

# Coal in the CR and Central Europe



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MINISTERSTVO ŠKOLSTVÍ,  
MLÁDEŽE A TĚLOVÝCHOVY



OP Vzdělávání  
pro konkurenceschopnost



INVESTICE  
DO ROZVOJE  
VZDĚLÁVÁNÍ

# Commodity specifics

- Main use of coal: production of heat and electricity by combustion; production of metallurgical coke by carbonization of coal
- 1 kWh of electricity = combustion of 0.00049 tons of coal on average
- 1 MWh of electricity = 0.49 tons of coal
- 1,000 MW power plant's 1 hour production = combustion of 490 tons of coal
- 24-hour-production = 11,760 tons
- 1-month-production = 352,800 tons

# Commodity specifics

- This greatly affects transport of coal, most of the inland coal transports are carried out by:
  - freight trains (60-70%)
  - river transport (5-15%)
  - trucks (10-15%)
  - conveyor belts (8-10%)
  - or pipe (1%).



# Commodity specifics

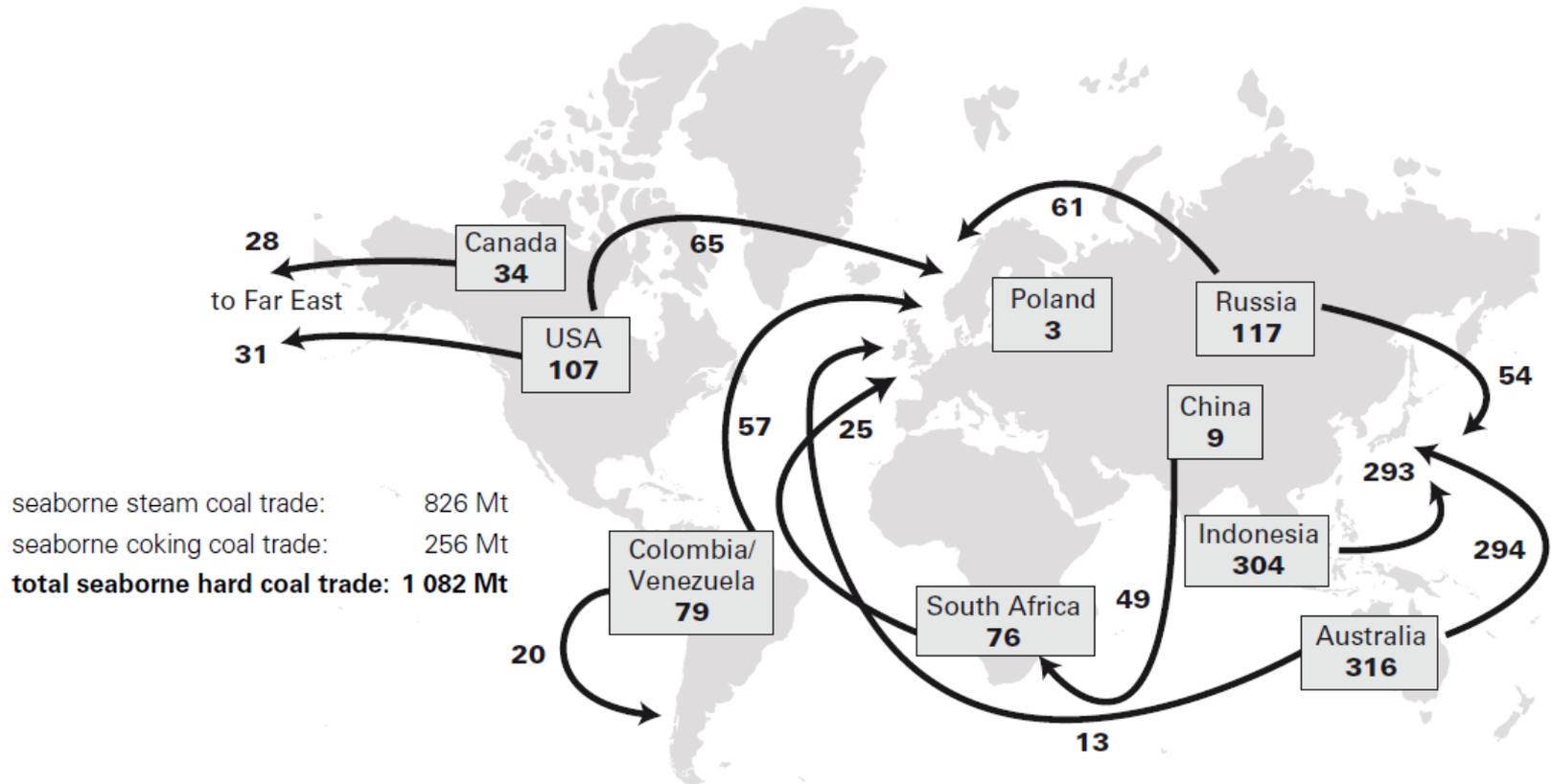
- Coal is traded all over the world, with coal shipped huge distances by sea to reach markets.
- Ships are commonly used for international transportation, in sizes ranging from:
  - Handysize - 40-45,000 DWT
  - Panamax - about 60-80,000 DWT
  - Capesize vessels - about 80,000 DWT
- Overall international trade in coal reached **1142Mt in 2011**; while this is a significant amount of coal it still only accounts for about **16% of total coal consumed**. Most coal is used in the country in which it is produced.

# Commodity specifics

- Transportation costs account for a large share of the total delivered price of coal, therefore international trade in steam coal is effectively divided into two regional markets
  - **the Atlantic market**, made up of importing countries in Western Europe, notably the UK, Germany and Spain.
  - **the Pacific market**, which consists of developing and OECD Asian importers, notably Japan, Korea and Chinese Taipei. The Pacific market currently accounts for about 57% of world seaborne steam coal trade.

# Commodity specifics

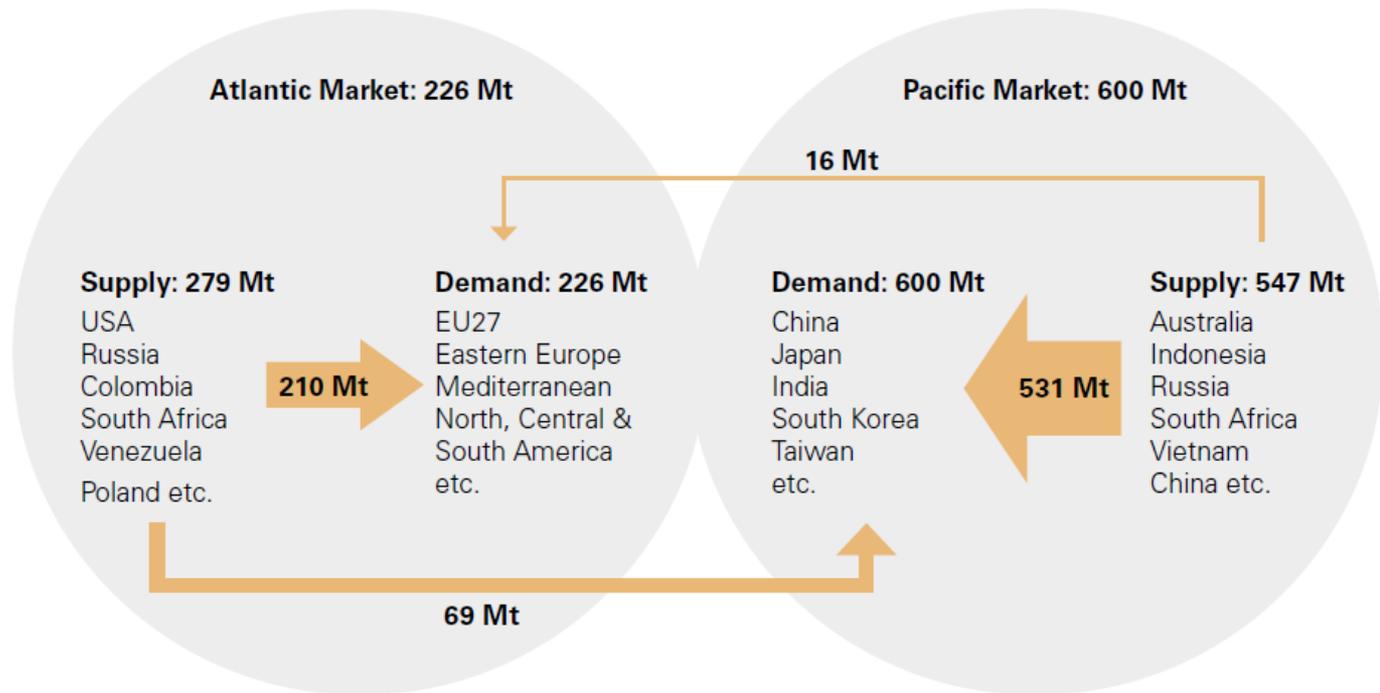
Seaborne trade flows on the international hard coal market, 2012



Source: Euracoal

# Commodity specifics

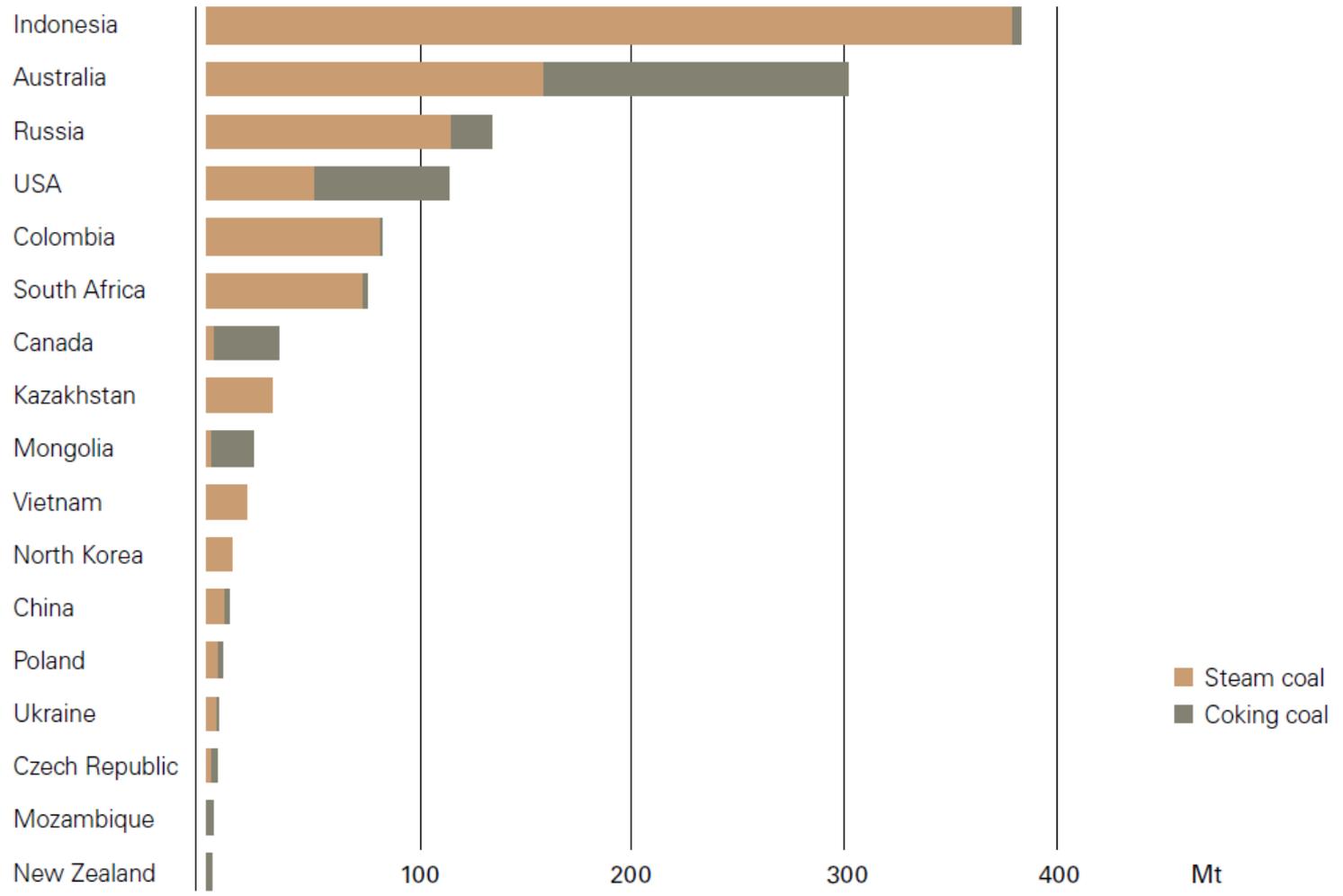
Major steam coal flows within and between the Atlantic and Pacific markets, 2012



Source: Euracoal

# Commodity specifics

Top coal exporting countries, 2012



Source: Euracoal

# Commodity specifics

- The coal business in CE is thus rather local or regional (bituminous coal)
- High quality coal and metallurgical coal is however a part of the cross-border trade
  - Higher quality of the material
  - Better use (cogeneration, metallurgy)
  - More expensive products (heat and electricity, metal)
  - Transport expenditures are balanced with better revenues for use

# Hard Coal in the Czech Republic

<b>Installed Capacity in the Czech Electricity Grid on 31 December 2017</b>			
<b>Type of Power Station</b>	<b>Installed Capacity (MWe)</b>	<b>Production (brutto, MWh)</b>	<b>Percentage (%)</b>
Thermal Power Station	11,075.4	45,431.7	49.7 / 52.2
Gas Combined Cycle Power Station	1,363.5	3,722.4	6.1 / 4.3
Gas Fired Power Station	895.9	3,719.6	4.0 / 4.3
Hydroelectricity	1,092.7	1,869.5	4.9 / 2.1
Pumped-storage Hydroelectricity	1,171.5	1,170.5	5.3 / 1.3
Nuclear Power Station	4,290.0	28,339.6	19.3 / 32.6
Wind Power	308.2	591.0	1.4 / 0.7
Solar Power	2,069.5	2,193.4	9.3 / 2.5
Geothermal Power	0	0	0 / 0
<b>Total</b>	<b>22,266.7</b>	<b>87,037.6</b>	<b>100 / 100</b>

Source: Energetický regulační úřad, 2018, s.5, 40

## Coal Power Plants in the Czech Republic with more than 150 MWe of Installed Capacity

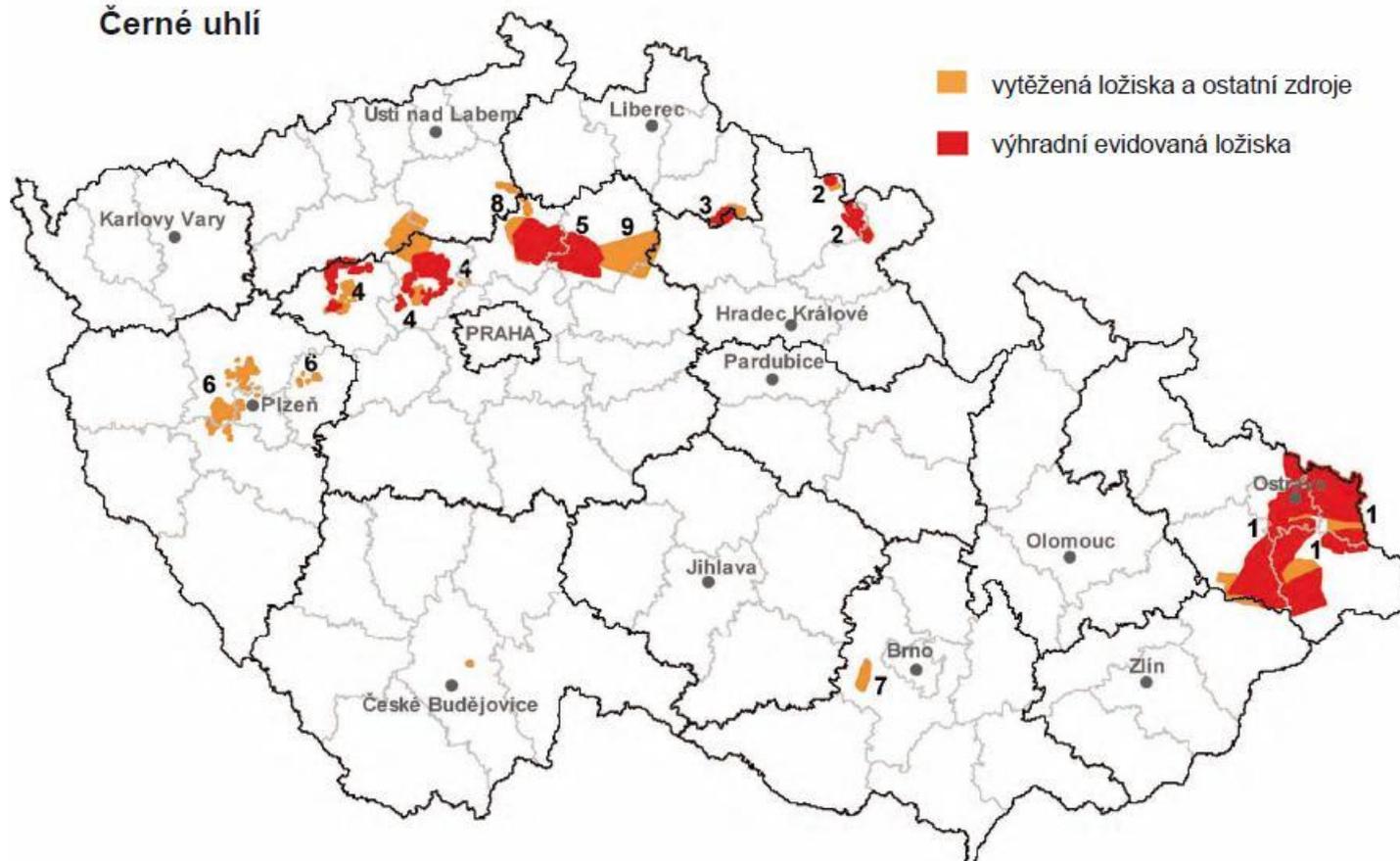
Power Plant	Owner	Installed Capacity	Connected to the Grid	Fired on	Life Expectancy*
<b>Detmarovice</b>	CEZ, a. s.	800 MWe	1975 - 1976	Bituminous coal	2020-2030
<b>Chvaletice</b>	Severni energeticka a.s.	800 MWe	1977 - 1978	Brown coal	2020-2029
<b>Kladno</b>	Alpiq Generation (CZ), s. r. o.	299.1 MWe	1976, 1999	Bituminous coal, brown coal	2045-2050
<b>Komorany</b>	United Energy pravni nastupce, a. s.	239 MWe	1959, 1978, 1986, 1994, 1997, 1998	Brown coal**	2025
<b>Ledvice II</b>	CEZ, a. s.	220 MWe	1966-1968	Brown coal	2015
<b>Ledvice III</b>	CEZ, a. s.	110 MWe	1998	Brown coal	2040-2055
<b>Ledvice IV</b>	CEZ, a. s.	660 MWe	2014 - 2015	Brown coal	2055
<b>Melnik (II)</b>	CEZ, a. s.	220 MWe	1971	Brown coal	2015-2020
<b>Melnik (III)</b>	CEZ, a. s.	500 MWe	1981	Brown coal	2015-2020
<b>Melnik (I)</b>	Energotrans, a. s.	352 MWe	1961, 1994 - 1995	Brown coal	?
<b>Opatovice</b>	Elektrarny Opatovice, a. s.	378 MWe	1979, 1987, 1995 - 1997	Brown coal	2020-2030
<b>Pocerady</b>	CEZ, a. s.	1,000 MWe	1970 - 1977	Brown coal	2029+
<b>Porici</b>	CEZ, a. s.	165 MWe	1957	Brown coal, bituminous coal**	?
<b>Prunerov II</b>	CEZ, a. s.	1,050 MWe	1981 - 1982	Brown coal	2015-2023 (2040***)
<b>Prunerov I</b>	CEZ, a. s.	440 MWe	1967 - 1968	Brown coal	2015-2023 (2040***)
<b>Tisova I</b>	CEZ, a. s.	183.8 MWe	1959 - 1961	Brown coal	2020+
<b>Tisova II</b>	CEZ, a. s.	112 MWe	1959 - 1961	Brown coal **	2020+
<b>Trebovice</b>	Dalkia Ceska Republika, a. s.	174 MWe	1961, 1998	Bituminous coal, light fuel oil	2015-2020
<b>Tusimice II</b>	CEZ, a. s.	800 MWe	1974 - 1975	Brown coal	2035

# Coal in the Czech Republic

Year	Exploitable economic reserves	Explored economic reserves	Prospected economic reserves	Potentially economic reserves	Crude extraction <sup>I</sup>	Saleable extraction <sup>I</sup>
<b>2008</b>	192,182	1,523,979	5,928,406	8,741,585	16,628	12,662
<b>2009</b>	205,630	1,543,177	6,011,672	8,900,448	15,130	11,001
<b>2010</b>	168,917	1,536,411	6,009,407	8,875,686	15,786	11,584
<b>2011</b>	180,729	1,518,929	5,998,902	8,821,173	15,681	11,455
<b>2012</b>	168,538	1,496,792	5,995,983	8,831,488	15,889	11,439
<b>2013</b>	66,301	1,487,287	5,993,801	8,834,579	13,368	10,045
<b>2014</b>	56,569	1,475,446	5,993,812	8,835,351	13,166	11,471
<b>2015</b>	41,844	1,475,464	5,746,510	8,839,345	8,483	7,640
<b>2016</b>	25,199	1,465,793	5,991,317	8,828,495	6,725 <sup>VI</sup>	6,074

Source: Geofond, 2017

## Černé uhlí



1 – česká část hornoslezské pánev

2 - česká část vnitrosudetské pánev

3 - podkrkonošská pánev

4 - středočeské pánev

5 - mšensko-roudnická pánev

6 - plzeňská a radnická pánev

7 - boskovická brázda

8 - mšensko-roudnická pánev

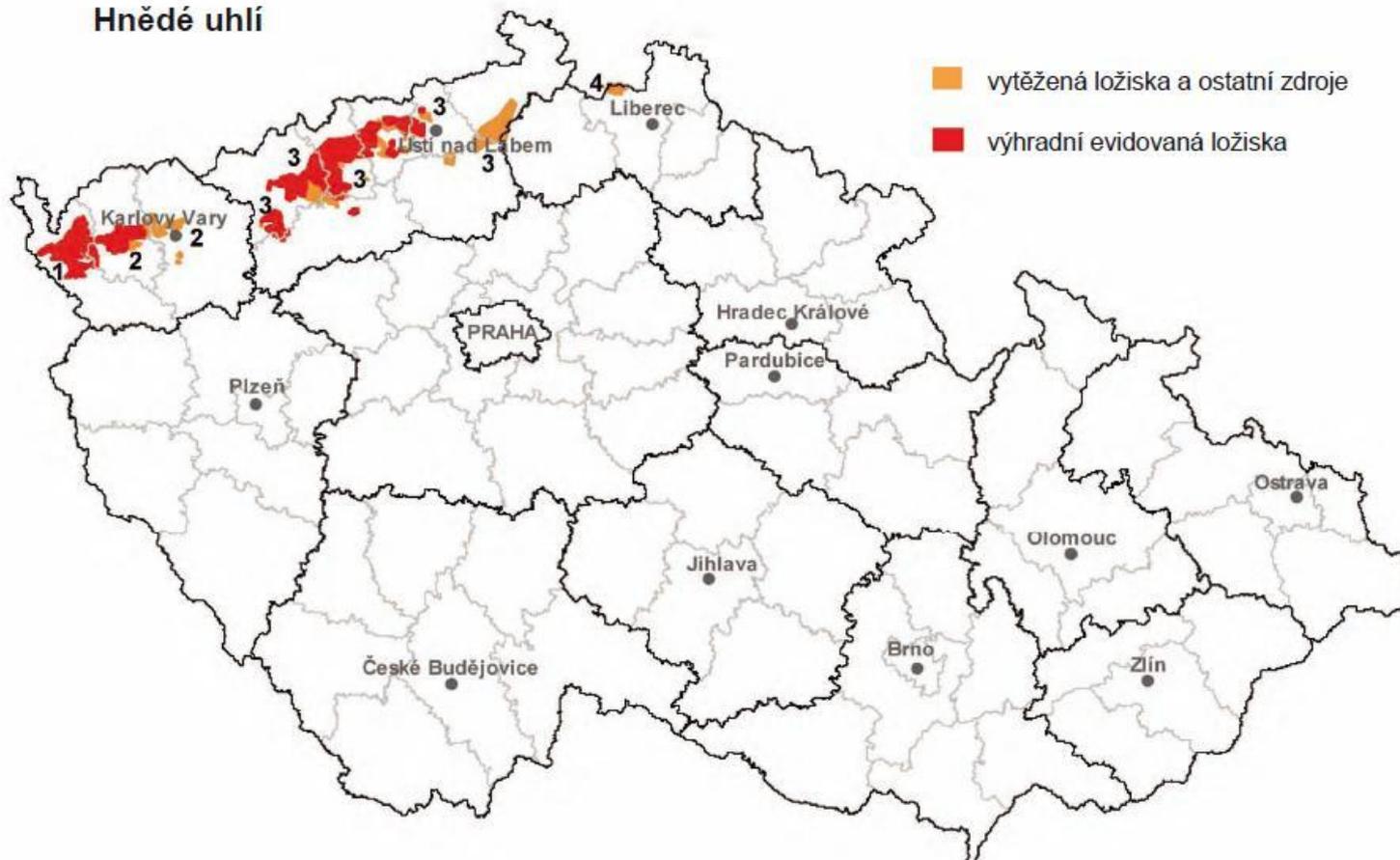
9 - mnichovohradištská pánev

# Brown Coal in the Czech Republic

<b>Year</b>	<b>Exploitable economic reserves</b>	<b>Explored economic reserves</b>	<b>Prospected economic reserves</b>	<b>Potentially economic reserves</b>	<b>Crude extraction<sup>1</sup></b>
<b>2012</b>	862,202	2,347,268	2,063,445	4,525,445	43,710
<b>2013</b>	825,322	2,308,649	2,062,445	4,488,796	40,585
<b>2014</b>	796,277	2,273,951	2,062,445	4,489,937	38,348
<b>2015</b>	749,075	2,239,329	2,062,445	4,473,282	38,351
<b>2016</b>	714,356	2,203,911	2,059,859	4,465,466	38,646

Source: Geofond, 2017

## Hnědé uhlí



1 – chebská pánev

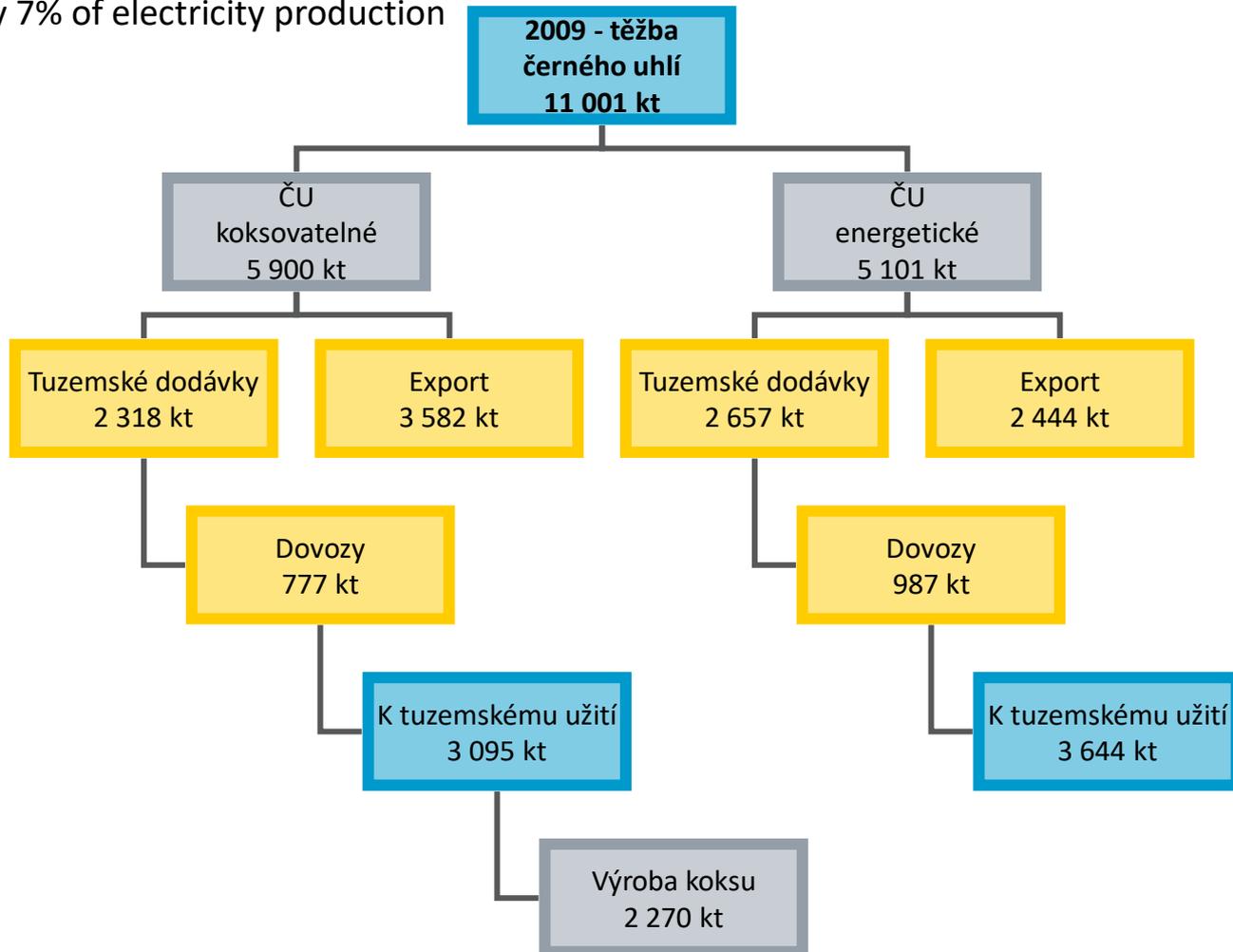
2 – sokolovská pánev

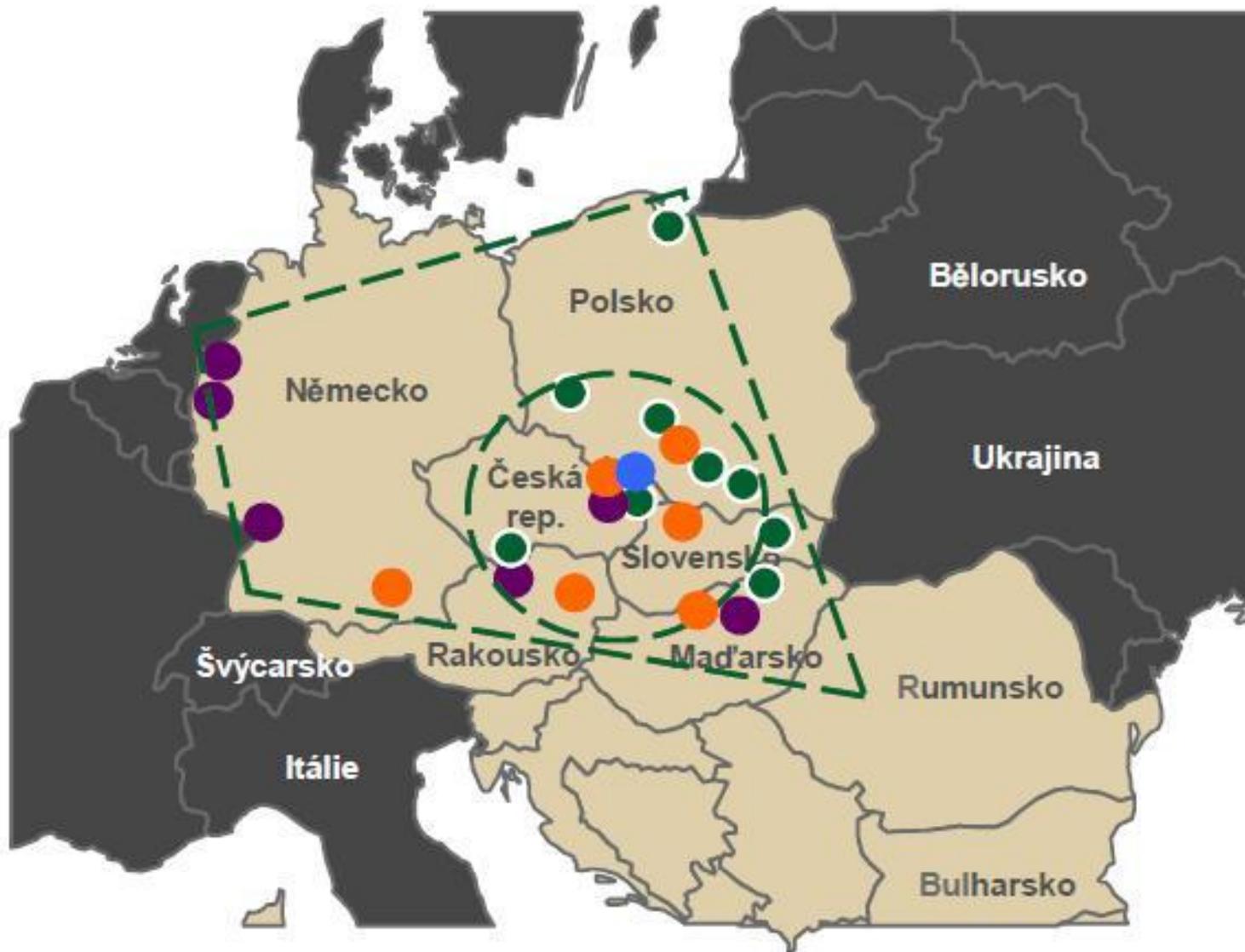
3 – severočeská pánev

4 – česká část žitavské pánve

# Czech coal market structure (2009, source: Kavina 2010)

- Two separate markets
- Coking and Heating
- Hard coal only 7% of electricity production





● OKD/NWR   
 ● Odběratelé - koks   
 ● Odběratelé – koks. uhlí   
 ● Odběratelé – energ. uhlí

# Coal in the Czech Republic

- Coal is an essential source in the Czech energy and electricity mix
- Coal is the only energy source, in which we are self-sufficient in terms of energy security
- Domestic production of lignite fully cover domestic consumption
- Hard coal is also a major export commodity of the Czech Republic
- Current problems of the coal sector will most likely not and will not have a significant negative impact on the electricity sector of the Czech Republic, but may be at risk of inaction respective companies and industries significantly negative impact on the sector CHP

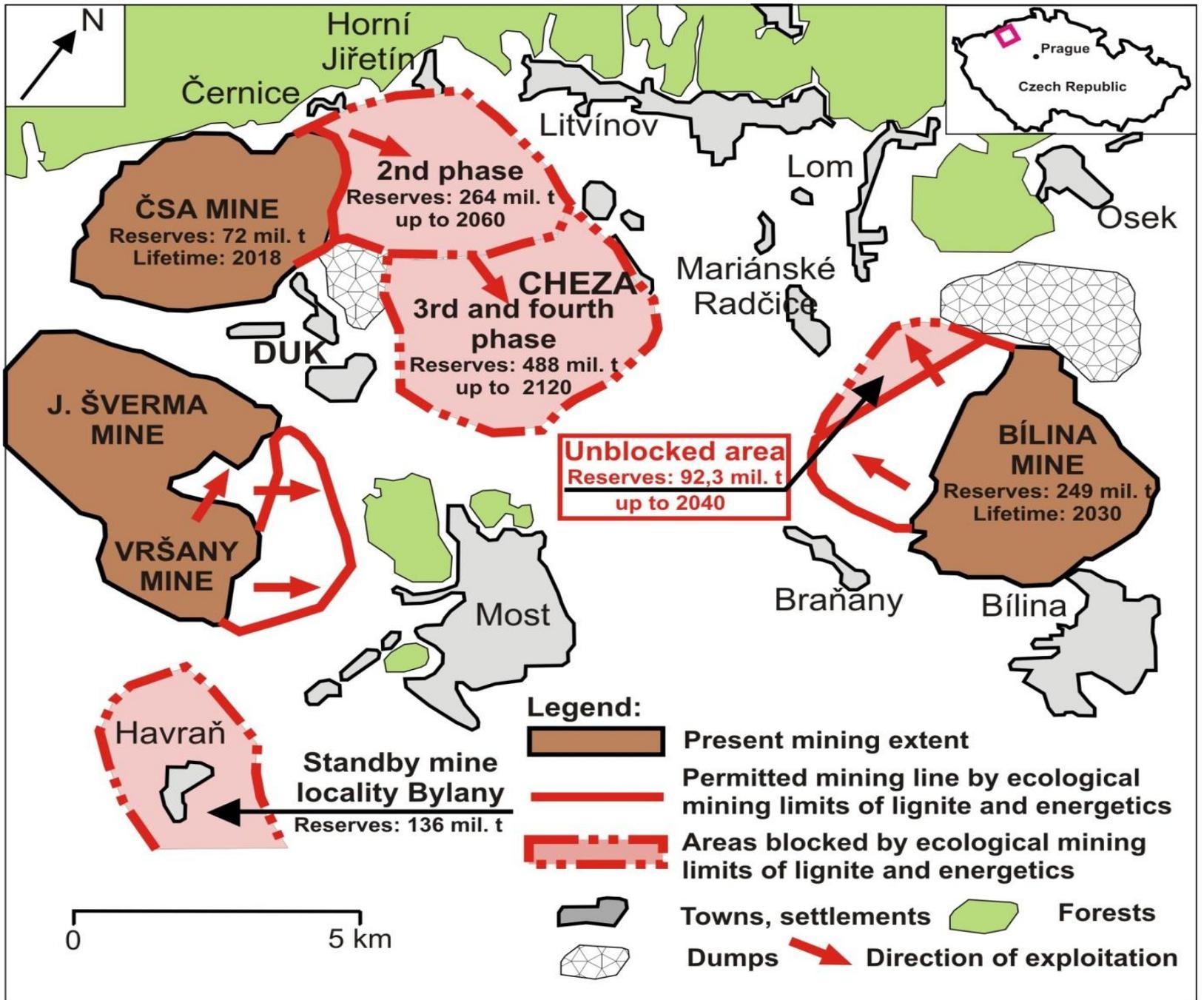
# Coal in the Czech Republic

- Two problems:
  - Financial crisis and general drop in economic production (hard coal)
  - Territorial Ecological Limits on Brown Coal Mining (brown coal)



# Limits on coal mining

- Territorial Ecological Limits on Brown Coal Mining guided by the Government's Resolution No. 444/1991 on territorial ecological limits on brown coal mining in the North Bohemian Basin of October 30, 1991.
- This resolution specified the final lines of mining and landfill in the mines Merkur, Brezno, Libous, Sverma, Vrsany, CSA, Lezaky, Bilina and Chabarovice and in Ruzodolska and Radovesicka landfills as well as the limit values of air pollution in basins in the regions Chomutov, Most, Teplice, Usti nad Labem and Louny.



# Limits after SEP 2015

- Decision transferred to RMP which states (p. 49):
- On 19. 10. 2015 the Government discussed the material "Further procedures and solutions for the territorial environmental limits of the brown coal mining in northern Bohemia" and issued Resolution no. 827 to tackle the issue of territorial environmental limits.
- At Bílina mine the government approved changes in the territorial environmental limits with the new mining limits set 500 m from the urban area of the nearby municipality.
- At the ČSA mine the government left the territorial environmental limits in force. But the coal will be conserved and protected and new assessment of the situation will take place in 2020, taking account the process of construction of new nuclear units.

# Financial Crisis

- The general specification of coal industry usually begins with a very true statement that coal supply adds up 50-66 % of overall operational costs of the coal fired power plant.
- It is thus very sensitive to the fluctuations in price.



# Financial Crisis

- At this moment the bituminous coal sector in the CR and CE is very negatively affected by the world market
- CR: drop in prices, production and closure of Paskov (31.3.2017)
- PL: drop in prices, production and significant closures, miners striking, threat of bankruptc, energy security

<b>Comparison of key indicators of JSW SA and OKD, a.s. (recalculated to EUR)</b>				
	<b>JSW 2015</b>	<b>OKD 2015</b>	<b>JSW 2017</b>	<b>OKD 2017</b>
<b>No. of employees<sup>I</sup></b>	18,947	9,135	20,887	6,120
<b>Capital expenditures</b>	EUR 190.5 m	EUR 34.3 m	EUR 200.6 m	EUR 15.3 m
<b>Sales revenues</b>	EUR 1,657.5 m	EUR 885.2 m	EUR 2,084.8 m	EUR 630.1 m
<b>EBIT</b>	EUR 931.2 m	EUR -251.9 m	EUR 731.9 m	EUR 124.5 m
<b>EBITDA</b>	EUR 605.4 m	EUR -210.3 m	EUR 925.6 m	EUR 132.1 m
<b>EBITDA net<sup>II</sup></b>	EUR 122.8 m	-	EUR 824.0 m	-
<b>Net result</b>	EUR 785.2 m	EUR -250.4 m	EUR 597.3 m	EUR 128.8 m
<b>Coking coal production</b>	11,151.2 kt	3,760.7 kt	10,675.7 kt	2,829.2 kt
<b>Thermal coal production</b>	5,161.7 kt	3,674.4 kt	4,092.7 kt	2,046.5 kt
<b>Coke production</b>	4,221.5 kt	-	3,458.0 kt	-
<b>External sales of coking coal<sup>III</sup></b>	5,800.3 kt	3,658 kt	5,937.2 kt	2,757.0 kt
<b>External sales of thermal coal<sup>III</sup></b>	5,381.3 kt	3,701 kt	4,167.9 kt	1,936.8 kt
<b>External sales of coke<sup>III</sup></b>	4,014.9 kt	-	3,460.8 kt	-
<b>Unit cash mining costs</b>	73.4 EUR/t	66 EUR/t	73.4 EUR/t	n/a

<sup>I</sup> At mining posts

<sup>II</sup> Net of non-recurring events

<sup>III</sup> External means outside the JSW Group/NWR, not necessarily outside Poland/Czech Republic

**Sources:** JSW SA 2018a, p. 7, 35, 36; JSW SA 2016a, p. 6, 13, 29, 30; JSW SA 2016b, p. 36, 114; JSW n.d.b; OKD, a.s. 2016, p. 6, 7, 8, 11-13, 22, 32-33, 54; New World Resources Plc 2016, p. 23; Správa pohledávek OKD, a.s. 2018, p. 6, 13, 15, 17, 23, 30, 64

# Case Study: Poland

- Coal supplies about 87% of Poland's electricity, it is the world's most coal-dependent country
- It is mined in State-owned Kompania Weglowa, Europe's largest hard coal miner with 50,000 workers
- Mines are deep and expensive, rendering them uncompetitive at a time of falling global coal prices
- Strong evidence of a problem:
- Polish buyers are increasingly turning to cheaper imported coal, some of it from Russia

# Case Study: Poland

<b>1,000 MWe+ Power Plants in Poland</b>				
<b>Power Plant</b>	<b>Installed Capacity</b>	<b>Fuel</b>	<b>Operator</b>	<b>Construction Year</b>
Bełchatów TPP	5,354 MWe	Lignite	PGE GiEK S.A.	1981
Kozienice TPP	2,913 MWe	<b>Hard Coal</b>	ENEA S.A.	1972
Połaniec TPP	1,800 MWe	<b>Hard Coal</b>	Electrabel Połaniec SA (GDF Suez)	1973-1979
Rybnik TPP	1,775 MWe	<b>Hard Coal</b>	EDF Polska Oddział w Rybniku	1972
Turów CHP	1,694.8 MWe	Lignite	PGE GiEK S.A.	1962-1971
Pątnów I, II CHP	1,669 MWe	Lignite	Zespół Elektrowni Pątnów-Adamów-Konin SA*	1958-1974
Opole TPP	1,532 MWe**	<b>Hard Coal</b>	PGE GiEK S.A.	-
Jaworzno II, III CHP	1,485 MWe	<b>Hard Coal</b>	Tauron Polska Energia S.A.	1972-1979
Dolna Odra CHP	1,362 MWe	<b>Hard Coal</b>	PGE GiEK S.A.	1974
Łaziska CHP	1,155 MWe	<b>Hard Coal</b>	Tauron Polska Energia S.A.	1967-1972

\* Ownership structure: 52.67% Zygmun Solorz-Żak; 10.76% ING Open-end Pension Fund; 36.57% Others

\*\* A 1800 MW expansion of the station began construction in 2014

Note: CHP = Combined Heat Power Plant, TPP = Thermal Power Plant

Source: *Polska Grupa Energetyczna SA* and other open sources

# Case Study: Poland

Source of the problem?

- Primary: financial crisis and world markets of course, high production costs (1 km depths)
- Secondary: Complete lack of diversification

Future effect:

- CO<sub>2</sub> emissions policy
- Unemployment
- Possible bankruptcy; the government plans to create a new enterprise that will take over the profitable assets of KW (CZK1 billion debt, 2015 losses CZK 190/1 tonne)
- Positive: diversification (?)