REA member briefing on the Hydrogen Investment Package

Following the positive hydrogen related announcements in the Energy Security Strategy on the 7th April (see our briefing here), on 8th April BEIS published the Hydrogen Investment Package. Following its publication, a few days later, they also released a raft of secondary documents to accompany the package.

The package includes the government responses to the Hydrogen Business Model, Net Zero Hydrogen Fund, and Low Carbon Hydrogen Standard, all of which the REA wrote responses to.

BEIS have also confirmed that the Industrial Hydrogen Accelerator, will open for applications **25 April** (see further details below).

This package is accompanied by the Hydrogen Investor Roadmap, which showcases the UK's hydrogen offer and the scale of the Government's ambition for the role of the hydrogen economy in meeting Net Zero.

Please read on for details briefings of the various documents.

Government response on the design of a business model for low carbon hydrogen

The government response confirms the following:

- the business model will be applicable to a range of hydrogen production pathways to facilitate the growth of the nascent hydrogen economy across the whole of the UK. The technologies in scope of each round of allocation to award business model support will continue to be guided by the UK Hydrogen Strategy.
- a contractual, producer-focused business model, will be introduced, applicable to a range of hydrogen production pathways and able to facilitate hydrogen use in a broad range of sectors.
- this will be a variable premium price support model where the subsidy is the difference between a 'strike price' reflecting the cost of producing hydrogen and a 'reference price' reflecting the market value of hydrogen (similar to the renewable power CfD).
- the reference price will be based on the producer's achieved sales price, with a floor at the natural gas price, and a contractual mechanism to incentivise the producer to increase the sales price (an amount linked to the increment by which the sales price exceeds the floor price for each unit of hydrogen sold). A market benchmark price will be integrated into the reference price at the earliest opportunity for future projects.

- volume support will be provided via a sliding scale in which the strike price (and therefore subsidy) is higher on a per unit basis if hydrogen offtake falls.
- small-scale hydrogen transport and storage costs will be supported through the business model where necessary, taking into account affordability and value for money
- The contract will be a 10-15 years contact (tbc).
- a levy will be introduced to fund the business model from 2025 at the latest, subject to consultation and legislation, with the first electrolytic projects being funded through general taxation if they are operational before the levy is in force.
- The Government aims to finalise the hydrogen business model in 2022, and to allocate the first support contracts for projects reaching final investment decisions from 2023. BEIS have confirmed the first allocation round will be for electrolytic projects only.

Small scale

Disappointingly, BEIS do not see a compelling case for introducing a separate scheme for smaller scale projects, though they said they will continue to develop their proposed model so that it can work across different project scales and technologies. The minimum confirmed threshold for eligibility under the business model is 5 MW.

Price indexation

BEIS will consider different approaches for different technologies within the overall model design, for example on strike price indexation, as well as running separate allocation processes. CPI inflation linked for electrolytic projects and CPI plus natural gas price linked for CCUS-enabled projects.

Increasing volumes / expansions

BEIS are considering the case for producers to increase the volume of hydrogen produced within an existing plant above any level defined in their contract. Building a new plant or a new module would not be subsidised under the existing contract and would require application to a new allocation process.

Competitive auction

Allocation will be initially done via bilateral agreements, but government's ambition is to move to price competitive allocation by 2025 as soon as legislation and market conditions allow.

Grey hydrogen producer and hydrogen as a by-product

Existing producers of hydrogen looking to retrofit using CCUS technology will not be eligible for support through the hydrogen business model but may be eligible to apply for support through the ICC business model.

BEIS do not intend to support new build industrial facilities generating hydrogen as a by-product through the hydrogen business model.

Specific offtakes

BEIS have set out the following proposals for some specific offtake cases, subject to compliance with subsidy control and other public law principles:

- Own consumption: allowing business model subsidy where the producer and user are the same entity. BEIS are considering options for model design to accommodate this.
- Intermediaries: BEIS are considering any potential challenges to the business model created by sales to intermediaries.
- Blending hydrogen into the gas grid: BEIS are considering whether and how to support blending through the business model to achieve the intended role of blending as a demand-sink for hydrogen producers. Given the timescales for wider policy decisions on blending, they are not planning to include support for blending hydrogen into the gas grid in the initial business model contracts but they will consider a contractual reopener, which could enable support for blended volumes in future.
- Exports: exports of hydrogen would be permitted for projects benefitting from business model support, but the specific volumes exported would not be eligible for support payments.
- No exclusion from the business model support for sales of hydrogen to feedstock users

Business Model Heads of Terms

Alongside the government response BEIS have published high level, indicative Heads of Terms for the Low Carbon Hydrogen Agreement (the business model contract). This sets out further detail on key elements of business model design, including the payment mechanism. Like in the renewable power CfD, projects will need to meet initial and operational conditions precedent and milestone delivery targets and they can be terminated if not operational by an agreed 'Long-stop date'.

Market engagement on electrolytic allocation consultation

They have also issued a market engagement document which sets out a proposed approach to a joint Hydrogen Business Model and Net Zero Hydrogen Fund allocation process for electrolytic hydrogen projects. The deadline for providing comments on the proposal is **6th May.**

- BEIS is consulting on a joint Hydrogen Business Model (HBM) and Net Zero Hydrogen Fund (NZHF) allocation process for electrolytic hydrogen projects.
- BEIS recognise that projects are likely to see a HBM as the main factor driving decisions towards Final Investment Decision but expect that projects may also

need or enjoy NZHF capital co-funding to lower upfront costs and risks. This could result in a project requiring less HBM support overall.

- As such, a common theme raised by consultation replies was the importance of an integrated HBM and NZHF application process.
- For the HBM/NZHF electrolytic allocation round, BEIS are proposing that potential projects can either apply for HBM revenue support only, or joint HBM revenue support and CAPEX support through the NZHF.
- BEIS encourages projects to consider applying for NZHF CAPEX support alongside HBM.
- Projects successful at assessment in the 2022 HBM/ NZHF electrolytic allocation round will receive:
    - Ongoing contractual revenue support via the HBM. This is expected to provide price support through a variable premium model.
    - Where relevant, an offer of capital grant support through the NZHF to help overcome high upfront costs and risk. BEIS proposes this could be up to 20% co-funding support, although this number is subject to change.
- Projects who wish to receive CAPEX support as well as HBM support will need to state this in their applications.

Government response to the Low Carbon Hydrogen Standard Consultation

Government has published the response to the low-carbon hydrogen consultation as well as the UK Low Carbon Hydrogen Standard ('the standard') which is Guidance on the greenhouse gas emissions calculation and sustainability criteria. This defines 'low carbon hydrogen' at the point of production. Annexes to the standard have also been published and include important detail on the GHG methodology. The Data Annex can also be read here.

We have included below some key features of the standard, but please note this is not comprehensive and there is much more detail in the standard and the government response.

One label

The standard will include one label that defines 'low carbon hydrogen'.

Grandfathering

BEIS propose to review the standard where required, to coincide with future funding rounds, but have said they would not expect future changes to the standard to apply retrospectively to contract that have already been awarded.

Certification

BEIS will be setting up a hydrogen certification scheme by 2025 to underpin deployment of low carbon hydrogen and support future international trade.

Additionality

A key positive point to highlight is that BEIS will not be adopting an additionality requirement for hydrogen production to meet the standard at this time as this could constrain deployment of electrolytic hydrogen production in the 2020s. This in line with our position submitted to Government.

They propose a proportionate approach to incentivise hydrogen producers to meet these through allocation of HBM and NZHF support. Projects that meet additionality principles will improve their score when applying through these schemes.

BEIS have also said they will not require additionality conditions to be met for biomethane inputs to prove compliance with the standard, but they may seek to incentivise additionality for biomethane inputs through the allocation of government support.

Threshold and methodology and system boundary

The standard will be set at the point of production, covering upstream emissions from the feedstock, such as natural gas, input materials and emissions from the production process.

Hydrogen producers proving compliance with the standard are required to:

- Meet a GHG emissions intensity of **20gCO_2e/MJLHV** of produced hydrogen or less for the hydrogen to be considered low carbon.
- Calculate their GHG emissions up to the 'point of production', accounting for the following emissions components:
  - E_T = Efeedstock supply + Eenergy supply + Einput materials + Eprocess+ Efugitive non-CO_2 + ECCS process and infrastructure – $E$$CO_2$ sequestration + Ecompression and purification
- Account for the emissions associated with meeting a theoretical minimum pressure level of 3MPa and a theoretical minimum purity of 99.9% by volume
- Include emissions associated with capture, compression, transport, and storage of CO_2.
- Set out a risk mitigation plan for fugitive hydrogen emission.
- There are further requirements for the use of biogenic inputs (p.27).

Trajectory

BEIS expect to tighten the standard over time, in line with government's trajectory to net zero. However, given that there is very little low carbon hydrogen currently in production in the UK (less than 5MW), they will need time to understand how the

standard will work in practice as the market develops and therefore do not propose setting out the trajectory for the threshold at this stage.

Electricity inputs

The standard will define three technical requirements for low carbon electricity input that must be met by hydrogen producers seeking to demonstrate compliance with the standard:

- *Energy attribute information* – to demonstrate exclusive ownership of the attributes of the low carbon electricity used.
- *Low carbon electricity generation attributes* – to prove links to low carbon electricity input – e.g. the hydrogen production facility has entered into a Power Purchase Agreement, has purchased low carbon wholesale electricity or has other contractual information to prove links to the electricity attributes of the low carbon source.
- *Temporal correlation* – to prove time-based links between generation and hydrogen production consumption.

A range of production pathways will be permitted under the standard if producers can provide clear evidence of meeting the technical requirements for low carbon electricity input. This includes allowing the use of averaging of different electricity inputs, for example grid imported electricity consignments with low carbon electricity consignments, *on a monthly basis*. This approach will provide flexibility in how the standard is met, whilst maintaining the integrity of the standard threshold.

To ensure accurate reporting of GHG intensity of hydrogen produced using electricity, all electricity inputs will be measured as discrete consignments over 30-minute electricity settlement periods, and any use of grid imported electricity will need to be measured using real time national grid average carbon intensity data, matched to time of hydrogen production.

For electrolytic hydrogen producers using a mixture of electricity inputs (e.g. wholesale grid imported electricity and direct connected low carbon generation), the standard will permit the use of either: i) discrete consignments from a single measurable input; or ii) averaged consignments based on the average of multiple discrete consignments (allowed once in a calendar month provided within the standard threshold). Further detail is provided in the standard guidance document.

Excerpts from the standard:

Off-grid generation (via physically linked renewable or low carbon electricity generation): Where evidence can be provided electricity used for hydrogen production is off-grid (e.g. using on-site physically linked renewable or low carbon electricity generation) and consumed in the hydrogen production process, then the emissions would be any scope 1 emissions resulting from generating that electricity. Following the product system boundaries, Scope 1 emissions from electricity use are considered to be zero if off-grid on-site renewable electricity is used.

Grid connected low carbon electricity via contractual link (such as PPA or wholesale procurement): Where evidence can be provided renewable or nuclear electricity has been used for hydrogen production and the grid has only been used to transmit renewable or nuclear electricity with no further import, the emissions are assumed to be the actual emissions of the low carbon generation source in real time. Where the grid is used to transmit electricity, evidence will need to be provided that transmission and distribution losses have been considered in emissions calculations.

Grid imported electricity: Grid imported emissions can be calculated using actual national grid average GHG intensity data per 30-minute settlement period. This figure should include the combustion emissions of generation on the UK grid, and transmission and distribution losses from generation to use. Upstream emissions of UK generation plants are not included due to a lack of time resolved upstream emissions data.

All electricity inputs shall have a discrete consignment size of 30 minutes. Real time tracking of generation and consumption (temporal correlation) is required across all 30-minute consignments.

Different types of discrete consignment will need to track carbon intensities in different ways:

- Off-grid physical links must provide generation data matched to hydrogen production consumption per 30 mins.
- Direct or sleeved PPA must provide generation data matched to hydrogen production consumption per 30 mins (accounting for all transmission and distribution losses).
- Wholesale grid import must provide actual carbon intensity data per 30 minutes matched to consumption for hydrogen production (accounting for all transmission and distribution losses) using data provided by NGESO.
- Where a mix of renewable, low carbon electricity and/or grid import are used this should be separated into individual discrete consignments within the 30-minute period with the % of each input clearly matched to hydrogen output volumes (and with all transmission and distribution losses factored in). (example for mixed consignments provided in the standard).

Consignment approach

The standard will allow both discrete and averaged of consignments.

Embodies emissions

The standard will not account for embodied emissions, although BEIS may consider their inclusion in the future.

Biomass sustainability

The use of biomass will be subject to additional sustainability criteria under the standard, which is consistent with the requirements of the Renewable Transport Fuel Obligation (RTFO). In addition, the standard requires that at least 50% of hydrogen (by

energy content) from biogenic feedstocks is produced using wastes or residues, in line with the requirements of the Green Gas Support Scheme (GGSS).

Further detail can be read in the consultation response and the standard.

Accounting for waste fossil feedstocks

When accounting for emissions, the standard will not consider fossil waste feedstocks with counterfactuals at this stage. This means that these feedstocks will not be treated differently from other fossil-based inputs, such as oil or natural gas, when conducting emissions calculations. BEIS will keep this under review and update as necessary dependent on further evidence, analysis, and cross-government work on GHG accounting for waste-based fuels.

GWP

The standard will not include a Global Warming Potential (GWP) factor for fugitive emissions associated with hydrogen production although this will be included at a future review point once data has been gathered.

Materiality threshold

The standard will not set a materiality threshold – all emissions will need to be considered.

Carbon capture and Utilisation (CCU)

CCU will not be given carbon reduction credits under the standard.

Negative emissions

Negative emissions will be accounted for and reported under the standard, provided they are genuine and associated directly with the hydrogen production process.

Chain of custody

Chain of custody requirements will not be required as the system boundary is at the point of production. This may be included in the future certification scheme.

Hydrogen emissions calculator (HEC)

Since the publication of the Hydrogen Investment Package, BEIS has released a calculator developed by E4Tech that can be used to calculate the greenhouse gas emissions associated with a prospective hydrogen production facility and determine its likely compliance with the Low Carbon Hydrogen Standard.

BEIS have said that you do not need to use the calculator for Strand 1 of the NZHF, but it is necessary if you are applying to Strand 2. For the remaining strands of the NZHF

and future allocations of the hydrogen business model, the appropriate scheme guidance will confirm how the calculator should be used.

Government response to Net Zero Hydrogen Fund

The response can be downloaded here.

The Net Zero Hydrogen Fund (NZHF) is confirmed to be worth up to £240 million and be delivered between 2022 and 2025. In setting out the Eligibility criteria, BEIS state they have designed the fund to support *all forms of hydrogen production, including biohydrogen and from nuclear energy*.

The final competition brief documents for the NZHF are expected to be published on the **19th April 2022**, by the UKRI. These will set out the assessment process for the first funding wave, finalised eligibility criteria and what is required of applicants.

The Government response confirms the approach to splitting the fund into four strands, focused on different levels of project readiness. Following feedback within the consultation, additional amendments have been made to the four strands, these are outlined below.

Strands 1 and 2

- *Strand 1: Development Expenditure (DEVEX) for Front End Engineering Design (FEED) studies and post FEED costs.*
- *Strand 2: Capital Expenditure (CAPEX) for projects that do not require revenue support through the hydrogen Business Model.*

The government response confirms:

- The first funding window will open in April 2022, with plans for a further funding window in 2023/24.
- Funding for ***Strand 1*** must be spent by Q1 2024 and ***Stand 2*** by Q1 2025, as such projects with long deployment timelines, are encouraged to apply as soon as possible to fit these timelines.
- The response confirms that funding will take the form of grants, co-funded with private sector funding for both strands 1 & 2.
- Hydrogen production projects will be able to apply for co-funding through ***strand 1*** if they require support with DEVEX costs for FEED and post-FEED costs. Where appropriate, support will also be available for FEED and post-FEED costs for associated on-site transport and storage (T&S) infrastructure.
- Projects applying to ***strand 1*** will be able to bid up to 50% of their total eligible costs and applicants will be expected to evidence that their bid represents the minimum funding necessary
- Capital co-funding will be available through ***strand 2*** for hydrogen production projects that do not require the Hydrogen business model to take a final investment decision (FID).

- ***Strand 2*** will support multiple hydrogen production technologies, including biohydrogen which was well represented in responses to the consultation.
- Projects applying to ***strand 2*** will be able to bid up to 30% of their total eligible costs and applicants will be expected to evidence that their bid represents the minimum funding necessary.

Eligibility criteria, which will be set out later in April by the UKRI, will ensure projects:

- Produce new low carbon hydrogen as defined by the Low Carbon Hydrogen Standard
- Are based in the UK
- Use a core technology that has a Technology readiness level (TRL) of 7 or above.
- Have at least one agreed offtaker for strand 2 (CAPEX) or demonstrated demand for hydrogen for strand 1 (DEVEX).
- Are able to demonstrate they have the required private sector financial backing and can begin FEED

Projects applying for strands 1 and 2 will be assessed against seven criteria:

- Deliverability
- Risk
- Project governance and stakeholder management
- Emissions and wider environmental impacts
- Commercial
- Economic benefits and project significance
- Hydrogen market development and knowledge sharing

Strand 3

- *Strand 3: Capex for non-Carbon Capture, usage and Storage (CCUS) enabled projects that also require revenue support through hydrogen specific business model.*
- The consultation confirms an additional market engagement exercise from Strand 3, setting out a proposed approach for a joint hydrogen business model and net zero hydrogen fund allocation process. This was published alongside the NZHF consultation response.
- The engagement exercise proposes that the first allocation round for round 3, will be *limited to electrolytic projects only.*
- Strand 3 is expected to open in late June/early July 2022, following the market engagement exercise.

Strand 4

- *Strand 4: CAPEX for CCUS-enabled projects that require revenue support through the hydrogen business model*
- The government intend to run an expression of interest stage in summer 2022 for projects shortlisted through the phase-2 CCUS Cluster Sequencing Process.

Budgets

- Strands 1 & 2 will receive £90mn, spread across both strands, with majority expected to go to strand 2 as government are keen to focus on actual deployment.
- The remainder of the fund (£150mn) is expected to be shared between strands 3 and 4, although BEIS has reserved the right to revise budget allocations as the fund evolves over time. The response also indicates that that further funding may be made available beyond 2025, with a total quantum of funding of £500mn between 2022-2030, although this is all subject to ongoing review.
- The Government response also confirms that NZHF will be delivered on a UK-wide basis. However, notes, that is any applicants or awards are in scope of Article 10 of the Northern Ireland Protocol, EU state aid rules will apply.

Further documents published since the 8th April

Atmospheric implications of increased hydrogen use

Research into the atmospheric impacts of fugitive hydrogen emissions in a future UK hydrogen economy.

Fugitive hydrogen emissions in a future hydrogen economy

Research into the potential for fugitive hydrogen emissions in a future UK hydrogen economy.

Facilitating a grid conversion hydrogen heating trial Government response

Response to consultation on legislative changes to enable the delivery of a hydrogen grid conversion trial.

Industrial Hydrogen Accelerator

- The Industrial Hydrogen Accelerator (IHA) competition will support projects generating evidence on end-to-end industrial fuel switching to hydrogen. It will cover the full technology chain, including the integration of the components in a single project.
- The competition will fund demonstrations and, where needed, feasibility studies:
    - The feasibility studies will explore how systems could be designed.
    - The demonstration projects will construct end-to-end industrial hydrogen systems. In order to prove their feasibility and provide further evidence on the real-world performance and costs.
- The structure of the programme is subject to change, but the initial proposed design is:

- **Stream 1: Demonstration projects – Grant (up to £17 million available)**
  - ✓ Up to £10 million grant funding per project
  - ✓ Applicants need to provide match funding
  - ✓ Open late April 2022
- Stream 2A: Feasibility studies – SBRI
- Stream 2B: Demonstration projects – Grant (up to £7 million available)