

Subsidy Advice Unit Report on Strand 4 of the Net Zero Hydrogen Fund

Referred by the Department for Energy Security
and Net Zero

11 September 2024

Subsidy Advice Unit

Part of the Competition and Markets Authority



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CONTENTS

1. Introduction	3
The referred scheme	3
SAU referral process	4
2. Summary of the SAU's observations	6
3. The SAU's Evaluation	8
Step 1: Identifying the policy objective, ensuring it addresses a market failure or equity concern, and determining whether a subsidy is the right tool to use	8
Step 2: Ensuring that the subsidy is designed to create the right incentives for the beneficiary and bring about a change	12
Step 3: Considering the distortive impacts that the subsidy may have and keeping them as low as possible	15
Step 4: Carrying out the balancing exercise	19
Energy and Environment Principles	21
Other Requirements of the Act	23

1. Introduction

- 1.1 This report is an evaluation prepared by the Subsidy Advice Unit (SAU), part of the Competition and Markets Authority, under section 59 of the Subsidy Control Act 2022 (the Act).
- 1.2 The SAU has evaluated the Department for Energy Security and Net Zero's (DESNZ) assessment of compliance for Strand 4 of the Net Zero Hydrogen Fund (NZHF Strand 4) subsidy scheme (the Scheme), with the requirements of Chapters 1 and 2 of Part 2 of the Act (the Assessment).¹
- 1.3 This report is based on the information provided to the SAU by DESNZ in its Assessment and evidence submitted relevant to that Assessment. The SAU has also received and considered six third-party submissions. These have been shared with DESNZ and taken into account where relevant in this report.²
- 1.4 This report is provided as non-binding advice to DESNZ. The purpose of the SAU's report is not to make a recommendation on whether the Scheme should be implemented, or directly assess whether it complies with the subsidy control requirements. DESNZ is ultimately responsible for making the Scheme, based on its own assessment, having the benefit of the SAU's evaluation.
- 1.5 A summary of our observations is set out at section 2 of this report.

The referred scheme

- 1.6 NZHF forms part of a suite of measures designed to support the deployment of low carbon hydrogen production during the 2020s. Hydrogen is intended, amongst other uses, to decarbonise sectors of the economy which will prove difficult to electrify. The NZHF programme is split into four distinct strands.
- 1.7 The referred Scheme relates to Strand 4³ which provides capital expenditure (CAPEX) funding to build new hydrogen production facilities, enabled with Carbon Capture Use and Storage (CCUS), which is a technology to capture and store carbon dioxide (CO₂) emissions via a transport and storage (T&S) network. These

¹ Chapter 1 of Part 2 of the Act requires a public authority to consider the subsidy control principles and energy and environment principles before deciding to give a subsidy. The public authority must not award the subsidy unless it is of the view that it is consistent with those principles. Chapter 2 of Part 2 of the Act prohibits the giving of certain kinds of subsidies and, in relation to certain other categories of subsidy creates a number of requirements with which public authorities must comply.

² [Operation of the subsidy control functions of the Subsidy Advice Unit - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/operational-guidance/operation-of-the-subsidy-control-functions-of-the-subsidy-advice-unit)

³ The other strands provided support for other types of hydrogen production: Strand 1: DEVEX (development expenditure) for FEED studies and post FEED costs. Strand 2: CAPEX (capital expenditure) for projects that do not require revenue support through the hydrogen business model. Strand 3: CAPEX for non-CCUS enabled projects that also require revenue support through the hydrogen business model.

plants produce hydrogen from natural gas, with CO₂ by-products captured. The Scheme budget (for Strand 4) is up to £600 million.

- 1.8 CCUS technology will be deployed through a phased industrial cluster sequencing programme. Hydrogen projects applying for funding through NZHF Strand 4 will be in the first two clusters.⁴ The individual projects in a cluster will connect to that cluster's CO₂ T&S network to transport their captured CO₂ to the storage sites.
- 1.9 Only CCUS-enabled hydrogen projects which have applied for support through the Hydrogen Production Business Model (HPBM)⁵ to subsidise the unit cost of the hydrogen they produce were eligible to apply for Strand 4 CAPEX support.
- 1.10 Eligible CCUS-enabled hydrogen projects made a submission for capital support with each project checked against eligibility criteria and ranked.⁶ Following this competitive process, two hydrogen projects have been selected for the Scheme: Hynet Hydrogen Production Plant 1 HPP1 (Hynet Cluster), and bpH2 Teesside (East Coast Cluster).
- 1.11 Key design features of projects selected for the Scheme include that they must:
 - (a) be located in the UK and have access to a T&S solution (ie Hynet and the East Coast Cluster).
 - (b) be a new build CCUS-enabled hydrogen production plant.
 - (c) be operational no later than the end of December 2027.
 - (d) have identified an offtaker or multiple offtakers.⁷

SAU referral process

- 1.12 On 24 July 2024, DESNZ requested a report from the SAU in relation to Strand 4 of NZHF.

⁴ A CCUS cluster is defined as the T&S network and an associated set of Capture Projects. The selection process concluded in 2021. Cluster sequencing for carbon capture, usage and storage (CCUS) deployment: Phase-1 - GOV.UK (www.gov.uk)

⁵ The HPBM scheme is designed to incentivise the production and use of low carbon hydrogen over a 15 year contract term. The subsidy is a variable premium that will provide i) price support (because low carbon hydrogen is more expensive than counterfactual fuels) and ii) volume support (because the market is nascent and demand is uncertain), see [Referral of Hydrogen Production Business Model subsidy scheme by the Department for Energy Security and Net Zero - GOV.UK \(www.gov.uk\)](#).

⁶ [Cluster sequencing Phase-2: Track-1 project negotiation list, March 2023 - GOV.UK \(www.gov.uk\)](#)

⁷ ie buyers of the low carbon hydrogen.

- 1.13 DESNZ explained⁸ that Strand 4 is a Scheme of Particular Interest because it allows subsidies to be granted over the value of £10 million.⁹
- 1.14 The SAU notified DESNZ on 30 July 2024 that it would prepare and publish a report within 30 working days (ie on or before 11 September 2024).¹⁰ The SAU published details of the referral on 31 July 2024.¹¹

⁸ In the information provided under section 52(2) of the Act.

⁹ Within the meaning of regulation 3 of [The Subsidy Control \(Subsidies and Schemes of Interest or Particular Interest\) Regulations 2022](#) which sets out the conditions under which a subsidy or scheme is considered to be of particular interest.

¹⁰ Sections 53(1) and 53(2) of the Act.

¹¹ [Referral of the proposed Net Zero Hydrogen Fund Carbon Capture Use and Storage Scheme by the Department for Energy Security and Net Zero - GOV.UK \(www.gov.uk\)](#)

2. Summary of the SAU's observations

- 2.1 The Assessment uses the four-step structure described in the Statutory Guidance for the United Kingdom Subsidy Control Regime (the [Statutory Guidance](#)) and as reflected in the SAU's Guidance on the operation of the subsidy control functions of the Subsidy Advice Unit (the [SAU Guidance](#)).
- 2.2 In our view, DESNZ has considered in detail the Scheme's compliance with the subsidy control and energy and environment principles. In particular, we consider that the Assessment reflects the following positive features:
- (a) It clearly sets out and evidences the specific policy objective of the Scheme and explains well a range of market failures limiting the production of low carbon hydrogen at scale.
 - (b) It demonstrates that DESNZ considered several policy options for achieving the policy objective and clearly sets out the arguments in favour of the chosen model.
 - (c) It further demonstrates that the Scheme will not finance a project or activity that would have been undertaken in a similar manner and timeframe absent the Scheme.
- 2.3 We have however identified the following areas for improvement:
- (a) In Principle C, the Assessment should reach a clear conclusion on the appropriate counterfactual. The change in economic behaviour brought about by the Scheme should then be more clearly set out against this counterfactual.
 - (b) In Principle B, the Assessment should explicitly consider if other subsidies to the same beneficiary to achieve similar policy objectives could impact the proportionality of the subsidy.
 - (c) In Principle F, the Assessment should more explicitly identify the markets which might be affected by the subsidy and provide a more comprehensive discussion of potential distortions. Given the wider framework of subsidy for CCUS this should also consider potential impacts on competition across the wider CCUS supply chain and related markets as they develop.
 - (d) In relation to the Energy & Environment Principles, DESNZ should explain its reasoning as to why it considers an assessment of Principle H is unnecessary given the focus of the Scheme and its intended benefits. If necessary, DESNZ should undertake and include an assessment of Principle H, giving regard to the Statutory Guidance. In doing so DESNZ may benefit

from consideration of the third-party comments specifically as they relate to the potential for decarbonisation and greenhouse gas emissions.

- 2.4 Our report is advisory only and does not directly assess whether the Scheme complies with the subsidy control requirements. The report does not constitute a recommendation on whether the Scheme should be implemented by DESNZ.

3. The SAU's Evaluation

3.1 This section sets out our evaluation of Assessment, following the four-step framework structure used by DESNZ.

Step 1: Identifying the policy objective, ensuring it addresses a market failure or equity concern, and determining whether a subsidy is the right tool to use

3.2 The first step involves an evaluation of the Assessment against:

- (a) Principle A: Subsidies should pursue a specific policy objective in order to (a) remedy an identified market failure or (b) address an equity rationale (such as local or regional disadvantage, social difficulties or distributional concerns); and
- (b) Principle E: Subsidies should be an appropriate policy instrument for achieving their specific policy objective and that objective cannot be achieved through other, less distortive, means.¹²

Policy Objective

3.3 The Assessment sets out that the primary policy objective of the Scheme is to help deliver the CCUS-enabled hydrogen production capacity that will be needed to meet the Government's ambition of at least 10GW per annum of hydrogen production by 2030. It explains that the Climate Change Committee's Carbon Budget advice¹³ suggests low carbon hydrogen will be essential for meeting Net Zero and for meeting the target of reducing CO₂ emissions by 78 per cent on 1990 levels by 2035.

3.4 The Assessment explains that the Scheme will support this objective by enabling, through capital grants, the construction of new CCUS-enabled low carbon hydrogen production projects that will subsequently commence commercial deployment supported by the HPBM.

3.5 It sets out that an additional policy objective of the Scheme is to reduce the amount of ongoing revenue support needed by HPBM projects due to lower

¹² Further information about Principles A and E can be found in the [Statutory Guidance](#) (paragraphs 3.32 to 3.56) and the [SAU Guidance](#) (paragraphs 4.7 to 4.11).

¹³ [Sixth Carbon Budget - Climate Change Committee \(theccc.org.uk\)](https://www.theccc.org.uk)

CAPEX financing costs, thus achieving better value for money for government and/or future levy payers.¹⁴

- 3.6 In our view the policy objectives have been clearly set out and explained. DESNZ has used relevant evidence to underpin its policy aims, including the Climate Change Committee's Carbon Budget advice and the UK Hydrogen Strategy.¹⁵

Market failure and equity objective

- 3.7 The Statutory Guidance sets out that:

- (a) Market failure occurs where market forces alone do not produce an efficient outcome.¹⁶
- (b) Equity objectives seek to reduce unequal or unfair outcomes between different groups in society or geographic areas.¹⁷

- 3.8 The Assessment identifies the following market failures:

- (a) Investment uncertainty: whereby 'first movers' in the production and consumption sides of the market bear significant learning costs and risks, which may benefit future producers and offtakers. The Scheme aims to remedy this market failure through CAPEX co-funding to reduce the costs and risks for developers and investors entering the nascent market.
- (b) Coordination failures and a lack of market structure: the Assessment sets out that at present, the lack of demand for CCUS-enabled low carbon hydrogen makes it unprofitable to invest in its production, and in turn, that demand will only arise in response to production plants being able to offer certainty of supply at the right price. The Assessment explains that the Scheme fits into the wider landscape of funding support for CCUS systems and hydrogen production offered by the Government (alongside the HPBM) to overcome the initial cost and risk hurdles that are restricting investment and ensure that a well-functioning market is able to develop in a coordinated manner and in the timescales required to deliver Net Zero targets.
- (c) Negative externalities: the Assessment argues that low carbon fuels, including low carbon hydrogen, are at a competitive disadvantage due to the social cost of emissions (a negative externality) not being adequately captured in the market price or current UK Emissions Trading Scheme

¹⁴ The Energy Act 2023 contains provisions that will enable government to introduce a hydrogen levy on gas shippers through secondary legislation to fund HPBM payments and associated costs (see [Hydrogen Strategy Delivery Update: Hydrogen Strategy Update to the Market: December 202e \(publishing.service.gov.uk\)](#)).

¹⁵ [UK Hydrogen Strategy \(publishing.service.gov.uk\)](#)

¹⁶ [Statutory Guidance](#), paragraphs 3.35 to 3.48.

¹⁷ [Statutory Guidance](#), paragraphs 3.49 to 3.53.

carbon pricing¹⁸ for high carbon fuels. The Assessment sets out that the Scheme aims (in conjunction with the HPBM) to contribute to an overall reduction in hydrogen production costs, thereby reducing the price advantage associated with producing and using high carbon fuels, and that low carbon hydrogen produced from Scheme recipients will contribute to a reduction in emissions.

- 3.9 We consider that the Assessment explains well a range of market failures limiting the production of low carbon hydrogen at scale, providing relevant detail and supporting evidence. However, the Assessment could more clearly articulate the relative contributions of the Scheme and HPBM to addressing the market failures identified, as well as how the two Schemes will work in conjunction to address them.

Consideration of alternative policy options and why the Scheme is the most appropriate and least distortive instrument

- 3.10 In order to comply with Principle E, public authorities should consider why the decision to give a subsidy is the most appropriate instrument for addressing the identified policy objective, and why other means are not appropriate for achieving the identified policy objective.¹⁹
- 3.11 The Assessment explains that the Scheme is the most appropriate instrument as investors will require additional funding to cover the higher costs and risks in the initial stages of development of CCUS-enabled low carbon hydrogen production solutions until they reach the scale, efficiency and maturity to compete against other technologies. It explains that the Scheme, in providing targeted CAPEX support, overcomes these barriers to investment.
- 3.12 The Assessment then goes on to set out several existing or alternative policy options that were considered and rejected, including:
- (a) Tax incentives; the Assessment and supporting evidence explain that investors will require support to overcome the coordination failures and high barriers to investment and that tax incentives would not adequately address them.
 - (b) Higher carbon prices and an extension of the Emissions Trading Scheme; the Assessment and the supporting evidence conclude that amendments to the carbon price alone are unlikely to be sufficient in the near term to close the cost gap and incentivise offtakers to replace fossil fuels with CCUS-

¹⁸ [Consultation on a business model for low carbon hydrogen \(publishing.service.gov.uk\)](https://www.publishing.service.gov.uk/government/consultations/a-business-model-for-low-carbon-hydrogen)

¹⁹ [Statutory Guidance](#), paragraphs 3.54 to 3.56.

enabled hydrogen, nor to address the other risks and barriers associated with early hydrogen production projects.

- (c) Utilising existing hydrogen funds; the Assessment explains that existing policies and funds that could have a bearing on low carbon hydrogen are not designed to bring forward commercial deployment of low carbon hydrogen production projects that the Scheme is targeting.

- 3.13 The Assessment, together with the supporting evidence provided, also considered repayable loans, equity stakes and capital guarantees and explains they were rejected as less effective at achieving the policy objective.
- 3.14 Loans were discounted as they are generally provided on the assumption that projects are already investable. The Assessment explains that in relation to commercial finance, this can prove difficult to secure for First of a Kind (FOAK) projects because they often involve new technologies or combinations of existing technologies and new processes which creates unique challenges. These complexities can make it difficult for traditional lenders to assess the risks accurately. Lenders also typically prefer projects with a proven track record and predictable cash flows. In contrast, FOAK projects may face uncertainties related to performance, regulatory compliance, and market acceptance as well as lengthy lifecycles.
- 3.15 The Assessment further explains that feedback from the NZHF consultation²⁰ alongside market intelligence indicated that loans would be ineffective at removing the risks and barriers identified. Therefore, DESNZ conclude that loans are unlikely to de-risk private sector investment and meet policy objectives.
- 3.16 Equity holdings were discounted due to what are described as increased risks in relation to control, decision making and a lack of communication between parties. The Assessment also explains that equity holdings were deemed to be a more complicated method of managing funding, with balance sheet impacts for the Government, and did not align with DESNZ's broader energy policy approach.
- 3.17 In relation to capital guarantees, whilst it was recognised that these could unlock third-party investment and help to create a sustainable capital market, the Assessment argues that they would not confer the same benefits as a grant, eg it does not improve the economic viability of a project through the interaction of CAPEX funding on HPBM costs, and may also incur administrative costs beyond the life of the Scheme. This option was therefore discounted.

²⁰ [Net Zero Hydrogen Fund: government response \(publishing.service.gov.uk\)](https://www.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/100000/net-zero-hydrogen-fund-government-response.pdf)

- 3.18 In our view, the Assessment demonstrates that DESNZ considered several policy options for achieving the policy objective and clearly sets out the arguments in favour of the chosen model.
- 3.19 The Assessment could be improved by more extensive use of the material provided in the supporting documentation, for example the option analysis in explaining why alternative forms of subsidy such as loans were not considered effective. The Assessment could also better explain why importing hydrogen (see paragraph 3.26) was not considered a suitable alternative (eg with reference to energy security or other priorities).

Step 2: Ensuring that the subsidy is designed to create the right incentives for the beneficiary and bring about a change

- 3.20 The second step involves an evaluation of the assessment against:
- (a) Principle C: First, subsidies should be designed to bring about a change of economic behaviour of the beneficiary. Second, that change, in relation to a subsidy, should be conducive to achieving its specific policy objective, and something that would not happen without the subsidy; and
 - (b) Principle D: Subsidies should not normally compensate for the costs the beneficiary would have funded in the absence of any subsidy.²¹

Counterfactual assessment

- 3.21 In assessing the counterfactual, the Statutory Guidance explains that public authorities should assess any change against a baseline of what would happen in the absence of the subsidy (the ‘do nothing’ scenario).²² This baseline would not necessarily be the current ‘as is’ situation (the ‘status quo’) but what would likely happen in the future – over both the long and short term – if no subsidy were awarded.
- 3.22 The Assessment states that absent the Scheme there would either be (i) no government support for build of new CCUS-enabled low hydrogen production plants in the 2020s and beyond, or (ii) only revenue support via the HPBM.
- 3.23 The Assessment goes on to explain that in this scenario, it is expected that the market failures and risks of investments outlined in Step 1 are too great for the private market to overcome absent the Scheme and there will either be:

²¹ Further information about the Principles C and D can be found in the [Statutory Guidance](#) (paragraphs 3.57 to 3.71) and the [SAU Guidance](#) (paragraphs 4.12 to 4.14).

²² [Statutory Guidance](#), paragraphs 3.60 to 3.62.

- (a) no CCUS-enabled low carbon hydrogen production capacity built; or
- (b) the development of CCUS-enabled low carbon hydrogen capacity will be delayed and at a higher cost.

- 3.24 It further outlines that costs to government for CCUS-enabled low hydrogen production projects will have higher lifetime costs without NZHF capex. However, in the second counterfactual scenario, the Assessment does not provide detail on the potential length of the delay.
- 3.25 The Assessment states that in either case there would be continued use of high carbon fuels and potential delays to wider decarbonisation of the power sector.
- 3.26 The Assessment also outlines that offshoring hydrogen production could result in lower UK emissions compared to a scenario where the UK has a developed hydrogen economy. It explains that this would result in increasing the UK's dependence on foreign countries for energy, and would lead to higher costs and lower benefits due to the environmental impacts of transportation.
- 3.27 DESNZ also explains that absent the scheme, CCUS-enabled hydrogen production plants would not be constructed in time to deliver the low carbon hydrogen required to meet Net Zero commitments.
- 3.28 In our view, the Assessment presents a number of different possible counterfactuals and does not reach a clear conclusion on which counterfactual is most likely to apply. It should have more clearly concluded on which counterfactual is the relevant scenario. This would provide greater clarity for the assessment of the change in economic behaviour as a result of the Scheme.

Changes in economic behaviour of the beneficiary

- 3.29 The Statutory Guidance sets out that subsidies must bring about something that would not have occurred without the subsidy.²³ In demonstrating this, public authorities should consider the likely change or additional net benefit.
- 3.30 The Assessment notes that the Scheme subsidises upfront CAPEX which, alongside time limited revenue support (the HPBM scheme), reduces risks to private investors. As a result, the subsidy will change the beneficiary's economic behaviour by encouraging investment into FOAK projects, initiating production of low carbon hydrogen that otherwise may not have been financially viable.

²³ [Statutory Guidance](#), paragraph 3.64.

- 3.31 DESNZ notes that, in order to realise benefits from upfront CAPEX support, project developers are required to contribute private sector funding. This will ensure that they are committed to the project's success.
- 3.32 The Assessment and relevant evidence on which it relies shows that the Scheme would fund projects that would directly contribute to the Government's ambition to reduce UK greenhouse emissions and assist with reaching Net Zero by 2050 by supporting at scale deployment of new low carbon hydrogen production.
- 3.33 As set out in paragraph 3.28 the Assessment did not reach a clear conclusion on the counterfactual. We therefore evaluate how the Assessment considers the change in economic behaviour in the two different counterfactual scenarios set out in paragraph 3.23:
- (a) No new CCUS-enabled low hydrogen production plants: the Assessment clearly sets out the expected change in economic behaviour of the beneficiaries and how the scheme encourages private investment and funding for the commercial deployment of new low carbon hydrogen projects, thereby contributing directly to the policy objective.
 - (b) Delayed new CCUS-enabled low hydrogen production plants: the Assessment could have provided additional detail of how the Scheme results in a change in economic behaviour of the beneficiaries, given the beneficiaries would attract finance to develop the plants absent the Scheme.
- 3.34 We consider that the Assessment should have more clearly set out the counterfactual against which the change in economic behaviour has been measured, and so clarify the change in economic behaviour arising from the Scheme.

Additionality assessment

- 3.35 According to the Statutory Guidance, 'additionality' means that subsidies should not be used to finance a project or activity that the beneficiary would have undertaken in a similar form, manner, and timeframe without the subsidy.²⁴ For schemes, public authorities should also, where possible and reasonable, ensure the scheme's design can identify in advance and exclude those beneficiaries for which it can be reasonably determined would likely proceed without subsidy.²⁵
- 3.36 The Assessment outlines that the Scheme is limited to funding construction of new CCUS-enabled low carbon hydrogen production plants. It also explains that, while projects will receive support through both the Scheme and HPBM, the HPBM

²⁴ [Statutory Guidance](#), paragraphs 3.63 to 3.67.

²⁵ [Statutory Guidance](#), paragraph 3.66

scheme has been designed not to cover costs already covered under the Scheme, and therefore avoid double compensation.

- 3.37 The Assessment sets out that bilateral negotiations have been undertaken with projects to confirm that the subsidy is needed to de-risk private investment, improve the commercial viability of projects and provide better value for money for government.
- 3.38 DESNZ notes that a competitive process for selection for support under the Scheme (coupled with effective eligibility criteria that encourages strong applicants and transparent selection criteria) helps to provide best value for money and, through due diligence, additionality.
- 3.39 In our view the Assessment demonstrates that the Scheme will not finance a project or activity that would have been undertaken in a similar manner and timeframe absent the Scheme.

Step 3: Considering the distortive impacts that the subsidy may have and keeping them as low as possible

- 3.40 The third step involves an evaluation of the assessment against:
- (a) Principle B: Subsidies should be proportionate to their specific policy objective and limited to what is necessary to achieve it; and
 - (b) Principle F: Subsidies should be designed to achieve their specific policy objective while minimising any negative effects on competition or investment within the United Kingdom.²⁶

Proportionality

- 3.41 The Assessment acknowledges that a grant is likely to be more distortive than a loan. However, it explains that it considered both as part of a consultation with stakeholders (see paragraph 3.15) and concluded that a loan may not overcome the hurdles faced by developers to attract the scale and level of private sector investment to kick start the nascent market, and therefore achieve the policy objective.
- 3.42 The Assessment sets out a number of mechanisms which show how the subsidy is proportionate.
- 3.43 These include (i) the subsidy being limited to projects building new facilities; (ii) funding being paid in arrears on completion of pre-agreed project milestones and

²⁶ Further information about the Principles B and F can be found in the [Statutory Guidance](#) (paragraphs 3.72 to 3.108) and the [SAU Guidance](#) (paragraphs 4.15 to 4.19).

deliverables; (iii) a list of eligible expenditure; (iv) funding being ringfenced; (v) no expenditure being reimbursed from before the subsidy; (vi) audit trails of grant related expenditure being provided; (vii) cost overruns being borne by the projects; (viii) project costs being internally and externally scrutinised during the application process; (ix) no double subsidy funding or overlap with HPBM funding; (x) quarterly reports on progress; performance criteria; and (xi) monitoring and evaluation being in place.

- 3.44 The Assessment explains that the maximum subsidy funding intensity is set at 20% of eligible capex costs, which is lower than for other projects without HPBM support. It explains that the figure was tested with stakeholders and was set at that level to ensure that projects had sufficient financial certainty to proceed, overcome initial cost hurdles and attract private sector investment.
- 3.45 It explains that a lower level of subsidy might be sufficient in some cases, however the 20% rate was chosen to balance overcoming the investment barriers and reducing the overall cost of support to CCUS-enabled hydrogen producers and future levy payers of HPBM (see paragraph 3.5).
- 3.46 In our view, the Assessment explains how the subsidy has been designed to be proportionate to the policy objectives. However, the Scheme is part of a programme of several CCUS-related schemes and hydrogen production schemes, and recipients of the Scheme will also receive HPBM operational support.
- 3.47 The Assessment should therefore explicitly consider if other subsidies to the same beneficiaries to achieve similar policy objectives could impact on the proportionality of the subsidy, for example HPBM.
- 3.48 In addition, given the Assessment acknowledges a lower level of subsidy could have been possible, it could have provided more explanation as to why the 20% cap was chosen as the right level to both overcome the investment hurdles and reduce the overall costs of support including the HPBM scheme, giving the best outcome and value for money across the two schemes.

Assessment of effects on competition or investment

- 3.49 The Assessment identifies the beneficiaries to be CCUS-enabled hydrogen projects,²⁷ which will be located in industrial clusters where they can connect to CO₂ T&S networks.
- 3.50 The Assessment sets out some considerations relevant to potential competition impacts on hydrogen producers:

²⁷ Hynet Hydrogen Production Plant 1 HPP1 (Hynet Cluster), and bpH2Teesside (East Coast Cluster)

- (a) It is likely that only a single CCUS hydrogen project will exist in each CCUS cluster, although this (or support to beneficiaries outside existing clusters) is subject to future policy decisions, and each of these projects is likely to be delivered by a different developer based on current market intelligence signals.
- (b) In the short term, it is not expected there will be any non-subsidised CCUS-enabled hydrogen competitors in operation until the levelized cost²⁸ of hydrogen falls to parity with natural gas. There could in the future be competitors who receive HPBM subsidy funding but not NZHF funding. However, the Assessment argues that they are unlikely to be at a disadvantage, primarily because these competitors would be unlocking new demand and not competing directly with plants already operational (given FOAK contracts in place with offtakers). In addition, future competitors can be expected to benefit from the lessons of the FOAK projects who will receive funding under the Scheme, such as understanding and managing risk and lower financing costs.
- (c) The development of a low carbon hydrogen market will be geographically constrained by the location of the clusters. This may impact hydrogen producers with the potential to transition to CCUS-enabled hydrogen, due to being outside the cluster location without access to a T&S network and therefore ineligible for the subsidy.
- (d) Suppliers of alternative fuels (such as existing grey hydrogen²⁹ producers) will be affected by the construction of new CCUS-enabled low carbon hydrogen production plants.
- (e) Producers of electrolytic hydrogen³⁰ are unlikely to be competing with CCUS-enabled hydrogen due to the different needs of offtakers.

3.51 In relation to input markets, the Assessment explains that the subsidy may displace the use of natural gas by some industrial offtakers who currently use it as an energy source. However, displacement is expected to be minimal as CCUS hydrogen still uses natural gas as feedstock. There is also expected to be no displacement of inputs from elsewhere (ie there will be no shortfall of natural gas for other grid users) and no competitive advantage would arise from the use of natural gas supplied by the grid to make CCUS-enabled low carbon hydrogen.

3.52 The Assessment also sets out a number of potential impacts on international trade and investment, concluding that this Scheme (NZHF strand 4) when considered apart from HPBM is likely to have only a minimal impact as it is covering costs of

²⁸ [Levelized Cost of Energy \(LCOE\) - What is it, Formula, Importance](#)

²⁹ <https://www.weforum.org/agenda/2021/07/clean-energy-green-hydrogen/>

³⁰ [Grey, blue, green – the many colours of hydrogen explained | World Economic Forum \(weforum.org\)](#)

construction of new projects that otherwise would not have been built on a timeline and to the scale needed.

- 3.53 In our view, it is unclear which counterfactual the Assessment is comparing the above competition impacts against (see paragraph 3.28). While the Assessment concludes impacts would be minimal as the Scheme only covers the cost of construction, the Assessment should consider the wider competition impacts the Scheme may have as a result of enabling the operation of the CCUS-enabled hydrogen projects.
- 3.54 As the Scheme, together with other CCUS and hydrogen schemes,³¹ seeks to enable the creation of the CCUS and related markets, the Assessment should consider how it could directly or indirectly impact competition in the various markets across the entire CCUS supply chain, taking into account the wider context where relevant (eg the cluster selection process).
- 3.55 While recognising that the Assessment provides some detail on the potential distortive impacts of the Scheme, it should more explicitly identify the relevant and related markets which might be affected by the subsidy (eg the affected green and non-green fuel alternatives).
- 3.56 It should then provide a more comprehensive discussion of potential distortions, for example, outlining potential longer-term impacts on future CCUS-enabled hydrogen producers active within CCUS clusters, including producers not in receipt of this or other subsidies, as well as producers of non-abated hydrogen (known as grey hydrogen producers).
- 3.57 The Assessment could also consider potential displacement of unabated and other non-green fuel alternatives (including the potential displacement of investment), given the objective of the Scheme to do this.

Design of subsidy to minimise negative effects on competition and investment

- 3.58 The Assessment sets out some mechanisms which could help minimise potential distortive effects (in addition to those discussed under proportionality, see paragraph 3.42). In addition, it notes that the selection of projects included a competitive process in accordance with published criteria, and that whilst exported hydrogen will not be eligible for support payments under HPBM, the producers are

³¹ Previously published SAU reports on CCUS related subsidies
Transport and Storage - [Report on the proposed CCUS Transport and Storage Regulatory Investment Model Support Scheme \(publishing.service.gov.uk\)](https://publishing.service.gov.uk)
Dispatchable Power Agreement - [Report on the proposed CCUS Dispatchable Power Agreement Business Model scheme \(publishing.service.gov.uk\)](https://publishing.service.gov.uk)
HPBM - [Final report \(publishing.service.gov.uk\)](https://publishing.service.gov.uk)
NZHF Strand 3 - [Final report \(publishing.service.gov.uk\)](https://publishing.service.gov.uk)

free to export unsubsidised volumes which should minimise the impact on the UK projects' ability to participate in international trade.

- 3.59 In our view, while the Assessment explains some mechanisms which could limit potential distortions, it could more clearly explain the counterfactual and relevant impacts on competition and investment in order to more clearly demonstrate the effectiveness of these mechanisms.

Step 4: Carrying out the balancing exercise

- 3.60 The fourth step involves an evaluation of the assessment against subsidy control Principle G: subsidies' beneficial effects (in terms of achieving their specific policy objective) should outweigh any negative effects, including in particular negative effects on: (a) competition or investment within the United Kingdom; (b) international trade or investment.³²
- 3.61 The Assessment sets out a series of potential negative effects of the scheme including:
- (a) Crowding out of private financing: public funds could displace private sector provision, however, it considers this is unlikely in that private finance would be either unavailable or less affordable.
 - (b) Geographical impacts: the Scheme is only available in Track 1 industrial cluster areas (see paragraph 1.10). Projects which could deploy the same production methods outside these clusters may be negatively impacted, since they will not benefit from T&S systems (while we note separate Government support schemes for the build and operation of T&S networks are restricted to particular recipients). This may in turn have geographical impacts in terms of development of hydrogen production and hydrogen T&S systems in other places in the country. However, the Assessment argues that this effect is limited since there are relatively few locations available in the UK with access to offtakers and CO₂ sequestration sites, which are necessary for projects to be economically viable.
 - (c) Impact on natural gas markets: the Assessment explains that whilst the construction of CCUS-enabled hydrogen plants will not directly impact the UK natural gas market, the operation of those plants may have such an impact, although it explains that these effects, if realised, are a consequence of the policy choice to reduce emissions.

³² See [Statutory Guidance](#) (paragraphs 3.109 to 3.117) and [SAU Guidance](#) (paragraphs 4.20 to 4.22) for further detail.

- (d) International trade impacts: the Assessment concludes that by developing domestic production capacity, there is a potential that the UK will develop as a hydrogen exporter.

3.62 The Assessment then goes on to explain the expected benefits including:

- (a) Increased private sector investment in low carbon hydrogen production: that by providing up-front CAPEX, the Scheme will help to reduce the quantum of costs and risks of 'first movers' which in turn will help stimulate private sector investment into low carbon hydrogen production projects.
- (b) Progress towards 10GW 2030 ambition: the Scheme will enable growth in hydrogen production (in line with the 10GW ambition (see paragraph 3.3)).
- (c) Learnings and cost reductions: that by enabling projects, CAPEX support will help trigger learnings and insights, generating a benefit by driving down the development and construction costs of future projects.
- (d) Emissions reduction: that the Scheme will displace the use of high carbon fuels across multiple industrial sectors.
- (e) Improved value for money for the HPBM: that by lowering lifetime project costs through lower financing costs, the Scheme will lower the amount of ongoing revenue support required through HPBM, achieving better value for money for government and any future levy payers.
- (f) Increased inward investment into the UK: that by incentivising large scale CCUS-enabled low carbon hydrogen production projects in the UK this is likely to increase the potential for inward investment into the UK.

3.63 The Assessment concludes that the benefits presented by the Scheme outweigh any potential negative impacts and that the scheme will play a direct role in reducing emissions as one of a range of Government interventions intended to facilitate the deployment of hydrogen projects.

3.64 We received a number of third-party representations on the Scheme (see paragraph 1.3). Broadly speaking these representations suggested that the negative outcomes in terms of environmental impacts may outweigh the overall benefits of the Scheme. Whilst this point has relevance for Step 4, we note that DESNZ's Assessment considers the benefits of the subsidy (in relation to the specific policy objective, which in this case relates to developing CCUS-enabled hydrogen production capacity) and is based on comparison with unabated CO₂ emissions from continuing fossil fuel usage in the counterfactual. We return to the points raised in the representations in the discussion of the Energy and Environment Principles.

3.65 In our view, the Assessment clearly sets out the positive effects of the Scheme in relation to the specific policy objectives as well as potential negative impacts, and conducts a high-level balancing exercise between them, in line with the Statutory Guidance.

Energy and Environment Principles

3.66 This step involves an evaluation of the Assessment with regard to compliance with the Energy and Environment Principles, where these are applicable to the Scheme.³³

3.67 The Statutory Guidance summarises the scope of the different Energy and Environment Principles that apply to different types of subsidies.³⁴ DESNZ has conducted an assessment of the scheme against Principles A and B.

3.68 The SAU received several representations from third parties in relation to the assessment of these principles. Broadly speaking these representations expressed doubt on the capacity of the proposed subsidy, and CCUS-enabled hydrogen production methods more generally, to deliver an overall increase in the level of environmental protection.

3.69 They explained that, amongst other factors, the projected increase in the importation and use of liquified natural gas in the UK network and the high upstream environmental costs associated with its use, including in production, transport and potential methane leakage would outweigh any potential benefits. The representations also expressed doubt as to the proposed efficiency of the CCUS technologies.

Principle A: Aim of subsidies in relation to energy and environment

3.70 The assessment against Principle A should show how the subsidy/scheme is consistent with delivering a secure, affordable and sustainable energy system and a well-functioning and competitive energy market, or increasing the level of environmental protection compared to the level that would be achieved in the absence of the subsidy. If a subsidy/scheme is in relation to both energy and environment, it should meet both of these limbs.³⁵

³³ See Schedule 2 to the Act.

³⁴ Principles A and B apply to all subsidies in relation to energy and environment. Principle C applies for subsidies for electricity generation adequacy, renewable energy or cogeneration. Principle D applies to subsidies for electricity generation only. Principle E applies to subsidies for renewable energy or cogeneration. Principle F applies to subsidies in the form of partial exemptions from energy related taxes and levies. Principle G applies to subsidies that compensate electricity intensive users for increases in electricity costs, Principle H relates to subsidies for decarbonisation of industrial emissions. Principle I relates to subsidies for improving energy efficiency of industrial activities.

³⁵ [Statutory Guidance](#), paragraphs 4.19 to 4.28.

- 3.71 The Assessment sets out that the Scheme is aimed at supporting the commercial development of new low carbon hydrogen production which aims to deliver a secure, affordable and sustainable energy system. DESNZ also sets out that the NZHF will help to form a well-functioning and competitive market by providing developers up-front CAPEX co-funding in order to stimulate private sector investment.
- 3.72 It also explains that the Scheme increases the level of environmental protection compared to a level that would be achieved in the absence of the Scheme (ie continuing unabated use of fossil fuels) by developing the market, lowering the cost of hydrogen production, reducing emissions and supporting the development of low carbon hydrogen production facilities. We note that the Statutory Guidance sets out that subsidies and schemes with a specific policy objective of promoting Net Zero will tend to be consistent with Principle A of the Energy and Environment Principles.³⁶
- 3.73 We consider that DESNZ has engaged in the assessment and analysis of this Principle and explained its reasoning, including through further clarification, as to why the Scheme will deliver an overall increase in environmental protection compared with the otherwise continued unabated use of fossil fuels.

Principle B: Subsidies not to relieve beneficiaries from liabilities as a polluter

- 3.74 The assessment against Principle B should explain clearly how the proposed subsidy or scheme does not relieve a polluter from having to bear the full costs of the pollution caused.³⁷
- 3.75 The Assessment sets out that the Scheme requires all beneficiaries to comply with the Low Carbon Hydrogen Standard³⁸ in order to receive funding. The Assessment goes on to explain that the Scheme sets a maximum threshold for the amount of greenhouse gas emissions allowed in the production process for hydrogen to be considered 'low carbon hydrogen.' It explains that all beneficiaries of the Scheme are required to comply with this standard and that there are no provisions within the Grant Funding Agreement or the Grant Offer Letter which relieve beneficiaries from liabilities arising from their responsibilities as a polluter.
- 3.76 We consider that DESNZ has clearly explained its reasoning as to how the Scheme complies with Principle B of the Energy and Environment Principles.

³⁶ [Statutory Guidance](#), paragraph 4.27.

³⁷ [Statutory Guidance](#), paragraphs 4.29 to 4.35.

³⁸ The Low Carbon Hydrogen Standard defines what constitutes 'low carbon hydrogen' at the point of production and sets a maximum threshold for the amount of greenhouse gas emissions allowed in the production process for hydrogen to be considered 'low carbon hydrogen'. The standard sets out in detail the methodology for calculating the emissions associated with hydrogen production and the requirements producers are expected to meet to prove that the hydrogen they produce is compliant.

Principle H: Subsidies for the decarbonisation of emissions linked to industrial activities

- 3.77 Under Principle H, subsidies for the decarbonisation of emissions linked to industrial activities in the UK should achieve an overall reduction in greenhouse gas emissions, and reduce the emissions directly resulting from the industrial activities concerned.
- 3.78 As set out in paragraph 3.68, the SAU received third-party representations in relation to the Scheme. In addition to the issues raised in paragraph 3.68, a number of those representations referred to Principle H and queried whether the proposed Scheme is compliant with it, given that there is expected to be increasing use of liquified natural gas in the UK's natural gas supply and that liquified natural gas is associated with increased upstream emissions of greenhouse gases.
- 3.79 The Assessment does not assess Principle H as it concludes that it is not applicable to the Scheme. The reasoning advanced is that the Scheme will subsidise the construction of CCUS-enabled low carbon hydrogen production plants and not their operation. However, we note that the assessment of Principle B considers the operation of the plants, and the Assessment of the subsidy control principles takes account of benefits arising from operation of the plants.
- 3.80 The Assessment should explain its reasoning as to why it considers an assessment of Principle H is unnecessary given the focus of the Scheme and its intended benefits. If necessary, DESNZ should undertake and include an assessment of Principle H, giving regard to the Statutory Guidance.³⁹ In doing so DESNZ may benefit from consideration of the third-party comments specifically as they relate to the potential for decarbonisation and greenhouse gas emissions.

Other Requirements of the Act

- 3.81 This step in the evaluation relates to the requirements and prohibitions set out in Chapter 2 of Part 2 of the Act, where these are applicable.⁴⁰ DESNZ confirmed that no other requirement or prohibitions set out in Chapter 2 or Part 2 of the Act apply to the Scheme.

11 September 2024

³⁹ [Statutory Guidance](#), paragraphs 4.61 to 4.69

⁴⁰ [Statutory Guidance](#), chapter 5.