

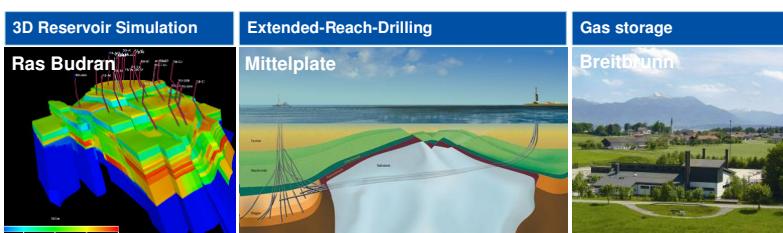
# Overview about the RWE Dea CCS-Project

Workshop on Sub-Seabed Carbon Dioxide Storage  
UBA, Berlin, 17.06.2008

Siegfried Vennekate  
RWE Dea (CO<sub>2</sub> -R&D Coordinator)



## RWE Dea: Know-how made in Germany

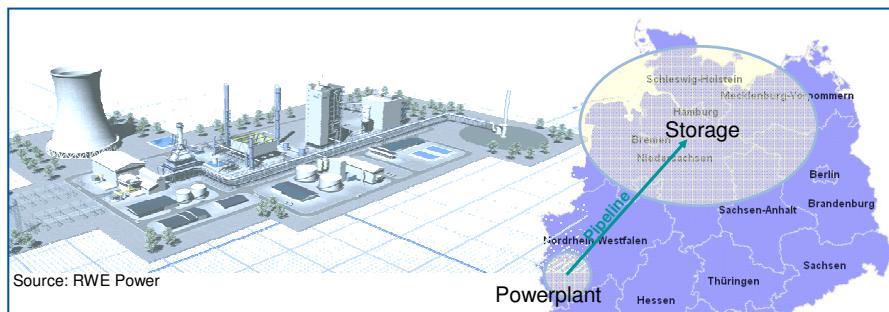


### Technical Expertise

- Know-how about modern E&P-Technologies from Formation-Evaluation, geostatistic modeling, Prediction of uncertainties up to dynamic Reservoir Modeling
- Laboratory for advanced Geosciences, Core analysis, Production chemistry including Stimulation and Development of drilling fluid
- Extended Reach Drilling / Multilateral Drilling
- Operations offshore and within sensitive ecologic Environment
- High-pressure and high-temperature Drilling
- Multi-Frac-Technology
- Operator of grand volume gas storage installations



## Status RWE IGCC-CCS -Projekt

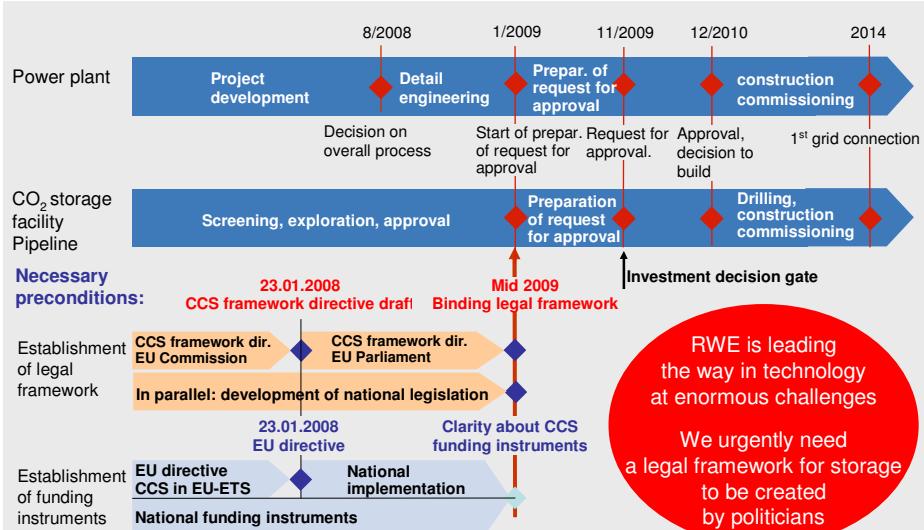


- Base technology: IGCC (Integrated Gasification Combined Cycle); CCS (CO<sub>2</sub> Capture and Storage)
- Fuel: preferred Lignite
- El. capacity: 450 MW<sub>gross</sub>, 330 MW<sub>net</sub>
- Efficiency target: 35%
- CO<sub>2</sub>-Storage: 2,6 MMt/a in depl. Gas reservoirs or deep saline formations
- Commissioning: By 2014; Scheduled: 40 Years lifetime



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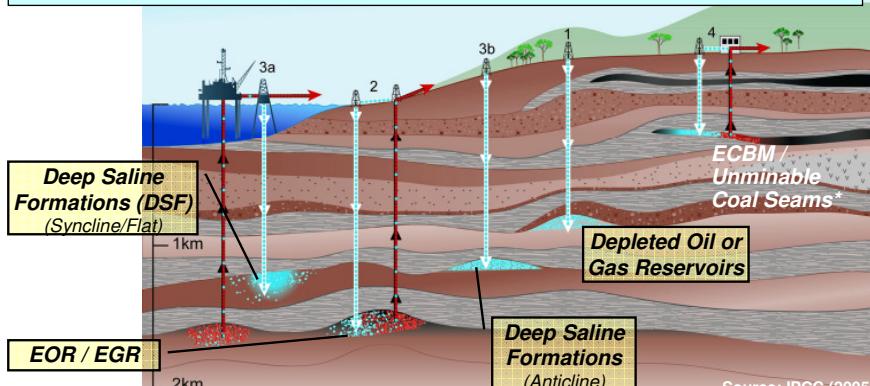
### Preconditions for timely Realization of the IGCC CCS Project



## CO<sub>2</sub> Storage Options

### Site Selection Criteria:

- Storativity: Sufficient Storage
- Injectivity: Thick, continuous storage formation
- Containment: Continuous, high quality caprock \*\*
- Depth: > 1000 m, to ensure non-gaseous state of CO<sub>2</sub>



Source: IPCC (2005)

\* Not feasible for RWE's project  
\*\* or other highly reliable trapping mechanisms

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## Oil & Gas Fields: Selection Criteria

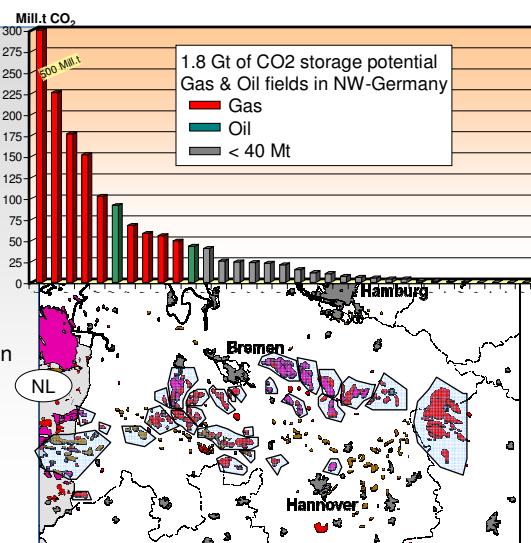
### For Assessment of Potential:

- Small, adjacent reservoirs may be combined into clusters
- Capacity, (at least) cluster capacity has to be above 40 Mt CO<sub>2</sub>
- Depth: below 1000 m
- Gas Fields: no H<sub>2</sub>S

→ 1.8 Gt of CO<sub>2</sub> storage potential identified, thereof 0.5 Gt in Altmark gas province and 4% in appropriate oil reservoirs

### For Assessment of Project:

- Ownership
- Maturity

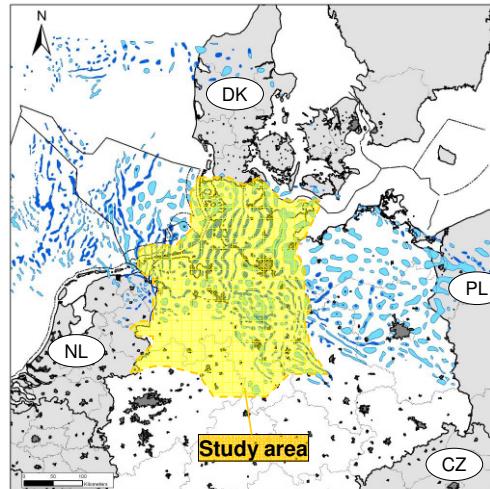


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## Deep Saline Formations: Selection Criteria and Assessed Potential

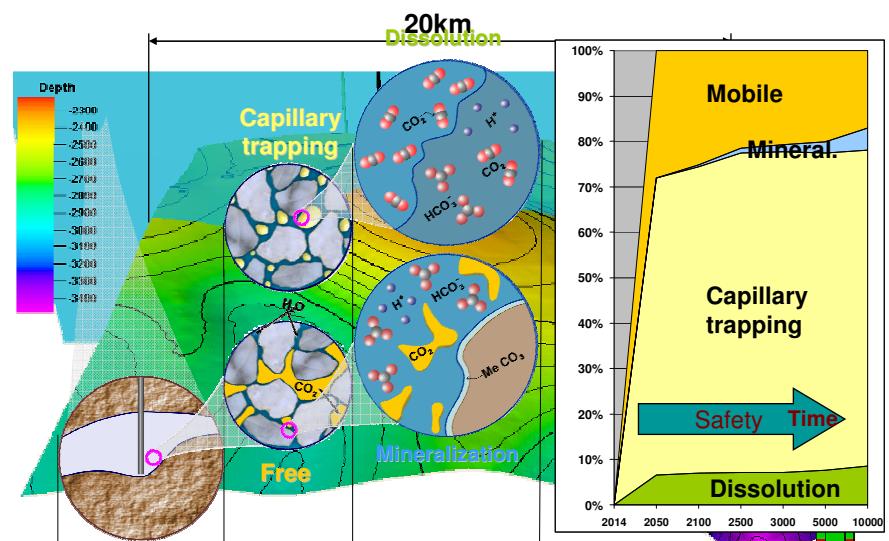
- Depth = 1000..4000 m
- No faults in area, halite as seal preferred
- Capacity Factor: Anticlines 30% Synclines/Flat areas 20%
- Preferred System: Anticline/Syncline - Combination
- Single local Capacity  $\geq 100$  Mt CO<sub>2</sub>
- Pore Volume Injected  $\leq 0.1..0.7\%$  of the hydraulic system
- Intermediate result of potential approx. 3.8 Gt storage in NW-Germany (onshore + close to shore)



**RWE**  
the energy of ideas

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## CO<sub>2</sub>-Storage Mechanisms

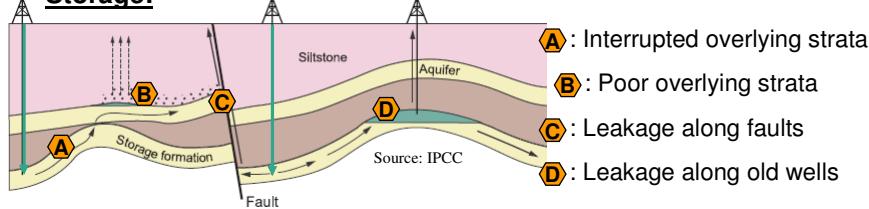


CO<sub>2</sub> can be stored underground over the long term!

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## Challenges

### Storage:



### Operational challenges:

- Magnitude of operated volume
- High concentration of CO<sub>2</sub> in subsurface
- Injection operation without production
- Abandoned and old wells, if existing

### Non-technical challenges:

- Public acceptance (local and general)
- Regulatory framework



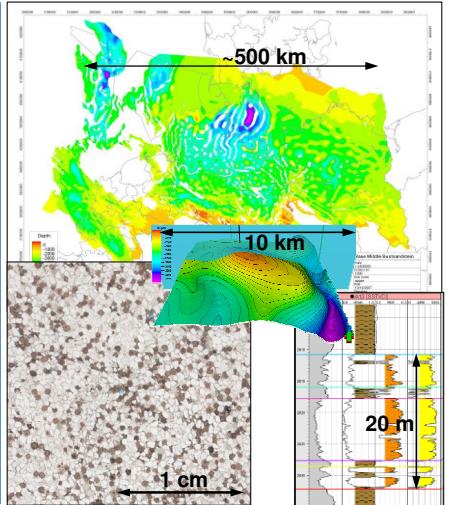
- The challenges are well-known and manageable.
- The storage of CO<sub>2</sub> underground is a valid option for the following decades.
- Transport of CO<sub>2</sub> via pipeline is a well known technical practice in the USA since 1971  
At least 2500 km in operation without *any* severe accidents



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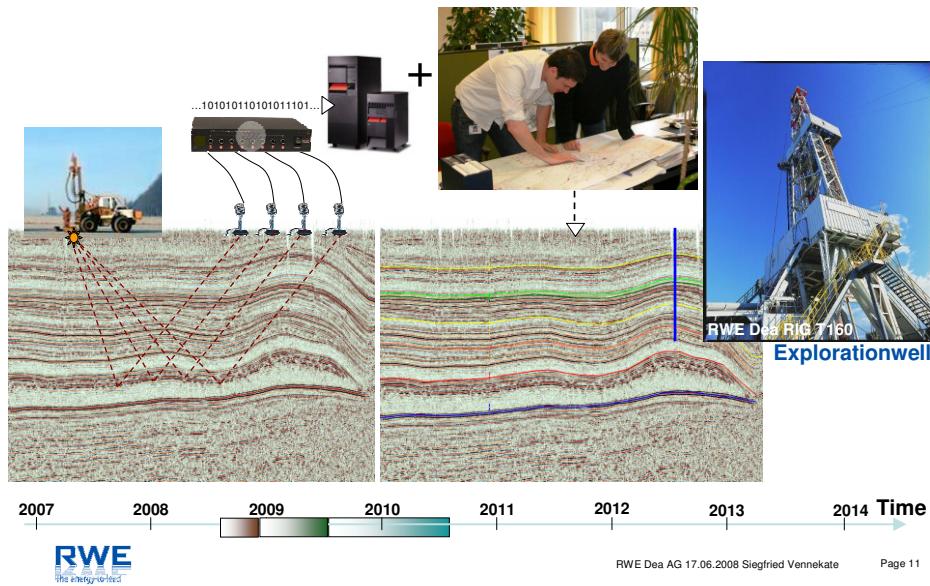
## Preinvestigation

- Data situation
  - Regional maps
  - Logs of wells
  - Seismic sections
  - Personal expertise
- Modeling of regional and local storage and caprock
- Optimization and selection of sufficient exploration area
- Participation in appropriate R&D-Projects



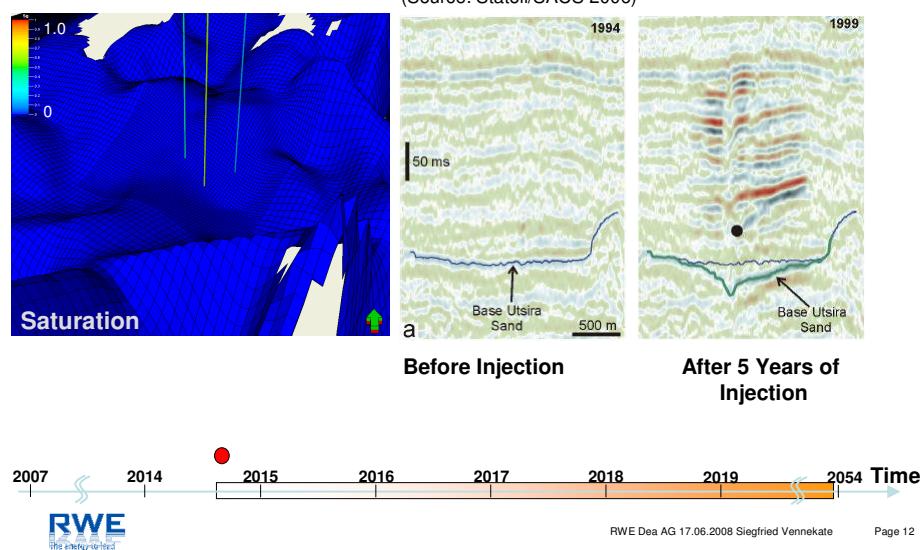
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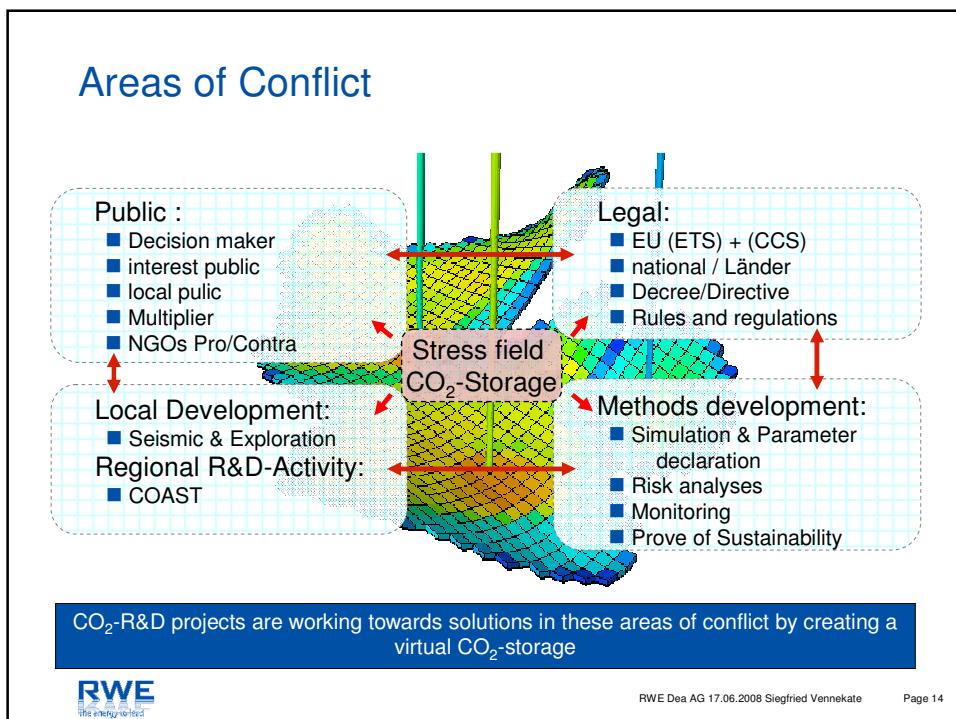
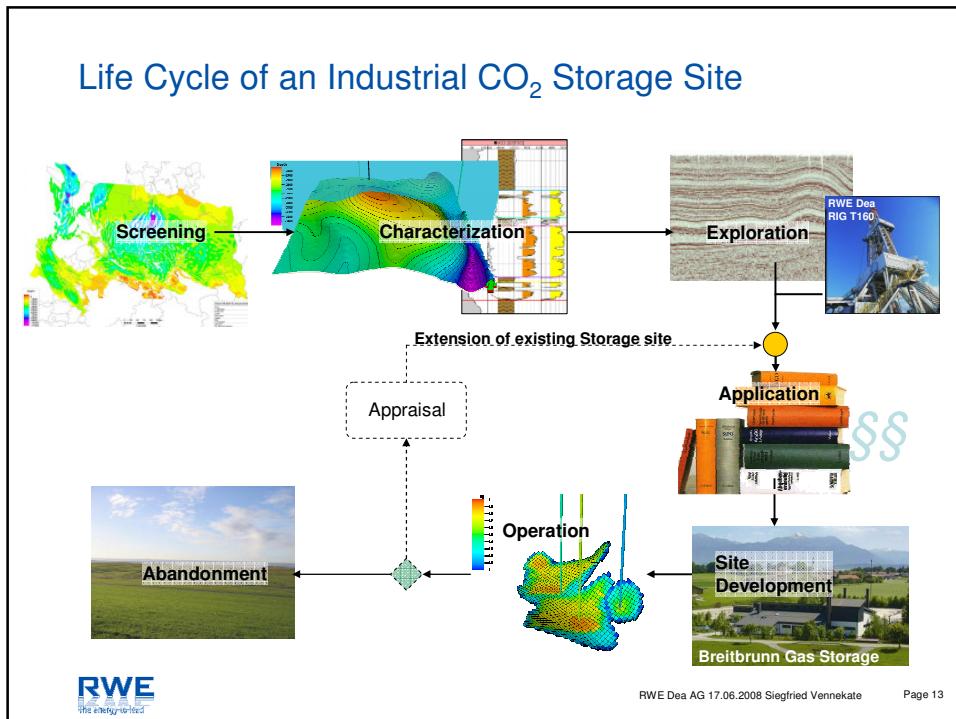
## Methodology of Exploration

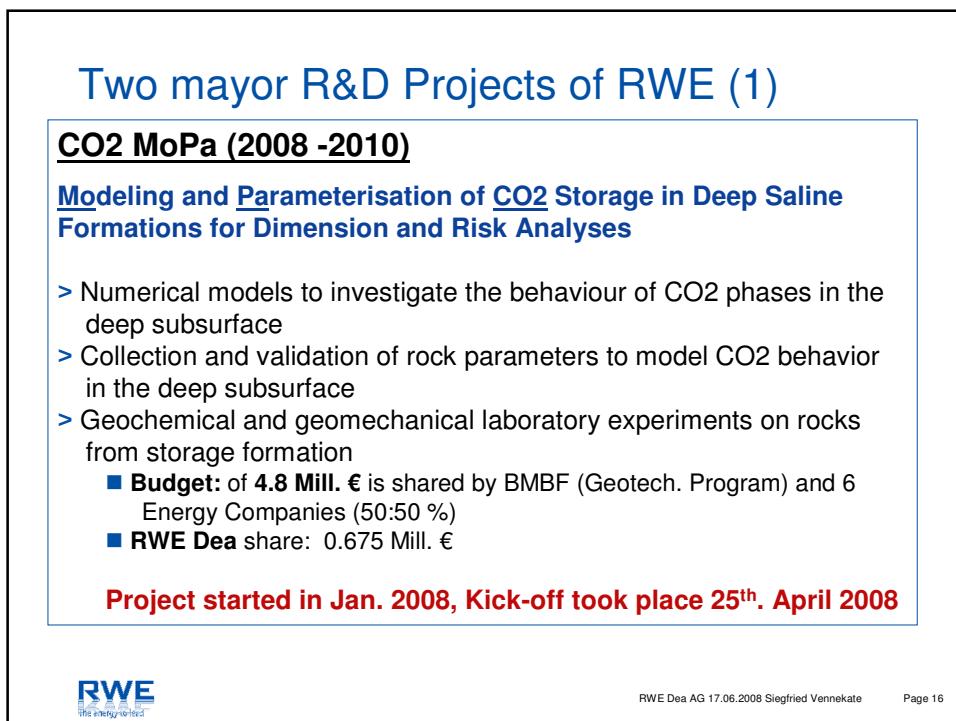
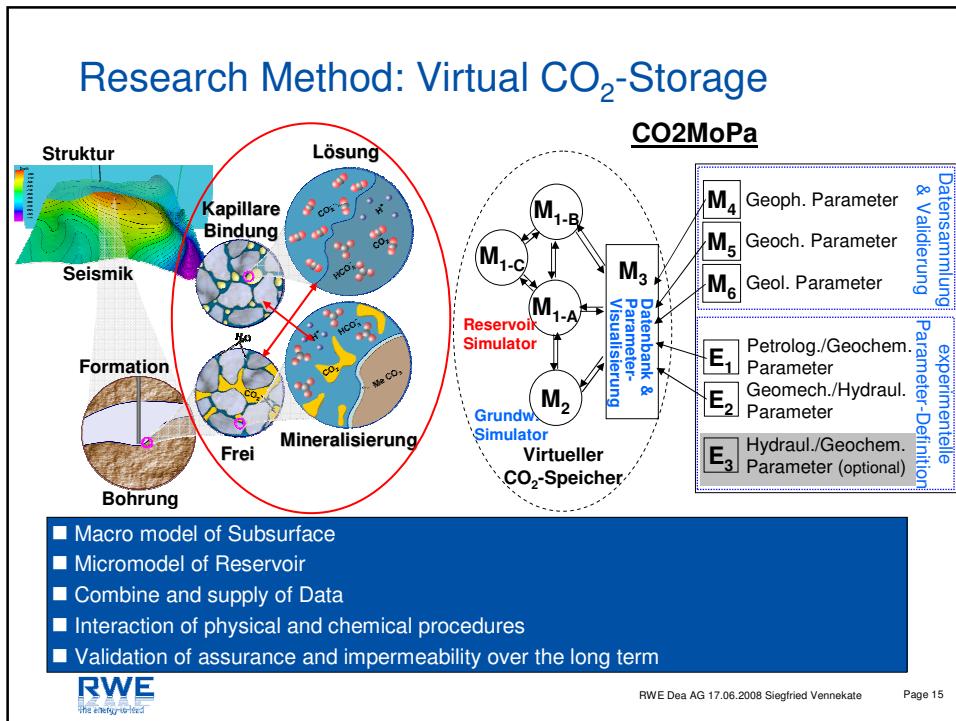


## Storage Operations and Monitoring

Seismic Monitoring: Sleipner  
(Source: Statoil/SACS 2006)







## Two major R&D Projects of RWE (2)

### **BMBF Lighthouse Project COAST (CO2 Aquifer Storage) in Connection with the IGCC-CCS Project of RWE (Duration: 2009 -2011)**

> Comprehensive program with 6 subprojects and around 30 institutes

- **Seismics:** Communication between Reservoir/Aquifer and Surface Structure
- **Geology, rock mechanics:** Prognosis of tensions, fracture networks, possible reservoir leakage
- **Chemistry, petro physics:** Kinetic and chemical control of processes in CO2-Brine-rock-system
- **Reservoir technology:** Developing of advanced methods for reservoir simulations
- **Completion&Cementation:** Stability of casing/cement installation, developing of multi-barrier systems along well bores and well abandonment
- **Monitoring, Environment:** Seismic CO2 plume measurement, possible leakage detection methods

> Coordination: BGR, Industrial partner: RWE Dea,

> BMBF budget: 15 mill. € over three years.

**Project in final definition phase, Start expected January 2009**



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Thank you for your attention!

Any questions ?



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