ACEF 2020 Deep Dive Workshop

CCS/CCUS: The Way Forward in Asia

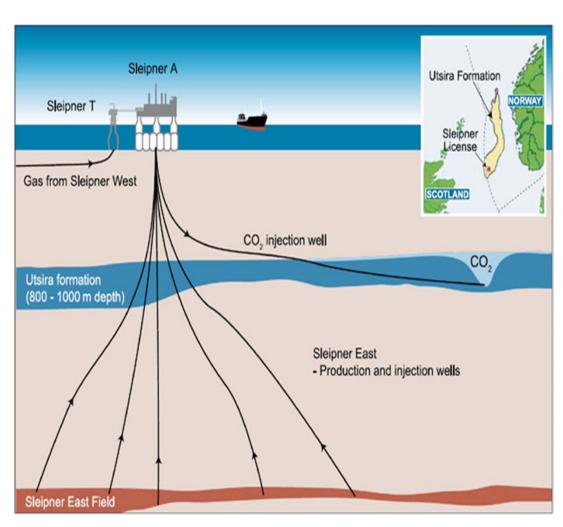
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The World's 1st CCS Project: Sleipner, Norway, North Sea

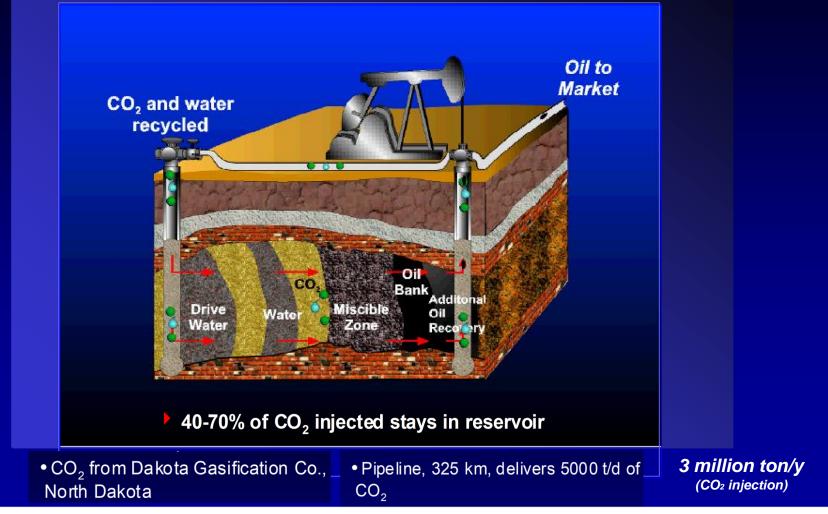




- CCS part of gas field development
- Amine capture from natural gas
- <u>0.9 Million tonnes</u> stored per year
- Injection started in Sept. 1996
- <u>23 years</u> assurance monitoring

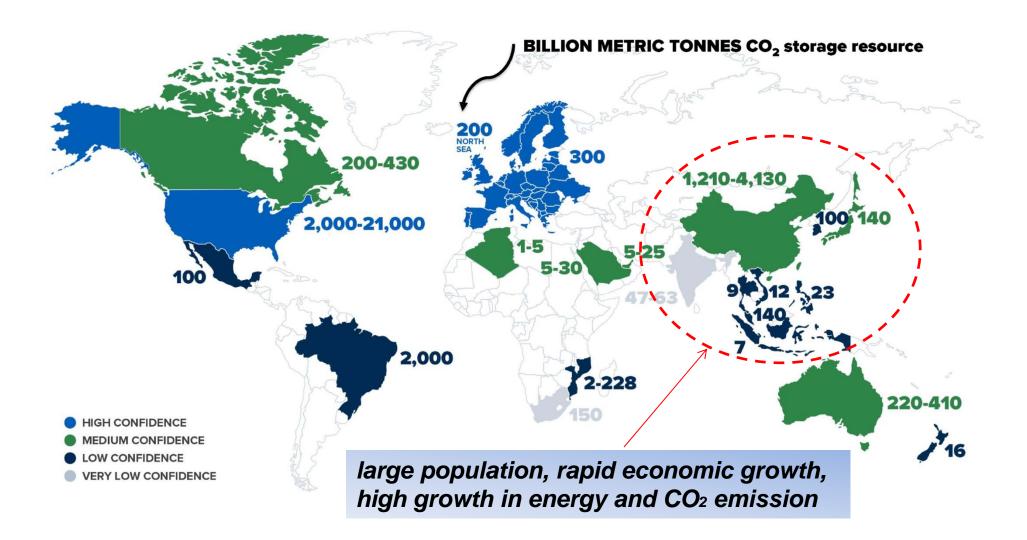
Weyburn CO₂ Miscible Flood Project

CCUS (Enhanced Oil Recovery)



GLOBAL STORAGE RESOURCES

Source: GCCSI



Stages of Carbon Capture and Storage Development

LEARNING by **DOING** !

Source: ADB, 2013

PILOT	DEMONSTRATION	COMMERCIAL	
 50–100 tons per day of CO₂ over several years Knowledge of reservoir performance to support financing and designing of demonstration project 	 Larger quantities of CO₂ injected into many wells continuously over many years 500–2,700 tons per day or more of CO₂ injected over 10 years Confirmation of long-term successful CO₂ storage to support financing and construction of at least one full-scale commercial operation 	 Very large quantities of CO₂ captured from one or more sources and injected into one or more locations for a very long time period 2,700–30,000 tons per day of CO₂ captured and injected over 20 years Capture and store sufficient quantities of CO₂ to substantially reduce CO₂ emissions 	

<u>Most</u> CCS/CCUS projects operating in North America and Europa and main operators are major oil and gas companies.

<u>Some</u> projects in East Asian countries (China, Japan, South Korea), Australia and Middle East, but <u>less</u> in Southeast Asian countries.

"...realise a cost-effective solution for full-scale CCS in Norway, provided that this incite technology development in an international perspective".

Much Progress on Carbon Storage, But Uncertainties Remain

Source: US DOE

	Then CCS Program Initiated (1997)	Now Progress to Date	Future CCS Broad Commercial Deployment
Storage R&D	• Little known	• Knowledge gained and tools being developed and tested	 "Commercial <u>toolbox</u>" developed
Infrastructure/Field Tests	• Little known; Sleipner project initiated	• Increased visibility; Knowledge gained and lessons learned	• Potential realized; Frameworks in place for market deployment

> If cost issues lie with capture, risk issues lie with storage

• Questions about scale up, liability, performance

•R&D focused on: <u>Cost (Capture)</u> and <u>Confidence</u> (Storage),

Demonstrations: <u>Integration</u> and <u>Learning</u>

Can We Achieve Commercial CO₂ Storage?

