

# NEW LOOK AT LIGNITE

Wojtek Ksiązkiewicz



Slawomir Mazurek



## LIGNITE OUTPUT, RESOURCES and RESERVES in EUROPE 2007

COUNTRY	Annual output mln t	Resources mln t	Reserves mln t
Germany	180,4	> 70 000	> 40 000
Russian Federation	72,3	> 200 000	>100 000
Turkey	70,0	> 3 000	> 500
Greece	64,4	> 6 000	> 3 000
Poland	57,5	> 30 000	> 2 000
Czech Republic	49,6	~ 5 000	> 500
Serbia and Montenegro	35,6	n.a.	> 15 000
Romania	35,5	> 3 000	> 1 000
Bulgaria	28,9	> 3 500	~ 2 000
Estonia	16,9	n.a	n.a
Hungary	9,8	~ 9 000	> 3 000
Bosnia-Herzegovina	9,5	~ 2 500	~ 1 500
Spain	9,3	n.a	n.a
Macedonia	5,0	n.a.	n.a.
Slovenia	4,6	~ 600	~ 100
Slovakia	2,1	~ 1 000	~ 70
Ukraine	0,3	n.a.	> 1 000

RESOURCES  
geological documentation  
or  
prefeasibility study

RESERVES  
feasibility study  
or  
mining report



TOTAL : 651,7 mln t

Sources : EURACOAL, WORLD ENERGY COUNCIL

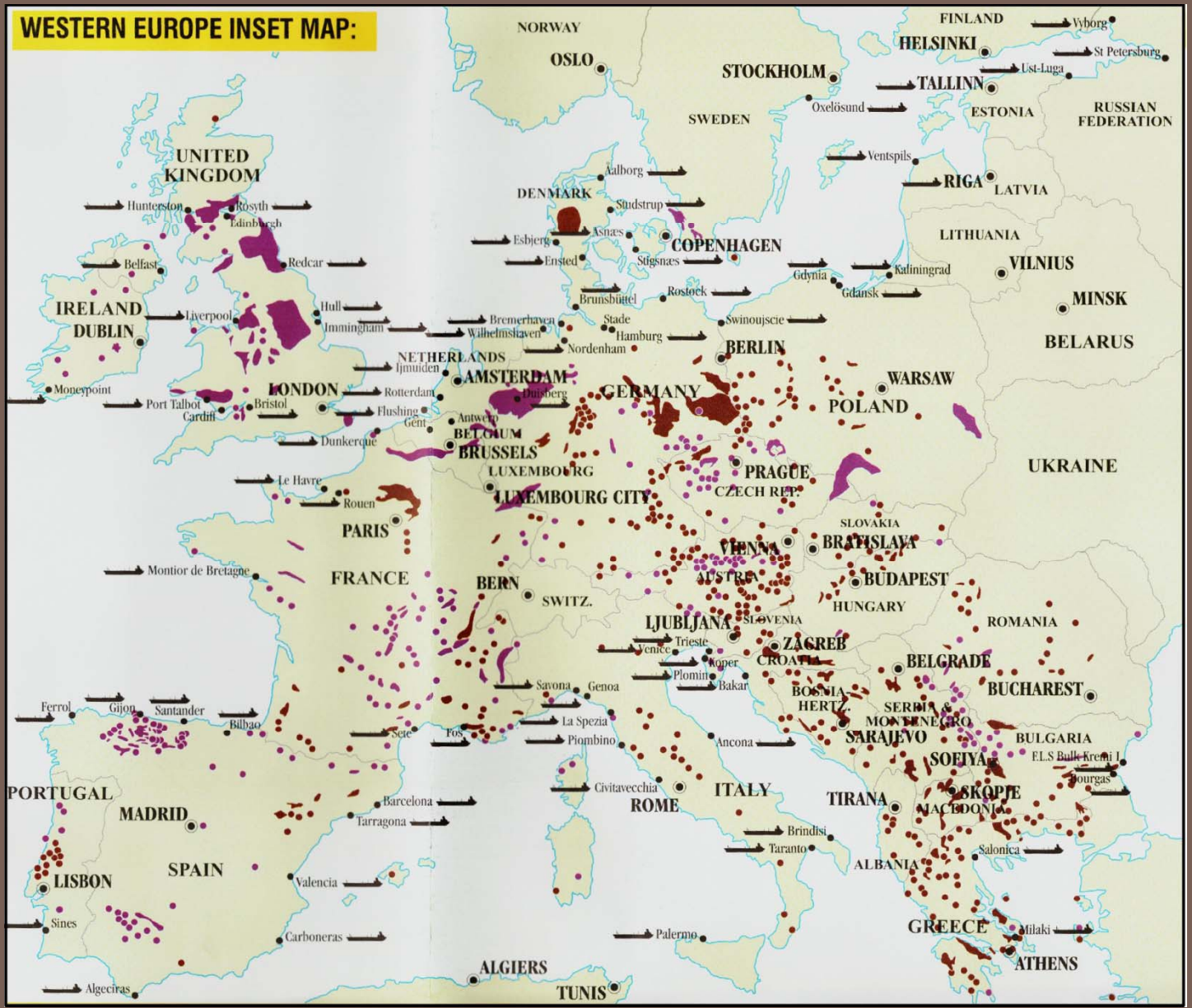
## Usage of LIGNITE in Europe Q1 / 2010

( LIGNITE output / LIGNITE consumption in power plants )

Country	Output mln t	Consumption in power plants mln t	%
Bulgaria	7,77	7,39	95,11
Czech Republic	11,52	9,56	82,99
Germany	44,34	40,28	90,84
Greece	12,92	13,77 *	106,58 *
Hungary	2,36	2,25	95,34
Poland	14,89	14,73	98,92
Romania	6,50	6,50	100,00
Slovakia	0,63	0,63	100,00
Slovenia	1,31	1,17	89,31
<b>EU – 27</b>	<b>102,24</b>	<b>96,28</b>	<b>94,17</b>
Serbia	10,54	9,56	90,70



# COAL and LIGNITE deposits in Europe



COAL

LIGNITE



Source : COALTRANS

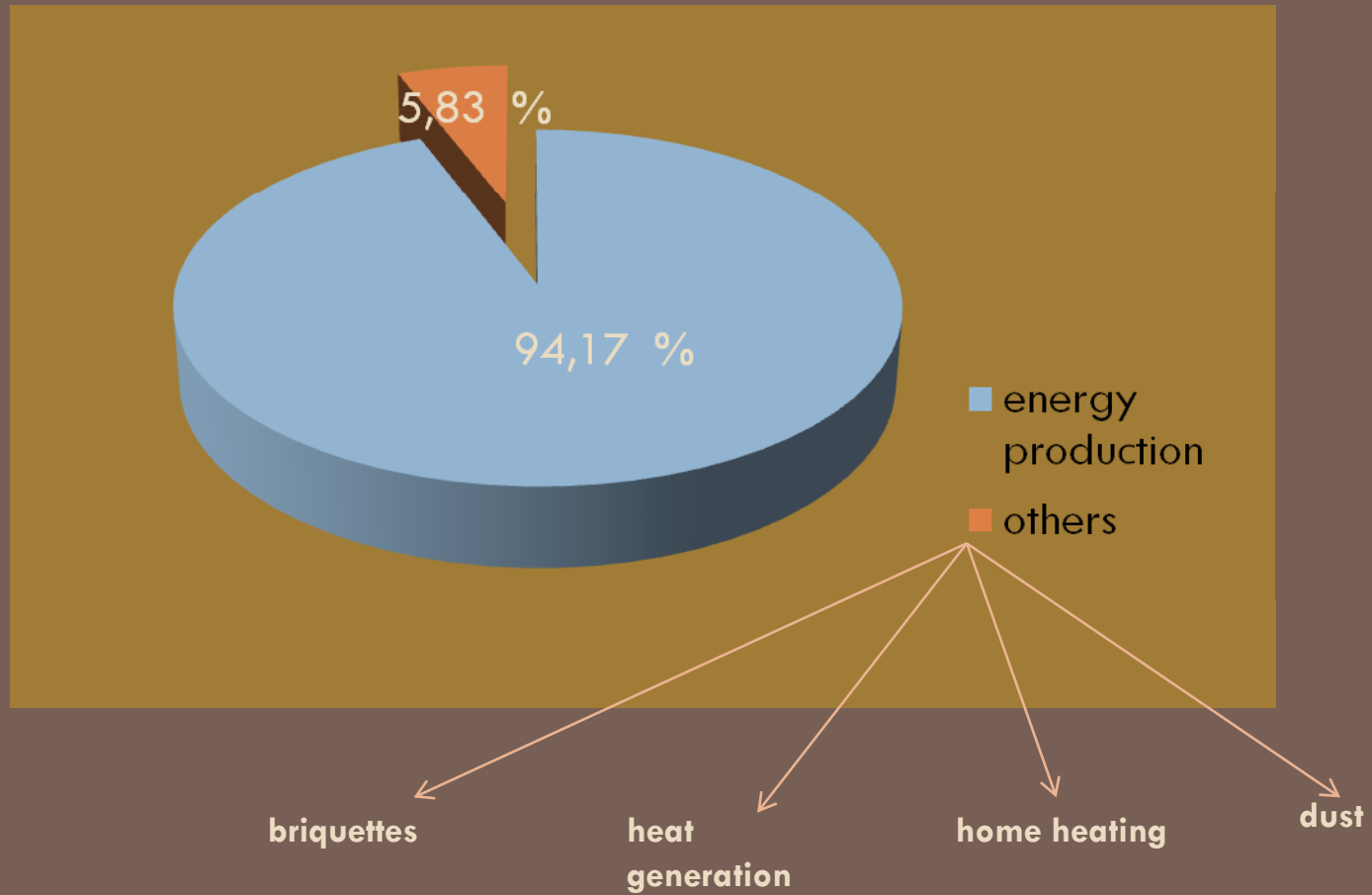


## Evolution of efficiency in energy production from LIGNITE

Years	Max. power of units MW	Net efficiency [%]
50 - 60	120 – 300	30 – 32
70	< 500	35 – 36
80 - 90	500 – 800	< 40
00 - 10	500 - 1100	41 – 43
10 - 20 *	~ 1100	~ 50 *

# Usage of LIGNITE in Europe

## SUMMARY



## LIGNITE as a fuel

- High ash and moisture content (ash < 20 %, moisture ~ 50 %)
- Low calorific value ( $\frac{1}{3}$  to  $\frac{1}{2}$  LHV of hard coal)
- Economical short distance transport only (< 100 km)
- Lignite burning = CO<sub>2</sub> emission (~1 t of CO<sub>2</sub> per 1 MWh)
- Growing price of CO<sub>2</sub> emission ( ~ 40-60 euro / t of CO<sub>2</sub> in 2030 in EU)

- Abundant in lot of countries (Europe, Asia, North America)
- Lower output cost then price of imported hard coal (1,5 - 2 USD/GJ v. ~ 3 USD/GJ in ARA + transport from ARA)
- Energy independence

## GASIFICATION of LIGNITE - WHY NOT ?

> 100 years ago in Germany.....

35 years ago in North Dakota .....

.....so what in 21 - th century ?

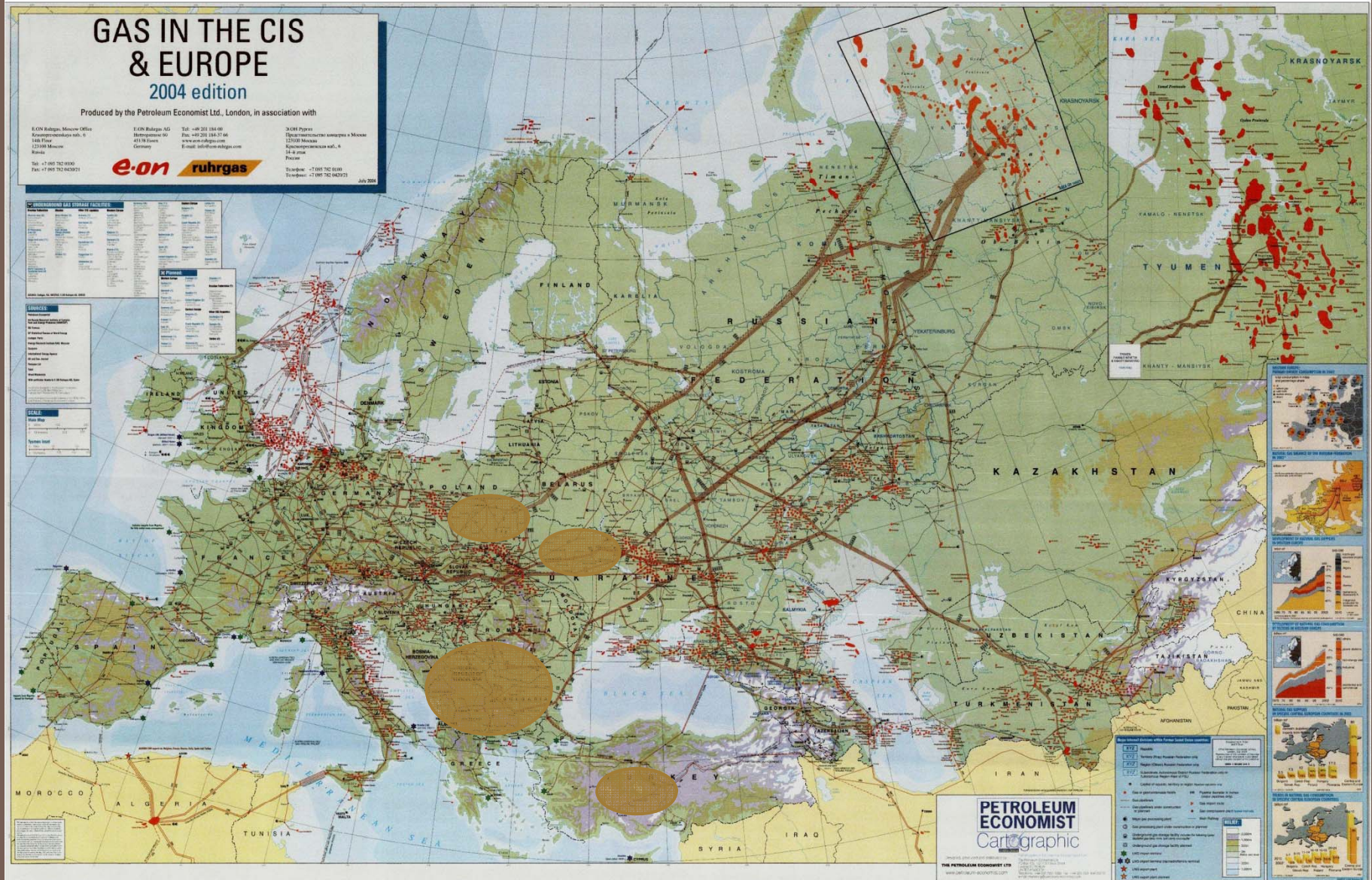
## LIGNITE gasification is proven

- Largest scale - in North Dakota with CCS
- Several licensors will support lignite
  - Slurry Feed: low HHV affects efficiency
  - Fluid Bed: good choice if lignite flows smoothly
  - Dry Bed: good all around choice
- Drying involves energy consumption
- Continuing improvements to technology:
  - reducing energy consumption for milling and drying (up to 30 % of power requirements) using waste heat
  - implanting new technologies for oxygen production
  - low cost production of upgraded lignite (up to 30 % of raw lignite with LHV ~ 22 GJ/t)

## Strong drivers to LIGNITE gasification – case study Europe

- Oil prices remain at USD 65+ level
- Demand for energy increases at global annual rate of 1,2 %
- EU regulations requirements carbon capture or .....pay (after 2020) for 100 % of emission
- Central Europe has limited access to gas / petroleum supplies
- Supplies and prices are controlled by others
- Lignite = energy and gas independence , f.ex.:
  - instalation for 1,2 mln tons/year of typical raw lignite produces 860 mln Nm<sup>3</sup> of syngas with LHV = 10,5 MJ/Nm<sup>3</sup>

# Map of main pipelines network in Europe.



## CONCLUSIONS

- LIGNITE is widespread in Central and SE Europe (also Asia and North America)
- LIGNITE is a low cost source of energy (electric and chemical)
- Gasification technology is proven
- Environmental regulations (CCS) improves economics of gasification in general
- LIGNITE gives energy independence

DON'T IGNORE LIGNITE.....

Thank you

[wojtek.ksiazkiewicz@sncclavalin.com](mailto:wojtek.ksiazkiewicz@sncclavalin.com)



[slawomir.mazurek@kwbkonin.pl](mailto:slawomir.mazurek@kwbkonin.pl)

