

# ***Gas – The Impact of New Supplies and the Potential Impact of Unconventional Gas Supplies***

*International Conference: “Advancing EU Energy Objectives in East Central Europe: The Next 40 Years”, organised by the Atlantic Council and REKK, Budapest, Hungary, 4-5 October 2012*

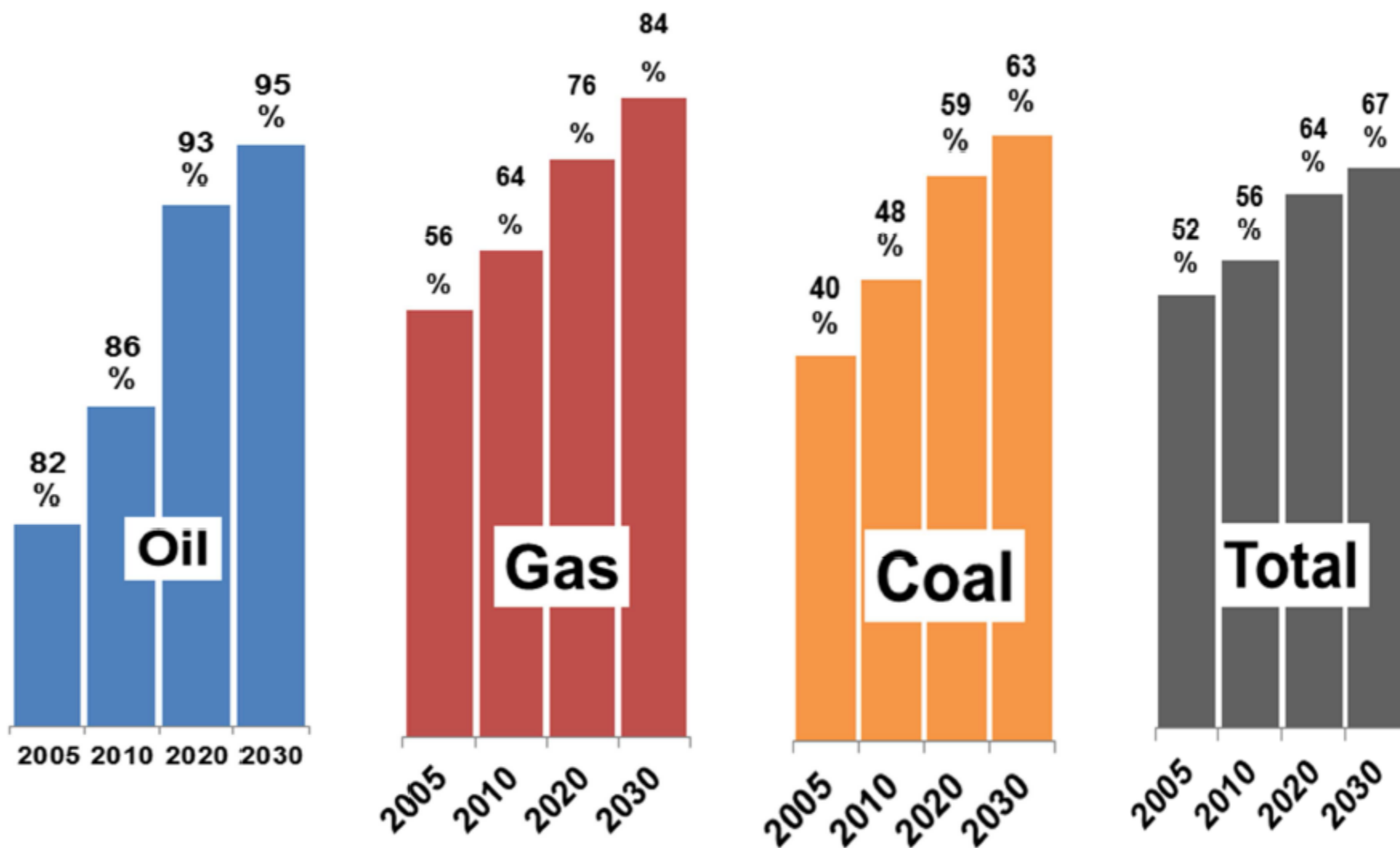


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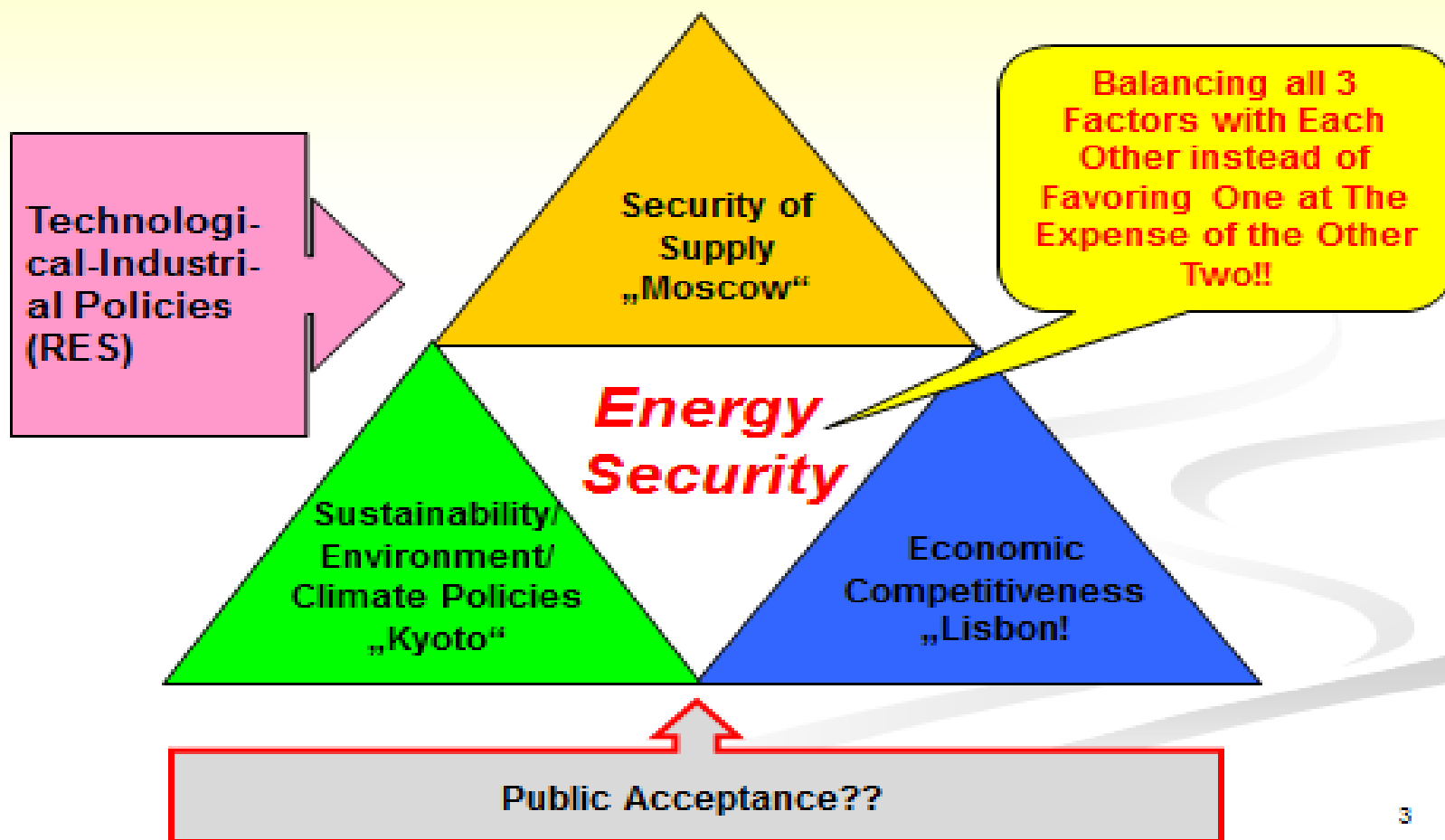
## Increase of EU Import Dependency 2005-2030



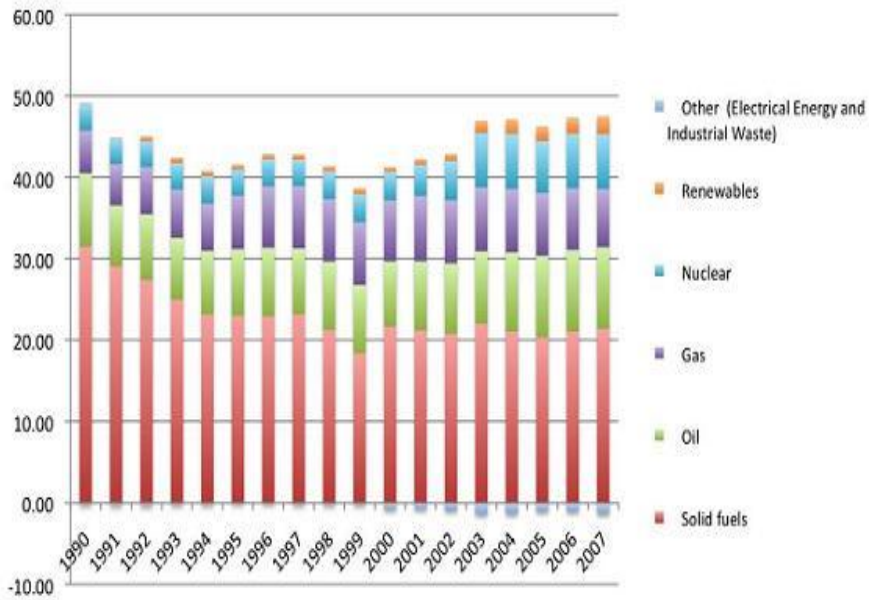
Source: Dr. Frank Umbach, based on Euracoal, An Energy Strategy for Europe: Importance and Best Use of Indigenous Coal, Brussels 2009, p. 1.

# Maintaining the Balance within the EU's Energy Triangle and between its Three Objectives

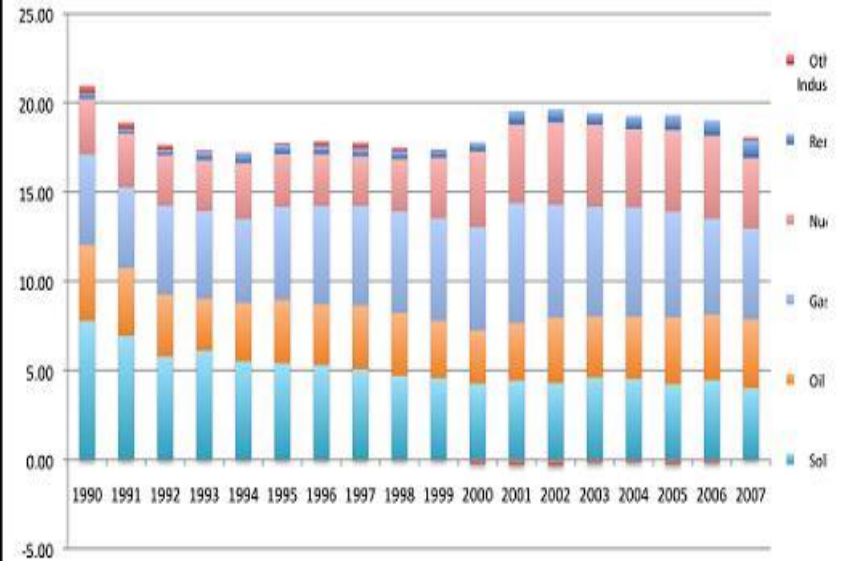
## Energy Triangle – Objectives of Energy Security



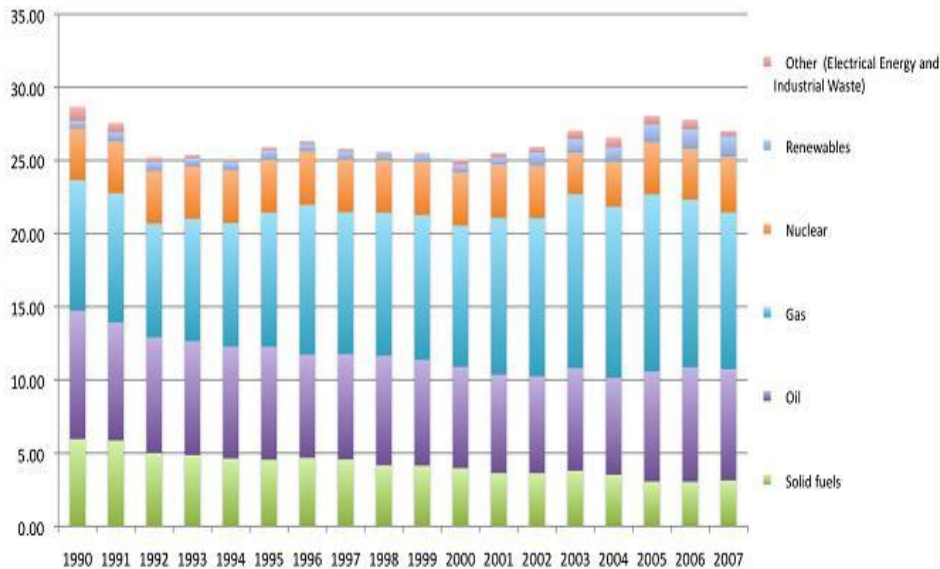
### Czech Gross Inland Consumption (Mtoe Eurostat data)



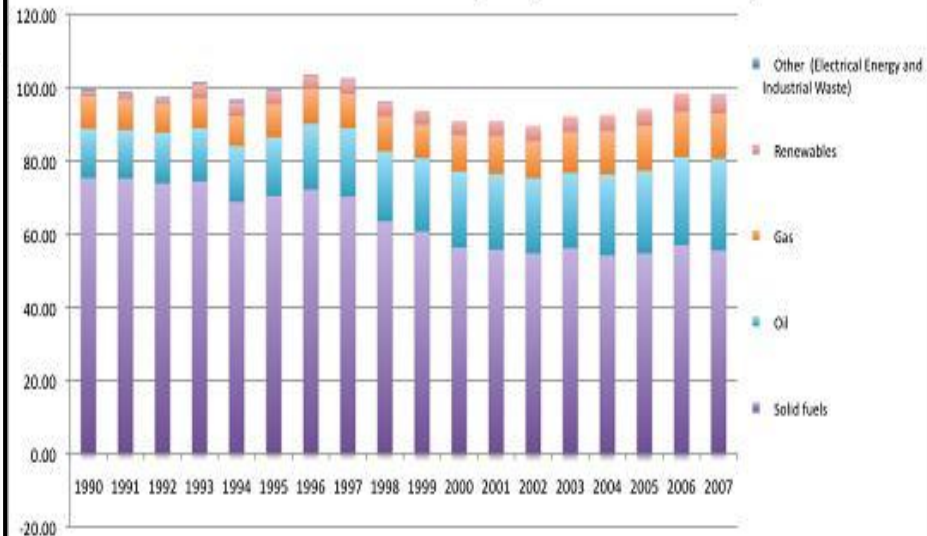
### Slovak Gross Inland Consumption (Mtoe Eurostat data)



### Hungarian Gross Inland Consumption (Mtoe Eurostat data)

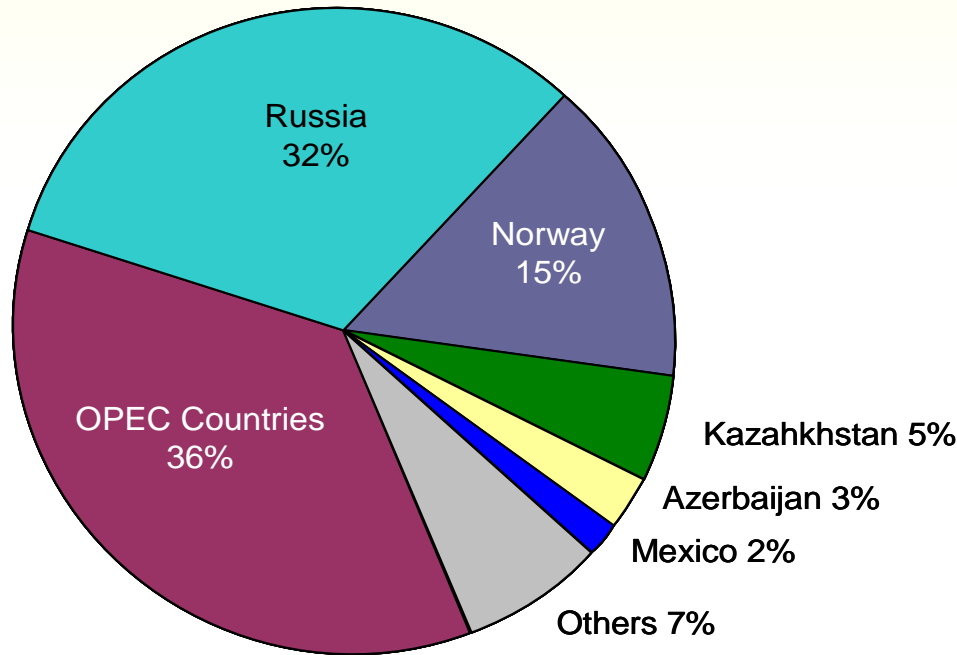


### Polish Gross Inland Consumption (Mtoe Eurostat data)



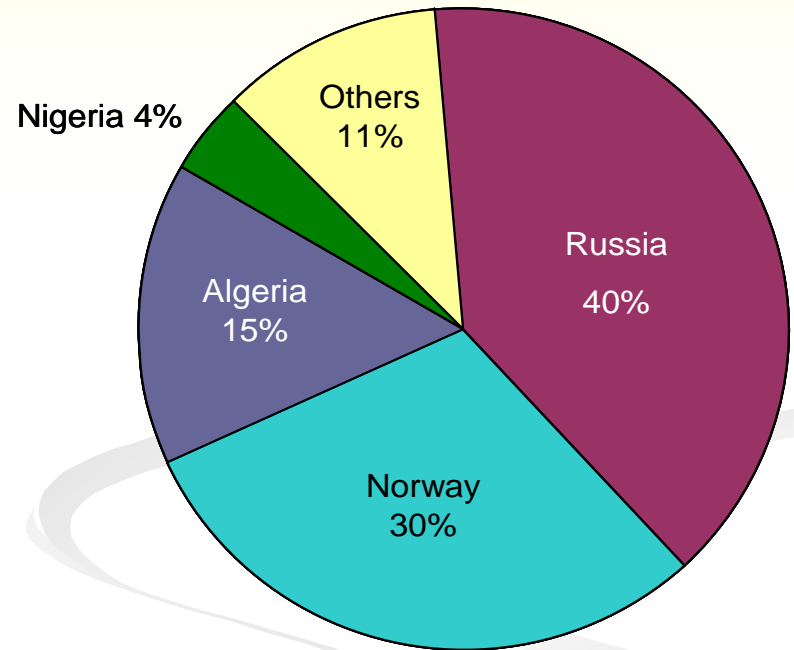
# EU-Oil and Gas imports: Comparison of Diversification Sources (2008)

EU imports of crude oil



in % (2008, total = 561,46 Mt)

EU imports of natural gas

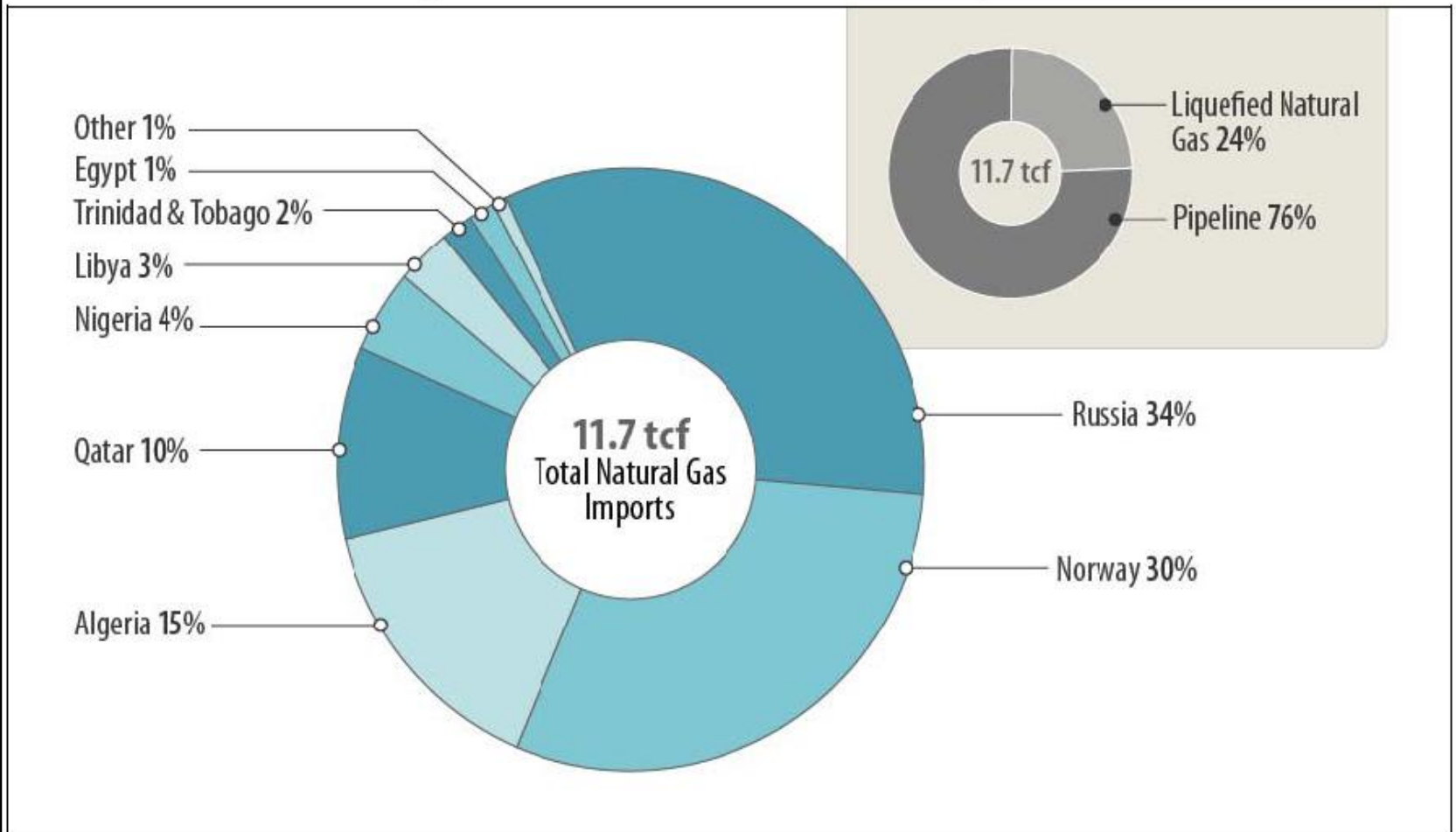


in % (2008, total = 12,958,133 TJ)

Pipeline - versus Tanker Import Dependencies: Factor Crisis Stability!

# European Gas Diversification (Status 2010)

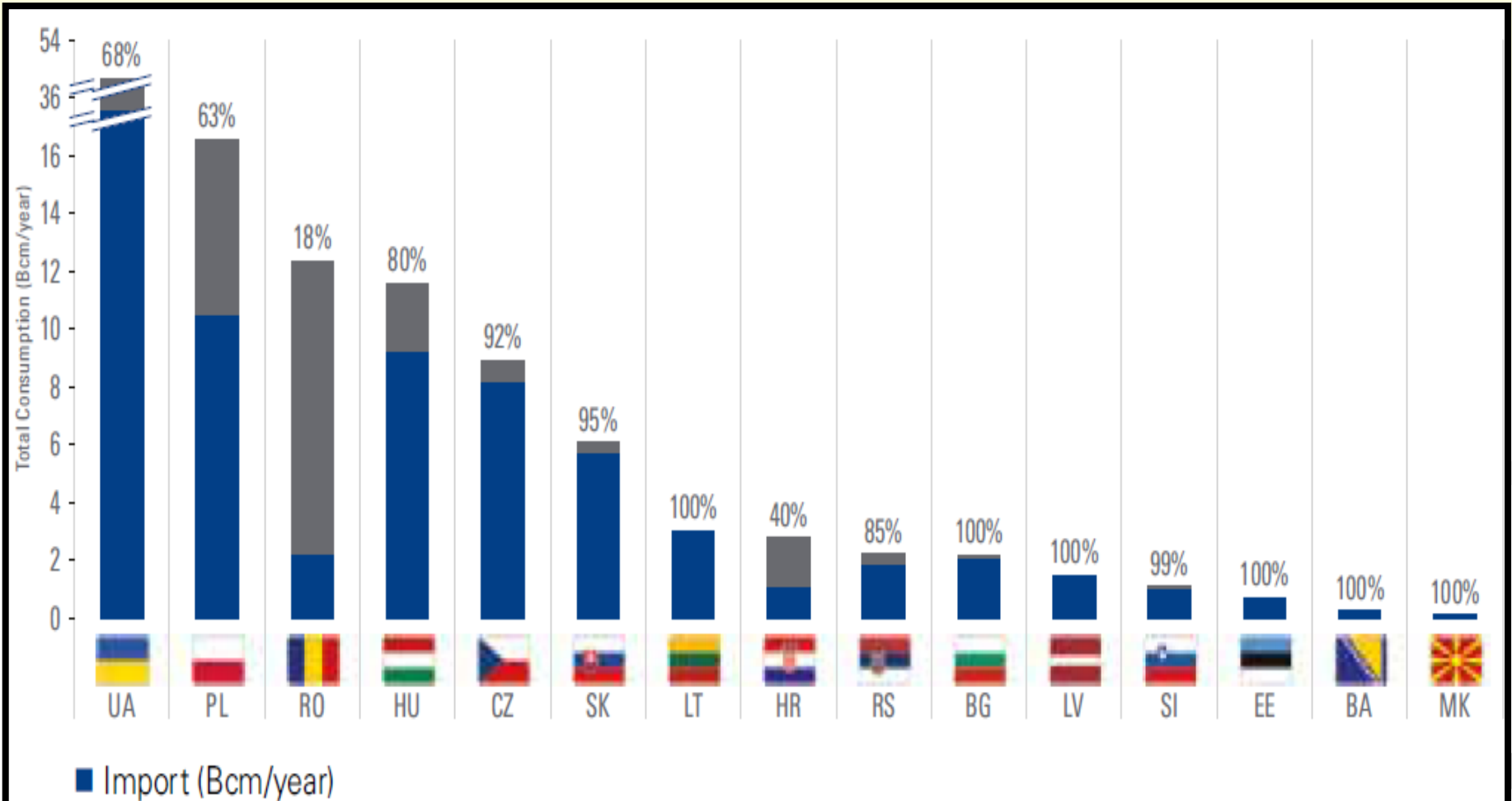
Figure I. 2010 EU Natural Gas Imports



Source: BP Statistical Review of World Energy 2011, <http://www.bp.com/sectiongenericarticle800.do?categoryId=9037130&contentId=7068669>.

Source: M.Ratner/P.Belkin/J.Nicol/S.Woehrel, European Energy Security: Options and Challenges to Natural Gas Supply Diversification, CRS Report for Congress, Washington D.C., 13 March 2012.

# Total Import and Domestic Consumption of Natural Gas in 2010

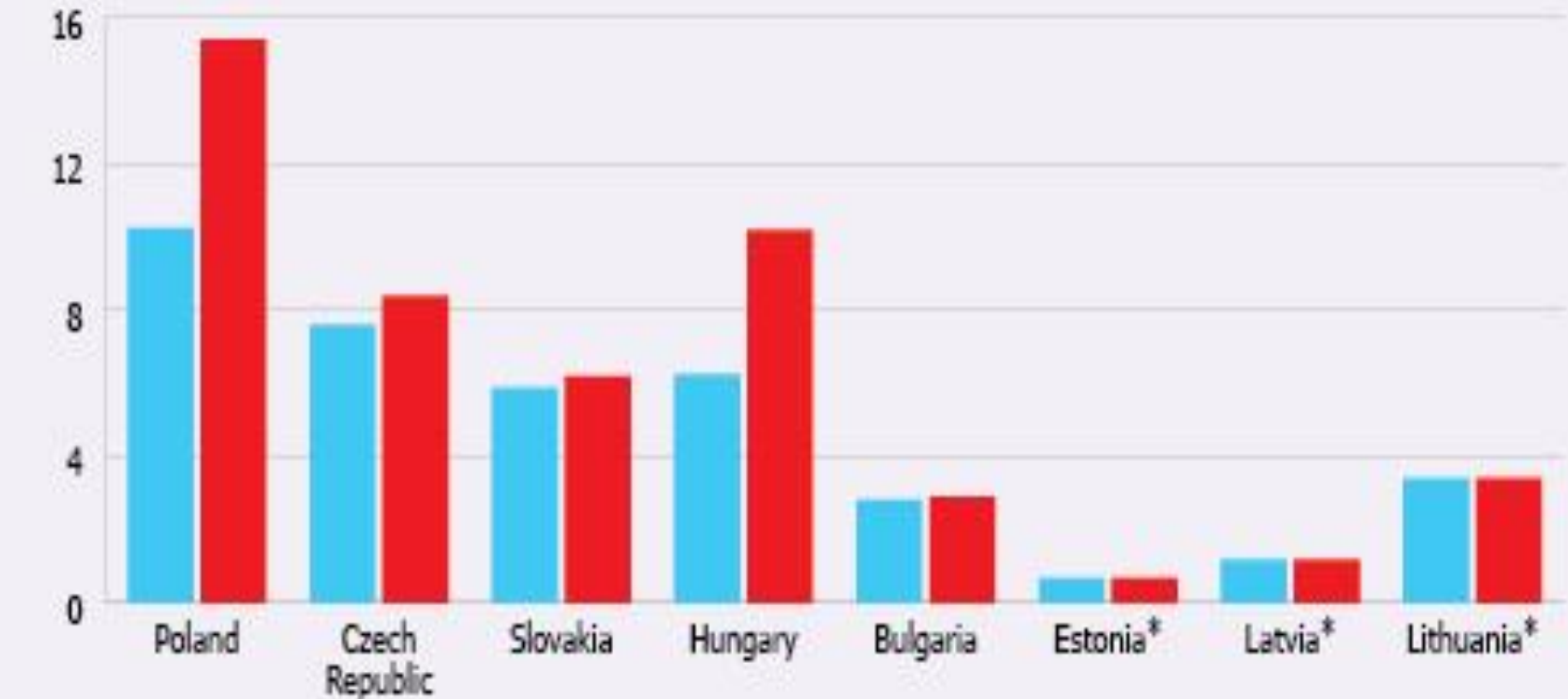


Note: percentage values represent import/consumption ratio based on 2010 figures

Source: US Energy Information Administration, 2011

## Gazprom imports vs total annual gas consumption, 2011

billion cubic metres

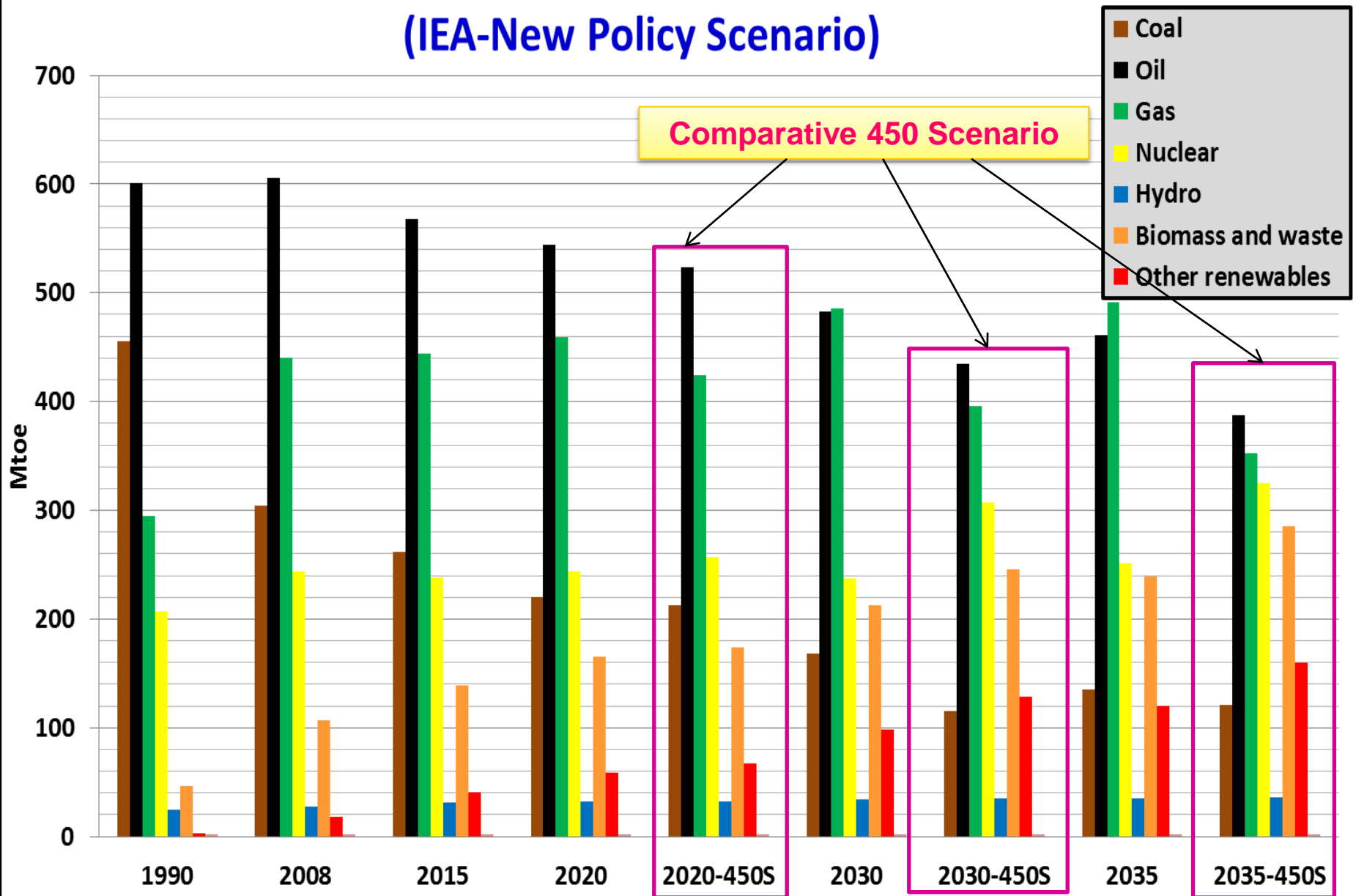


■ Gazprom imports  
■ Total annual gas consumption

\*No data available for the Baltic states. However it is understood that each state is totally dependent on Gazprom imports so it is assumed that each market is as large as the imports suggest.  
Source: Gazprom, BP Statistical Review of World Energy



# EU-27: Total Primary Energy Demand 1990-2035 (IEA-New Policy Scenario)



# EU-Gas Forecast of 2010

EU 27 Bcm	2005	2020 Baseline* scenario, oil price \$88/bbl	2020 Reference* * scenario, oil price \$88/bbl	2030 Baseline* scenario, oil price \$106/bbl	2030 Reference* * scenario, oil price \$106/bbl
Demand for natural gas	519	538	479	511	457
Natural gas production	219	130	129	88	87
Natural gas imports	<b>299</b>	<b>408</b>	<b>349</b>	<b>423</b>	<b>370</b>

**Table: EU-Gas Forecast of 2010**

Sources: European Commission (internal), here following Hugh Belin, To Russia with Love, European Energy Review, 2 September 2010

(<http://www.europeanenergyreview.eu/index.php?id=2299>).

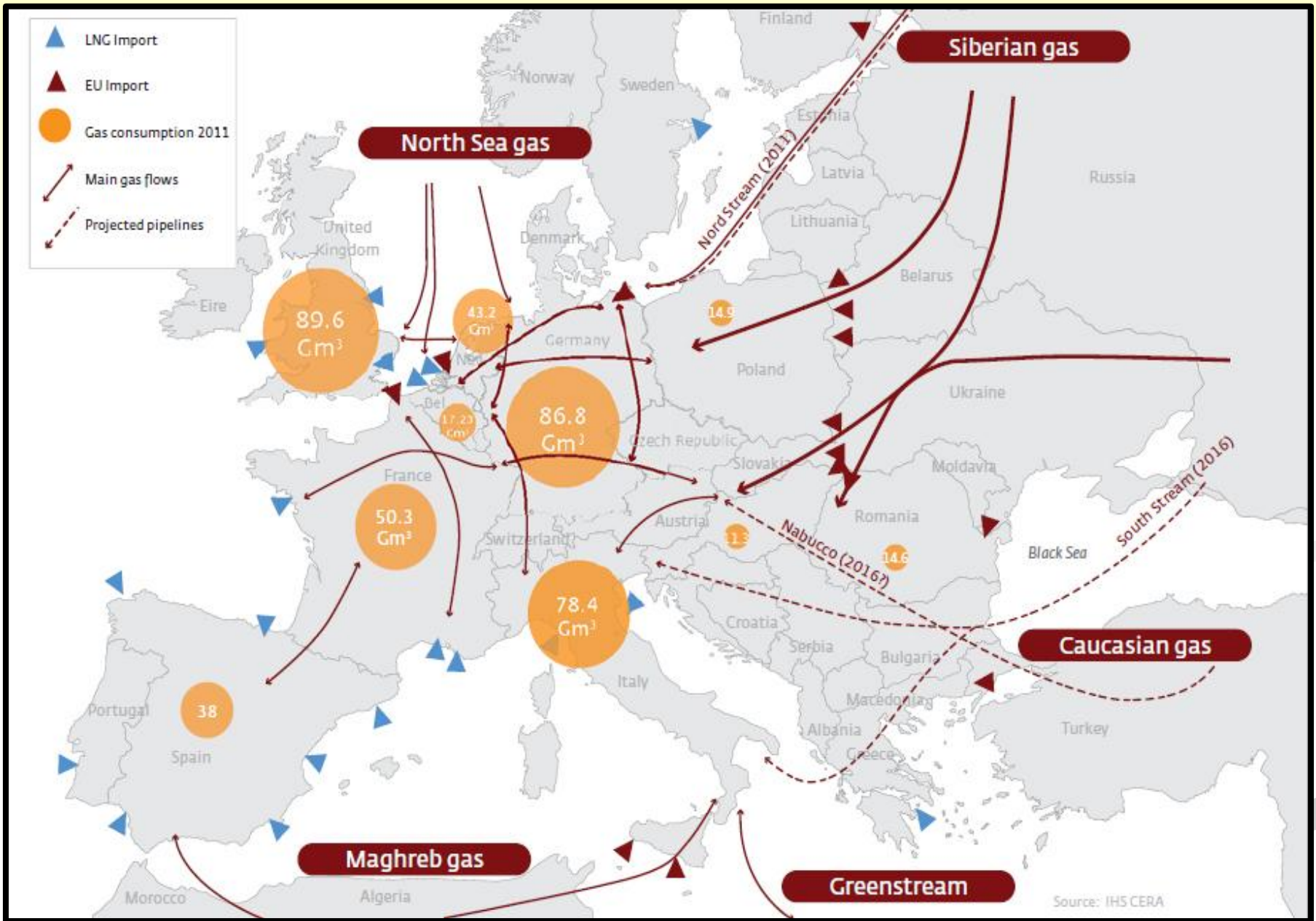
\* includes energy policy measures implemented until April 2009

\*\* includes 20% renewables in energy consumption, 20% less CO2 emissions, and policy measures implemented until the end of 2009 and a few energy efficiency measures.

# Diversification of Non-Russian Gas Pipeline Projects:

Project	Supplier	From	To	Capacity (Bcm)	Investment (M €)	Foreseen Start-Up
Medgaz	Algeria	Hassi R'Mel	Spain	8-10	1300	End 2008
Galsi	Algeria	Hassi R'Mel	Italy	8-10	1200	2009-2010
ITG-IGI	Caspian	Greece	Italy	8-10	950 (IGI)	2011
Langeled	Norway	Ormen Lange	UK	22-24	1000	2006-2007
Nabucco	Caspian	Turkish Border	Austria	31	4600	2010

**Total additional non-Russian gas supply capacity via pipelines to Europe: 71 – 84 bcm + 120 bcm LNG in 2020 + <120 bcm from Norway = < 310 bcm;**  
**➔ gas import demand of the EU?**



Source: Gasunie

# Competing European and Russian pipeline projects for a Eurasian gas corridor



CSS Analyses in Security Policy No. 36, June 2008 (Center for Security Studies, ETH Zurich)



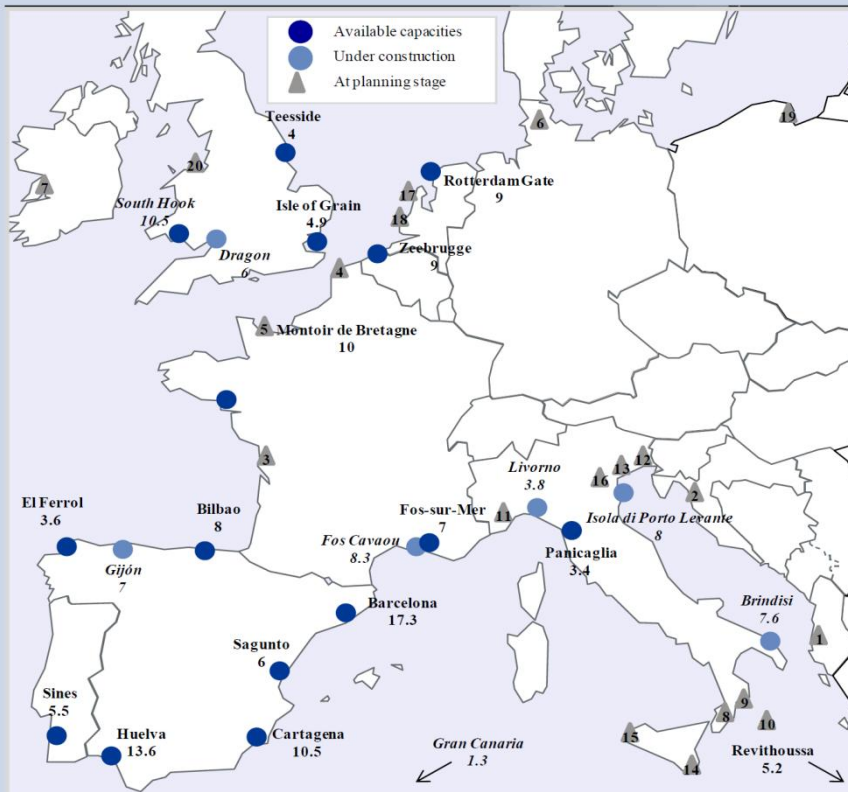
# Shah Deniz-2: TAP-Nabucco Competition



# LNG-Expansion in the EU Gas Market

## LNG import terminals for Europe becoming more important

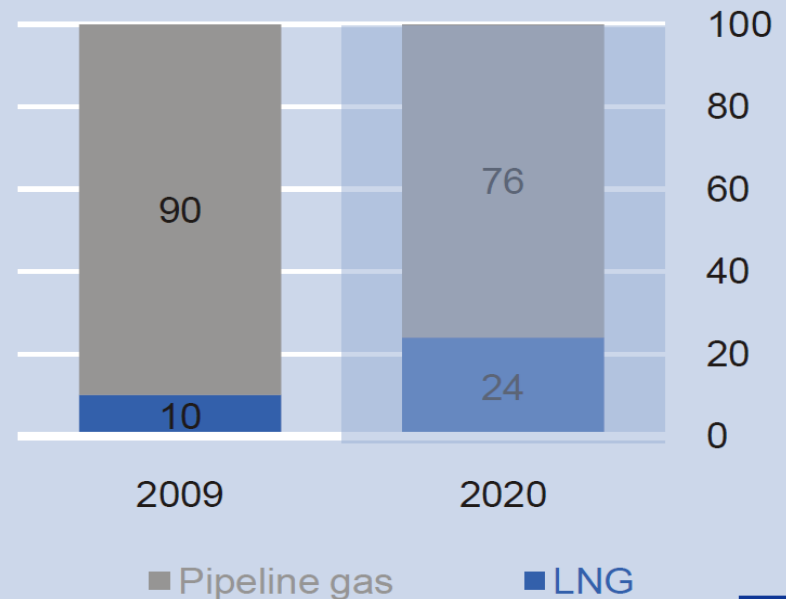
Capacities in m<sup>3</sup> bn/year



Sources: DIW, King Spalding (2006), IEA (2009), DB Research

## Strong surge in share of LNG in Europe by 2020

EU-30, % of natural gas supplies 2020



Source: E.ON Ruhrgas

4

Source: Deutsche Bank Research

# New Gas Import Options for Europe

## ■ Global Gas Market:

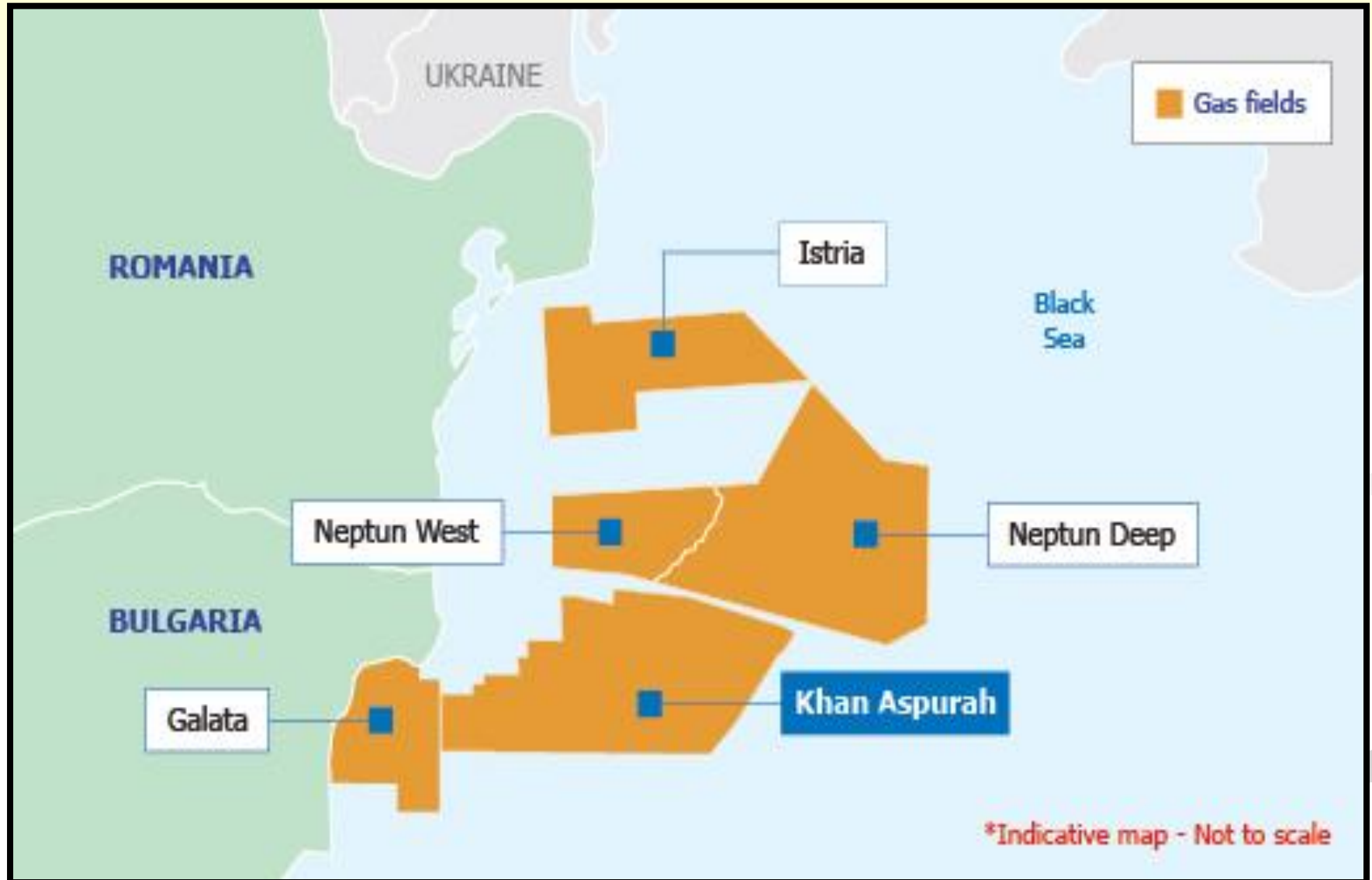
- **North America/U.S.:** may become a Net Gas Exporter in 2016;
- **Australia:** becoming a bigger LNG producer than Qatar by 2018/2019 (the world's largest one since 2006 ahead of Indonesia, Malaysia and Algeria).
  - **Brazil and Arentina:** LNG-Exporter?

## ■ Europe/Eurasia:

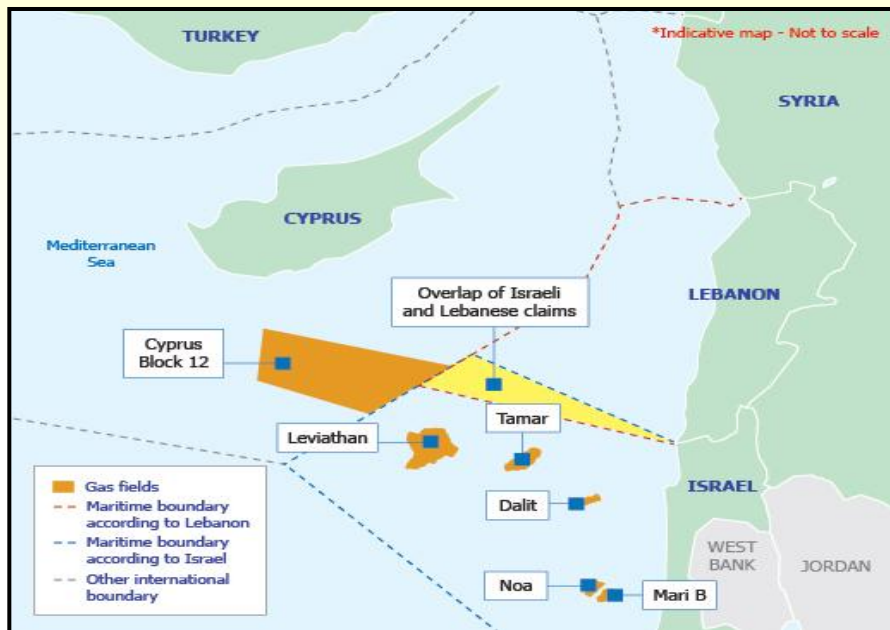
- **North Sea gas supplies will play a longer and more important source of supply for EU gas imports than forecasted just two years ago:**
  - new large oil and gas discoveries in Norway;
  - record capital investment, new field allowances and decommissioning cost tax relief for investors in UK.
- CACR: Azerbaijan and Turkmenistan;
- Kurdistan/Iraq;
- New Potential Offshore Gas Exports from Offshore Gas Fields in the EEZ of Bulgaria, Romania, Greece and the East Mediterranean Sea.



# Bulgarian and Romanian Offshore Gas Fields



# Another Potential Gas Import Source?: Offshore Gas Finds in the East Mediterranean Sea/Levant Region



Source: Interfaxenergy.com

## Leviathan Basin – Resource Conflict:

- Includes EEZ of Israel, Cyprus, Syria and Lebanon;
- New significant gas finds off the coast of Cyprus and Lebanon in 01/2012;
- Maritime agreement between Cyprus and Israel in 2010 (Leviathan and Tamar fall in Israel's EEZ); Turkey opposition to Cyprus gas projects;
- But official complaint by Lebanon to the UN against this agreement; maritime boundaries not defined and agreed by all parties.

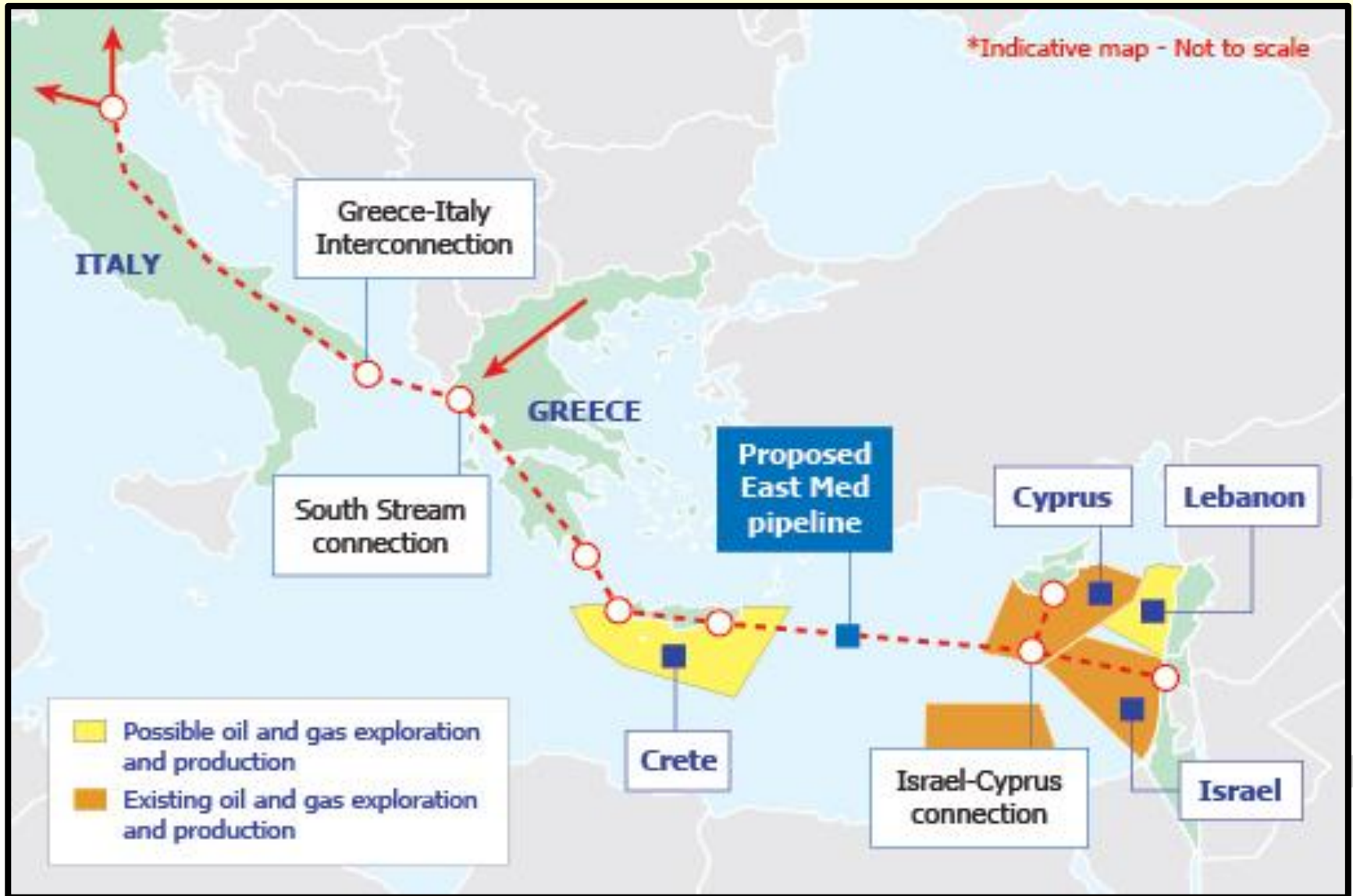
## ■ Leviathan Gas Field (Basin):

- encompasses around 83,000 sq km, stretching from Israel to Lebanon, Syria and Cyprus
- Almost twice the size of Tamar;
- USGS: recoverable 1.7 bnbl oil and 122 Tcf /3.5 tcm gas;
- Israelian gas field production can be used for exports.

## ■ Israel: From Gas Importer to Exporter?

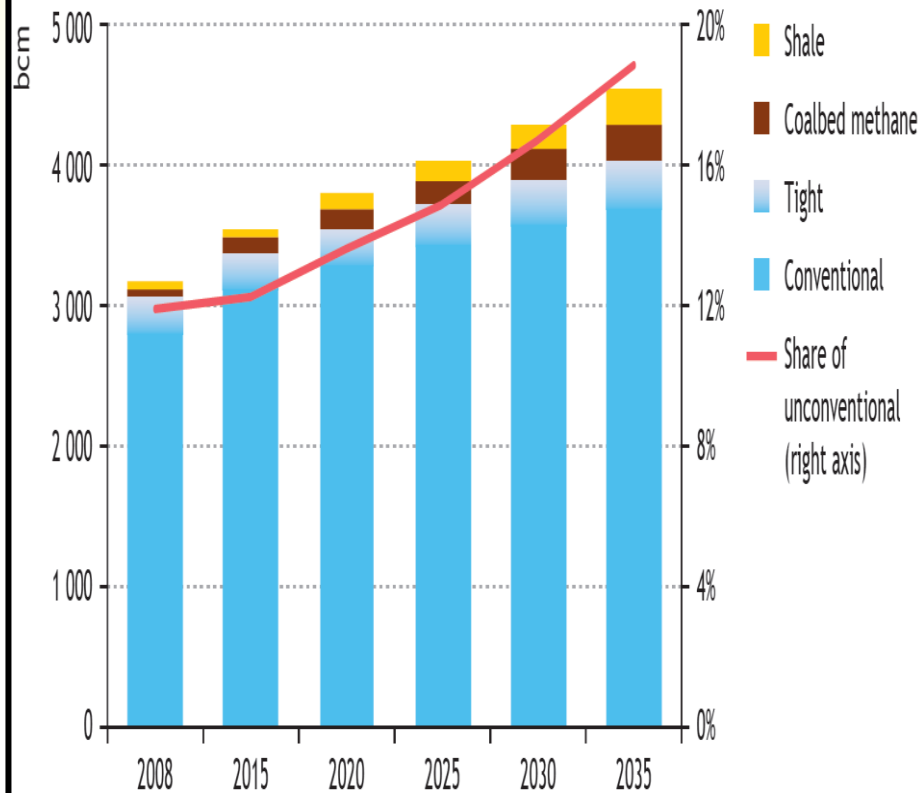
- Tamar gas field production will start in 2013; will satisfy most of its domestic demand for the next 20-25 years;
- Domestic gas production declining sharply in 2013;
- Presently 40% of its gas supplies from Egypt through the Eastern Mediterranean Gas pipeline;
- Domestic gas consumption will double between 2010-2015;
- Share of gas for electricity production will increase from 33% in 2009 to 50% in 2013;
- Floating LNG terminal at the end of 2012.

# East Med Pipeline



# Global Dimensions of Shale Gas

**Figure 5.4** • World natural gas production by type in the New Policies Scenario



## Estimates - IEA, USGS, BGR:

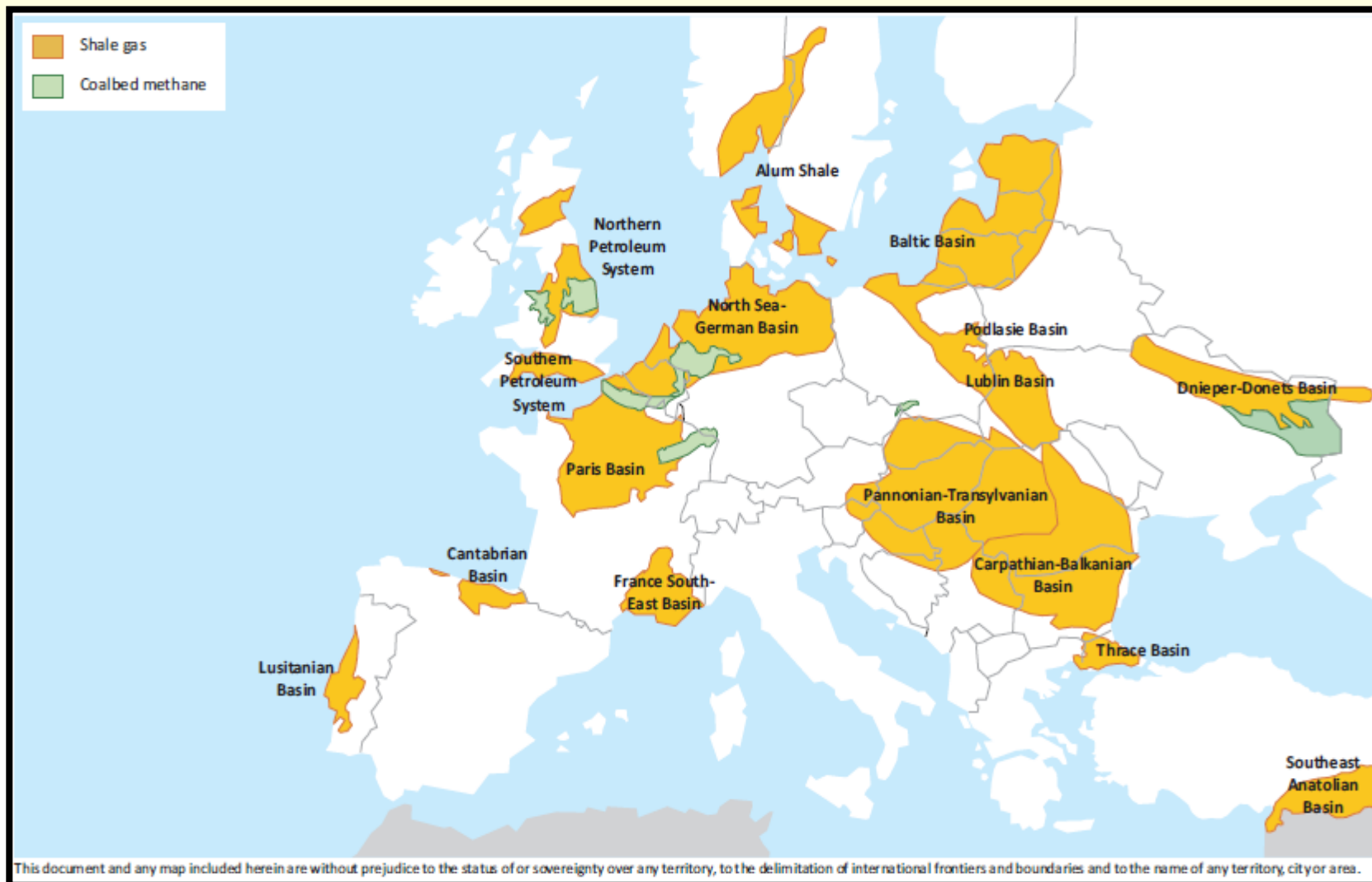
- **Recoverable Conventional Gas Resources:** **404 tcm**  
(120 years of production at 2010 levels);
- **Total Unconventional Gas Resources:** **909 tcm;**
- **Recoverable Unconventional Resources:** **380 tcm;**
- **Total Conv. and Unconv. Gas Resources:** **800 tcm**

**➡ 250 Years of Current Production!**

## IEA:

- **39% of the Incremental Increase in Global Gas Production till 2035 from Unconventional Sources;**
- **Total UG production will almost double to 22% by 2035 (shale gas: 9%).**

# Unconventional Natural Gas Resources in Europe



Source: IEA, 2012.


# Natural Gas Indicators in the EU by Case

	2010	Golden Rules Case		Low Unconventional Case		Delta*
		2020	2035	2020	2035	2035
Production (bcm)	201	160	165	139	84	81
Unconventional	1	11	77	0	0	77
Share of unconventional	1%	7%	47%	0%	0%	47%
Cumulative investment in upstream gas, 2012-2035**		434		235		199
Unconventional		181		-		181
Net imports (bcm)	346	432	480	423	510	-30
Imports as a share of demand	63%	73%	74%	75%	86%	-11%
Share of gas in the energy mix	26%	28%	30%	26%	28%	2%
Total energy-related CO <sub>2</sub> emissions (million tonnes)	3 633	3 413	2 889	3 414	2 873	16

\* Difference between the Golden Rules Case and the Low Unconventional Case. \*\* Investment figures are in billions of year-2010 dollars.

Source: IEA, 2012.

# Europe's Potential

- European shale market still in its infancy: „*easy to find, but hard to get*“?
  - **IEA/European Potential:**
    - Recoverable reserves of shale gas: 33-38 tcm (BP: total proven conventional gas reserves at 2.42 tcm).
      - 12 tcm tight gas;
      - 15 tcm shale gas;
      - 8 tcm coalbed methane;
    - Getting access to just 10% of its estimated recoverable shale gas reserves = 1/3 of Russia's total gas reserves.; or
-  **up to 60 years of pre-crisis level.**
- Only concrete test drilling data can lead to specific conclusions of the recoverable unconventional gas reserves (taking 2-5 years ahead);
  - Technological innovation: increasing the number of laterals per well decreases environmental impacts and increases output;

# Forecasts and Prospects of UG in Europe

## ■ Douglas Westwood Study of October 2011:

- Shale gas production: ~ 35 bcm by 2020, led by Poland and UK;
- Coal-bed methane production: up to 22 bcm by 2020;
- Almost 4,000 wells need to be drilled annually by 2020;
- Germany, France and Netherlands to reach commercial production by 2020;

## ■ Pre-Conditions for a Positive UG Development in Europe:

- But public acceptance and pro-active political leadership will be keys challenge for the industry and the development of UG;
- European gas demand;
- Competitive price towards LNG-imports and new pipeline gas from Russia, Norway, Central Asia and North Africa.

## ■ Differences to the U.S.

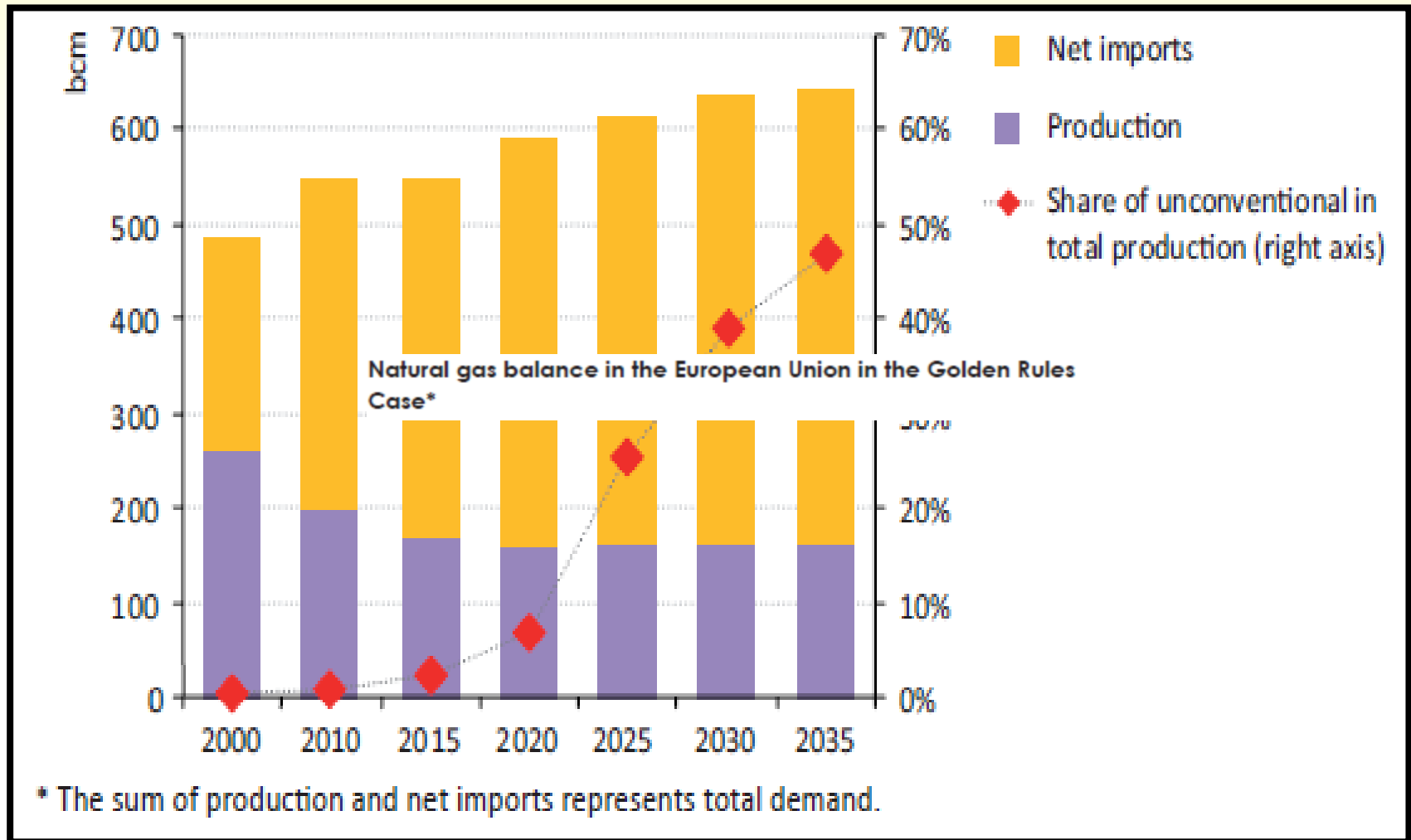
- US landowners directly benefit from all fossil fuels found on their land;
- Population density and, accordingly, higher environmental regulation;
- Higher Costs of Production.

## ■ European Debates

- focusing on potential environmental risks rather than benefits (supply security, economic prices, GHG emissions compared with Russian pipeline gas and LNG-imports);
- Focusing on recent US data, regulatory regimes and best practices (but often 2-3 years old) rather than strategic trends, historical experiences and technology innovation etc.

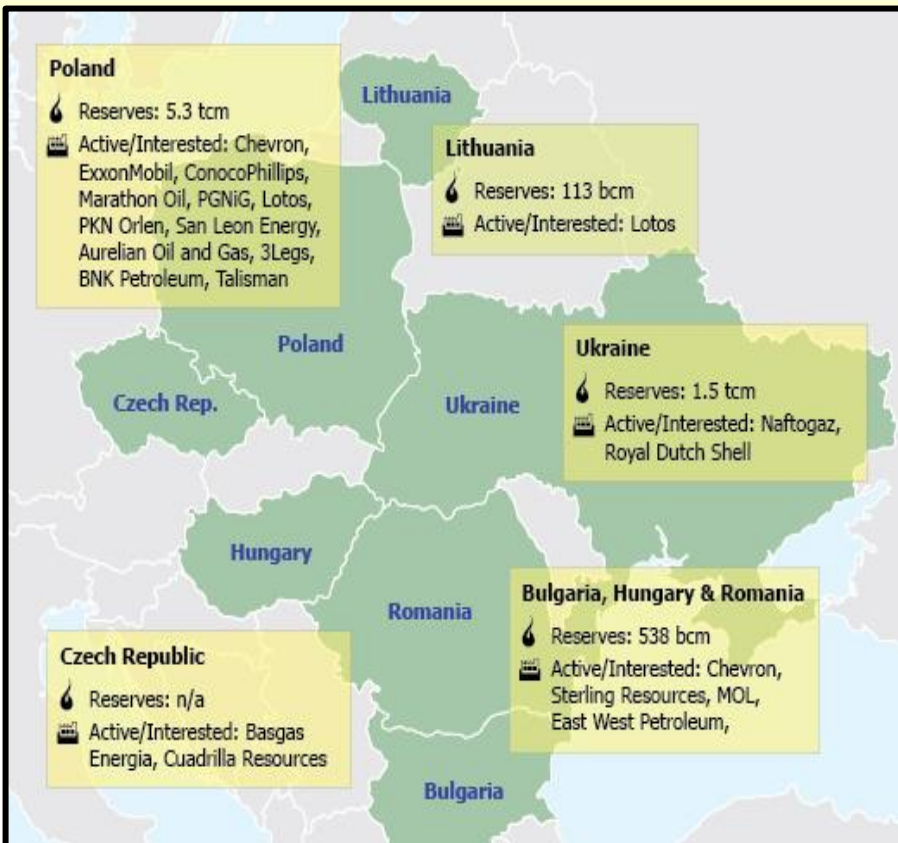


# Natural Gas Balance in the EU in the Golden Rules Case



Source: IEA, 2012.

# Developments of UG in Europe



Source: Interfaxenergy.com

## At Present:

- Proven reserves and commitment from major Western energy companies such as *Shell, Exxon-Mobile, Chevron* etc. give at least supply leverage for contract pricing negotiations with Gazprom.
- „Sense of Economic Sovereignty“ and reducing gas import dependency from Russia.

## Poland:

- New Estimate: 768 bcm-1.9 tcm (rather than EIA's 1.4-5.3 tcm of recoverable shale gas);
- Two exploratory wells drilled commercially by ExxonMobile not viable at the end of 2011.

## Bulgaria:

- consuming 4 bcm natural gas a year; depending on Gazprom for over 90%;
- Parliament (166 votes against 6) banned hydraulic fracturing (fracking) and revoked a 5-year exploration permit to Chevron last January;
- But majority of public opinion (75%) in favor as long as environmental risks are minimal and substantial economic benefits are given (*Movement for Energy Independence/DEN*).

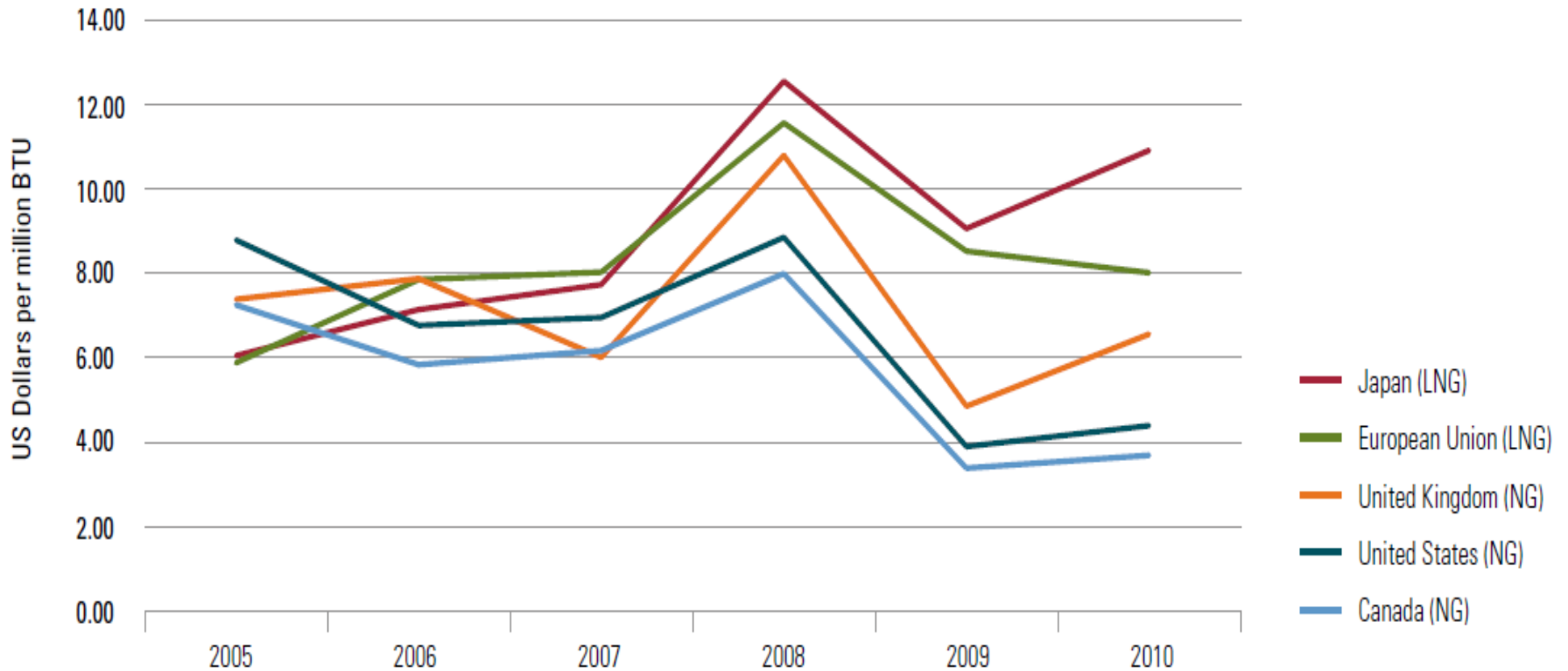
## Ukraine:

- Came late to the shale gas game; but vast reserves (covering at least 50 years of its natural gas supply).
- Little price incentive & insufficient investment climate
- But politically supported increasingly to reduce gas import dependence from Russia;
- Plans to produce 15 bcm in 5 years (first commercial shale gas by 2015);

**Romania, Hungary and Lithuania:** still at an embryonic stage; no detailed estimated reserves.

# Average Natural Gas Prices 2005-2010

Average Natural Gas Prices – 2005–2010



\* Source: 1984-1990 German Federal Statistical Office 1991-2010 German Federal Office of Economics and Export Control (BAFA).

† Source: Heren Energy Ltd.

‡ Source: Energy Intelligence Group, Natural Gas Week.

Note: Btu = British thermal units; cif = cost+insurance+freight (average prices).

# European-Russian Gas Partnership – The View from Moscow I

## ■ Concerns and Impacts on Gazprom and Russia:

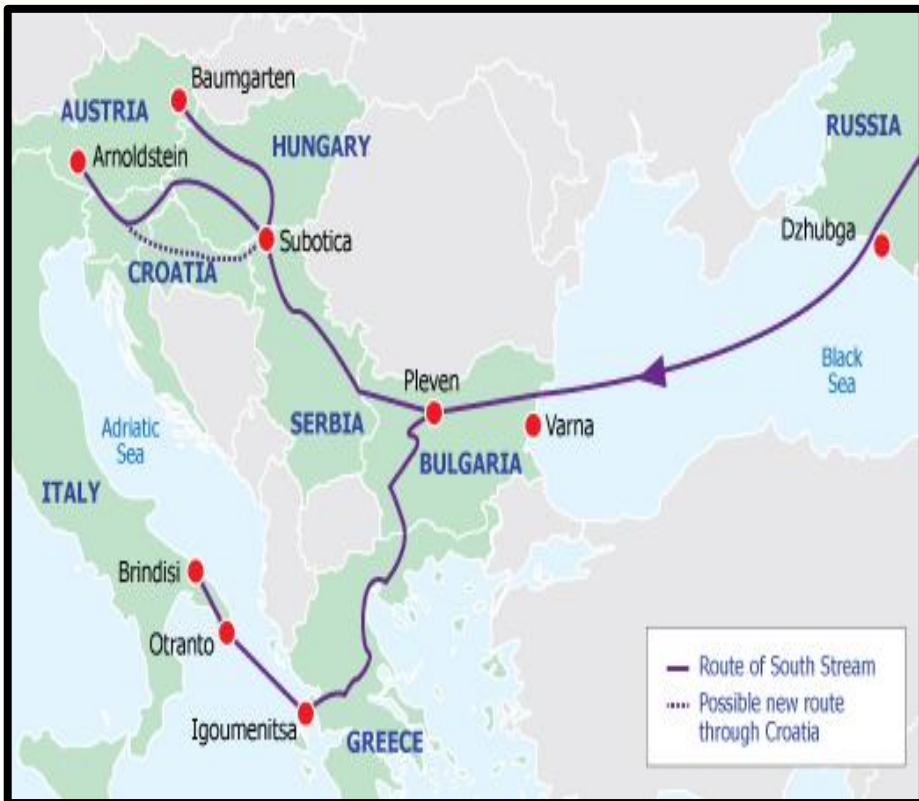
- Declining Increase of EU-Gas Demand;
- Growing Share of Spot-Markets versus Oil-Indexed Prices;
- 2011: only around 56 per cent of long-term contracts in Europe with a duration of up to 25 years were still indexed.
- Declining Market Share in Europe: fallen from almost 50% in 2000 to 34% in 2010 ;
- **February/March 2012:**
  - Russia cut European gas exports by up to 30%;
  - Imposed restrictions in 45 of its regions after it reached its capacity limits;

## ■ Domestic Gas Market:

- Increasing Competition by Smaller, but More Efficient and Cost Effective Domestic Competitors (i.e. Novatek);
- Their smaller fields and from under-exploited assets could be much more competitive on the future European gas market with cheaper LNG imports and unconventional gas production in Europe itself;

# Russia's South Stream Project

**Investment: €25-30 bn of the South Stream pipeline itself + another > €30 bn of the Bovanenkov-Russkaya gas interconnector**



Source: Interfaxenergy.com - Natural Gas Daily

Source: Mikhail Korchemkin

# European-Russian Gas Partnership – The View from Moscow II

## ■ Investment Needs:

- US\$277-289 to develop new infrastructure and to maintain the existing 161.700 km long pipeline network and 215 compressor units of its Unified Gas Supply System (USG);
- 67% of its USG infrastructure is more than 20 years old.

## ■ Shale Gas Impact:

- Transformed the global gas markets from a seller's into a buyer's market;
- **At the end of 2011:** the largely non-subsidized US gas price (US\$83) was already lower than the heavily-subsidized gas from Russia (US\$97);
- destroying the old gas market structure in Europe, based on bilateral long-term contracts and controversial pay-and-take-clauses between a limited number of big suppliers and buyers;
- **Gazprom/Russia:** already the most expensive gas option for Europe and will be in the future;
- **Threat:** Gazprom/Russia Becoming the Biggest Loser?.

# Summary and Perspectives I

## ■ EU/CEE:

- Its increasing dependence on energy imports and external suppliers will make it more vulnerable to unpredictable changes and uncertain developments on global markets in a new age when its relative importance as a global energy consumer (presently 17%) will rapidly decrease (less than 10% by 2030);
- EU-gas markets becoming increasingly united, liberalized and integrated with growing competition:
- Spot Markets and Spot Markets Prices Becoming More and More Important – even Russia's Deputy Finance Minister Sergei Shatalov admitted: „*Long-term contracts hold less meaning. The spot market is becoming more significant*“ (March 2012).
- New transnational energy infrastructures (pipelines, grids etc.) demand a common energy (foreign) policy towards third energy partners outside of the EU.
- New Gas Import Options (prospects different and more positive than in 2006 during the first gas crisis).

# Summary and Perspectives II

- **Unconventional Gas in the EU-Perspective: a “Game Changer”:**
  - fulfils all three objectives of the “*Energy Triangle/Energy Trilemma*”: (a) economic competitiveness; (b) supply security, and (c) environmental/climate change mitigation.
  - **Supply Security:**
    - Domestically produced resource, reducing gas imports from unstable countries/regions and problematic exporters;
    - Diversifying the national and EU energy mix and gas imports (even when no UG is being produced in Europe);
  - **Economic Competitiveness:**
    - unit supply costs probably higher in Europe than in U.S.,
    - but also much lower than Russia’s future long-distance pipeline gas from new and very expensive gas fields in the high north (like *Yamal*) or even the Barents Sea and the Arctic, based on long-term contracts with inflexible price adaptation mechanism and highly problematic third-party clauses.
    - **Historical experiences: production costs will always go down with new energy resources and further innovations of drilling technologies;**



# Summary and Perspectives III

- **Environmental/Climate Change Mitigation:**
  - shale gas - like conventional gas - produces equally much lower CO<sub>2</sub> emissions than coal; slightly higher than domestically conventional gas exploitation.
  - **New research analyses:**
    - *Potential* risks yes, but not significantly higher than for conventional gas drilling;
    - won't damage drinking water supplies or cause seismic shocks or have other environmental consequences if it is properly managed, controlled & regulated;
  - full life-cycle emissions: carbon footprint of domestically produced UG is 10-30% lower than long-distance Russian pipeline gas (life-cycle and wells-to-wheel analyses).
  - Negating domestically produced UG gas means higher imports of pipeline gas and LNG with higher CO<sub>2</sub> and methane emissions;
  - domestically produced unconventional gas is both technologically and environmentally less risky than the increased drilling of conventional gas resources in ever more deeper offshore seas or in the environmentally most sensitive Arctic and Antarctic regions.

# Summary and Perspectives IV

## Unconventional Gas (UG):

- The most important energy revolution of fossil fuels during the last 40 years; **in Europe: progress evolutionary rather than revolutionary (U.S.A.)**
- **Far-Reaching Global Impacts:**
  - **Geo-economic:** international gas markets, gas prices, LNG versus Pipeline-rivalry; international competition; energy mix (“*Golden Age of Gas*?”), diversification;
  - **Prices:** weakening of the oil-linkages and the traditional long-term contracts (adaptation of prices and 3-year price regulations needed);
  - **Geopolitical:** domestic source; diversification options; strengthening of regional and global energy supply security and importers (negotiation power); weakening of political instrumentalisation of energy and pipeline dependencies; or gas cartels (GECF);
  - **Gas Market Liberalisation: US- UG-revolution only possible without (the European) pipeline monopolies;**
  - **Game Changer:** regardless of a European UG revolution, shale gas has already changed the European market, even before a single well has been drilled, or a single molecule of unconventional gas has been extracted from the European basins.