



# CCUS Hubs and Clusters

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**IEAGHG's remit is to assess the role that technology can play in reducing greenhouse gas emissions from the power and industry sectors**

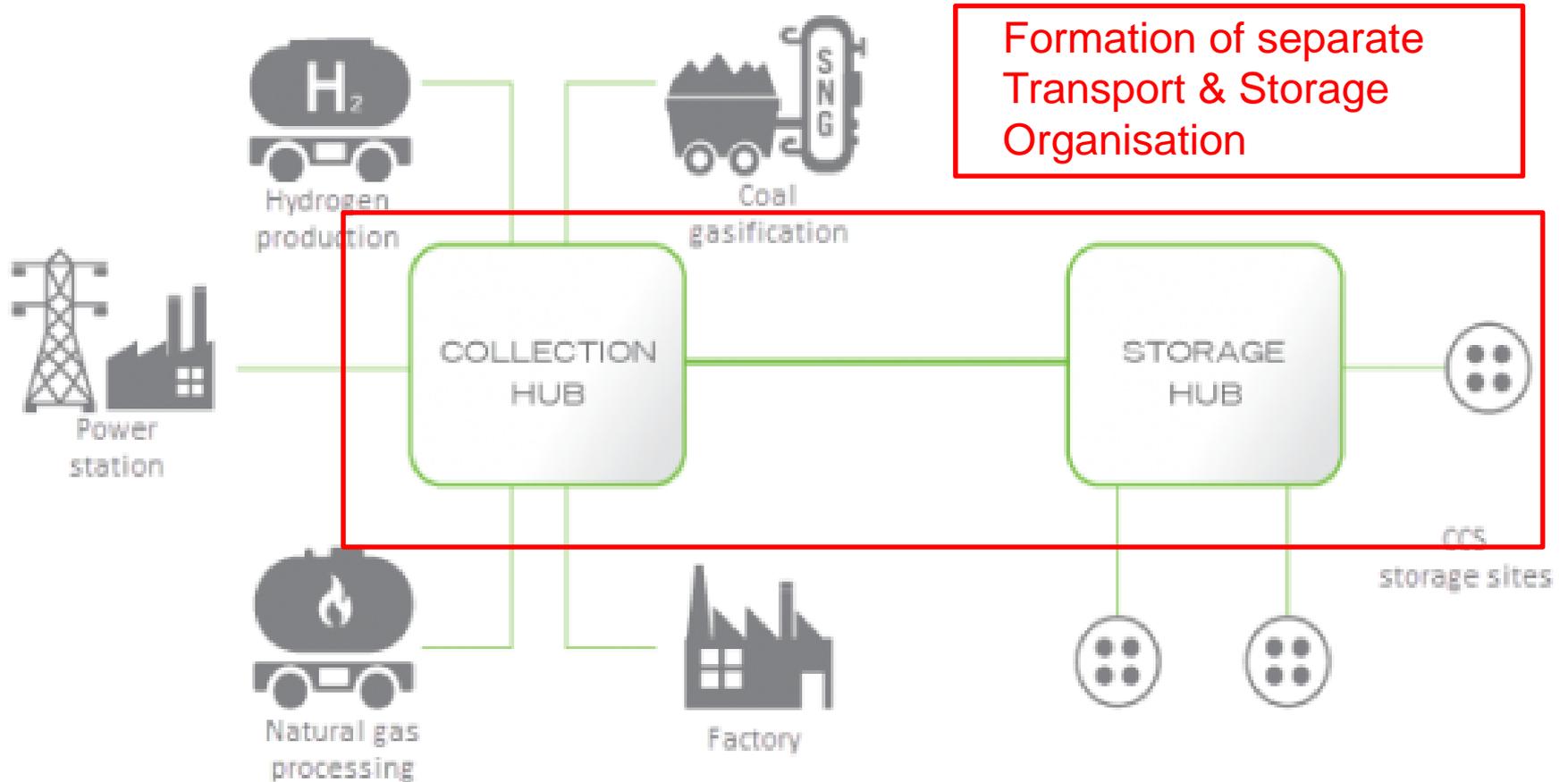
**IEAGHG provides independent technical advice**

# CCUS Progress



- 21 large-scale CCS projects in operation or under construction globally (GCCSI)
  - CO<sub>2</sub> capturing 40 Mtpa.
  - Concern that CCUS project pipeline is slowing
- The IEA reported at the CEM in 2016 that:
  - *“progress is falling short”*
  - *“Industry and governments need to make significant investment in projects and technology development to get CCS on track to meet the 2DS target”.*
- The EU Zero Emission Platform advised to EU that:
  - The key to delivering CCS is the development of CCUS infrastructure
  - Drive the creation of sustainable economic zones,
  - Deliver the least cost decarbonisation route for Europe,
  - Generate new jobs and boost economic prosperity

# The Hubs and Cluster concept



Source: Global CCS Institute

# Understanding Hub and Cluster Development



- The most successful hubs and clusters are those based on the use of CO<sub>2</sub> for EOR
- The main risks for hubs and clusters are commercial not technical
- Hub clusters will likely require substantial, i.e. 50% or more, government support.
- Pre-investment by Government to generate investor interest e.g. for capture plant is essential
- A major obstacle in early years is maintaining a core organisation which is able to carry a CCUS cluster project forwards.

Source: [http://www.ieaghg.org/docs/General\\_Docs/Reports/2015-03.pdf](http://www.ieaghg.org/docs/General_Docs/Reports/2015-03.pdf)

# Developing the Business Case



- New study completed to address key questions
  - What are the key economic and business related issues with hubs and clusters, including private investment
  - Identify the role governments can play in accelerating their deployment
- Principles:
  - Separates Capture from Transport and Storage (T&S) investment
  - Focus on Industrial CCUS ( also applicable to power and mixed industry/power cases)
  - Investigated 4 different business models that allow industrial emitters to remain competitive
  - Focused on Europe but also considered applicability in North America, Europe, China, Australia

# Creating the climate for investment



- Four enablers that need to be addressed
  - Addressing the carbon leakage issue
    - High carbon prices do not drive production to less regulated/low cost base markets
  - Creation of a market that is attractive to prospective investors
  - Public-private sector risk sharing
    - Storage and Loan guarantees, grants for storage development, grants to reduce external financing needs
  - Decoupling the CCUS business chain
    - No single organisation willing to manage full CCUS chain
    - De linking allows all parties to focus on core strengths
    - Four different business cases for T&S infrastructure.

# Four Options Considered



## 1. Government-owned transport and storage infrastructure

- Government establishes a public transport and storage (T&S) company
- T&S company can be privatised at later date

## 2. A Regulated Asset Base (RAB)

- Model is used to enable fully privatised delivery of the project.
- An independent market regulator would need to be set up with government funding;

# Four Options Considered



## 3. Existing infrastructure

- Use existing infrastructure (which may either be government owned or regulated).
- Or join an existing “anchor” CCUS project provided the infrastructure was built oversized;

## 4 CO<sub>2</sub>-EOR

- Only if active oil fields exist in the region
- Most common option for currently operating projects
- May not be a long-term solution

# Model Outcomes & Applicability



- For the European case
  - Four models give a total investment of £75-110/t of CO<sub>2</sub> abated
  - Costs to Government in range £29-53/T CO<sub>2</sub> abated.
- Key conclusion: If the right market conditions are established then a public private partnership can be created that reduces Government investment in T&S infrastructure
- For other regions – at least one model might be relevant or features of different models can be combined

# Summary



- CCUS Hub and Cluster development is key to increasing global CCUS deployment to meet Paris target of below 2degree
- IEAGHG work has shown that business case examples can be developed that enable both public and private sector investment in hubs and clusters
- There is no “one fits” all business case model but several examples and combinations of features of models can be combined to best suit regional conditions.



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