Carbon Capture, Usage and Storage in the UK

an update to CSLF on the UK’s support for CCUS

28th April 2021
Objective for this session:

• To provide a high-level overview of UK government’s support for CCUS activities and outline proposed next steps.
### Agenda

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1.1 Introduction - UK's ambition

The Sixth Carbon Budget:

- On 20th April 2021, UK government announced its commitment to the Sixth Carbon Budget by setting in law a world leading climate change target, cutting emissions by 78% by 2035 compared to 1990 levels.

UK’s CCUS Ambition:

The government has recently published The Ten Point Plan for a Green Industrial Revolution (November 2020) and Energy White Paper (December 2020), setting out:

- Our ambition to capture 10Mt of carbon dioxide per year by 2030.
- Our commitment to invest £1 billion up to 2025 to facilitate the deployment of CCUS in two industrial clusters by the mid-2020s, and a further two clusters by 2030, in areas such as the North East, the Humber, North West, Scotland and Wales.

CCUS Programme Objectives:

1) Establishing a new CCUS sector
2) Enabling low cost decarbonisation in multiple sectors
3) Developing a market for carbon capture
1.2 Introduction – support mechanisms

Overview of funding streams and support mechanisms for CCUS in the UK:

- **Transport & Storage**
  - CCS Infrastructure Fund (CIF)
  - Revenue from T&S Fee

- **Industrial CCUS**
  - A portion of the Industrial Energy Transformation Fund (IETF)

- **Blue Hydrogen**
  - Net Zero Hydrogen Fund (NZHF)

- **Green Hydrogen**

- **Power CCS**
  - Control for Low Carbon Levies (CLCL)

- **BECCS**
  - Greenhouse Gas Removal (GGR) strategy under development
1.3 Introduction – CCUS FEED Support

UK support for FEED studies:

• In March 2021, UK government announced £171m of funding across nine projects as part of the Industrial Decarbonisation Challenge, to support the development of low-carbon technologies that will increase the competitiveness of industry and contribute to the UK’s drive for clean growth.

• The projects include:
  • three offshore storage sites for CO2 (in the north-west, north-east and Scotland)
  • CO2 capture and/or hydrogen production projects in the north-west, Scotland, Teesside, Humberside (two projects) and south Wales.

• The Industrial Decarbonisation programme is part of the Industrial Strategy Challenge Fund (ISCF) aiming to reduce the carbon footprint of heavy and energy intensive industries in the UK, such as:
  • iron and steel
  • cement
  • refining and chemicals
T&S Regulatory Investment (TRI) Model
2.1 TRI Revenue Model: User Pays model- a stable and predictable revenue stream

**User Pays Elements:**

1. **T&S Fees:** fees that are paid by users to T&SCo for using the T&S network.

2. **DPA & ICC Contract revenue:** power and industrial will be entitled to revenue under DPA and Industrial Carbon Capture (ICC) Contracts. The contract price would take account of the cost of the T&S fees through indexation.

3. **Consumer payments and tax payments:** consumers and taxpayers will ultimately contribute to the cost of the DPA and ICC Contract, OR through the TRI Model in the event of contingent resource being required in certain limited circumstances.

* LCCC is being considered as a potential counterparty.

** Revenue models for ‘blue’ hydrogen and negative emissions (i.e. bioenergy and direct air capture) are under development.
2.2 TRI Model: Government Support Package (GSP) - to offer protection for high impact low probability risks

- We are proposing a GSP to address market failure for investing in the T&S network due to high impact low probability risks that the private sector would not be able to bear at an efficient price or indeed any price.

1) Remote leakage events

- T&S Co’s responsibility for leakage costs would remain until the liability is transferred to the government.
- T&S Co should use the private insurance market where possible to mitigate this exposure.
- Where private insurance is not available, GSP would potentially provide insurance of last resort.
- However, before this, the government is considering measures to reduce taxpayer exposure, including:
  - Careful selection of storage sites
  - Effective incentive regime
  - Use of commercial insurance

2) Stranded Assets

- Risk that there is a complete and permanent loss of demand for the T&S network such that the T&S network assets become redundant or deemed uneconomic.
- We are considering how the GSP might act as an ‘insurer of last resort’. The below conditions should be exhausted prior to usage:
  - Commercial insurance is unavailable
  - Risk proactivity minimised through new connections
  - Regulatory involvement is inadequate
  - Further revenue options are exhausted
  - Cost profiles are adapted
  - Offset by T&S asset sale and reduced spend
Power CCUS
Our objective is to develop a business model which enables power CCUS to play a valuable **mid-merit role** in our generation mix. We are currently considering a DPA which could be established between the power CCUS project company and the Low Carbon Contracts Company (LCCC), a government company.

1. Private sector investment and construction of facility with carbon capture technology
2. The Power CCUS Plant provides dispatchable, low carbon power at the market price in the wholesale and balancing markets and provides ancillary services to the Electricity System Operator
3. The Generator pays T&S fees for captured carbon
4. LCCC acts as counterparty to the DPA
5. DPA provides the Generator with payments comprising of an **availability** and **variable payment**
6. **Consumer subsidy** funds availability and variable payment
7. Return on investment back to private sector
3.2 Power: Payment Mechanism

**Variable Payment:**

The Variable Payment (VP) is designed to ensure the power CCUS plant dispatches ahead of an unabated equivalent plant. The VP will be calculated by considering the difference between the power CCUS plant as agreed in the DPA and a theoretical reference unabated plant (referred to as the ‘Reference Plant’ in Annex D).

- It would include the following: Gas Cost Differential; Carbon Cost Differential; T&S Volumetric Fee; and Other Extra Variable Costs.

\[
VP = \sum (VPR_i \times MWh_i)
\]

\[VPR_i = \text{Variable Payment Rate for day } i \text{ in the billing period (£/MWh),}\]

\[MWh_i = \text{Metered Day Electricity Output for day } i \text{ of the billing period (MWh)}\]

**Availability Payment:**

The AP is intended to provide investors with a regular payment based on the availability of low carbon generation capacity.

The AP should be reduced in the case of outages of generation or capture equipment, or poor performance against the expected capture rate.

\[
AP = (\text{Availability of Generation} \times \text{Availability of Capture} \times \text{Net Dependable Capacity} \times \text{Availability Payment Rate}) + \text{T&S Capacity Fee in the AP Billing Period (£)}
\]
Industrial Carbon Capture
Our objective for developing a business model is to incentivise:

(i) Existing industrial facilities who have a viable future in the UK to invest in carbon capture to decarbonise, whilst maintaining their international competitiveness and delivering value for money for the taxpayer.

(ii) Investment in new industrial facilities in the UK, supporting our ambition to level up the economy.

**Capital co-funding Grant**
- Available to support construction costs for initial projects only.
- A portion of capital co-funding grant support available.
- Remainder funded through private investment and/or industrial facility’s owner balance sheet.

**Operating Revenue Support**
- The ICC contract will have an overall duration of up to 15 years and will be negotiated bilaterally.
- Provides predictability for both investors and government for the lifetime of the contract.
- Subsidy reduces over the lifetime of the contract as carbon prices increases and low carbon products market develops.
The model is reflective of both the initial investment nature of ICC projects and the current immaturity of the low carbon industrial market in the UK, the proposed commercial components are for initial ICC projects:

**Reference Price**

- A fixed trajectory that will provide a stable analogue to the carbon market price.
- The agreement will see ETS free allowance certificates forfeited in line with capture volumes and monetised against reference price, while residual emissions will remain subject to the ETS.
- As carbon capture is established, it is intended that the reference price would evolve to market-driven carbon price.

**Strike Price**

- Will be negotiated bilaterally for initial projects.
- The process will move to competitive allocation as the technology matures, when more CCUS clusters are operational and project bids are sufficiently large to allow competition.
Hydrogen
Following principles are guiding the design of revenue support interventions to kickstart the creation of a hydrogen economy:

**Situation today**
- **Market failures** exist, requiring business models to overcome them, in particular lifetime operating cost gap between low and high carbon fuels.

**Interim ambitions**
- 1GW low-carbon hydrogen production capacity by 2025 & 5GW by 2030.
- 2 low-carbon industrial clusters by mid 2020s and 4 by 2030.
- Flexible deployment across end uses.
- **Business models needed to help meet deployment ambitions**

**‘End’ state**
- A liquid low-carbon hydrogen market competing against other low-carbon alternatives in an economy with internalised carbon price.

- **Quickly scale up** to meet sector deployment ambitions.
- Support deployment of CCS-enabled and electrolytic production technologies.
- Support large and small scale projects.
- Unlock pipeline of projects – including high-capex projects.
- Support and enable hydrogen to be competitive in different end user markets.
- Ensure value for money and affordability.
- Fit within broader policy framework to support hydrogen and develop supply chain.
## 6 Next steps:

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<td>TRI Model update (including revenue model, ERR and GSP)</td>
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