LBr-1 – a CO$_2$ storage pilot project with CO$_2$-EOR in the Czech Republic

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LBr-1 storage pilot project overview

Depleted hydrocarbon field in the Czech part of the Vienna Basin, produced mainly in the 1960s

Tertiary sandstones at ca. 1100 m depth

Project development:

• Phase 1 – REPP-CO2 project funded by Norway Grants (2015-2016) – site characterisation and screening, 3D model of storage complex, dynamic simulations, risk assessment, monitoring plan

• Phase 2 – ENOS project – small steps forward

• Phase 3 – next round of Norway Grants(?), Horizon 2020 (?)
LBr-1 location
LBr-1 geological position

Vienna Basin – an intramontanous basin in the transitional zone between two mountain ranges

General overview and distribution of oil and gas fields in the Circum Carpathian Region of Central Europe. (Golonka & Picha, 2006)
LBr-1 stratigraphic and tectonic positions

LBr-1 oil field

Top of Lab Horizon

Fault
Pinch-out boundary
Gas zone
Oil zone
LBr-1 archive cores
New visualisation and interpretation of well and well-log data
New sequence stratigraphy

Upward coarsening / fining
Relative sea level fluctuation
Stratigraphic architecture
3D static geological model
Structural contour maps - top of the 4 partial sand horizons of the Lab reservoir
Net-to-Gross maps of the 4 partial sand horizons of the Lab reservoir
3D model – permeability distribution in the 4 partial sand horizons of the Láb reservoir
LBr-1 position in relationship to neighbouring structures
Dynamic modelling

- Material balance study
- Preparation of simulation model – upscaling and adjustment of the 3D static reservoir model; stochastic approach used for distribution of reservoir properties
- History matching
- Numerical modelling of CO2 injection scenarios:
  - Pilot storage case (70,000 tons of CO2)
  - Full storage case (up to 950,000 t CO2)
  - EOR case (additional oil recovery 26,000 t, 63 kt CO2)
  - Combined case – CO2 storage pilot followed by CO2-EOR and storage
Pilot storage case

- 2020-2026, 70 000 tons: 17 600 sm³/day
- No injection issues expected, pressure increase is small and local
Comparison of scenarios – volumes of stored CO2
CO2 balance – combined case
LBr-1 related work in ENOS project

- detailed risk analysis of faults and legacy boreholes
- simulations of possible leakage (threatening potable groundwater)
- scenarios combining storage with EOR
- trans-boundary issues (CZ-SK)
- EOR potential of the Vienna Basin (CZ-SK-AT)
Fault analysis – Allan diagrams
Assessment of well abandonment quality
Trans-boundary issues

- LBr – 1: Pilot project of CO₂ geological storage in Czech Republic
- Oil and gas zone
- Brodsky fault system
- Generalized pinchout of Lab Horizon
- Brodske – high block
- Farsky fault system

ENOS
Vienna Basin HC fields – possible regional CO2-EOR case
Lessons learned so far

LBr-1 is a promising structure for a CO2 storage pilot, providing an opportunity for CO2-EOR at the same time, with regional upscaling potential.

“Digging“ for information from old archive data is time consuming and requires specific „local“ knowledge but results can be excellent.

Supplementary site investigation is necessary, especially to get fresh cores for geomechanical and geochemical experiments and allow in-situ borehole tests (stress field, permeability).

Local conditions need to be taken into account for choice of monitoring methods (high seismic noise level, periodical flooding, etc.)

CO2 source is an issue - a promising nearby CO2 source revealed (95.5 % purity) – 240 th. t/yr released into the atmosphere.

Further steps towards project deployment will need stronger support by national government and industry.
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