eligible production pathways, iii) Refer to a fixed version of the standard or iv) Refer to the live standard

Summary of stakeholder responses to Question 13

Response summary	#
Set out eligible feedstocks	1
Set out eligible production pathways	0
Refer to a fixed version of the standard	1
Refer to the live standard	15
Responded with ‘don’t know’	8
Not answered or unclear	3

There were 25 responses to this question. The majority of respondents supported the option of referring to the live standard.

A few respondents did not have a clear preference. Four of these respondents felt government should opt for the option which gives the most flexibility. Two respondents noted that the option to refer to a fixed standard appears to create the most issues of requiring future legislative changes, as and when there are changes in the industry. One respondent did not support referencing the live standard due to ongoing updates that could undermine investment programmes.

Question 14

> 14. Are there any other approaches to define eligible low carbon hydrogen production pathways which would achieve our policy aims whilst also meeting the Bill definition of a "low carbon hydrogen producer"?

Summary of stakeholder responses to Question 14

We received 14 responses to this question, the majority of which did not feel there were any other suitable approaches to determine eligibility of a low carbon hydrogen producer.

Of the substantive responses received, one respondent felt that hydrogen production using fossil fuels should not be supported, another suggested that eligibility should be subject to a carbon intensity limit and that a condition of the contract should be to require reporting on the emissions from their supply chain and operations, hydrogen production volumes, and carbon sequestration volumes. One respondent proposed that a weighting measure could be applied to recognise a project's potential to contribute to the avoidance of carbon leakage which should incentivise projects in hard to decarbonise sectors in dispersed locations.

Question 15

> 15. Do you have any other comments on the proposals for the hydrogen eligibility regulations? Please provide reasons for your responses.

Summary of stakeholder responses to Question 15

Thirteen respondents provided further comments on the consultation proposals to determine the meaning of "eligible" in relation to a "low carbon hydrogen producer" in revenue support regulations.

Two commented on the need to make regulations as soon as possible and what alternative approaches may be available to award initial hydrogen production contracts to prevent delays in the development of critical initial hydrogen production projects, should the anticipated legislation not be in place in time.

Four respondents felt that the use of hydrogen derivatives and carriers, including ammonia cracking, to produce hydrogen, should be supported under the HPBM. Five respondents supported the use of imported feedstocks, such as ammonia, to complement domestic production. Respondents felt that excluding hydrogen derivatives and carriers, including imports, from being eligible under these revenue support regulations would be unnecessarily

restrictive, citing that ammonia would help fill the gap in domestic clean hydrogen supply and play an important role to achieve climate goals.

One respondent noted that the definition of a “low carbon hydrogen producer” in the Act references GHG emissions reductions, which are achieved at the point of use, and therefore imports would offer more value to the UK than exports. They also argued that if hydrogen produced from fossil fuels imported from outside the UK are eligible for revenue support, the same logic should apply for hydrogen produced from imported ammonia. They further encouraged that if the sole purpose of the HPBM regulations is to stimulate domestic production and use of hydrogen and exclude imported hydrogen, then government should provide an equivalent revenue support mechanism for imported derivatives/carriers, where policy design and the allocation mechanism could be used to minimise the risk of double subsidy.

One respondent felt that government should consider how to encourage competition to help develop the hydrogen market when assessing eligibility, where diversification of supply will be key for offtakers who are seeking security of supply.

Government response

There is a clear preference from responses to the consultation for regulations to refer to a live version of the standard to determine a project’s eligibility to apply for support under the HPBM and we intend to proceed with implementing this option.

The regulations will include an ambulatory reference to the standard. When the standard is updated, and if it is to be used for the purpose of these regulations, it will include an accompanying statement to make this clear. The Department has agreed to update Parliament with a Written Ministerial Statement whenever the reference to the standard is updated.

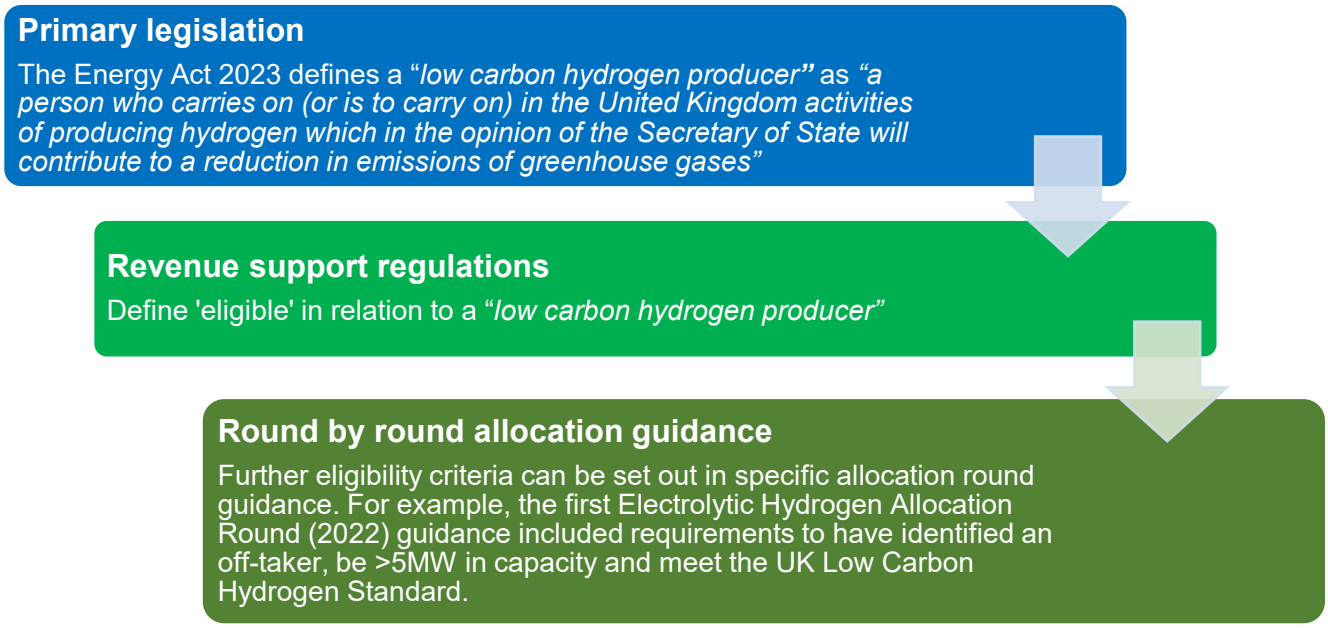
Changes to the standard between the point of application and contract signature

We stated our intention in the consultation to require projects to comply with the version of the standard in effect when the contract is entered into. We have elected to amend our approach to align with how the allocation processes are expected to run in practice, where a project’s ability to comply with the standard would be assessed as part of initial evaluation against the allocation criteria before shortlisting projects for negotiations.

For the purposes of the regulations, projects would need to be able to demonstrate they can comply with the version of the standard in force at the time an application is submitted to be considered eligible to receive a contract. Transitional provisions will be provided for in regulations for Track-1 Phase-2 hydrogen projects where no standard was in place during the application window. This does not preclude the need for projects to comply with any other requirements set out in the specific allocation rounds as the regulations form one part of a project’s eligibility assessment (see Figure 1).

Furthermore, the version of the standard in force at the time of application may not necessarily be the version that the project would be required to meet under the LCHA to receive subsidy.[14] The aim is that any review and updates to the standard will occur in advance of allocation rounds rather than during them, in order to provide certainty for investors. However, it may sometimes be necessary to introduce updates during an allocation round (the period between the launch of the application window and contracts being awarded). We would aim to provide as much notice as possible to projects as part of the allocation or negotiations process on any potential changes.

Figure 1: Approach to hydrogen production revenue support contract eligibility



Hydrogen derivatives and carriers

We have noted support from some respondents for hydrogen production using hydrogen derivatives and carriers. However, we maintain the position that hydrogen produced using hydrogen derivatives and carriers, such as ammonia cracking, is ineligible for support under the HPBM.

The British Energy Security Strategy[15] set out our clear aim to make the UK more energy self-sufficient. Therefore, the HPBM has been designed to support domestic low carbon hydrogen production, in the same way the CfD scheme does for domestic low carbon electricity generation. Supporting ammonia cracking using imported green ammonia would be akin to supporting hydrogen imports (as green ammonia is produced with low carbon hydrogen). As such, supporting ammonia cracking via the production business model would not be in line with our objective. This is different from our position on natural gas, which the UK already imports, is widely used throughout the economy and in some cases using it to produce hydrogen provides an opportunity to decarbonise the natural gas being used.

[14] Subject to the final terms of the LCHA, producers will not be required to adhere to updated versions of the standard after contract signature. However, they will be required to comply with the most recent version of the LCHS Data Annex to determine their emissions.
[15] www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy

There are also wider energy efficiency loss implications that might affect global decarbonisation efforts, considering that producing hydrogen through ammonia cracking requires higher levels of energy than using renewable energy sources in the UK.

We recognise the potential role hydrogen derivatives and carriers could have in a future hydrogen economy. The standard does not currently consider hydrogen production using hydrogen derivatives and carriers but may expand to consider these in future versions. Any further criteria around specific production pathways will be addressed through the round-by-round allocation guidance. This approach supports our goals to have reliable, secure energy that delivers against our emissions reduction targets and helps meeting our 10GW ambition by 2030.

Eligible pathways

We appreciate respondents' support for novel hydrogen production and requests for clarification on whether they would be eligible under the HPBM, or how they could be supported during their development.

Regulations will require projects to demonstrate they can comply with the standard to be considered potentially eligible for a contract. The standard has a list of eligible production pathways and sets out a process for how new pathways can request to be added to that list.

For more innovative technologies that require support for their development, government funding may be available under schemes such as the Net Zero Innovation Portfolio.[16]

Projects will need to comply with individual allocation round criteria as well as regulation requirements. For the Hydrogen Allocation Round (HAR) 2, as set out in our HAR2 Market Engagement document[17] which closed on 30 June, we are proposing to continue with an allocation process where projects bidding for support through the HPBM will be assessed against set evaluation criteria. The HAR2 market engagement response due to be published in autumn will confirm the final design of the round and we will confirm at application stage whether any pots or delivery pathways may be used for HAR2.

In price-based renewable energy auctions, different funding pots have been utilised to support different technology pathways. For allocation rounds beyond HAR2, we will be considering whether to use separate pots and how they could be structured to support the final objectives. We intend to engage with industry on the design of future allocation rounds.

Carbon capture and storage requirements

Under options 1 and 2, the consultation proposed to mandate the installation of CCS for facilities where fossil fuels are used as a feedstock to produce hydrogen and where CO_2 was produced. Production pathways where CO_2 is not emitted (e.g., solid carbon), would not have been required to install CCS.

[16] www.gov.uk/government/collections/net-zero-innovation-portfolio
[17] www.gov.uk/government/consultations/hydrogen-allocation-round-2-market-engagement

The consultation noted though that projects would still need to be considered on a case by case to determine whether CCS is required for the hydrogen produced to meet the standard and qualify for payment under the terms of the contract. Reporting on hydrogen production volumes and carbon sequestration volumes is intended to be required under the contract.

Under the option to comply with a live standard to determine eligibility, for the purposes of the regulations, projects will need to be able to meet the GHG emissions threshold set out in the relevant version of the standard. This takes into account all GHG emissions up to the point of production, including upstream supply chain emissions, operational emissions from the hydrogen production process and the capture rate of any CCS facilities. More information can be found in the latest guidance.[18]

Therefore, we do not consider it necessary to include a separate requirement in the regulations to install CCS for fossil fuel, biomass or waste feedstocks (or a minimum capture rate).

Regulation timings

We note concerns around potential delays to regulations that could affect the timelines for signing contracts for initial hydrogen production projects. We intend to lay regulations as soon as departmental and Parliamentary timelines allow. We intend to announce the successful projects that will be offered contracts for HAR1 towards the end of Q4 2023.

[18] www.gov.uk/government/publications/uk-low-carbon-hydrogen-standard-emissions-reporting-and-sustainability-criteria

Carbon capture entity eligibility

Question 16

> 16. Do you agree with the proposal to take a technology neutral approach, and not place restrictions within regulations on the types of technologies that may be used by a carbon capture entity to capture carbon dioxide?

Since the consultation was launched, the definition of "carbon capture entity" within the Act has been amended to include where the capture activity relates to carbon dioxide in the atmosphere or dissolved in seawater (paragraphs (b) and (c) of the definition in section 67(7)), having previously only covered capture of carbon dioxide produced from "commercial or industrial activities". However, this consultation and the proposed regulations remain concerned only with a carbon capture entity capturing carbon dioxide under paragraph (a) of the definition in the Act, i.e., carbon dioxide that has been produced from “commercial or industrial activities".

The Act requires that to be eligible for a carbon capture revenue support contract and receive revenue support, a person must meet the definition of a “carbon capture entity” in the Act and the eligibility requirements set out in the revenue support regulations. In any given allocation round, government may wish to focus on narrower sectors or technologies to ensure delivery of CCUS is consistent with wider government policy objectives at the time of such allocation. To that end, additional criteria may be set out in allocation round guidance which may include delivery, technical or sector specific criteria that entities must also meet in order to be considered for support within a particular allocation round.

Consultation position

The ICC business models have been designed to support the development of initial and early-stage ICC projects. We expect that the ICC business models will evolve as the technology, investor confidence and the markets for low carbon products develop.

The consultation proposed a technology neutral approach. This means projects can be eligible whatever the technology type used to capture the carbon dioxide, including but not limited to full-scale carbon capture, modular carbon capture and all carbon capture configurations (including pre- and post-combustion, oxyfuel and emerging technologies).

Summary of stakeholder responses to Question 16

Response summary	#
Agree with overall approach	18
Responded with ‘don’t know’	1
Did not agree with overall approach	0
Not answered or unclear	0

We received 19 responses to this question with many respondents in agreement with the proposal.

The main reason put forward by respondents for agreeing with the proposal was that it would ensure new innovative technologies were able to emerge that could drive down the cost of CCUS. Some respondents claimed the proposal would allow plants to deliver technologies that were best suited to their specific sites.

One respondent suggested the regulations should ensure the technology used by a carbon capture entity is as effective as is claimed. Another respondent requested that the government should extend technology neutrality to include any approach that decreases full-system carbon intensity including afforestation.

Government response

With majority support from respondents, we propose to proceed with a technology neutral approach. We note the comments raised by individuals on aspects of the proposals which are addressed below.

Ensuring effectiveness of carbon capture technology

Allocation round guidance for the ICC business models will include more detailed eligibility criteria on a round by round basis. For example, the government published detailed guidance for Phase-2 of the Track 1 Cluster Sequencing Process for CCUS, which set out eligibility and evaluation criteria for applicants to be assessed against before being considered further in the Phase-2 Cluster Sequencing Process. The eligibility criteria included a mandatory minimum CO_2 capture rate of 85%, and the ICC Contracts also include various performance requirements. We consider that allocation round guidance and the ICC Contracts are the most suitable means of including technical requirements for projects, which may change from round to round.

Broadening eligibility to any approach that decreases full-system carbon intensity

The ICC business models have been specifically designed to support the development of early-stage projects to enable the deployment of carbon capture technology for commercial and industrial users who often have no other option to achieve deep decarbonisation. The ICC business models are only one of a number of decarbonisation pathways being developed across government including the greenhouse gas removal (GGR) business model and the power bioenergy with carbon capture and storage (BECCS) business model[19].

To be eligible for an ICC carbon capture revenue support contract and receive revenue support, a person must meet the definition of a “carbon capture entity”, in respect of paragraph (a) of that definition in the Act, i.e., where the relevant carbon dioxide has been produced by commercial or industrial activities. A person must also meet the eligibility requirements (as they relate to paragraph (a) of the “carbon capture entity” definition), to be set out in these revenue support regulations, as well as any additional criteria that may be set out in allocation round

[19] In March 2023, the UK government response to the Power BECCS business model consultation was published, and in June 2023, the government response to the consultation on a GGR business model was published.

guidance. It is therefore not within the scope or power of these regulations to consider the capture of carbon dioxide otherwise than as produced from commercial or industrial sources (as would be the case with afforestation).

Question 17

17. Do you agree with the approach to not limit within regulations the class of person that may be eligible for a revenue support contract?

Consultation position

The consultation proposed to not include any restrictions in the revenue support regulations as to the class of persons who can be eligible. The consultation set out how we recognise that a variety of different entities with different corporate structures and based in different jurisdictions may wish to seek support under the revenue support regulations. We consider those seeking support are best placed to decide how to arrange themselves in this regard so long as allocation round specific criteria and the obligations of the carbon capture entity under ICC Contracts are able to be complied with.

Summary of stakeholder responses to Question 17

Response summary	#
Agree with overall approach	12
Responded with ‘don’t know’	1
Did not agree with overall approach	0
Not answered or unclear	0

We received 13 responses to this question with many respondents in agreement with the proposal.

Responders agreed that a flexible approach would allow different organisations and types of proposals to be eligible, with one respondent citing that this approach would support an eventual competitive allocation process.

One respondent agreed with the proposal but suggested that support should only be offered to UK based projects and UK based companies given the use of taxpayers’ money. This, they argued, would support transparency and public confidence. Another respondent suggested that the location of an organisation within the supply chain should not preclude eligibility and it should be made clear that operators are eligible.

Government response

With majority support from respondents, we propose to proceed not to include any restrictions in the revenue support regulations as to the class of persons who can be eligible. All applicants will be required to satisfy any additional criteria set out in allocation round guidance and be

able to fulfil the obligations set out in the ICC Contracts. We note the concerns raised by individuals on aspects of the proposals which are addressed below.

UK Based Projects and Companies

We have proposed not to include any restrictions in the revenue support regulations as to the class of persons who can be eligible including whether they are based in the UK. We consider that those seeking support are best placed to decide how to arrange themselves in this regard, so long as allocation round specific criteria and the obligations of the carbon capture entity under ICC Contracts are able to be complied with. Any specific requirements, if deemed necessary, would be more appropriately set out in allocation round guidance rather than regulations.

For example, the guidance for Phase-2 of the Track 1 Cluster Sequencing Process for CCUS sets out, as part of the ICC eligibility criteria, that a project must be located in the UK to be considered for revenue support from the ICC business models. The definition of a 'carbon capture entity' in the Act also makes clear the entity must be (or will be) capturing carbon dioxide in the UK (further to an amendment introduced after the launch of this consultation).

Transparency

As set out in the consultation, the aim of the information publication proposals is that revenue support regulations mandate a counterparty to publish each hydrogen production and ICC carbon capture revenue support contract and that a counterparty establish and maintain a public register, is to provide information and data in a transparent and open way. This includes project location data.

Location of an Organisation Within the Supply Chain

The revenue support regulations do not include any restrictions on the location of an organisation within the supply chain that may receive support. However, to be eligible for support under one of the ICC Contracts, a person must meet the definition of a “carbon capture entity”, as it relates to capture of emissions under paragraph (a) of that definition, set out in the Act. If a person’s location within the supply chain means they are not carrying on (or will not be carrying on) in the United Kingdom, activities of capturing carbon dioxide, then they are not a “carbon capture entity” under the Act and so cannot be eligible for support.

Question 18

> 18. We have proposed to exclude from eligibility entities that capture carbon dioxide which has been produced from a power generation facility that is solely connected to the transmission or distribution network (exempting CHP and EfW facilities). Do you agree with this proposed approach?

Consultation position

The consultation proposed to make explicit in the regulations that an entity capturing carbon dioxide from power generation facilities that are solely connected to the electricity transmission

or distribution network will not be eligible under the ICC business models for support. This is because such a power generation facility would only export its electricity output to the electricity grid and not to industrial facilities directly. This is not the case for generators connected to private wire networks and so emissions captured from such generators are not intended to fall within this exclusion.

The consultation also proposed that capture from Combined Heat and Power (CHP) plants and Energy from Waste (EfW) plants would be eligible regardless of whether such plants are connected solely to the electricity transmission or distribution network.

Summary of stakeholder responses to Question 18

Response summary	#
Agree with overall approach	11
Responded with ‘don’t know’	1
Did not agree with overall approach	2
Not answered or unclear	0

We received 14 responses to this question with many respondents in agreement with the proposal.

Two respondents specifically cited that other business models, such as the dispatchable power agreement (DPA), were available from the government to support carbon capture for power generation facilities.

One respondent requested that biomass power sites utilising waste wood feedstocks should be included in EfW eligibility. Another respondent requested further clarity on how the regulations would define an entity capturing carbon dioxide from power generation facilities that are solely connected to the electricity transmission or distribution network. They asked if there was a threshold for minimum power for heat production which could be eligible for the government’s DPA business model or if any heat production would automatically result in ICC business models eligibility and exclusion from the DPA business model.

Another respondent suggested that the regulations should allow power generation facilities and industrial facilities to share CCUS assets as they argued this may be more economical in some cases.

Two respondents requested further clarification regarding private wire networks which the consultation set out would not fall within the power exclusion in the regulations. One respondent queried if this could introduce an incentive for power generators to seek private wire agreements in order to receive support from the ICC business models. Another respondent suggested that a generator that is connected to a private wire network could still operate as a normal power station and sell the majority of its output to the transmission or distribution network. They therefore recommended that the eligibility requirement should be

tightened to require eligible plants to supply at least 70% of their electricity output to industrial facilities.

Government response

With majority support from respondents, we propose to proceed to exclude from eligibility entities that carry on (or will be carrying on) activities of capturing carbon dioxide produced from a power generation facility solely connected to the transmission or distribution network (exempting CHP and energy recovery generating stations). The policy intention is that the relevant connections in this regard are those for the export of electricity and the regulations will reflect this. This means that any connection through which the generator uses electricity at the site is not relevant to this exclusion. We note the concerns raised by individuals on aspects of the proposals which are addressed below.

Waste Wood Feedstocks

The proposed definition of energy recovery generating stations would not preclude waste wood facilities from being eligible for the ICC business models (refer to Question 19). The government is currently considering which business model that power stations using waste wood biomass with carbon capture may be eligible for. Further details will be set out in due course, including any criteria that may be set out in allocation round guidance.

Heat production as an eligibility criterion

The ICC and DPA business models each have their own separate eligibility criteria and rely on different primary powers. These regulations focus only on eligibility for the ICC business models. To be eligible for ICC carbon capture revenue support contract, an entity must meet the requirements set out in the revenue support regulations as well as the eligibility criteria set out in the allocation round guidance. We consider that the regulations are not best suited to including technical and detailed parameters relating to eligibility (e.g., heat production for CHP facilities) which are more appropriate to include in allocation round guidance. For example, the government published detailed guidance for Phase-2 of the Track 1 Cluster Sequencing Process for CCUS. This set out that for a current or proposed industrial CHP facility to be eligible for Phase-2, the facility must provide at least 70% of its energy output to industrial facilities.

Sharing Assets

We do not consider it necessary to prohibit the sharing of assets between industrial and power generation facilities in these regulations. Such scenarios may be feasible in the future, for example, through the development of Capture as a Service models, and the government may consider adapting business models to facilitate such schemes. However, the current ICC and DPA business models do not currently allow for the sharing of assets in this way.

Question 19

19. In drafting the regulations, we propose to define a generating station, a combined heat and power generating station and an energy from waste with CHP station, based upon similar definitions laid out in the Contracts for Difference regulations. Do you have any comments on this approach?

Consultation position

The consultation proposed definitions within the regulations for “power generation facilities”, “CHP Plants” and “EfW plants”. We proposed to base these definitions on those set out in the Contracts for Difference (Definition of Eligible Generator) Regulations 2014 (as amended). See below:

- A “generating station” means a station which generates electricity;
- A “combined heat and power generating station” means a station which generates electricity and is (or may be) operated in order to supply to any premises—

  (a) heat produced in association with the electricity generated;

  (b) steam produced from, or air or water heated by, such heat.

When defining a CHP generating station, we plan to remove ‘(b) steam produced from, or air or water heated by, such heat;’ from the definition above because, in this case, steam and heat are essentially the same. A CHP is designed to produce power (electricity) and heat, usually in the form of steam or hot water, which will be used for a specific purpose, for example, steam for industrial processes.

- An “energy from waste with CHP station” means a generating station which—

  (a) is an accredited CHP station; and

  (b) is fuelled by biomass or waste (or both), excluding—

  (i) gas formed by the anaerobic digestion of material, where that material is, or is derived from, waste; or

  (ii) gas or liquid formed by gasification or pyrolysis of biomass or waste.

When defining EfW plants, we plan to replace (a) ‘an accredited CHP station’, in the definition above with ‘a combined heat and power generating station’.

Summary of stakeholder responses to Question 19

Response summary	#
Agree with overall approach	8
Responded with ‘don’t know’	1
Did not agree with overall approach	1
Not answered or unclear	0

We received 10 responses to this question with many respondents in agreement with the proposal.

About half of respondents specifically cited that it was beneficial to create consistency between the government’s CfD scheme and ICC business models.

One respondent requested that both EfW without CHP and with CHP be eligible under the regulations as they believe it may not always be possible to operate CCS using EfW heat offtake.

Another respondent recommended the regulations ensure that supported CHP sites are CHP quality assurance compliant. They questioned why the phrase ‘accredited CHP station’ was removed from the definition of an EfW plant as set out in the consultation.

Government response

Based on the feedback we have received from the responses to the consultation we propose to continue to define a generating station, a CHP generating station and an EfW station in the regulations based on the definitions applied under the CfD scheme, with some amendments as described below.

We have further considered the exclusion of gasification or pyrolysis from the definition of EfW stations. This is in order to not exclude the facilities that manage waste via different technological pathways but still may generate electricity (even if their primary purpose is the creation of a product, such as the generation of alternative fuels). We therefore we propose to remove the exclusion of gasification or pyrolysis from the definition, and change the defined term from EfW to an energy recovery generating station (or similar).

Considering feedback received, we propose to remove the term ‘with CHP’ from the definition and instead only define an energy recovery generating station. This will ensure we do not exclude different types of energy recovery generating stations operating both with and without CHP. We consider it unnecessary to be prescriptive on this within regulations and will instead specify efficiency criteria in future allocation round guidance, which may change round by round, as appropriate.

As a result, we propose to amend the definition of EfW outlined in the consultation to the following broader defined term:

- An “energy recovery generating station” (or similar) means a generating station which is fuelled by biomass or waste (or both), excluding gas formed by the anaerobic digestion of material, where that material is, or is derived from, waste.

The definitions within the regulations for “power generation facilities” and “CHP Plants” would remain as proposed in the consultation which are based on those set out in the Contracts for Difference (Definition of Eligible Generator) Regulations 2014 (as amended) and are as follows:

- A “generating station” means a station which generates electricity;
- A “combined heat and power generating station” means a station which generates electricity and is (or may be) operated in order to supply to any premises heat produced in association with the electricity generated.

Question 20

20. Do you agree with the approach to exclude from eligibility a carbon capture entity which is, without already being party to a revenue support contract, capturing carbon dioxide with a view to its permanent geological storage through an existing or operational CCUS plant?

Consultation position

The consultation proposed that the revenue support regulations set out that a person who (i) is carrying on activities of capturing carbon dioxide (or any substance consisting primarily of carbon dioxide) that has been produced by commercial or industrial activities, with a view to its permanent geological storage and (ii) is not party to a carbon capture revenue support contract; will not be eligible under the revenue support regulations.

The ICC business models are designed to encourage the deployment of new carbon capture and storage activities; it is not, therefore, government’s intention to support projects which have existing and/or already operational CCS plants which are connected to the CO_2T&S network.

However, our intention is that existing and operational carbon capture and usage (CCU) projects, or CCS projects where the carbon dioxide is captured with a view to its permanent containment other than in geological storage (i.e., where the project is not connected to the CO_2 T&S network) could still be eligible. For example, a person with existing CCU equipment on its site who later sought revenue support to adapt to CCUS and connect to the CO_2 T&S network to access permanent geological storage could still be eligible under the regulations.

Summary of stakeholder responses to Question 20

Response summary	#
Agree with overall approach	6
Responded with ‘don’t know’	1
Did not agree with overall approach	5
Not answered or unclear	0

We received 12 responses to this question with half of respondents in agreement with the proposal.

Two respondents who agreed with the proposal provided feedback. One of these respondents cited the proposal to keep eligible existing CCU sites who may want to access support to be able to connect to the CO_2 T&S network. They explained this recognised the transitional steps that some sites will need to go through, to get to a point of delivering permanent storage of carbon. Another respondent who agreed with the proposal also cited keeping existing CCU sites eligible because, they argued, CCS should lead to the permanent geological sequestration of carbon dioxide in a way that CCU does not.

A respondent requested further clarity on the section of the proposal which states that CCU or CCS projects where CO_2 is captured with a view to being permanently stored (other than in geological storage) could still be eligible. They inferred this means the regulations would prevent the ICC business models in future iterations from supporting the deployment of CCUS when storage is in permanent mineral (or other) forms. They also questioned whether a plant looking to deploy CCS with multiple storage options (e.g., geological and mineral) would be eligible. They requested that the ICC business models regulations allow for all forms of permanent CO_2 storage.

This respondent also raised separate concerns that the current proposal presents a challenge where, in the future, plants which can operate without a revenue support contract and are exposed to a variety of external factors (energy prices, carbon prices and global markets) may experience a change in circumstances which mean the plant is no longer able to operate and needs to either: switch off the carbon capture facility to reduce operational costs, move to a mothballed state or cease operations. In certain circumstances, these installations may wish to enter into a revenue support contract. The respondent said they would welcome a more flexible approach which accounts for these potential changes in plant economics.

Another respondent suggested that new capacity being developed by an entity which is already capturing CO_2 should not be prohibited from receiving support from the ICC business models.

Another respondent claimed the proposals meant there was a risk for projects where there has been a delay in establishing a CO_2 T&S network or where the network has failed could lead to stranded assets which otherwise might provide additional emission reduction.

Government response

These responses highlight a number of possible future scenarios where this exclusion could conceivably have a hindering effect on business model support to the sector. This is not our intention and, based on the responses received following the consultation, we no longer intend to include this exclusion within the regulations.

Question 21

> 21. Do you have any other comments on the proposals for the industrial carbon capture eligibility regulations?

Summary of stakeholder responses to consultation

This question received seven responses on a broad range of topics which are set out below.

Three respondents requested further clarity of the timeline for the implementation of regulations to deliver BECCS, direct air carbon capture and storage (DACCS) and the future competitive CCUS allocation process. Another respondent suggested the government should consider extending ICC revenue support for GHG extraction other than CO_2.

Two of these respondents also requested clarification on the eligibility of international storage and whether the regulations will support projects that capture CO_2 in the UK but store it outside of the UK.

Another respondent stressed the importance of not introducing unnecessary additional eligibility criteria beyond those already set out.

Another respondent requested the legislation should make a distinction between stakeholders in the construction phase and operational phase as well as the owners of the project.

Government response

We note the concerns raised by individuals on aspects of the proposals which are addressed below.

Timeline of Regulations

Later this year the government will set out a vision for the UK CCUS sector, setting out how CCUS will support our net zero ambitions to raise confidence and improve visibility for investors.

The government published a response to its consultation on a GGR business model in June 2023 which confirms that we are minded to progress work on a GGR business model, based on a "contract for difference" structure. We will publish an update later this year, which will set out further detail on key elements of the business model design and eligibility criteria for future allocation rounds.

Extending ICC business models for GHGs other than CO_2.

To be eligible for a carbon capture revenue support contract and receive revenue support, a person must meet the definition of a "carbon capture entity" in the Act.

The Act defines a "carbon capture entity" as a person who carries on (or is to carry on) activities of capturing carbon dioxide (or any substance consisting primarily of carbon dioxide) and does not reference the capture of any other GHGs. It is not therefore possible for the revenue support regulations to make eligible a person capturing other GHGs and so this issue is not within the scope of the consultation.

International Storage

The ICC business models are currently designed for emitters to capture and store CO_2 within the UK. We will consider if and how the business models may adapt in the future as export markets for CO_2 develop. We consider that a prohibition on international storage would be unnecessary at this stage and therefore propose that the regulations do not set out eligibility criteria for the geographical location of CO_2 storage. Any further restrictions, if deemed necessary, will be outlined within future allocation round guidance.

Introducing Additional Eligibility Criteria

As set out in the consultation document, we anticipate that all ICC business models will evolve as the technology, investor confidence and the markets for low carbon products develop. We therefore intend to keep eligibility as broad as possible at this stage within the regulations, to ensure that we do not inadvertently limit the development of new carbon capture technologies and applications. In line with this approach, we have removed the exclusion for existing carbon capture entities already capturing carbon dioxide without a revenue contract.

Distinction between stakeholders

We have consulted on the class of person that may be eligible for a revenue support contract in Question 17 of the consultation. We propose not to limit further the eligibility of the class of person based on responses we received to the consultation.

As set out in the consultation document, to be eligible for a carbon capture revenue support contract and receive revenue support, a person must meet the definition of a "carbon capture entity" in the Act, the eligibility requirements set out in the revenue support regulations and any criteria set out in allocation round guidance.

Glossary

Defined Term	Definition
Achieved Sales Price	The price a hydrogen producer achieves selling hydrogen on the market.
Capex Payment Rate	The value calculated by the total capex payment plus return divided by the total expected CO_2 captured and stored over the initial ICC Contracts payment term.
CCUS cluster sequencing process	The process by which CCUS industrial clusters are selected, with two anticipated by the mid-2020s, and a further two clusters by 2030 as outlined in the 10 Point Plan.
CCUS-enabled hydrogen production	Hydrogen produced from methane reformation with CCUS.
CO_2 Capture Rate Estimate	The CO_2 capture rate refers to the technology efficiency of the capture plant and is defined as the percentage of CO_2 emissions captured from the specific emissions stream(s) (upstream of any bypass) that the capture technology is applied to. It does not: refer to the percentage of capture emissions from the whole site, otherwise known as the application rate; or refer to the additional emissions associated with providing heat and power to the capture plant, unless the emissions produced by providing heat and power to the capture plant are directed to the capture plant; or distinguish between captured CO_2 injected into the T&S network and captured CO_2 used for other purposes e.g. legal obligations to supply the food and drink industry.
CO_2 Transport and Storage Operator	Company providing the CO_2 transport and storage service. This is not a defined term in the LHCA or ICC Contracts.
Contracts for Difference (CfD)	A Contract for Difference is a contract between a generator and the Low Carbon Contracts Company (LCCC), to encourage the generation of low carbon electricity where-by LCCC will pay an electricity generator the difference between the CfD reference price and the CfD strike price.

Defined Term	Definition
Facility Fuel	The main substance from which the hydrogen molecules are produced.
Facility Hydrogen Production Technology	The type of technology used to produce the low carbon hydrogen.
Gas Reference Price	The price set under the contract for the purposes of calculating the Natural Gas Strike Price.
Greenhouse gas removal (GGR)	Group of methods that actively remove greenhouse gases, predominantly CO_2, from the atmosphere. The range of GGR approaches fall broadly into two categories: Nature-based approaches and engineering-based approaches.
Hydrogen production business model	Designed to support the deployment of low carbon hydrogen by providing revenue support to producers to overcome the operating cost gap between low carbon hydrogen and high carbon counterfactual fuels. Projects will be supported through a private law contract, that provides price support through a variable premium design, similar to the CfD for renewable electricity.
Hydrogen Storage Infrastructure costs	Costs paid to support a project's hydrogen storage infrastructure.
Hydrogen Transport Infrastructure costs	Costs paid to support a project's hydrogen transport infrastructure.
ICC business models	Designed to incentivise the deployment of carbon capture technology for industrial users (including waste management sector), the ICC business model is a private law contract, similar to a CfD, that provides the emitter with a payment per tonne of captured CO_2. Projects looking to retrofit carbon intensive hydrogen production will be eligible for support through this scheme.
Industrial Installation Technology	The eligible industrial technology deployed by the industrial installation.

Defined Term	Definition
LCHA Sales Cap	The maximum volume of low carbon hydrogen supported over the period of the contract.
Installation Capture Technology	The eligible capture technology deployed by the installation.
Longstop Date	The last day of a period agreed after the end of the Target Commissioning Window, as set out in the relevant business model front end agreement.
Maximum Annual CO_2 Capture Quantity	The greatest mass quantity of CO_2 that the emitter is expected to capture in any of years 1 to 15 of the Opex Payment Period under the ICC Contracts, based on the design capacity and projected availability of the capture plant.
Methane reformation	A process for hydrogen production in which methane is the input feedstock.
Natural Gas Cost Multiplier	The multiplier used to calculate the Natural Gas Strike Price, reflecting the amount of natural gas necessary to make one unit of hydrogen.
Natural Gas Strike Price	The value calculated by multiplying the market Gas Reference Price of the relevant billing period by the Natural Gas Cost Multiplier.
Non-Gas Strike Price	The component of the strike price for CCUS-enabled hydrogen production projects reflecting all costs other than those associated with the purchase of natural gas or refinery off-gas.
Non-Variable Costs Strike Price	A version of the strike price for hydrogen production projects reflecting only the fixed costs of production.
Reference Price	The sum that is specified in, or determined under, the ICC Contract or Waste ICC Contract as the reference price in respect of CO_2 captured and stored in the period specified in, or determined under, the contract.

Defined Term	Definition
Start Date (Expected and Actual)	The date from which the facility can start to claim revenue support.
Strike Price	The amount negotiated at the start of the contract to reflect the expected fixed and variable costs of the project.
Target Commissioning Date	The date which the facility is intended to start producing low carbon hydrogen or capture carbon dioxide.
Target Commissioning Window Start and End Date	The timeframe within which the facility is intended to start producing low carbon hydrogen or capture carbon dioxide.
Termination Date	Date the revenue support contract terminates or expires.
Waste Installation Technology	The eligible waste technology deployed by the waste installation.

List of respondents to the consultation

The consultation received a total of 28 responses, with 26 from the organisations listed below and two responses from members of the public.

Organisation
Air Products
Associated British Ports
Association for Decentralised Energy
Bioenergy Infrastructure Group
BP
Carbon Capture and Storage Association
Centrica PLC
E.ON
EDF
Energy UK
HiiROC Ltd
Hydrogen UK
Kellas Midstream Limited
MCS Charitable Foundation
National Physical Laboratory
Pannell Hayes
Progressive Energy
REA
SSE
Statera Energy
Storegga
Tees Valley Combined Authority
Thalia Waste Management
Uniper
Vertex Hydrogen
Viridor

This publication is available from: www.gov.uk/government/consultations/proposals-for-hydrogen-production-and-industrial-carbon-capture-regulations

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