

Enabling investment in CO₂ storage

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Where have we come from in European CCS?

- Research and development
- De-carbonising fossil fuel power generation
- □ Large scale demonstration projects
- Government sponsored competitions
- Capital grants and operating subsidies
- □ A "failed" carbon market

The focus is changing to CCS on industrial processes and biomass energy:

- Post COP21 commitments and de-carbonisation pathways
- Sustainable industrial regions or clusters
- Economies of scale for transport and storage infrastructure
- □ New business models for storage services



How do we make CO₂ transport and storage an investible asset class?

Key CO₂ storage business risks to be managed





Commercial framework for CO₂ storage must address:

□ Technical viability: Limited appetite for pre-FID site characterisation

 Missing market: Lack of revenue visibility

 Leakage Liability: Exposure to uninsurable levels of potential liability

Performance Guarantees:

Exposure to counterparty non-performance and consequential loss

Strategic infrastructure solutions under uncertainty

Create robust system level investment strategies which allow for <u>flexibility</u> in future expansions and <u>minimise future losses</u>.

<u>Create option value</u> (ensure benefits outweigh potential losses) of strategies which help <u>safeguard investors</u>.

Ensure storage site portfolio and investment plans mitigate future uncertainties



Strategic vs Project Infrastructure Development





UK capital project financial models

Government Department or agency and public procurement	Goco Government owned, contractor operated	PFI/PF2 Contract based service and assets	PPP joint venture	Price regulated private sector corporate	Private sector corporate with grant and price stabilisation	Private sector corporate with price stabilisation	Concession company	Unregulated private sector company
Public sector								Private sector
Crossrail Olympic Delivery Authority	National Nuclear Laboratory	Future Strategic Tanker Aircraft	NATS (air traffic control)	Thames Water (Thames Tideway Tunnel in separate vehicle)	UK CCS Commercial- isation Projects DECC CCS Competition	Power projects with CfD	M6 Toll	Tesco
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Commercial Models for CO₂ Storage

PRE-FID

POST-FID

Grant Funding

- Grant contribution to appraisal costs
- Certainty of income required in operational phase with minimum availability payment
- Open book policy for costs
- Award through public sector procurement process

Cost-plus pricing

- Public sector body commissions characterisation of potential CO₂ stores using service contracts with the private sector
- Rights to use the characterised sites then auctioned to private sector based on defined revenues for CO₂ storage in new industry regulation

UK Competition Model

- Grant contribution to construction cost in construction phase
- Power CfD in operational phase
- Open book policy for costs
- Risk allocation matrix

PPP Model

- Public/private partnership splits the ownership of assets and liabilities
- Minimum capacity based payment
- Subsidy top up for usage paid by CO₂ emitter
- Performance incentives or deductions for under-performance

Public Sector Model

- Public sector body commissions builds and operates using service contracts with the private sector
- Public sector retains ownership of assets
- Open book policy for costs
- Private sector risk allocation based on relevant commercial precedent for services provided

Private sector RAB Model

- Capital investment forms the Regulated Asset Base
- Guarantee that regulated company's investment is recovered with appropriate IRR
- Liability cap Government back stop
- · Periodic price setting



An integrated policy portfolio





What have we learnt?

- CCS deployment at scale requires commercial, financial and policy innovation;
- A multi-sectoral infrastructure policy is needed to create a business case for investment in CO₂ transport and storage;
- Business model structures for the pre and post FID stages of CO₂ storage projects exist which can incentivise investment;
- Infrastructure capital could be attracted with the right form of publicprivate business model and enduring policy framework.



Thank you!

