ACEF 2020 Deep Dive Workshop

## **CCS/CCUS:** The Way Forward in Asia

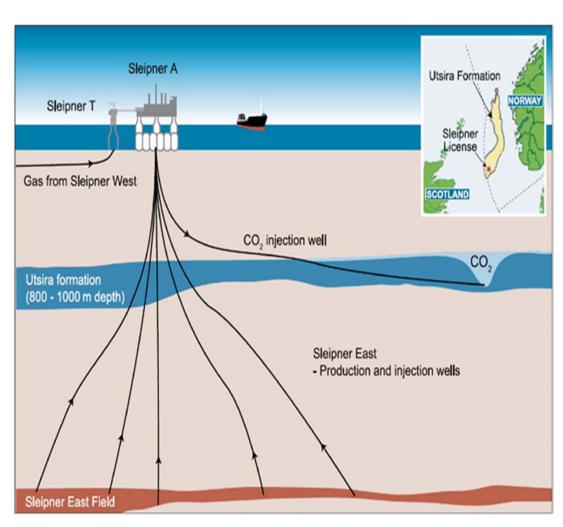
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# The World's 1<sup>st</sup> CCS Project: Sleipner, Norway, North Sea

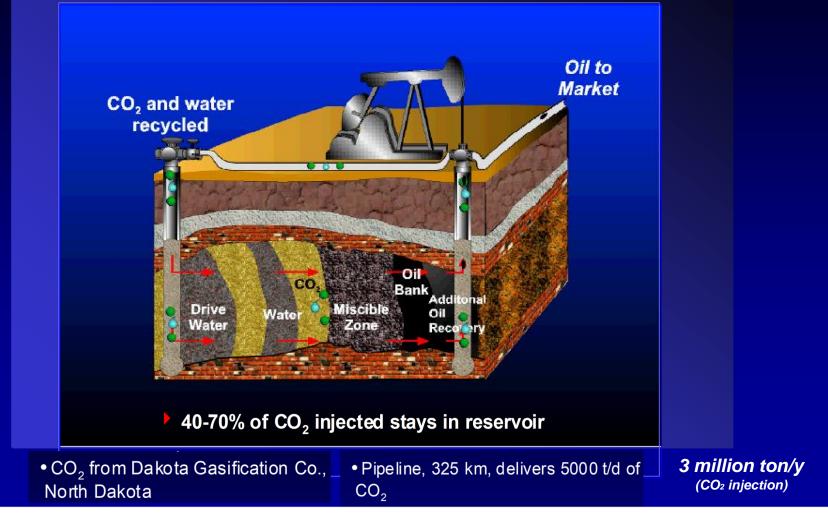




- CCS part of gas field development
- Amine capture from natural gas
- <u>0.9 Million tonnes</u> stored per year
- Injection started in Sept. 1996
- <u>23 years</u> assurance monitoring

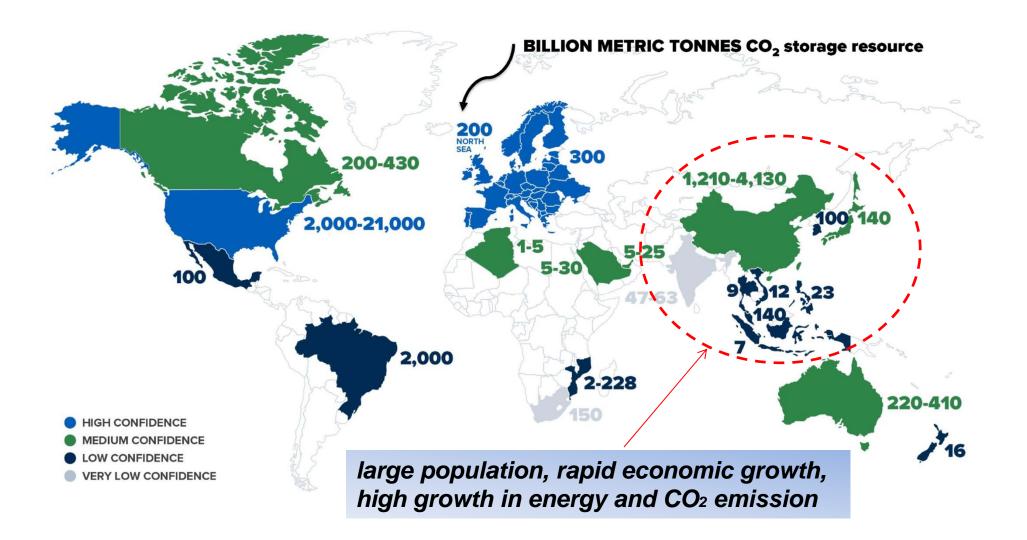
### Weyburn CO<sub>2</sub> Miscible Flood Project

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

<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

	<b>Then</b> CCS Program Initiated (1997)	<b>Now</b> Progress to Date	<b>Future</b> CCS Broad Commercial Deployment
Storage R&D	• Little known	• Knowledge gained and tools being developed and tested	<ul> <li>"Commercial <u>toolbox</u>" developed</li> </ul>
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 CO<sub>2</sub> Storage?

