Energy and Infrastructure

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Selected energy indicators
Balkan Countries

	TPES/pop.	TPES/GDP	Elec. Cons./Pop.	CO2/TPES
Country	Toe/capita	Toe/0002005 $	kWh/capita	T CO2/toe
World	1.88	0.19	2933	2.39
OECD	4.28	0.14	8266	2.33
Albania	0.68	0.20	1 983	1.78
Bosnia and Herzegovina	1.89	0.54	3 263	3.21
Bulgaria	2.57	0.57	4781	2.56
Croatia	1.91	0.18	3 789	2.22
Kosovo	1.41	0.50	2 942	3.35
FYR of Macedonia	1.51	0.43	3 956	2.91
Montenegro	1.87	0.41	5 644	2.12
Romania	1.68	0.31	2 486	2.28
Serbia	2.23	0.57	4 473	3.08

Selected energy indicators CEE

	TPES/pop.	TPES/GDP	Elec. Cons./Pop.	CO2/TPES
Country	Toe/capita	Toe/0002005 $	kWh/capita	T CO2/toe
World	1.88	0.19	2933	2.39
OECD	4.28	0.14	8266	2.33
Belarus	3.11	0.65	3628	2.24
Czech Republic	2.03	0.65	3 298	2.92
Hungary	2.50	0.22	3 895	1.90
Republic of Moldova	0.94	0.89	1 471	2.37
Poland	2.63	0.25	3 833	2.96
Russian Federation	5.15	0.77	6 533	2.26
Slovak Republic	3.19	0.28	5 306	1.95
Slovenia	3.53	0.18	6 806	6 806
Ukraine	2.77	1.33	3 662	2.26

Challenges

- Technology shift
- Demand off the market
- New resources to the market
- Divestments
- Integration to Western Europe
- Market opening
- Environmental challenges
- “New” infrastructure emerging
- Security of Supply
- Shocks

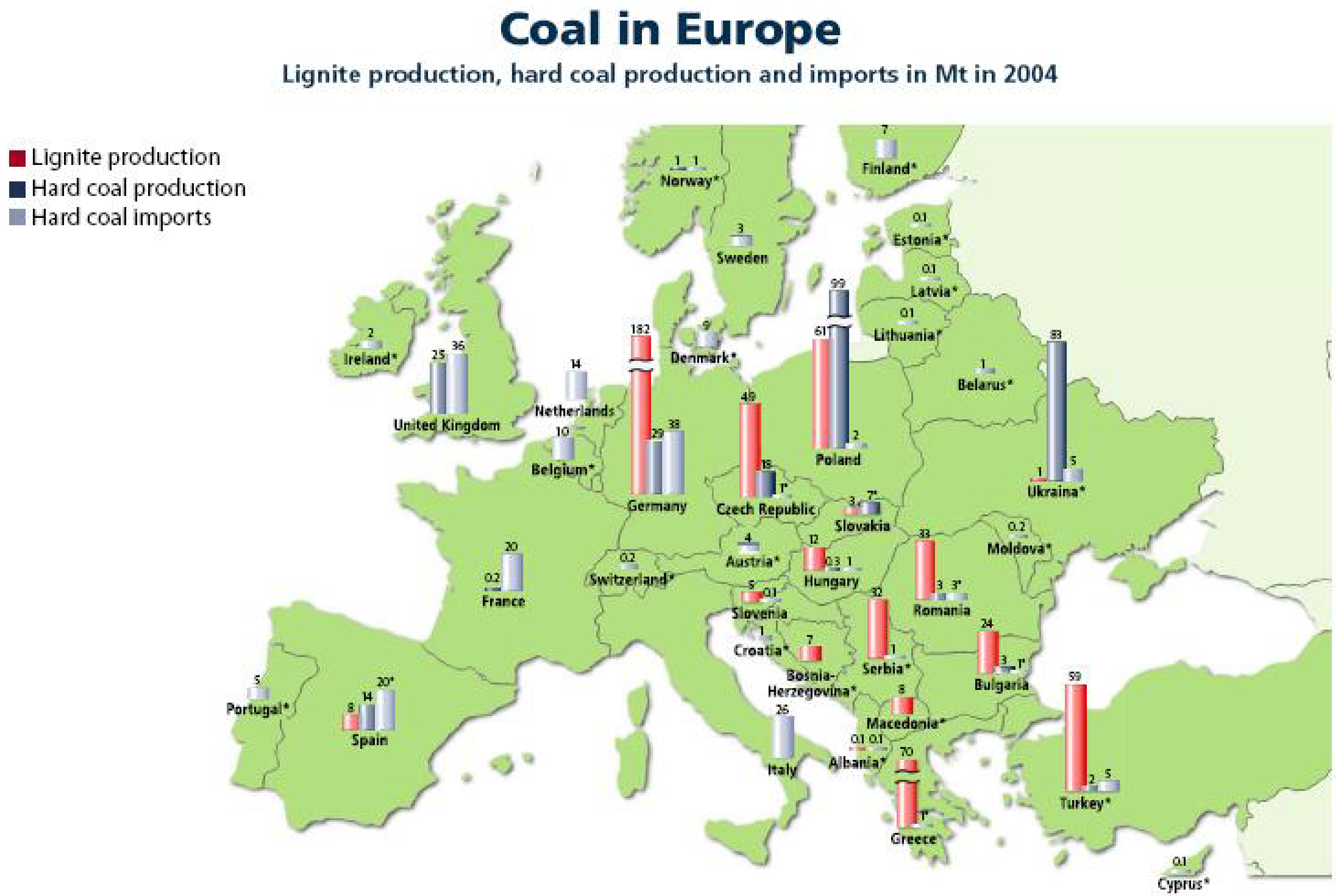
Technology shift

- New individual and diversified technologies (solar, heat pump, energy efficiency)
- Change between economy of scale and economy of standardization
- Environmental protection technologies
- Transport technologies
- Computer based management systems
- Materials
- Mixture of the above

Demand off the market

- Industrial shift
- Fly of energy intensive industry
- Transport capacity, technology and cost
- Technology change
- New transport fuels
- Energy Efficiency
- Phase out of coal and lignite
- District heating challenge

Lignite & Coal industry in the European context



*2002/2003

New resources to the market

- Unconventional gas and shale oil
- Conventional Renewable energy
- Emerging renewable energy
- Biomass
- Liquid fuel imports
- LNG and new transport opportunities
- Balkan hydro energy (?)

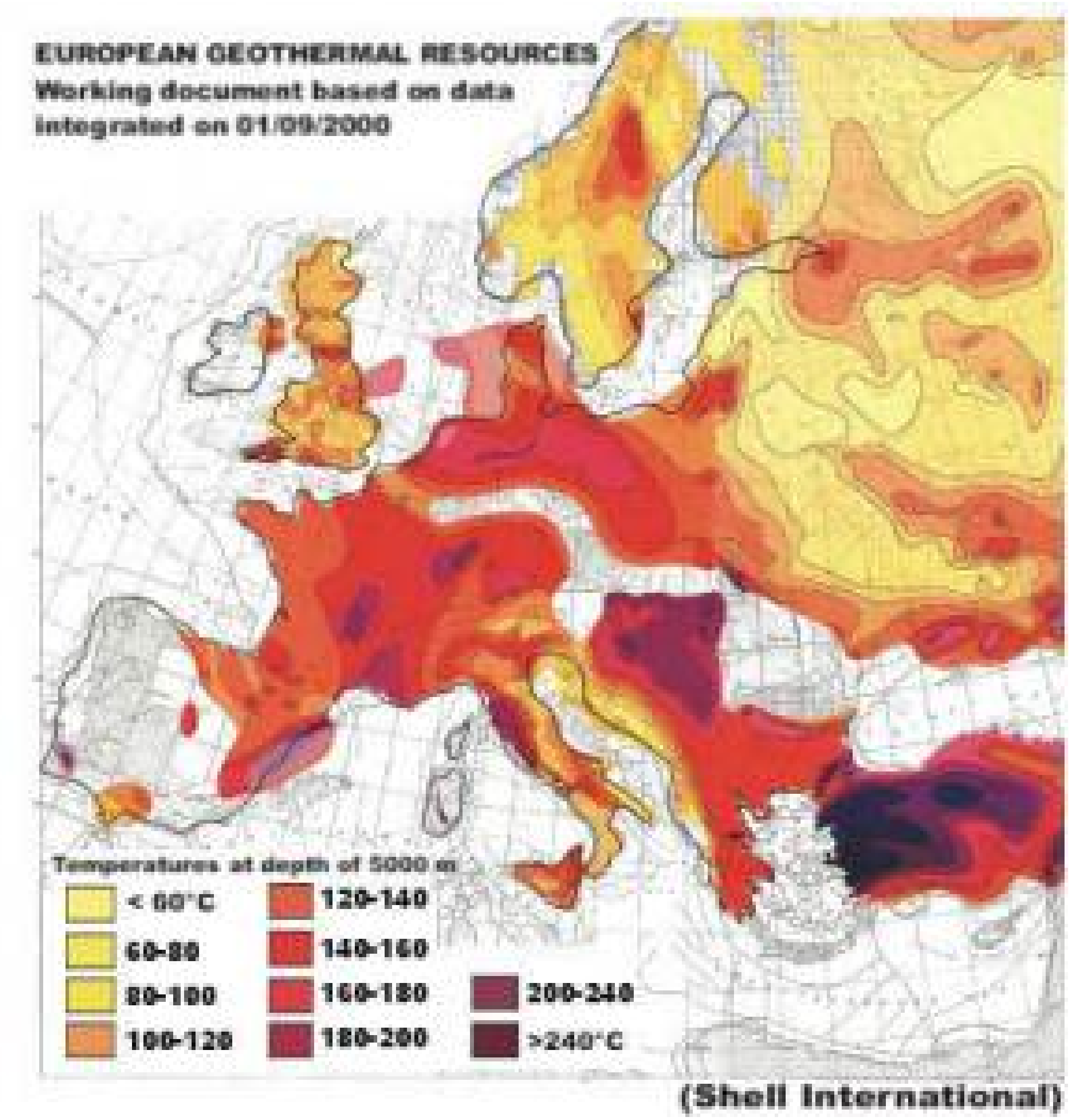
Shale gas resources

Estimated shale gas technically recoverable resources for select basins in 32 countries, compared to existing reported reserves, production and consumption during 2009

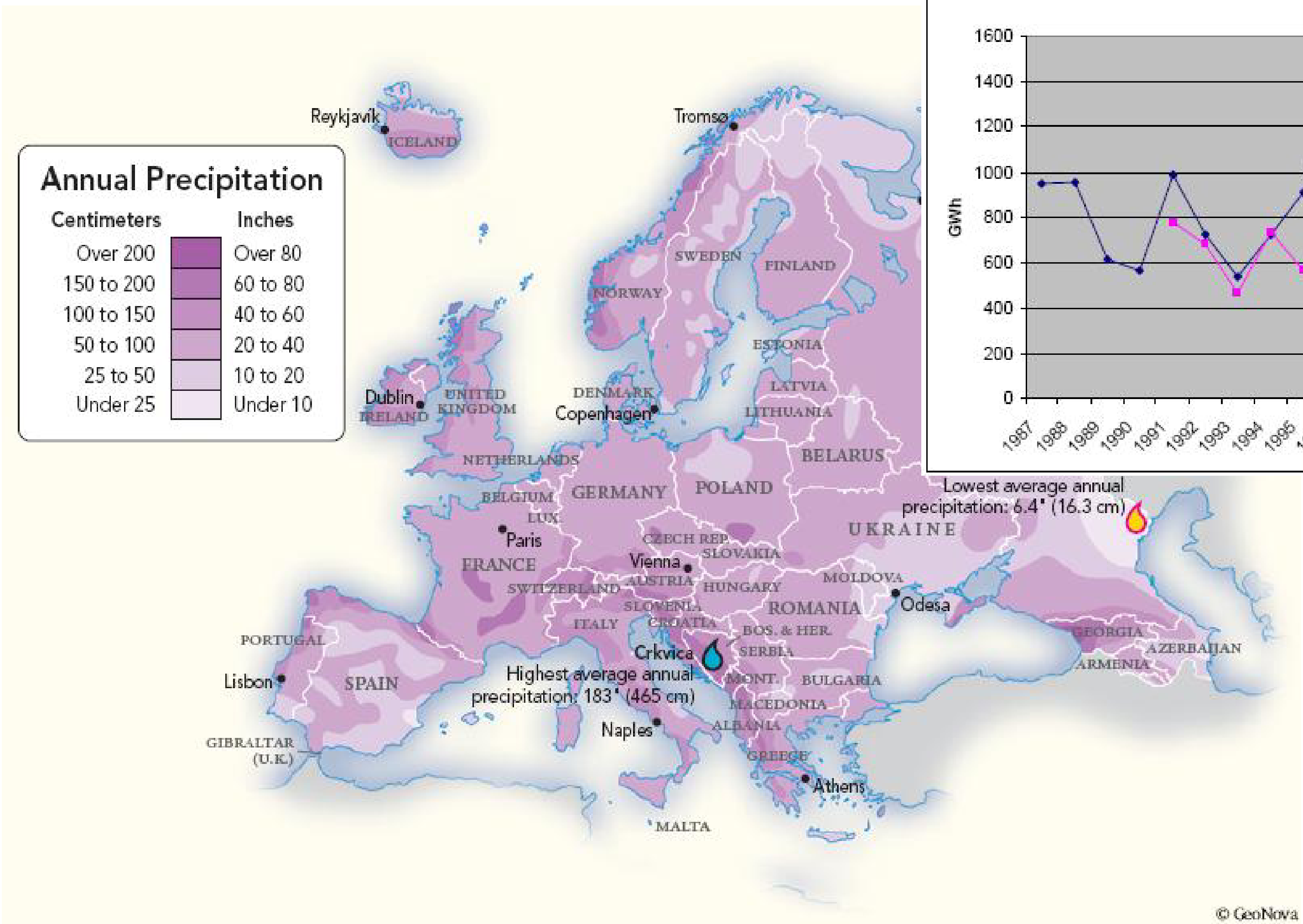
	2009 Natural Gas Market[1] (trillion cubic feet, dry basis)			Proved Natural Gas Reserves[2] (trillion cubic feet)	Technically Recoverable Shale Gas Resources (trillion cubic feet)
	Production	Consumption	Imports (Exports)		
Europe					
France	0.03	1.73	98%	0.2	180
Germany	0.51	3.27	84%	6.2	8
Netherlands	2.79	1.72	(62%)	49.0	17
Norway	3.65	0.16	(2,156%)	72.0	83
U.K.	2.09	3.11	33%	9.0	20
Denmark	0.30	0.16	(91%)	2.1	23
Sweden	-	0.04	100%		41
Poland	0.21	0.58	64%	5.8	187
Turkey	0.03	1.24	98%	0.2	15
Ukraine	0.72	1.56	54%	39.0	42
Lithuania	-	0.10	100%		4
Others[3]	0.48	0.95	50%	2.71	19

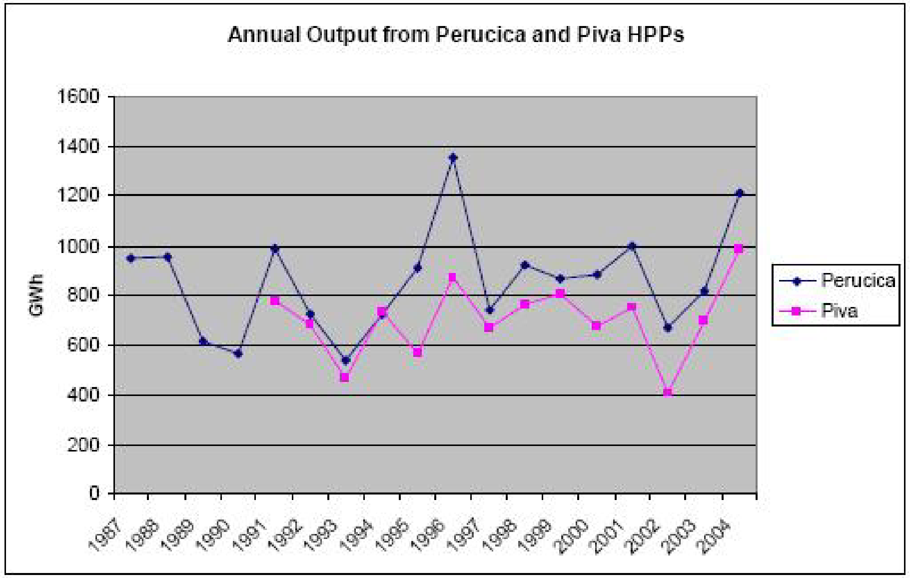
Source: US Energy Information Agency, 2011

Europe geothermal resources



While about 1/3 of electricity is generated from hydro sources, that are unpredictable and getting more volatile





Source: EPCG

Divestments

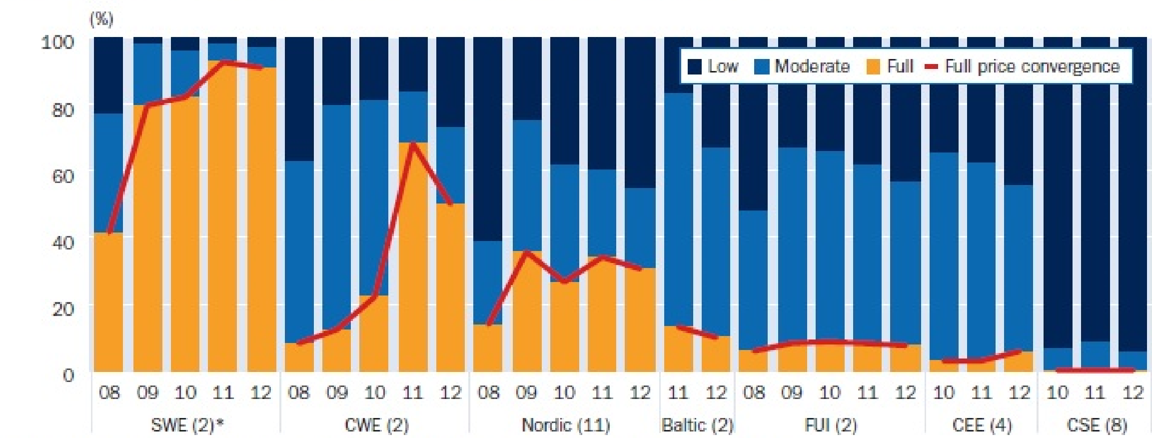
- Western Europe energy investors divesting from Central Europe or canceling intentions
- Energy intensive industry fly away
- Geo- strategic shifts
- Emergence of new investors (China, Azerbaijan, Kazakhstan, etc)
- EoN, GdFSUEZ, RWE, OMV, etc.

Integration to Western Europe

- Market coupling between structurally different markets:
- Renewable vs. conventional
- Open-to-seaborne-markets vs. landlocked
- Flexible (?) vs. In-flexible
- High density vs. low density

Cross border markets, integration, price convergence and welfare

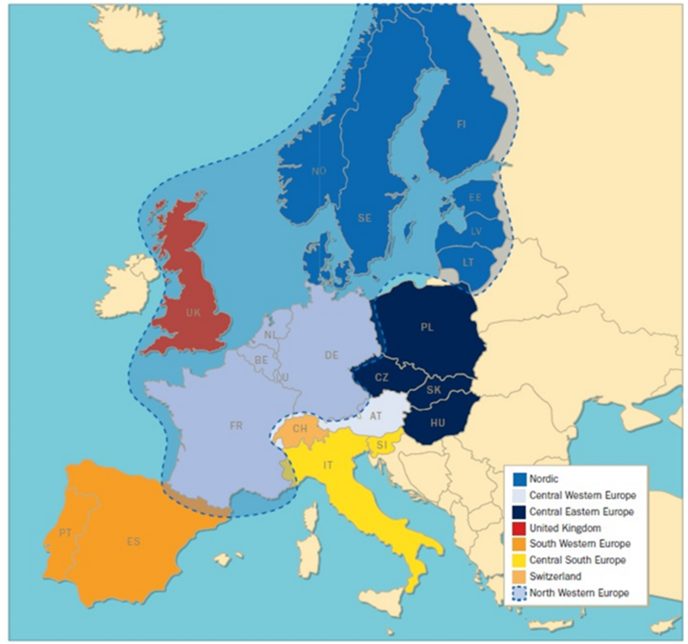
Price convergence in Europe by region (ranked) – 2008 to 2012



*The numbers in brackets, e.g. SWE (2), refer to the number of bidding zones per region included in the calculations

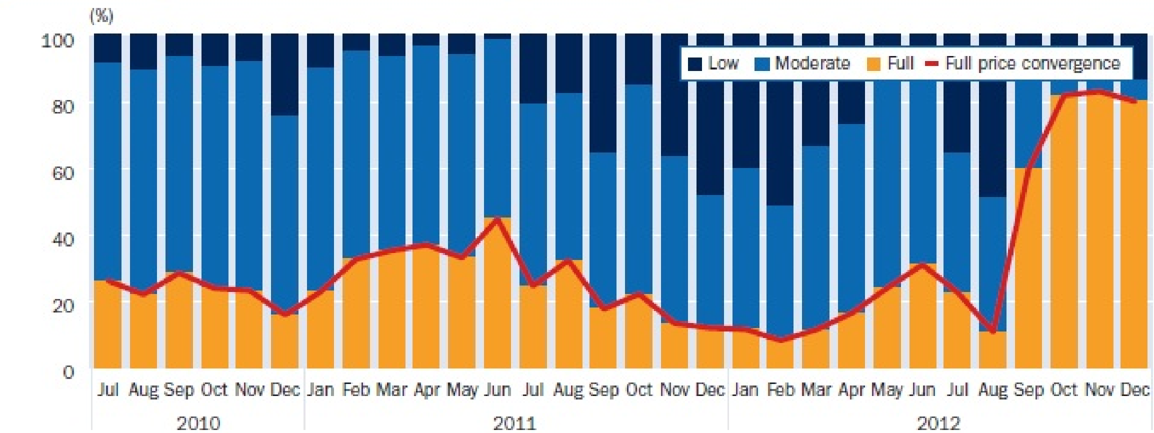
Source: Market Monitoring Report 2013 (ACER), Platts, PXs and data provided by NRAs through the ERI (2013) and ACER calculations

Europe's power market integration regions



Source: EPEX SPOT

Price convergence between the Czech Republic, Hungary and Slovakia – Jul 2010 to Dec 2012



Source: Market Monitoring Report 2013 (ACER), Platts, OKTE, HUPX (2013), ACER calculations

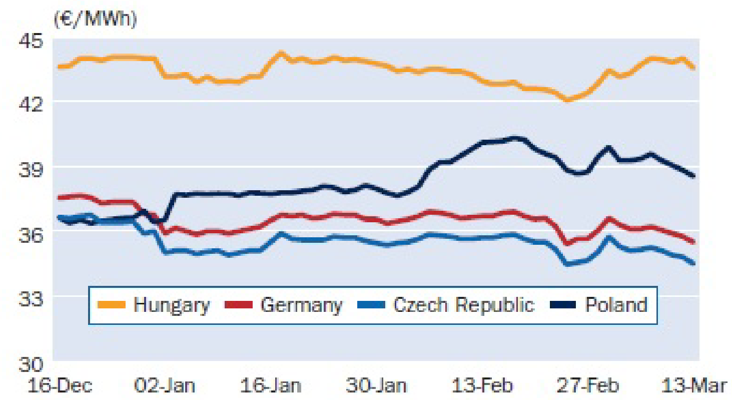
Estimated 'loss of social welfare' due to the abesnce of implicit DA methods, per border* – 2012

*The borders within the CEE region featuring 'multilateral' technical profiles are not included in this figure

Source: Market Monitoring Report 2013 (ACER), ENTSO-E, data provided by NRAs through the ERI, Vulcanus (2013) and ACER calculations

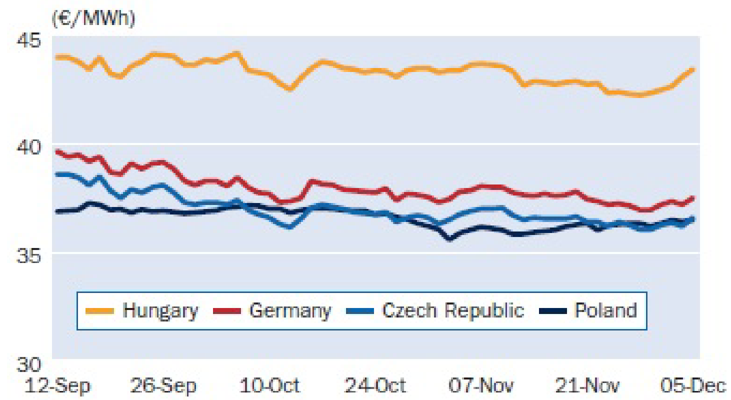
Electricity markets

Central & Eastern Europe year-ahead baseload



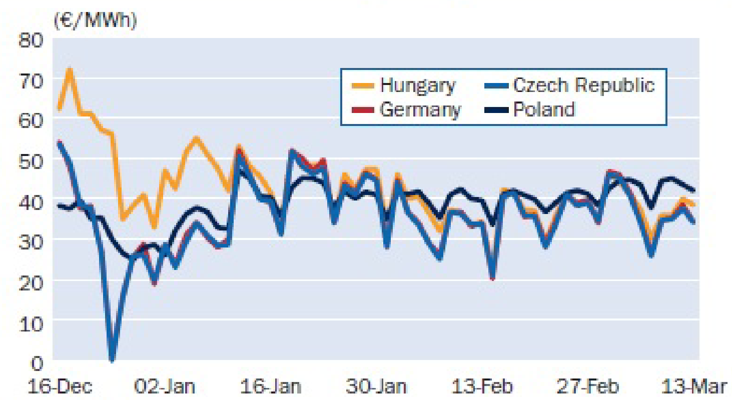
Source: Platts

Central & Eastern Europe year-ahead baseload



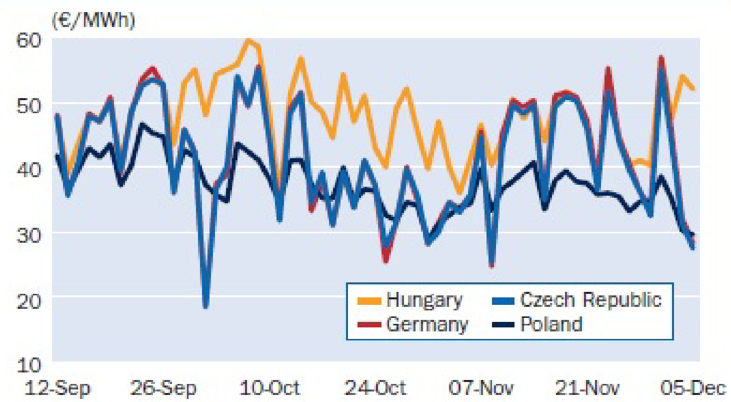
Source: Platts

Central & Eastern Europe day-ahead baseload



Source: Platts

Central & Eastern Europe day-ahead baseload



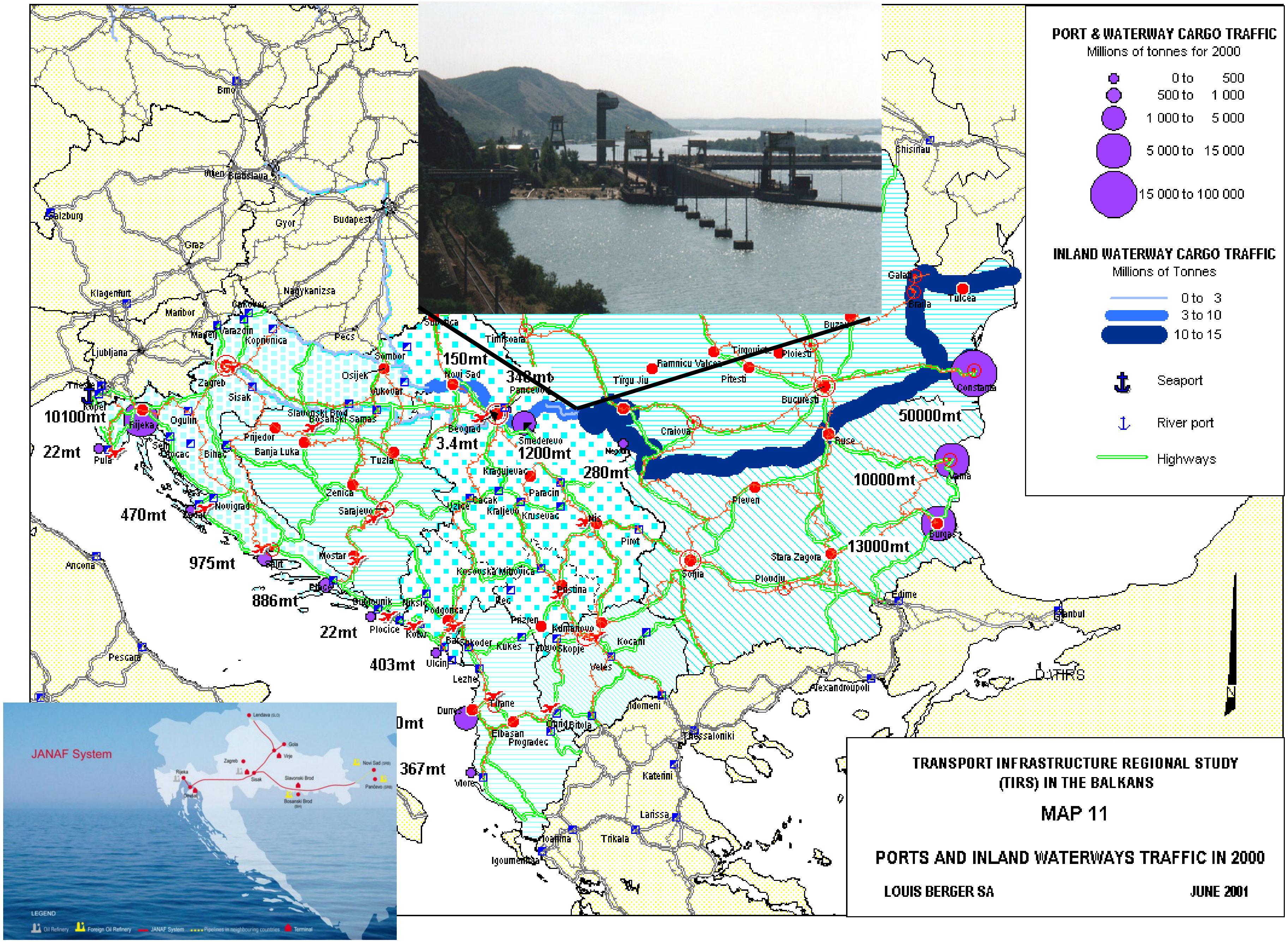
Source: Platts

Environmental challenges

- Large Combustion Plant Directive and alike
- Climate change
- Liquid fuel standards
- Civil society

Market opening

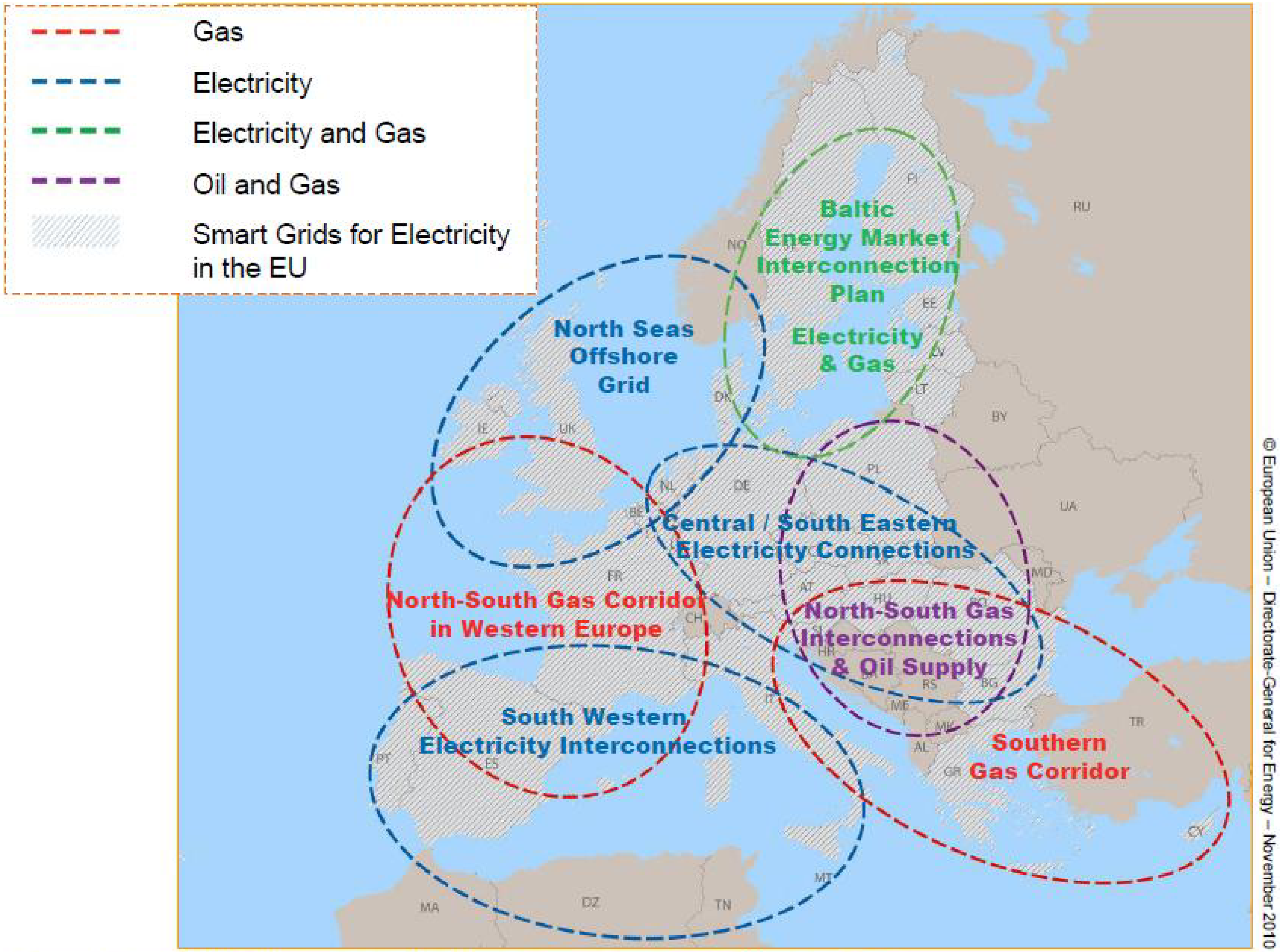
- Physical openness
- Ports and land based infrastructure
- Danube,
- Suez channel
- Transport fuels
- Size of ships


PORT & WATERWAY CARGO TRAFFIC
Millions of tonnes for 2000
0 to 500
500 to 1 000
1 000 to 5 000
5 000 to 15 000
15 000 to 100 000
INLAND WATERWAY CARGO TRAFFIC
Millions of Tonnes
0 to 3
3 to 10
10 to 15
Seaport
River port
Highways
10100mt
22mt
470mt
975mt
886mt
22mt
403mt
367mt
150mt
340mt
3.4mt
1200mt
280mt
50000mt
10000mt
13000mt
JANAF System
LEGEND
TRANSPORT INFRASTRUCTURE REGIONAL STUDY
(TIRS) IN THE BALKANS
MAP 11
PORTS AND INLAND WATERWAYS TRAFFIC IN 2000
LOUIS BERGER SA
JUNE 2001

“New” infrastructure emerging

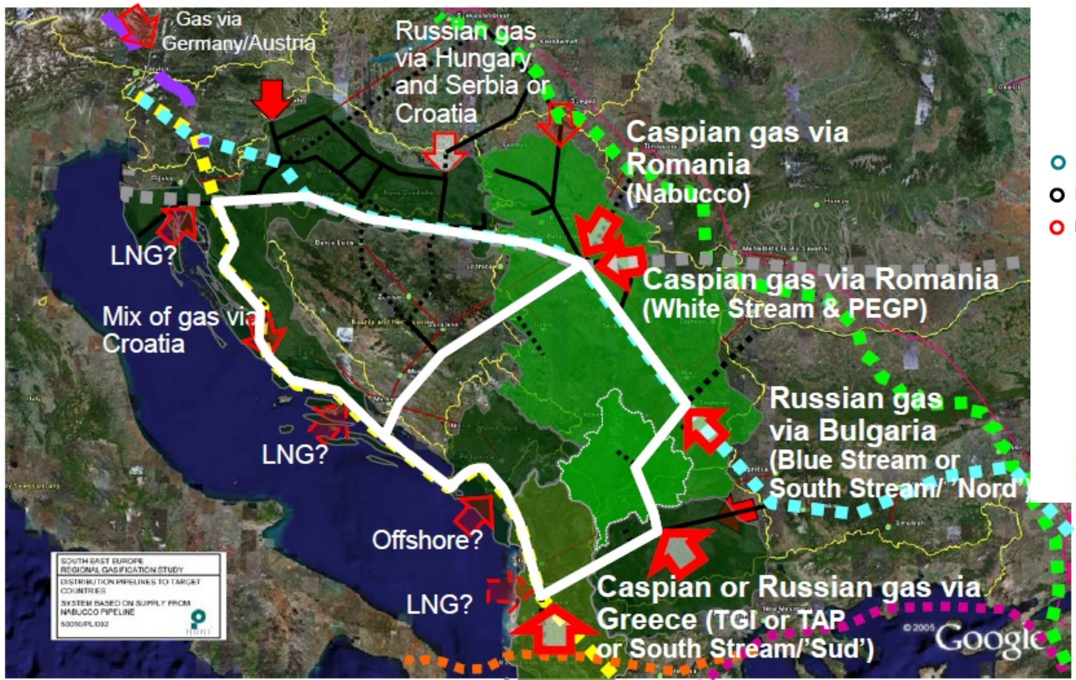
- Ports
- Pipelines
- Re-use and retrofit of infrastructure (high voltage lines, pipelines, sites)
- New railway technologies
- New tunnel technologies
- New shipping and inland shipping technologies
- Gas transport (and bulk transport in general)

European TEN E priority corridors

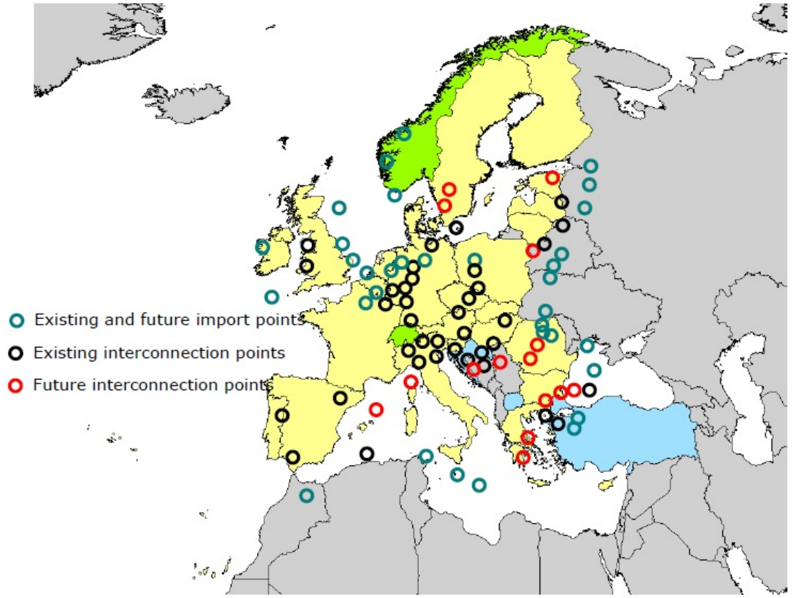


Presentation of J.M. Barroso to the European Council, 4 February 2011

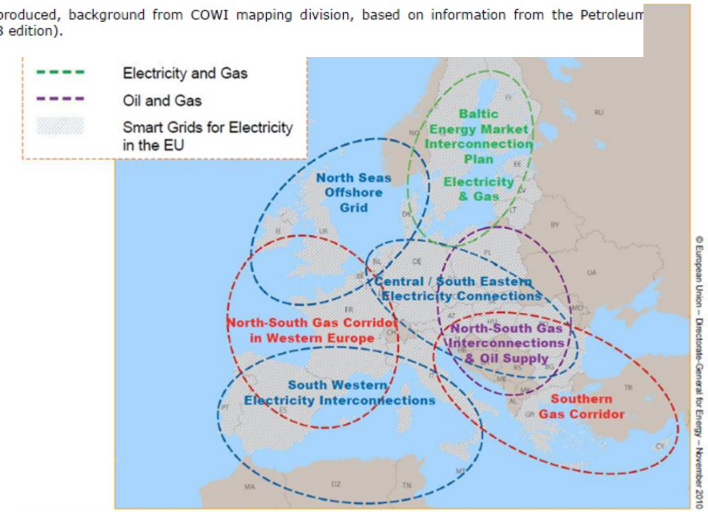
Western Balkan gas ring in the European context



SOURCE : ECA, SEE Regional Gasification Study *World Bank and KfW*



Source: COWI produced, background from COWI mapping division, based on information from the Petroleum Economist, (2008 edition).

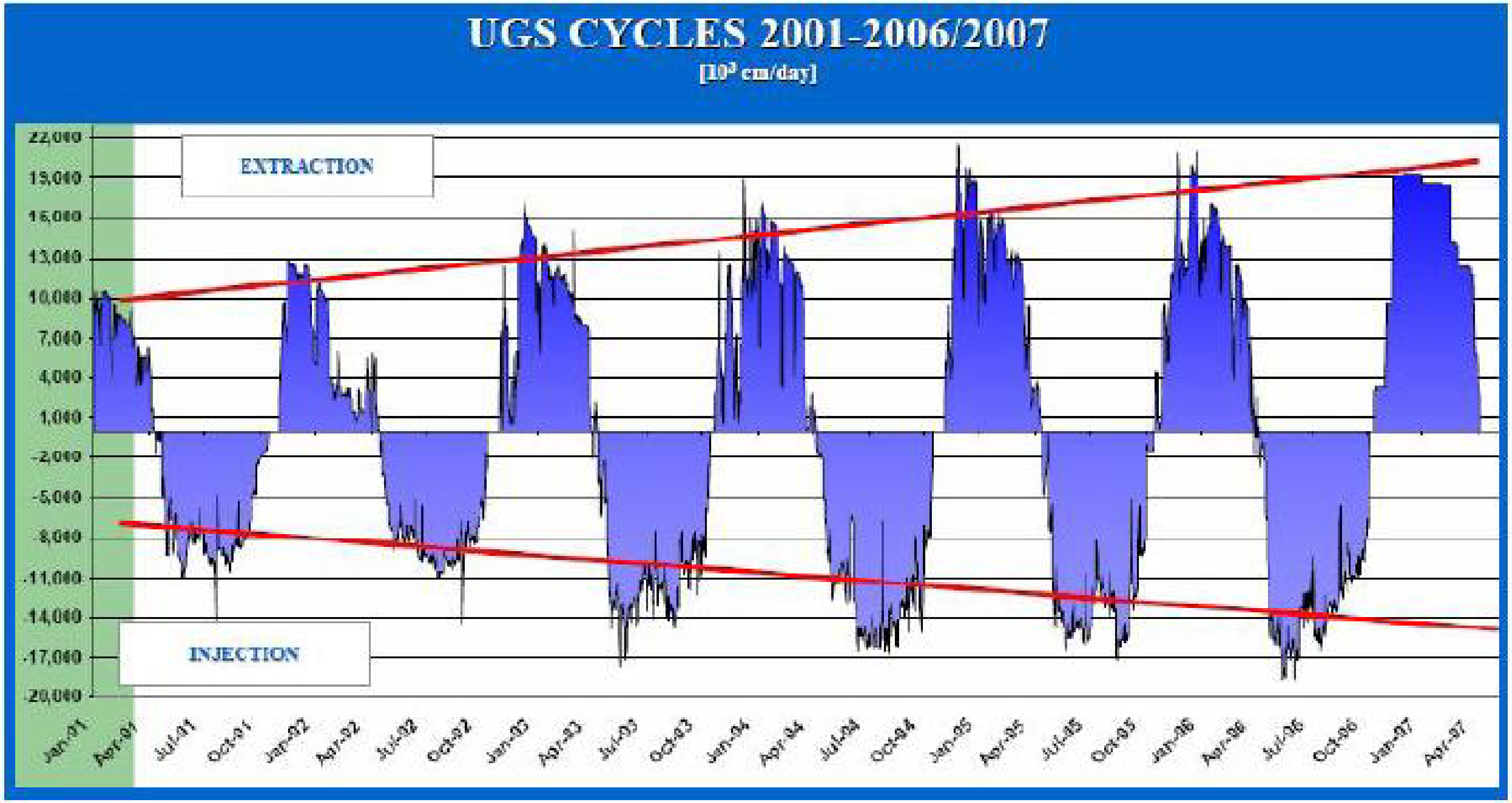


Presentation of J.M. Barroso to the European Council, 4 February 2011

Security of Supply

- External risks and shocks
- Latent and long term risk
- EU security of supply arrangements
- Nexus between energy and transport
- Maintenance and age of infrastructure
- Cost
- Emerging energy poverty

Growing weather sensitivity in gas demand

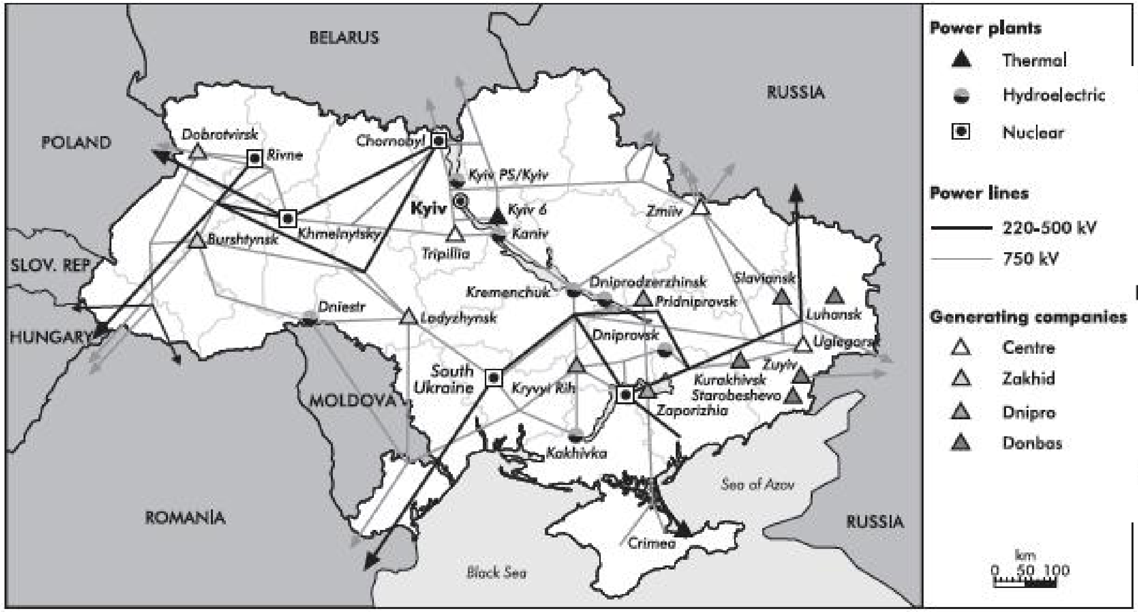


Source: Florian Tobescu, Storage Facilities in Romania, Presentation to the Energy Community Treaty Mini Gas Forum, May 11, 2007

Shocks

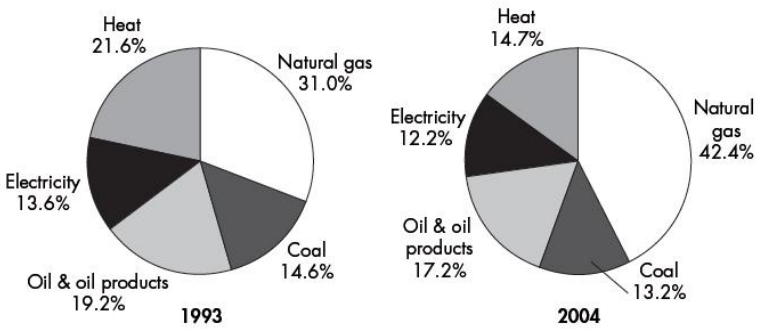
- Historical shocks (Ukraine 2006, Ukraine 2009, USA shale gas, Fukushima, Arab Spring, Iraqi war)
- International emergency management
- Price shocks
- Natural disasters and weather shocks (draught in Balkans 2011, earthquakes, Winter 2013/2014, etc)
- Regulatory shocks
- Political turmoil
- Renewable energy

Ukrainian Power Network

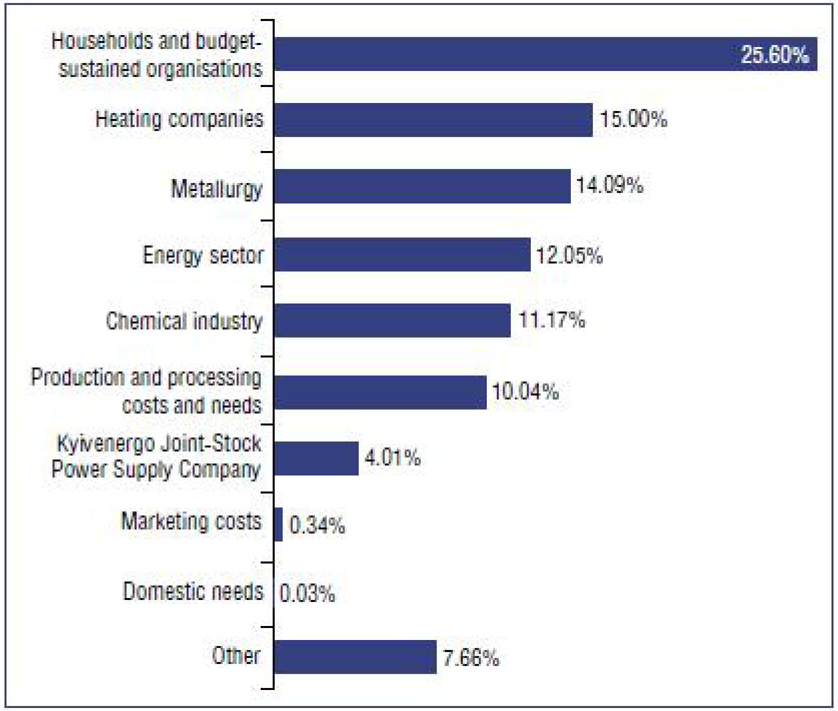


Source: EBRD.

Total Final Energy Consumption by Fuel, 1993 and 2004



Source: IEA statistics.



Zaporzhskaya TPP:
4x300MWe (coal) + 3x800MWe (gas)

Gas fired electricity generation is embedded into existing coal fired power plants in form of very large (800MWe!) gas fired steam cycle units

Location of major TPPs and district heating systems – excessive gas demand - is away from underground storages

Зміна режиму роботи ГТС ДК "Укртрансгаз"

07.01.2009 10:00 (млн. куб. м/добу)

1000 м. куб. м/год * 24 год