
Energy resources and future economic development of the Czech Republic

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Domestic primary energy resources

Coal

- Coal-beds in north-western Bohemia and northern Moravia
- Availability of domestic exploitable hard coal and lignite reserves is low
Utilization limited by the territorial ecological limits

Oil

- Reserves in southern Moravia
- Proportion of domestic extraction on the oil consumption = 4.5%
- The ratio expected to fall down in future

Natural gas

- Negligible reserves in Moravia
- Proportion of domestic extraction on the gas consumption = 1.5-2%

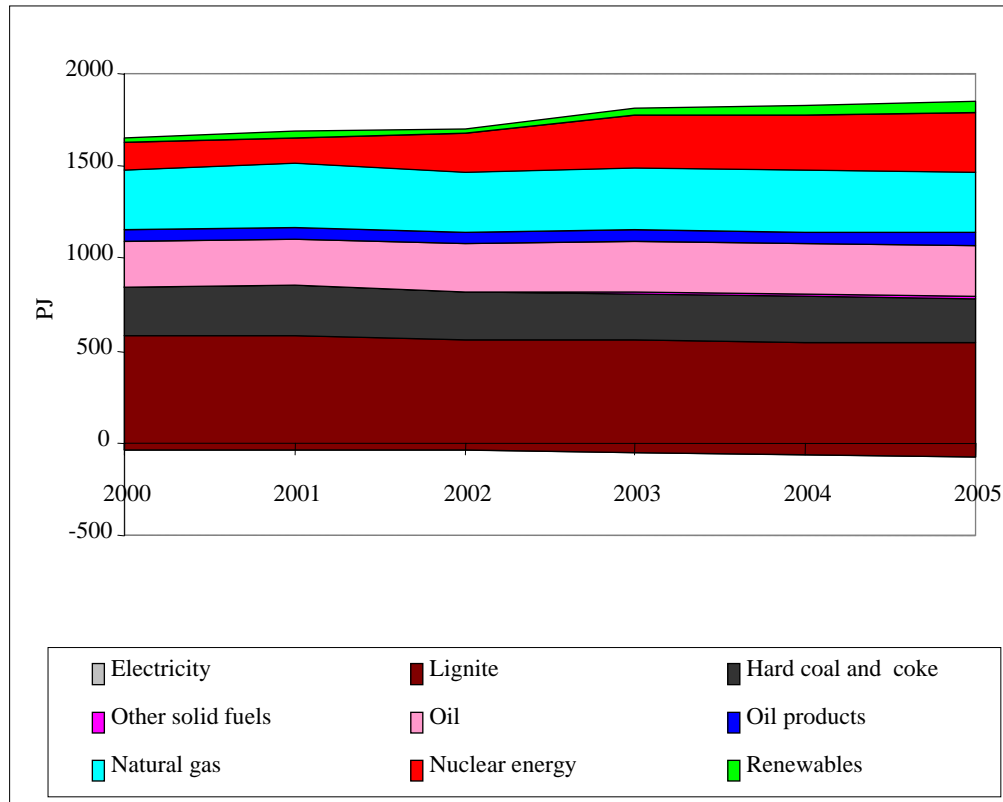
Uranium

- Uranium reserves available, chemical extraction finished
- End of deep-mined extraction at the end of 2008 approved by the government
- In 2007 information on possible continuation of extraction will be submitted to the government



Domestic primary energy resources

Structure of primary energy resources consumption



Source: Ministry of Industry and Trade

- After 2000 the energy balance diversified at the expense of the increase in proportion of imported fuels.
- Fast growth of total consumption of PER proportional to the fast growth of economics.

Development in energy sectors

Coal

- Coal mining and deliveries slowly decreased
- Large portion of hard coal production exported (40-42% of extraction)

Natural gas

- Consumption stabilized after its dynamic growth in 1990's
- Major part consumed on heat production

Oil

- Imports of oil increased

Electricity

- Gross electricity consumption grew in 2000-2004 on average by 2.1%
 - Gross electricity production grew faster, on average by 2.85%
- Consequence of higher exports and high active balance in foreign trade with electricity

Renewables

- Utilization increased insignificantly
- Proportion of electricity from renewables on gross electricity consumption in 2004 = only 4.04%
- Indicative target of the Czech Republic, obligation towards EU = 8% in 2010



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Import energy dependence

		2000	2001	2002	2003	2004	2005
Import without nuclear fuel	PJ	728.3	773.9	785.3	794.6	784.0	775.1
Import with nuclear fuel	PJ	875.8	922.2	989.6	1075.3	1084.0	1092.8
Export	PJ	338.5	342.4	345.9	336.5	326.5	313.5
Net import without nuclear fuel	PJ	389.8	431.4	439.4	458.1	457.5	461.6
Net import with nuclear fuel	PJ	537.3	579.7	643.7	738.8	757.5	779.3
Import dependence without nuclear fuel (% domestic consumption of primary energy resource)	%	23.5	25.5	25.8	25.3	24.8	25.0
Import dependence with nuclear fuel (% domestic consumption of primary energy resource)	%	32.4	34.2	37.8	40.8	40.5	42.1

Source: Ministry of Industry and Trade

Import energy dependence

- Import energy dependence increases
- Increase caused by:
 - ✓ Higher imports of nuclear fuel and oil
 - ✓ Lower exports of hard coal, lignite and coke
- Electricity network dependent on the imported energy sources (nuclear fuel, natural gas) only by 33.6%.
- Total deficit of the year balance of the foreign trade with energy resources moves around CZK 70 – 80 billion.
- Total down-fall mitigated by the positive balance from the export of solid fuels and electricity.
- Due to increasing prices of energy resources further deepening of the deficit expected.



Import energy dependence - predictions

Import energy dependence (%) according to the Green scenario, State energy policy

2000	2005	2010	2015	2020	2025	2030
32.1	41.2	42.3	45.9	48.6	53.0	57.8

Energy intensity (MJ/CZK GDP) according to the Green scenario, State energy policy

2000	2005	2010	2015	2020	2025	2030
1.212	1.053	0.889	0.743	0.623	0.538	0.454

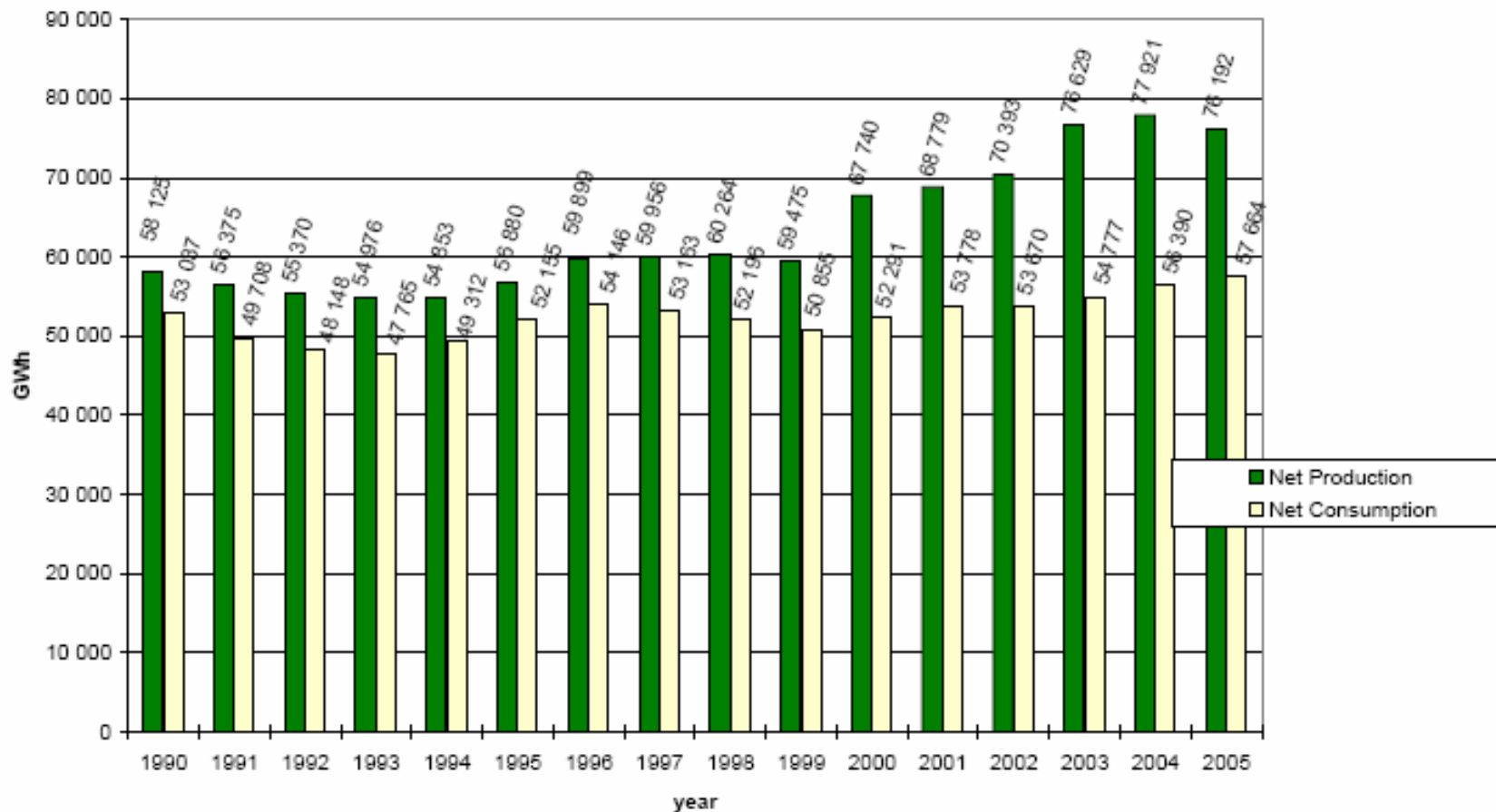


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Electricity market – production and consumption



Source: Ministry of Industry and Trade

Electricity market – installed capacity

- Total installed capacity as of January 1, 2006 = 17,412 MW
- Structure:
 - ✓ Steam power plants 61.2 %
 - ✓ Nuclear power plants 21.6 %
 - ✓ Water power plants 12.5 %
 - ✓ Gas power plants 4.5 %
 - ✓ Alternative resources 0.2 %
- 2005: Total decrease by 22 MW
 - ✓ Decrease in installed capacity of steam power plants including cogeneration by 41 MW and installed capacity of gas power plants by 10 MW
 - ✓ Increase in installed capacity of water power plants by 6 MW and other renewable resources (mainly wind) by 23 MW
- Construction of new big electricity power plant (with installed capacity higher than 50 MW) not expected
- Expected increase in small sources using renewables



Electricity market in 2005 and in the future

2005

- Total domestic electricity consumption = 69.9 TWh
- Increase by 1.9% in comparison with 2004
- Continuing trend of moderate growth in domestic electricity consumption
- Production side – significant influence of domestic and EU legislation on renewable energy resources

Predictions

- Important increase in maximum load and electricity consumption not expected
- Increase in households consumption mitigated by the decrease in energy intensity of industries
- Forecast increase in electricity consumption = 1.0-2.1% until 2010

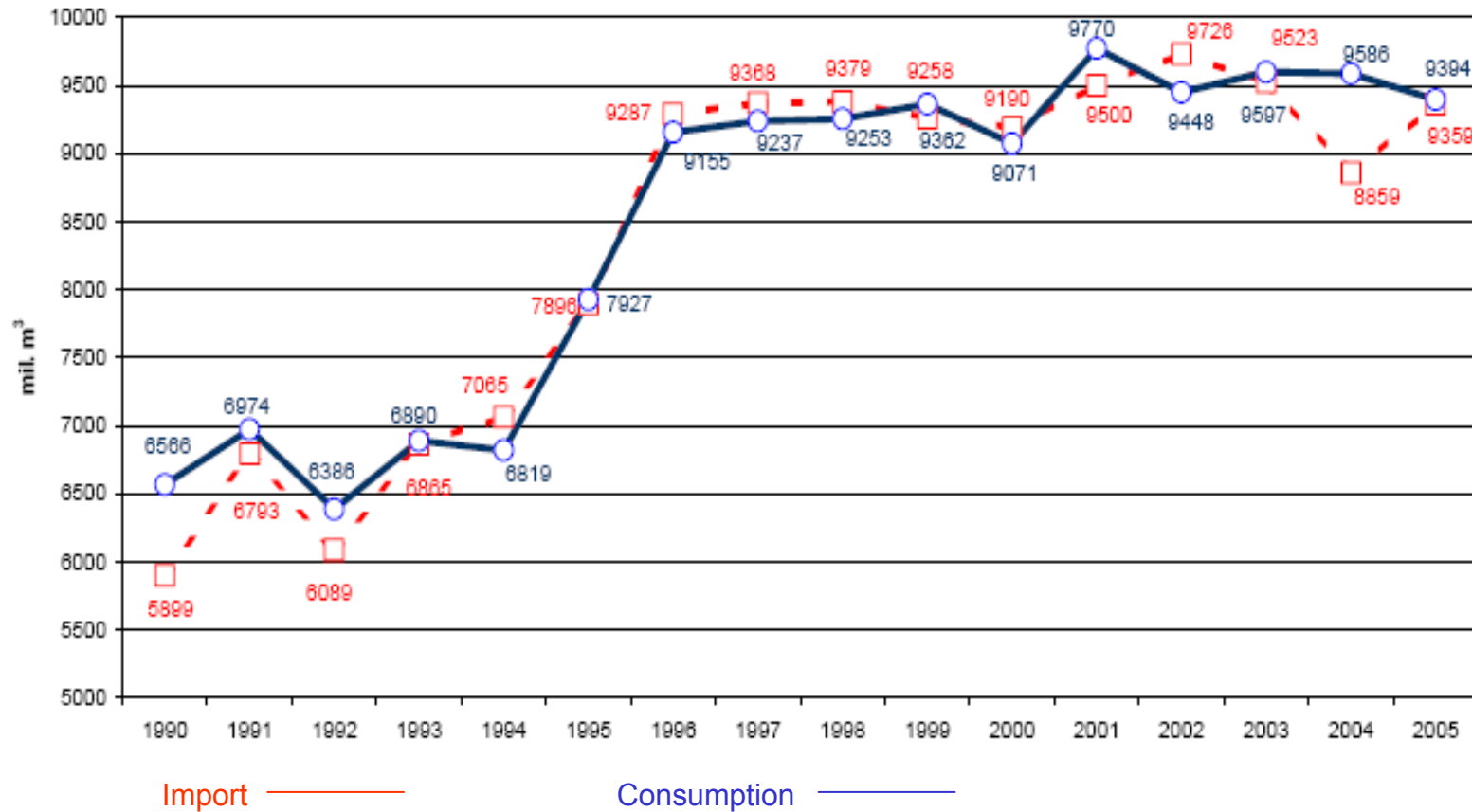


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Natural gas market – import and consumption



Czech natural gas system almost 100% dependent on foreign imports

Natural gas market in 2005

Consumption

- 9,562 million m³ (i.e. 100,828 GWh)
- Decrease by 129 million m³ in comparison with 2004

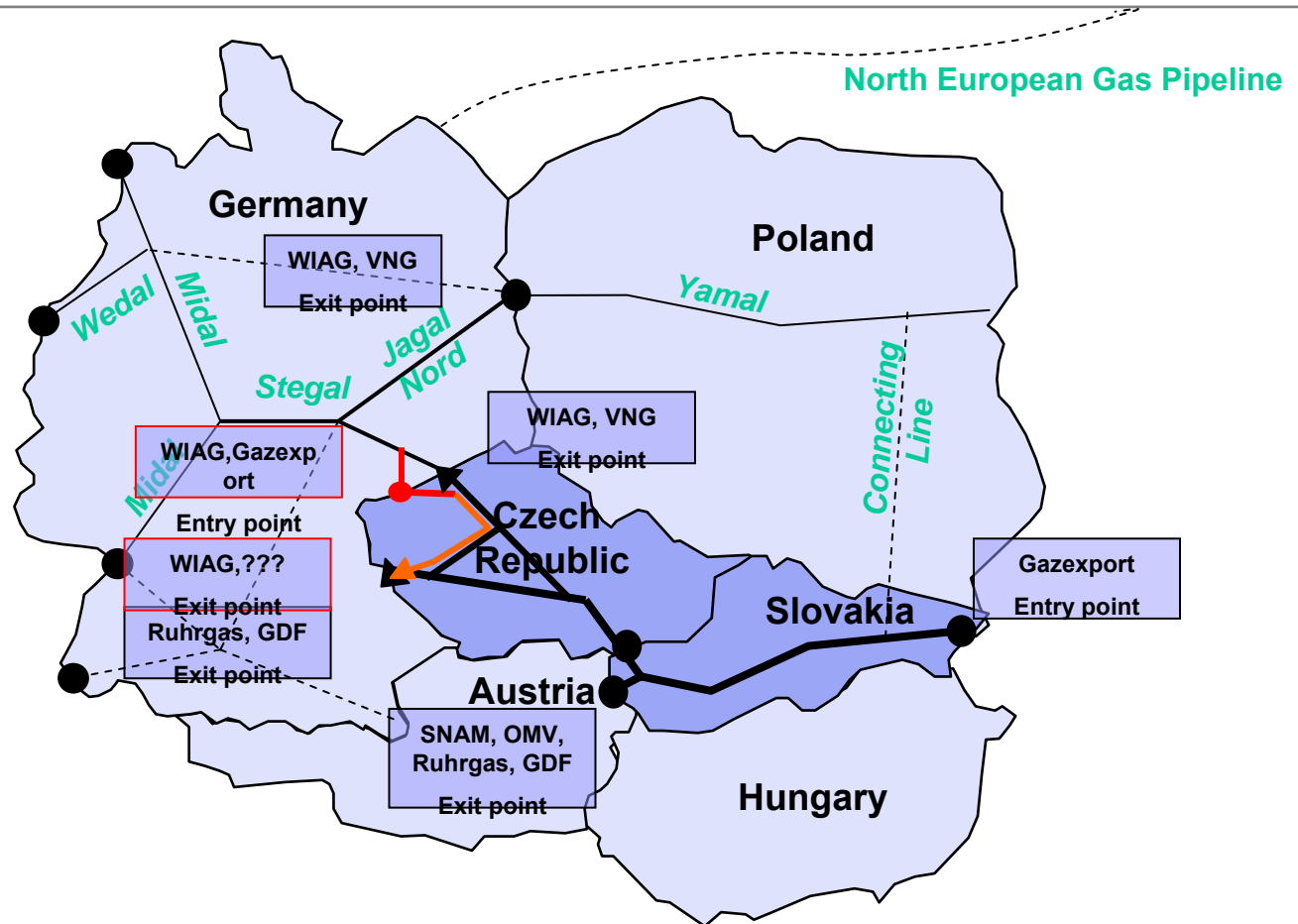
Production and import

- Domestic extraction and deliveries: 60.8 million m³
- Regarding that consumption of natural gas since 1996 moves under 10 billion m³, import capacity is ensured with sufficient reserve
- Total import for the Czech needs: 9,358 mil. m³
- In comparison with 2004 import was higher by 344 mil. m³
- Deliveries ensured from Russia and Norway
 - ✓ 75% Russia (until 1997 the only supplier)
 - ✓ 25% Norway (since 1997)
- This level of supply combined with existing storage capacities contributes to relatively high security of supply.

By the end of 2004 EU Directive concerning measures to safeguard security of natural gas supplies was implemented into Czech legislation.



Natural gas market – transmission system

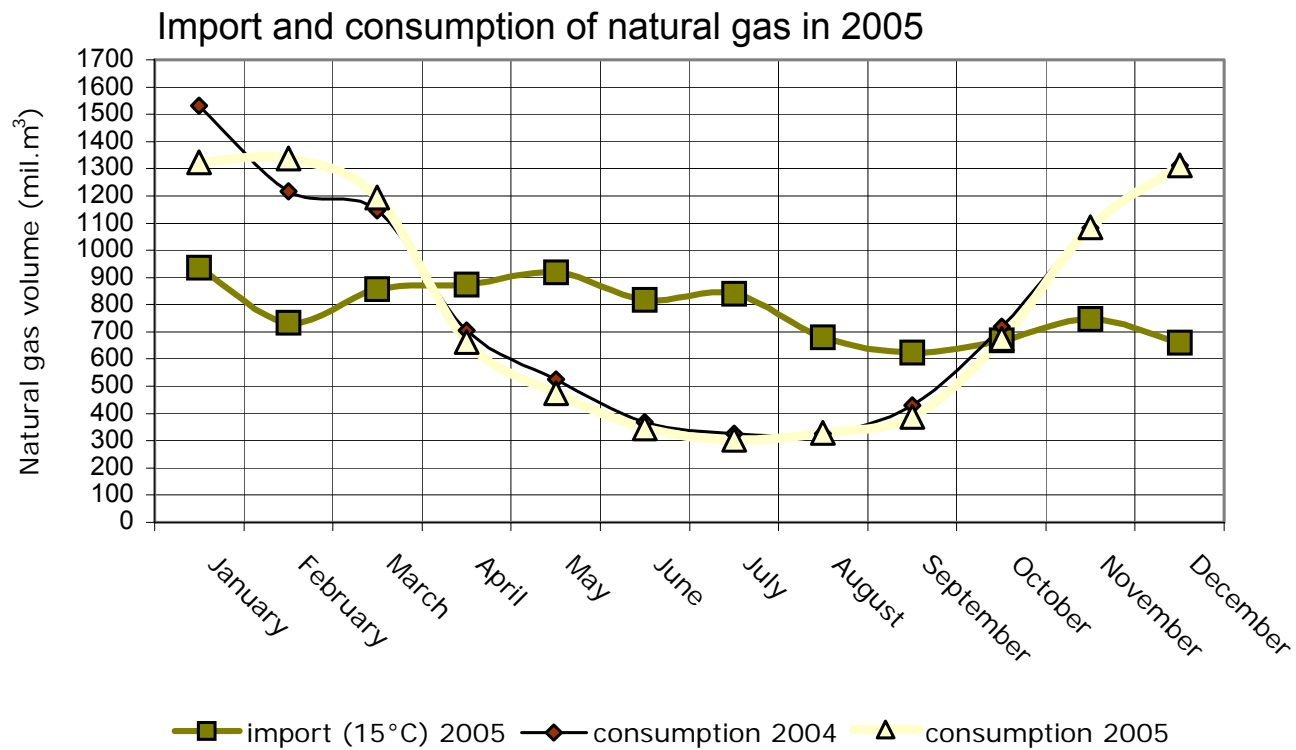


Transmission (2005)

- Capacity of transmission system: 53,500 mil. m³ of natural gas per year
- Gas entering the Czech transmission system: 40,589.4 mil. m³
- Gas exiting the Czech transmission system to foreign customers: 30,902.5 mil. m³

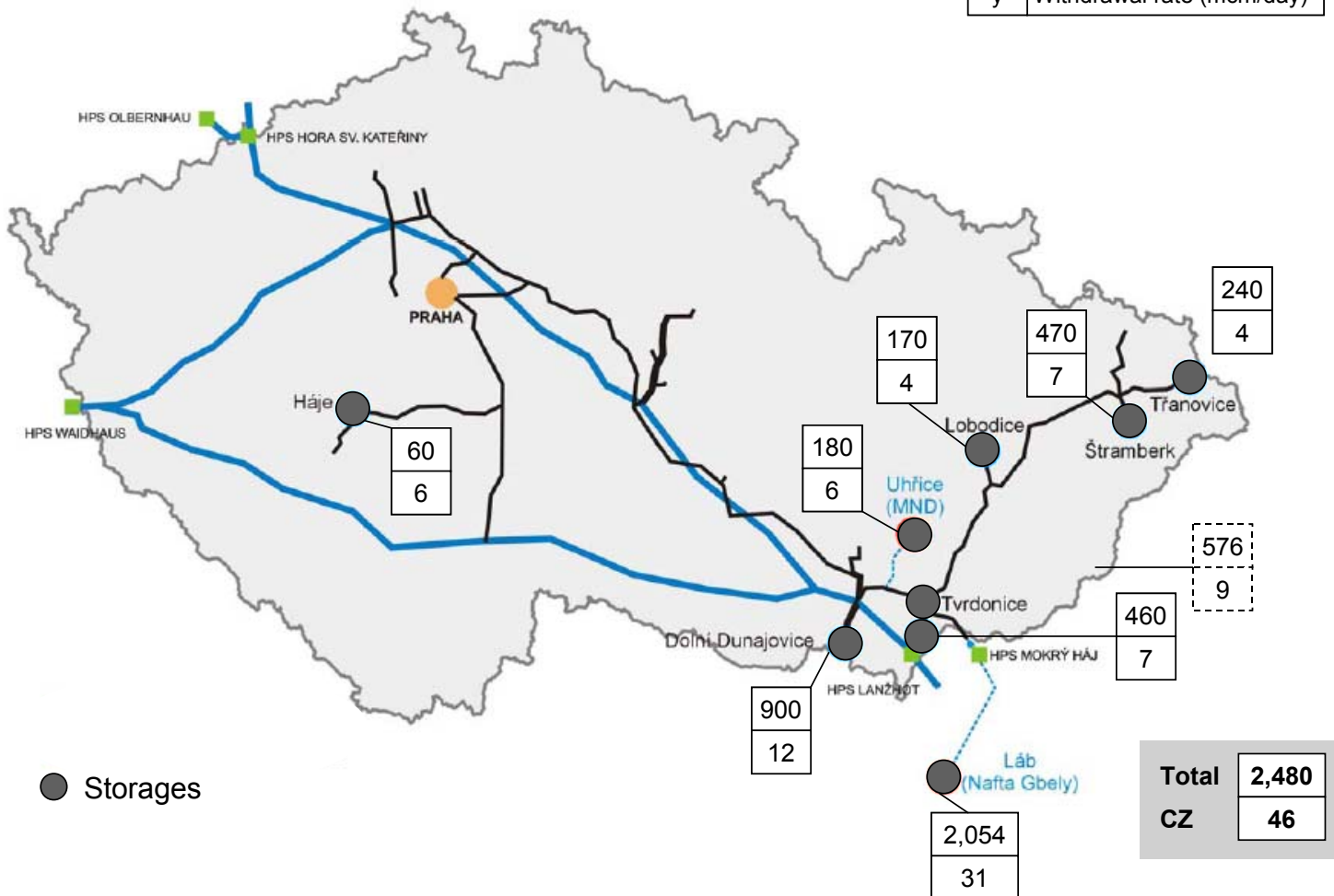
Natural gas market in 2005

- Unstable consumption throughout the year
- Importance of underground storages



Natural gas market – underground storages

x	Working gas volume (mcm)
y	Withdrawal rate (mcm/day)



Source: Ministry of Industry and Trade; RWE Transgas; MND; SPP Bohemia; Nafta Gbely Annual Reports

Natural gas market in the future

Recent decline in consumption

- Trend of increasing gas consumption stopped in 1997. During the last three years the consumption has been slightly decreasing.
- The main reason of lower consumption: higher oil price and consequently higher price of natural gas. Some customers shift to solid fuels (coal, wood).
- Another reason of lower consumption: customers' aim of energy savings, installation of modern technologies.

Expected consumption of natural gas in 2007 – 2010

- For the period 2007-2010 slight growth of gas consumption is expected.
- Assumptions: stable prices and preference for gas as an ecological fuel.

	Reality	Estimate	Forecast				
	2004	2005	2006	2007	2008	2009	2010
Gas consumption	9,821.9	9,577.0	9,350.0	9,400.0	9,490.0	9,600.0	9,700.0
Change in consumption %	1.19	-2.49	-2.37	0.53	0.96	1.16	1.04

Source: Ministry of Industry and Trade

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Oil market in 2005

Import

- Oil: 7,736 th. tons (CZK 70 billion) = highest import in Czech history
- Oil products: 3,175 th. tons (CZK 43 billion)
- Increase in oil import by 20% in comparison with 2004
- Average price of imported oil increased by 37%
- Oil imported by Druzhba pipeline (65%) and Ingolstadt-Kralupy pipeline (IKL; 35%)
- Oil supplies diversified
 - ✓ Russia 71%
 - ✓ Azerbaijan 19%
 - ✓ Kazakhstan 4%
 - ✓ Libya 3%
 - ✓ Algeria 2%
 - ✓ Turkmenistan 1%

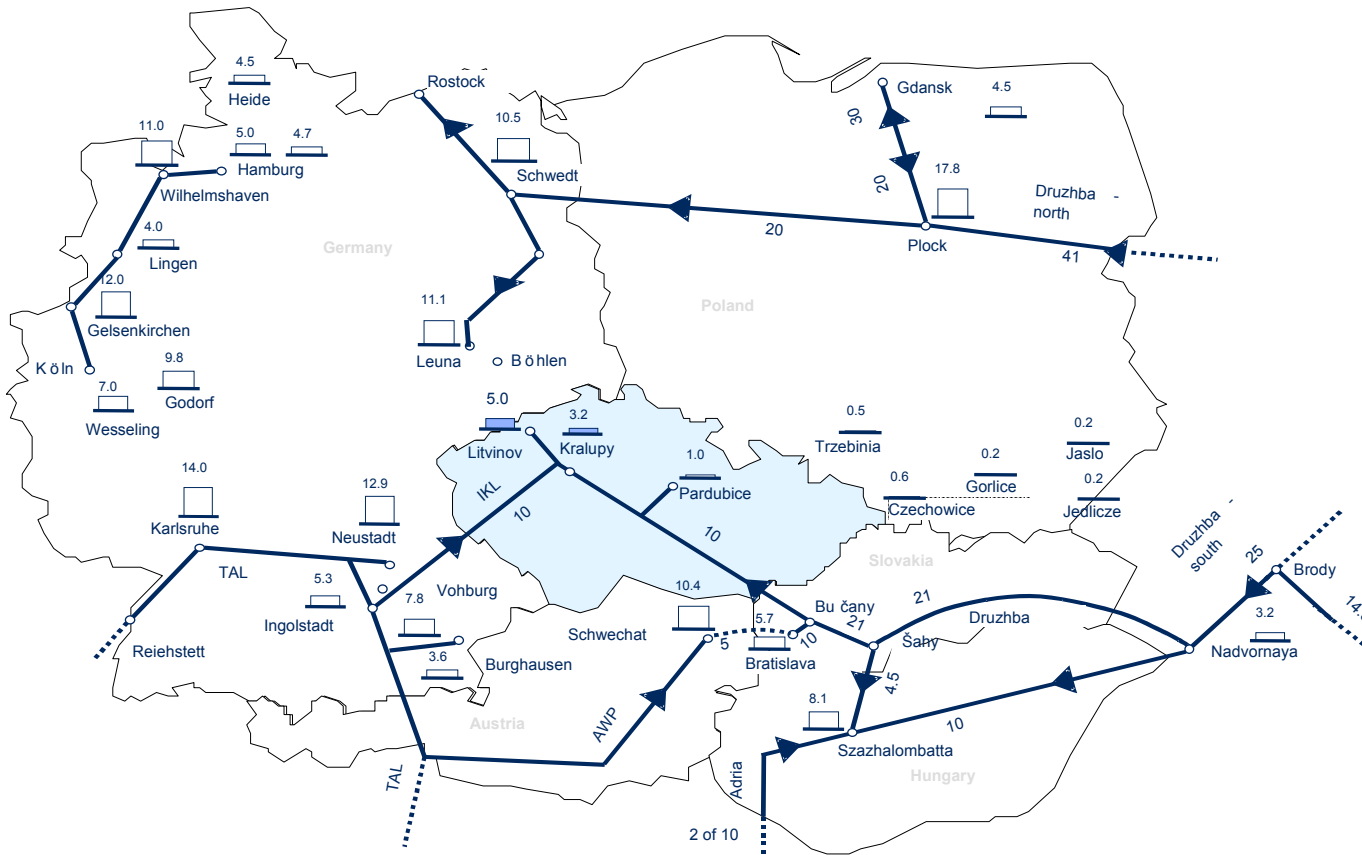
Export

- Oil: 1,393 th. tons (CZK 15 billion)
- Oil products: 1,335 th. tons (CZK 14 billion)

Oil reserves

- Compulsory emergency oil reserves as of December 31, 2005 (IEA methodology): 112 days

Oil pipelines



Druzhba pipeline

Crude oil from Russia through Belarus, Ukraine and Slovakia

Transport capacity: 9 mtpa

Length in CR: 357 km

Ingolstadt-Kralupy pipeline

Crude oil from Mediterranean

Transport capacity: 10 mtpa

Length in CR: 169.7 km

Nelahozeves central oil tank facility

Total storage capacity of 1,300,000 m³

14 oil tanks

Short-term interim storage of oil transported by Druzhba and IKL pipelines

Storage of strategic emergency oil reserves

Source: EIA; PFC Energy; Transpetrol; JANAF; Slovak rating agency; Petroleum Intelligence weekly, Energy Intelligence Group; MERO Annual Report 2005

Product pipeline and storage system



- Interconnection of storages and refineries
- Length: 1,100 km
- State reserves (EU commitment – 90 days reserve)

Source: ČEPRO, a.s. (Czech Pipelines)

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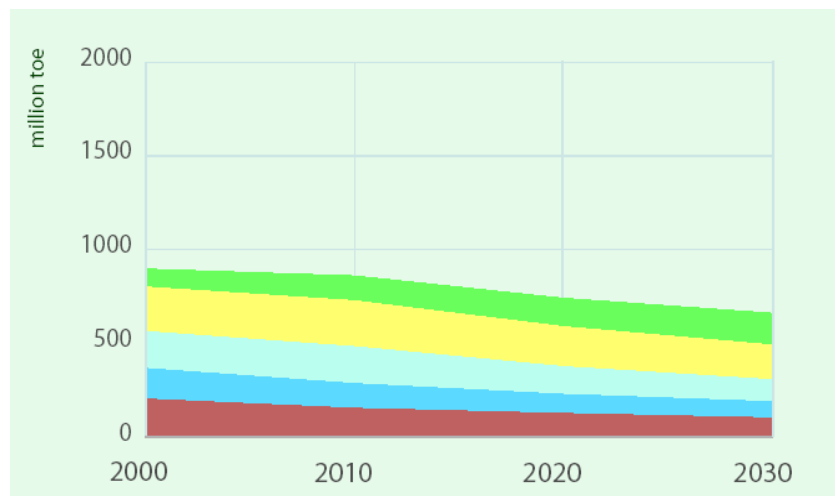
Annex: EU natural gas market



Production and demand for natural gas 2000 – 30 (EU-25)

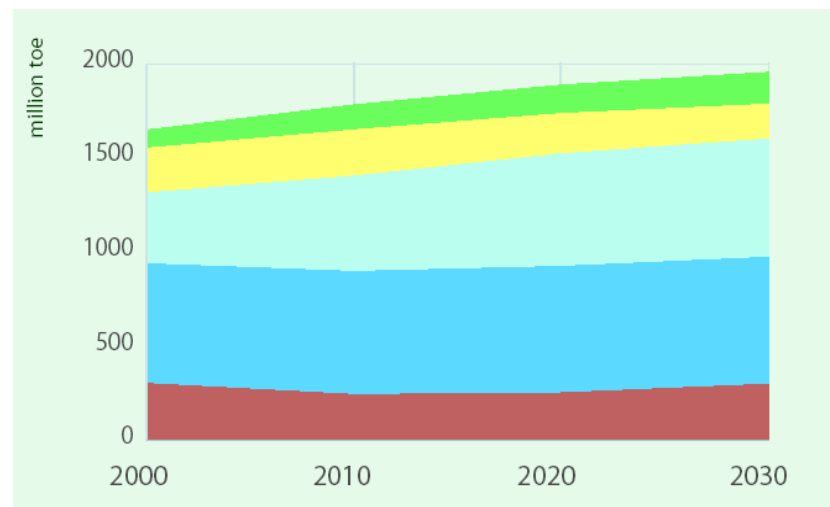
Trends in production of primary energy

- Production of primary sources decreases
- Significant decrease in natural gas production



Trends in demand for primary energy

- Increase in demand for primary energy is given namely by increase in natural gas demand



Source: European energy and transport – „Scenarios on key drivers“, European Commission, 2004.

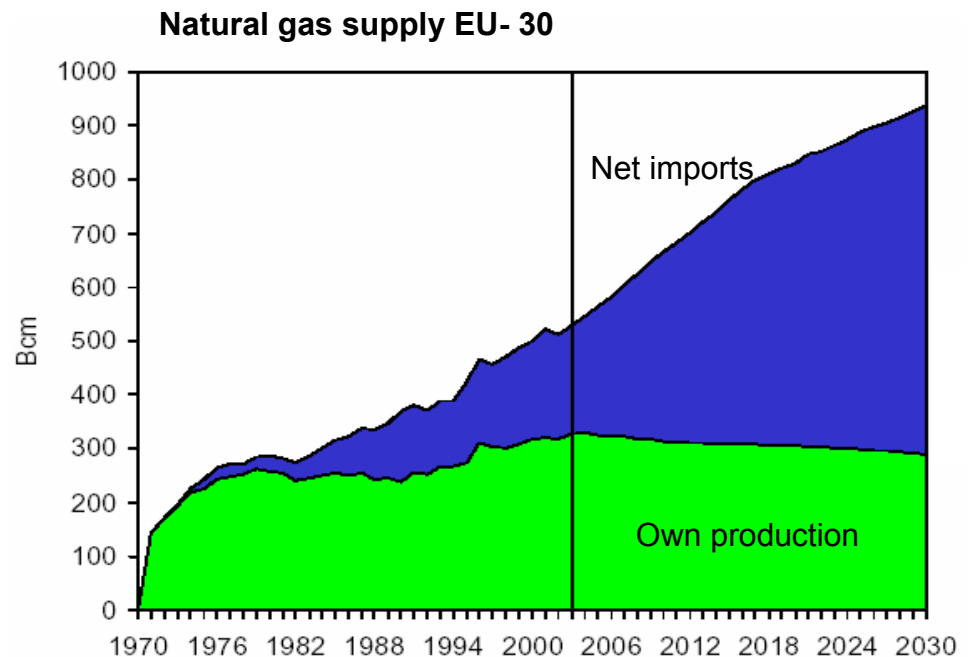
Increasing EU's dependence on natural gas imports

Dependence of EU countries on natural gas imports (2000 data)

- EU-15: 47%
- EU-25: 50%
- EU-30: 40%

Prediction of EU-25 dependence

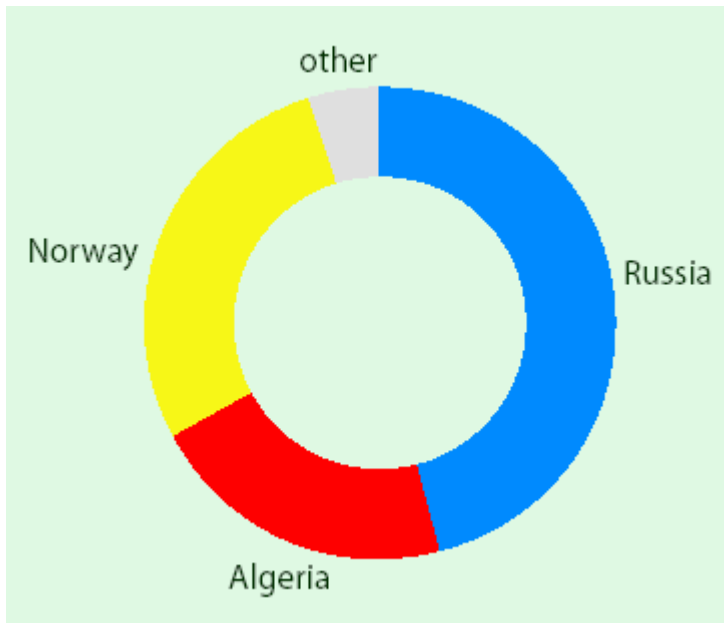
- 2010: 61%
- 2020: 75%
- 2030: 80%



Source: World Energy Investment Outlook, IEA 2003

Limited diversification of natural gas sources

Origin of natural gas imported to EU-15 (2003)



Source: European Commission and IEA

- Imports primarily from three countries.
- Huge problems in the case of supply shortfalls.
- Currently, Russia covers almost 50% of EU-25's natural gas imports, by 2030 an increase over 60% is expected.
- Need to search for new resources of natural gas and to ensure higher security of supply.
- 2006: EU published the Green Paper, which includes list of priorities for the construction of new natural gas infrastructure.

New sources of natural gas – Caspian region

Turkmenistan

- The second largest natural gas producer in the former U.S.S.R. (after Russia)
- In 2004 55 billion m³ produced, approximately three-quarters exported
- Proven reserves: 2.9 trillion m³ (potential reserves even bigger – huge increase in production expected)

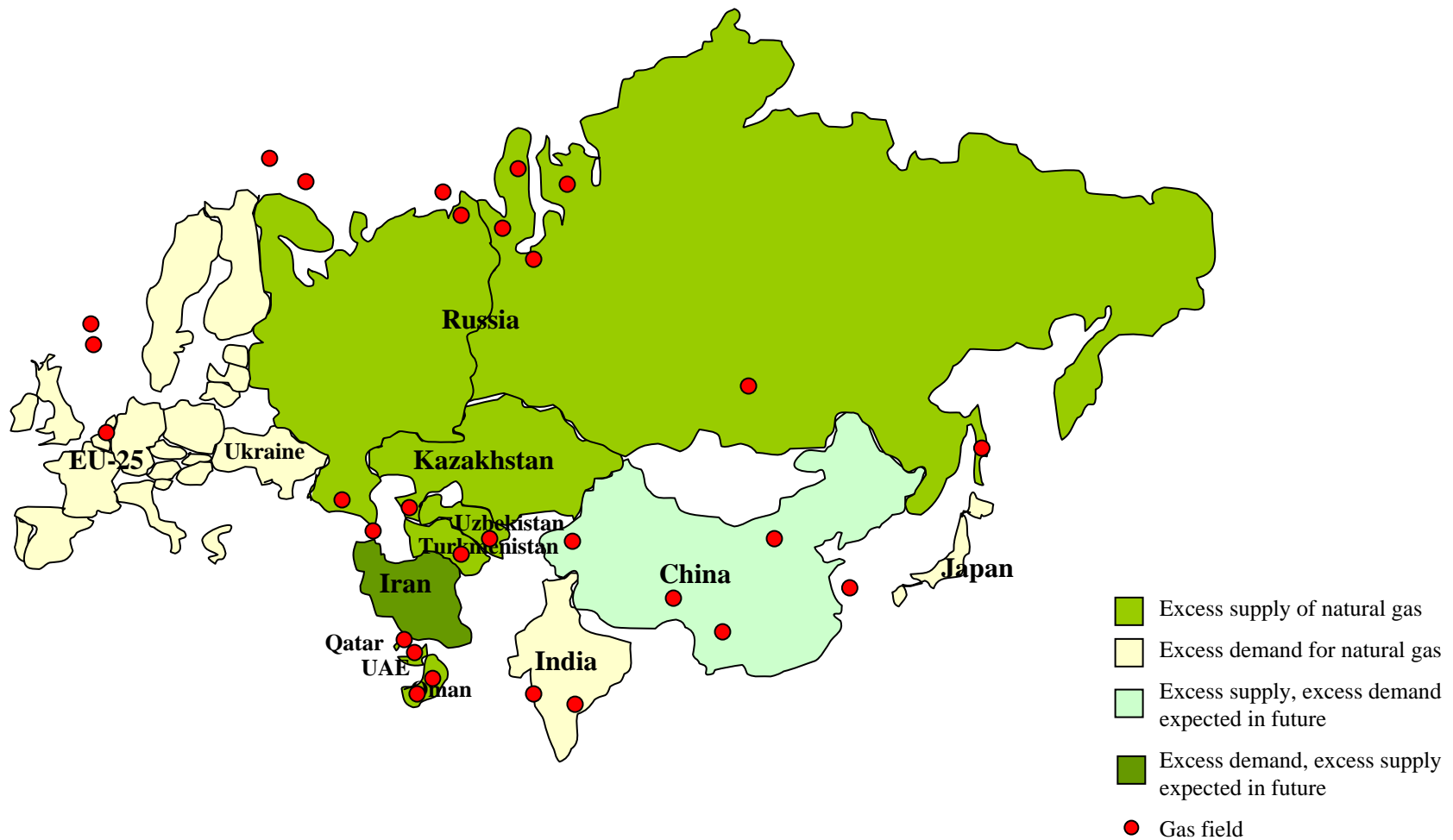
Uzbekistan

- The second largest producer in the Caspian region, production approx. 55 billion m³ in 2004
- Proven reserves: 1.86 trillion m³, total reserves could exceed 6 trillion m³
- Export quite low so far, plan to increase export by 170% by 2020 (up to 20 billion m³)

Kazakhstan

- In 2004 18.5 billion m³ produced, most of it exported
- Domestic consumption covered by imports from Turkmenistan, Uzbekistan and Russia
- Bad condition of gas pipeline network

New sources of natural gas – Caspian region



Crossroad: Where will the natural gas from Caspian region flow?

Natural gas reserves, production and consumption in selected countries

Country	Proven gas reserves end 2005 (bcm)	Potential reserves 2000 (bcm)	Production 2005 (bcm)	Consumption 2005 (bcm)	Gas balance 2005 (bcm)	Consumption 2025 (bcm) 2020 (bcm)
Source	British Petroleum	USGS*	British Petroleum	British Petroleum	British Petroleum	EIA IEA
Ukraine	1,110	1,400	18.8	72.9	-54.1	?
Russia	47,820	66,300	598	405.1	192.9	594
Turkmenistan	2,900	11,500	58.8	16.6	42.2	17
Kazakhstan	3,000	4,300	23.5	17.8	5.7	27
Uzbekistan	1,850	900	55.7	44	11.7	68
Iran	26,740	16,800	87	88.5	-1.5	?
Oman	1,000	1,900	17.5	?	+?	?
Qatar	25,780	2,100	43.5	15.9	27.6	?
UAE	6,040	2,600	46.6	40.4	6.2	?
China	2,350	5,100	50	47	3	140
India	1,100	1,700	30.4	36.6	-6.2	70
Japan	0	0	0	81.1	-81.1	118
USA	5,450	?	525.7	633.5	-107.8	880
EU-25	2,570	20,500**	199.7	471.2	-271.5	664***

* The U.S. Geological Survey World Petroleum Assessment 2000

** Europe is considered to include the onshore and offshore areas of Europe exclusive of the former Soviet Union and Turkey

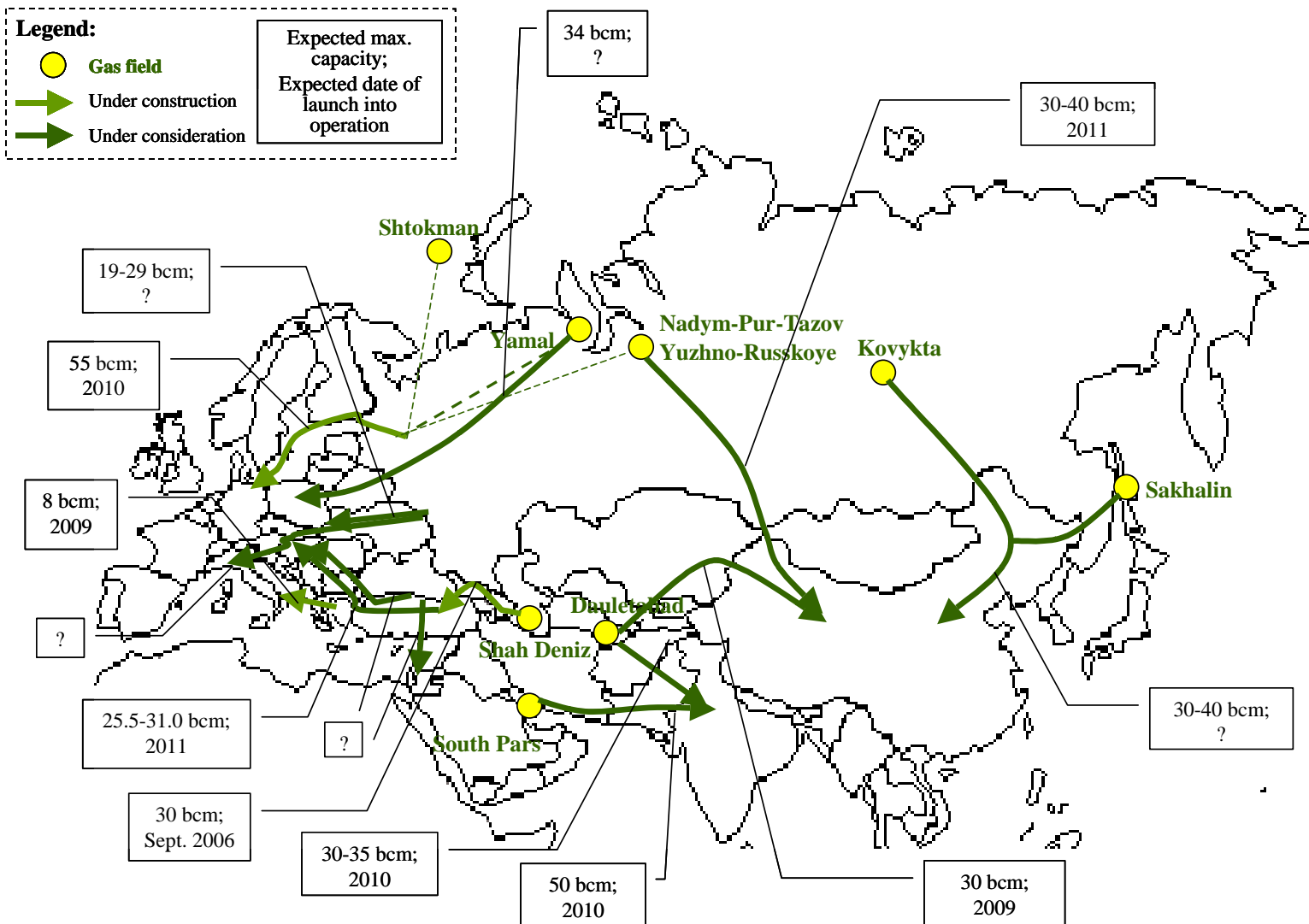
*** Western Europe

- Increase in natural gas consumption in the USA, India and China.
- LNG projects – independence on gas pipelines, flexibility of supplies to different parts of the world.

Excess supply of natural gas

Excess demand for natural gas

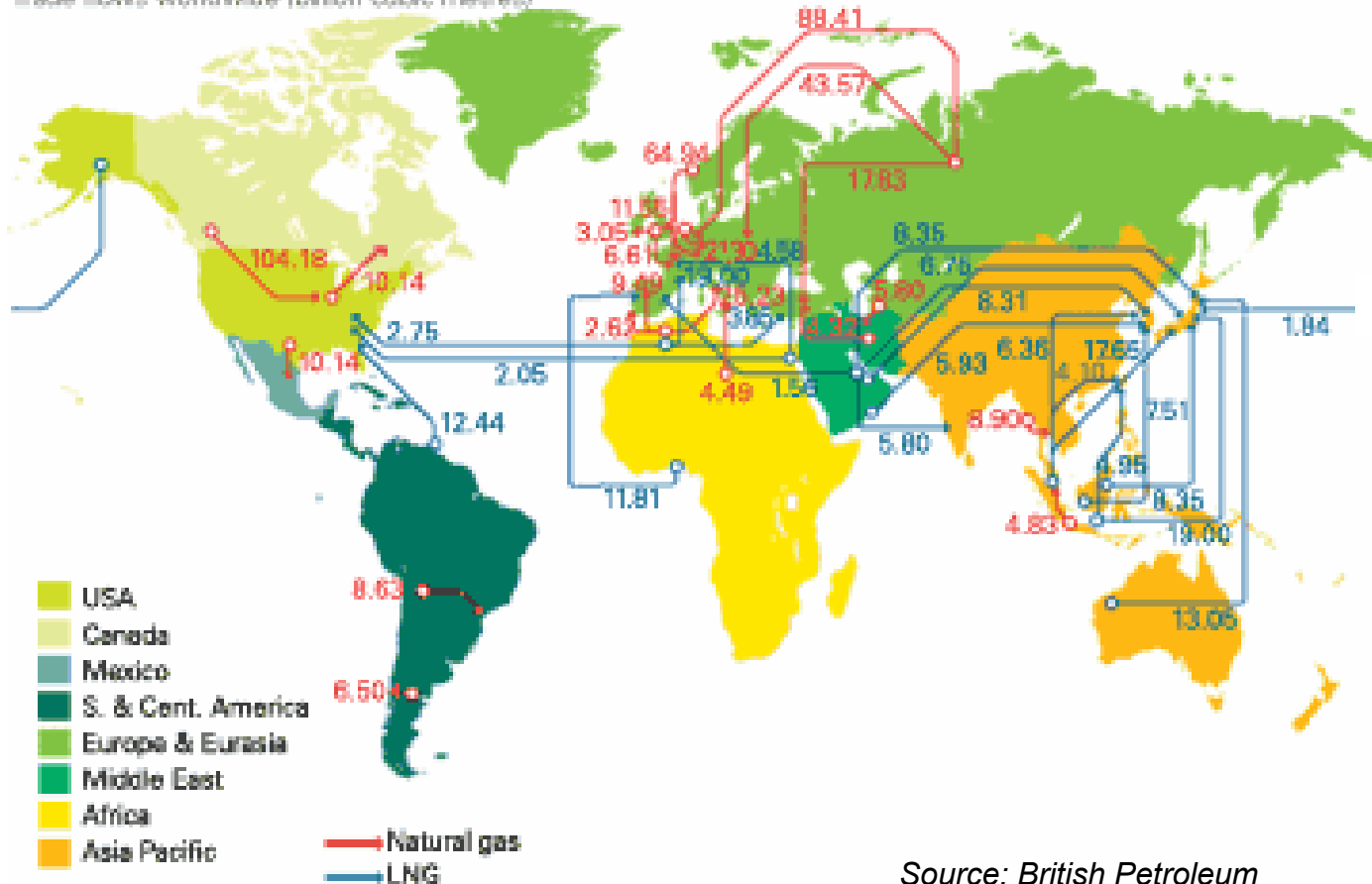
Crossroad: Proposed gas pipelines



World LNG market

Major trade movements

Trade flows worldwide (billion cubic metres)



Exporters

Indonesia	16.7%
Malaysia	15.1%
Qatar	14.4%
Algeria	13.6%
Iran - high potential	

Importers

Japan	40.4%
S. Korea	16.1%
Spain	11.6%
USA	9.5%

Possible solutions for Europe

Diversification of natural gas imports

- Lower dependence on Russia, Norway and Algeria
- Supplies of natural gas from Kazakhstan, Turkmenistan and Uzbekistan are uncertain due to the dependency on Russian transit pipelines
- Increasing demand of India and China for natural gas might divert exports destination from Europe to Asia (especially from Caspian region)

LNG development

- An alternative to gas pipelines
- Extension of suppliers spectrum, especially Qatar, Iran (threat of political instability) and Oman

Is there an alternative?

- Decrease in energy dependence on primary energy sources
- Maintaining and diversification of energy sources
- Renewable energy sources
- New technologies
- Ecology – reduction in CO₂ emissions

