

Carbon Sequestration Leadership Forum

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Financing Task Force Report

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Chair





Total: ~ 40 Mtpa



7 CCS large scale projects added to already 15 existing projects

- Abu Dhabi CCS Project (Middle East) 0.8 Mtpa
- Petra Nova Carbon Capture Project (USA) 1.4 Mtpa
- Illinois Industrial CCS Project (USA) 1 Mtpa
- Kemper County Energy Facility (USA) 3 Mtpa
- Alberta Carbon Trunk Line with Agrium CO₂ Stream (Canada) 0.3 – 0.6 Mtpa
- Alberta Carbon Trunk Line with North West Sturgeon Refinery CO₂ Stream (Canada) 1.2 Mtpa
- Gorgon Carbon Dioxide Injection Project (Australia) 4 Mtpa.

Financing CCS

- **Market Pull:** Carbon markets, Electricity markets, Enhanced Oil Recovery (EOR), poly-generation, ...
- **Technology Push:** Direct subsidies, Tax credits, Loan guarantees, Mandates (e.g., portfolio standards), feed-in tariffs, contracts-for-differences)
- **Regulatory Drivers**
- **Business Drivers**



EOR



Al Reyadah 0.8 Mtpa

Petra Nova project

NRG Energy – JX Nippon Oil and Gas Exploration

World's largest post-combustion CO₂ capture system in operation

EOR





Saskpower Boundary Dam project uses Regulatory Driver, Business Driver, Technology Push, Market Pull

Banks are chilled

- Failure of the UK competition and lack of progress elsewhere has sapped confidence in the finance community
- Failure of EU's NER300 program: most disappointing
- Brexit
- Possible change of climate policy in the USA
- Economics risks
- Lack of incentive and regulatory framework

Financing CCS needs a stable energy policy

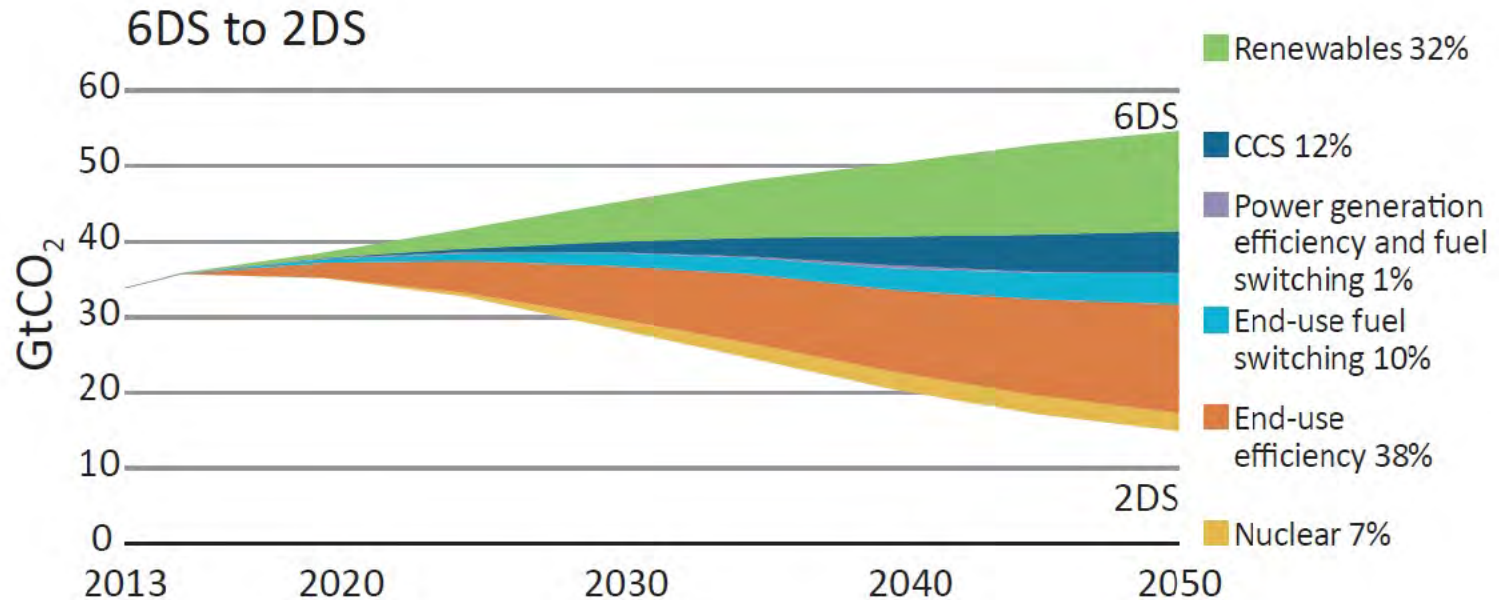
- Investment in a fossil fuel using or producing asset demands 10 years of work and investment prior to production beginning. The owner want to produce for 40+ years.
- Power plants take years of planning to serve an identified need, then have a long recovery period for the capital investment. This raises at least two issues:
 - The license to operate must endure for the life of the asset.
 - CO2 EOR requires that oil prices must remain high enough to keep a field operating; electricity markets must be such that the plant can keep operating.



Coal Utilization Research Council Study

1. There are strong links between the successful CCS demonstration projects and the oil & gas industry.
2. Access to markets has to move beyond EOR.
3. Regulatory drivers are critical to creating markets for CCS.
4. Business drivers play a major role.
5. Over reliance on government subsidies is a risky business.
6. Successful CCS power projects used multiple financing components.
7. Innovative CCS power projects (e.g., poly-generation) are interesting, but may be hard to replicate.
8. Gasification-based power projects have a poor record.
9. Setting arbitrary time limits on projects generally has led to failure.
10. CCS projects that have shorter timelines have greater chances of success.
11. Stronger political support is needed for CCS.
12. All major CCS demonstration projects require a public outreach program.

IEA: CCS is a key contributor to the reduction of CO2 emissions



CCS@scale - How to get there ?

Norway has considerable experience with Sleipner and Mongstad



- Business as well as climate targets
- Strong government policy
- Comprehensive action plan



Ministry of Petroleum and Energy



Feasibility study for full scale CCS in Norway



The results of this study demonstrate that a flexible CCS chain is feasible that makes use of CO₂ transport by ship from multiple sources to a single storage hub. That would mean the initial investment in CO₂ infrastructure can benefit several CO₂ capture projects.

Conclusions: reasonable optimism

- To invest in CCS, banks will need stable Energy Policy including explicitly CCS.
- 21 projects in 2017 give confidence in CCS maturity
- EOR using CO₂ from Power and Industry is a success
- Al Reyadah project demonstrates the success of commercial project without public incentive.
- Beyond EOR what business model ?
- Impact of CCS on climate mitigation: CCS@scale ?
- Norway feasibility study: an important initiative



**This meeting is an excellent occasion to
prepare the next ministerial meeting**

Financing ?

What can be done to accelerate the
development of CCS at scale ?

Messages and recommendations ?