Polish Oil & Gas Company (PGNiG SA) Headquarters - 25 M. Kasprzaka Street, 01-224 Warsaw, Poland Phone: +48 22 589 45 55 Fax: +48 22 691 82 73 http://www.pgnig.pl/	UNECE Palais des Nations 1211 Geneva 10 Switzerland Tel : +41 22 9172446 Fax : +41 22 917 0430 www.gascentre.unece.org

4th Meeting of the UNECE Gas Centre Task Force on Supply, Infrastructure and Markets (SIM)

Instytut Studiów Energetycznych

Andrzej Sikora

Warsaw, March 30th, 2011

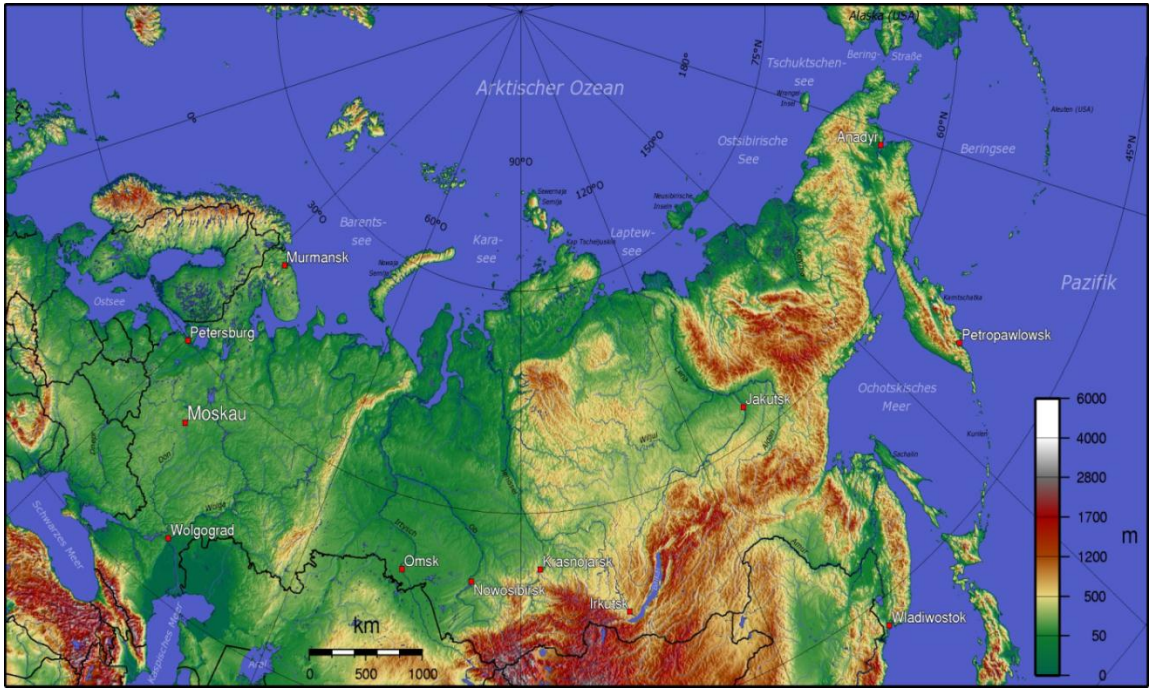
Disclaimer

The information on which this presentation is based derives from our own experience, knowledge, data and research. The opinions expressed and interpretations offered are those of Energy Studies Institute and have been reached following careful consideration. However, the Oil&Gas business is characterized by much uncertainty and all of our comments and conclusions should be taken in that light. Accordingly, we do not accept any liability for any reliance which our clients may place on them.

The plan of the workshop

„strengthen on new and arguable statements with highlights on Poland".

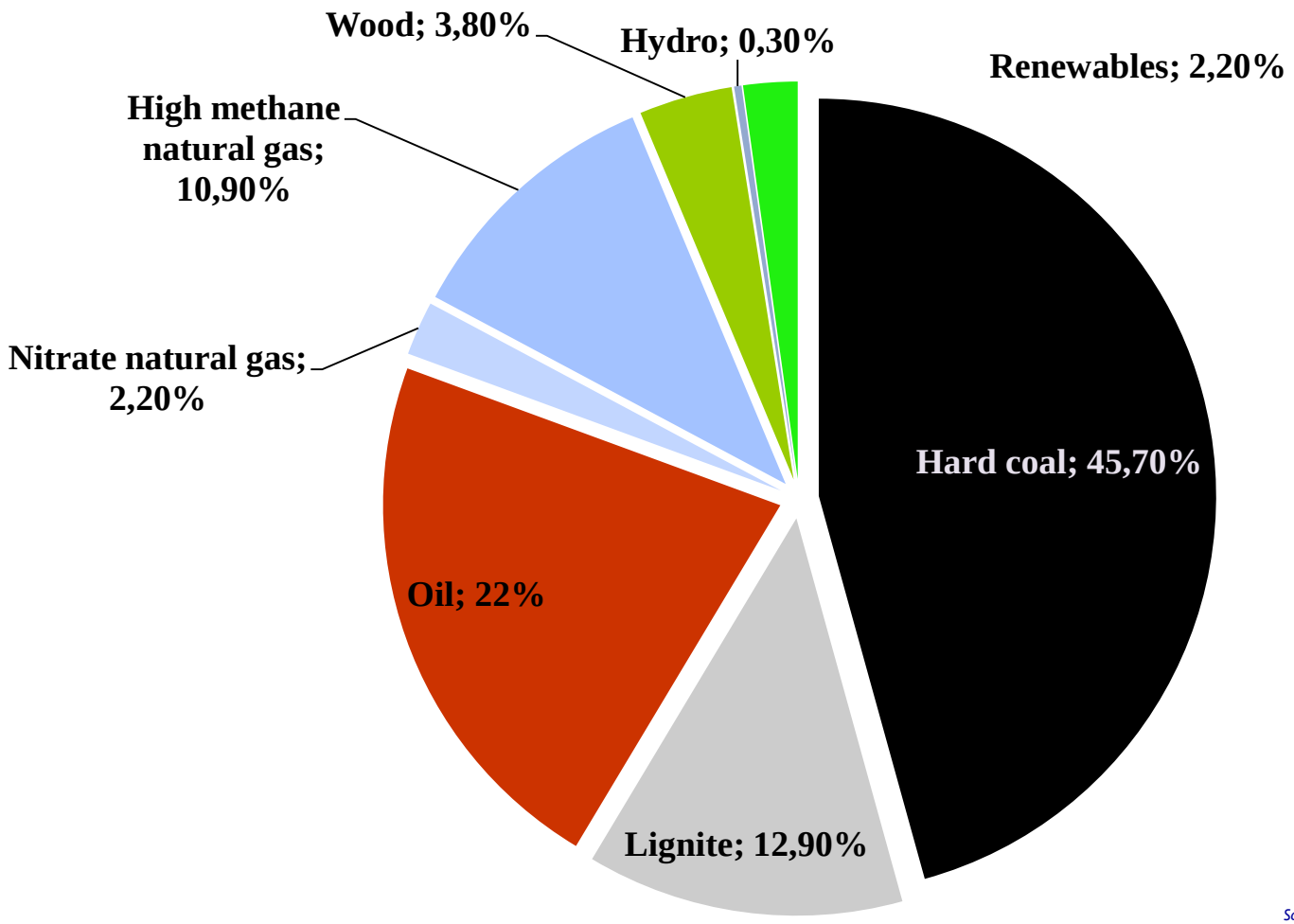
- ✓ Does Poland need to revise Energy Policy?
- ✓ EU-RUSSIA ENERGY DIALOG based on mismatched forecasts…
- ✓ Do we observe new Russian Energy Policy ?
- ✓ Why EU-27 is not still ready for common European Gas Strategy ?



Source: www.russiamap.org

- ✓ Europe's (The NEW Entrants) need for transparent gas pricing .
- ✓ Will unconventional gas break the trend and Poland is ready to lead the European quest for gas independence?

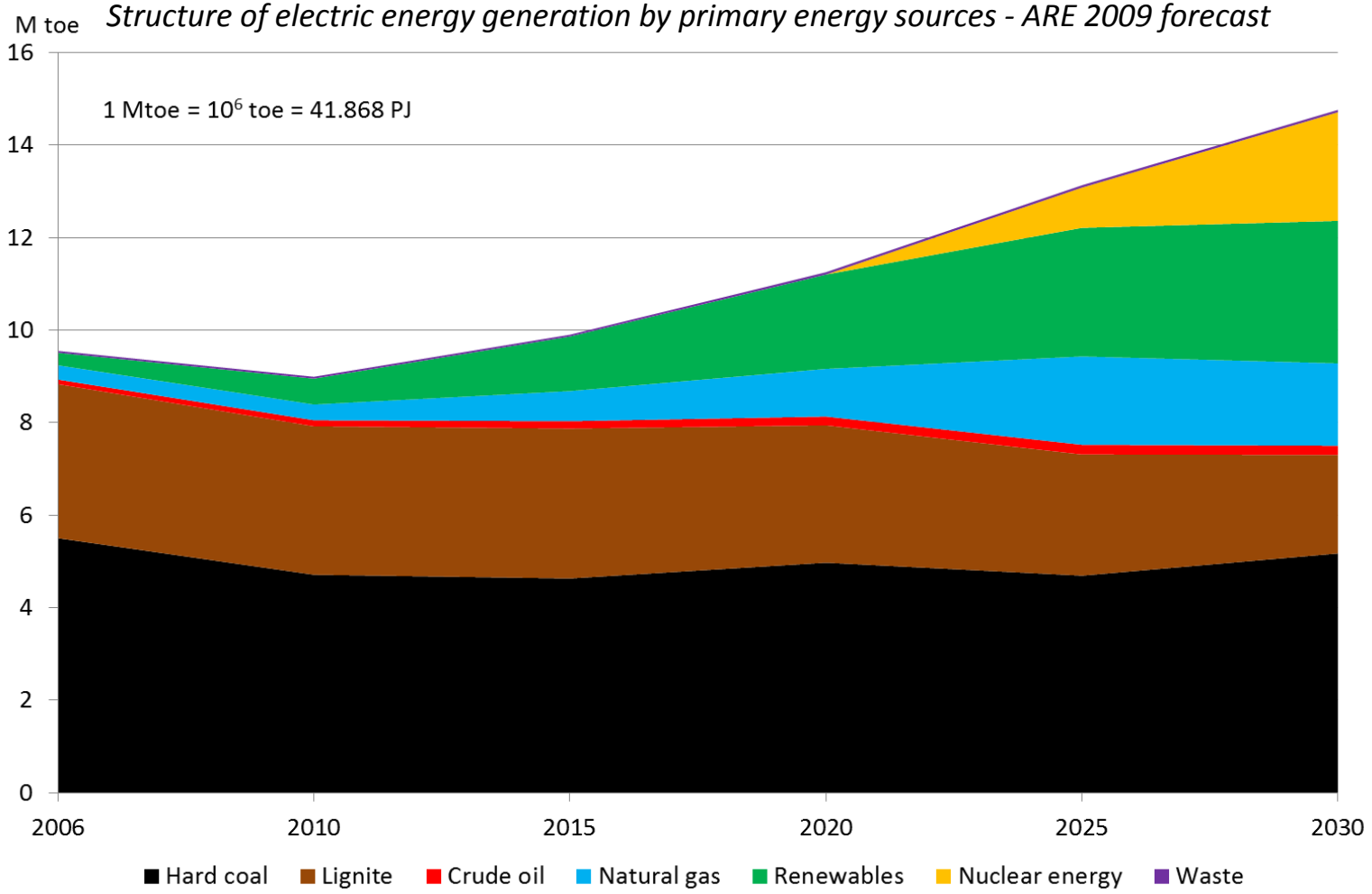
Structure of the primary energy consumption, Poland 2009.



Source: Miinistry of Economy.2011

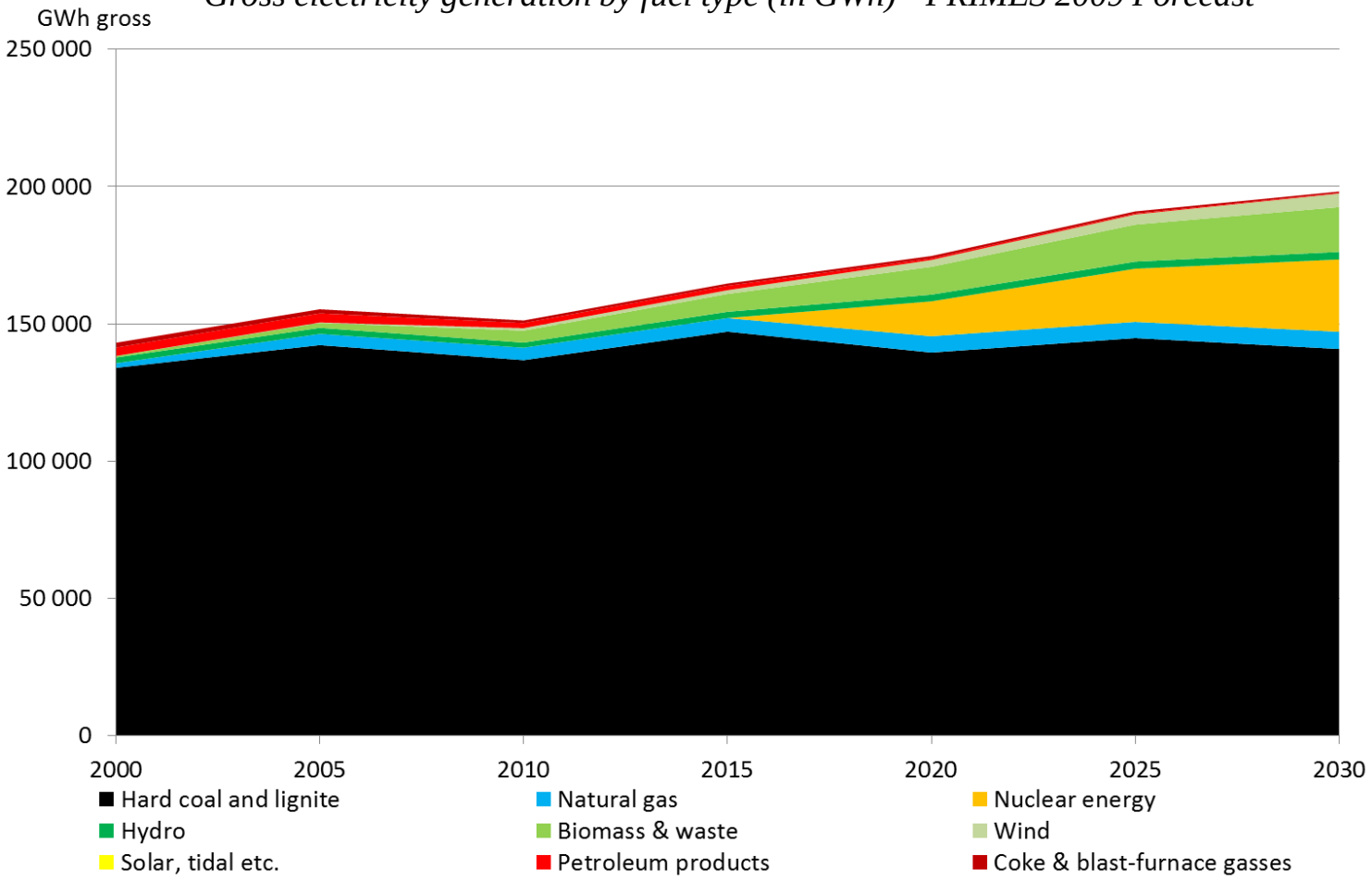
Historical and planned electrical energy generation

Structure of electric energy generation by primary energy sources - ARE 2009 forecast



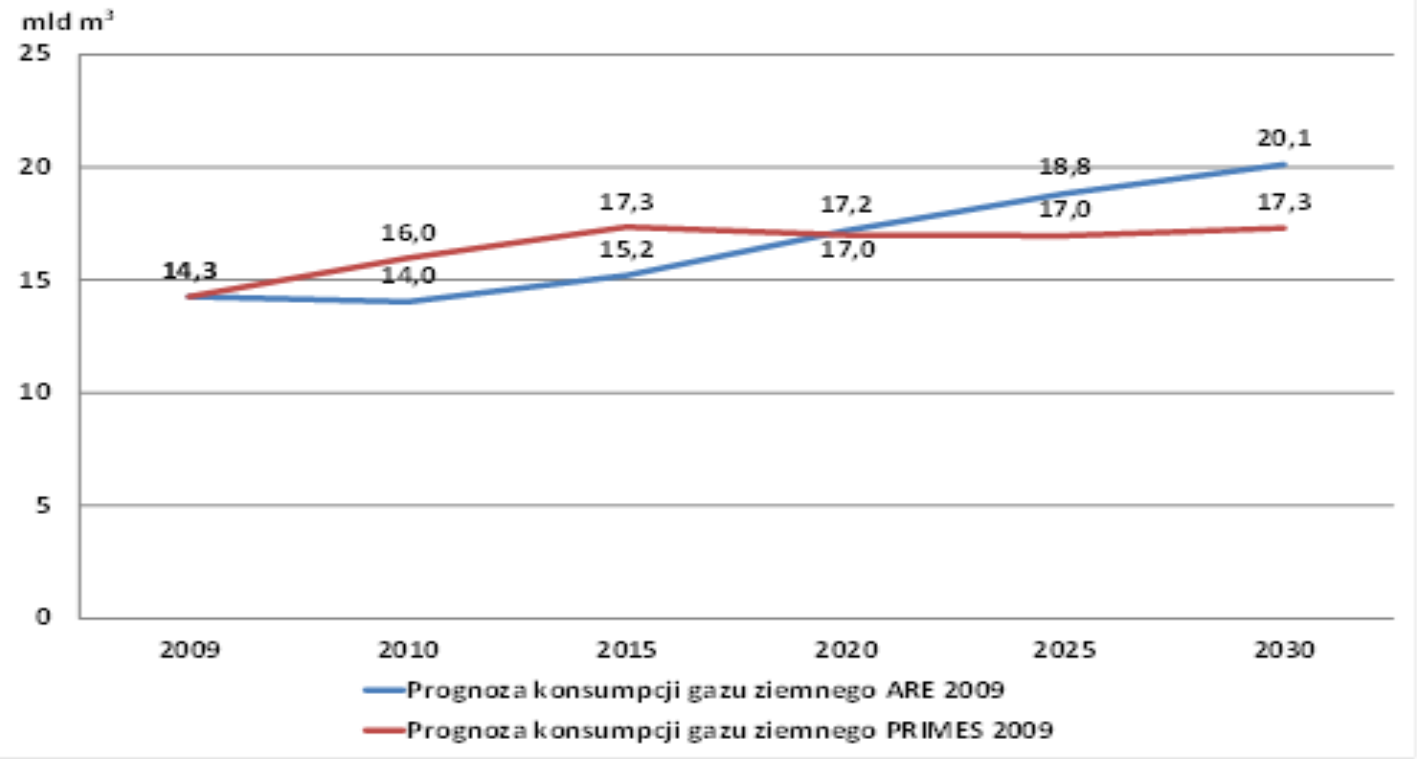
Historical and planned electrical energy generation

Gross electricity generation by fuel type (in GWh) - PRIMES 2009 Forecast



Gas consumption forecasts in Poland.

Source: **Model PRIMES Baseline 2009, Fuel and energy demand forecast for Polish market until 2030, Energy Market Agency, March 2009.**



[1] Volumes in mln toe are recalculated into mld m^3 where burning heat is equal to 37,7 MJ/m^3, ARE forecast was based on burning heat ratio 35,5 MJ/m^3, so all data in ARE's projections are 6% higher.

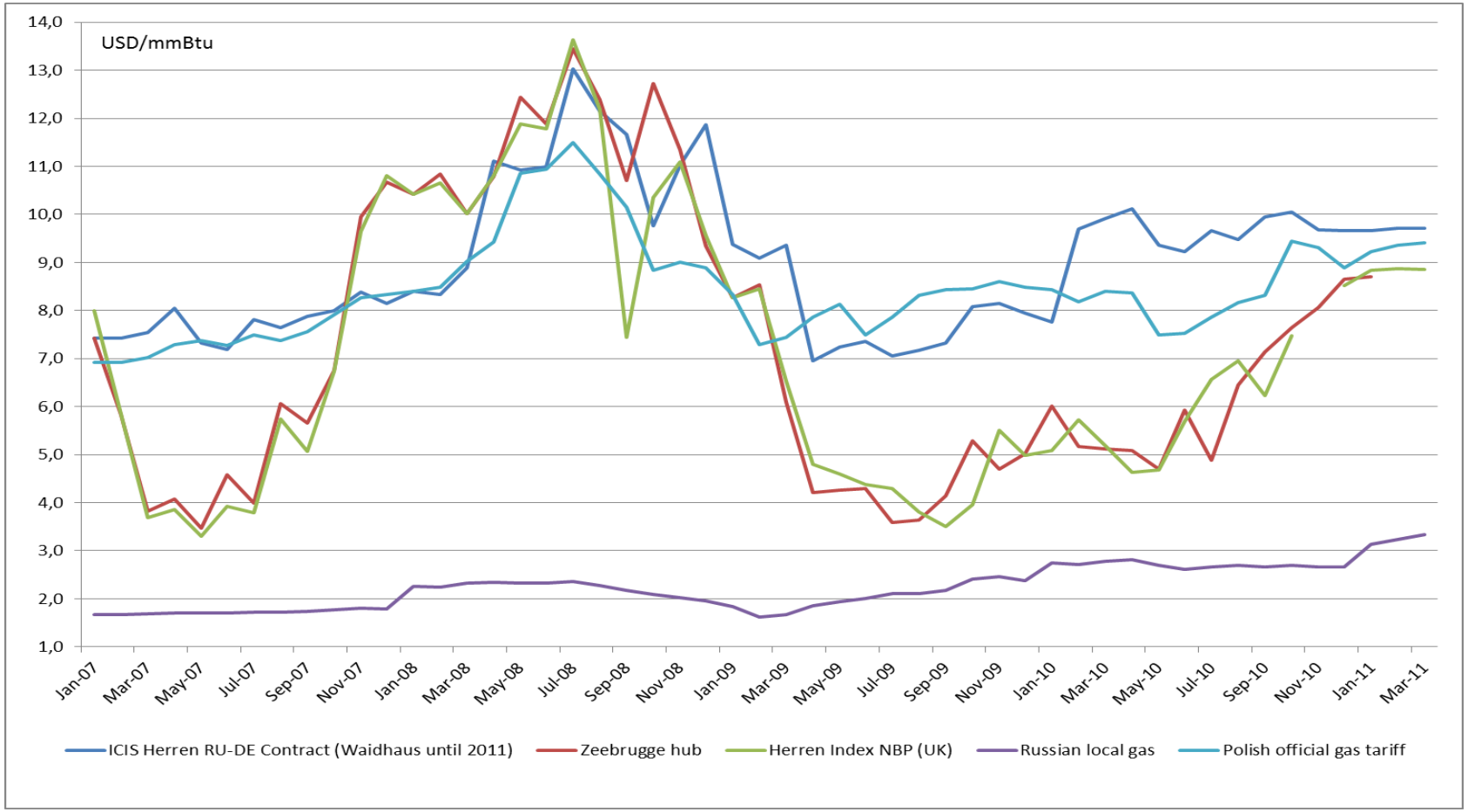
Comparison of natural gas (netto) forecasts for production, consumption and import (Poland)[1]:

Volume / Forecast mld m³	2007	2010	2015	2020	2025	2030
Natural gas production Baseline 2007	4,33	3,56	3,44	3,33	3,11	3,00
Natural gas production ARE 2009	4,33	4,48	4,63	4,63	4,63	4,63
Natural gas production Baseline 2009	4,33	3,56	3,44	3,33	3,11	3,00
Natural gas consumption Baseline 2007	13,75	15,68	18,60	21,21	23,72	25,90
Natural gas consumption ARE 2009	13,75	13,33	14,44	16,33	17,89	19,11
Natural gas consumpotion Baseline 2009	13,75	15,17	16,48	16,14	16,12	16,44
Natural gas import netto Baseline 2007	9,17	12,12	15,15	17,88	20,61	22,90
Natural gas import netto ARE 2009	9,17	8,92	9,94	11,60	13,37	14,53
Natural gas import netto Baseline 2009	9,17	11,62	13,04	12,81	13,01	13,44

Source: Own ISE calculation based on PRIMES Baseline 2009 & Baseline 2007 & Agencja Rynku Energii.

[1] Volumes in mln toe are recalculated into mld m³ where burning heat is equal to 37,7 MJ/m³, ARE forecast was based on burning heat ratio 35,5 MJ/m³, so all data in ARE's projections are 6% higher.

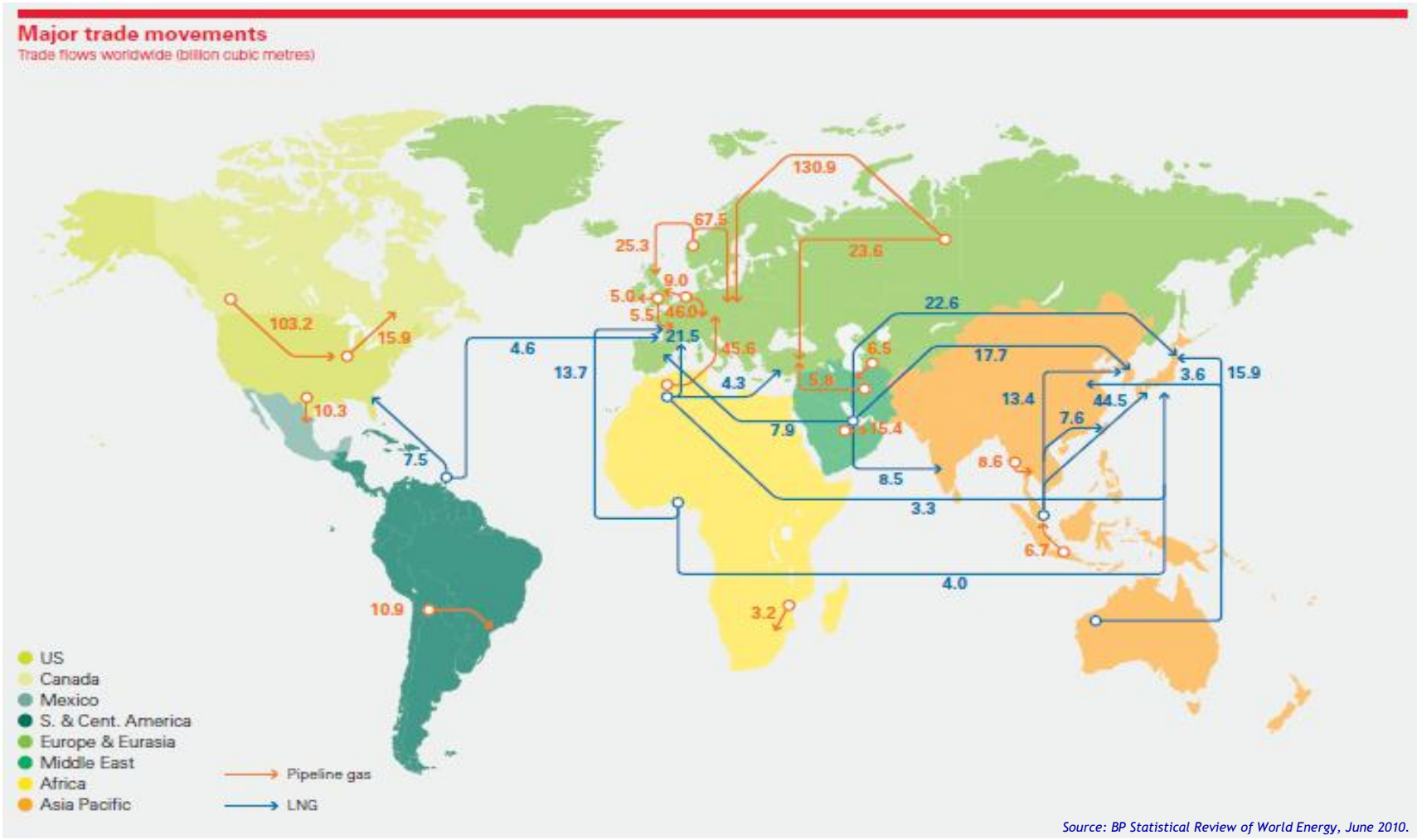
Natural gas prices Poland vs. UE
Russian domestic gas 2011



Source: Fertilizers Europe

Major trade movements

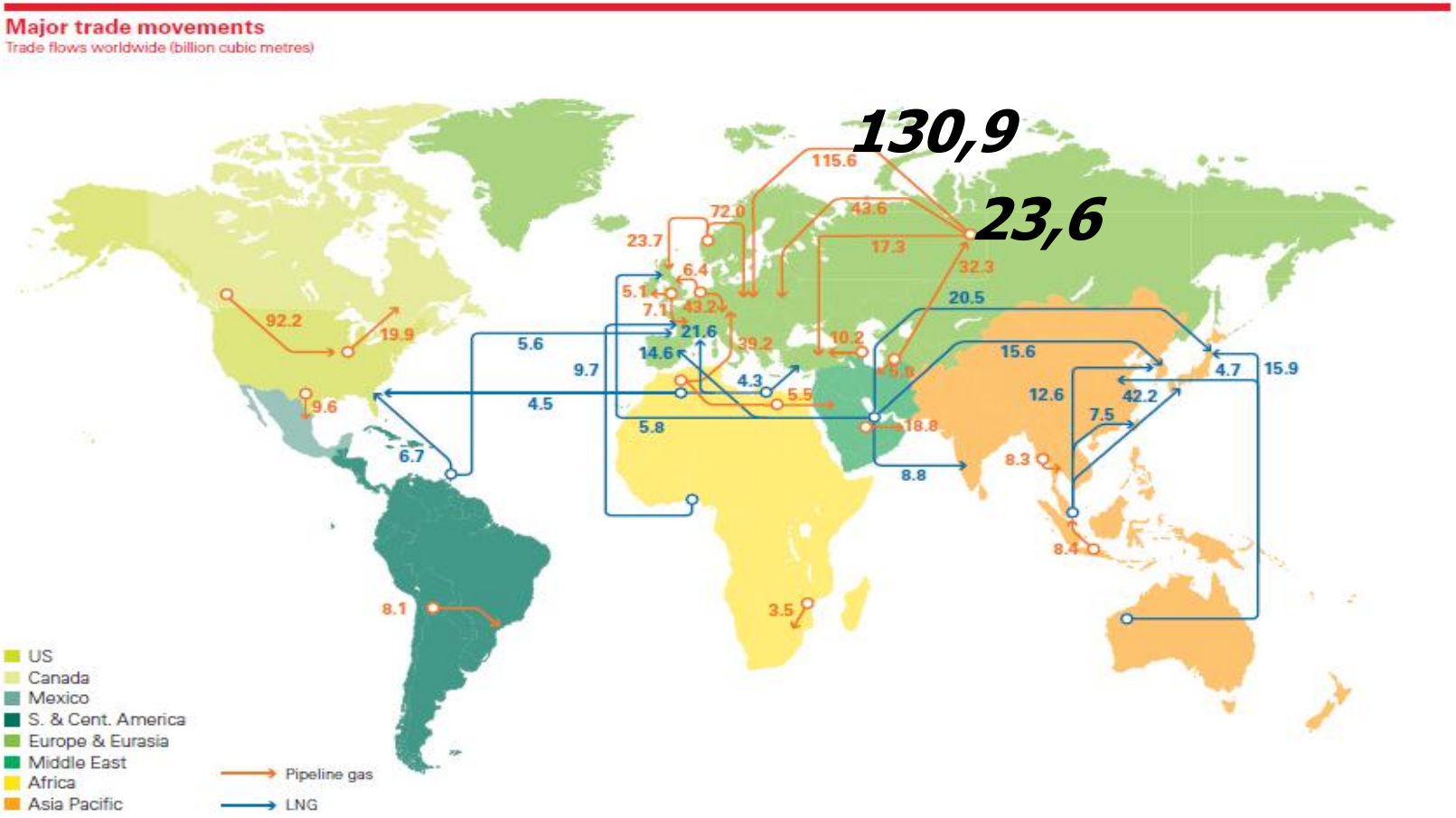
trade flows worldwide (bcm)



Source: BP Statistical Review of World Energy, June 2010.

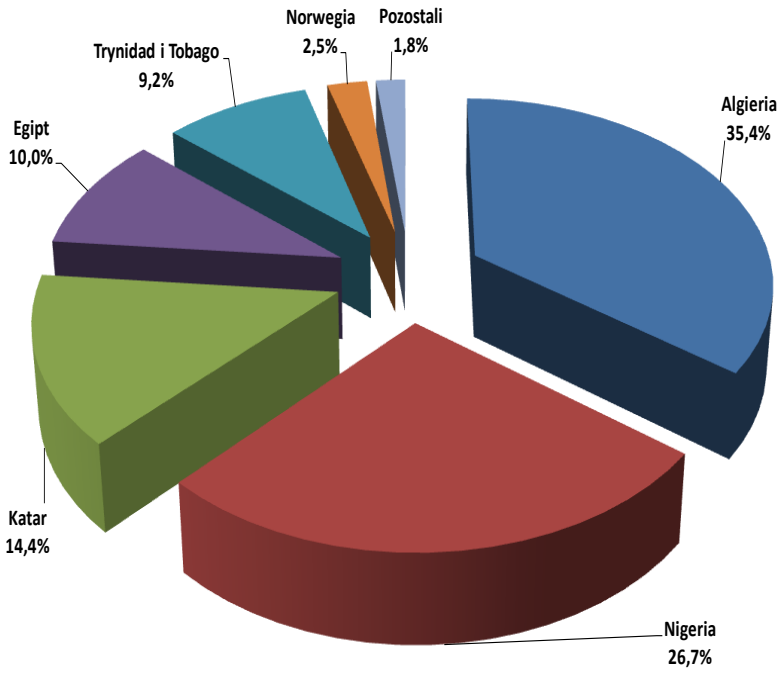
Major trade movements

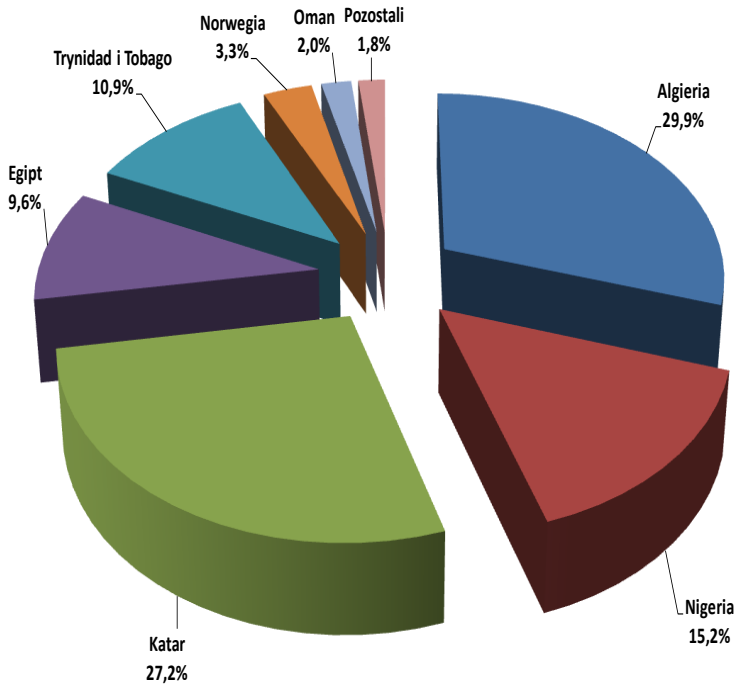
trade flows worldwide (bcm)



Source: BP Statistical Review of World Energy, June 2009/2010.

Structure of the LNG deliveries to the UE 2008/2009



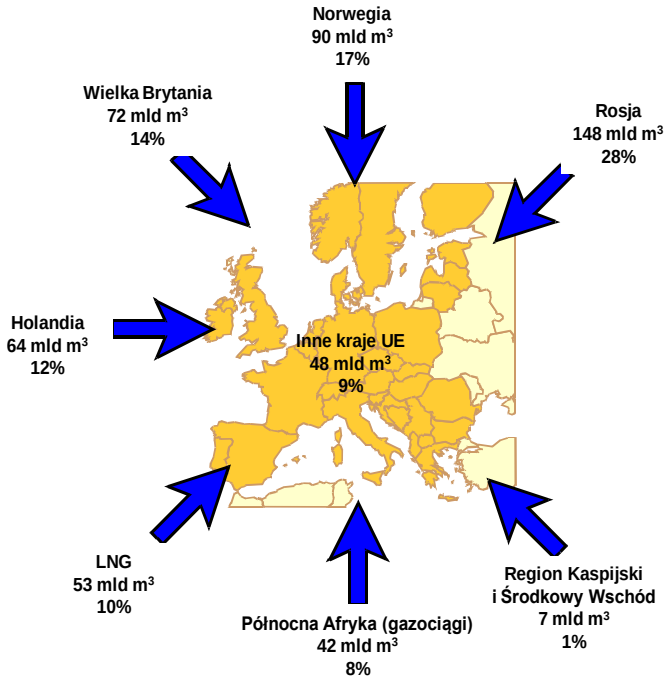


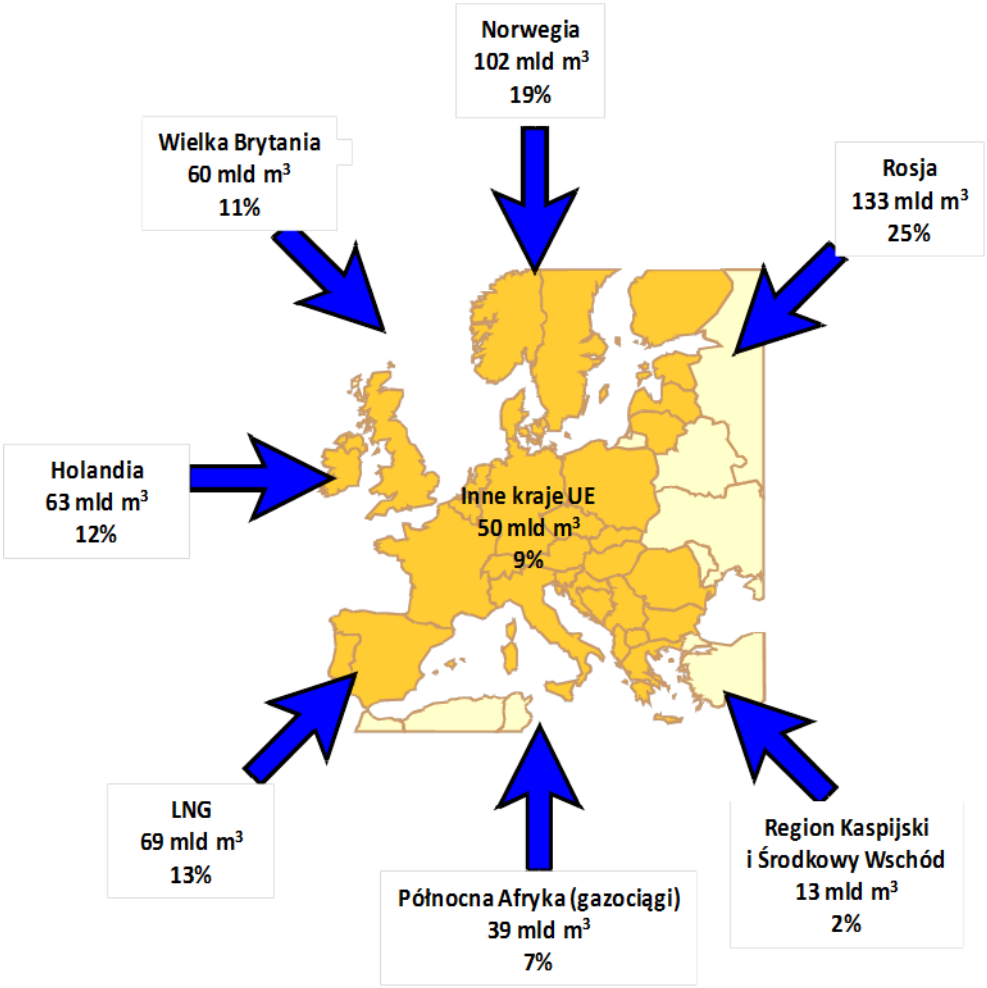
Arbitrage occurs and spot LNG is being directed to the best paying market (adjusted for transport costs).

Source: Own calculation based on CERA, Mai 2010 and BP Statistical Review of World Energy, June 2010.

Sources for natural gas deliveries to Europe (2008/2009)

„we need to come back to rudiments …"





Source: Own calculations based on BP Statistical Review of World Energy 2008/2009

Consumption forecasts – mismatched ?

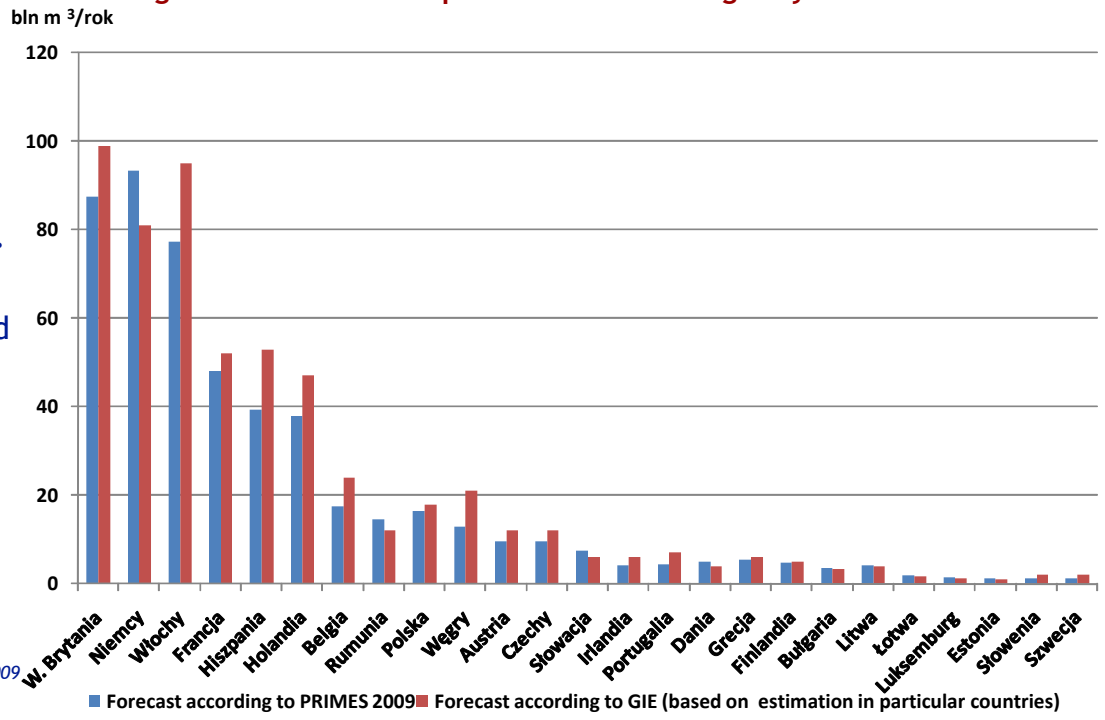
- **Main sources of the forecasts:**
  - New version of the PRIMES model (Baseline 2009) **dated Aug.5th, 2009,**
  - Consumption forecasts and own production from *„Infrastructure Europe GTE+ Demand Scenarios vs. Capacity Report"* June 2009, have been prepared by the member countries based on their own internal's documents and forecasts (energy policies, emergency and contingency actions, infrastructure development plans etc.).

- In our opinion the forecast adopted to the new PRIMES model could be too low. For example in 2015 total consumption of the natural gas for the EU-27 is predicted to the level of 535 bln m^3, when we have already consumed in 2008 ca. 515 bln m^3. The Member States own estimations show that consumption in **2015 will be 575 bln m^3.**

- Having on mind security of the supply we need to use and adopt higher level of the forecast.

- Higher estimation and higher parameters are more secure in the prognosis.

Prognosis of the consumption of the natural gas by the EU-27 in 2015



Source: Own calculation based on data from PRIMES MODEL (Baseline 2009), Aug 5th, 2009 and GTE+ Demand Scenarios vs. Capacity Report, July 31st, 2009.

Possible sources of natural gas supply for Europe

(bcm) mld m³	2007	2008	2010	2015	2020	2025	2030
Internal production (low scenario)	186,0	184,6	184,2	**142,5**	**127,9**	**108,1**	**93,3**
Internal production (base scenario)	186,0	184,6	184,2	**142,5**	**127,9**	**108,1**	**93,3**
Import:							
Norway (low scenario)	90,6	92,8	96,8	**102,5**	101,1	97,7	90,6
Norway (base scenario)	90,6	92,8	98,2	**110,7**	110,1	103,2	91,7
Russia (low scenario)	148,0	151,4	163,0	**132,3**	**121,1**	**125,1**	122,7
Russia (base scenario)	148,0	151,4	167,2	**170,8**	**183,8**	**216,0**	231,6
Caspian Region & Middle East (low scenario)	7,4	12,2	7,0	**10,0**	10,0	10,0	13,6
Caspian Region & Middle East (base scenario)	7,4	12,2	7,0	**10,3**	16,4	15,2	19,1
North Africa pipelines (low scenario*)	41,9	45,2	46,8	**55,7**	54,6	54,3	56,6
North Africa pipelines (base scenario*)	41,9	45,2	45,4	**55,5**	58,4	58,4	58,5
LNG (low scenario)	53,3	55,5	79,6	**105,1**	118,0	141,6	137,0
LNG (base scenario)	**53,3**	**55,5**	**73,1**	**110,9**	**142,7**	**173,9**	**175,4**
Total :law scenario	527,2	541,7	577,5	**548,1**	532,8	536,8	513,8
TOTAL base scenario	527,2	541,7	575,2	**600,7**	639,4	674,8	669,6

* For North Africa countries supply: low scenario shown in above was originally as a base scenario because of much higher production and base scenario was originally low scenario (much lower production estimation).
Such assumption was taken to have better comparison and cohesion with forecasts from other directions.

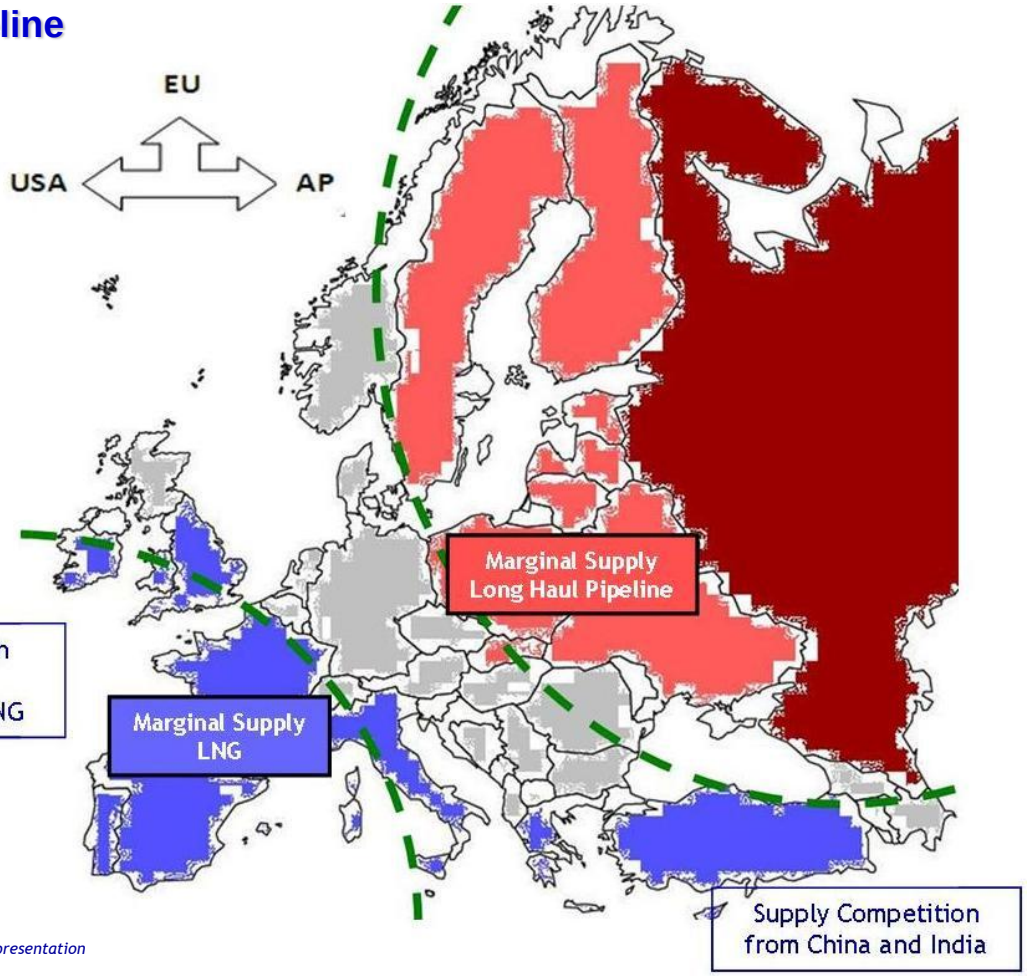
Source: Own estimations based on PRIMES Baseline 2009; CERA forecasts; BP Statistical Review of World Energy (data for 2007, 2008, 2009).

Price arbitrage LNG vs. Pipelines

(supply competition has an effect on price movements)

LNG vs. Long Haul Pipeline
2020

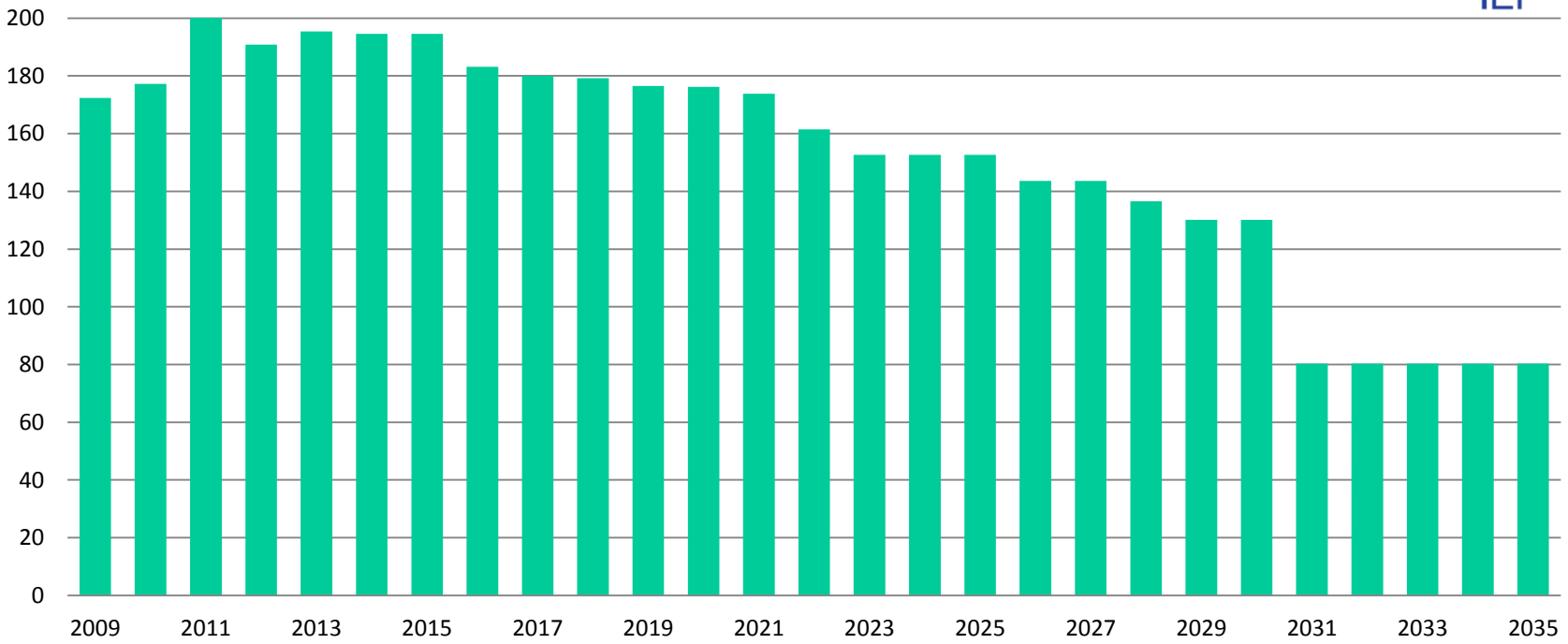
Supply Competition will have an effect on price movements (increased arbitrage)



Source: Own graph based on Shell presentation

Long-term basis for interdependence

Gazprom: European long-term contracts.



- ✓ **Gazprom has supply** (mainly "Take-or-pay") **contracts till 2037.**
- ✓ **Russia can redirect part of gas flows to the East Asia or create gas-chemistry industry but it needs a lot of time and investments.**

Sources: Gazprom, IEF estimate, M.Belova

Russia

Russian Oil and Natural Gas at a Glance

Oil	2006
Oil reserves	80 billion barrels
Oil reserves, as percentage of world	7 percent
Saudi Arabian reserves	264 billion barrels
US reserves	30 billion barrels
Oil production	10 million barrels per day
Oil production, as percentage of world	12 percent
US oil production	7 million barrels per day
Oil exports	7 million barrels per day
Oil exporter, rank	2
Oil exports, to US	370,000 barrels per day

Natural Gas	2006
Gas reserves	48 trillion cubic meters
Gas reserves, as percentage of world	26 percent
Iranian reserves	28 trillion cubic meters
US reserves	6 trillion cubic meters
Gas production	612 billion cubic meters
Gas production, as percentage of world	21 percent
US gas production	524 billion cubic meters
Gas exports	263 billion cubic meters
Gas exporter, rank	1
Gas exports, to Europe	151 billion cubic meters

The 3rd package* in natural gas sector

„The 3rd package of measures adopted by the Commission will ensure that all European citizens can take advantage of the numerous benefits provided by a truly competitive energy market.

Consumer choice, fairer prices, cleaner energy and security of supply are at the centre of the third legislative package, adopted by the Commission on 19 September 2007.

In order to reach those goals, the Commission proposes:

- ✓ *to separate production and supply from transmission networks,*
- ✓ *to facilitate cross-border trade in energy,*
- ✓ *more effective national regulators,*
- ✓ *to promote cross-border collaboration and investment,*
- ✓ *greater market transparency on network operation and supply,*
- ✓ *increased solidarity among the EU countries."*

* DIRECTIVE 2009/73/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC.

Source: http://ec.europa.eu/energy/gas_electricity/third_legislative_package_en.htm

ISSUES for Russia – EU Relations in gas sector

GAZPROM

28.08.2009
RELEASE

- **3rd Energy (GAS) Directive* & Regulation issues – GAZPROM assets case.**
- **Gazprom needs real demand for new pipeline projects - stable forecast for future demand.**
  Task № 19: Increase the Russian gas export to European market:
  160 bcm in 2008
  120 bcm in 2009
  TARGET ⇨ 200 bcm in 2030
- **EU gas market forecast is strongly needed.**
- **Demand for EU ⇔ secure demand for Russian natural gas.**
  Task № 21: Promote the gas pricing system in Europe, including both long-term and spot contracts.
- **No external politics please!** (transit problems towards Ukraine and/or Belarus).
- **Bilateral investments in gas fields, pipelines, energy (NUCLEAR!) and access to end users.**
  Task № 22-23: Bilateral investment in gas projects.

* DIRECTIVE 2009/73/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC.

Source: www.gazprom.com; RIA Novosti, www.ft.com

EU-Russia WTO „gas formula" deal

„The representative of the Russian Federation confirms that producers/distributors operating on gas supplies to industrial users would operate to recover their costs (including cost of production, overheads, financial charges, maintenance and upgrade of extraction and distribution infrastructure, investment in the exploration and development costs of new fields) […] and would be able to make a profit, in the ordinary course of business."

(This is a commitment)

Source: Draft Working Party report, WTO ACCESSION OF RUSSIA, Q3 2004

- ✓ **2008 – 63,3 USD/1000m³**
- ✓ **2011 – 126,0 USD/1000 m³**

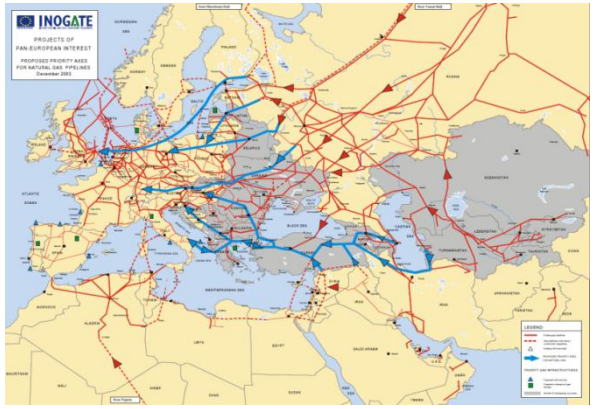
(no tariffs and transportation costs)

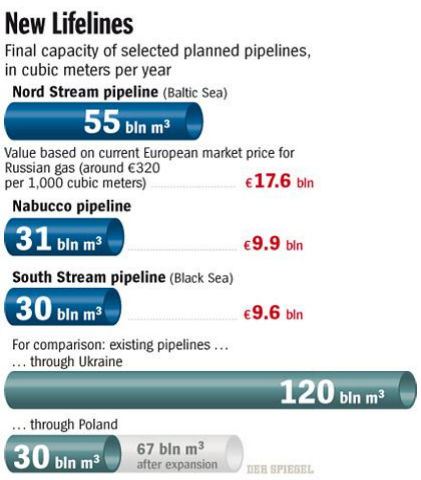
*„Some analysts have questioned whether it is in Moscow's economic interest to join the WTO, since there are **no tariffs** on its biggest export to the EU **- oil and gas**. But the EU policymakers believe the Kremlin has concluded that it needs membership in order to attract the foreign investment necessary to modernize its economy."*

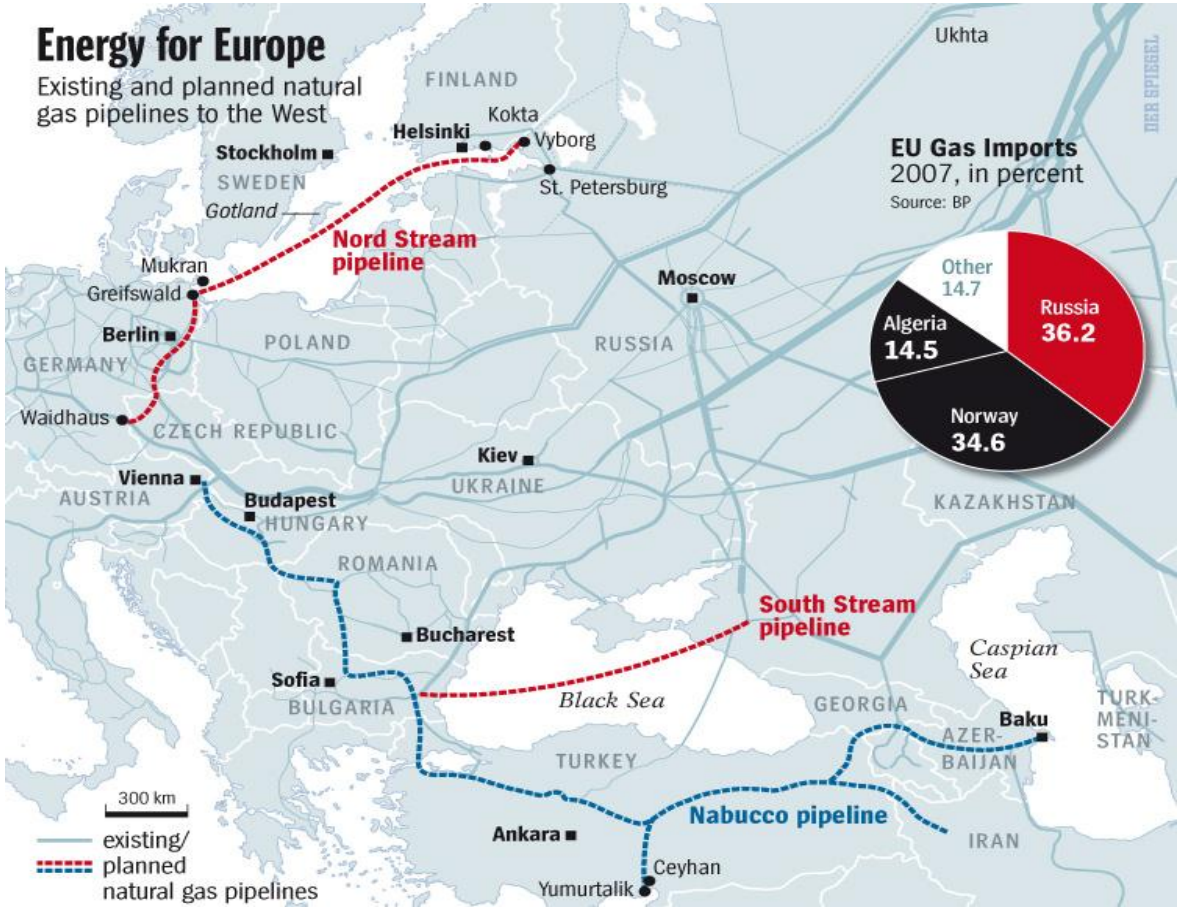
Source: Financial Times
(www.ft.com/cms/s/0/785eb542-f802-11df-8d91-00144feab49a.html)

Who dares duplicate the American unconventional gas revolution ?

Decisions on starting new transport routes construction

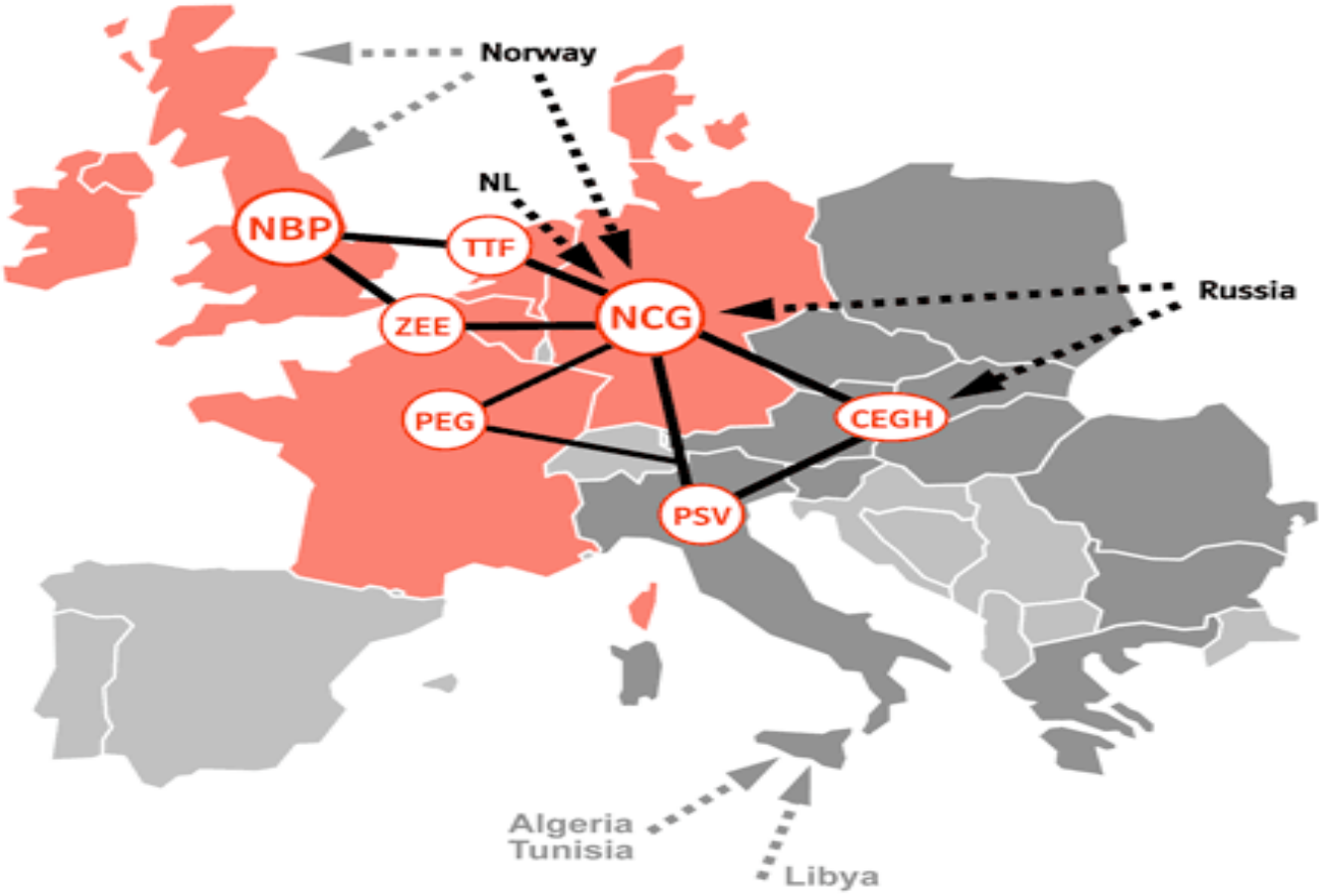






Source: Der Spiegel, 2009

Why EU-27 is not still ready for common European Gas Strategy ?

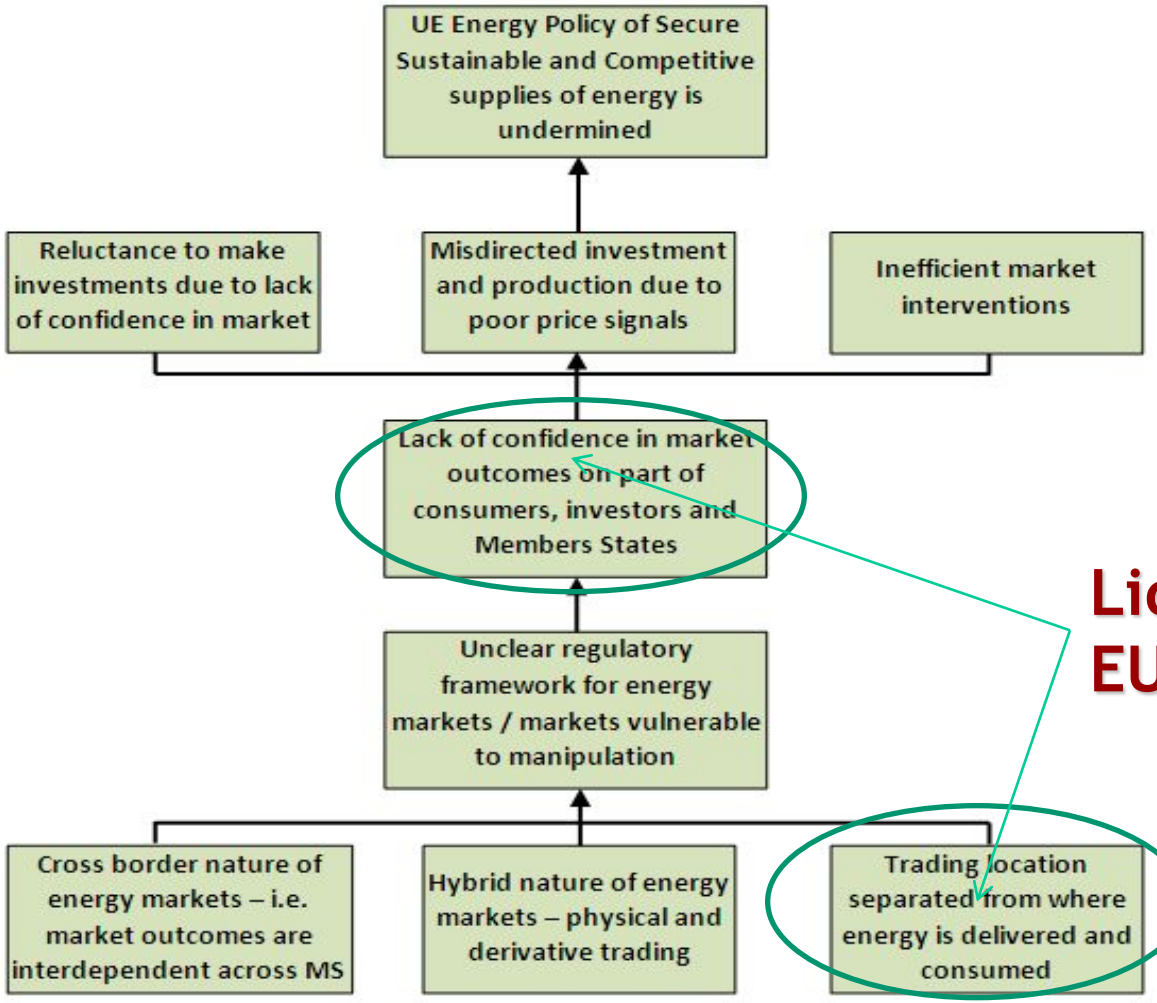


Source: www.eon-energy-trading.com

Progress of the key projects implemented by Gaz-System S.A.

Source: www.gaz-system.pl, GTE+ Demand Scenarios vs. Capacity report, July 2009 . ISE own estimation.

Common EUROPEAN gas strategy…

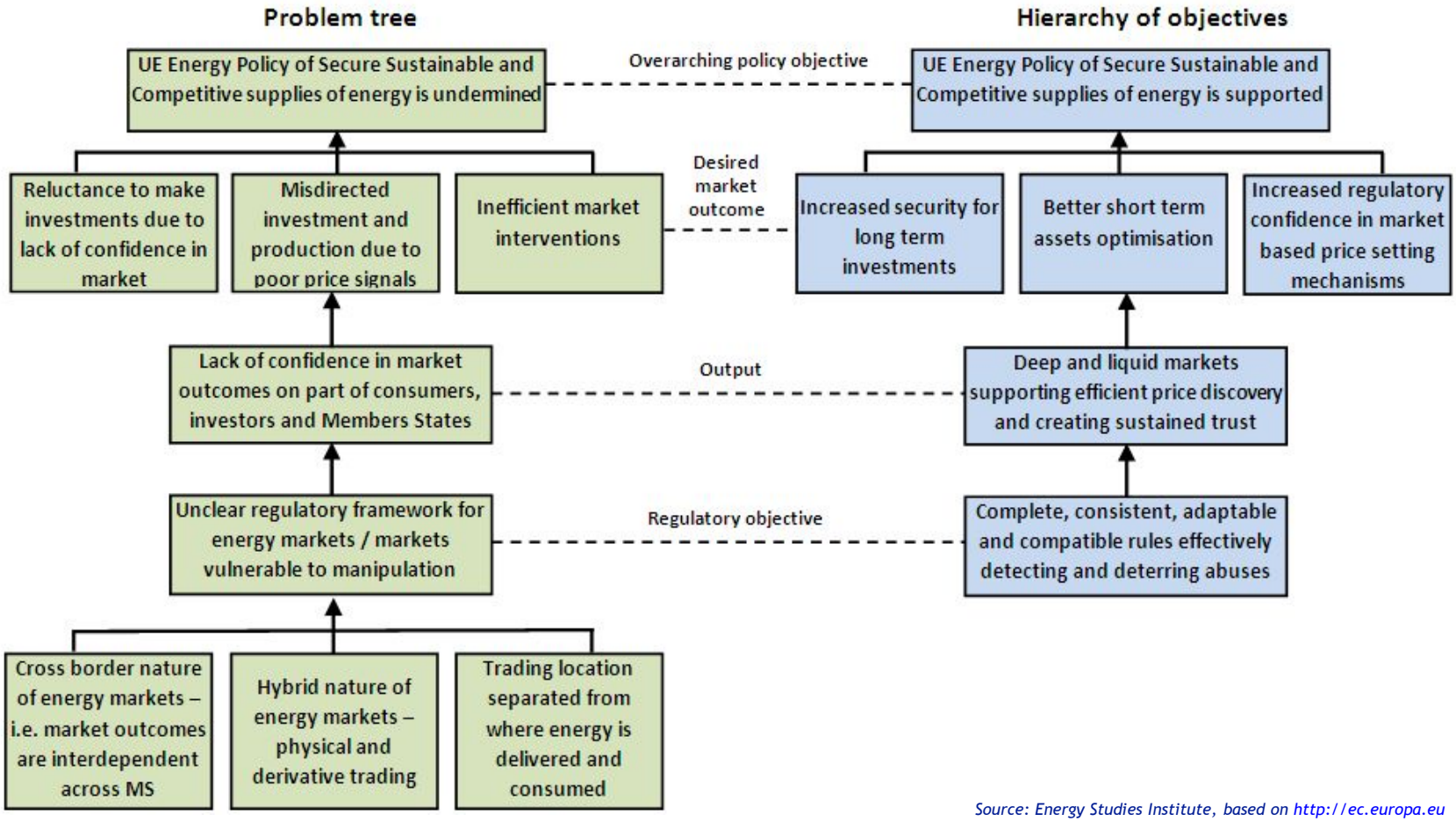


Liquid? EUROPEAN?

Source: Energy Studies Institute, based on http://ec.europa.eu

Common EUROPEAN gas strategy…

Deduction of Objectives from the Identified Problems

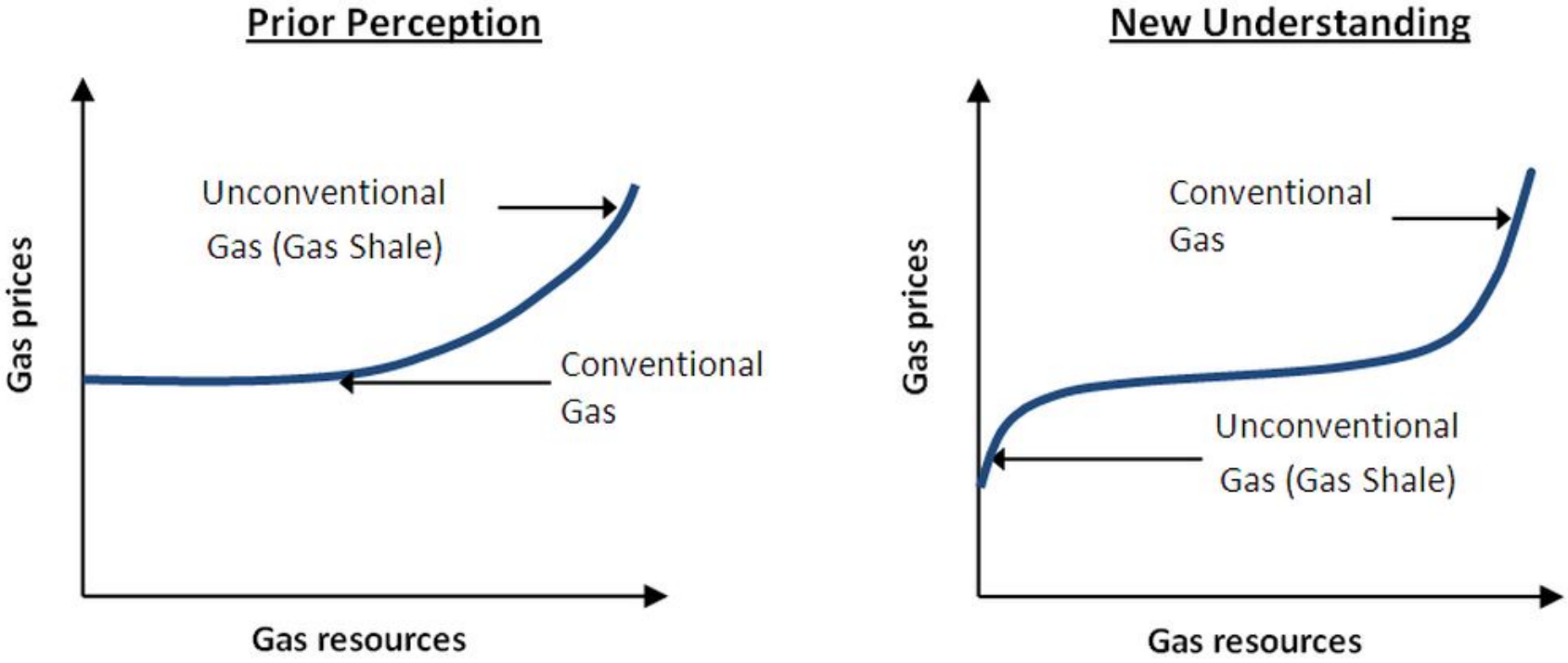


Source: Energy Studies Institute, based on http://ec.europa.eu

Russia ?

✓Shale gas has moved to the bottom of the US gas supply curve.

✓Until recently, conventional gas was viewed as low-cost, while shale gas was an abundant but high-cost US resource – that perception has now reversed.



Source: Vello A. Kuuskraa, „Gas Shales Drive the Unconventional Gas Revolution", Advanced Resources International, Inc., Washington Energy Policy Conference: The Unconventional Gas Revolution, March 9, 2010, Washington, D.C.

Potential growth in demand for natural gas in various areas of the Polish economy and the household sector

in million m^3 (36 MJ/m^3)	Total demand for fuels and carriers (base year 2008)	Consumption of natural gas (2008)	Theoretical potential for growth (consumption of other fuels and carriers without natural gas)	Effective potential for substitution – an optimistic scenario	Effective potential for substitution – an intermediate scenario
Energetics	46.392	1.323	45.069	9.750	2.720
Industrial processing (for energy uses)	10.722	4.337	6.385	1.270	280
Non-energy consumption (chemistry)	2.312	2.312	0	0	-400
Other sectors of economy	6.406	2.445	3.962	1.190	1.000
Households*	10.339	3.651	10.339	3.100	1.200
Own consumption (extraction and transport)	269	269	0	0	0
TOTAL	76.440	14.337	65.754	**15.310**	**4.800**

**Without heat from CHP plants.*

Source: Kaliski M., Krupa M., Sikora A., „Ograniczenia i bariery polskiej infrastruktury gazowej w kontekście możliwego rozwoju wydobycia polskiego gazu łupkowego". Katedra Ekonomiki i Organizacji Przedsiębiorstw Uniwersytetu Ekonomicznego w Krakowie, ISBN 978-83-62511-25-9; Kraków 2010 str.807 – 826.

Potential barriers for large scale shale gas exploration and production in Poland

- ✓ **Strong population in service areas.**
- ✓ **„Natura 2000" - a strong environmental organizations and changes and heterogeneity of environmental** (noise, lack of water).
- ✓ **Protectionism of companies servicing the domestic market** (especially drilling).
- ✓ **Impediments to the entry of foreign firms drilling** (eg, Polish/EU powers for operators of drilling equipment).
- ✓ **Difficult and lengthy procedures for procurement of drilling equipment from outside the European Union.**
- ✓ **Auctions** (time/price) **to perform drilling.**
- ✓ **Lack of the market liberalization and uncertainty over gas prices resulting from insufficient liberalization of the domestic gas market** (the domestic price of mining ?).
- ✓ **Unclear** (difficult) **provisions concerning the right to geological information and the high price of the geological information.**
- ✓ **Lack of tax and financial incentives and capital for exploration.**
- ✓ **Lack of Polish technical thought** (the need to purchase technology).
- ✓ **Lack of competition in the market for service.**
- ✓ **Break the generation among Polish drillers, geologists, geophysicists, etc.** (lack of the specialists in the country).
- ✓ **Polish Energy policy PEP2030 not pushing gas as an energy source.**

Potential barriers for large scale shale gas exploration and production in Poland

- ✓ **Strong population in service areas.**
- ✓ **„Natura 2000" - a strong environmental organizations and changes and heterogeneity of environmental** (noise, lack of water).

…and lets imagine that somebody will be „supporting" such voices:

- „Mining also disturbs the groundwater patterns in your area. Water tables may be lowered and runoff is redirected. This can have an impact on the ecosystems in the area – your area !
- As many oil shale deposits are in desert areas, such as the Western US and Israel's Negev desert, water disturbances are of particular concern.
- Extraction of gas from shale has many environmental impacts. Extraction uses large amounts of water, from one to five times as much water as fluid produced. This water can be highly contaminated with organic and inorganic compounds and provides a serious ecological hazard […]."

…and I am not drawing your attention to an economic point of view ☺☺☺

Shale gas influence - our view (1)

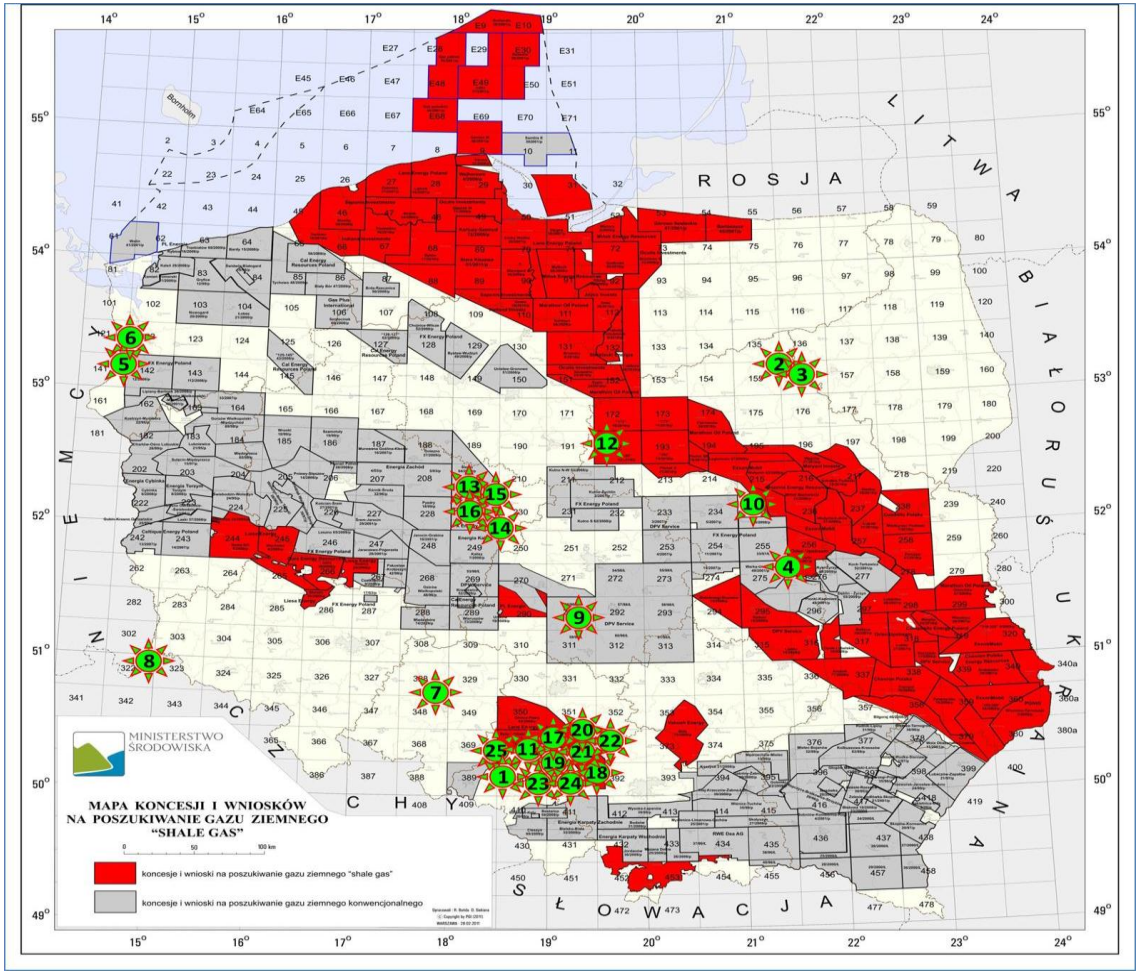
- In the very optimistic scenario, the growth potential of natural gas consumption in Poland may be more than 15 billion m^3 a year. Compared with the level of current consumption, we obtain a giant increase in demand, over 100%, but in the view of production growth from 40–80 billion m^3 per year, this is not a volume that would give the adequate level of comfort for potential energy investors.
- However, we should keep in mind that only 100% gasification of the whole economy would be able to manage all or most of these volumes, and such a scenario is quite improbable.
- In the intermediate variant, the increase in demand for gas may be less than 5 billion m^3 per year, which means that the domestic market potential would constitute a significant barrier to the development of gas production from unconventional sources.
- The largest increase in demand for natural gas may come from the backward energy sector based on solid fuels.

Shale gas influence - our view (2)

- On the basis of our knowledge regarding results of the first two boreholes (unofficial, no statements have been released) shale gas in Poland is a reality. However profitability of its production is at the moment unknown.
- We expect first economic assessments of the shale gas production in Poland to be determined and revealed in 2013 the earliest.
- Large scale production of shale gas in Poland would not take place before 2015-2016 (and only in case that significant reserves are discovered, and all abovementioned necessary preconditions fulfilled).
- Production volumes and economy of shale gas production – when determined – will allow to assess impact of domestic gas production on the Polish energy sector. Only then one will be able to foresee its influence on the future coal vs. gas energy generation.
- Therefore we do not expect any changes in the Polish Energy Policy at least until 2015. Afterwards shale gas may have an impact on the future energy mix. Its scale will be determined by the amount of domestic reserves and productivity of shale gas fields.
- However according to our estimations (Table on slide 29) we believe that 7-10% of energy in Poland will be produced in gas-fired generators by 2020, and 15-20% by 2025.

Shale gas influence - our view (3)

1 Power plant Rybnik
2 Power plant Ostrołęka B
3 Heat and power plant Ostrołęka A
4 Power plant Kozienice
5 PGE Dolna Odra
6 PGE Dolna Odra
7 PGE Opole
8 PGE Turów
9 PGE Bełchatów
10 Vatenfall – P&H Siekierki in Warszawa
11 Elcho Chorzów
12 Orlen Płock
13 PAK Konin
14 PAK Konin
15 PAK Konin
16 PAK Pątnów
17 Tauron Łagisza
18 Tauron Siersza
19 Tauron Katowice
20 Tauron Katowice
21 Tauron Jaworzno
22 Tauron Jaworzno
23 Tauron Łaziska
24 Tauron Tychy
25 Tauron Halemba



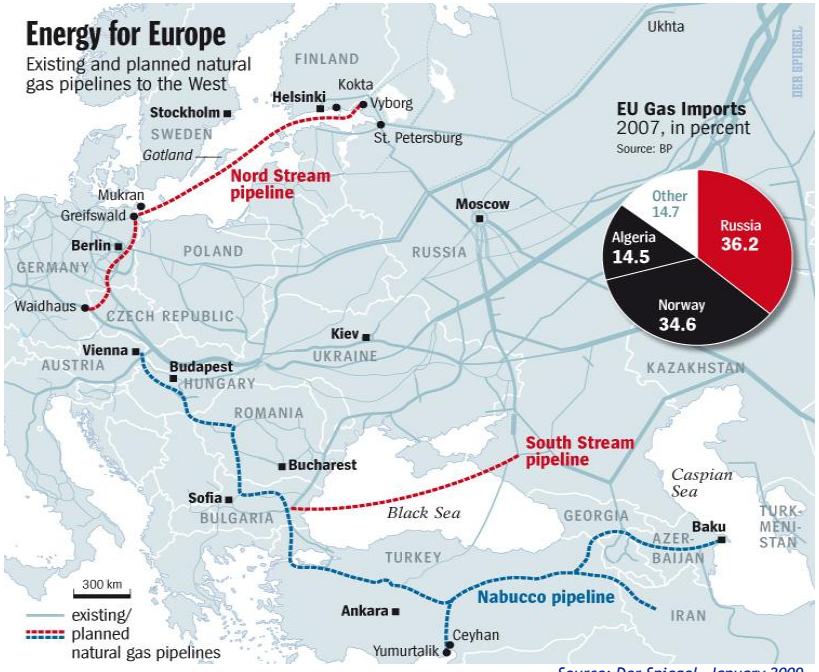
Can Poland duplicate the unconventional gas revolution ?

„With a little help from my friends…"

Strategy at first…

- ✓ Stable and long term energy policy
- ✓ Strategic planning for coal industry
- ✓ Development of the gas market
- ✓ Pro-ecological solutions:
  - CCS what for ?
  - Nuclear - to expensive ?
- ✓ Technology or support for an access to high efficient & flexible technology and services

Existing and planned natural gas pipelines to the West



Source: Der Spiegel, January 2009

Questions ?

About Energy Studies Institute

Energy Studies Institute
is a Polish consulting company dedicated for Oil&Gas sector.

Our services are well-known in heavy chemistry business and power generation (CHP) based on natural gas.

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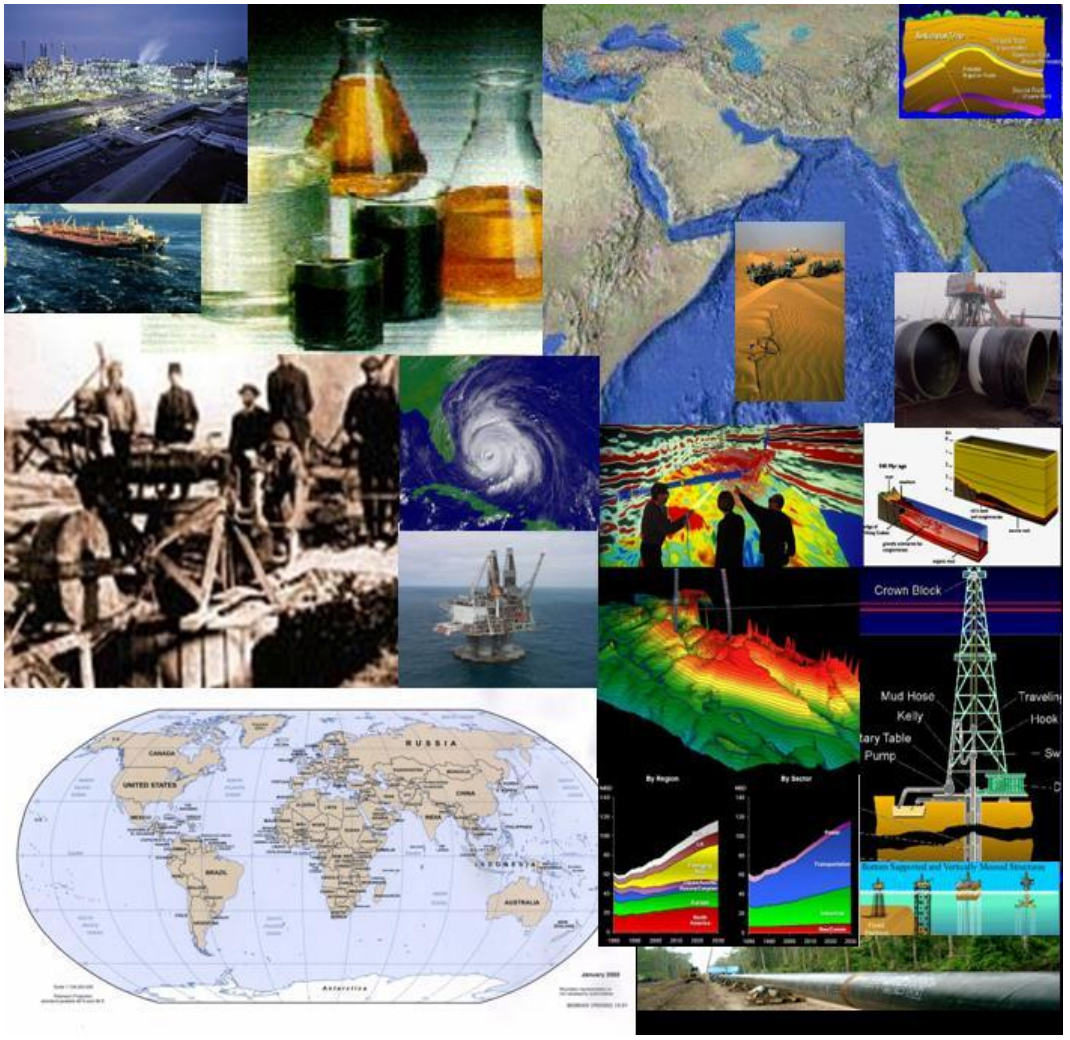

Thank you very much !

☺

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