



CARBON SEQUESTRATION LEADERSHIP FORUM

Melbourne, Australia, September 13-15, 2004

Geological Storage of CO₂ in Europe

Niels Peter Christensen
International Ventures Director
Geological Survey of
Denmark and Greenland





THE GESTCO PROJECT



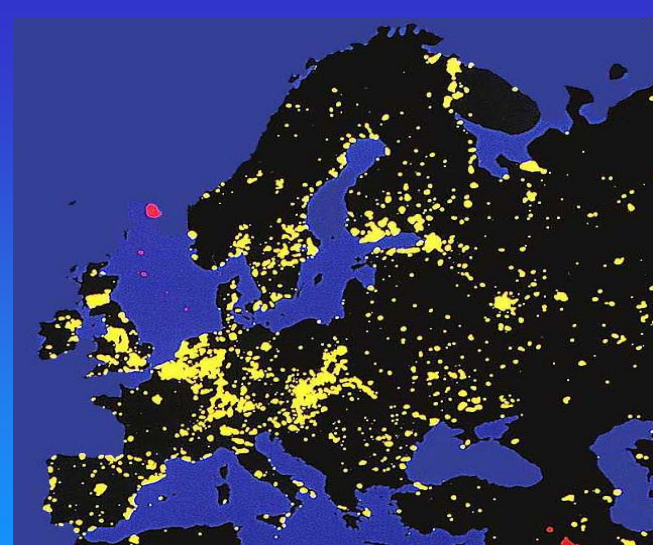
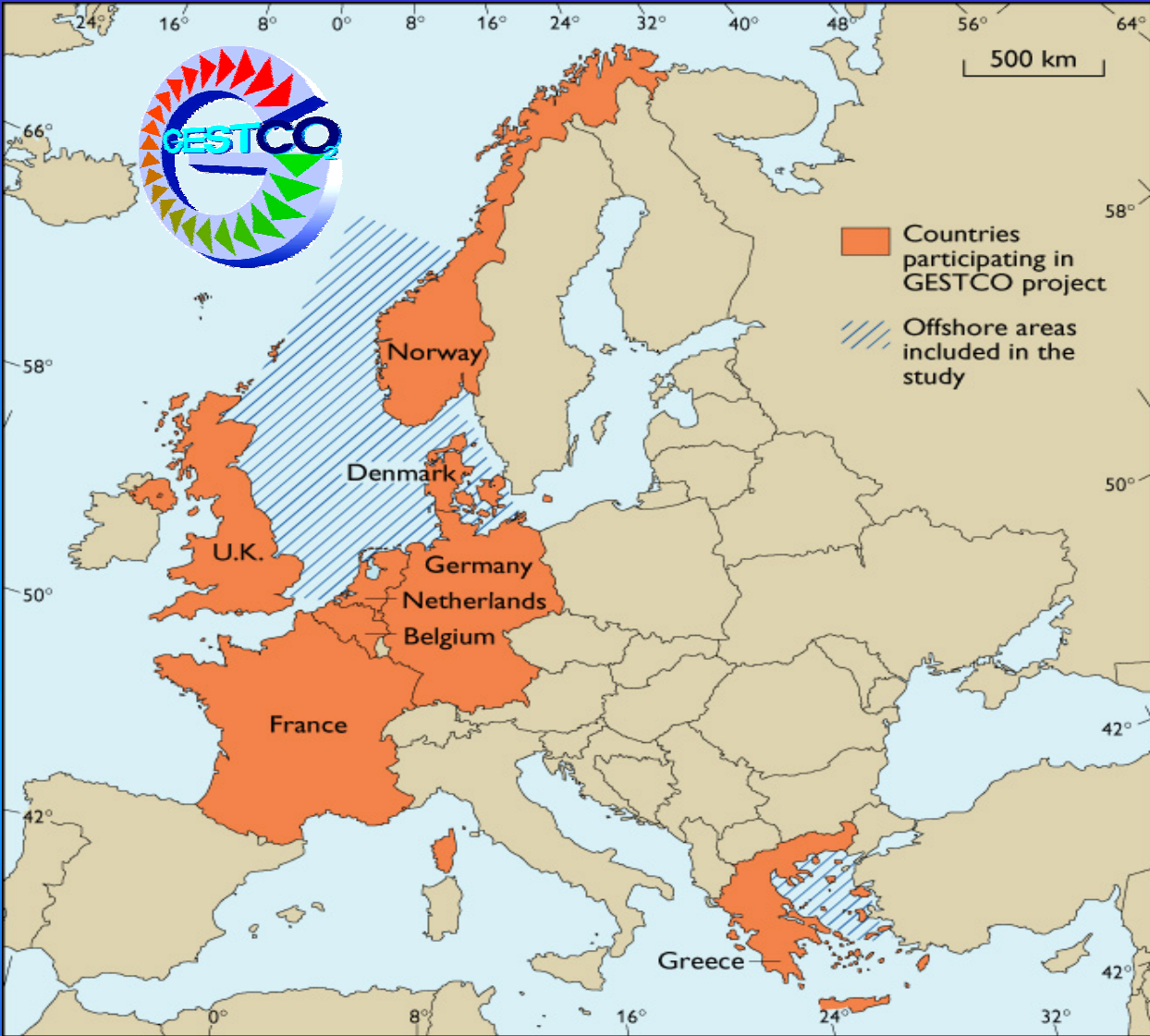
Geological Storage of CO₂ - a viable method of reducing greenhouse gas emissions in Europe?

Project rationale

If long term storage capacity can be demonstrated close to European CO₂ emission sources (e.g. within +/- 100 km), the geological storage method could potentially make fossil fuel based power generation environmentally acceptable.

Project Co-ordinator





Country	Annual CO ₂ emissions (10 ⁶ tonnes)	
	Major industrial point sources	Total emissions (IEA, 1998)
Belgium	75	122
Denmark	29	60
France	191	413
Germany	393	886
Greece	43	100
Netherlands	96	181
Norway	23	42
UK	218	546
Total	1068	2350



Geographical Information System (GIS)

Gestco.mxd - ArcMap - ArcInfo

File Edit View Insert Selection Tools Window Help

1:3,616,286

Gestco DSS

Layers

- sources
 - Emission
 - 0 - 696
 - 696 - 2451
 - 2451 - 5311
 - 5311 - 12039
 - 12039 - 25153
- sinks
 - CONTENT
 - Aquifer
 - Condensate
 - Gas
 - Gas and condensate
 - Gas with minor oil zone
 - Gas with thin oil zone
 - Oil
 - Oil and condensate
 - Oil with a gas cap
 - Oil with minor gas cap
- Pipelines
- Topography
- Eur_as_1poly
- CostGrid

Display Source

Drawing

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-1037559.58 6709162.37 Mete

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Office

Microsoft

Geographical and technical data for 8 European countries

- Major CO2 sources
- Injection points
- Pipeline and landuse information
- Selected geological features (basins, coal seams etc.)
- LNG storage sites
- Geothermal plants
- Case studies

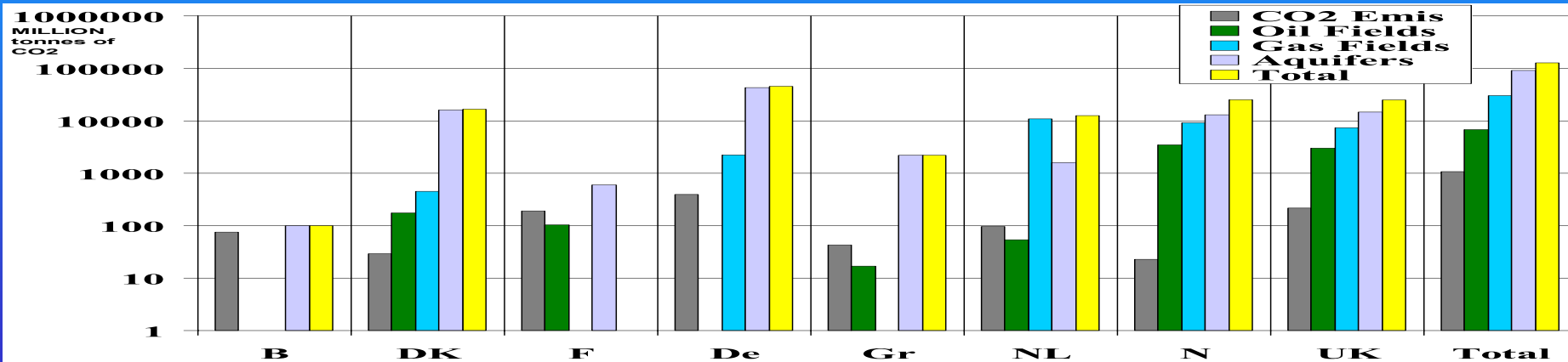
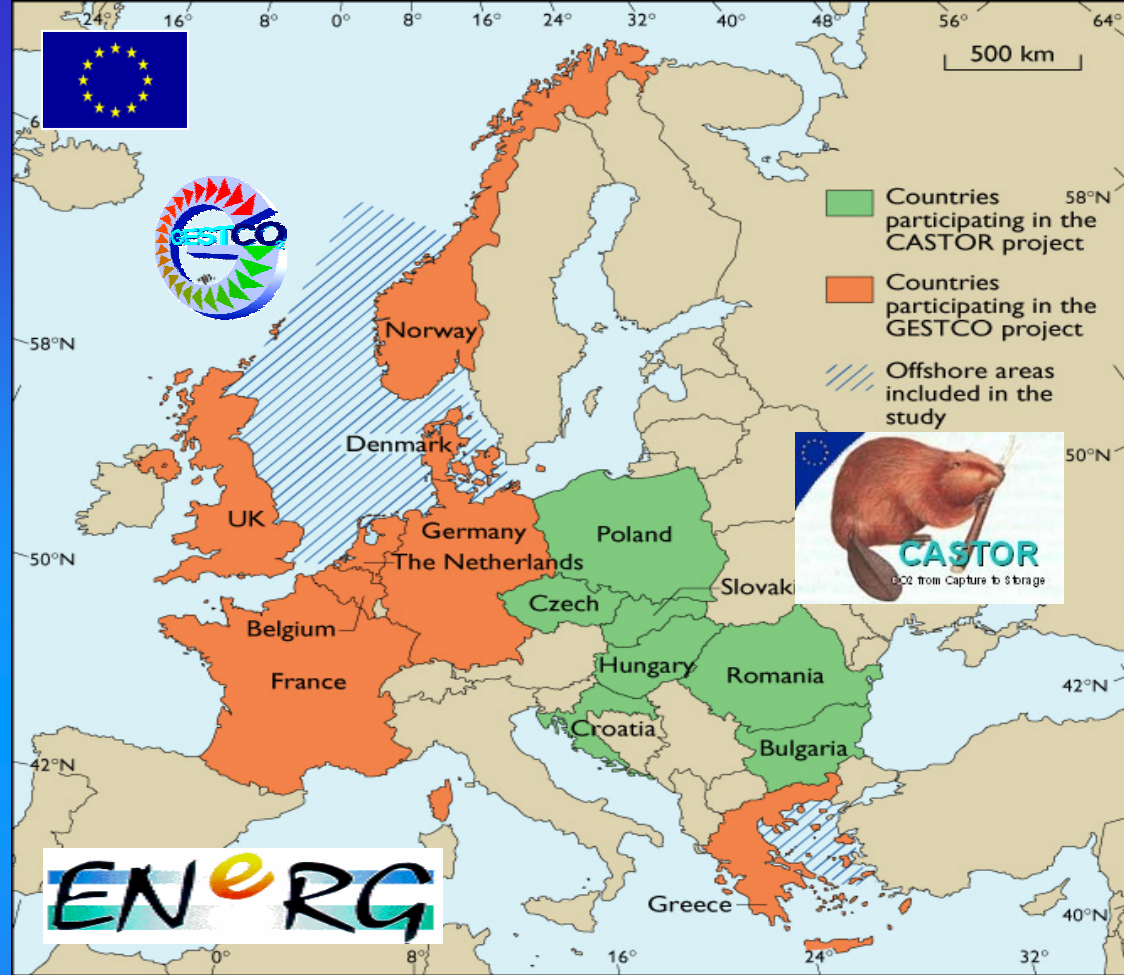
What next?

New and coming
EU members

Southern EU

Outside EU
(e.g. CSLF members)

Standards for
Geological Capacity
Assessment





The CO₂SINK Pilot Project

for Demonstration of Capture and Storage of CO₂

**Günther Borm, GFZ Potsdam,
Niels Peter Christensen, GEUS Copenhagen
Wolf Heidug, Shell The Hague**

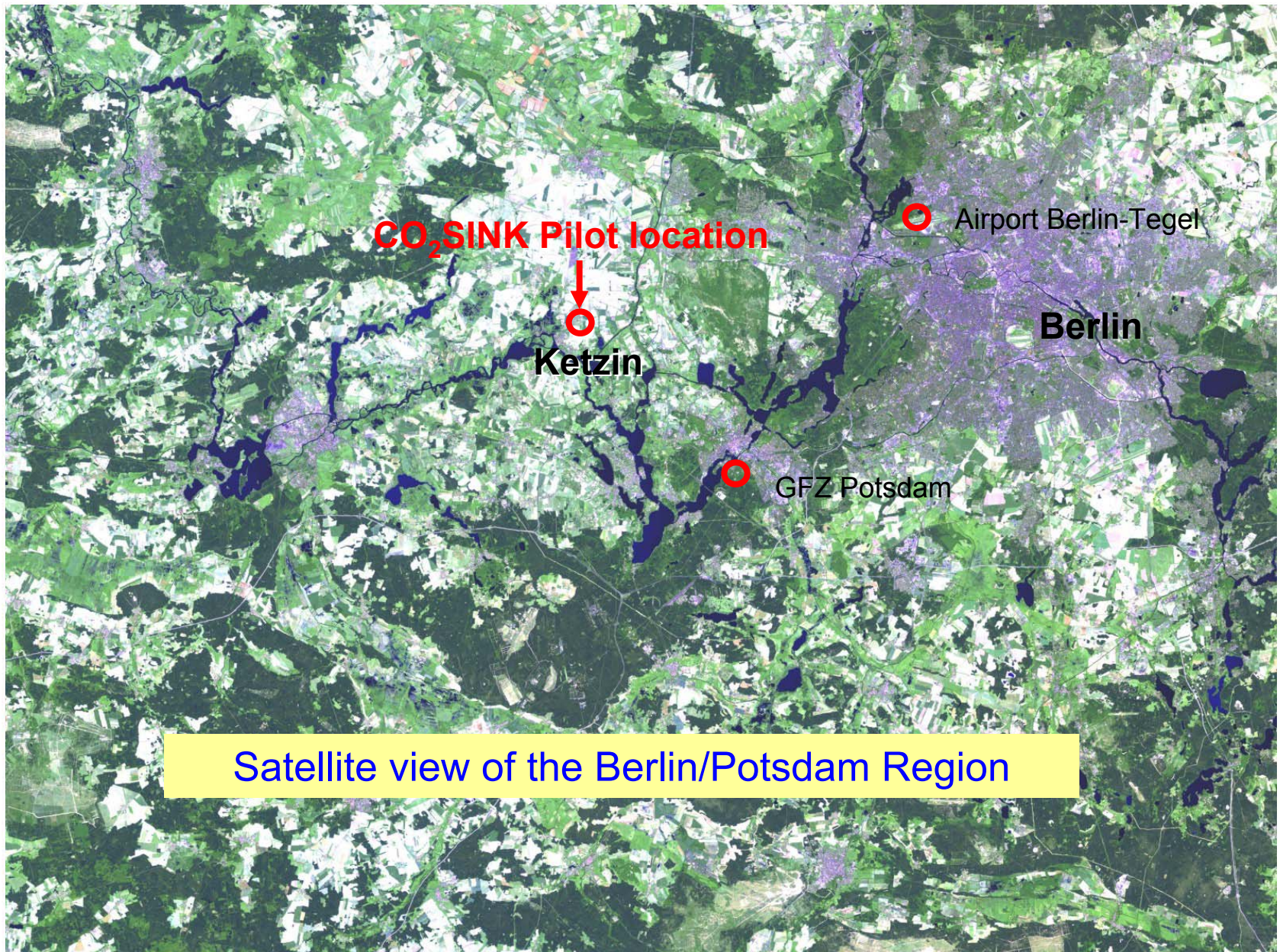
Project Co-ordinator



12°30' E

13°00' E

13°30' E



CO₂ SINK Pilot location

Airport Berlin-Tegel

Berlin

Ketzin

GFZ Potsdam

52°30' N

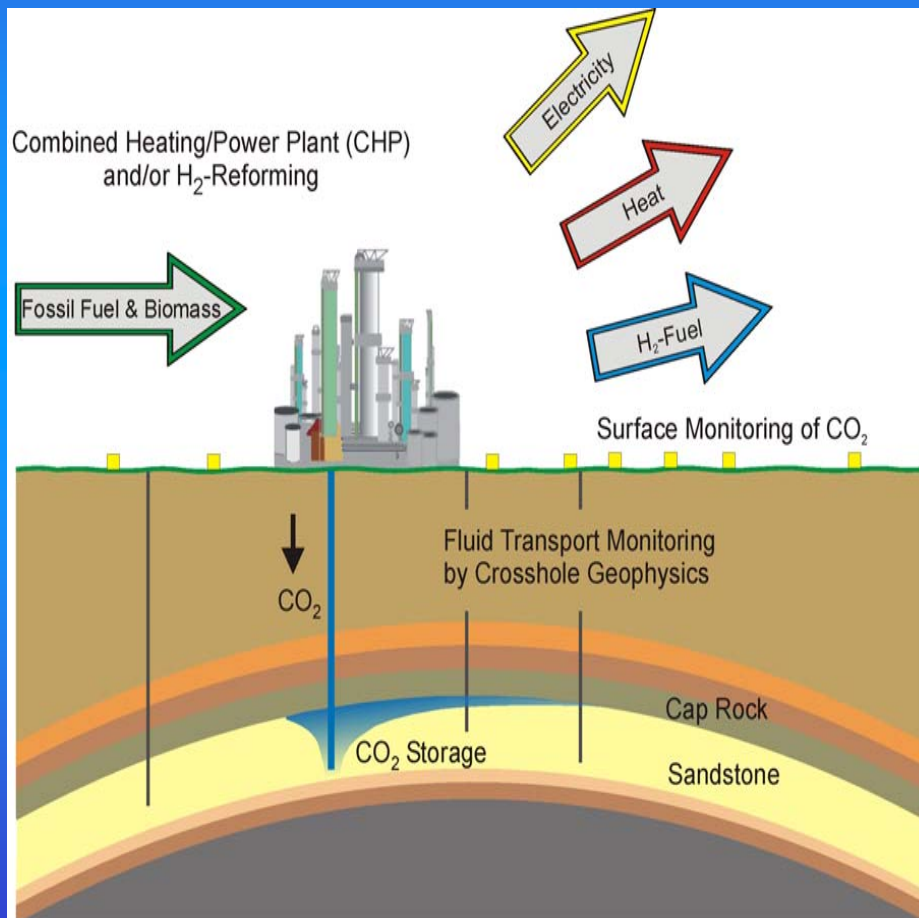
52°15' N

Satellite view of the Berlin/Potsdam Region

The Natural Gas Storage Facility at Ketzin

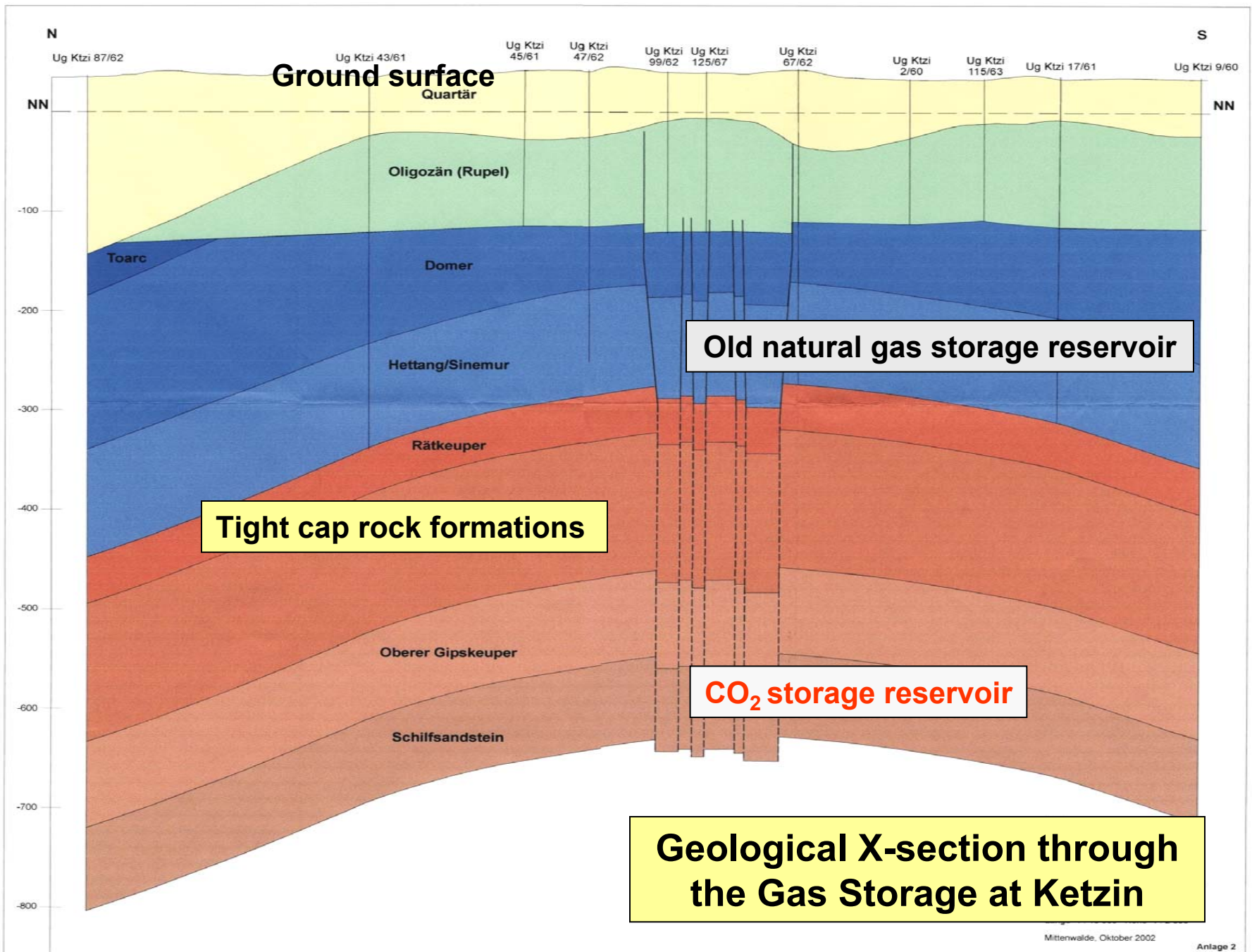


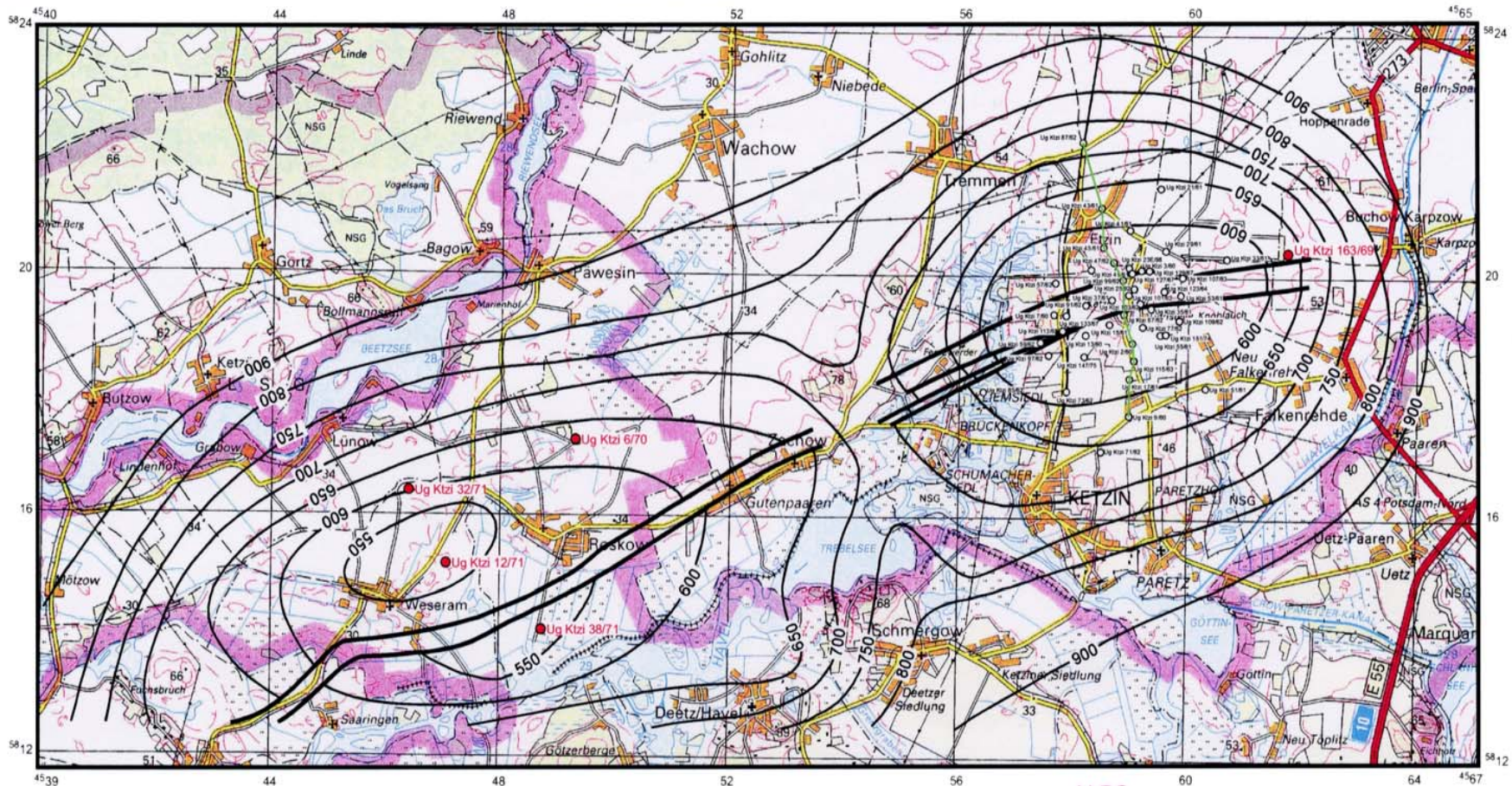
The general aim of the project is to develop cost effective CO₂ capture and sequestration technologies by establishing and operating a new fossil fuel and biomass fired combined heating and power plant in connection with an existing saline aquifer natural gas storage infrastructure close to Berlin. It will be worldwide the first demonstration project of its kind.



Goals

- capture of CO₂ during energy production (electricity, heat, and hydrogen) from natural gas, brown coal and biomass
- underground storage of CO₂ in deep saline aquifers
- complete chain of processes from CO₂ capture at the source, transportation to the site, storage by injection
- monitoring of CO₂ at depth and on the surface
- development and verification of safety concepts





Legende:

- Bohrungen mit Aufschluss des Schilfsandstein
Ug Ktzi 3871
- Betriebssonden des Untergrundspeichers Ketzin
Ug Ktzi 1271
- 900 — Isobathen
- Störungen
- Profilschnitt in Anlage 2

Depth map of the Schilf Sandstone in meters below sea level

UGS
 Untergrundspeicher- und Geotechnologie-Systeme GmbH

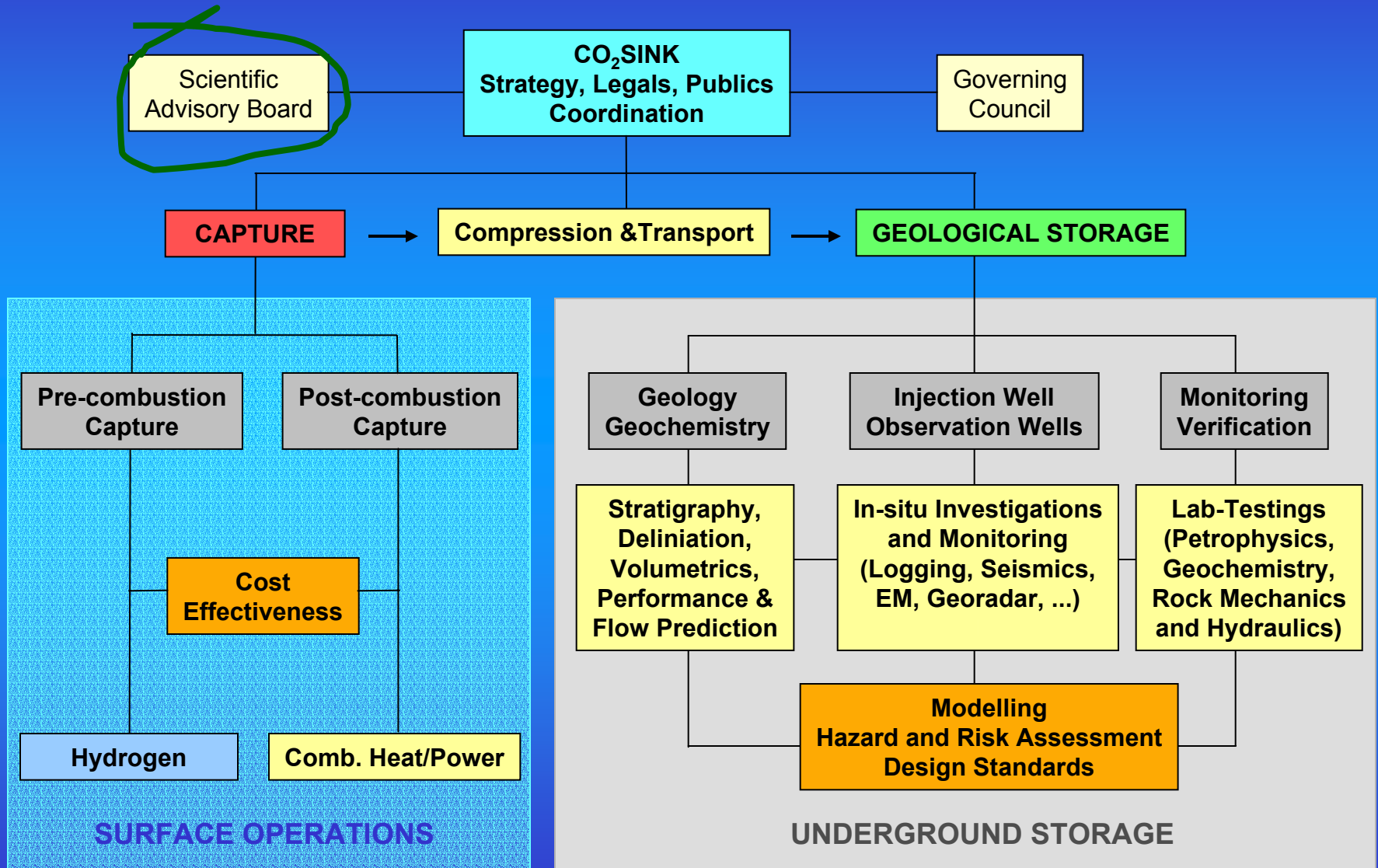
Erstbewertung CO₂-Speicherung im Schilfsandstein Ketzin

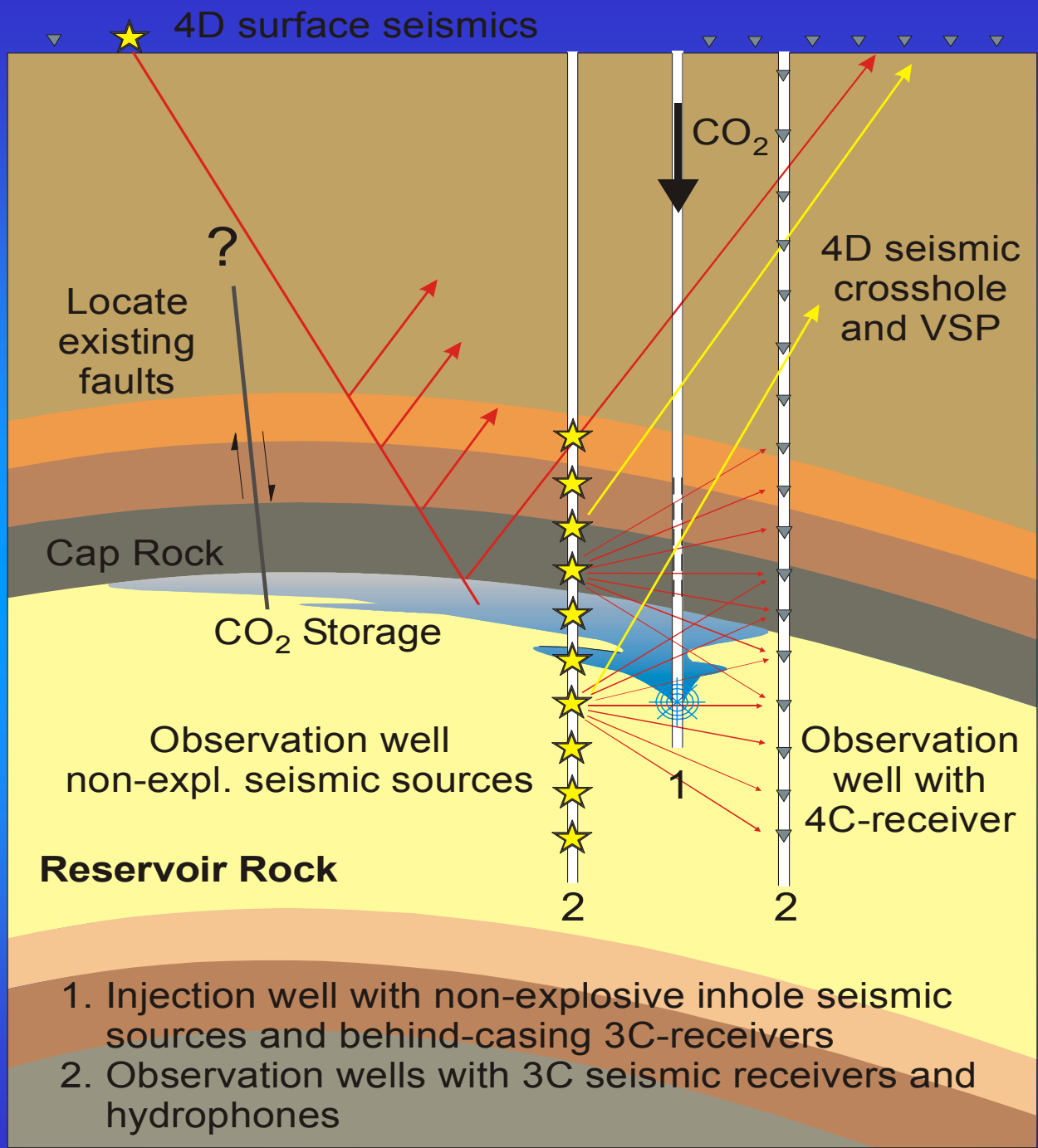
Isobathen des Schilfsandsteins in den Strukturen Roskow/Ketzin

Maßstab 1 : 100 000

Mittenwalde, Oktober 2002

CO₂SINK Project Structure





The CO₂ plume will be monitored using surface and down-hole geophysical methods



THE CO₂SINK PROJECT

Project Partners



GeoForschungsZentrum Potsdam (D)



G.E.O.S. Freiberg Ingenieurgesellschaft (D)

Geological Survey of Denmark and Greenland (DK)

Mineral and Energy Economy Research Institute (PL)



Det Norske Veritas (N)

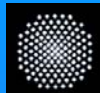


Statoil (N)

Shell International Exploration and Production (NL)



University of Stuttgart (D)



Vibrometric Finland (SF)

University of Kent (GB)



Uppsala University (S)



RWE Power AG (D)



International Energy Agency – Greenhouse Gas Programme (UK)



Vattenfall Europe Generation (D)





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Proposal for **JOINT CSLF ACTIVITIES**

Project Recognition & Information Sharing

- CO₂SINK offered as joint project at Rome Meeting, January 2004
- 3 Positions on Scientific Advisory Board for CSLF Members

Technology Development and Transfer

- A joint leakage experiment would be welcomed (e.g. Teapot Dome)
- Testing of new tools for monitoring welcomed at Ketzin

Technology Awareness & Development

- GESTCO GIS and Economy methodology to be made available for other CSLF countries
- The size and quality of Geological Storage Capacity is a key issue: There is a need for joint action regarding protocols for such work
(joint proposal for action by EU, Canadian and Australian stakeholders)