Discussion on non-CCUS / small scale hydrogen revenue support

12 April 11-1pm

Meeting etiquette

Please can you:

- ✓ Turn off your video when not speaking
- ✓ Mute your microphone when not speaking
- ✓ Raise questions via the chat function or put your hand up

This meeting will be recorded

Objective of this session

- To test/challenge current BEIS Industrial Energy Hydrogen Business Models team thinking on issues pertinent to non-CCUS / small scale hydrogen projects

- This session is not about design features of a contractual support mechanism (eg price/demand risk) which will be covered in the wider expert group session

Note: The content in the following slides does not represent BEIS policy, but provides ideas for discussion

Agenda

	Item	Time
1	BEIS approach and objectives for non-CCUS / small scale hydrogen projects	11.05-11.20
2	Existing policies relevant to revenue support	11.20-11.35
3	Applicability of contractual producer-side support instrument for sub100MW projects	11.35-12.05
4	Eligibility criteria	12.05-12.30
5	Allocation	12.30-12.55

Part 1
BEIS approach and objectives for 2021-2025

How are we thinking about revenue support for non-CCUS / small scale hydrogen projects?

Case for green hydrogen
- Strategic reasons for supporting deployment and scale up of non-CCUS / small scale enabled hydrogen – 2050 and now

Market barriers
- Why is small scale enabled hydrogen not being taken up now?
- Is the problem levelized or marginal cost (or both)?

Existing policies
- Could existing policies be amended to enable investment in (likely smaller scale) low carbon hydrogen projects?

New policies
- Separate revenue support instrument for small scale projects, or same as larger scale?

Eligibility criteria
- Technologies and primary energy inputs
- Target end user sectors / fuels
- Etc…

Allocation
- How could any revenue support be allocated?

Cross cutting inputs
- Project intelligence database
- Technology landscape
- Lessons from other schemes
- Interactions with other schemes

Current understanding of non-CCUS / small scale deployment landscape

Project Landscape

- Current UK projects are mostly **demos**; some HRSs
- Pipeline highly **diverse**
- 90+ we know of; majority in **mobility**
- Mobility sector projects likely to stay **<5MW**
- Wider projects aiming for **greater scale** & often in areas of **high VRE** / low power demand
  - Various projects in 10-100MW range proposed, all early stage
- Globally, confirmed projects increasing rapidly to double digit MW

Technology Landscape

- Relatively **niche production technologies**
- **Modular -** enables flexible deployment
- **Multiple different** production technologies
- Significant potential for **capital cost reduction** through technology innovation and learning by doing
- High levels of **competition** among suppliers
- On **demand side**, mobility most mature (technology and price); other sectors still require technical / practical demonstration?

Recent information gathering exercise has sought to increase our understanding

Combined with understanding of market barriers, clear that no 'one size fits all' to development of this sector

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Defining what good looks like

Overarching objectives for hydrogen

- 5GW by 2030
- Twin track production technologies
- Development of roadmap for Hydrogen Strategy

Guiding approach for hydrogen business models, as discussed in Hydrogen Advisory Council Dec 2020

- Support blue and green
- Support large and small scale
- Support current pipeline
- Develop supply and demand in tandem
- Support a range of end use sectors
- Enable shared infrastructure, esp. in clusters

Specific objectives for non-CCUS hydrogen 2021-2025

- **Innovation**: improving production/end use technology to reduce costs
- **Deployment**: moving beyond feasibility studies to learning by doing
- **Scale**: larger/centralised vs smaller distributed?
- **Sector coverage / off-taker**: demonstration projects in less mature sectors, or focus on most mature sector (mobility)?

Innovation
NZHF
Business model

Questions on Part 1

- What should ‘good’ look like in 2025 for non-CCUS / small scale hydrogen deployment?

Part 2
Existing policy landscape

Existing policy landscape and possible short term amendments

- The following non-exhaustive list of policies could *potentially* have a material effect in enabling smaller scale hydrogen in sectors, obviating the need for bespoke revenue support for such projects. These have been collated on the basis of feedback received to date.
- These policies relate specifically to revenue support and not capital support (eg demonstration projects or grant funding for end use infrastructure).
- Such amendments are not expected to have a material bearing on projects in particular sectors / of a particular size and would be complementary to standalone revenue support awarded under a subsidy contract

	Existing policy area	Relevance to hydrogen	Status
Heat	GGSS	Could enable blending	'May' be scope to include hydrogen in scheme lifetime
All	Environmental levies on cost of power – indirect emission costs + RO/FIT/CFD costs	Reduces cost of input electricity for power grid connected hydrogen production technologies	Identified as option
All	Power grid use charges		Identified as option
All	General taxation	Reduce input / end product costs	Identified as option
All	Enhanced Capital Allowances	Improve investment case	Super allowances from April 2021 – 2023
Mobility	Red diesel rebate	Increase price of counterfactual	To be implemented from April 2022
Mobility	RTFO	Supply support via dRTFCs	Out to consultation; various changes proposed

Questions on Part 2

- How much focus should be placed on developing policy in these areas vs developing standalone contractual subsidy support mechanism?
- What effect might these changes have on small-scale deployment pre-2025?
- To the group's knowledge, are power grid-connected electrolysers already exempt from RO/FIT/CFD policy costs?

Part 3

Applicability of contractual producer support mechanism to sub100MW projects

Reminder on overall approach to revenue support

A producer subsidy featuring appropriate **contractual certainty** could unlock supply side investment in FOAK projects, **combined with demand side incentives** going forward to ensure hydrogen demand grows in each market segment and to develop a hydrogen market

- Heterogeneous nature of end users makes a **single, 'one size fits all' demand side intervention** a complex tool that is unlikely to deliver either value for money, or sufficient certainty to unlock supply side investments.
- **Suite of targeted demand side interventions** beneficial to creating a hydrogen market, but does not provide sufficient certainty to unlock large scale supply side investments.
- A **supply side intervention** is coming out as the **most favourable** revenue support mechanism to deliver FOAK projects by providing an **investable framework** that works for CCUS-enabled and non-CCUS enabled hydrogen projects across different end use sectors. This is likely to also provide a suitable framework to transition to NOAK projects, delivering cost reductions and replicability.
- Question remaining, from Frontier report, about applicability of contractual producer support instrument to sub100MW projects

On balance, we consider a contractual mechanism could apply across larger and smaller scale hydrogen projects

Project landscape
+
Overall objectives
+
Lessons from other schemes

Relevant points to note

- Can work with point-to-point, 'no network', applications
- Assumes relatively sophisticated investor profile
- No reason couldn't support aggregation of projects
- Scope for administrative burden on counterparties to flex
- Scope for treating non-CCUS enabled and CCUS-enabled hydrogen differently in allocation (and within non-CCUS enabled technologies)
- Feasibility of designing an altogether separate revenue support intervention

Lessons from renewables CFD

- Smallest project in generation c.6MW
- c.50% rCfDs awarded to sub100MW projects
- Better Value for Money than FiTs
- Can be allocated bilaterally or competitively

Lessons from RHI

- Average size of largest technology (biomass boilers) c.5MW. Other technologies even smaller
- 20,000 applications, over 9 years
- Overall scale considered insufficient to meet decarbonisation goals
- VfM considerations

Questions on Part 3

- What are your views on the proposed approach?

Part 4
Eligibility Criteria

What do we mean by eligibility criteria?

Eligibility vs allocation

A. Eligibility criteria – clarifying which projects and volumes are eligible for funding

B. Allocation process – process to select which projects will get support (see Part 5).

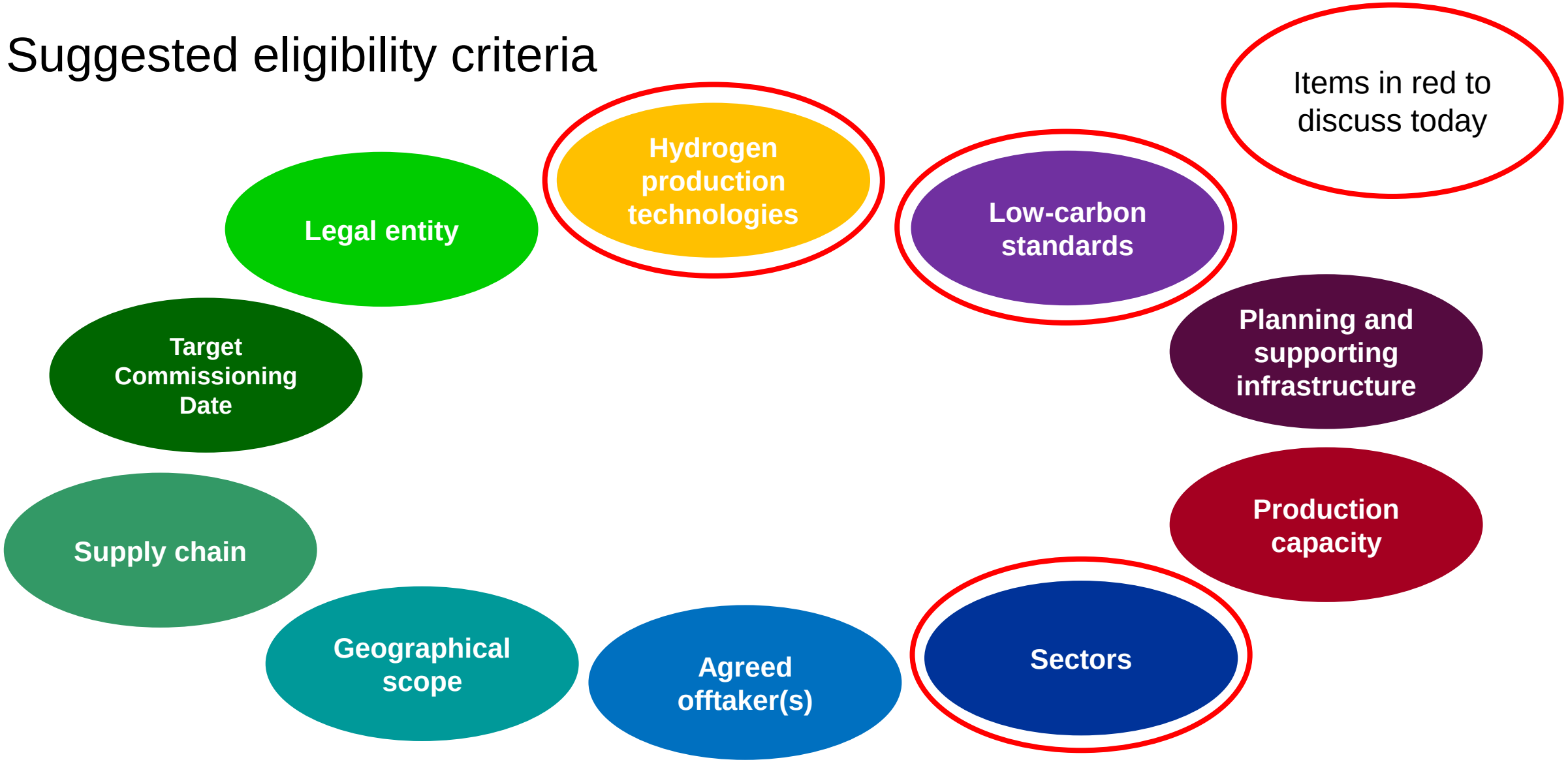
Objectives of eligibility criteria

- Ensuring alignment of Business Model with HMG strategic objectives
- Providing clarity on scope of Business Model and requirements projects must meet
- Providing evidence of credibility of projects, discouraging speculative applications

Key considerations

- Consistency between CCS-enabled and non-CCUS enabled hydrogen projects
- Key eligibility and assessment criteria will need to be tailored to reflect the different characteristics of production technologies

Suggested eligibility criteria



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Eligibility criteria – production technologies

Hydrogen production technology

Technology readiness

- Context:
  - Individual components of value chain at various stages of commercial viability
  - End-to-end value chain demonstration quite limited; some mobility sector projects and small scale power generation

Technologies covered

- Context:
  - Multiple different production technologies available across CCS and non-CCS applications
  - Low carbon hydrogen standards will define eligibility / volumes of hydrogen that qualify for support
  - Potential for projects to be treated differently via ‘pots’ in subsequent allocation rounds

Currently we are minded to rely on *low-carbon hydrogen standards* to define technology eligibility and on contractual mechanisms for ensuring mature propositions come forward

Eligibility criteria – end uses in scope

End use sectors

Potential approaches:

- Sector agnostic – all applications eligible as long as fossil fuel is displaced. Approach avoids being over-prescriptive to ensure diversity of off-takers, and to stimulate supply chain and competition
- Sector specific – prohibit supply of / limit volumes of hydrogen to specific strategic sectors
- 'Hydrogen merit-order' i.e. limit scope of Business Model to applications where hydrogen has 'highest value' – could be challenging to define 'highest value'; might be more easily addressed as part of allocation process (e.g. through assessment criteria), or by incentivising targeted sectoral demand for hydrogen through demand-side policies

Additional considerations

- 'Efficiency of use' – consider need to demonstrate that hydrogen is the commercially and technically optimal solution (e.g. over electrification) and that projects have invested in energy efficiency improvements before deploying hydrogen
- Exports – exported volumes not subsidised through BM

Currently we are minded to rely on take a sector agnostic approach, potentially with pricing or broader assessment criteria (depending on the allocation model chosen) driving initial deployment

Eligibility criteria – deep-dive on primary energy input for electrolysis 1/2

Low-carbon standards

Low-carbon electricity could be sourced in various configurations. Example options presented below, which are not mutually exclusive and could be combined

1. Grid connected – based on GoOs / PPAs / trading	2. Grid connected – 'excess' electricity only	3. Co-location with existing generation – based on direct physical links	4. New dedicated generation via grid – GoOs / PPAs	5. New co-located generation – based on direct physical links
Likely necessary when offtaker requires baseload supply, unless storage available?	In principle attractive but unclear if it provides a business case given limitations and uncertainties around curtailment	Offtaker requirements? Unclear if possible under existing market arrangements?	Planning constraints and lead time? Offtaker requirements? Not practical for non-renewable plants?	Planning constraints and lead time? Offtaker requirements? Not practical for non-renewable plants?



Configurations might need a way of ensuring hydrogen produced does not increase emissions (next slide)

Eligibility criteria – deep-dive on primary energy input for electrolysis 2/2

Low-carbon standards

Potential approaches to ensure electrolysis is not increasing carbon emissions

1. **Additionality** – ensure that use of electricity for hydrogen production does not divert low carbon electricity from other users. Currently used in RTFO

2. **Requirement for temporal and geographical correlation** – can be combined with PPAs/additionality approach to prove link between low-carbon electricity generation and hydrogen production based on trading and settlement

3. **Local marginal carbon intensity** – hydrogen production must not exceed local marginal carbon intensity threshold; proves link between hydrogen production and use of low-carbon generation in local area by settlement period. Provides signals to produce hydrogen when carbon intensity is low

4. **Wholesale market signals** – hydrogen production could naturally align with times of low-carbon electricity generation when wholesale prices tend to be low, or the hydrogen Business Model could incentivise production when wholesale prices are low

5. **Limit eligibility of grid electricity to a maximum number of hours per year corresponding to periods in which low-carbon electricity sources are expected to be the marginal generators** – number of hours can be based on projected evolution of the electricity generation mix. Mechanism proposed in the Netherlands (SDE++)

Propose to set out options to track and account for low-carbon electricity input in upcoming low-carbon hydrogen standard consultation. We are interested to understand impact on projects of particular standards

Questions on Part 4

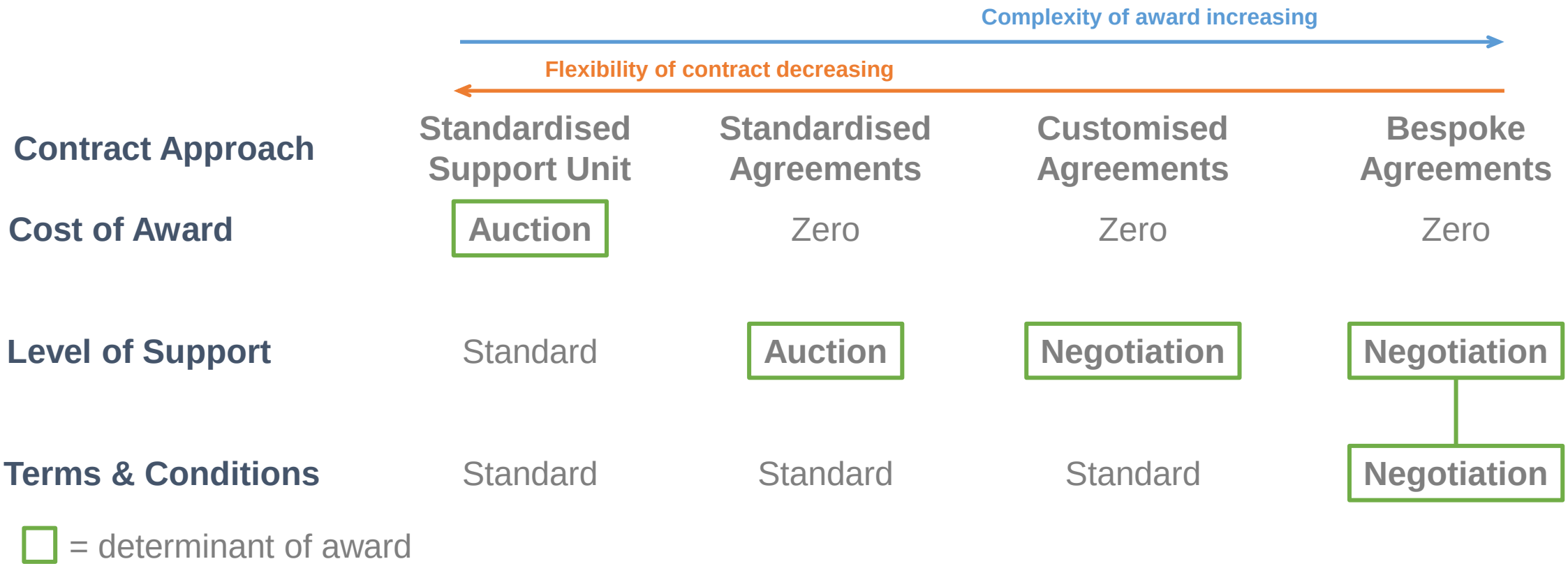
- What are your views eligibility criteria, both in general and on the specific points covered?

Part 5
Allocation

How should initial support contracts be allocated?

Context

- **CCUS-enabled hydrogen** projects to be bilaterally negotiated initially. Desire for more competitive approach
- Allocation process potential to vary over **time** – key decision for now is how to allocate initial / first wave of support contracts



Questions on Part 5

- What are your views on how a revenue support contract should be allocated for initial projects?