

# PROJECT facts

U.S. DEPARTMENT OF ENERGY  
OFFICE OF FOSSIL ENERGY  
NATIONAL ENERGY TECHNOLOGY LABORATORY



Sequestration

03/2006

## A SEA FLOOR GRAVITY SURVEY OF THE SLEIPNER FIELD TO MONITOR CO<sub>2</sub> MIGRATION

### Background

In order for geologic sequestration of carbon dioxide (CO<sub>2</sub>) to be a viable option for reducing greenhouse gas emissions, techniques have to be developed to monitor the emplacement and sequestration of CO<sub>2</sub> in an underground geologic environment. This project seeks to apply high precision gravitational surveying techniques to quantify the change in the local gravitational field associated with the sequestration of CO<sub>2</sub>.

The Sleipner West natural gas field in the North Sea produces CO<sub>2</sub>. To avoid paying a tax on CO<sub>2</sub> emitted into the atmosphere, Statoil, which owns the field, has been injecting most of this carbon into a saline aquifer, the Utsira formation, about 1,000 meters beneath the sea. The Utsira formation is a permeable sandstone saline aquifer about 200–250 meters thick and is overlain by mudstone. The studied site covers an approximately 3 x 7 km area, and the water depth averages about 80 meters.

### CONTACTS

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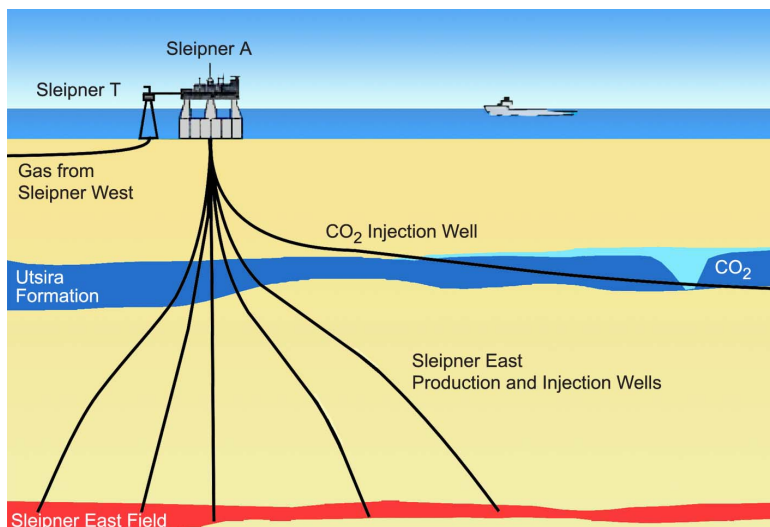
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### Primary Project Goal

The primary project goal is to quantify the change in the local gravitational field associated with the sequestration of carbon dioxide in the saline aquifer below the bed of the North Sea to assess the ability of microgravity techniques to monitor geologically sequestered CO<sub>2</sub>. This study will utilize high precision gravitational surveying techniques along with seismic data.



Schematic Cross-section of geologic strata for the Sleipner project



## PARTNERS

University of California  
San Diego, CA

Statoil

## COST

**Total Project Value**  
\$651,986

**DOE/Non-DOE Share:**  
\$341,986 / \$310,000

## ADDRESS

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## Objectives

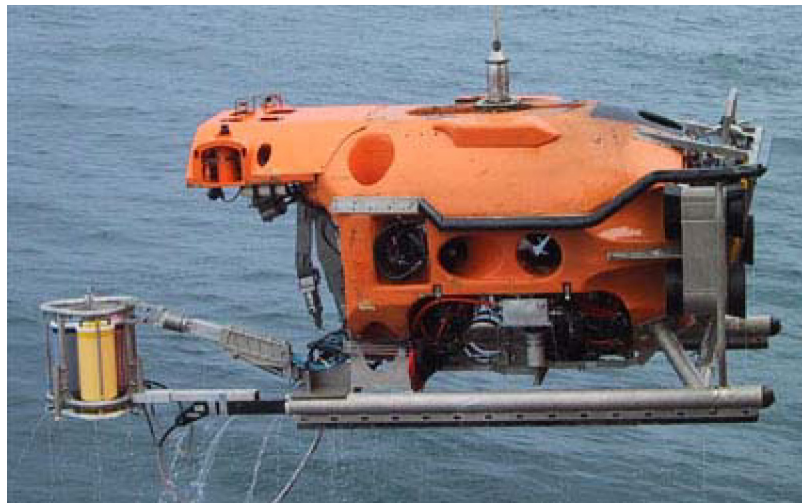
- Perform two high precision gravity surveys on the seafloor over the CO<sub>2</sub> injection. The first is to record the baseline gravity and the second (three years later) is to measure the changes due to the continued CO<sub>2</sub> injection.
- Reduce and analyze the gravitational potential field data along with existing seismic data to discriminate zones of geologic formation infused with CO<sub>2</sub> and to begin putting constraints on the density of the CO<sub>2</sub> within the reservoir.
- Use results of this application of high precision gravitational surveying techniques as a baseline for long-term monitoring of the sequestration of carbon dioxide in a saline aquifer.

## Accomplishments

Microgravity surveys were successfully conducted in 2002 and 2005, both with better-than-expected repeatability.

## Benefits

This project will develop new techniques to monitor CO<sub>2</sub> migration in a saline aquifer. Successful monitoring and verification are necessary to confirm that saline aquifers are a satisfactory repository for CO<sub>2</sub> and can be used to reduce greenhouse gas intensity by providing a viable geologic CO<sub>2</sub> sequestration option.



*Deployment of the Remotely Operated Vehicle with a Deep Ocean Gravimeter (ROVDOG)*