

REPP-CO₂

Further developments at LBr-1

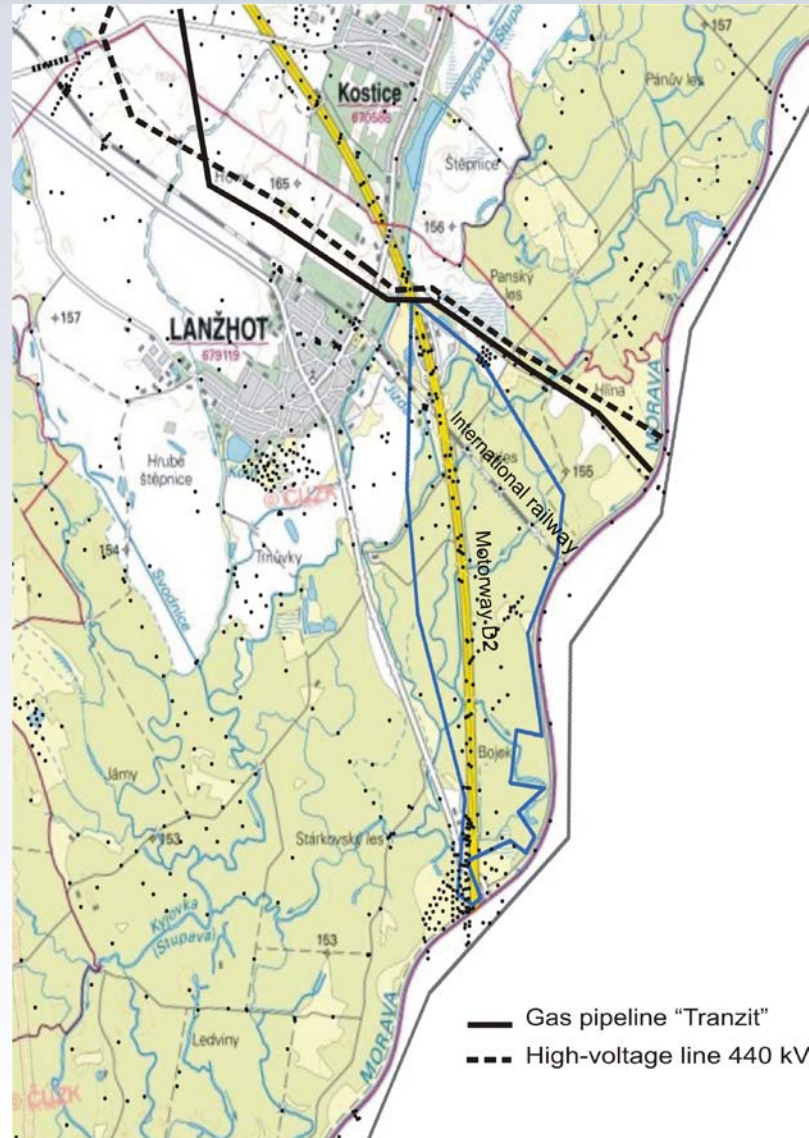
Conflict of interests

According the Geological Act, all potential conflicts of interests must be identified and solved in the project of geological works.

- Nature conservation and environmental protection
- Water protection
- Protection of mineral resources
- Protection of pipelines, roads and railways („linear construction works“)

The main conflict in the potential storage site represents the motorway D2 (TEN-T) and the protected area of natural water accumulation (CHOPAV) „Quaternary of the river Morava“

Conflict of interests



CO₂ sources

Linde Gas – 268 EUR / ton (transport and VAT incl.),
CO₂ purity 99.9 %

Messer Poland – 150 EUR / ton (transport and VAT
incl.), CO₂ purity 99.9 %

Duslo Šaľa (Slovakia) – price unknown, the company
has no license yet, CO₂ purity 95.5 % and better,
capacity 50 tons / hour.

Transport

- Transport by pipeline is not suitable for pilot project (less than 100 kt)
- Transport by tank truck is limited – 24 tons per tank
- The distance from „source“ to LBr-1 is 370 km (Linde), 300 km (Messer Poland) and 120 km (Duslo, Slovakia)
- The CO₂ emission from transport represents 3 % of the stored CO₂...

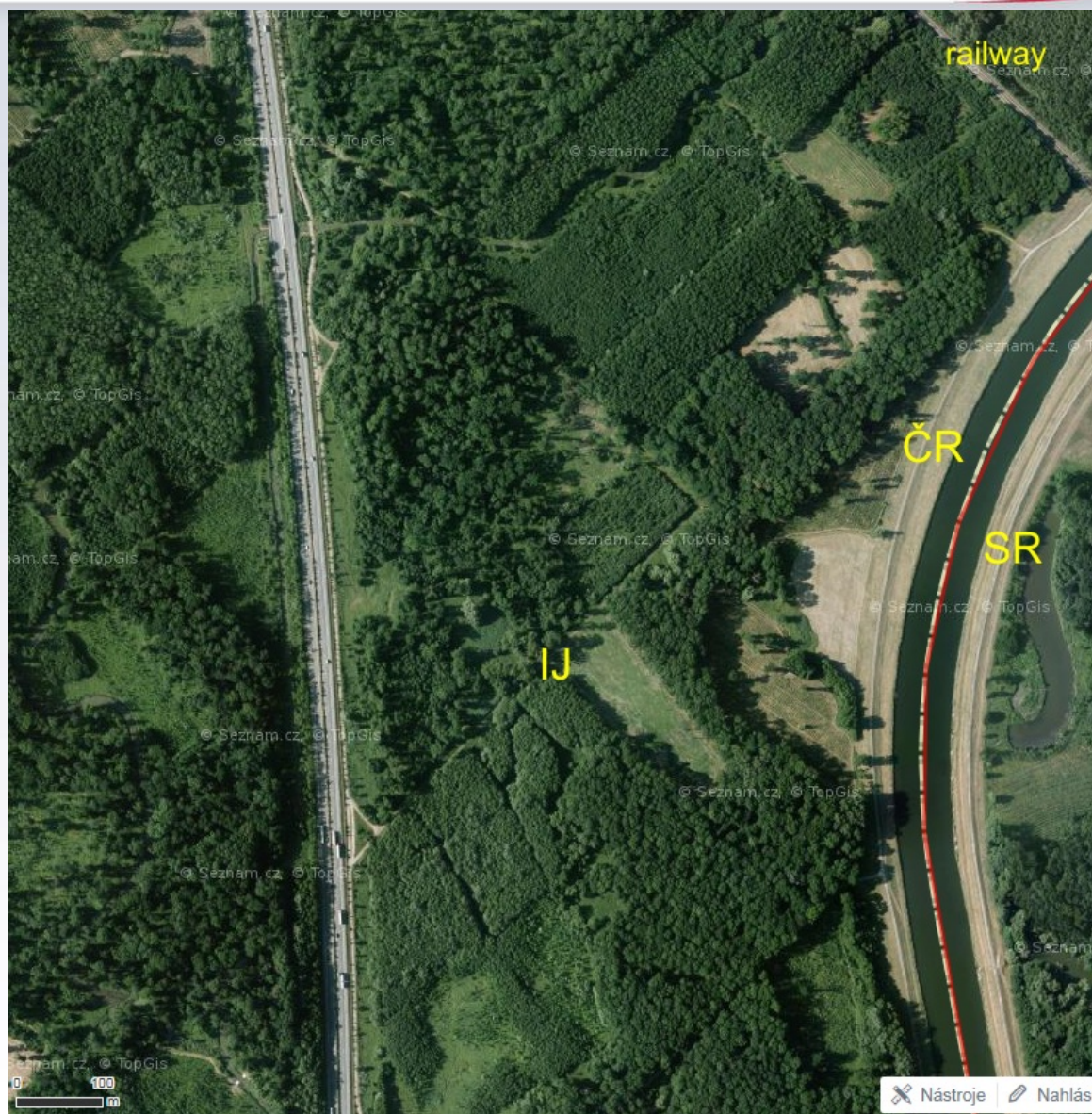
Injection

According to the modelling results (A3), the total amount of 70 kt might be stored in the LBr-1 pilot storage project during 6 years. The daily rate would be 32 tons of CO₂, the stationary storage tank would be installed (tank truck = 24 tons).

Only one injection well is planned, located near by the well Br-89. This position is suitable also from point of view of the conflict of interests.

The position of monitoring wells is planned in the north-western direction, 300 and 1000 m from injection, out of the motorway protected zone.

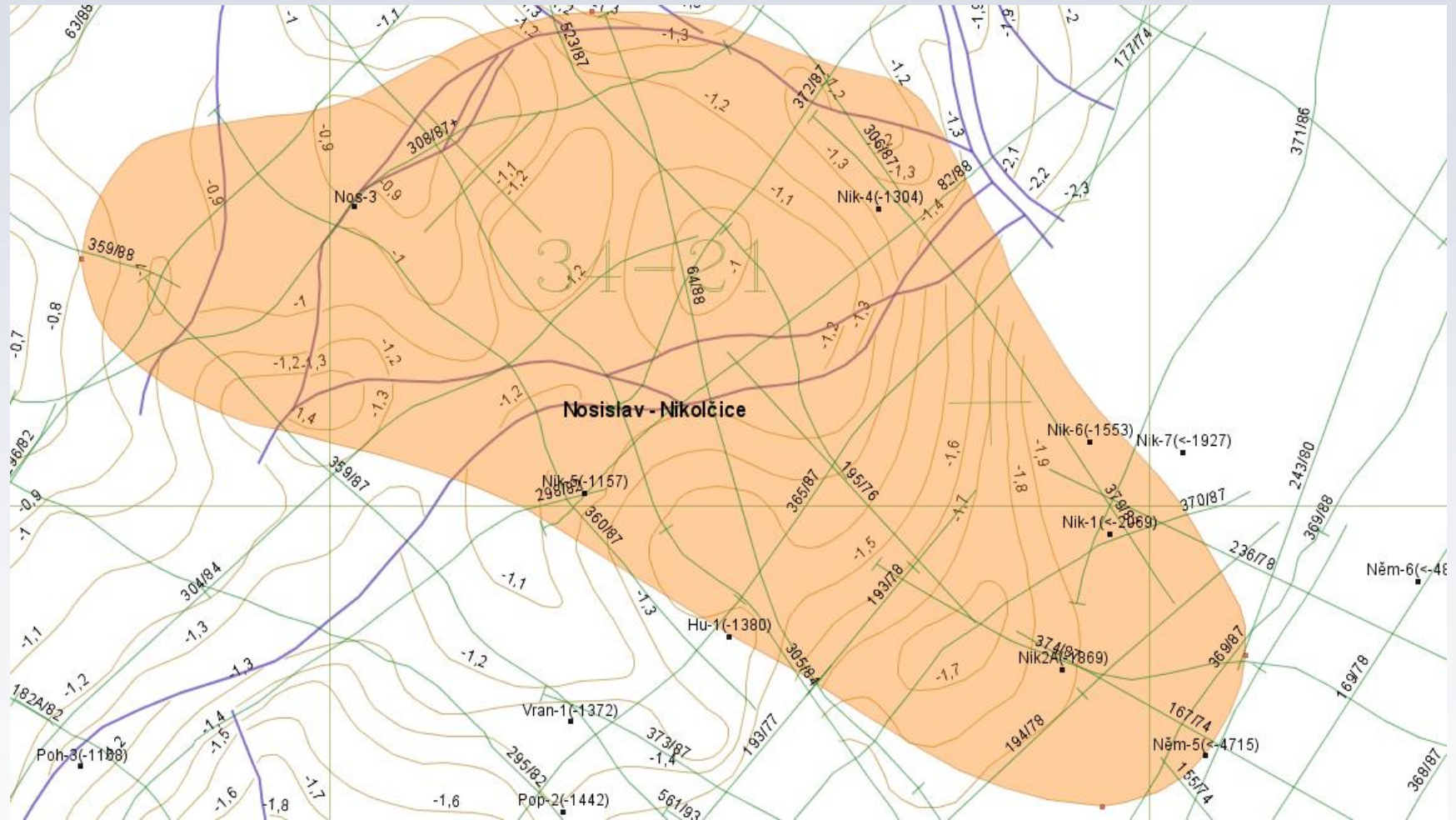
Injection



Research in the Western Carpathians – Carpathian Foredeep and Carpathian Flysch Zone

In total, 23 structures were identified as potential storage sites, based on results of previous hydrocarbon exploration (seismic, wells, petrography, ...)

	pore volume	density	theor cap	theor cap	effec coefic	effec capacity
	km3	t/km3	t	Mt		Mt
Kobeřice	0,113	630000000	71190000	71,19	0,1	7,1
Nosislav-Nikolčice	0,368	630000000	231840000	231,84	0,1	23,2
Vlasatice	0,09	630000000	56700000	56,7	0,1	5,7
Mušov	0,179	630000000	112770000	112,77	0,1	11,3
Iváň	0,745	630000000	469350000	469,35	0,1	46,9
Drnholec	0,16	630000000	100800000	100,8	0,1	10,1
Mikulov	0,105	630000000	66150000	66,15	0,1	6,6
Kobylí	2,783	630000000	1,753E+09	1753,29	0,1	175,3
Zdounky-Bařice	0,292	630000000	183960000	183,96	0,1	18,4
Vlkoš-Lobodice	0,54	630000000	340200000	340,2	0,1	34,0
Rusava	0,262	630000000	165060000	165,06	0,1	16,5
Kozlovice-Lhotka	0,194	630000000	122220000	122,22	0,1	12,2
Frýdland-Malenovice	0,249	630000000	156870000	156,87	0,1	15,7
Vyšší Lhoty-Morávka-Oldřichovice	0,139	630000000	87570000	87,57	0,1	8,8
Koryčany	0,042	630000000	26460000	26,46	0,1	2,6
Osvětimany-Stupava	0,135	630000000	85050000	85,05	0,1	8,5
Starý a Nový Jičín	0,298	600000000	178800000	178,8	0,1	17,9
Fryčovice	0,119	500000000	59500000	59,5	0,1	6,0
Děť výmol východ	0,735	630000000	463050000	463,05	0,1	46,3
Děť výmol střed	0,049	630000000	30870000	30,87	0,1	3,1
Děť výmol západ	0,106	630000000	66780000	66,78	0,1	6,7
Blud výmol východ	1,387	630000000	873810000	873,81	0,1	87,4
Blud výmol západ	1,576	630000000	992880000	992,88	0,1	99,3
					TOTAL	669,5



- $M_{CO_2} = \rho_{CO_2} * R_f (1 - F_{IG}) * OGIP * ((P_s * Z_r * T_r) / (P_r * Z_s * T_s)) \cong \text{produced gas volume} * Bg \text{ factor} * \rho_{CO_2}$

for gas

- $M_{CO_2} = \rho_{CO_2} * (R_f \times OOIP / B_f - V_{iw} + V_{pw})$
 $\cong \text{produced oil volume} * \rho_{CO_2}$

for oil

Recovery factor, fraction of injected gas, pressure, temperature, gas compressibility factor, formation volume factor, injected and produced water.

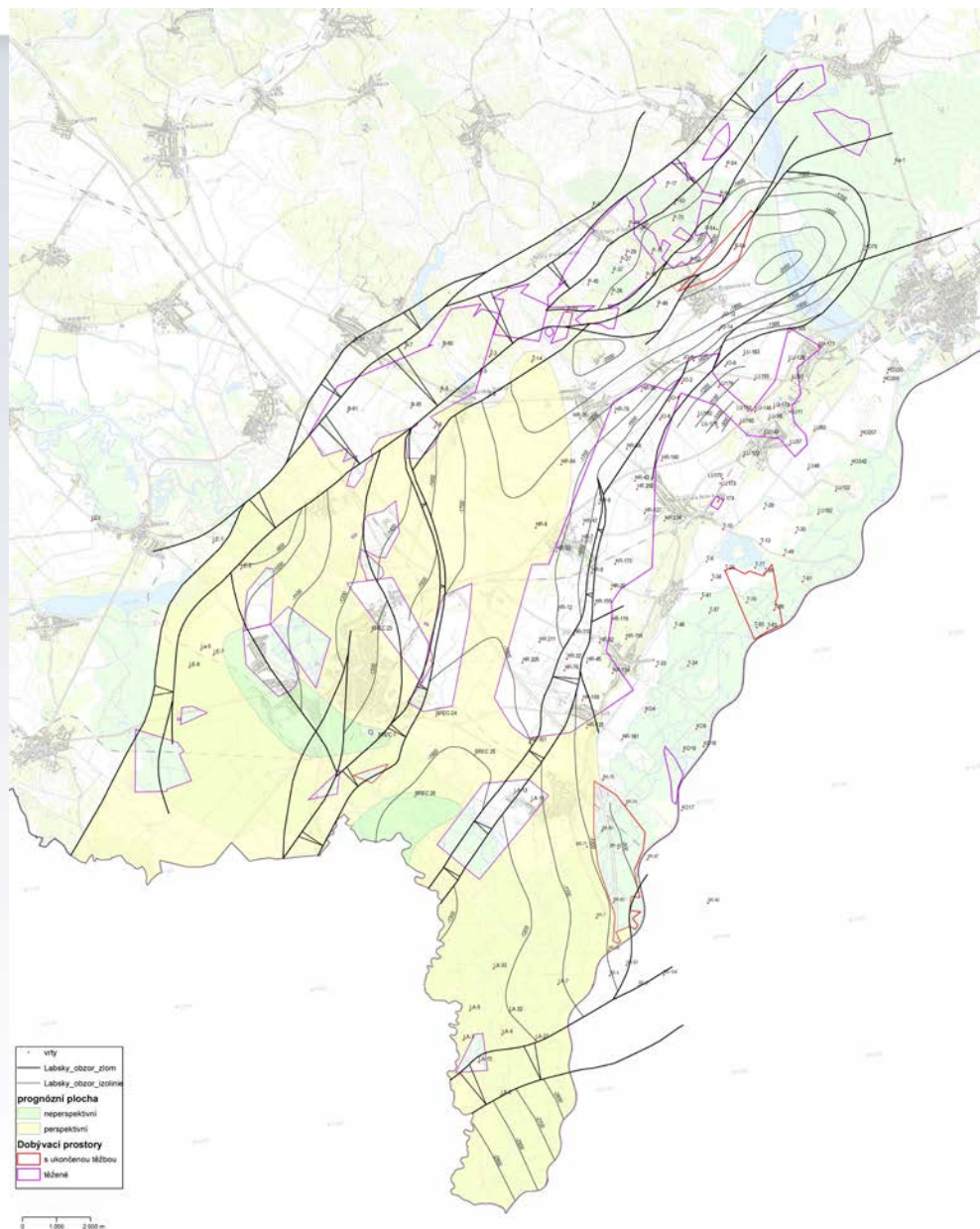
(Bachu et al. 2008, CSLF)

Fundamental assumption:

- The volume previously occupied by the produced hydrocarbons becomes, by and large, available for CO₂ storage.
- ... but not for reservoir in hydrodynamic contact with an underlying aquifer

Estimation for LBr-1

- Production history: 72.4 th. m³ oil, 75.4 mill. m³ gas
- CO₂ density: 630 kg m⁻³
- Bg factor (compress.) = 0.0078169
- **Estimated capacity = 417 kt CO₂**



- Future steps planned within the 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)
- Progress towards CO₂ injection depends on industrial & governmental co-funding; recovery of oil prices needed
- Possible additional funding opportunities:
 - next round of Norway Grants
 - European funds

www.geology.cz/repp-co2