Oil and natural gas price relation – world reserves, natural gas price development after the end of regulation stemming from the EU experience, market regionalization and flexibility, liberalization experience abroad

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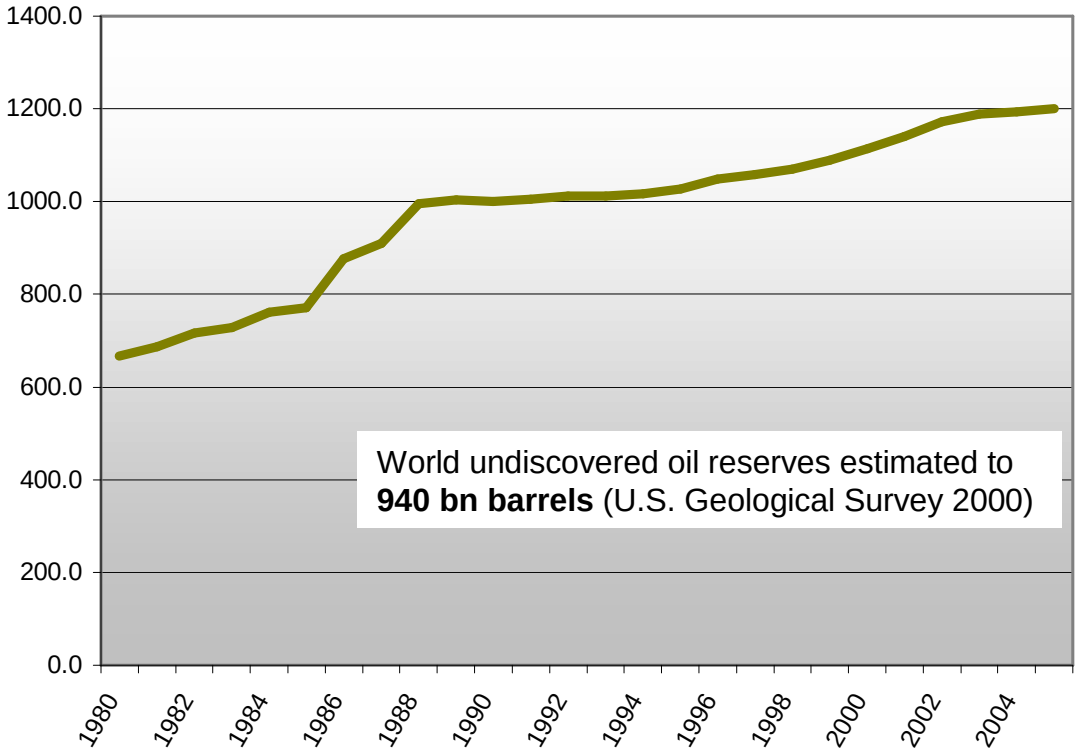
Content:

1. World reserves and consumption of oil and natural gas
2. Oil and natural gas price relations
3. Experience from neighboring countries´ experience
4. Price development after liberalization
5. Liberalization vs. security of supply

OIL – fast increase in world reserves and consumption in time

World oil reserves; 1980-2005; bn barrels



Source: BP Statistical Review of World Energy 2006

Long-term growth of world oil reserves

New oil fields:

- Sept. 2006, Gulf of Mexico, 15 bn barrels
- August 2006, Baltic Sea, 110 mil. barrels
- Jan. 2006, Caspian Sea, 600 mil. barrels

Increase of reserves during 2006:

- Iran, 6.7 bn barrels
- Saudi Arabia, 4.9 bn barrels
- Kuwait, 2.5 bn barrels

Vs. substantial growth of world oil consumption

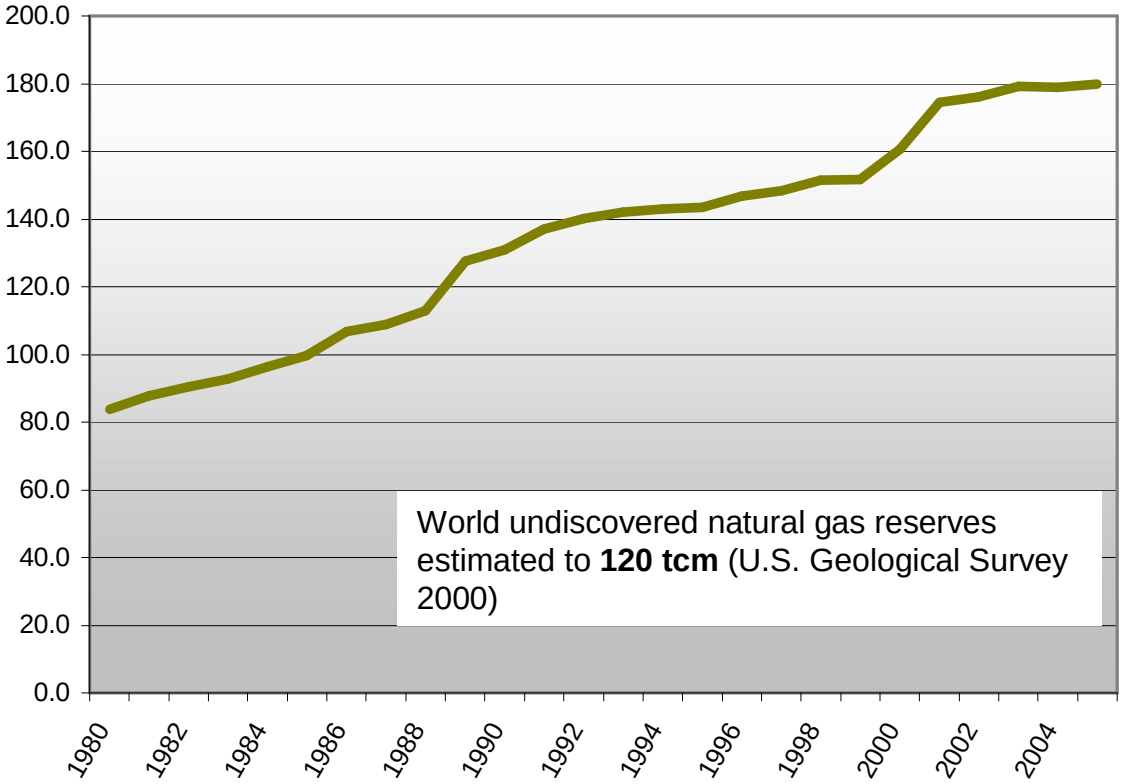
Between 1965 and 2005 increase by **165%, i.e. on average faster then increase of reserves, however during the last 6-7 years the paces equalized.**

The highest growth – China, India and other fast growing economies.

Between 2003 and 2030 increase by 50% expected (International Energy Outlook 2006), i.e. the growth of consumption by 1.4% p.a.

NATURAL GAS – fast increase in reserves and consumption in time

Proved world natural gas reserves; 1980-2005; tcm



Source: BP Statistical Review of World Energy 2006

Long-term increase in world natural gas reserves

New fields:

- June 2005; India; 560 bcm
- October 2006; China; 150 bcm
- Nov. 2006; Turkmenistan; 7 tcm

Increase in reserves during 2006:

- Iran, 870 bcm
- Norway, 300 bcm
- Nigeria, 250 bcm

Vs. substantial increase in world natural gas consumption

Between 1965 and 2005 increase by **290%, the growth geographically more balanced.**

Between 2003 and 2030 increase by 90% expected (International Energy Outlook 2006), i.e. increase in consumption by 2.4% p.a.

OIL – proved reserves highly concentrated

Proved oil reserves, the end of 2005; bn barrels

Source: BP Statistical Review of World Energy 2006

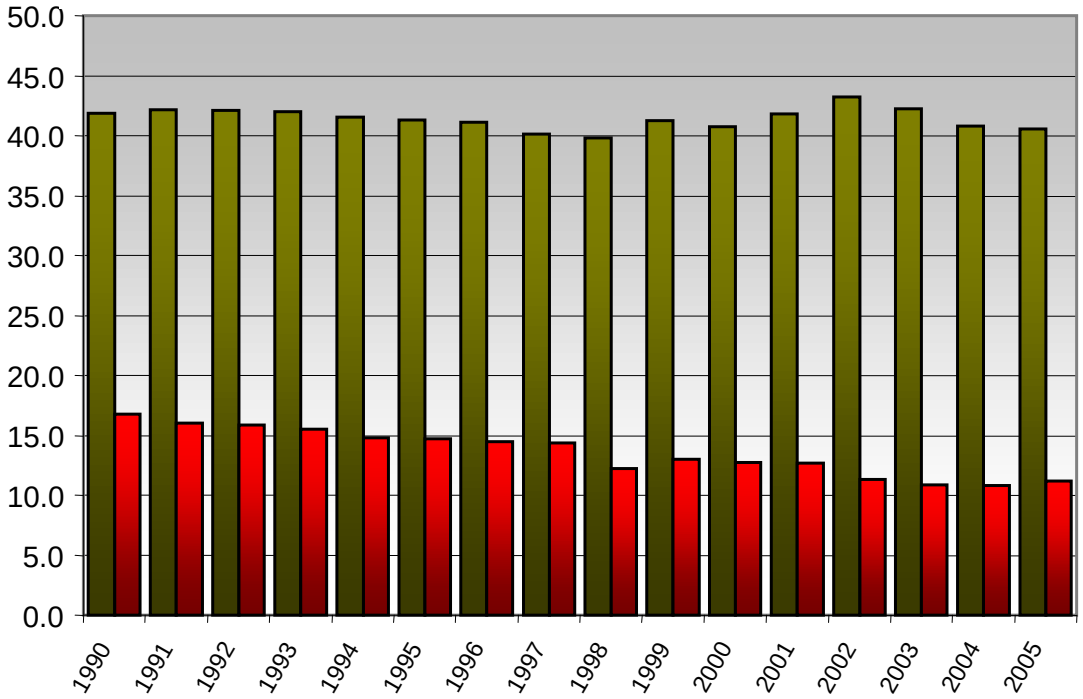
NATURAL GAS – proved reserves concentrated

Proved natural gas reserves, end of 2005; tcm

Source: BP Statistical Review of World Energy 2006

Reserves/production of oil non-balanced – transport requirements

Proportion of oil proved reserves and production; 1990-2005; World and OECD countries

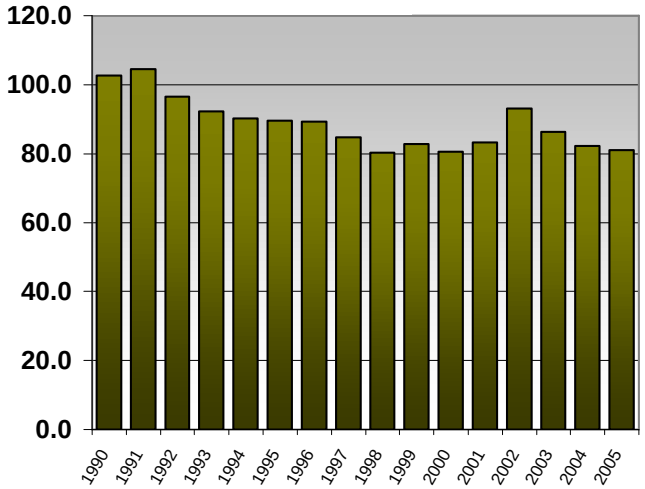


World proportion of oil reserves and production fluctuates in long-term slightly above 40. However, during the last years it has moderately decreased – higher market tensions, despite the increase in world oil reserves. The highest increase registered by Iran and Russia.

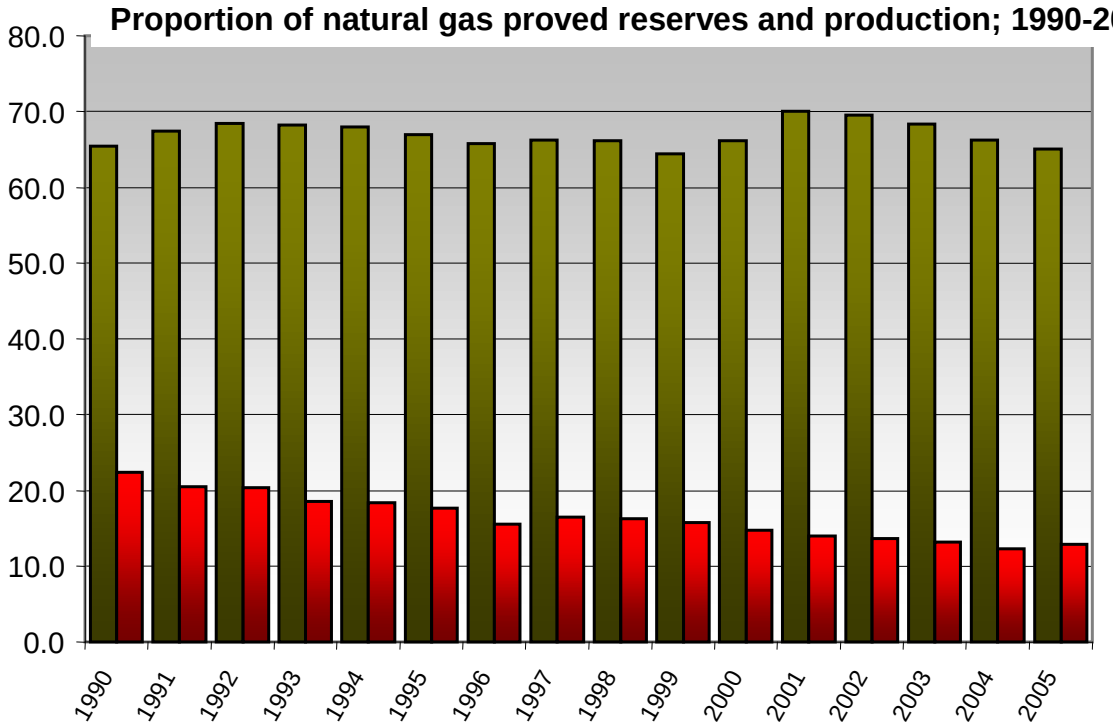
OECD countries indicator fell from multiple 17 in 1990 to **multiple 11.**

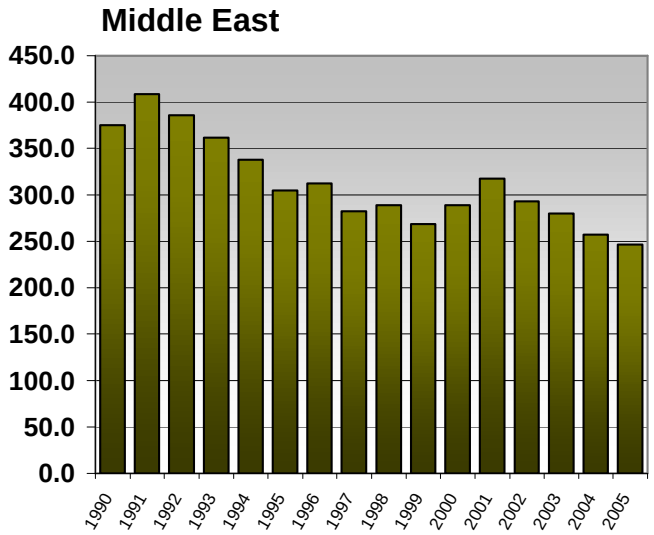
For Middle East the indicator reaches **multiple 80**

Middle East



Reserves/production of natural gas – transmission requirements





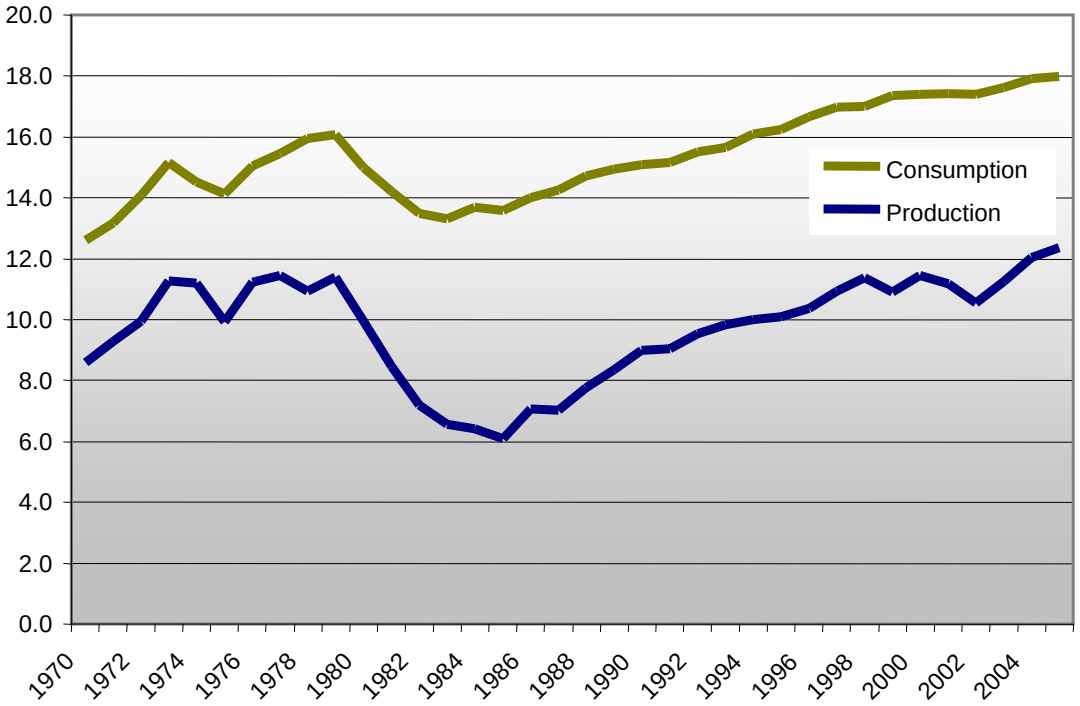
Whereas in long-term the world proportion of natural gas reserves and production fluctuates around multiple 65, **during the last years it has slightly gone down, in spite of the world reserves growth**. In **EU-25 countries since 1990 it even decreased** from multiple 22 to multiple **13.**

For Middle East the indicator is a multiple of **250. Due to increasing production it went down from** 400 in 1990.

Source: BP Statistical Review of World Energy 2006

Oil production and consumption in OECD countries

1970-2005; bn barrels per year

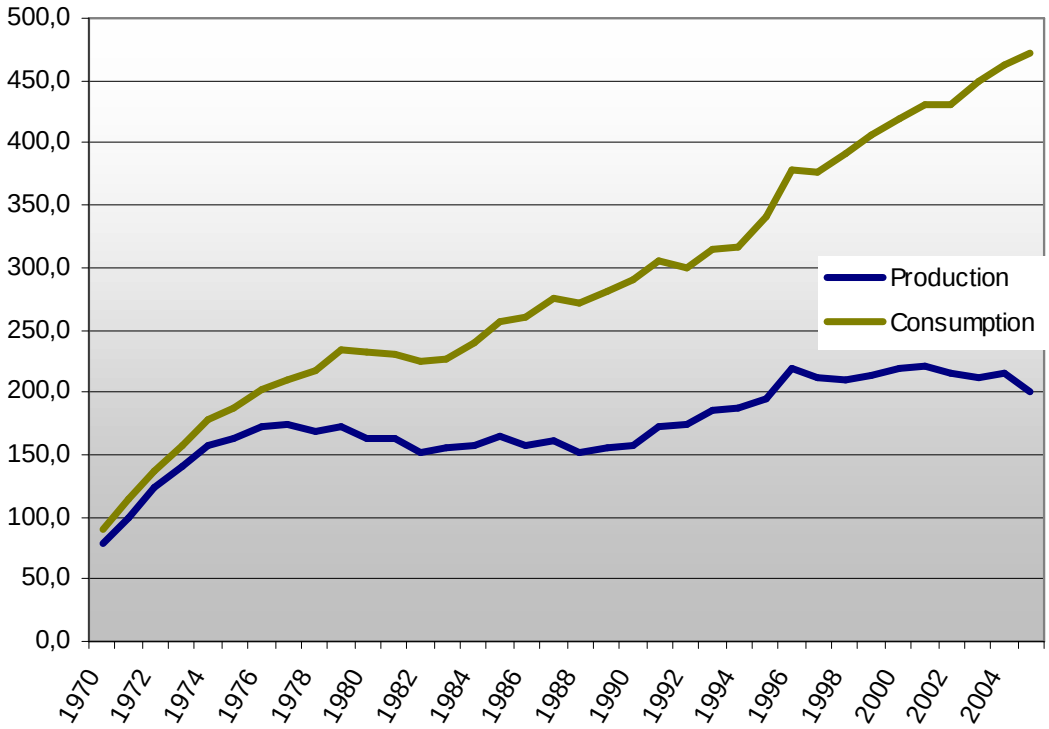


While in 2003, the OECD countries imported on average 32.4 mil. barrels per day, according to forecasts they will import 40.1 mil. barrels per day in 2030.

Source: BP Statistical Review of World Energy 2006

Natural gas production and consumption in EU-25

1970-2005; bcm per year

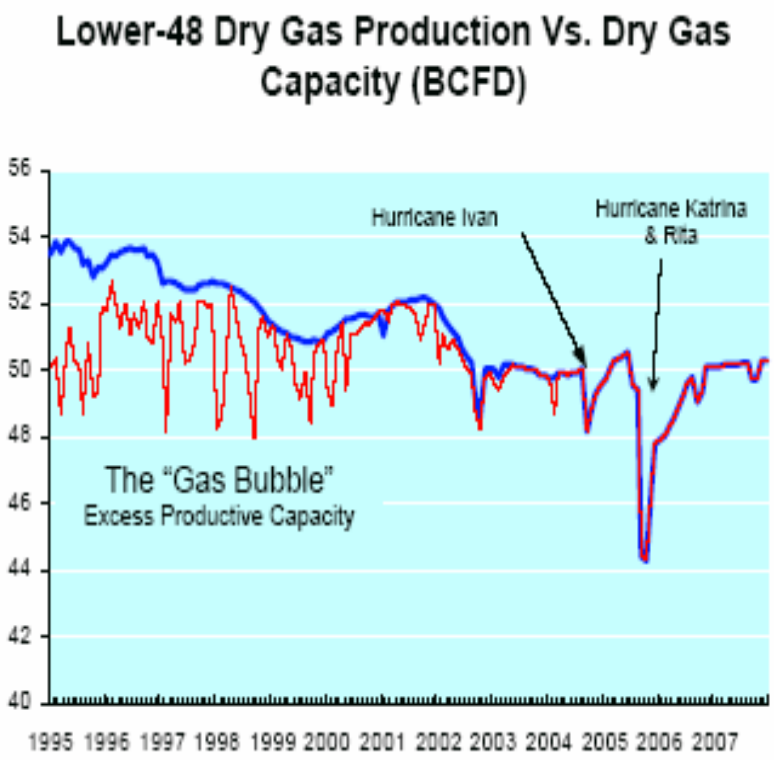


Source: BP Statistical Review of World Energy 2006

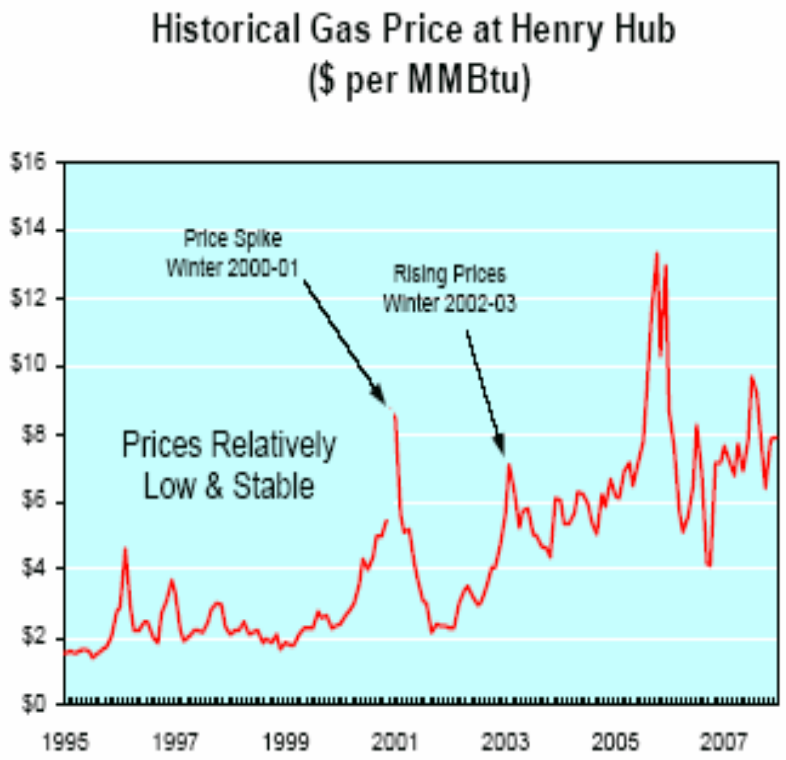
According to forecasts the EU-25 import dependency will come up from current almost 50% to:

- 61 % in 2010
- 75 % in 2020
- 80 % in 2030

Disappearing excess supply on key markets – USA – price increase



Source: Energy and Environmental Analysis, Inc.



Source: Platts Gas Daily & Energy and Environmental Analysis, Inc.

More and more acute and fragile balance of production and consumption leads to price increases and higher price volatility – this situation will continue

Source: Petak, K.R. 2006. Oil and Gas Prices. Will They Stay Linked?

New natural gas infrastructure construction speeded up by higher prices

More and more fragile balance on natural gas market – price increases and higher price volatility

Expected growth of demand: quickly growing economies of developing countries (China, India), Europe,...

Expected growth of production: Middle East, Caspian region. Wide range of natural gas pipelines with high capacity linking Middle East and Caspian region with Europe and quickly growing Asian countries is being either planned or under construction – their rate of return goes up due to higher prices.

Russia

- ✓ **Yamal – Europe,** second branch of NG pipeline from Northern Russia via Belarus and Poland to Germany (capacity 33 bcm)
- ✓ **North European Gas Pipeline**, under Baltic Sea, via Germany to Great Britain (capacity 20 to 30 bcm, finalization in 2007)
- ✓ **Novopskov – Uzhorod,** from east to west Ukraine up to Slovak borders (capacity 28 bcm)
- ✓ **Extension of Blue Stream pipeline**, possibilities of NG pipeline extension (leading under Black Sea from Russia to Turkey) to Greece and Italy, and further to Hungary

Caspian region – Turkmenistan, Uzbekistan, Kazakhstan

- ✓ **Nabucco project,** NG pipeline construction from Turkey to Austria via Bulgaria, Romania and Hungary (capacity 25-30 bcm, from which 8-10 bcm for domestic consumption of transit countries, launch of operation planned for 2011)
- ✓ **Turkay-Greece-Italy**, connection of Turkey and Greece, eventually Italy (max. cap. 3 bcm, in case of extension to Italy 11-12 bcm, finalization 2009)
- ✓ **NG pipeline South Caucasus**, linking Azerbaijan and Turkey via Georgia (capacity 7 bcm with possible doubling in future, finalization 2006)
- ✓ **Trans-Caspian NG pipeline**, from Turkmenistan under Caspian Sea, via Azerbaijan and Georgia to Turkey
- ✓ **Turkmenistan – Iran**, part of pipeline from Iran to Turkey finished, NG pipeline construction via Iran did not start, Shell company drew off the country in 2003 (capacity 15 bcm, possible extension to 28-30 bcm improbable due to political instability in Iran)

With regards to distances between fields and consumers the importance of **LNG** grows: the most important LNG exporters are (and/or substantially invest into LNG infrastructure) Iran, Qatar, Oman and United Arab Emirates

New infrastructure construction: Does the dependence on Russia decrease or increase?

1. Yamal – Europe
2. Northern European Gas Pipeline
3. Novopskov – Uzhorod
4. Nabucco Project
5. Turkey-Greece-Italy
6. South Caucasus Natural Gas Pipeline
7. Trans-Caspian Natural Gas Pipeline
8. Turkmenistan-Iran-Turkey

Where will the natural gas from the Caspian region go to?

Connection of natural gas pipelines from Kazakhstan, Turkmenistan and Uzbekistan

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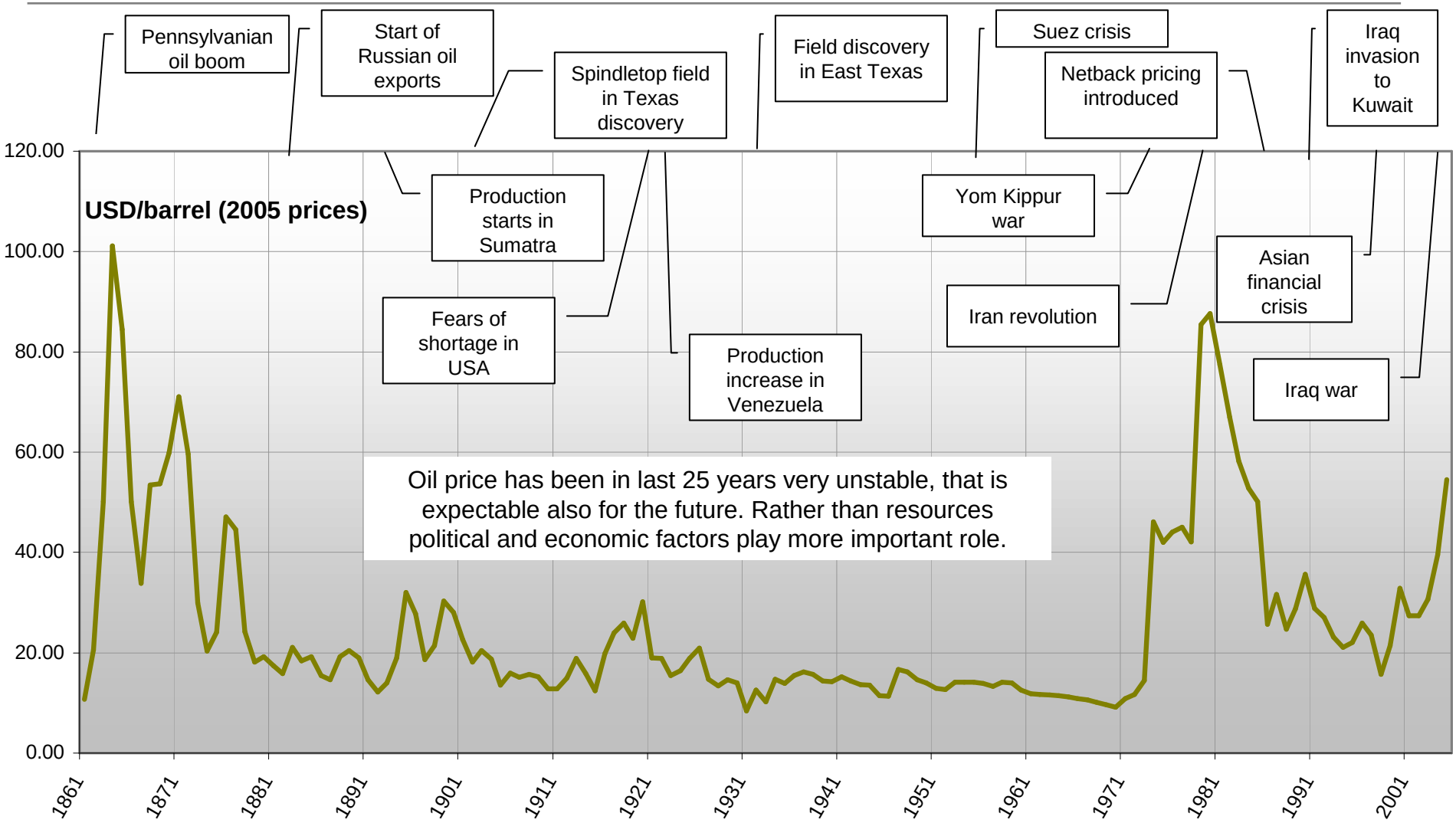
Long-term oil price development influenced by important world events



Source: BP Statistical Review of World Energy 2006

Relation between oil and natural gas price

Relation between oil and natural gas

- Consumption: substitutes
- Production: complements

Oil price → natural gas price, not reversely

- Reason: relative market sizes
  - Oil price determined on the world markets
  - Regional natural gas market segmentation

Effects

- Demand effect
  - Rise in oil price → substitution → higher natural gas demand → rise in price
- Supply effect
  - Higher oil demand → price increase → higher oil production → higher production costs (for oil and natural gas as well)
  - Consequently possible increase in natural gas production → lower natural gas prices (when the demand for natural gas not changed)
- Volatility
  - Tight balance between demand and supply → world events strongly influence price
- LNG market
  - Extending LNG market → price convergence on regional natural gas markets

Signposts – will the oil and natural gas prices coupled?

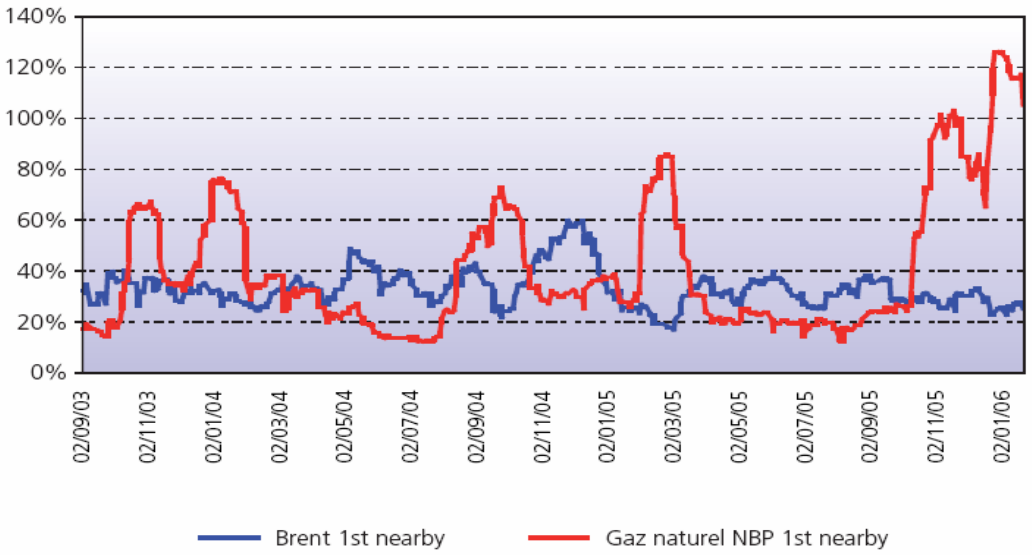
Signpost	Example Market Event	Likely Outcome
Gas-to-oil switching capacity	Retirement of capacity	Gas prices up relative to oil prices
Globalization of LNG	Political turmoil delays liquefaction development	Gas prices up
Globalization of LNG	Aggressive development of LNG liquefaction capability	Gas prices fall relative to oil prices
Environmental policies favoring gas	Carbon control leading to retirement of coal capacity	Gas prices up
Environmental policies favoring other fuels	Nuclear or IGCC subsidy	Gas prices down
Weather	Significant hurricane disruptions along the Gulf Coast	Gas prices up
Weather	Mild temperatures with wetter than normal conditions in the western U.S.	Gas prices down
Underground Gas Storage	Aggressive development of storage facilities	Reduces the impact of adverse weather conditions, increasing the correlation between gas and oil prices

Source: Petak, K.R. 2006. Oil and Gas Prices. Will They Stay Linked?

Long-term oil and natural gas price development

- Oil prices ⇔ natural gas prices
  - Algeria, Saudi Arabia – joint oil and natural gas field – necessary to extract both for the similar price
  - Azerbaijan – joint fields in sea – at first necessary to extract oil, then natural gas
  - Russia – only natural gas fields
    - discussion Russia - EU – possible to tie the natural gas price on a mix of other fuels? New cartel?
    - beneficial for CR, SR, other CEE countries, against the majority of EU 15 states – natural gas = competition for oil

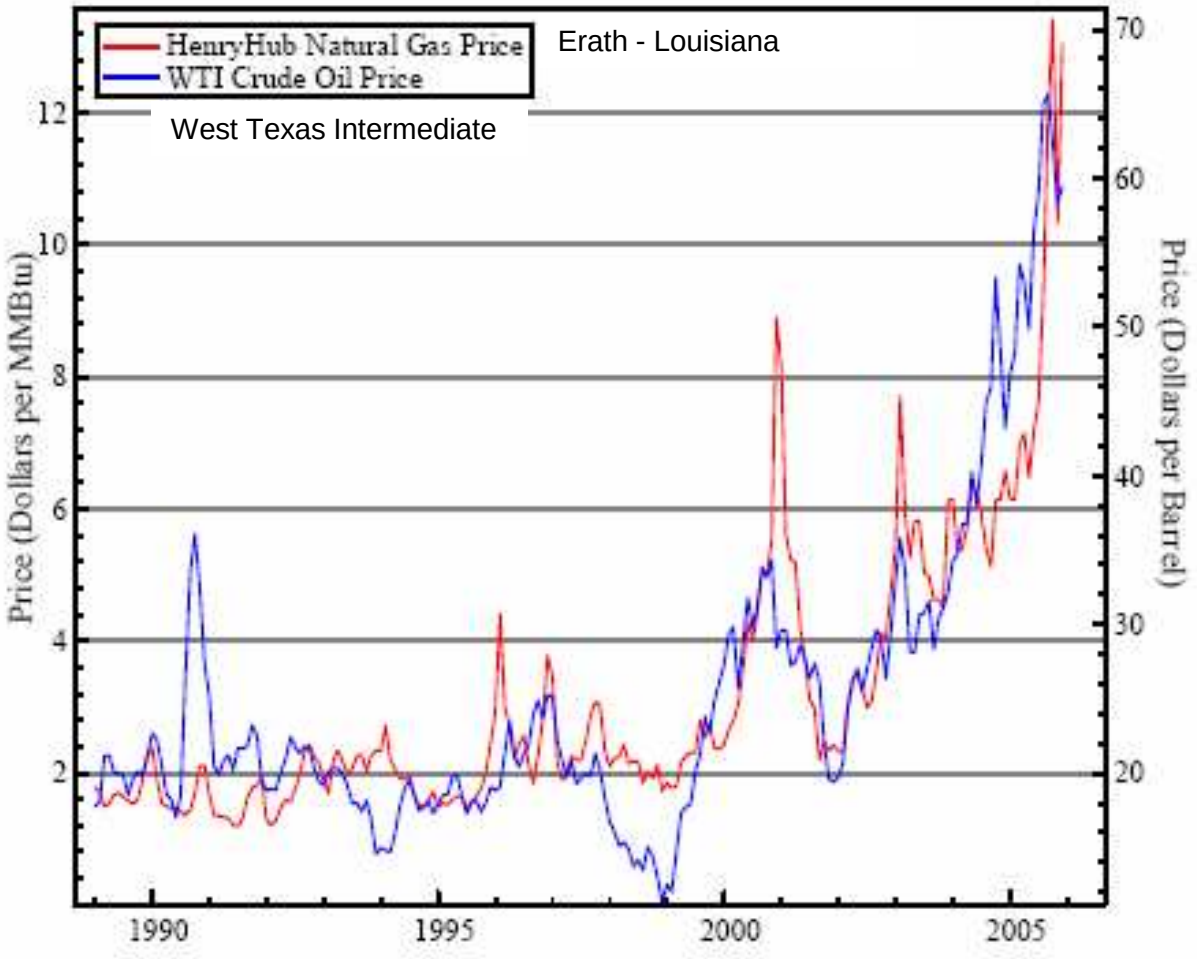
Oil and natural gas price changes (%) – example of UK (loose relations)



Source: The European Gas Market. Eurogas Views On The Way Forward, www.eurogas.org

Note: NBP – A notional point in the UK National Transmission System (NTS) used as a delivery point for gas which is traded 'entry paid', i.e. already in the NTS. For accounting and balancing purposes all gas is said to flow through this point.

Oil and natural gas prices – USA (tight relation)



Source: Villar, J.A. and F.L. Joutz. 2006 The Relationship between Crude Oil and Natural Gas Prices. EIA

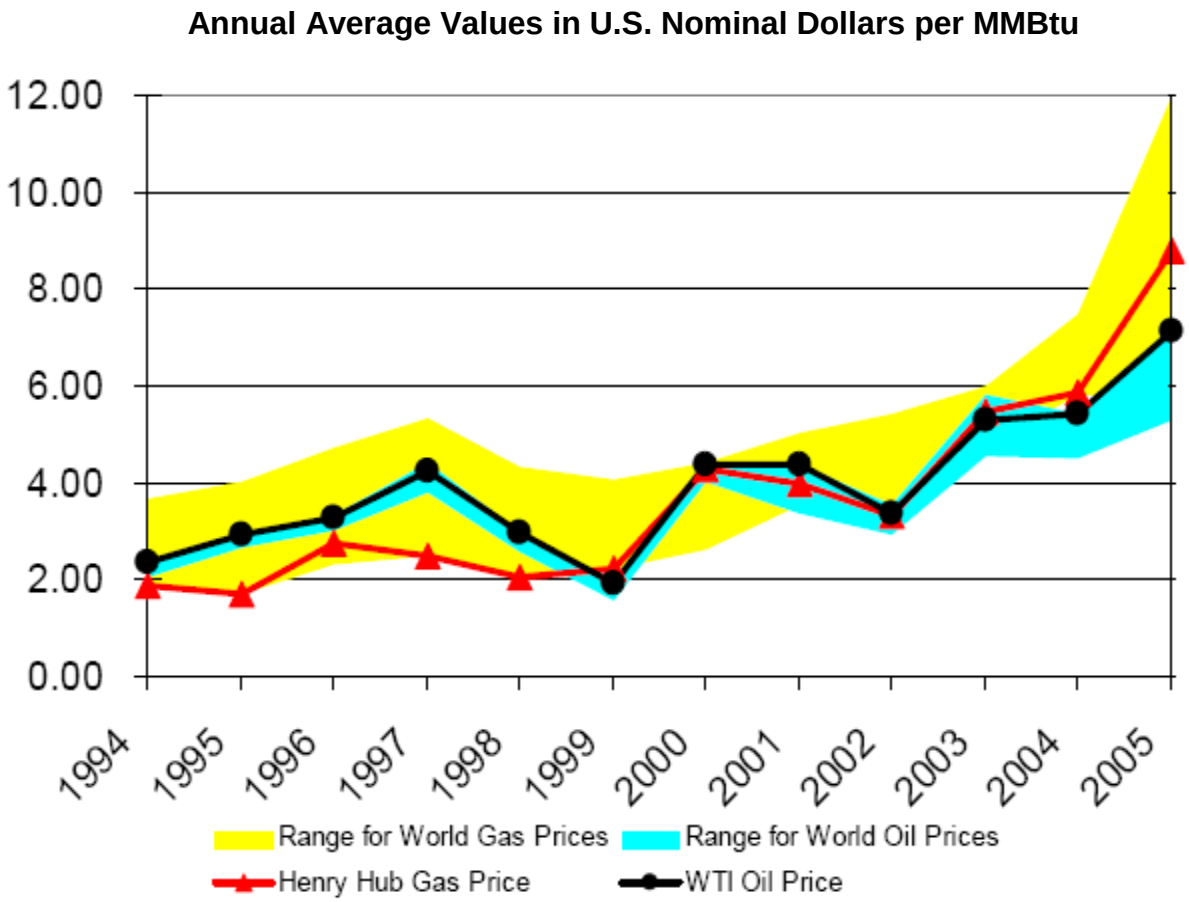
Historically stable relations between oil and natural gas prices.

Dynamic analysis:

Temporary shock in oil price (20%, 1 month) → 5% impact on natural gas price

Permanent shock (20%) → 16% impact on natural gas price

Oil and natural gas prices – USA and world

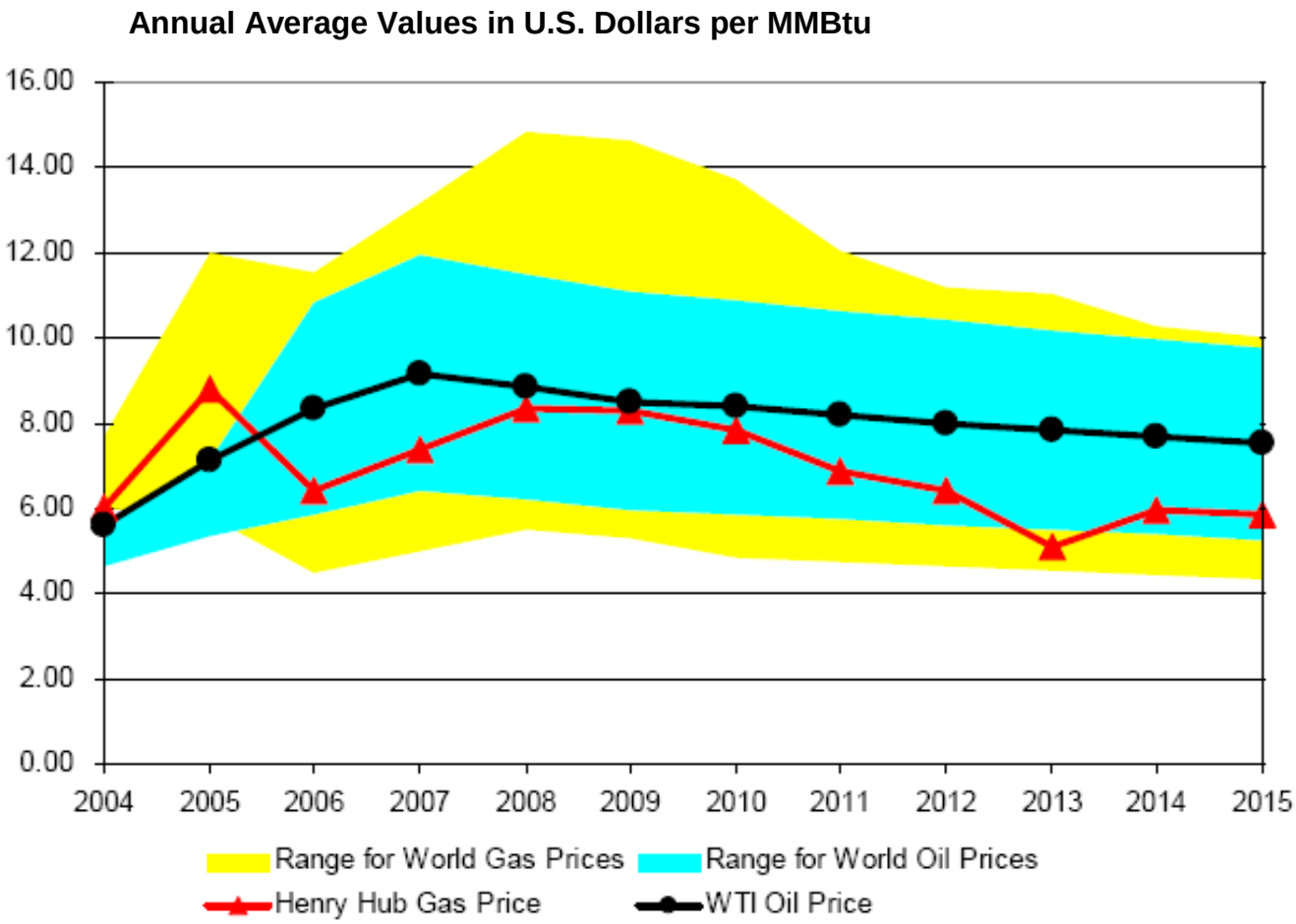


Wider range for natural gas prices → relatively week correlation among regional markets

Vs. developing LNG market → expected price convergence

Source: Petak, K.R. 2006. Oil and Gas Prices. Will They Stay Linked?

Oil and natural gas prices – USA and world



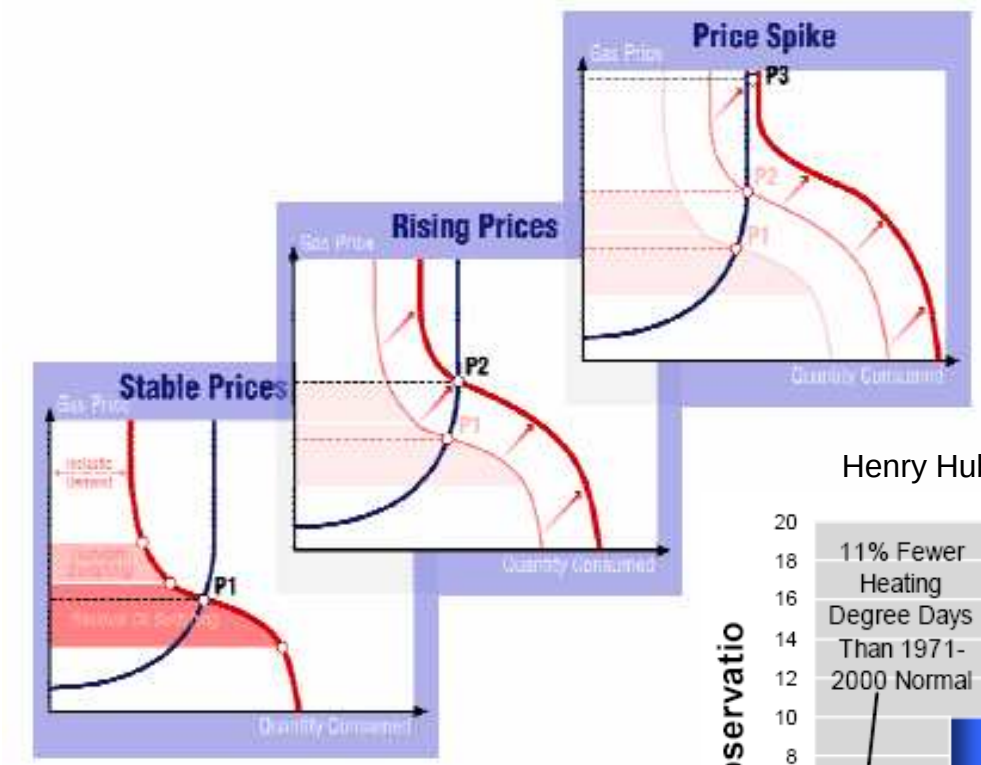
Tight balance between supply and demand → relatively high and volatile prices

Current linkage influenced by competition on the demand side (change in fuel)

Future linkage between oil and natural gas prices influenced by the supply side (LNG vs. oil reserves development)

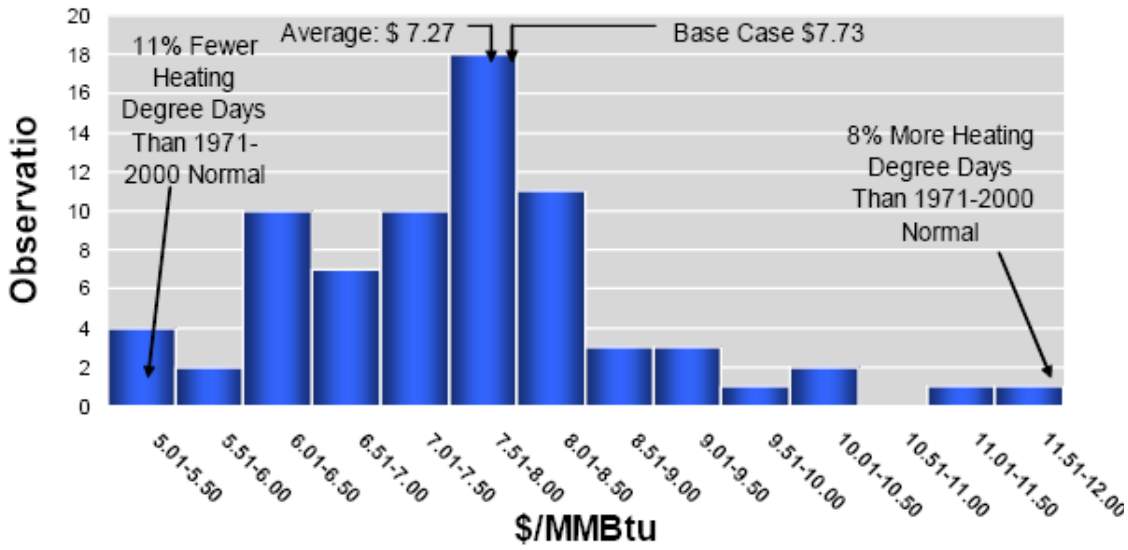
Source: Petak, K.R. 2006. Oil and Gas Prices. Will They Stay Linked?

Natural gas demand – substantial price volatility and impact of weather



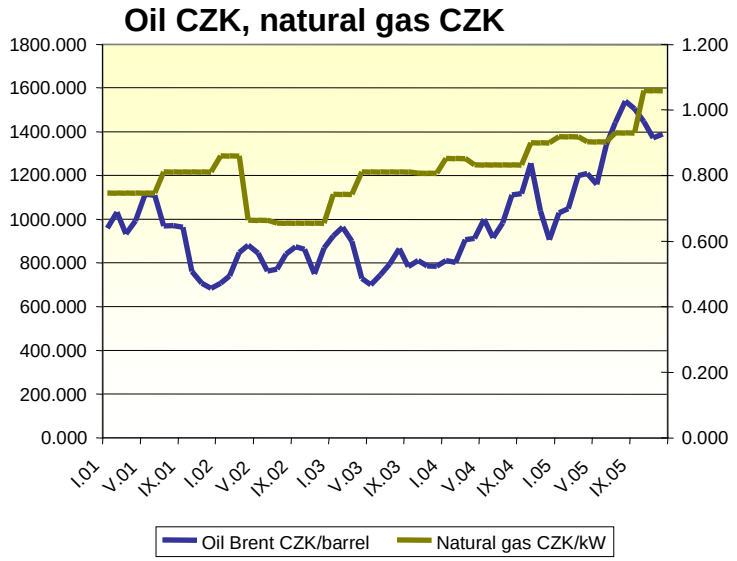
Substantial price volatility → need of additional sources of flexibility, introduction of peak-load pricing

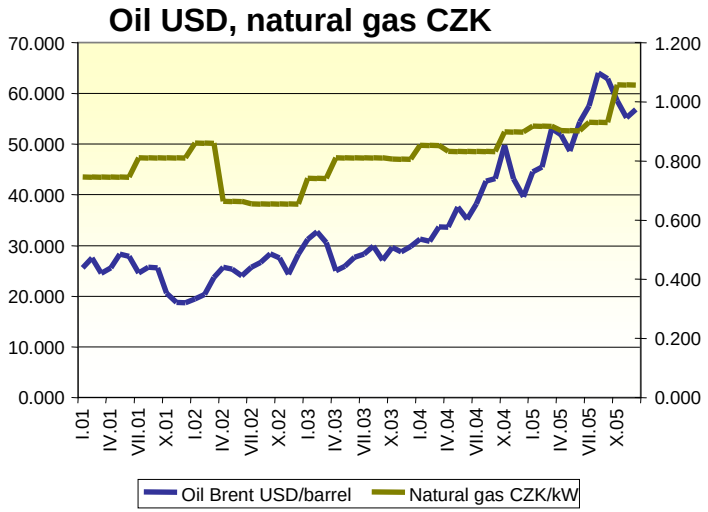
Henry Hub Price Distribution for Jan. 2007 - Dec.2007

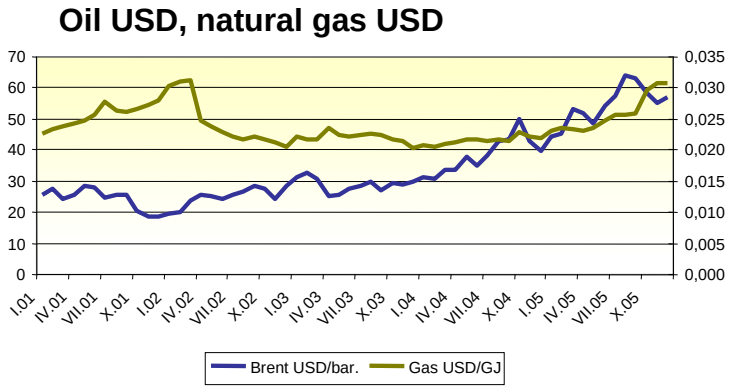


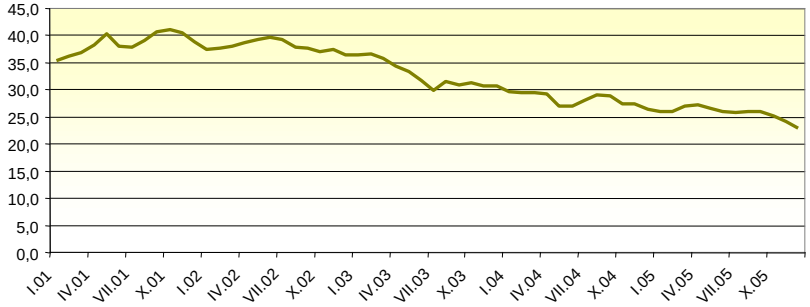
Source: Petak, K.R. 2006. Oil and Gas Prices. Will They Stay Linked?

Relation between oil and natural gas price importantly influenced by the ER CZK/USD









Oil – Brent Europe (Source: EIA); Natural gas – CR; JČP, household 0-1890 kW (Source: ERO); Exchange rate CZK/USD (Source: CNB)

Relation between oil and natural gas price, exchange rate effects

Correlation: Oil Brent (Europe; price per barrel) – natural gas (NG) (household in the CR; price per kW)

	Oil CZK - NG CZK	p-value	Oil USD - NG CZK	p-value	Oil USD - NG USD	p-value
Without lag	0.620157311	0.0000001	0.726971758	0.0000000	0.088783131	0.4999436
1Q lag	0.693572109	0.0000000	0.796939136	0.0000000	0.204576285	0.1268869
2Q lag	**0.724850024**	**0.0000000**	**0.8467861**	**0.0000000**	0.305547985	0.0246527
3Q lag	0.527865555	0.0000687	0.846171578	0.0000000	0.43677692	0.0013530
4Q lag	0.25365016	0.0819306	0.796530074	0.0000000	0.493511547	0.0003648

Note: p-value – level of significance

statistically significant correlation for $p < 0.05$

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Results of natural gas markets liberalization (1)

- Tight relation between oil and natural gas markets
- Shift of margin towards producers (Gazprom)

⇒ **Liberalization**

- Considerable costs (unbundling – change in organizational structures of companies, revaluation of assets,...) vs. relatively small benefits in comparison with expectations
- Price development for customers influenced mainly by the oil price development – entry of new suppliers did not cause sharp decrease of prices
- Positive contribution – discussion about contracts and contractual conditions started
- Results
  - continuous existence of separated national markets
  - change of supplier in limited cases
  - former state monopolies on the major part of markets – they held their monopoly position
  - new entities´ interest in market entry? (Vemex, Wingas)
- Comparability of natural gas industry with electro-energy sector?
  - electricity producers – possible choice from a large variety of primary resources, possibility to influence their competition environment
  - natural gas companies – dependent on import contracts for the sole type of fuel, which is produced by several state monopolies
- 86% of natural gas volume in Europe traded for prices derived from oil prices ⇒ prices determined by market?
  (issue of a creation of independent natural gas market operator – costs (higher price) vs. returns (higher transparency))
  - EC effort = producers competing for a customer – possible on the natural gas market? (natural gas – Russia, Norway, Algeria, LNG vs. electro-energy – plenty of resources)

Results of natural gas markets liberalization (2)

Classification of member states according to change of supplier

- The biggest progress – Benelux, Denmark, Spain, Italy
- For other, especially new, member states market opening negligible effect on customers´ behavior

Cumulative switching since market opening	Large Industrial users/power plants	Medium industrial/ commercial	Small commercial/ household
>50%	IE, ES, UK	EK, ES	
20-50%	DK, IT, BE	BE, IE, DK	UK
5-20%	AT, FR, HU	AT, BE, FR, HU	BE, NL
<5%	all others	all others	all others

Source: Report on Progress in Creating the Internal Gas and Electricity Market, 2005, EC

Results of gas markets liberalization (3)

Customer switching: volume of gas consumption, cumulative since market opening

	Power plants	Large and very large industrial	Small-medium industrial and business	Very small business and households
Austria	6%			4%
Belgium	25%		9%	
Czech Republic	0%	0%	0%	0%
Denmark	30%			<2%
Estonia	0%	0%	0%	0%
France	14%			0%
Germany				
Hungary	6%			
Ireland	100%		49%	0%
Italy	23%		3%	1%
Latvia	0%	0%	0%	0%
Lithuania	0%	0%	0%	0%
Luxembourg		2%	0%	0%
Netherlands				5%
Poland	0%	0%	0%	0%
Slovakia	0%	0%	0%	0%
Slovenia	0%	0%	0%	0%
Spain	60%			2%
Sweden				
UK	>90%	>85%	>75%	47%

Source: Report on Progress in Creating the Internal Gas and Electricity Market, 2005, EC

Impediments:

- Unequal access to networks
- Price controls
- Unwillingness to change the supplier (⇐ uncertainty)

Results of gas markets liberalization (4)

Existence of price controls

	Industrial users	Small commercial users	Households
Austria	No	No	No
Belgium	No	No	Yes
Czech Republic	No	Yes	Yes
Denmark	Yes	Yes	Yes
Estonia	No	No	Yes
France	No	Yes	Yes
Germany	No	No	No
Hungary	Yes	Yes	Yes
Ireland	Yes	Yes	Yes
Italy	No	No	Yes
Latvia	Yes	Yes	Yes
Lithuania	No	Yes	Yes
Luxembourg	No	No	No
Netherlands	No	No	No
Poland	Yes	Yes	Yes
Slovakia	No	No	Yes
Slovenia	No	Yes	Yes
Spain	Yes	Yes	Yes
Sweden	No	No	No
UK	No	No	No

Source: Report on Progress in Creating the Internal Gas and Electricity Market, 2005, EC

Results of gas markets liberalization (5)

Degree of concentration

	Gas (import and production)	Electricity (generation)
Very highly concentrated(HHI above 5000)	all others	BE, FR, GR, IE, PT, EE, LV, SK, SI
Highly concentrated (HHI 1800-5000)	AT, IE, IT, ES, NL	DE, IT, ES, LT, CZ
Moderately concentrated (HHI 750-1800)	UK	AT, NORDIC, NL, UK, PL, HU

Source: Report on Progress in Creating the Internal Gas and Electricity Market, 2005, EC

Results of gas markets liberalization (6)

Market structure in import and production of gas – position end 2004

	Total consumption (bcm/year)	Number of companies with 5% share of production/import capacity	Number of companies with 5% share of available gas	Share of largest 3 gas shippers in wholesale market
Austria	9	2	4	80%
Belgium	17	2	2	-
Czech Republic	10	-	-	-
Denmark	4	3	3	97%
Estonia	1	1	-	100%
France	61	2	2	98%
Germany	102	5	10	ca 80%
Hungary	14	2	1	100%
Ireland	4	5	5	84%
Italy	80	3	3	62%
Latvia	3	4	-	92%
Lithuania	2	1	1	100%
Luxembourg	1	1	-	-
Netherlands	48	1	1	85%
Poland	8	1	1	100%
Slovakia	6.5	1	1	-
Slovenia	1	1	1	100%
Spain	27	4	4	73%
Sweden	1	1	5	78%
UK	105	7	7	36%

- High level of concentration
- Exception – Spain – competing suppliers 17% and 9% market share
- Question of long-term contracts:
  - ✓ Capacity negotiated for long-term makes it impossible for new players to reserve needed capacity
  - ✓ vs. relatively stable environment for investment

Source: Report on Progress in Creating the Internal Gas and Electricity Market, 2005, EC

Results of gas markets liberalization (7)

Structure of gas supply market – position end 2004

	Companies with market share over 5%	Number of fully independent suppliers (no network affiliates)	Market share of largest 3 companies power plants	Market share of largest 3 companies large industrial users	Market share of largest 3 companies small/medium businesses	Market share of largest 3 companies very small commercial/households
Austria	4	6	-	-	-	-
Belgium	3/5	12/8	-	100%/90%	100%/99%	99%/100%
Czech Republic	7	0	-	54%	51%	57%
Denmark	3	2	100%	92%	100%	100%
Estonia	1	1	85%	100%	100%	100%
France	2	8	91%	100%	100%	100%
Germany	1	9	-	-	-	-
Hungary	7	0	95%	77%	76%	79%
Ireland	3	8	91%	100%	100%	100%
Italy	5	110	80%	54%	-	33%
Latvia	2	0	-	100%	100%	100%
Lithuania	1	0	-	100%	100%	100%
Luxembourg	4	1	99%	95%	93%	93%
Netherlands	3	5	-	-	-	83%
Poland	7	0	100%	-	-	-
Slovakia	1	0	100%	100%	100%	100%
Slovenia	6	0	-	-	-	-
Spain	5	4	-	72%	77%	90%
Sweden	-	-	-	-	-	-
UK	6	8	56%	53%	61%	77%

- In majority of cases regulated price – for small businesses and households in 13 member states
- In some extent there is competition in UK, Denmark, Netherlands, Italy and Spain

- Austria, Germany – although according to legislation the market is fully open, majority of traditional suppliers kept their market share, competition in supplies for households does not exist

Source: Report on Progress in Creating the Internal Gas and Electricity Market, 2005, EC

Results of gas markets liberalization - TSO Unbundling (8)

Unbundling of gas transmission system operators 2005

	Legal unbundling implemented	Separate headquarters	Separate corporate presentation	Unbundled regulatory accounts with guidelines	Audit of unbundled accounts	Publication of unbundled accounts	Separeate board of directors without directors from other group companies	Total rating out of 6
Austria	yes	Y	Y	N	N	N	Y	3
Belgium	yes	Y	Y	Y	Y	Y	N	5
Czech Republic	no	N	N	Y	N	N	N	1
Denmark	yes and ownership	Y	Y	Y	Y	Y	Y	6
Estonia	no	N	N	Y	N	N	N	1
France	yes, stát	N	N	Y	Y	N	N	2
Germany	částečná	N	N	Y	Y	N	Y	3
Hungary	yes	Y	partly	N	Y	Y	Y	5
Ireland	no	N	N	N	N	Y	N	1
Italy	yes and ownership	Y	Y	Y	Y	N	Y	5
Latvia	no	N	N	Y	Y	N	N	2
Lithuania	no	N	N	N	Y	N	N	1
Luxembourg	no	N	N	Y	Y	N	N	2
Netherlands	yes and ownership	Y	Y	Y	Y	Y	Y	6
Poland	yes	Y	Y	N	Y	Y	N	4
Slovakia	no	N	Y	N	N	N	N	1
Slovenia	no	N	Y	Y	Y	Y	Y	5
Spain	yes	N	Y	N	Y	Y	N	3
Sweden	yes and ownership	Y	Y	Y	Y	Y	Y	6
UK	yes and ownership	Y	Y	Y	Y	Y	Y	6

„The UK market experience of full ownership unbundling suggests that it significantly changes the behavior of the transport undertaking: a fully unbundled TSO will focus on optimizing the use of its network.“

(Source: www.seris.co.uk, „The advantages of full ownership unbundling in gas transportation and supply? How the European Commission got it wrong about the UK“)

Source: Report on Progress in Creating the Internal Gas and Electricity Market, 2005, EC

European Commission - considers the option for the full liberalization of gas markets
Argument - integrated companies should be split up into separately owned gas transportation and gas supply companies

Results of gas markets liberalization - DSO Unbundling (9)

Unbundling of gas distribution system operators, 2005

	Legal unbundling implemented	Separate headquarters	Separate corporate presentation	Unbundled regulatory accounts with guidelines	Audit of unbundled accounts	Publication of unbundled accounts	Separeate board of directors without directors from other group companies	Total rating out of 6
Austria	yes	partly	partly	no	-	no	partly	2
Belgium	yes	yes	yes	yes	yes	yes	no	5
Czech Republic	no	no	no	yes	no	no	no	1
Denmark	yes	no	partly	yes	yes	yes	yes	5
Estonia	no	no	no	yes	no	no	no	1
France	no	no	no	no	yes	no	no	1
Germany	no	no	no	yes	yes	no	yes	3
Hungary	no	no	no	no	yes	yes	no	2
Ireland	no	no	no	no	no	yes	no	1
Italy	yes	no	no	yes	yes	no	no	2
Latvia	no	no	no	yes	yes	no	no	2
Lithuania	no	no	no	no	yes	no	no	1
Luxembourgh	no	no	no	no	partly	no	no	1
Netherlands	yes	no	yes	no	no	yes	no	2
Poland	no	no	no	no	no	no	no	0
Slovakia	no	no	yes	no	no	no	no	1
Slovenia	no	no	no	no	no	no	no	0
Spain	see note	no	yes	no	no	no	no	1
Sweden	no	no	no	yes	yes	yes	no	3
UK	yes and ownership	yes	yes	yes	yes	yes	yes	6

Note: In Spain, the distribution company is also the default supplier. However suppliers to non-regulated customers must be legally unbundled

Source: Report on Progress in Creating the Internal Gas and Electricity Market, 2005, EC

Content:

1. World reserves and consumption of oil and natural gas
2. Oil and natural gas price relations
3. Experience from neighboring countries´ experience
4. Price development after liberalization
5. Liberalization vs. security of supply

Impacts of liberalization on consumers – prices (1)

➢ Impact on gas prices

- ✓ In general, prices in 2003 and 2004 were the lowest in countries with the highest level of market opening and in New Member States.
- ✓ Remaining ? significant differences in prices between old and new EU countries
  - ✓ International discrimination of companies – in contrast to the argument of integrated EU market
  - ✓ „Cross subsidy“ among consumers of old and new EU Member States
  - ✓ **Expected convergence of prices** – above all at large customers, different margins in different countries will be hardly tenable
- ✓ There was no sharp price decline as a reaction to market liberalization

- ✓ Gas prices are rather expected to rise
  - ✓ Increasing oil prices
  - ✓ Increasing costs of production from new fields
  - ✓ Increasing costs of transport from distant fields
  - ✓ Partial inclusion of costs connected to unbundling
  - ✓ Marketing costs
  - ✓ New services for costumers

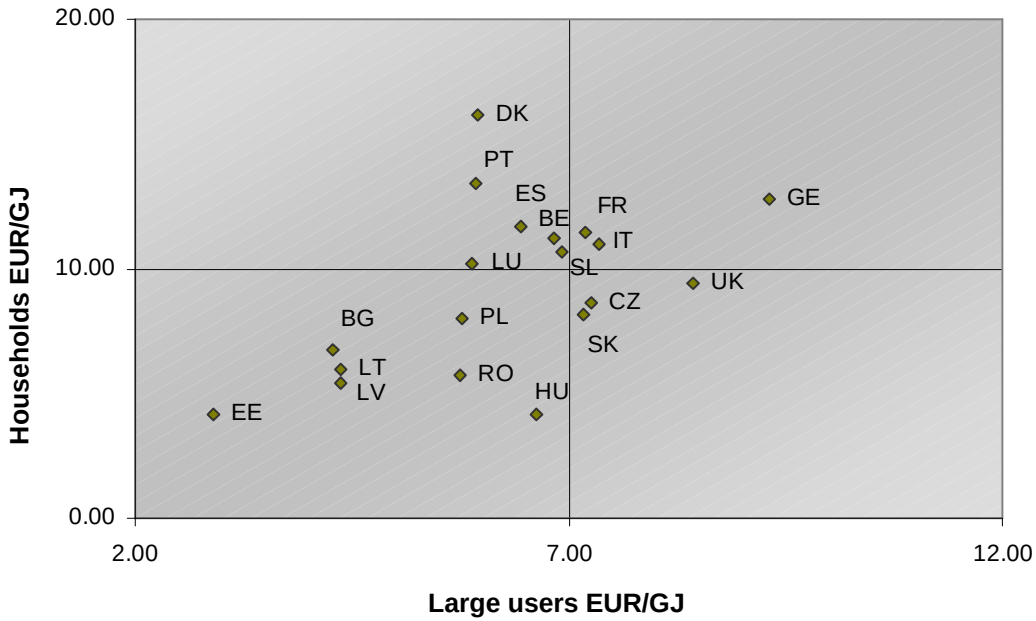
- ✓ Possibility of lower prices for the largest users
- ➢ **Deregulation should contribute to lower price differences between particular states.**

Impacts of liberalization on consumers – prices (2) - convergence

- **Gas prices** under the pressure of international oil prices, which are often embedded in contracts between gas importers and producing countries – see the first part.
- **Deregulation should contribute to lower price differences between particular countries.**

- Although wholesale prices are very similar in majority of Member States, according to Eurostat data there are significant price differences for end users.
- Prices for large users vary between 10 EUR/MWh in Estonia and 25 EUR/MWh in Sweden.
- Prices for households vary between 15 EUR/MWh in Estonia and more than 45 EUR/MWh in Portugal.

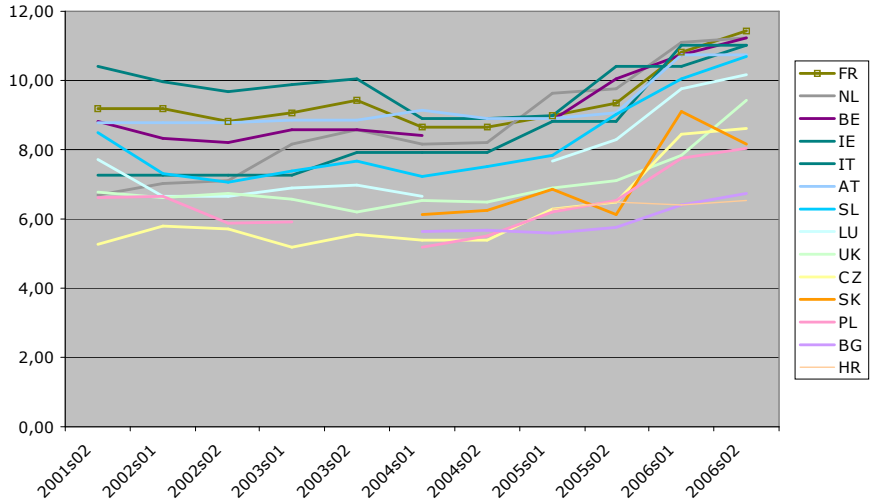
Comparison of gas prices for end users, 02/2006
(category D3 vs. I4-1, prices without taxes)

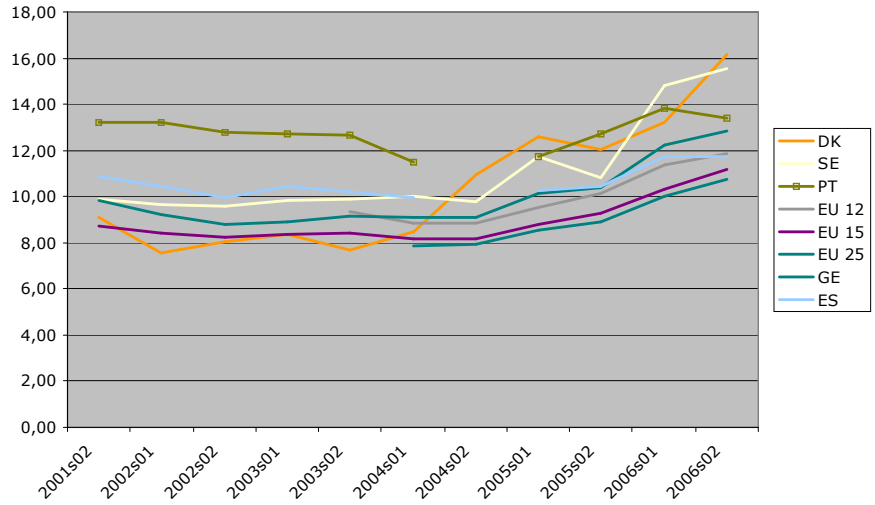


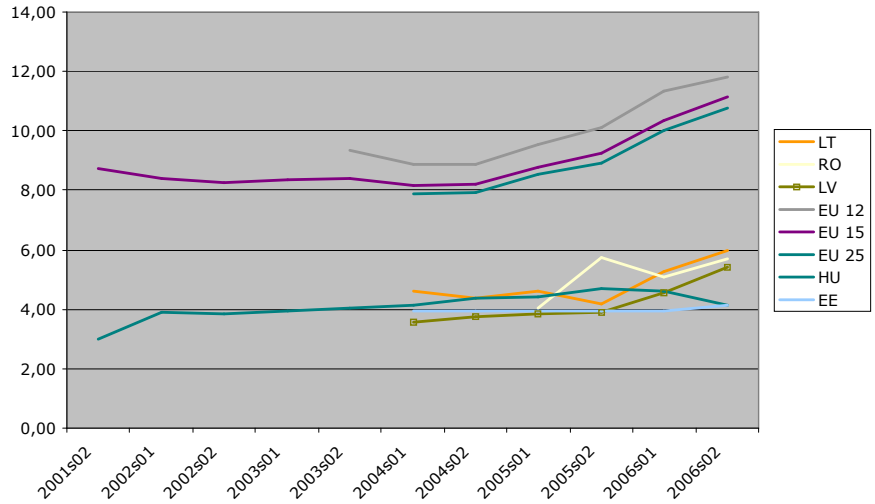
Source: EUROSTAT
Note: D3 – Annual consumption: 83.70 GJ
I4-1 – Annual consumption: 418 600 GJ; load factor: 250 days, 4 000 hours

Impacts of liberalization on consumers – prices (3)

Households - D3 (Annual consumption: 83.70 GJ)



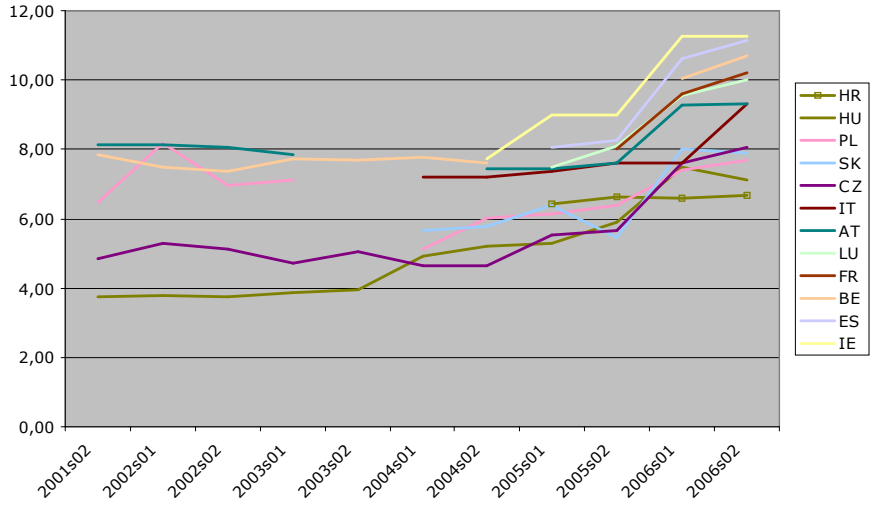


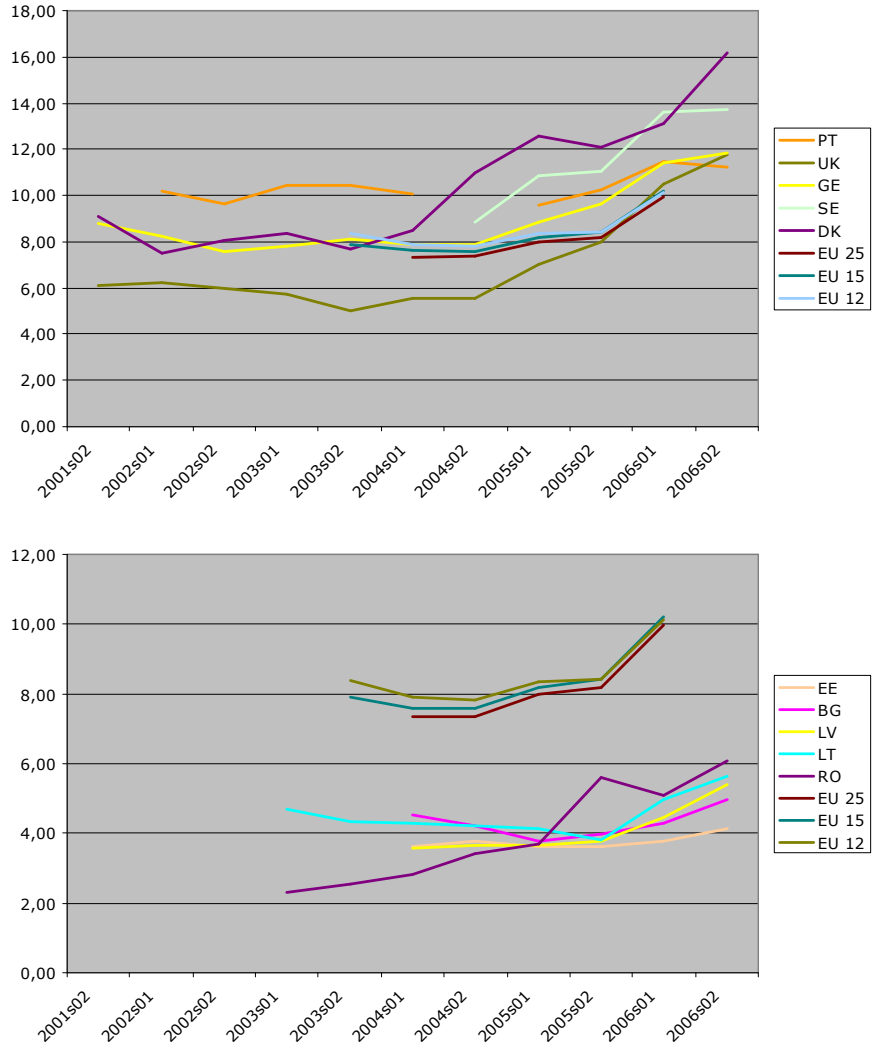


Source: EUROSTAT

Impacts of liberalization on consumers – prices (4)

Industry - I1 (Annual consumption: 418.6 GJ; no requirement for load factor)

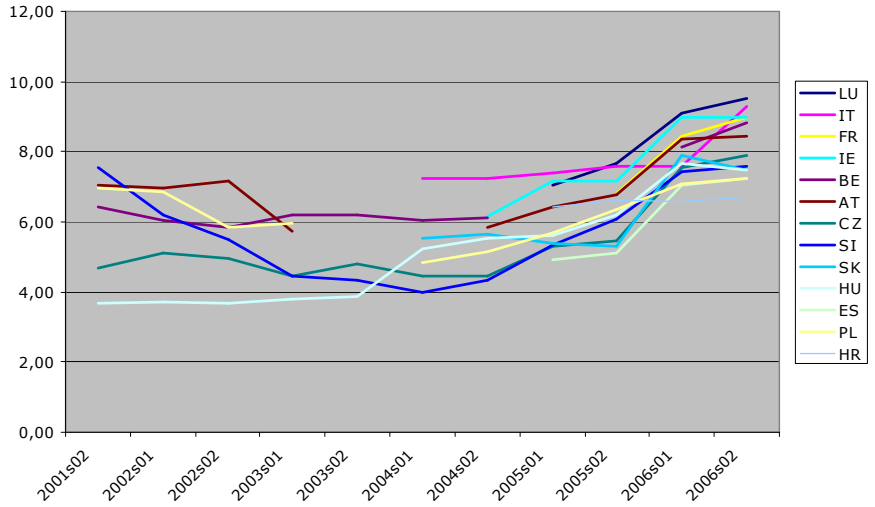


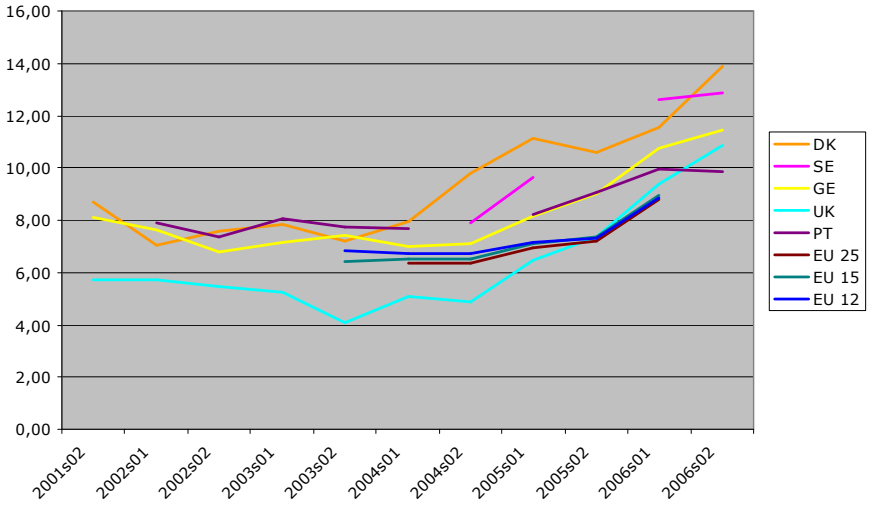


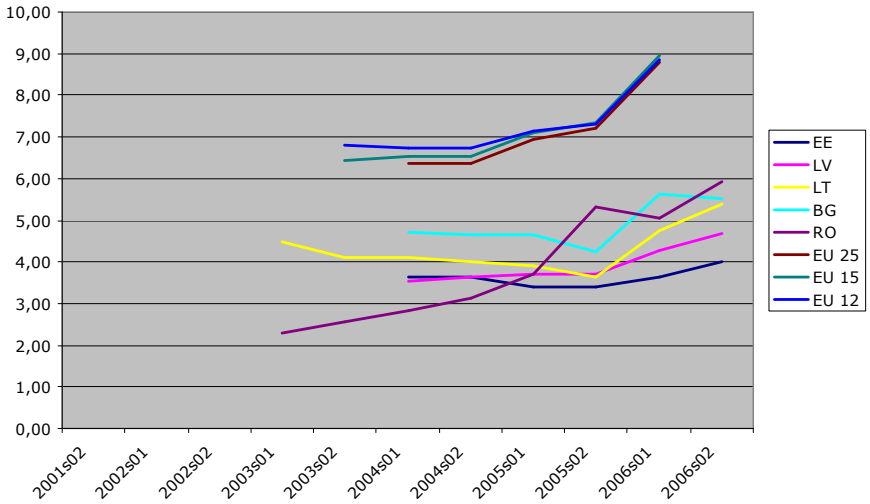
Source: EUROSTAT
Note: Load factor – ratio of the average load over a designated period of time to the peak load occurring during that period

Impacts of liberalization on consumers – prices (5)

I2 (Annual consumption: 4 186 GJ; load factor: 200 days)



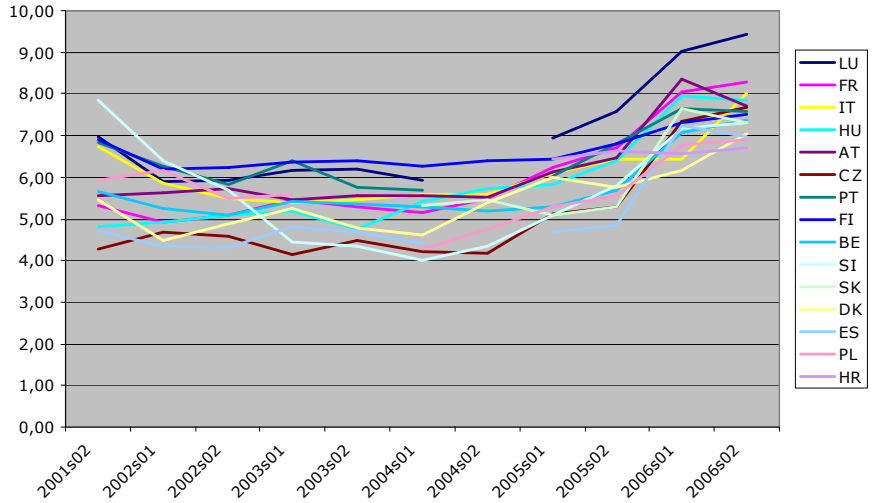


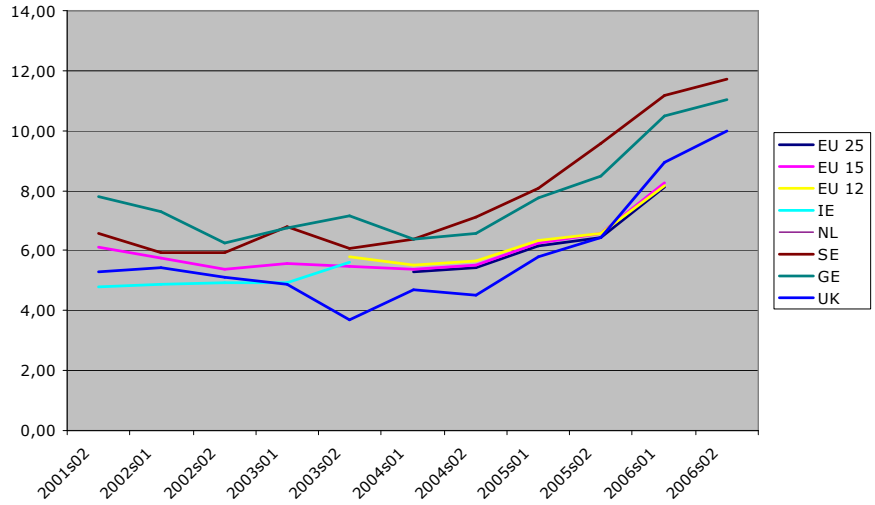


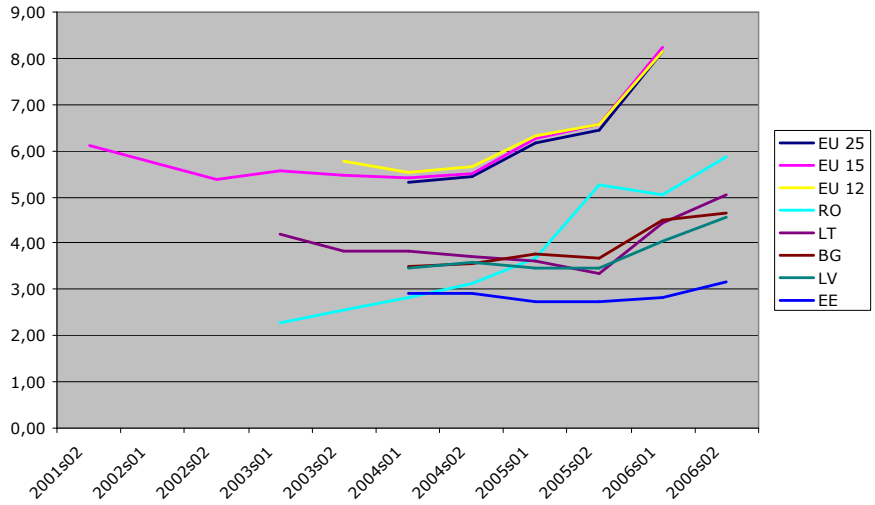
Source: EUROSTAT

Impacts of liberalization on consumers – prices (6)

I3-1 (Annual consumption: 41 860 GJ; load factor: 200 days, 1 600 hours)



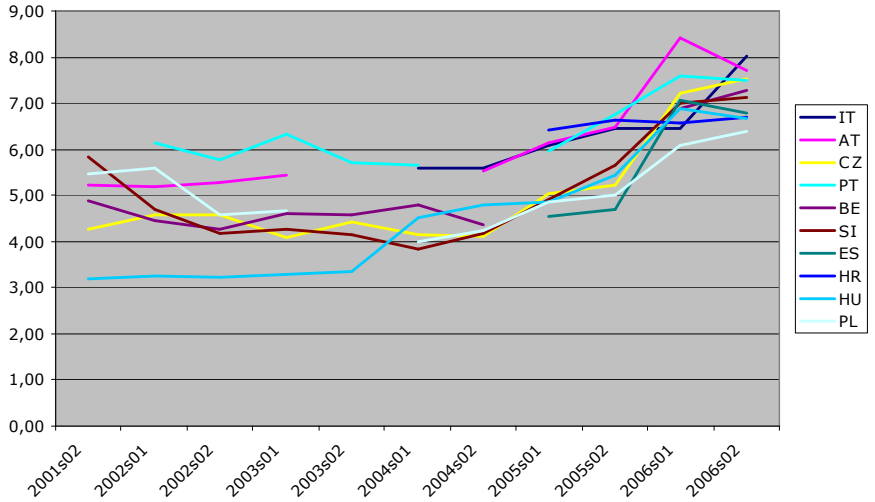


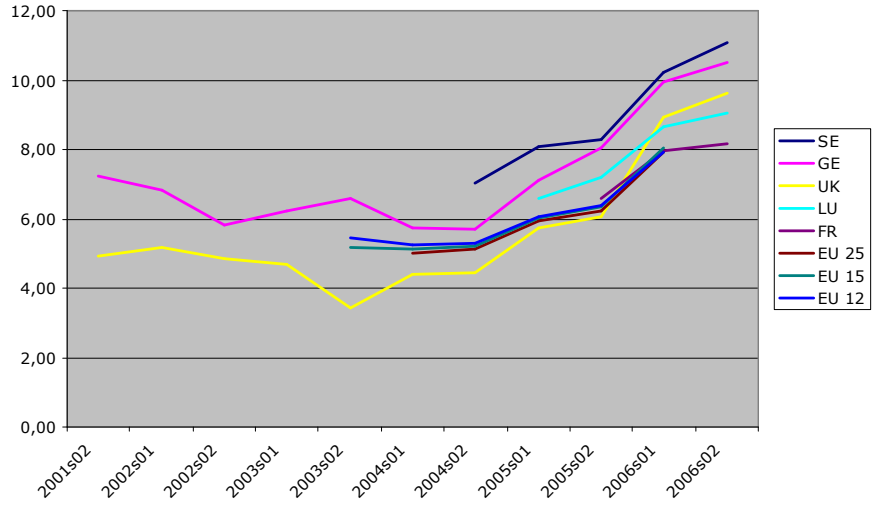


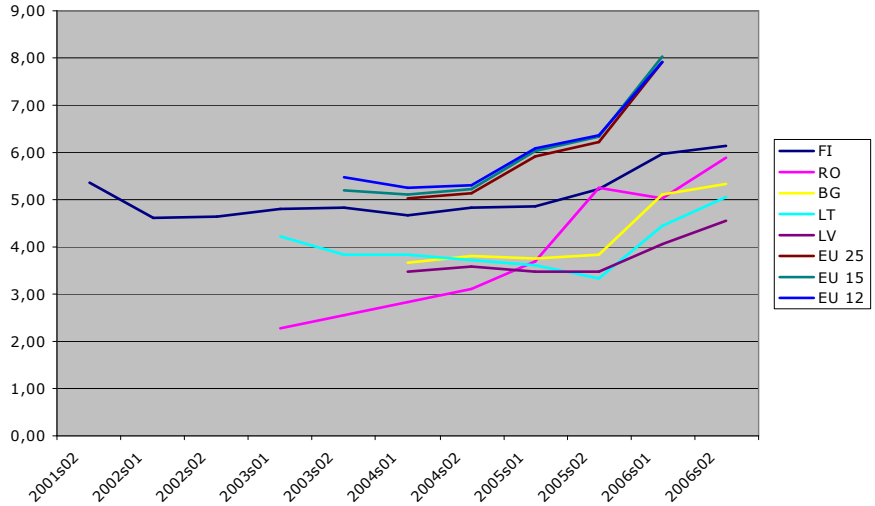
Source: EUROSTAT

Impacts of liberalization on consumers – prices (7)

I3-2 (Annual consumption: 41 860 GJ; load factor: 250 days, 4 000 hours)



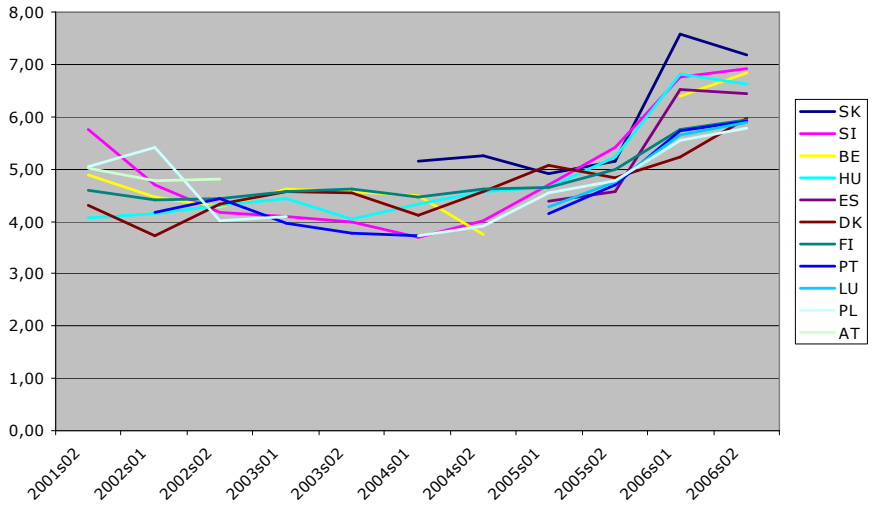


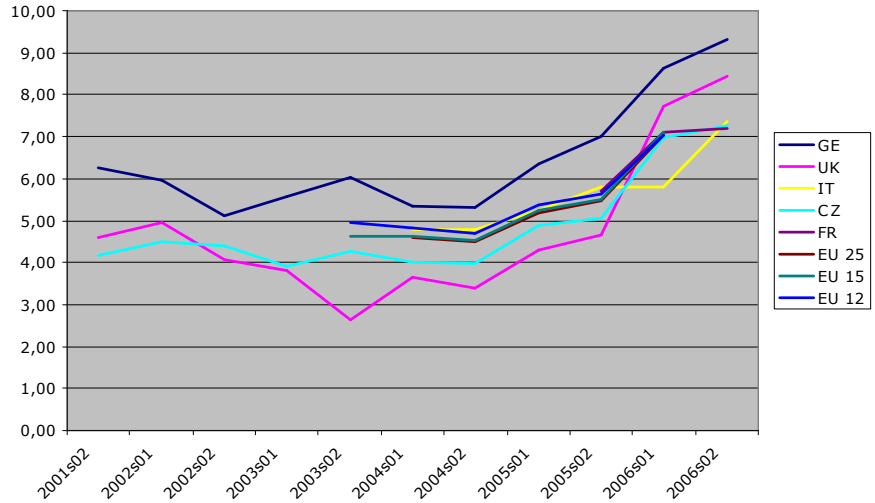


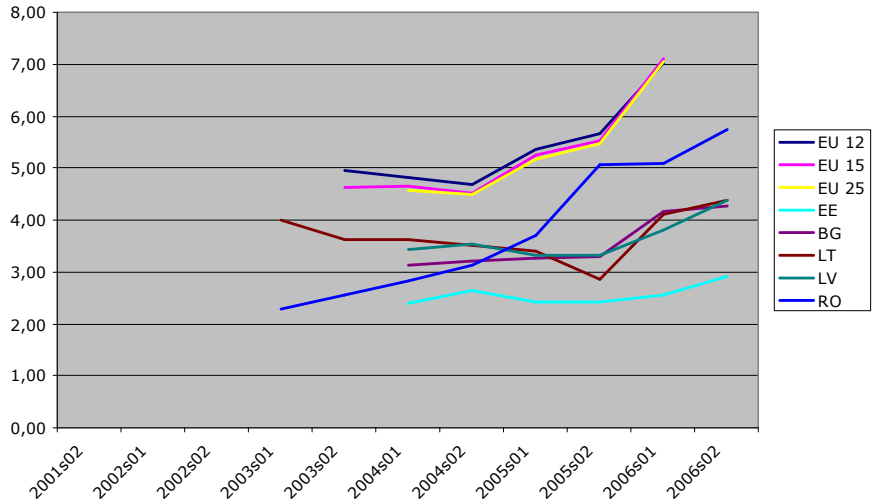
Source: EUROSTAT

Impacts of liberalization on consumers – prices (8)

I4-1(Annual consumption: 418 600 GJ; load factor: 250 days, 4 000 hours)



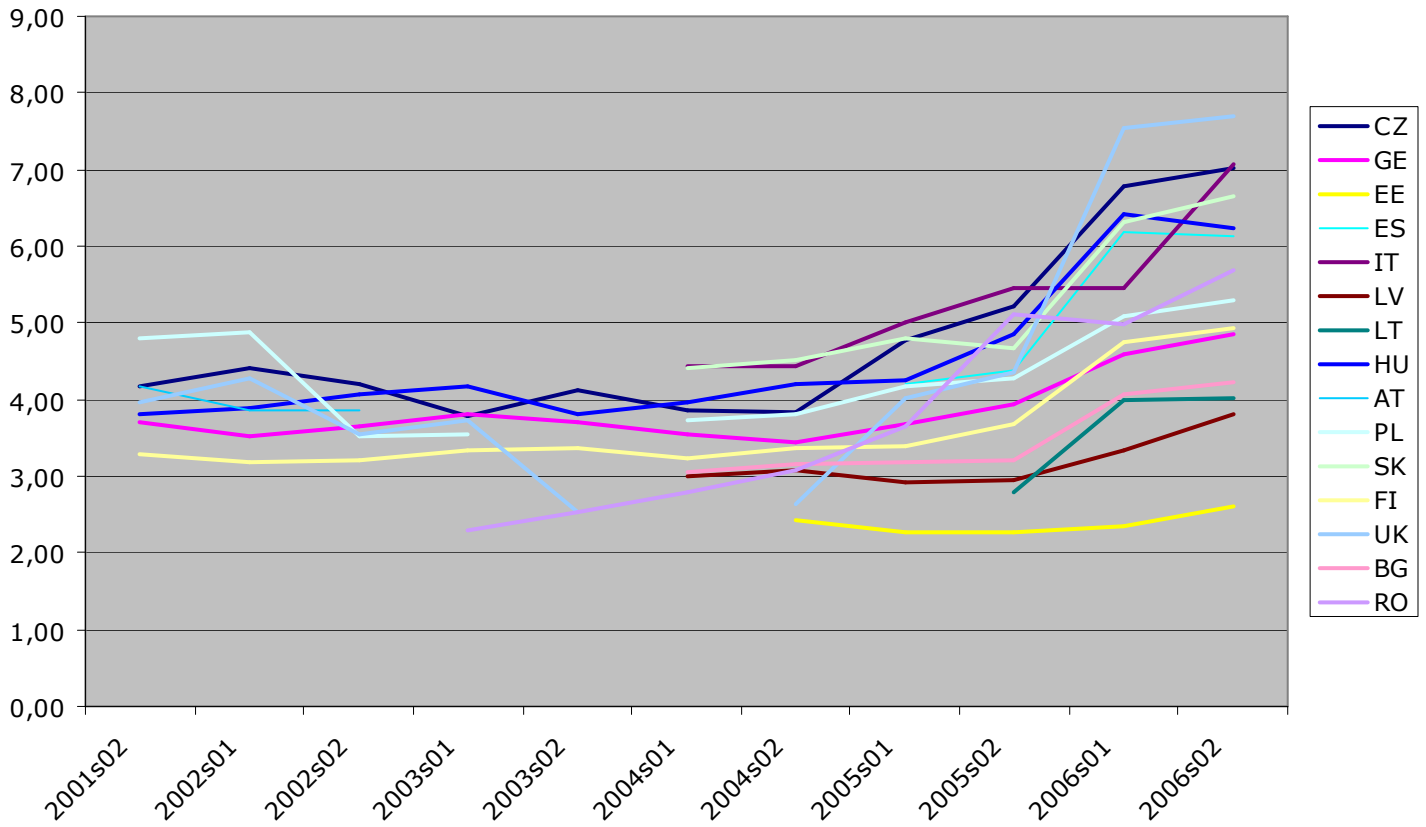




Source: EUROSTAT

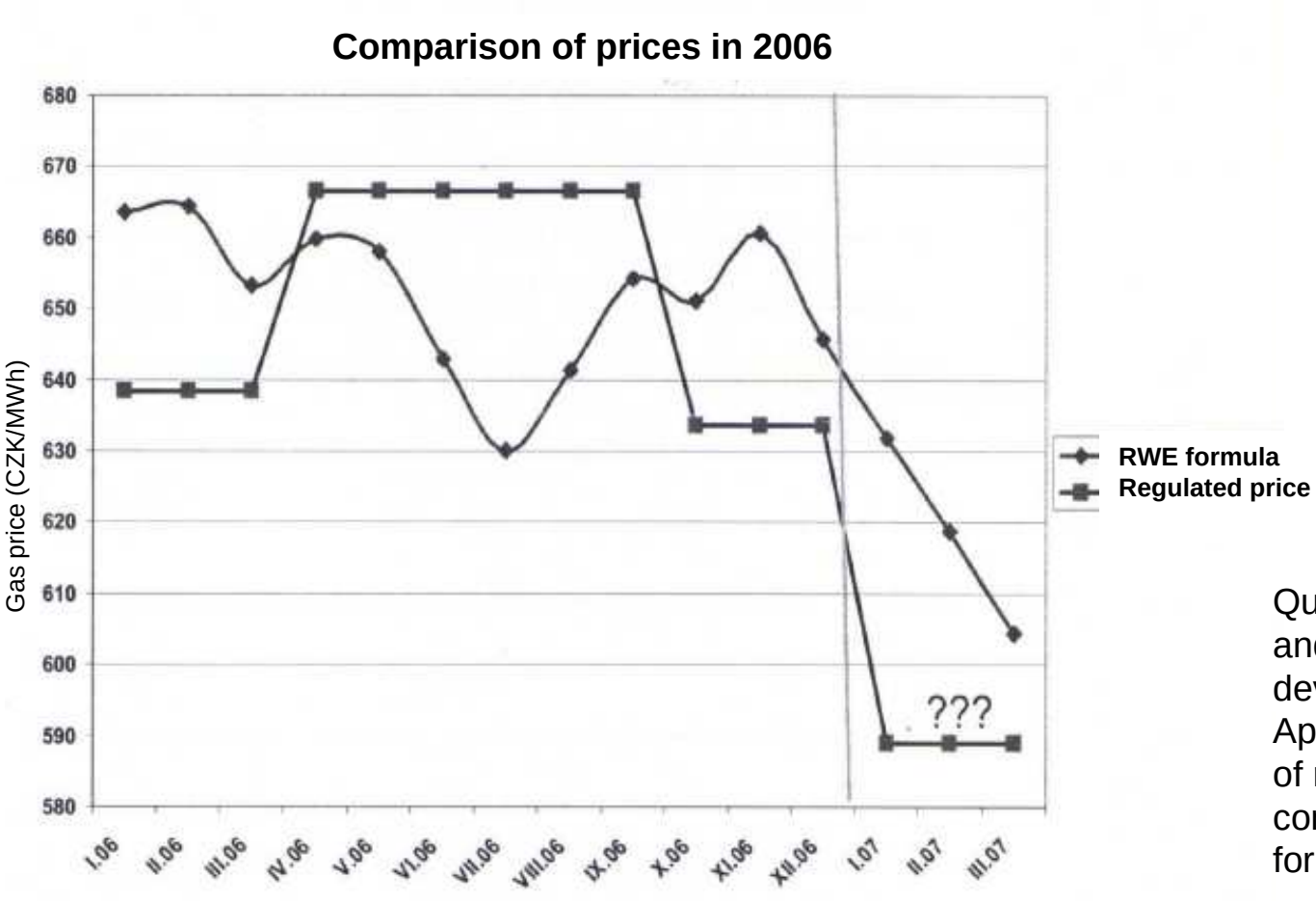
Impacts of liberalization on consumers – prices (9)

I5 (Annual consumption : 4 186 000 GJ; load factor: 330 days, 8 000 hours)



Source: EUROSTAT

Results of gas market liberalization – prices in CR according to ENA?



Question of price and market development after April 1, 2007 – end of regulation, conversion to formula

Source: ENA, conference „Plynárenství ČR a SR 2006“ (Gas industry in CR and SR 2006), Brno, 14. - 15. 11. 2006

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1. World reserves and consumption of oil and natural gas
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Liberalization vs. security of supplies - EU Green Paper (1)

- **Security of supplies** – hot issue besides liberalization – market opening in contrast to security and reliability of supplies
- **EU Green Paper** from March 2006 – Energy strategy for Europe: harmony between sustainable development, competitiveness and security of supplies
  - Urgent need for investment – to meet expected energy demand and to replace ageing infrastructure, investments of around one trillion euros will be needed over the next 20 years
  - Rising import dependency - in the next 20 to 30 years around 70 % of the EU energy requirements, compared to 50% today, will be met by imported products – some from regions threatened by instability
  - Reserves concentrated in a few countries - Russia, Norway, and Algeria – according to current trends, gas imports would increase to 80 % over the next 25 years
  - Increasing global demand for energy - expected to rise by some 60% by 2030, global oil demand projected to grow by 1.6% per year
  - Increasing oil and gas prices
  - Climate changes
  - Internal energy markets not yet fully competitive – only when such markets exist EU citizens and businesses would enjoy all the benefits of security of supply and lower prices

Liberalization vs. security of supplies - EU Green Paper (2)

- **6 priority areas**
  - Energy for growth and job opportunities in Europe: completion of internal energy electricity and gas market
  - Internal energy market ensuring security of supplies: solidarity among Member States
  - Security and competitiveness of energy supplies: way to more sustainable, efficient and diverse energy mix
  - Integrated approach to addressing the challenges of climate changes
  - Support of innovations: strategic plan for European energy technologies
  - On the way to common external energy policy

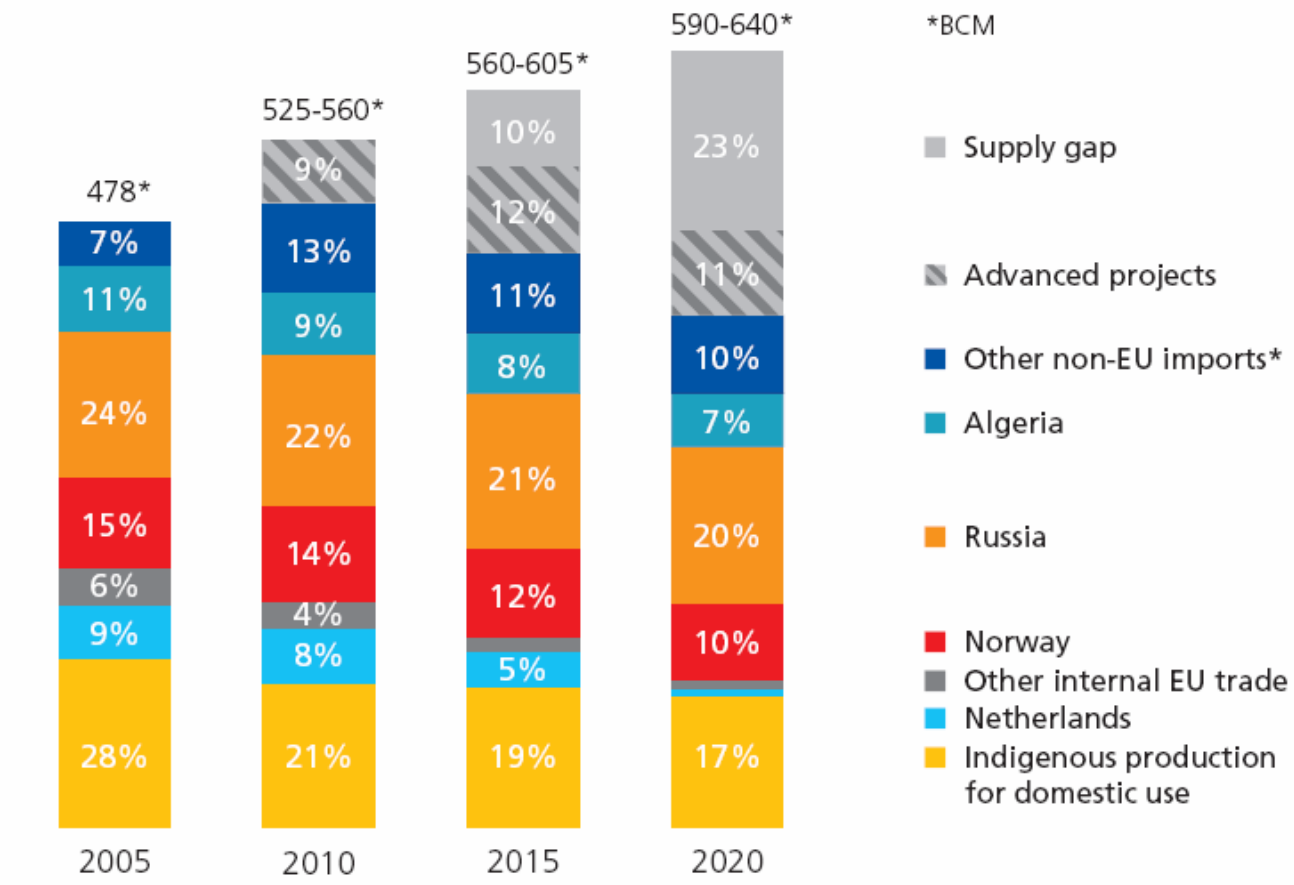
- **Ownership unbundling?**
  - Higher importance of the anti-monopoly offices (misuse of dominant position on the market) rather than further legislation adjustments

EUROGAS – security of supplies (1)

- **The European Gas Market; Eurogas Views On The Way Forward**
  - Impacts of liberalization ⇔ consequences for investment decision-making of companies
  - Higher transparency necessary and more coherent approach to regulation with the aim of higher level of European gas market integration
    - Priority = appropriate implementation of existing legislation
  - Emphasis on possible diversification to ensure security of supplies and on dialog between consumer, transiting and producing countries
  - Assessment of the importance of long-term take or pay contracts – they form a basis of security of supplies and complementary short-term relationships supported by liquid markets for majority of companies = expansion of supply options, improved portfolio optimization

EUROGAS – security of supplies (2)

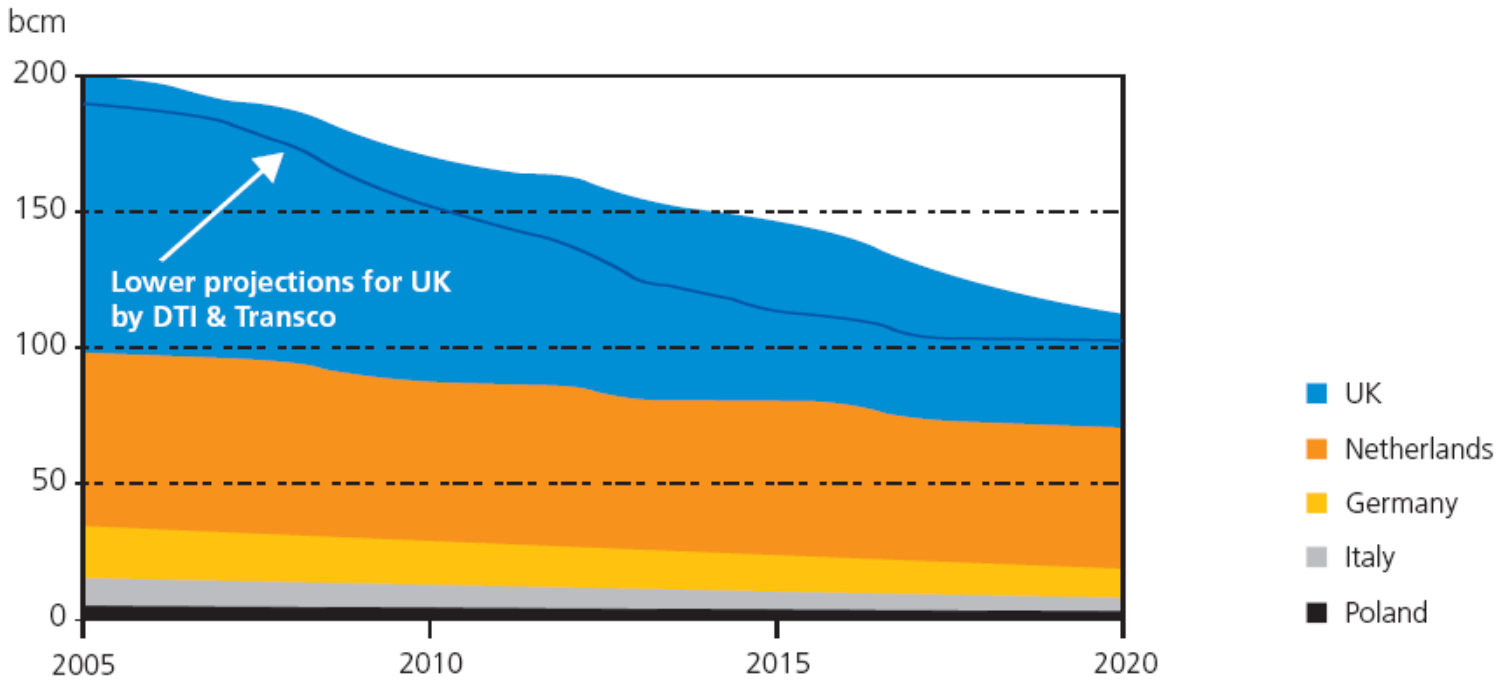
EU 25 – Structure of supplies



Source: The European Gas Market; Eurogas Views On The Way Forward

EUROGAS – security of supplies (3)

EU 25 – Domestic natural gas production



Source: The European Gas Market; Eurogas Views On The Way Forward

Flexibility tools for natural gas supplies

✓ Technically possible but typically at higher costs than alternatives

General flexibility tools

Types of flexibility needed		Linepack	LNG storage	UGS: Cavern	UGS: Depleted field	Flexible supply contracts	Interruptible consumer contracts	Peak-priced consumer contracts	Usage of global portfolio of gas contracts and UGS
INTRA-DAY	① Grid balancing (intra-day)	✓		✓	✓	✓	✓	✓	✓
INTRA-DAY	② Tolerance services (intra-day)	✓		✓	✓	✓	✓	✓	✓
INTER-DAY	③ Flexibility services (intra-month)		✓	✓	✓	✓	✓	✓	✓
SEASONAL	④ Winter peak delivery		✓	✓	✓	✓	✓	✓	✓
SEASONAL	⑤ Seasonal storage			✓	✓	✓			✓

Cycle time

Source: McKinsey/EEIP Report 2006

Structural change of the role of key supplier – Gazprom

- **Expected diversification of gas imports is mitigated by Gazprom activism** (lower dependence on Russia, Norway and Algeria was expected due to new „southern routes“ and also LNG project, which were activated by high oil and gas prices)

- **Gazprom** – projects – strengthening the company's importance
  - **Kazakhstan** – agreement on gas supplies = ensures that Kazakh gas will not be supplied via Nabucco to Europe but will be supplied to Russia
  - **Turkmenistan** – negotiations on higher export volumes above long-term contract
  - **Iran – Pakistan - India** – Gazprom interested to take part in the project – Iranian gas to Asia, not to Europe
  - **Northern European Gas Pipeline**
  - **agreement with MOL** – extension of the Blue Stream to Hungary (direct competition to Nabucco)
  - **China** – interested in supplies, construction of pipeline – however, so far China has not been willing to pay the same price as Europe
  - **LNG projects** (Stokhman – construction of new condensation unit)
  - Coordination Committee of **Nabucco project** – interest in participation of Gazprom on the project (construction or gas supplies) – Wien, 10/2006 – Gazprom representatives invited

  - **Shift of margin to suppliers**
  - **Approval of ownership unbundling by EC – further steps of Gazprom?**

Growing importance of LNG

- **LNG projects – alternative way**
  - ✓ LNG market (liquefied natural gas) will play more important role in the future
  - ✓ Flexibility of natural gas supplies worldwide – Europe, Asia, Japan
    - ✓ Japan – pioneer in LNG – security of supplies without pipelines
    - ✓ Algeria also exports gas to Europe via LNG
  - ✓ In 2002 LNG market amounted only to 6% of world gas consumption, however LNG seems to be a solution of gas transport for long distances

- **Middle East – Iran, Qatar, Oman, United Arab Emirates**
  - ✓ Gas transmission from Middle East to Europe in the form of LNG can play an important role in the future, in 2002 countries of Middle East accounted for ¼ of world LNG exports
- **Iran** - export to European markets and India; the second biggest world reserves – high export potential
- **Qatar** – export of LNG to Spain, Turkey, Italy, Japan, USA, France, South Korea and UK
- **Oman –** production for Japan and Spain
- **United Arab Emirates** – 97% exports to Japan
- **Barents Sea** – North of Russia, export of LNG to Europe and USA