

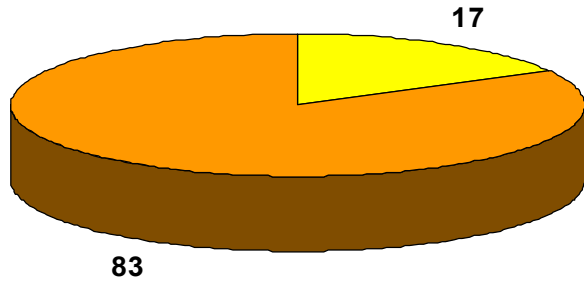
2nd IEA/CSLF Workshop for the G8 on Early Opportunities for CCS Oslo, 21-22 June 2007

**SESSION II:
Assessment of Regional CCS Policies and Industry Experiences
1. Regional CCS Discussion - Europe**

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Polish shares in Europe's hard coal reserves [%]

UE - without PL
PL - only Poland



Polish Fossil Fuel Reserves

Hard coal

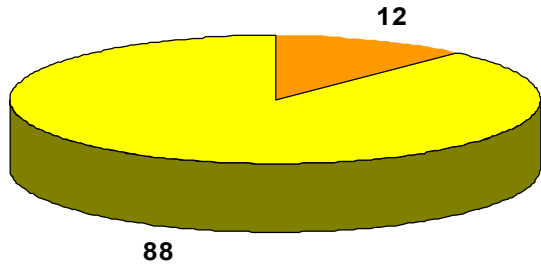
Poland Reserves/area

$$14 \text{ bln} / 312\,000 \text{ sq km} = \underline{4.5}$$

• UE - without Poland Reserves/area

$$3 \text{ bln} / 4\,013\,000 \text{ sq km} = \underline{0.075}$$

Polish shares in Europe's lignite reserves [%]



Polish Fossil Fuel Reserves

Lignite

- Poland

Reserves/area

$$1.9 \text{ bln} / 312\,000 \text{ sq km} = \underline{6.0}$$

- UE - without Poland

Reserves/area

$$20 \text{ bln} / 4\,013\,000 \text{ sq km} = \underline{5.0}$$

Polish priorities and opportunities for CCS and CCT

- Polish primary energy production in 95 % is based on coal – no remarkable change in the next decades is possible,
- ca. 3.2%/ yr growth in power demand till 2020,
- 1/3 of national energy sector should be upgraded or rebuilt in the next 10-15 years,
- 3 EU CCS demo projects and possible more country- based experimental and demo projects in:
 - Central Poland (Bełchatów lignite fueled PP with CCS in an aquifer structure)
 - S Poland - CCS in oil or gas fields
 - S Poland - ECBM
- Existence of enabling legal and regulatory framework for storage in geological structures – now limited to solid, liquid phases and/or geological origin gases.



POLISH EXPERIENCE in CCS

Since 1995 - Polish Oil & Gas Co. (PGNiG S.A.) - CO₂ and H₂S storage in gas field - small scale industrial project in Borzęcín (SW Poland)



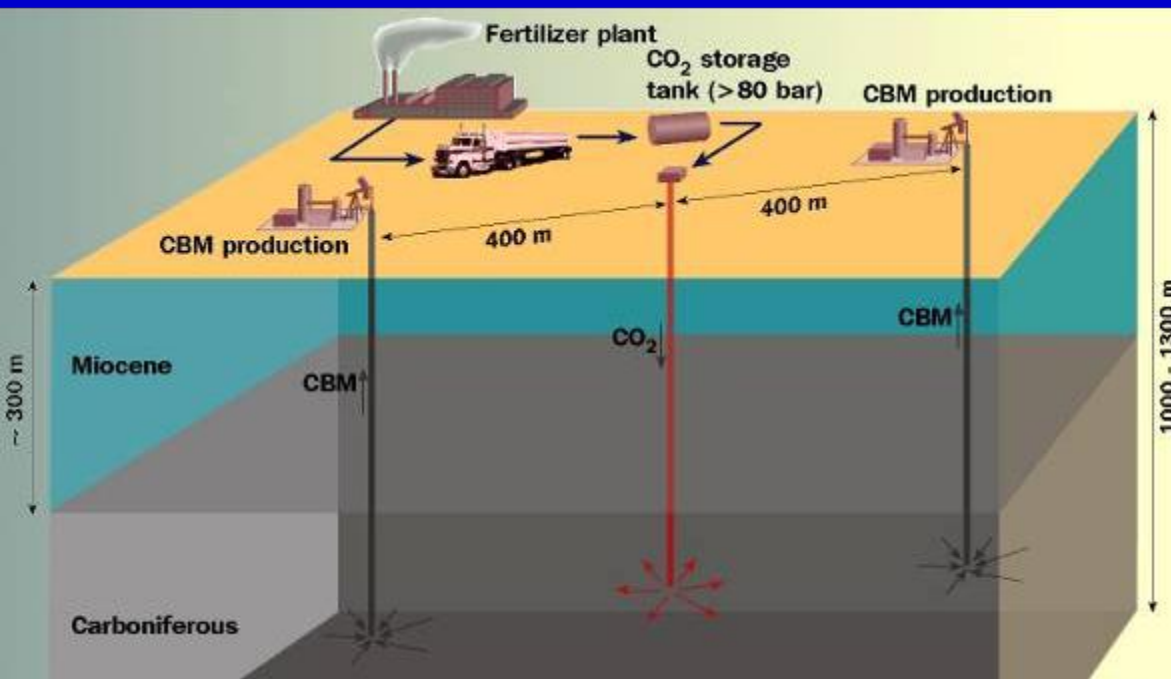
Polish experience with CCS - EOR

Since 1995 - Polish Oil & Gas Co. (PGNiG S.A.) - CO₂, H₂S and CH₄ storage extensive 12-year experience in oil & gas fields, small scale industrial project in Kamień Pomorski in NW Poland (CCS+EOR – Enhanced Oil Recovery with underground removal of acid gases and methane).

POLISH EXPERIENCE CCS (ECBM) RECOPOL PROJECT – 2001



- Optimistic results of monitoring - no leakage chemical and isotopic control of the produced gas (CO_2 and CH_4) + seismic monitoring,
- New project started in 2006 – MOVECBM



Challenges and opportunities: First estimate of Poland's CO₂ storage potential

– by A. Wójcicki (PBG) - CASTOR WP1.2 report 2005

<i>Type</i>	<i>Storage capacity [Mt]</i>	<i>Storage capacity [years]</i>
Regional aquifers (12 objects selected)	3 752	11.4
<i>Other regional aquifers (Cr1, J1, T1)</i>	<i>90 000</i>	<i>273</i>
Hydrocarbon fields (28 structures)	572	1.7
Coal seams (23 fields)	470	1.4
<i>Other coal seams (1-1.5 km – GeoCapacity)</i>	<i>2 306</i>	<i>7</i>
TOTAL	4 794 97 100	14.5 294

Gaps, pitfalls & uncertainties

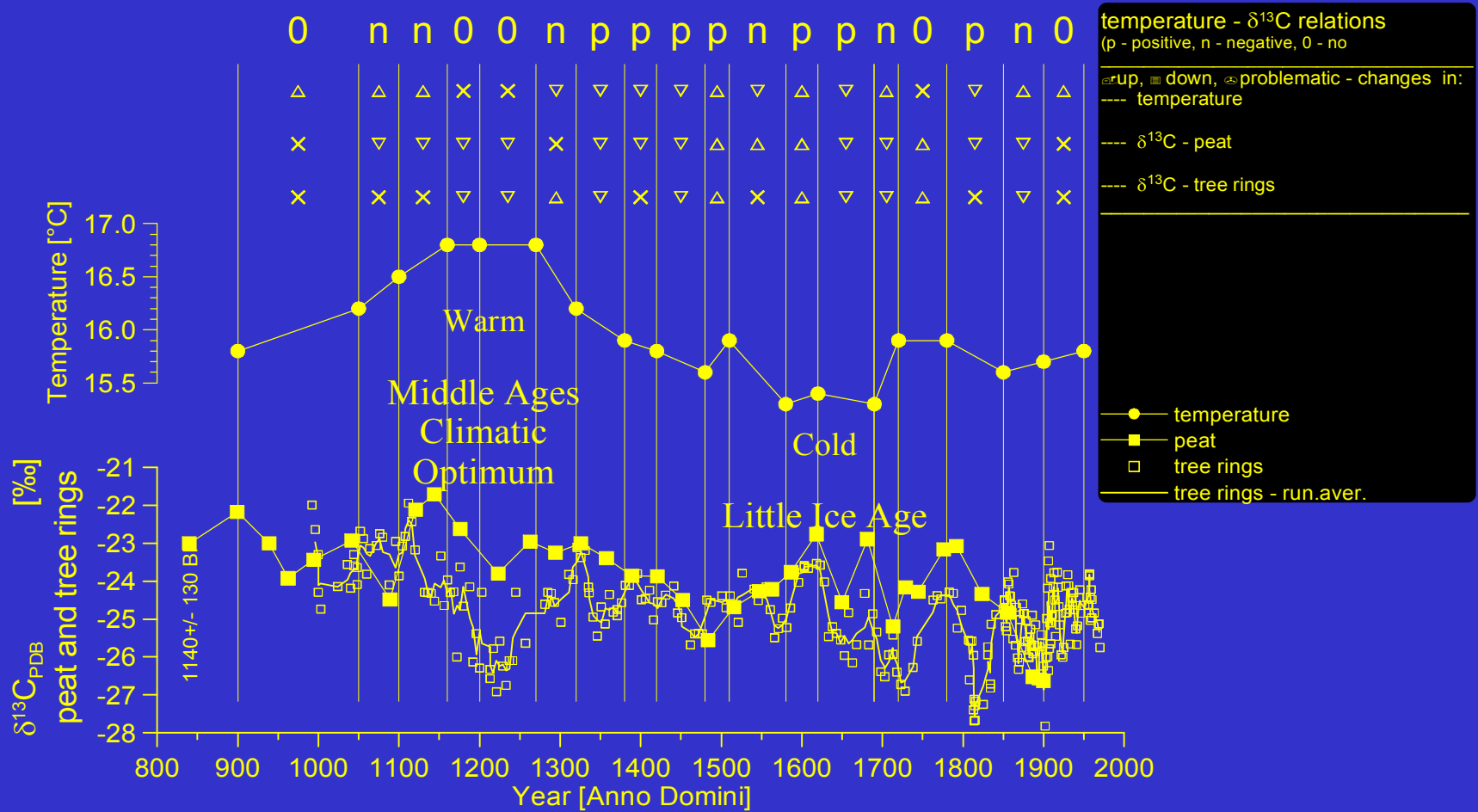
CCS Opportunities & Barriers

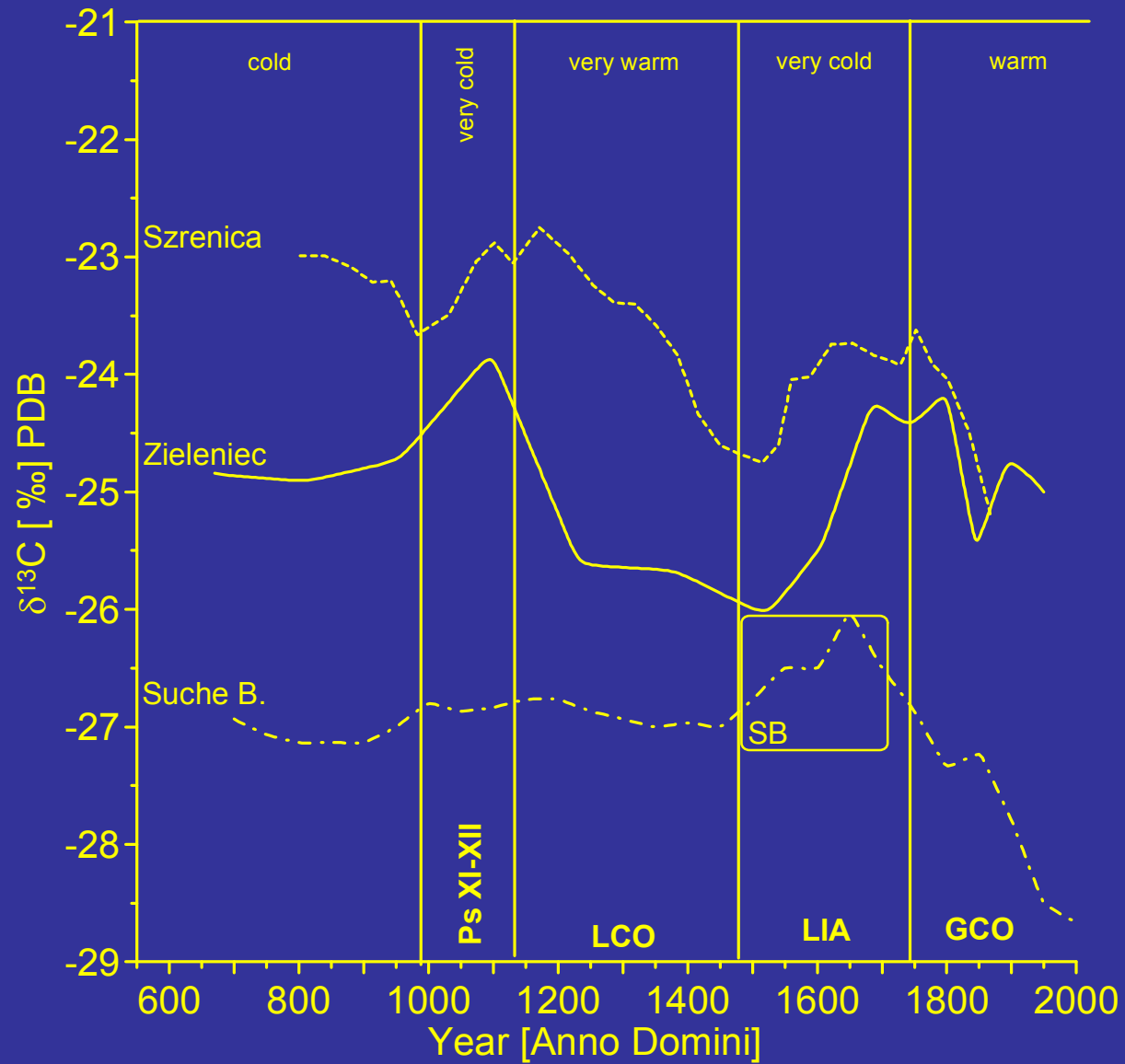
- ❖ 12 years experience with permanence and leakage monitoring - is it long enough ?
CCS long-term sustainability?
- ❖ Environmental, **social and economic costs, benefits and risk analysis of long term use of CCS**, public acceptance – missing
- ❖ **Lack of CCS EU and national legal framework, incl. supporting mechanisms**
- ❖ Co-financing of demo projects with a portion of the EU structural funds
(EU structural funds, industry, science/research infrastructure resources, others?)
- ❖ **Higher efficiency of energy production units needed**
- ❖ **Economic conditions for CCS (future emission trading mechanism, EU infrastructure for CO₂ transporting**
- ❖ High risk for EU economy **competitiveness induced by higher energy prices and unknown CO₂ prices**
- ❖ EU/EC criteria for demonstrable projects selection

Conclusions

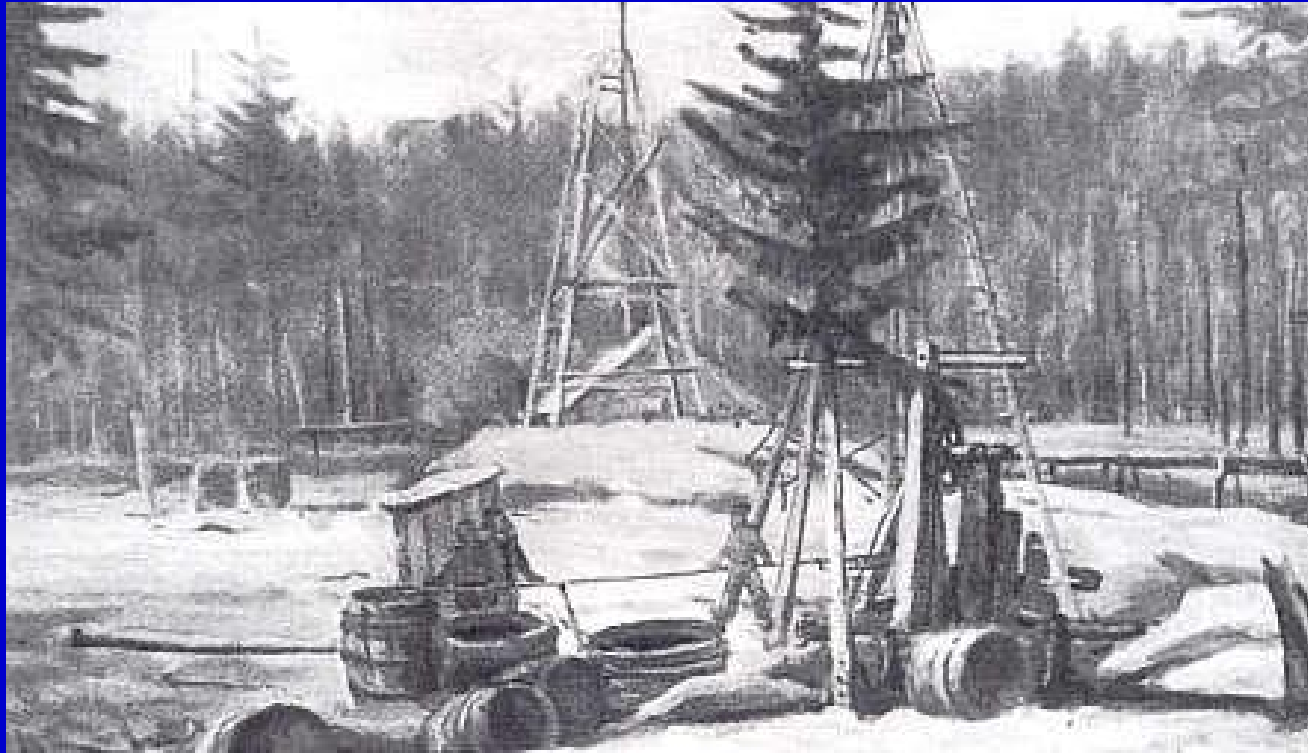
- **Clean Coal Technology including CCS requirements: 1) areas with exceptionally big resources of coal, 2) high CCS geological capacity, 3) experience and technology,**
- **Poland has legal regulations (now limited to solid, liquid phases and/or geological origin gases), experience, technologies, geological storage capacity to meet domestic needs and some potential for the implementation of CCS in energy sector, as well as ECBM and EOR**

Thank you





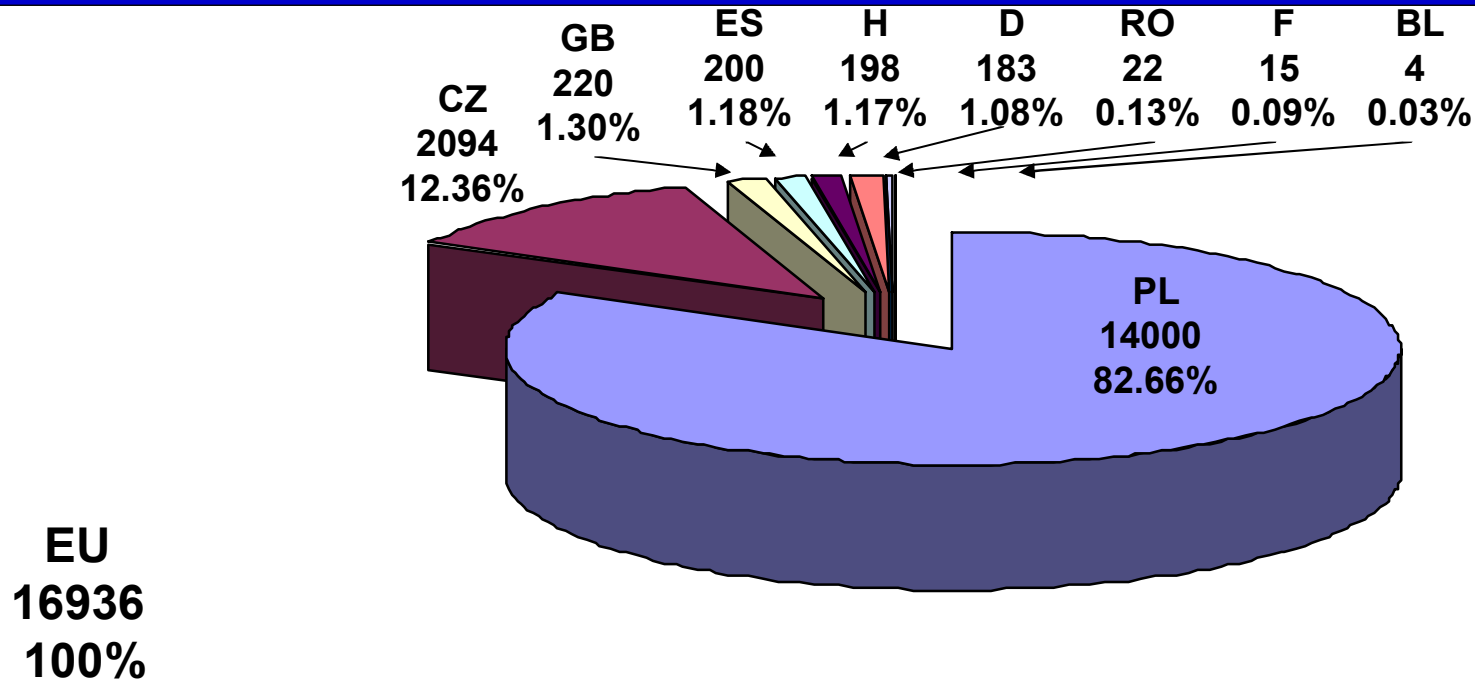
1854 - I. Łukasiewicz's development and first production from *Bóbrka* (SW Poland) - the first oil field in the world.



First oil distillation accomplished by Ignacy Łukasiewicz and his invention of a kerosene lamp in 1853



HARD COAL RESERVES in the EU (mln t.) – 2005 by Polish Geological Institute & BP Statistical Review of World Energy 2006





Resources of hard coal

Poland

- Reserves

c.a. 14.0 billion tonnes

EU-without PL

- Reserves

c.a.3.0 billion tonnes

Poland

Total resources

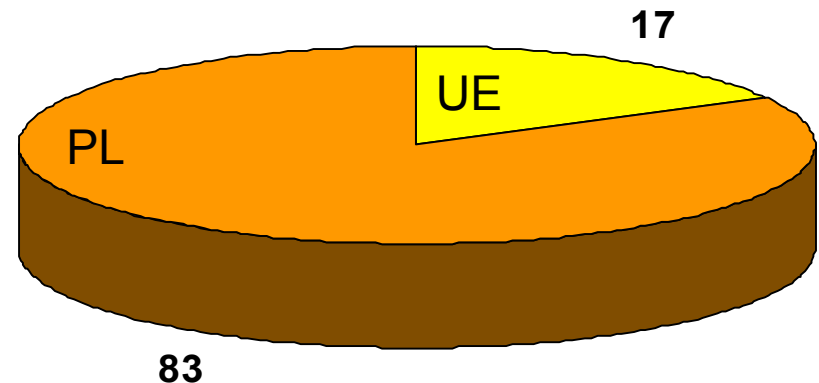
43.3 billion tonnes

EU-without

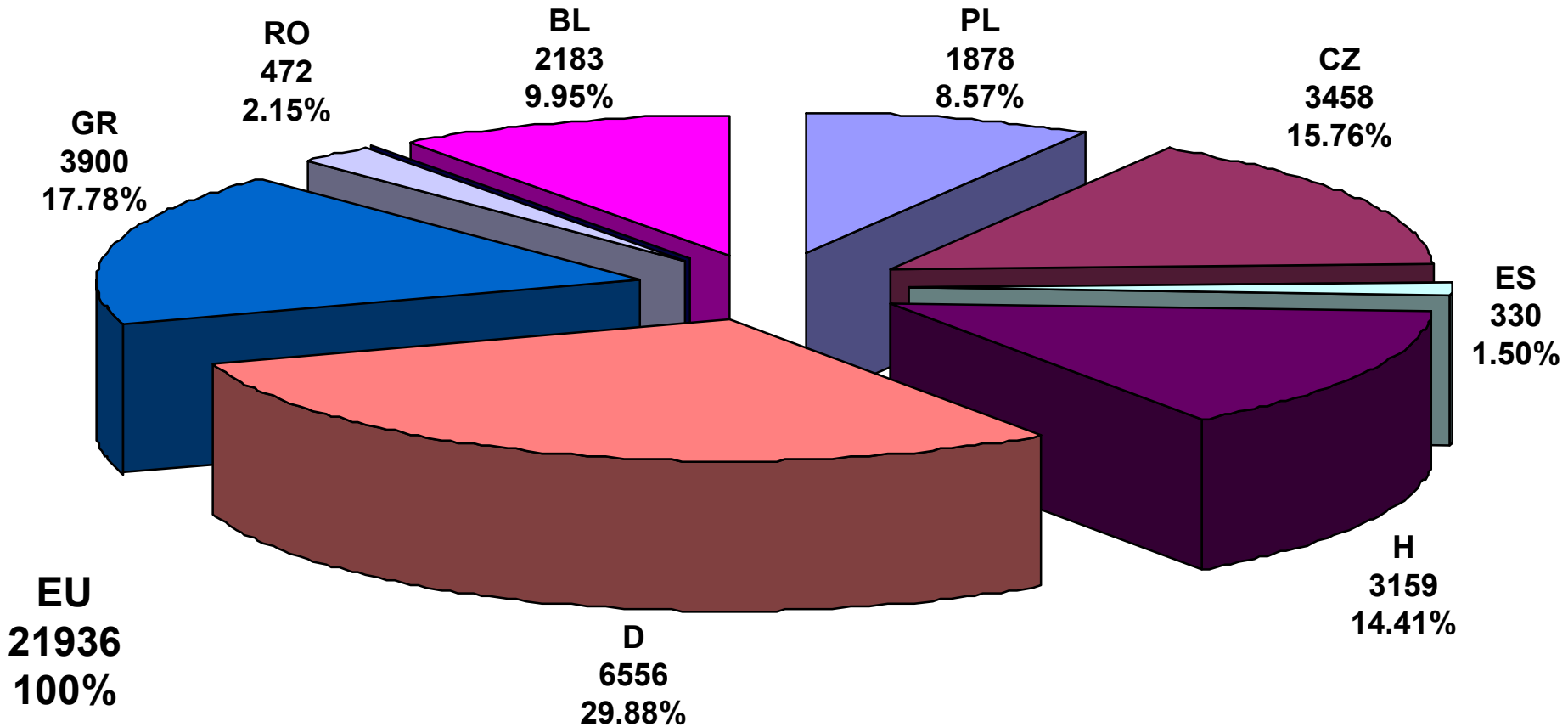
Total resources are not comparable due to incomparable criteria

Polish shares in Europe's hard coal reserves [%]

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LIGNITE RESERVES in the EU (mln t.) – 2005 by Polish Geological Institute & BP Statistical Review of World Energy 2006





Resources of lignite

Poland

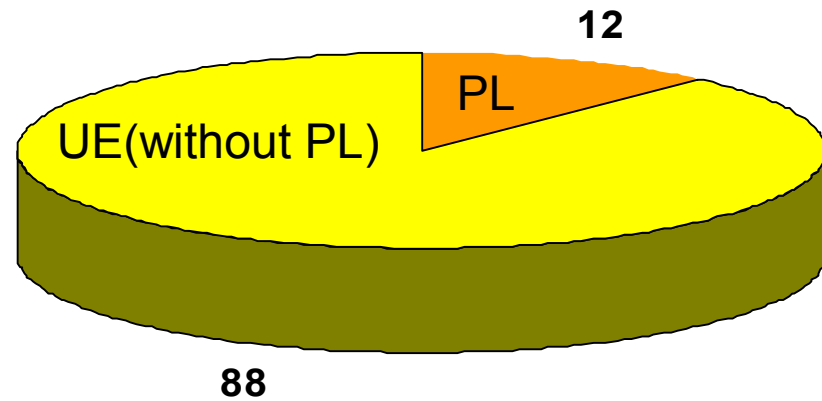
1.5 billion tonnes

•Reserves (well documented)

• Total resources
14 billion tonnes

(very roughly >60%
reserves of UE)

Polish shares in Europe's lignite
reserves [%]



Polish experiences with CO₂ storage (ECBM)

2001- Central Mining Institute (GIG, Katowice) – with the international consortium (partly EU financed **RECOPOL in Kaniów** (Silesian Coal Basin) investigate the technical and economical feasibility, safety and permanence of CCS in coal seams with enhanced coal-bed methane (ECBM) production – research and demonstration project (**ca. 600 t CO₂ total storage**)

- Nov. 2006 – MOVECBM project (Monitoring and Verification of CO₂ storage with Enhanced Coal bed Methane, ECBM), a new EC 2-year research project under VI. Framework Programme, implemented also by GIG with 17 research partners, incl. NL (TNO, Shell) and GER (RWTH) → to improve the current understanding of CO₂ injected in coal and migration of methane