Financing CCS

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My Agenda

• Financing CCS
  - Risk management and ‘Project Finance’
  - The problems with CCS...
  - Possible solutions

• Some closing thoughts
If CCS was a ‘mature’, ‘commercial’ technology, then...

- **Funds:**
  - Debt
  - Equity (shares)
  - Subordinated debt
  - Bonds
  - (Grants)
- **Insurances and loan guarantees**
- ‘**Bills of Exchange’** and ‘**Letters of Credit’**
- **Ownership model (eg BOO, BOT, BOOT, BOLT)**
- ‘**On balance sheet’** or ‘**off balance sheet’’? Customer type?
- ‘**Project Finance’**
- **Risk management**
**If CCS was a ‘mature’, ‘commercial’ technology, then...**

Various ‘capital providers’ would be involved:

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<tr>
<th>DEBT</th>
<th>EQUITY</th>
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<td>Specialist Debt</td>
<td>Specialist Equity</td>
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<td>Structured Finance</td>
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<td>Corporate Lending</td>
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<td>Corporate Debt</td>
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<td>Infrastructure Funds</td>
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<td>Private Equity</td>
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- **DEBT**
  - **Structured Finance**: eg project financiers
  - **Corporate Lending**: eg banks
  - **Corporate Debt**: eg company

- **EQUITY**
  - **Corporate Equity**: eg pension funds, insurance companies
  - **Infrastructure Funds**: eg private sector financiers
  - **Private Equity**: eg venture capital investors
If CCS was a ‘mature’, ‘commercial’ technology, then...

Risk management in ‘project finance’ – eg power plant:

- Construction risk
- Sponsor risk
- Economic risk
- Fuel supply risk
- Sales/off-take risk
- Operating risk
- Technology risk
- Environmental risk
- Country risk
- Political & legal risk
- Foreign exchange risk
- Inflation risk
- ‘Force majeure’ risk
- ... etc
If CCS was a ‘mature’, ‘commercial’ technology, then...

- Shareholders
- Commercial banks
- Export credit agencies
- Insurance
- Company/consortium or ‘project company’
- Construction consortium
- Fuel supply agreement
- Fuel supplier
- Operators
- Electricity distributors
- Power purchase agreement
- Export credit guarantees
- Turnkey construction contract
- Debt (loans) (70-80%)
- Sub-loan
- Equity (20-30%)
- O&M contracts
... but (with some exceptions) ‘1st Generation’ CCS is in the RD&D phase...
CCS financing problems

- Technology and technology risk
  - Scale-up to demonstration
  - Scale-up to FOAK
  - Integration for whole CCS-chain

- Economics and commercial risk
  - Generally, project costs > project revenues
  - Worst on demos and FOAK
  - Economic ‘gap’ narrows as technology matures
  - 2nd/3rd Generation - significant cost reduction

- Need for additional funding to address gap

- Complexity: Many ‘players’ involved in integrated CCS

- Long-term liability issues
How to bridge the economic ‘gap’?

For EU demo programme (10-12 projects), €7-12Bn additional funding required to close economic gap.
Further funding/financing needed in short-/medium-term (including for current demonstration projects)

CCS can be commercially viable by ~2025
Significant economic gap exists before then
Long-term liability/stewardship?

- Issue: Long-term stewardship of stored CO$_2$ (including liability for leakage) for 10-30 years after injection ceases
- Not a risk the private sector can either price or absorb (i.e., unlimited, indefinite risk) - barrier to financing
- Issue needs to be addressed prior to financing projects, not after construction
- 2 x IEA/CSLF roundtables on financing (2010) - consensus view that this is responsibility of governments
Possible solutions

- **Problem**: Technology and technology risk
  - Scale-up to demonstration
  - Scale-up to FOAK
  - Integration for whole CCS-chain

- **Solution**: Move ahead with large-scale, integrated demonstrations URGENTLY to technically prove!

Pilots-to-demos
Possible solutions

• **Problem**: Economics and commercial risk
  – Generally, project costs > project revenues
  – Worst on demos and FOAK
  – Economic ‘gap’ narrows as technology matures
  – 2\textsuperscript{nd}/3\textsuperscript{rd} Generation – significant cost reduction

• **Problem**: Need for additional funding to address gap

• **Solution**: Public financial support for large-scale integrated demonstrations and early mover projects while continuing R&D on 2\textsuperscript{nd}/3\textsuperscript{rd} Generation technologies

**Public funding to bridge the gap**

and more R&D to reduce CCS costs
Mechanisms for public financial support (excluding variants of the ‘public utility’ model)

- **Input-based:**
  - Direct capital grants
  - Equity/ownership position
  - Debt financing
  - OPEX subsidies
  - Tax measures

- **Performance-based:**
  - Standard storage payments
  - Contract for differences
  - Bonus/malus regimes
  - Feed-in tariffs
  - Power purchase agreements
  - Tax measures

All such interventions will have differing impacts on both the investment (and risk) and the market.
Funding the gap

- **G8 commitments (2010) - acting as ‘driver’**
- **International organisations, national governments and sovereign wealth funds are committing funds for demos:**
  - Australia (Commonwealth and States)
  - Canada (Federal and Provincial)
  - EC
  - Japan
  - Netherlands
  - Norway
  - Republic of Korea
  - UK
  - USA (Federal and States)
  - Masdar

- **Funding committed:**

- **No. of large-scale integrated projects committed by 2020:**
  - **25** (GCCSI, 2010), **19–43** (IEA/CSLF, 2010)
Possible solutions

- **Problem**: Complexity: Many ‘players’ involved in integrated CCS
- **Solution**: Look at and learn from other sectors (e.g., IT) and business models

- **Problem**: Long-term liability issues
- **Solution**: Down to Governments to address this (as per 2010 IEA/CSSLF Roundtable recommendations)
Closing Thoughts...  Financing CCS (1)

• For CCS to be commercially implemented, economic drivers will need to be in place to provide incentives for plant owners to incorporate CCS.

• Standard ‘Project Finance’ approaches and risk management mechanisms not yet suitable as CCS not mature or commercial yet.

• Technical risk remains high: Scale-up challenges, integration across CCS-chain.

• The economic ‘gap’ is real – needs additional funding to address.

• Full-chain CCS is complex with many ‘players’ – complicates financing CCS projects.

• Long-term liability/stewardship issues surrounding CO\textsubscript{2} storage are a major barrier to private sector financing – need addressing prior to financing a project.

• Private sector capital providers have important role in financing CCS roll-out but currently have many concerns (risk, scale, lead vs follow).
Closing Thoughts... Financing CCS (2)

- Demonstration of large-scale integrated demonstration projects for range of technologies/applications URGENT – to prove the technologies (address technology risk).

- Public funding vital to bridge ‘economic gap’ that currently exists for most CCS demonstrations (will continue to exist for ‘early adopters’) to address commercial risk.

- Continued public funding of R&D to reduce CCS costs also key.

- Various mechanisms exist for public financial support to CCS demos and early projects – all have differing impacts on investment/markets.

- G8 commitment acting as a driver for many governments etc to commit to funding demos – encouraging! What about early adopters?

- Lessons from other sectors and business models relevant to perceived complexity of CCS projects (ie number of ‘players’).

- Long-term liability/stewardship issues need resolving by governments – no other organisations can assume such unlimited/indefinite risks.
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