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Petroleum Research School of Norway

NorTex Petroleum Cluster

The Research Council of Norway

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San Francisco

Field Experiences from CO2 Injections in Hydrates: North Slope CO2-CH4 Exchange Project

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UNIVERSITAS BERGENSIS

Whole Value Chain CCUS Conference Week, Sept. 22nd – 26th, 2025, Golden, CO, USA

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Net Zero CO2 Emission Utilizing Energy from Gas Hydrates - Carbon Neutral Methane Production with CO2 Storage and Conversion to Hydrogen

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[1]Department of Physics and Technology, University of Bergen, Bergen Norway

Sponsoring Societies

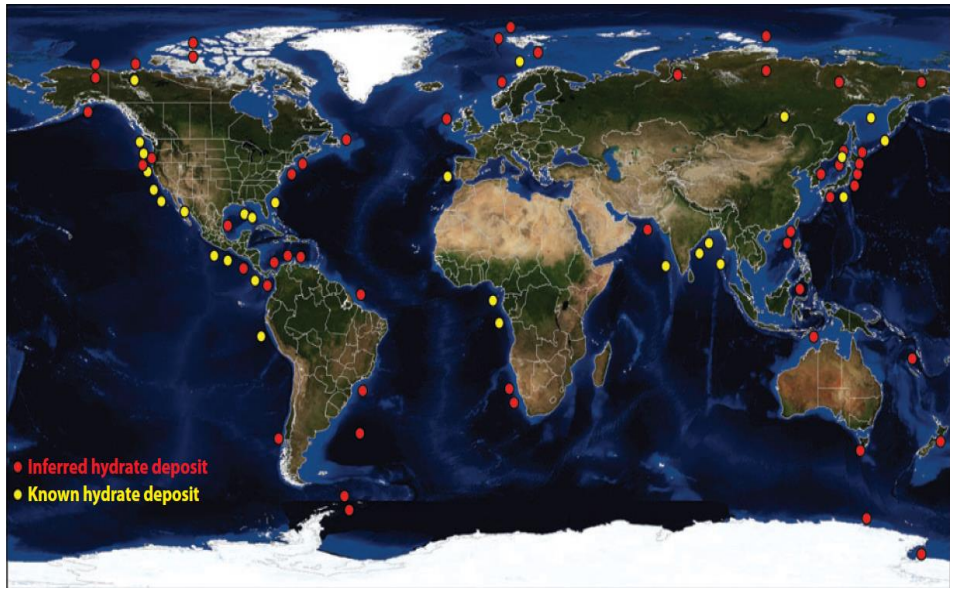
AAPG Advancing the World of Petroleum Geosciences™
EAGE European Association of Geoscientists & Engineers
SEG Society of Exploration Geophysicists
SPE International

CO_2 Storage in Hydrate Reservoirs with Associated Spontaneous Natural Gas Production

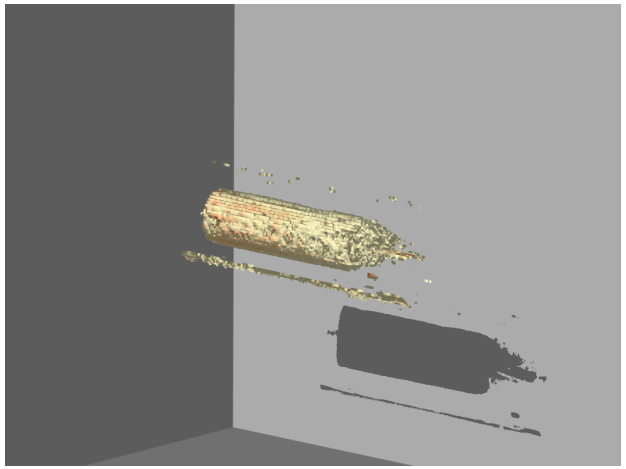
Presentation Overview:

Lab Verification Upscaled to Field Pilot Demonstration of Spontaneous Methane Production When Hydrate is Exposed to CO2. This technology provides Net Zero CO_2 Emission when Utilizing Energy from Gas Hydrates in Carbon Neutral Methane Production with CO_2 Storage.

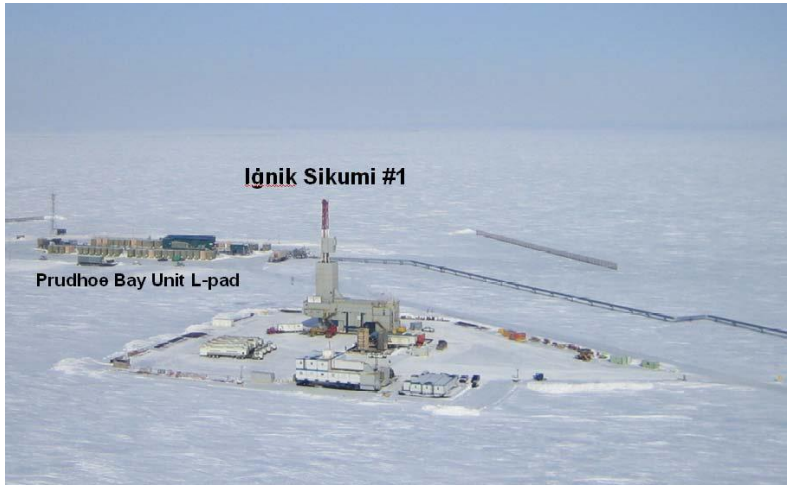
Methane hydrate reservoirs



***In-Situ* imaging (MRI) of hydrate formation**

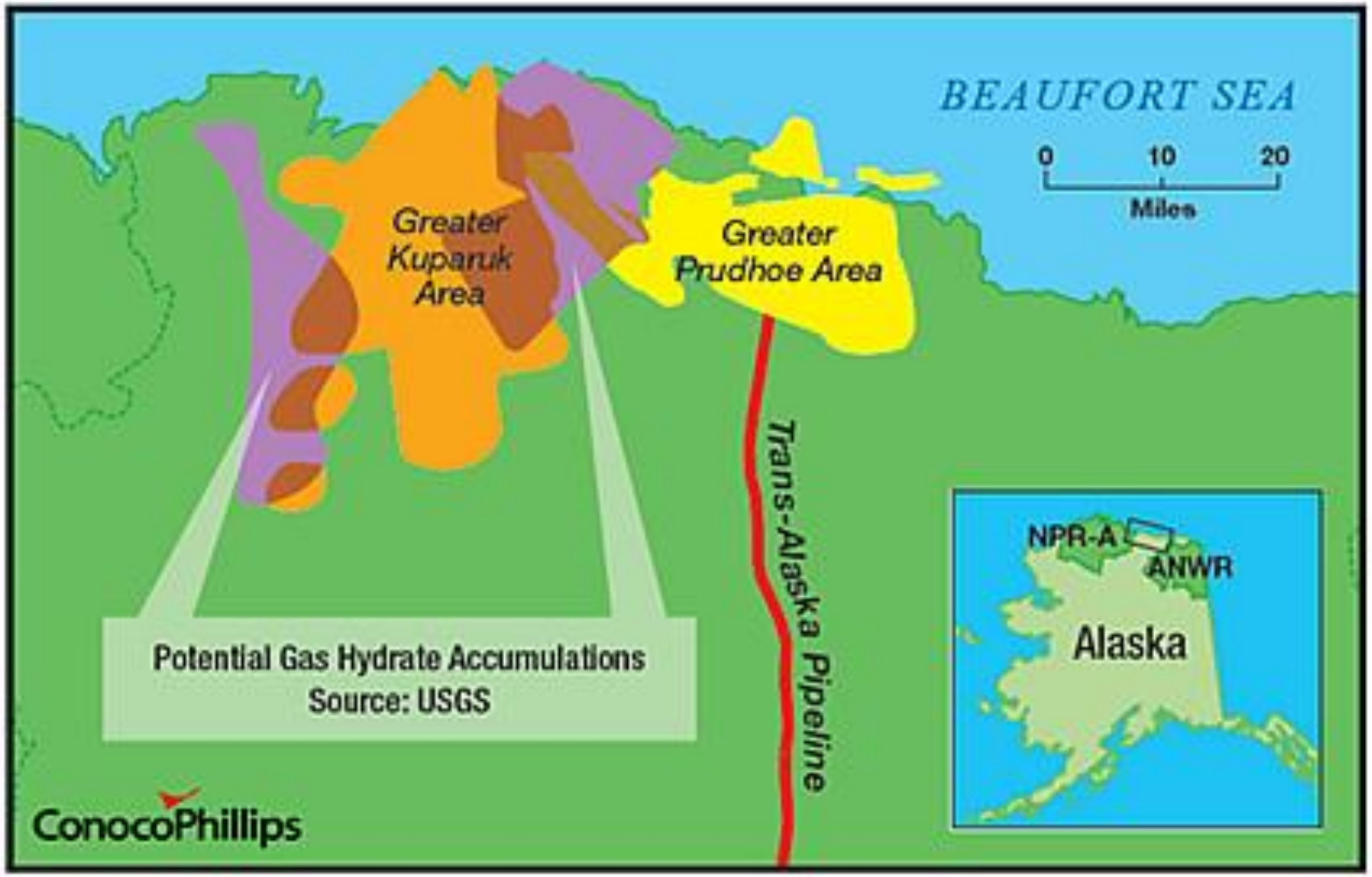


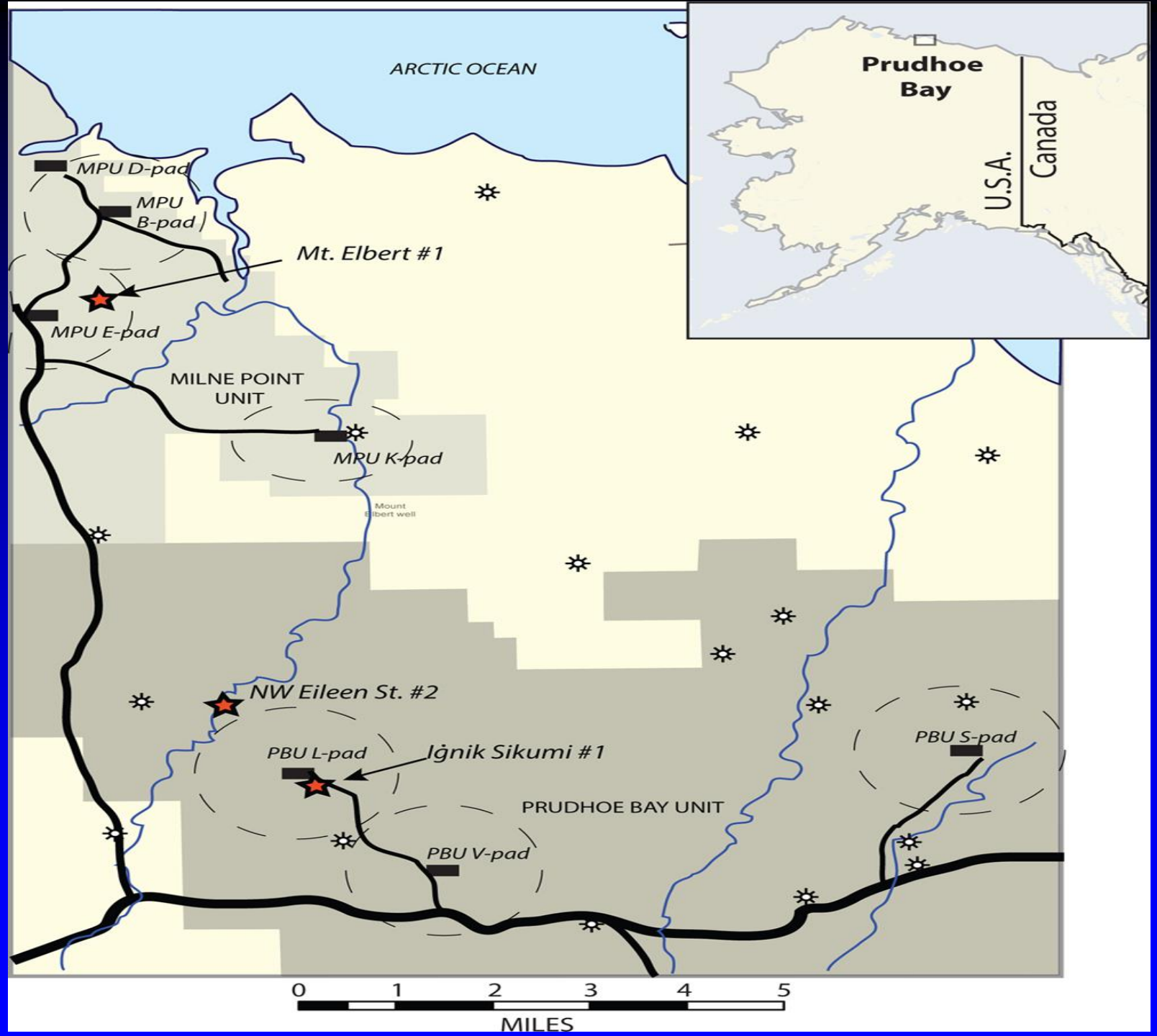
Methane production by CO_2 injection in field test in Alaska 2012



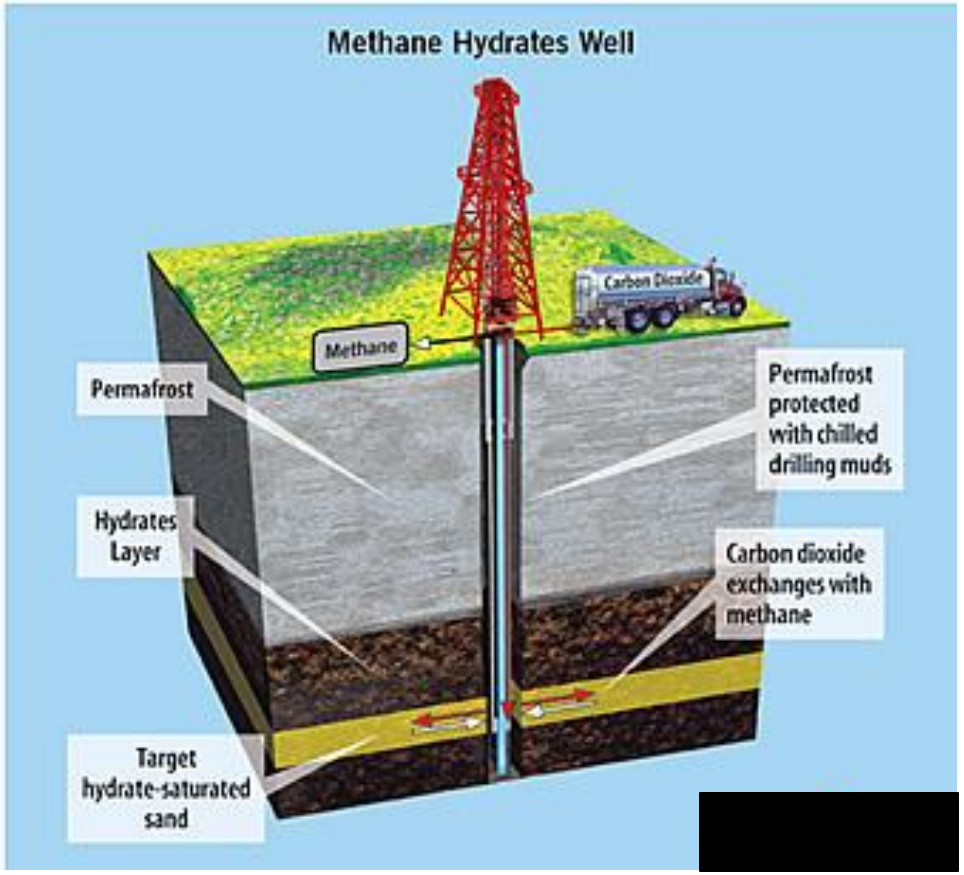
CO2 Field Injection Test in Alaska 2011-2012

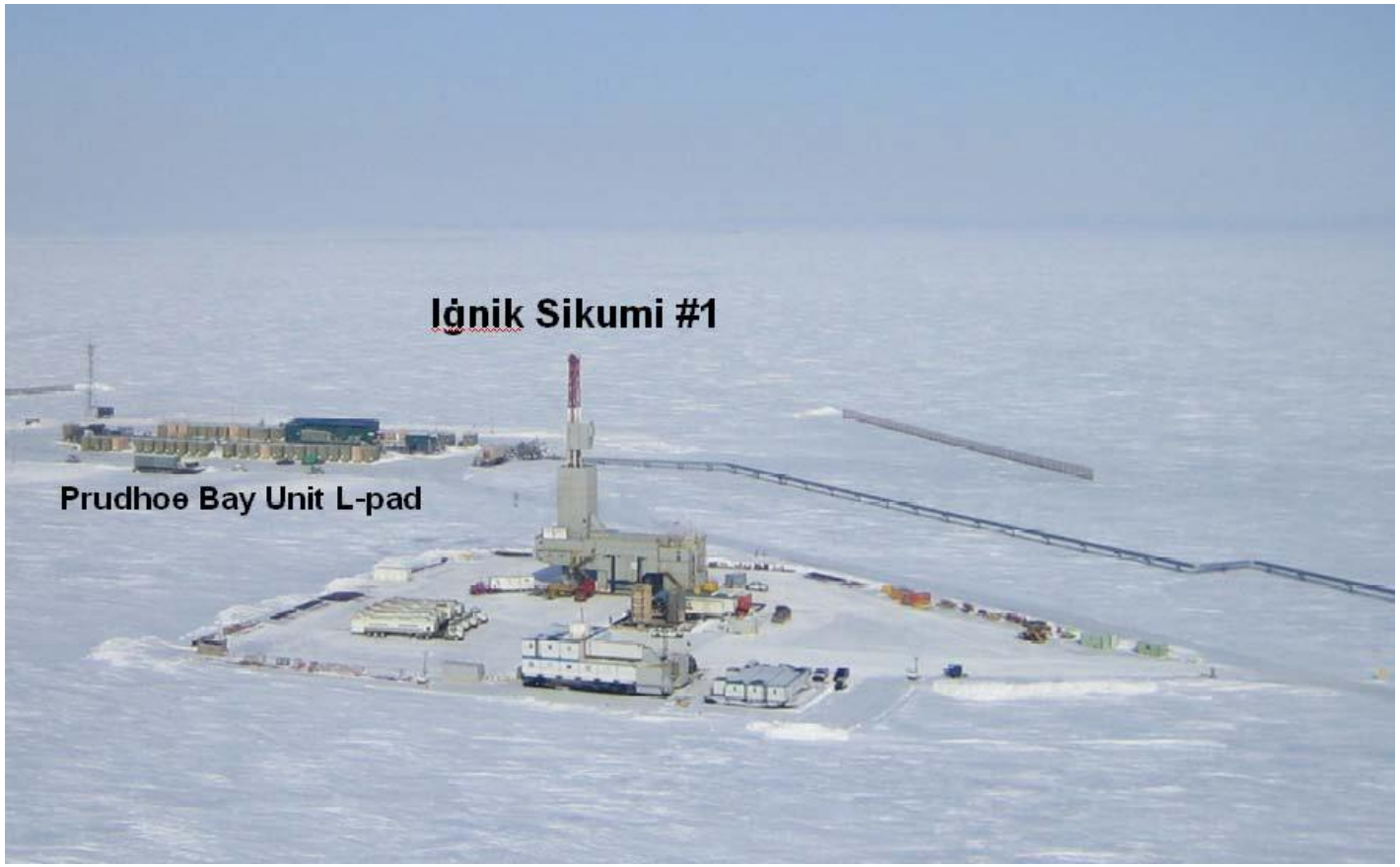
- **Cost ca. US$30mill**
- **USDOE, ConocoPhillips and JOGMEC**
- **US$ 11.6 mill funding from US DOE**

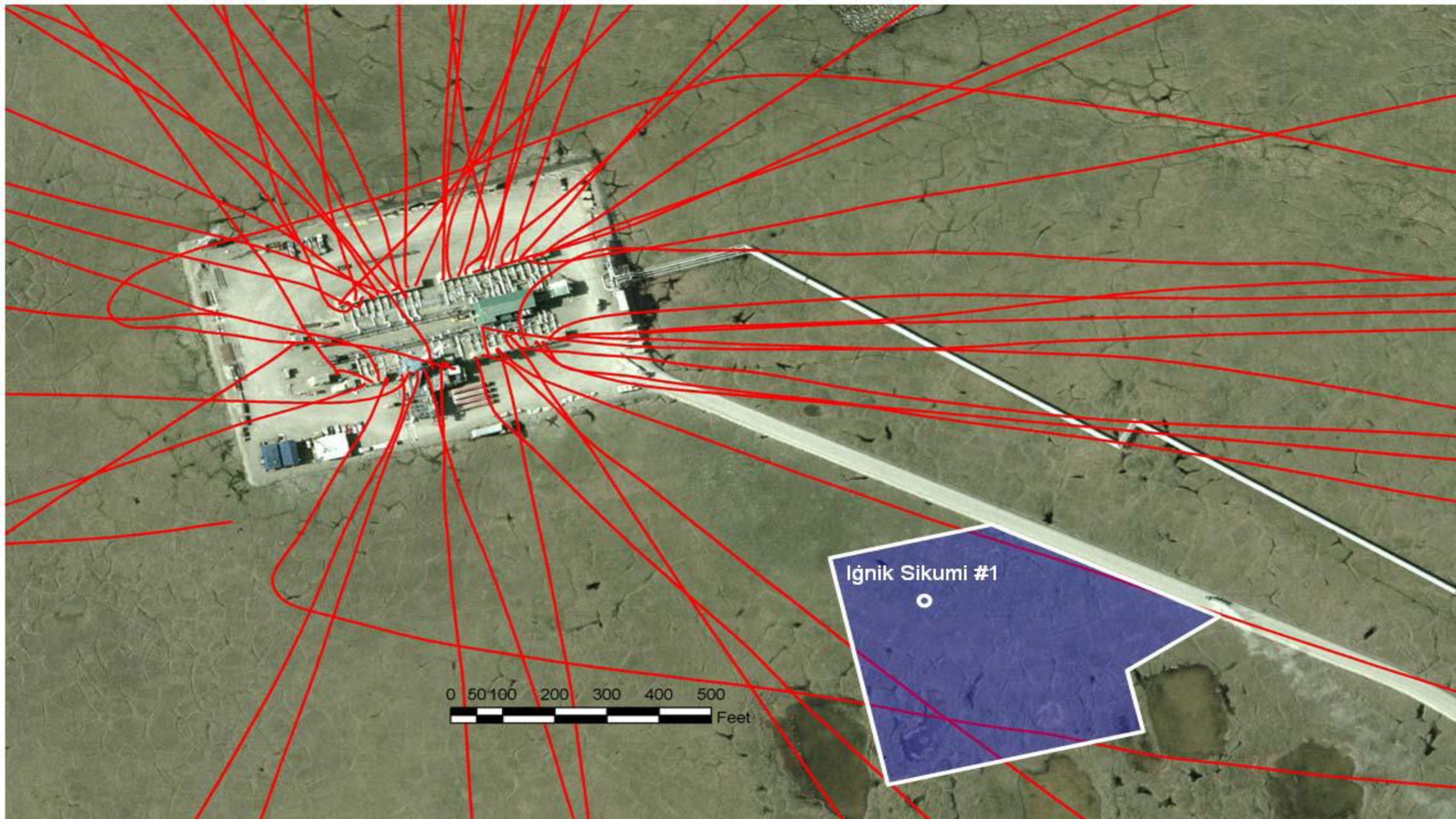

BEAUFORT SEA
0
10
20
Miles
Greater Kuparuk Area
Greater Prudhoe Area
Trans-Alaska Pipeline
Potential Gas Hydrate Accumulations
Source: USGS
NPR-A
ANWR
Alaska
ConocoPhillips


ARCTIC OCEAN
Prudhoe Bay
U.S.A.
Canada
MPU D-pad
MPU B-pad
Mt. Elbert #1
MPU E-pad
MILNE POINT UNIT
MPU K-pad
Mount Elbert well
NW Eileen St. #2
PBU L-pad
Iġnik Sikumi #1
PBU S-pad
PRUDHOE BAY UNIT
PBU V-pad
0 1 2 3 4 5
MILES

Alaskan Field Injection Test 2011-2012






Iğnik Sikumi #1
0 50 100 200 300 400 500
Feet

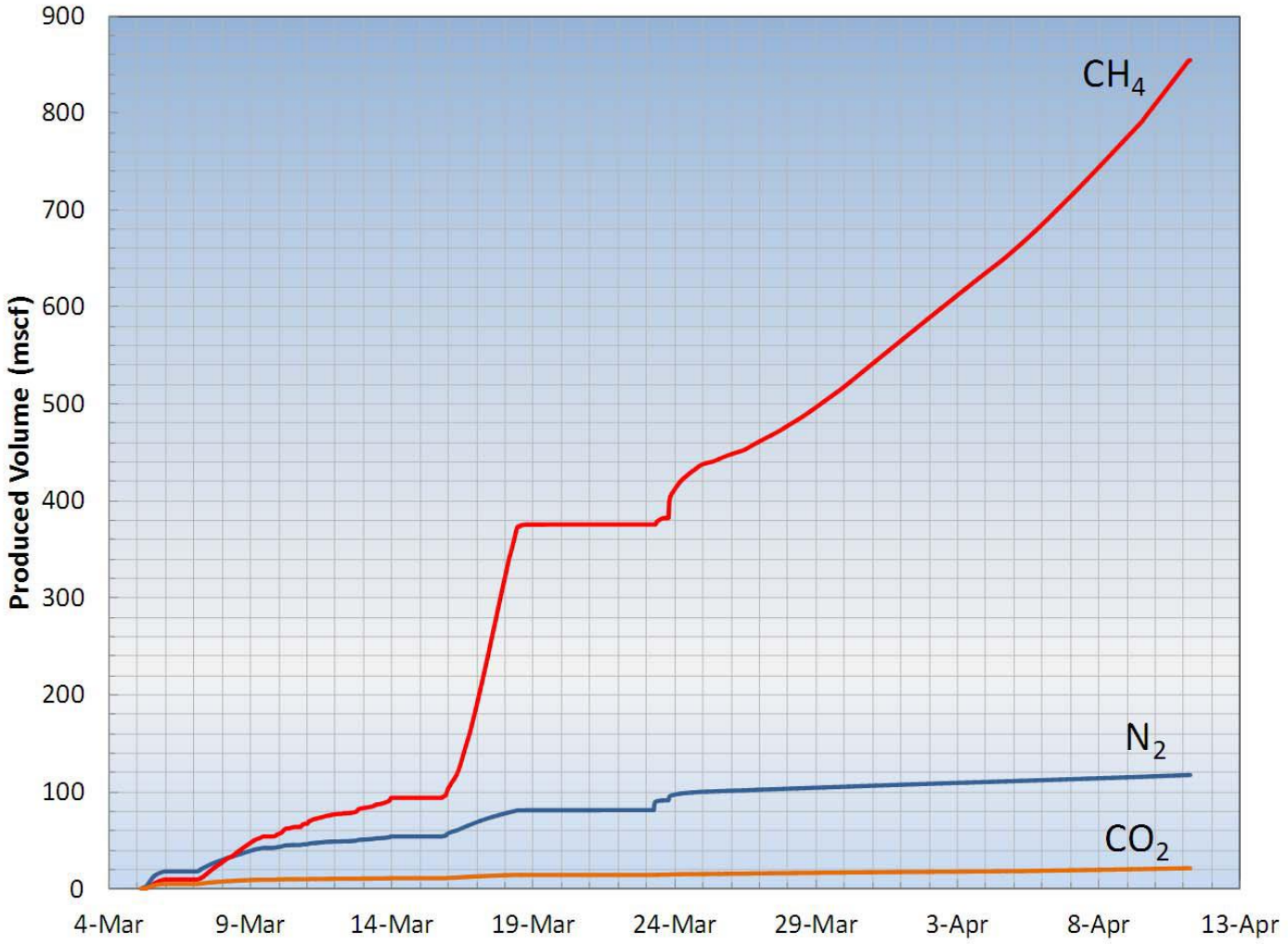
Summary of Field Test (Injection Test)

Schedule:

Apr. 2011: Drilling test well (Complete)
Nov. 2011: Finalizing parameters for the field test
Jan.-Apr. 2012: Field test

Location : Prudhoe Bay operating unit in Alaska, USA
Operator : ConocoPhillips Company (COP), through its wholly owned subsidiary, ConocoPhillips Alaska, Inc.
Investors : The United States Department of Energy（DOE）
JOGMEC; Japan Oil, Gas and Metals National Corp.

Gas Production from the Field Test



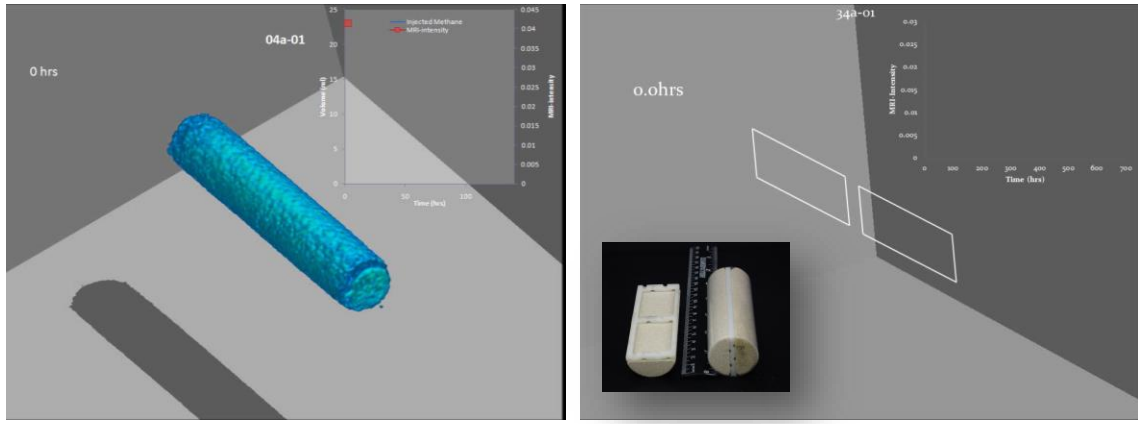
Iğnik Sikumi #1 Flowback/Drawdown: Gas composition

Sustainable Energy for the Future: **Net Zero CO2 Emission Utilizing Energy from Gas Hydrates**

Carbon Neutral Gas Production WITH CO_2 Storage in Hydrates

Energy bound in hydrates is more than combined energy in conventional oil, gas and coal reserves

UiB Laboratory Verification of Technology



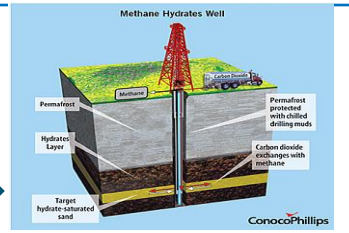
Field Verification of UiB Technology

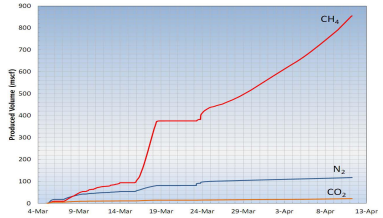
"*While this is just the beginning, this research could potentially yield significant new supplies of natural gas.*"

U.S. Energy Secretary Steven Chu, May 2nd 2012

< 10 year

US $30 mill





DOE, ConocoPhillips and JOGMEC at the Iğnik Sikumi test site, Alaska

What are Methane Hydrates?

Methane hydrates are ice-like structures with natural gas trapped inside, and are found both onshore and offshore along nearly every continental shelf in the world.

Excerpt from U.S. Energy Secretary Steven Chu's statement

...to conduct a test of natural gas extraction from methane hydrate **using a unique production technology, developed through laboratory collaboration between the University of Bergen, Norway**... [D]emonstrated that this mixture could **promote the production of natural gas**. Ongoing analyses of the extensive datasets acquired at the field site will be needed to determine the **efficiency of simultaneous CO_2 storage in the reservoirs**.

Conclusions

CO_2 Technology Ready for Commercial Implementation

- **CO2 Storage in Exploitation of Hydrate Energy:**
  - ***Carbon Neutral Gas Production***
  - ***Net Zero CO2 Emissions when Utilizing Fossil Energy***

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Conclusions on Industry Collaboration

- Mutually beneficial
- Students exposed to experienced senior petroleum experts
- Access to advanced and expensive equipment
- Leveraged research
- Provides qualified candidates for Norway and the oil industry
- Recruitment of national students

Thank you!