Carbon Sequestration Leadership Forum
www.cslforum.org

The Role of CCS in Mitigation Strategies

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CSLF Overview


Australia


Brazil


Canada


China


European Union


France


Germany


United States


Greece


United Kingdom


India


United Arab Emirates


Italy


South Africa


Japan


Saudi Arabia


Korea


Russia


Poland


Norway


New Zealand


Netherlands


Mexico

Mission

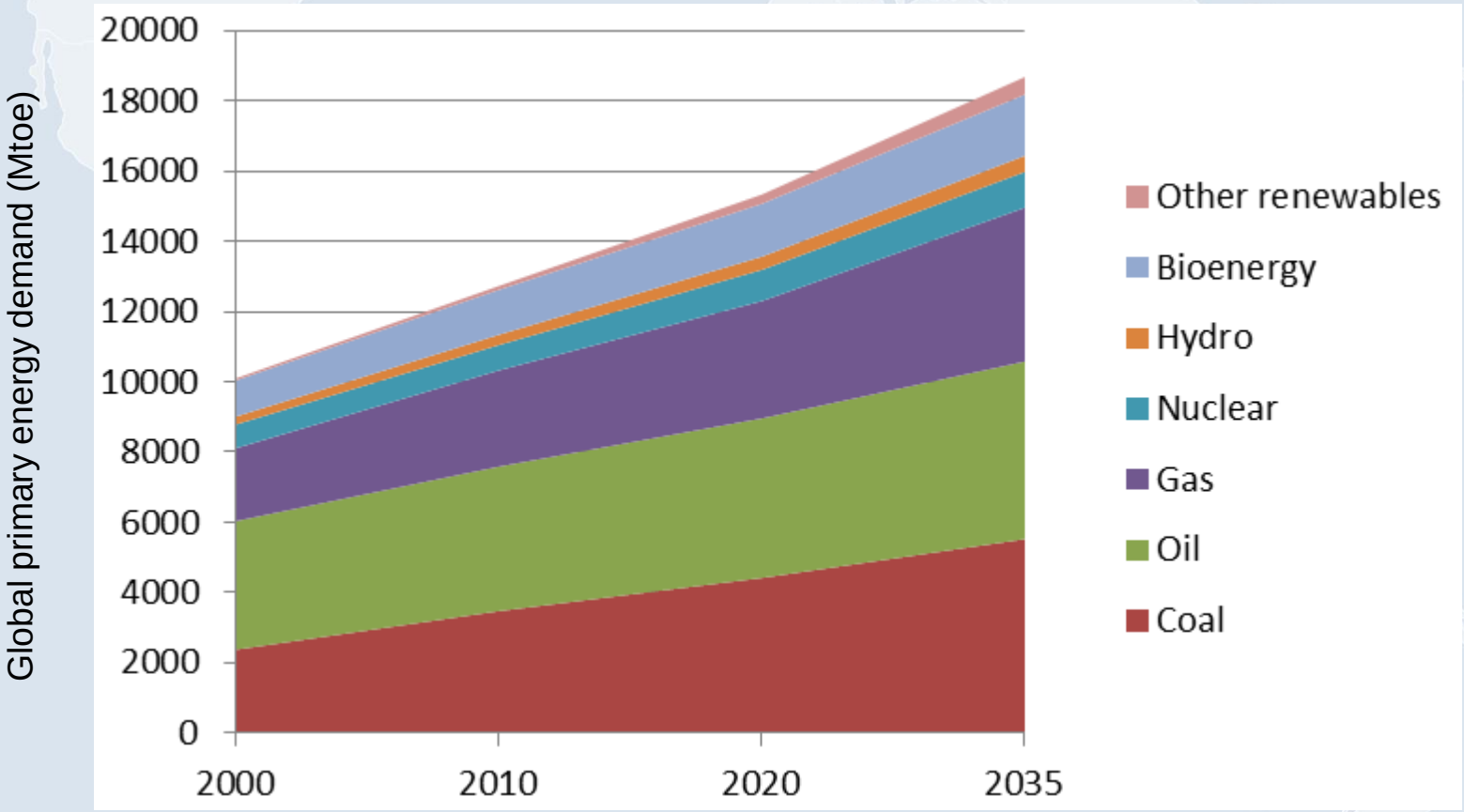
An international initiative focused on improved cost-effective technologies for the separation and capture of carbon dioxide for its utilization and long-term safe storage

Purpose

Make technologies broadly available internationally;
Identify and address wider issues

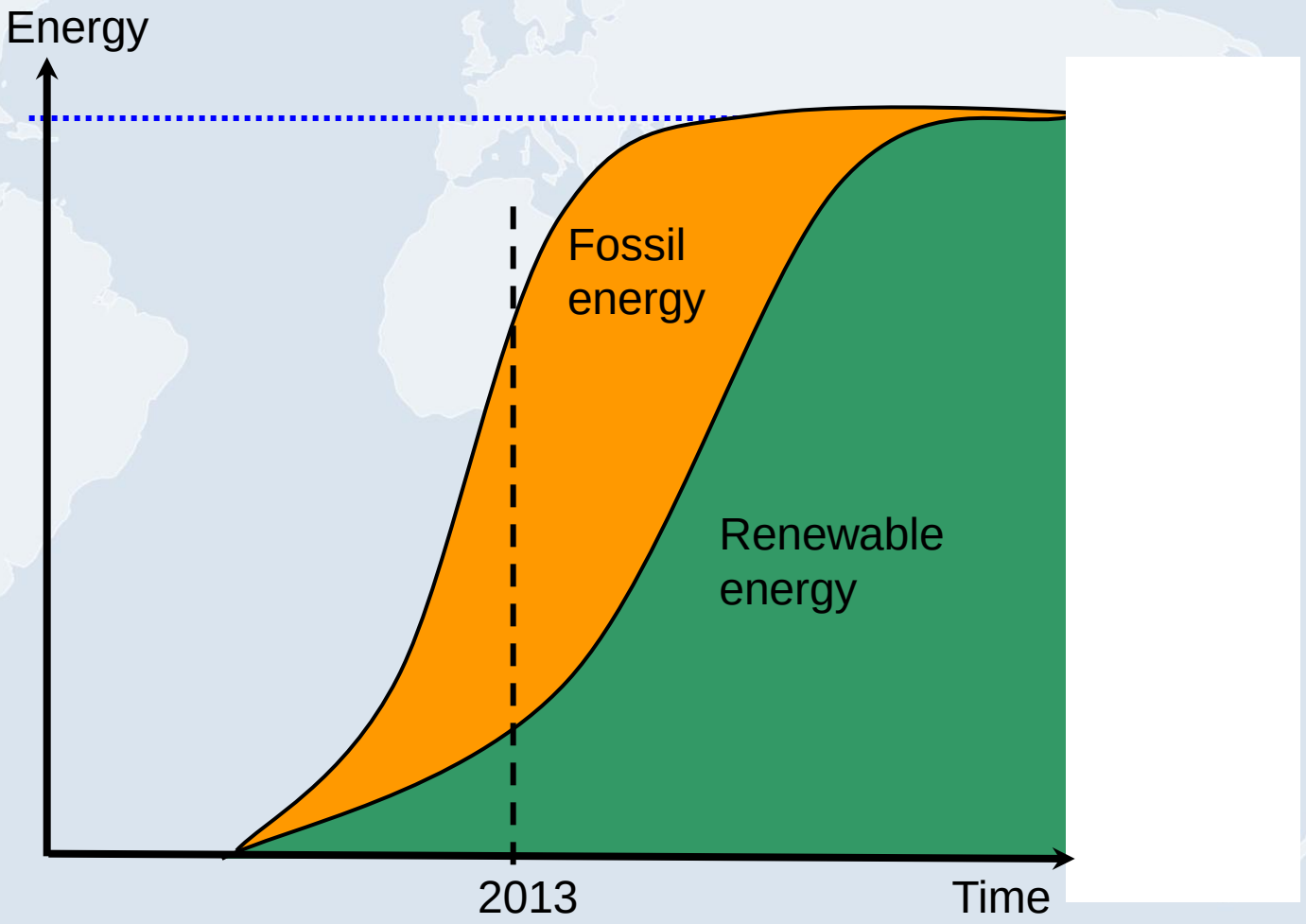
23 members

Global energy demand is increasing

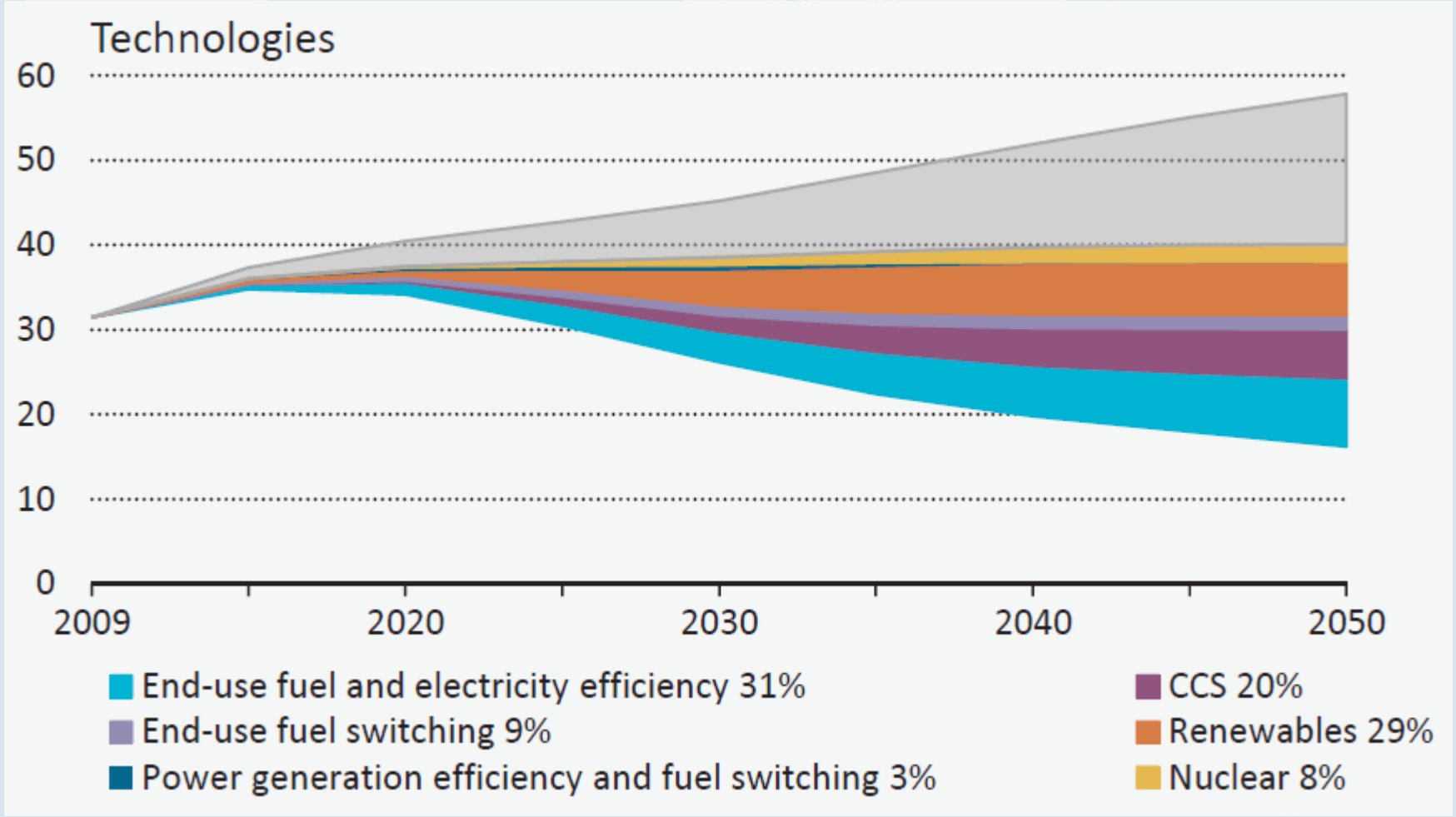


Source: IEA World Energy Outlook, 2012

Fossil fuels – main energy source for decades

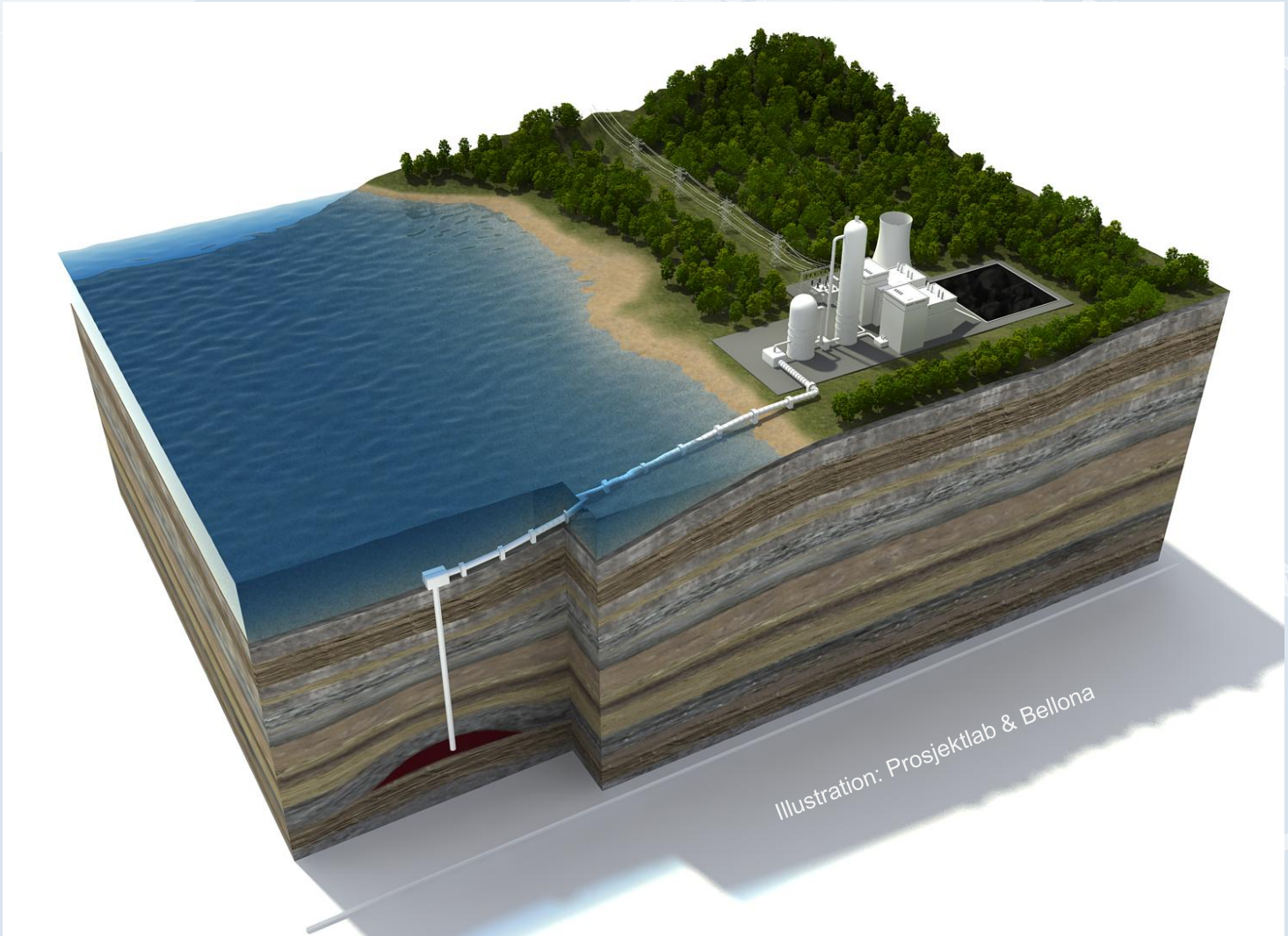


Technologies for 2DS



Source: IEA, Energy Technologies Perspectives, 2012

CO_2 Capture and Storage – How it works



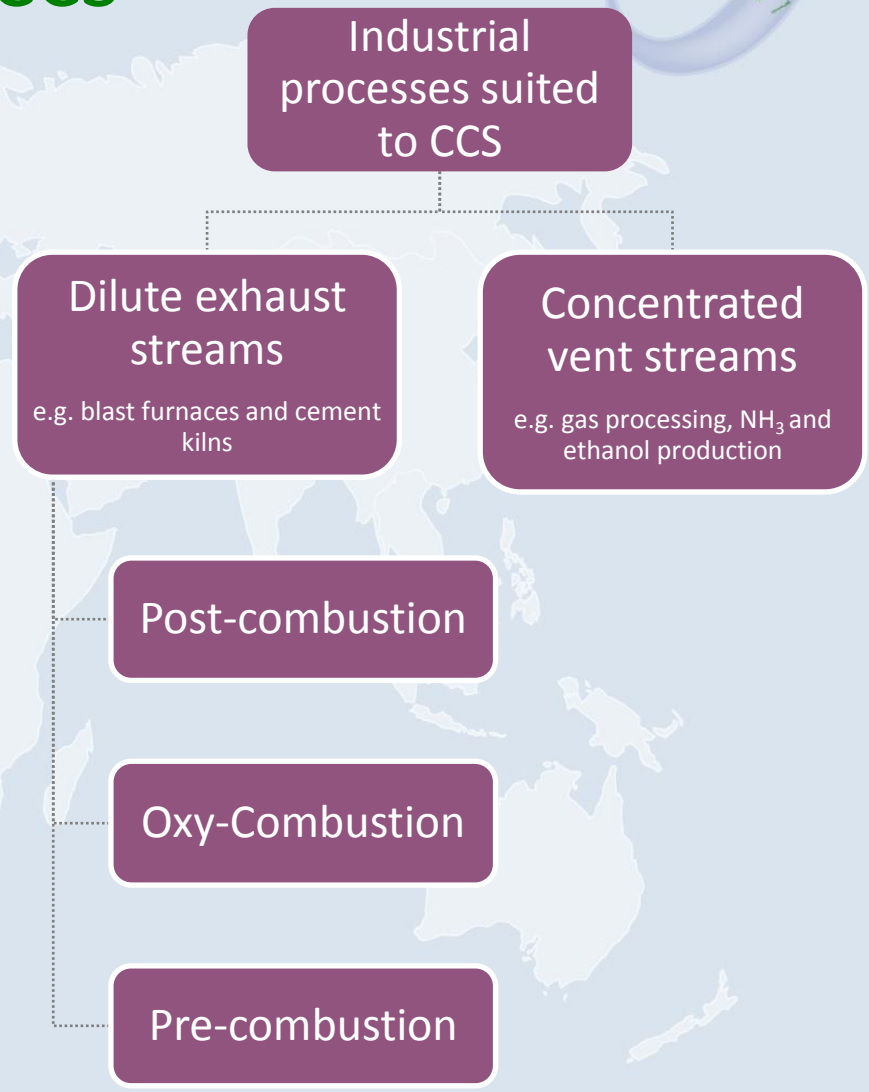
Three CO_2 capture routes in power

Post-combustion CO_2 capture	• Fossil fuel or biomass is burnt normally and CO_2 is separated from the exhaust gas
Pre-combustion CO_2 capture	• Fossil fuel or biomass is converted to a mixture of hydrogen and CO_2, from which the CO_2 is separated and hydrogen used for fuel
Oxy-combustion CO_2 capture	• Oxygen is separated from air, and fossil fuels or biomass are then burnt in an atmosphere of oxygen producing only CO_2 and water

At the present time, none of the options is superior; each has particular characteristics making it suitable in different power generation applications

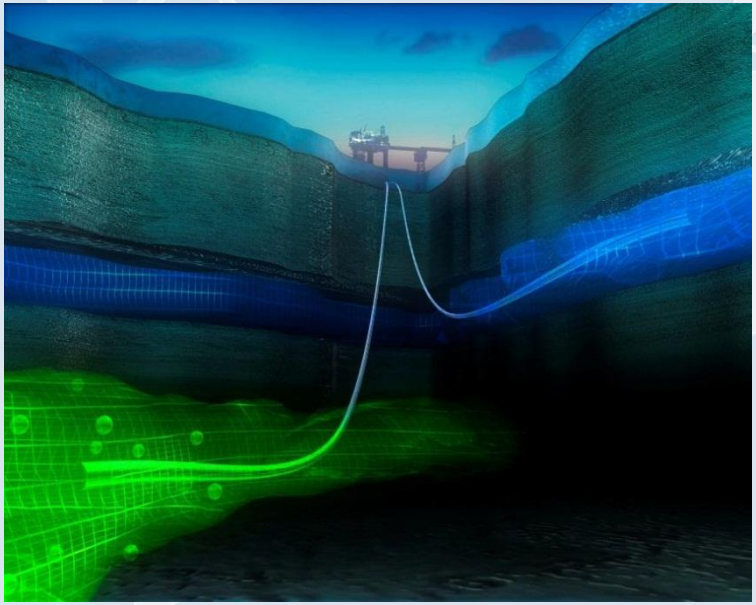
Industrial applications of CCS

- Some industrial processes produce highly concentrated CO_2 vent streams; capture from these "high-purity" sources is relatively straightforward
- Other industrial applications require additional CO_2 separation technologies to concentrate dilute streams of CO_2
- The same CO_2 separation technologies applied in power generation can be applied to industrial sources

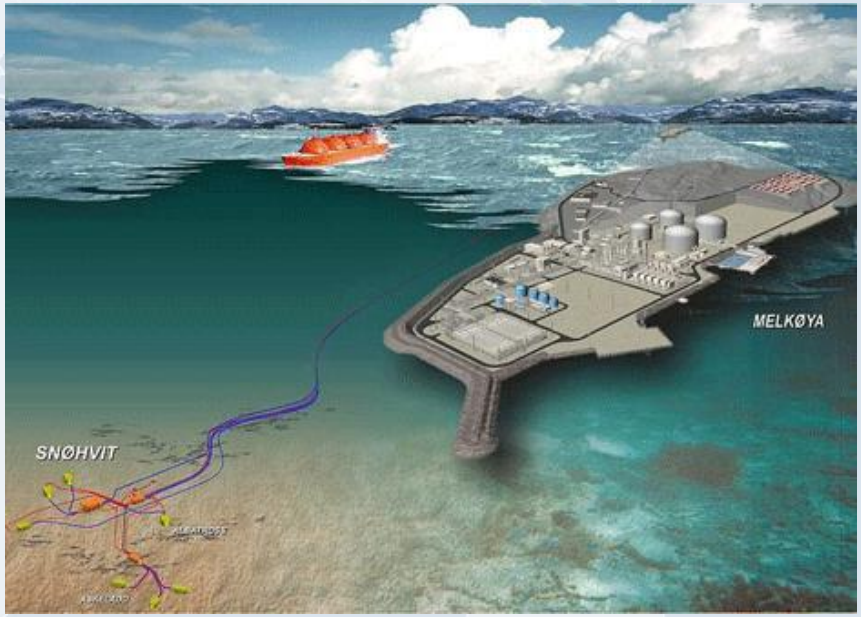


CO_2 storage works – 17 years on Sleipner, 1Mt/y

Sleipner from 1996

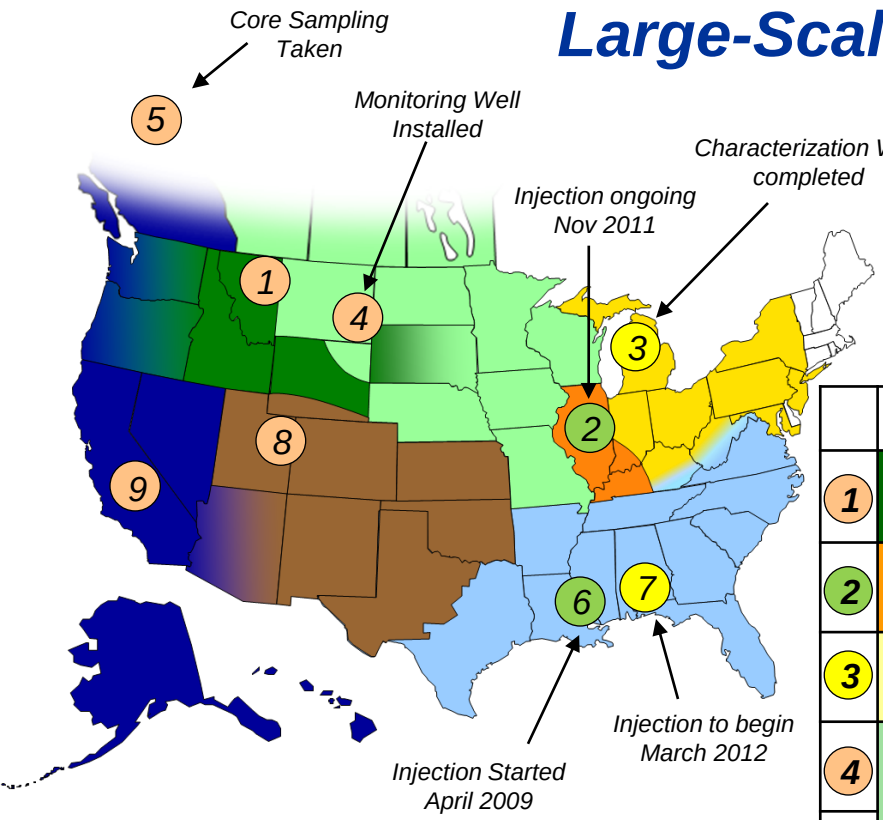


Snøhvit from 2007



RCSP Phase III: Development Phase

Large-Scale Geologic Tests



- ✓ *Injection Targets - minimum planned volumes*
- ✓ *Two ongoing RCSP Injection Projects*

	Partnership	Geologic Province	Storage Type
1	Big Sky	Sweetgrass Arch- Duperow Formation	Saline
2	MGSC	Illinois Basin- Mt. Simon Sandstone	Saline
3	MRCSP	Michigan Basin- St Peter SS or Niagaran Reef	Saline/Oil
4	PCOR	Powder River Basin- Muddy Formation	Oil Bearing
5		Alberta Basin- Sulphur Point Formation	Saline
6	SECARB	Interior Salt Basin- Tuscaloosa Formation	Oil/Saline
7		Interior Salt Basin- Paluxy Formation	Saline
8	SWP	Wasatch Plateau- Navajo Sandstone	Saline
9	WESTCARB	Regional Characterization	TBD

- *Injection Ongoing*
- *2012 Injection Scheduled*
- *Injection Scheduled 2013-2015*

Note: Some locations presented on map may differ from final injection location

Transport

Most straightforward and well-known step in the CCS chain. Pipeline and ship (or barge) are the only practical options at scale.

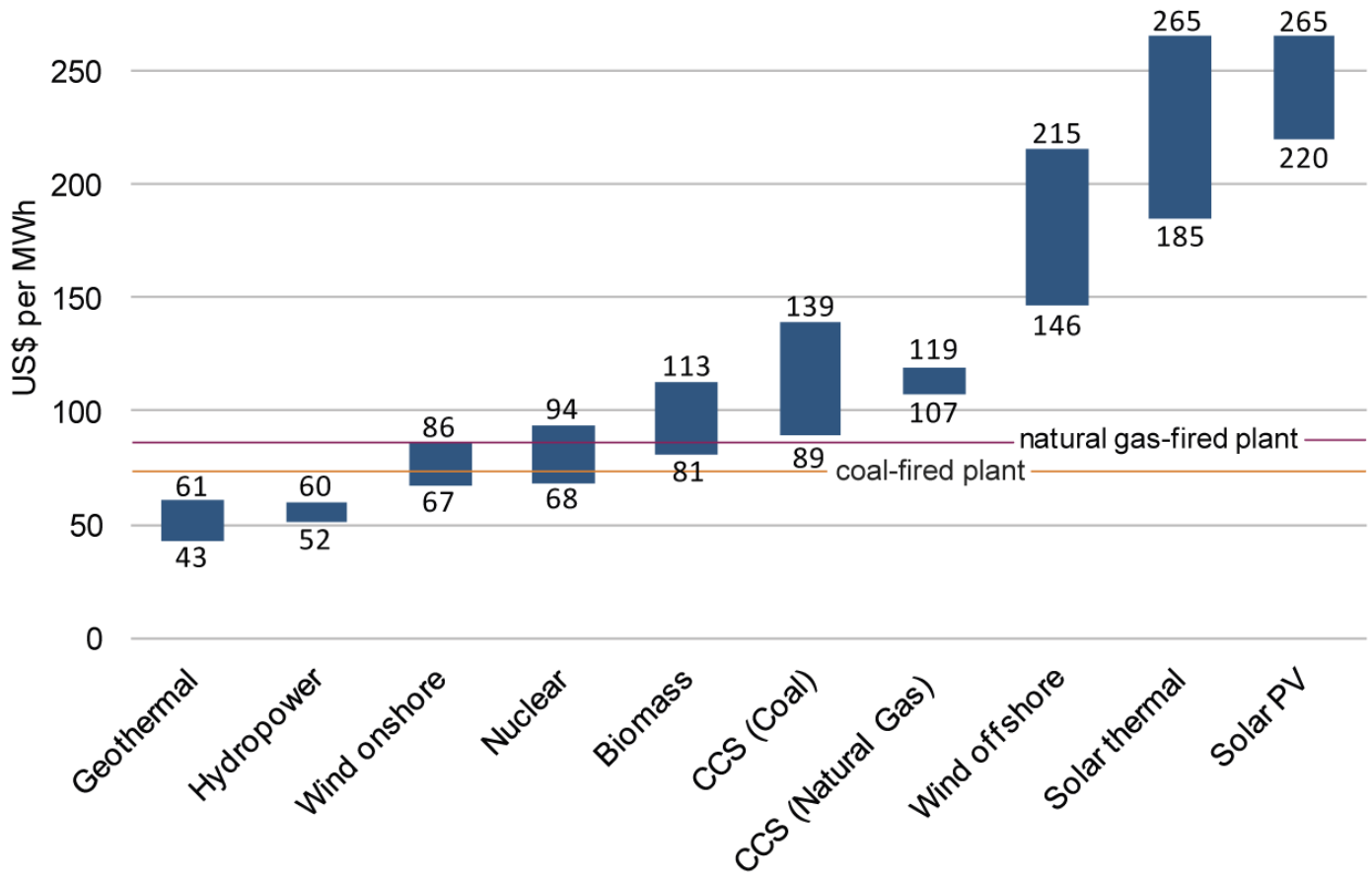
In 2010, over 60 $MtCO_2$ were transported through a 6 600 km pipeline network in the United States.

Cost of transport is generally low, but is a function of distance, capacity, and terrain.

Transport by ship or barge generally more expensive than by pipeline over short distances.

CCS is cost competitive

Levelised cost of electricity of low-carbon technologies and conventional power generation



Source: GCCSI: The costs of CCS and other low-carbon technologies, 2012 , 2012

Challenges

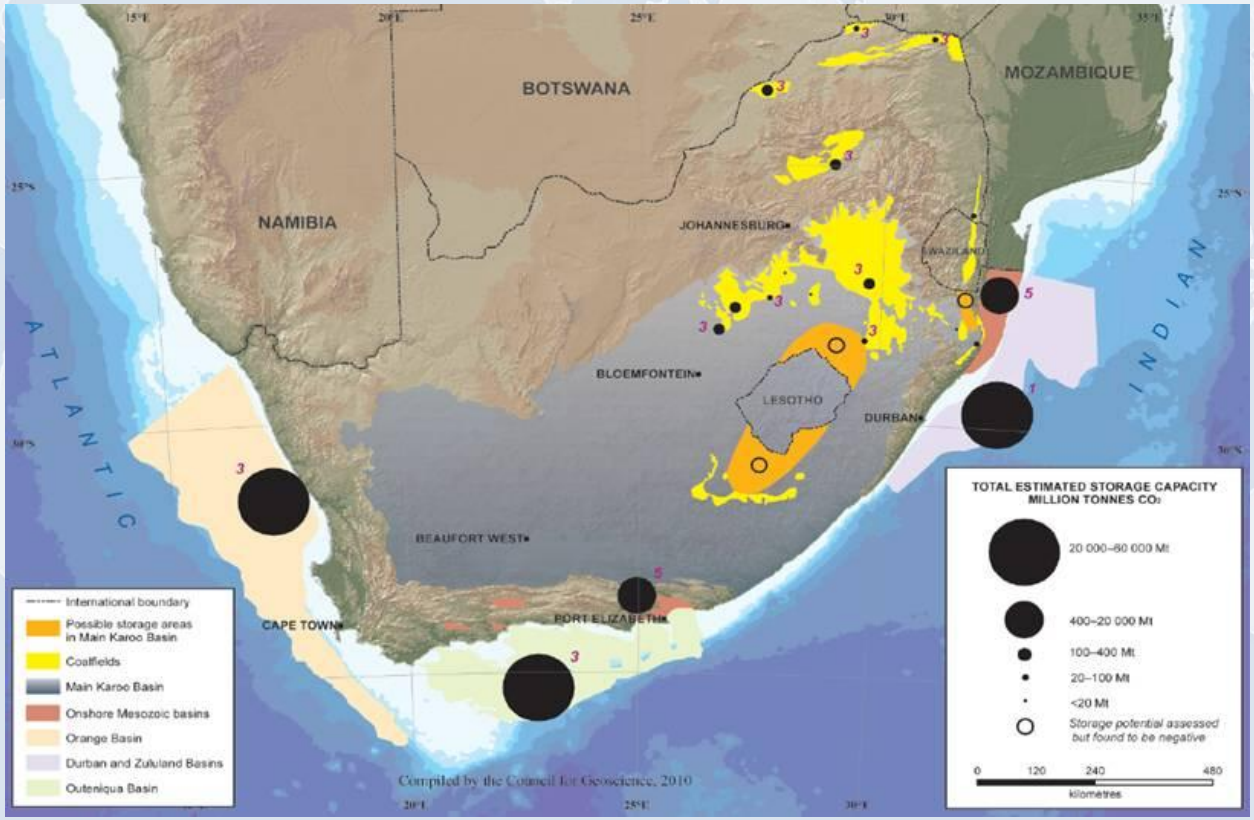
- Demonstration plants
  - Demonstration plants are required to gain experience and bring cost down.
  - Requires public funding – which is hard to find.
- Market incentives
  - Market incentives for CCS is lacking.
  - Industry reluctant to invest because of lack of a market for CCS.

Challenges

- CCS in Developing Countries
  - An increasing portion of world's GHG emissions comes from the developing world.
  - There is a scarcity of resources and expertise.
  - Financing challenges are amplified in developing countries.
- Public awareness
  - Safe CO_2 storage has been demonstrated, but lack of public awareness has lead to scepticism towards CCS.

CCS in developing countries - an example

- South African CO_2 Storage Project - 150Gt theoretical level:



Recommendations

- Funding for demonstration plants must be made available.
- Market incentives for CCS must be established at a level similar to renewable energy sources.
- CCS must be included as a viable technology in international climate agreements.
- Information campaigns must be established to ensure public awareness.

Key messages

- CCS is a key technology to meet CO_2 emission reduction targets.
- CCS is a cost competitive technology.
- Safe CO_2 storage has been demonstrated.
- Meeting emission reduction targets will be more expensive and probably unfeasible without CCS.

Meeting the Challenges Ahead

Coming Soon

2013 CSLF Technology Roadmap