The growing role of natural gas in the global energy supply

Natural Gas Day 11-11-2004

Finnish Natural Gas Association

George H.B. Verberg,

President, International Gas Union

IGU 2006

INTERNATIONAL GAS UNION covers >95 % of world gas sales ‘spokesman’ of the gas industry

Non Members

Membership from 66 countries

IGU mission:

- Promote the technical and economic progress of the global gas industry;
- Improving the competitiveness of natural gas in the world energy markets, emphasising sound environmental performance, safety and reliability;
- Promote transfer of technology and know-how, as a global information clearing house;
- Maximise value to members and customers.

Long Ago.....

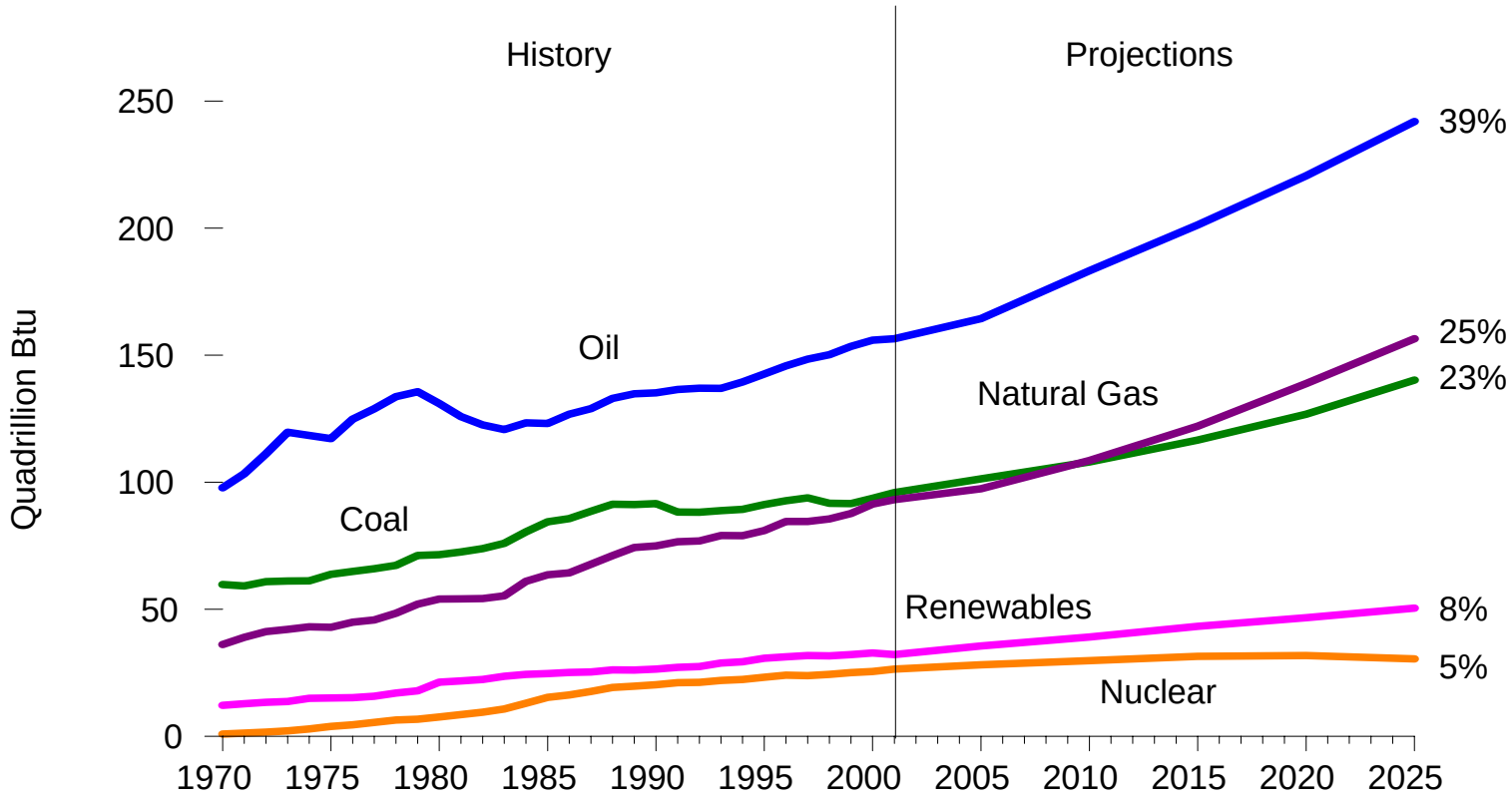
- Natural gas was used to predict the future of gods and mankind....

Gods and Mankind...

Apollo temple
Delphi, Greece

Enter the temple.....to the future

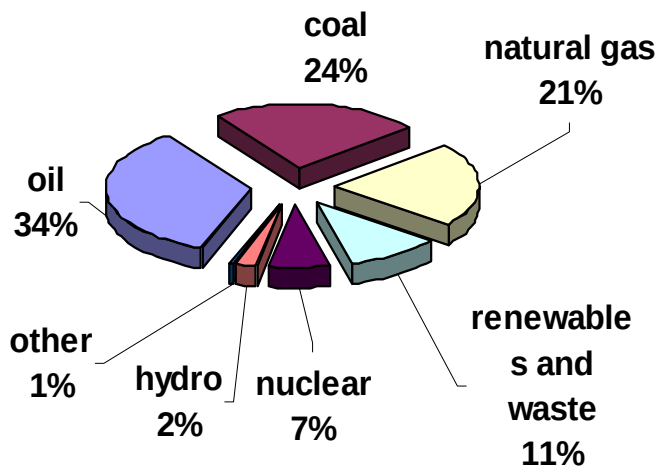
World consumption of primary energy per fuel type, 1970-2025



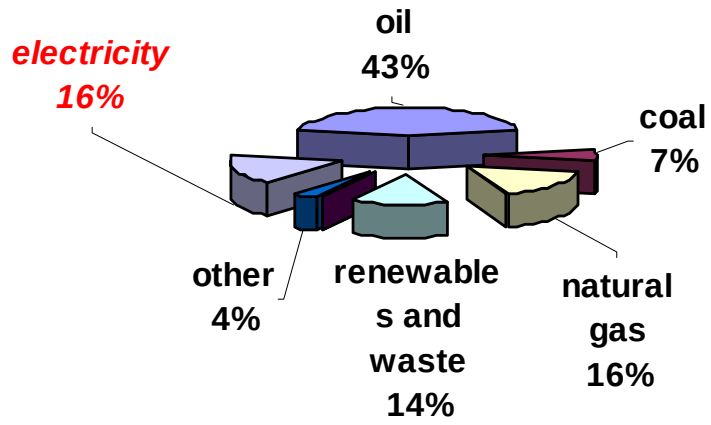
Source: EIA data

Global primary energy consumption

consumption of primary energy by type (world total, 2002, 10230 mtoe)



final consumption after conversion losses (world total, 2002, 7095 mtoe)

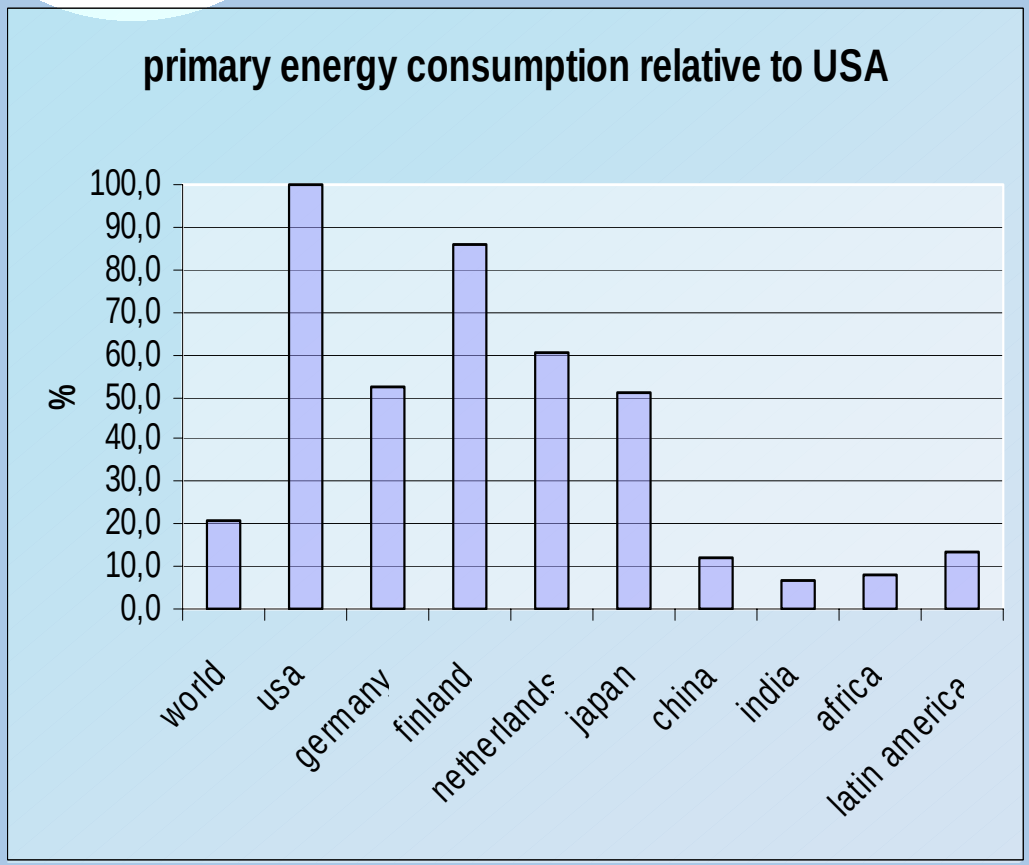


Source: IEA

Global Energy Challenges for the 21st century

- Cope with the increasing urbanisation;
  - in 2003 3bn people, or 48% of the world population, live in urban areas
  - in 2007 >50% and in 2030 5bn!
- Today 2 billion citizens of the world do not have access to energy/electricity
- Curb Climate Change

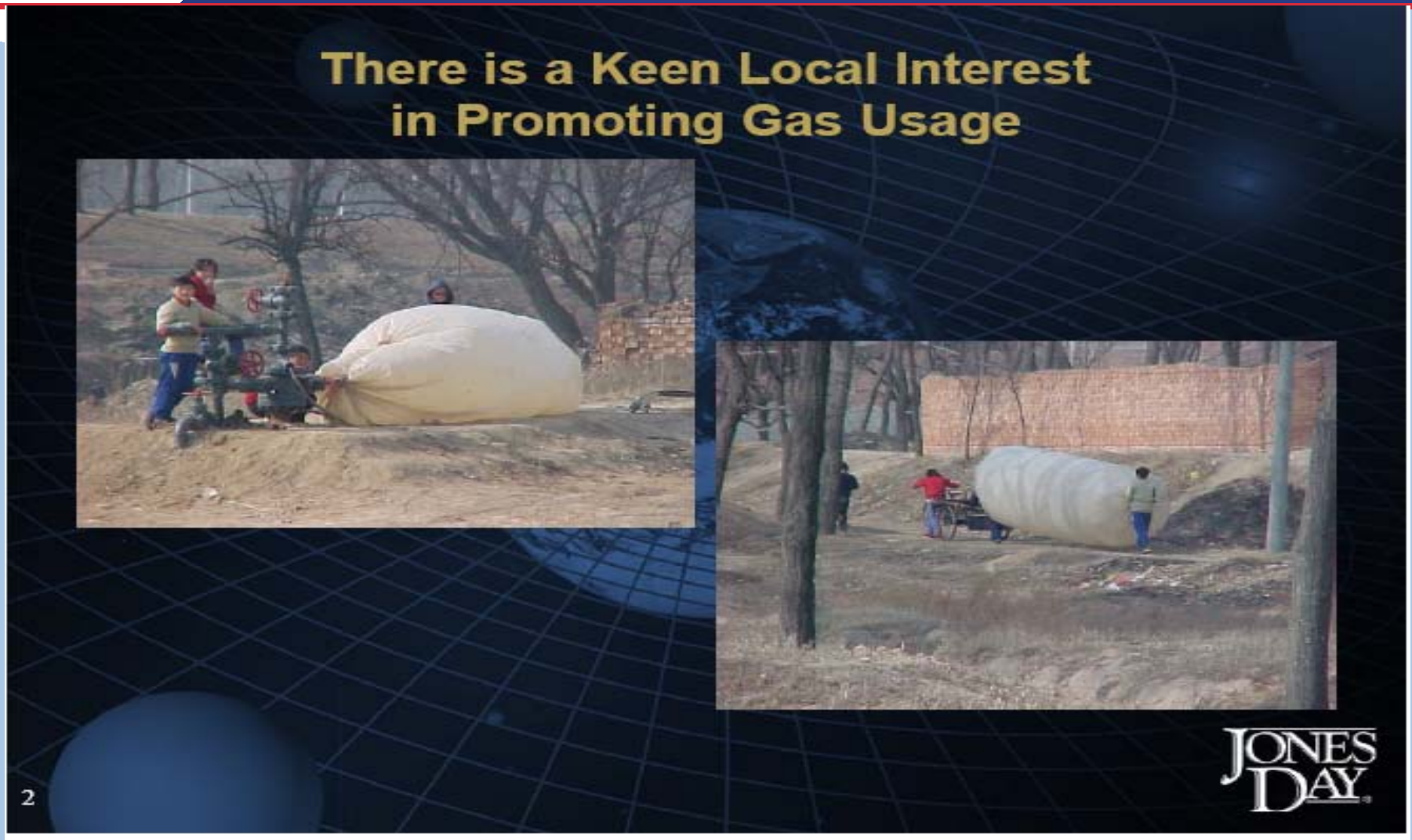
Energy consumption in perspective

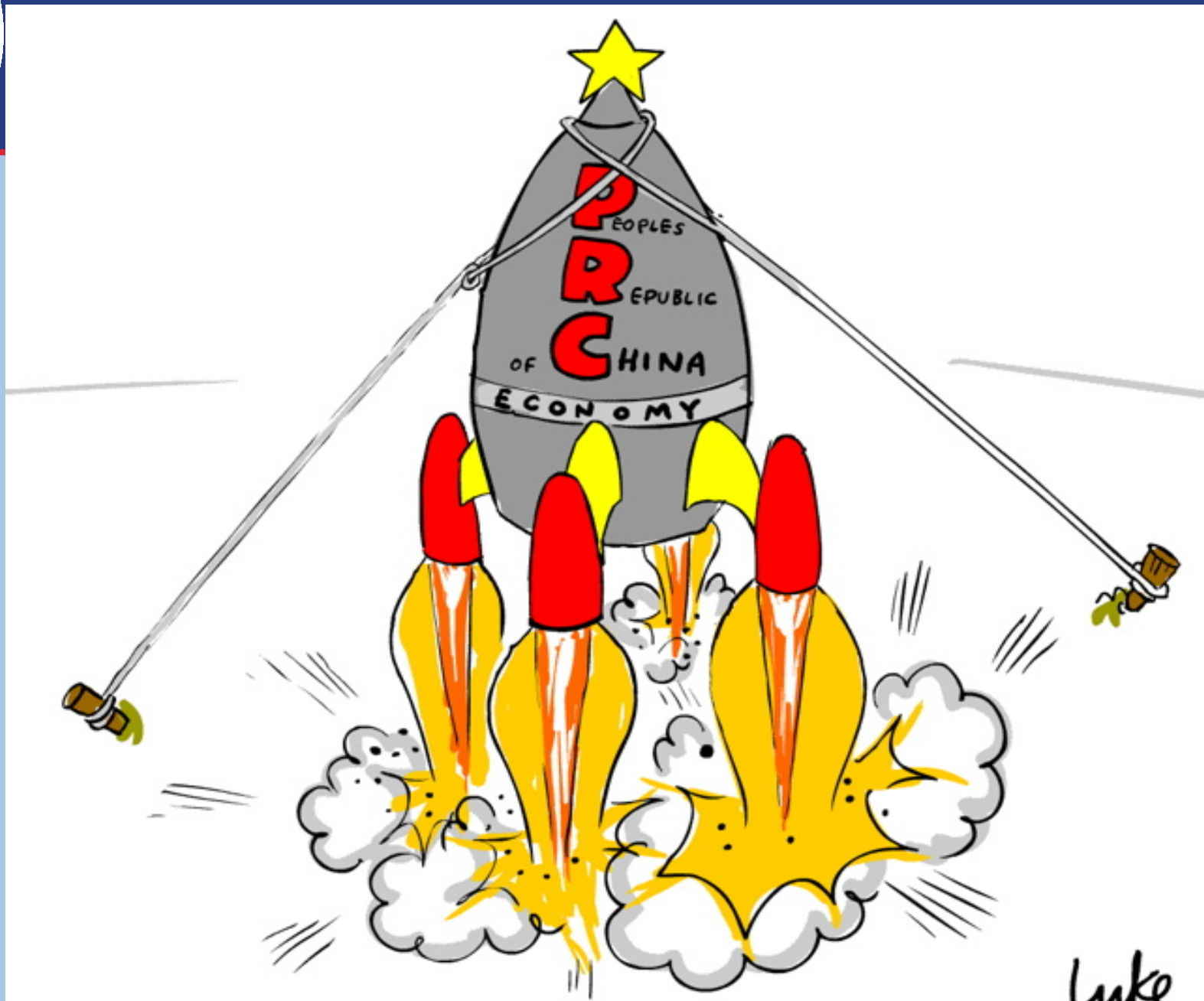


- If whole world on USA level: almost 5 times as much energy needed
- China + India: more than 1/3rd of world population, on the way of economic development

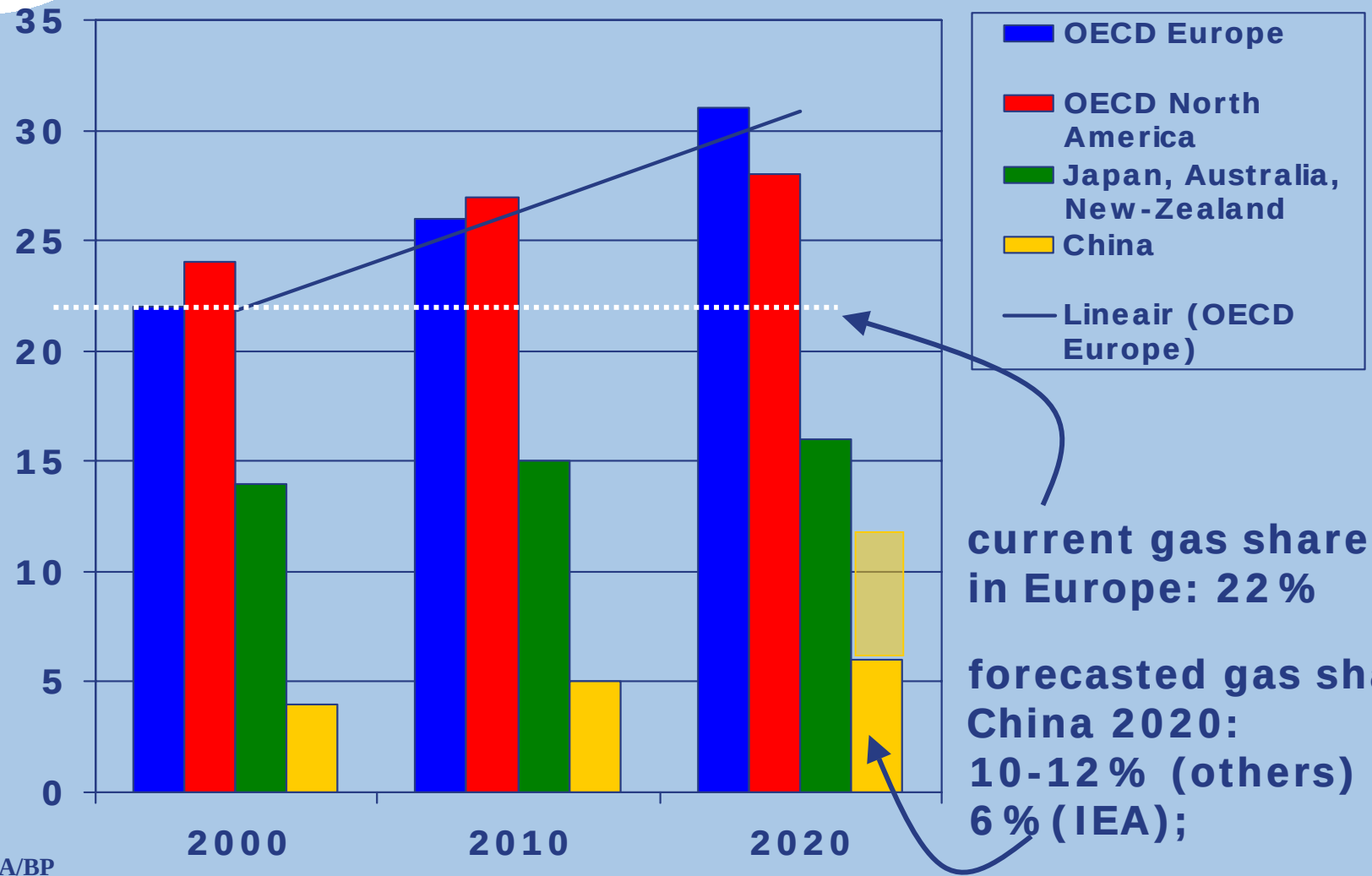
Source: IEA data year 2002

Still primitive gas transmission in China, but not for long!




PEOPLES
REPUBLIC
OF CHINA
ECONOMY
Luke

Gas share in primary energy demand

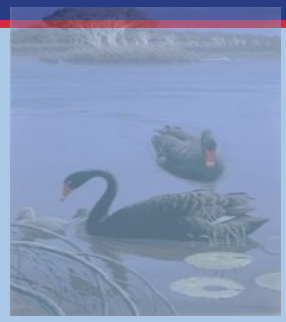


current gas share in Europe: 22%

forecasted gas share China 2020: 10-12% (others) 6% (IEA);

Source: IEA/BP

Shipping Fleet Expansion



- Northwest Swan launched May 2004
- Length: 287m, beam: 43.4m, draught: 11.5m, a capacity of 137,500 cubic metres

OIL (ENERGY) SUPPLY

- ‘The oil problem is not just an economic issue but is a matter of national security‘

- Fang Schangping, Professor at the International Energy Strategy Research Centre at People‘s University China has its own space mission and technology. Most important companies here is: CASC

China plays it broad to get access to reserves

Increasingly China is exporting telecommunication infrastructure to developing countries. Also here there are joint opportunities. Overseas China activities opening satellite communication opportunities are: GSM, telecommunication infrastructure, Oil & Gas (participations with national Petroleum Operations companies).

Australia will deliver gas to the first LNG terminal in China (Guandong), but had to meet the condition of China's participation in the gas field

LNG sales prospects for Russia

LNG Facilities in North America— Existing and Proposed (February 2004)

Source: Cambridge Energy Research Associates.
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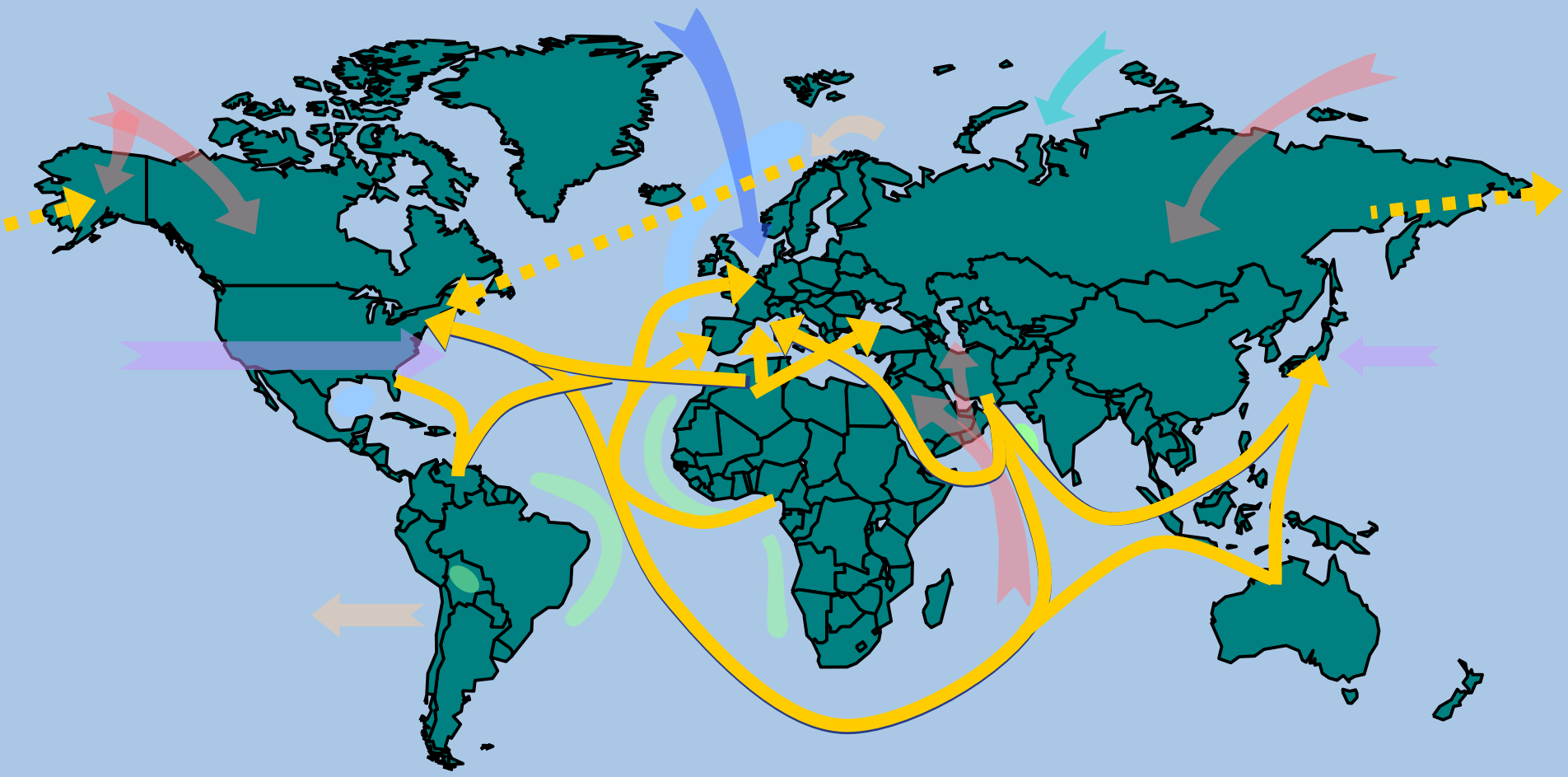
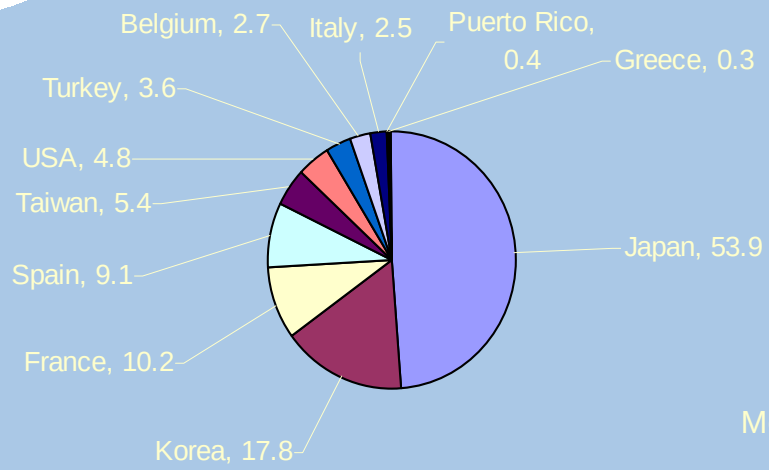
LNG: connects markets, increases global competition



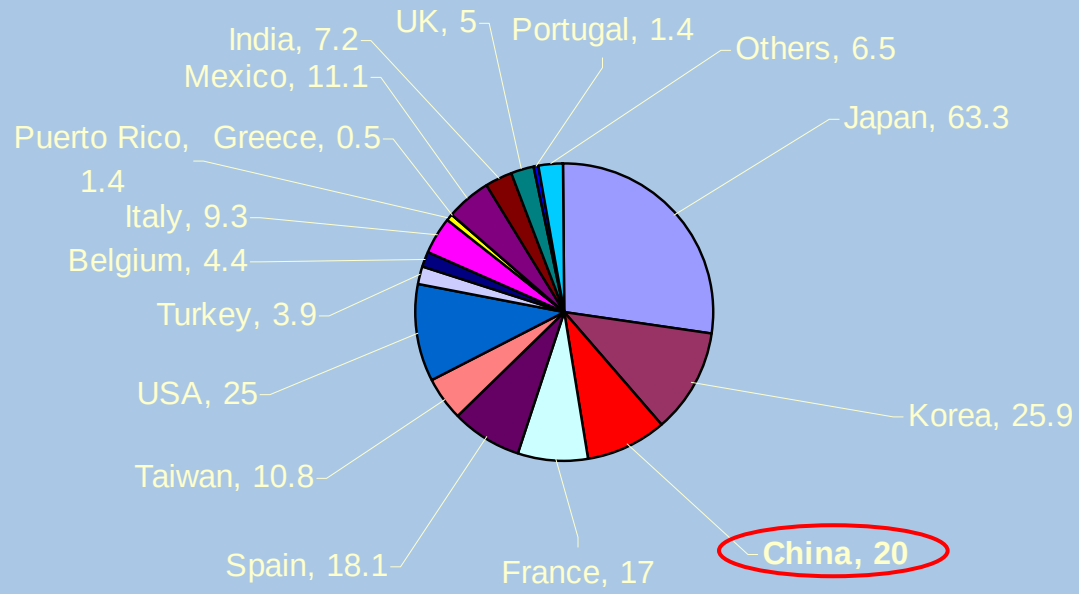
LNG Demand in 2002 & Forecast For 2010



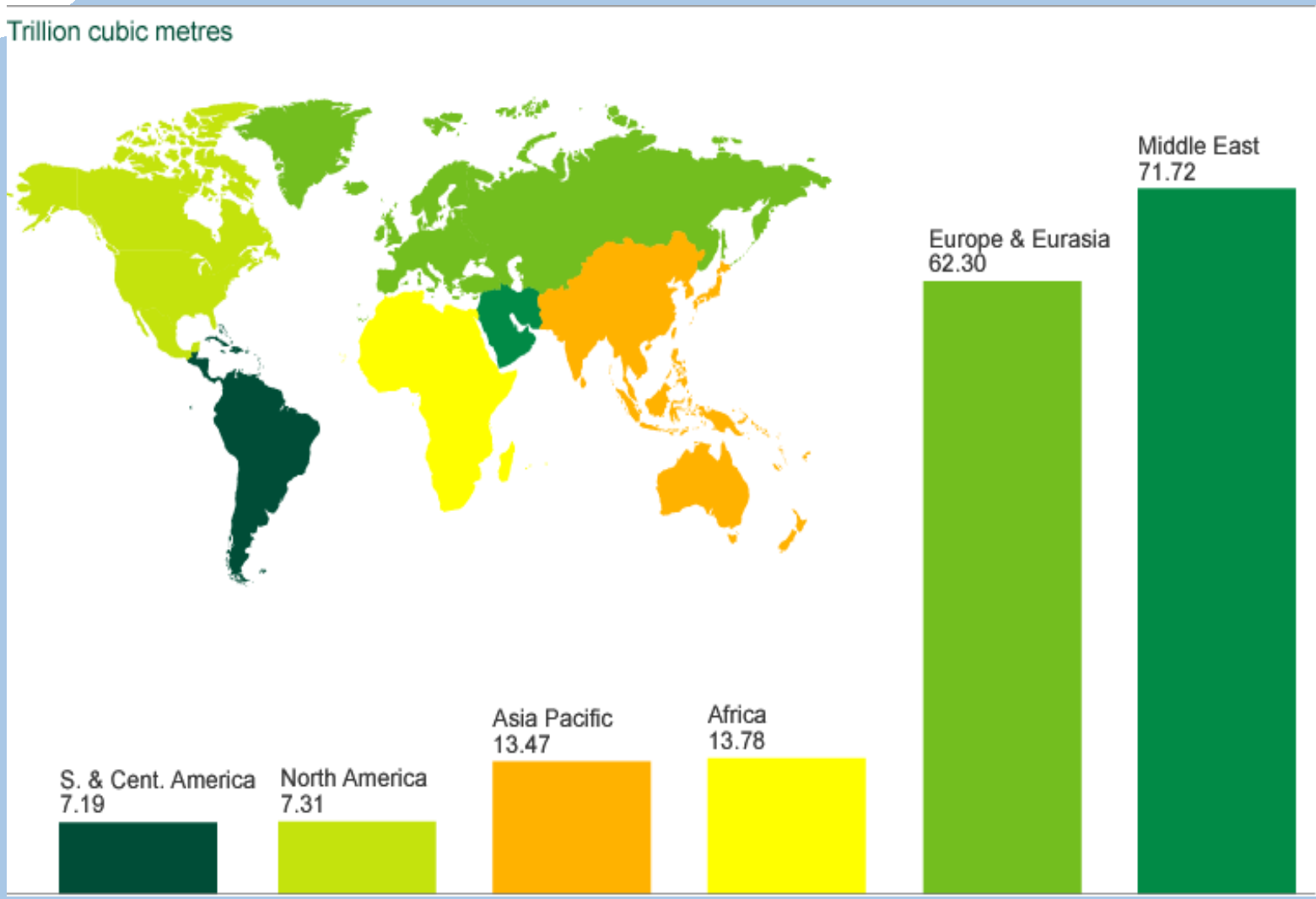
2002 TOTAL = 110 mln tonnes

2010, TOTAL = 230 mln tonnes

6 New Buyers Forecast to Enter the LNG Market (including US WC, UK and Mexico)



Proved natural gas reserves at end 2003



So for many decades to come...

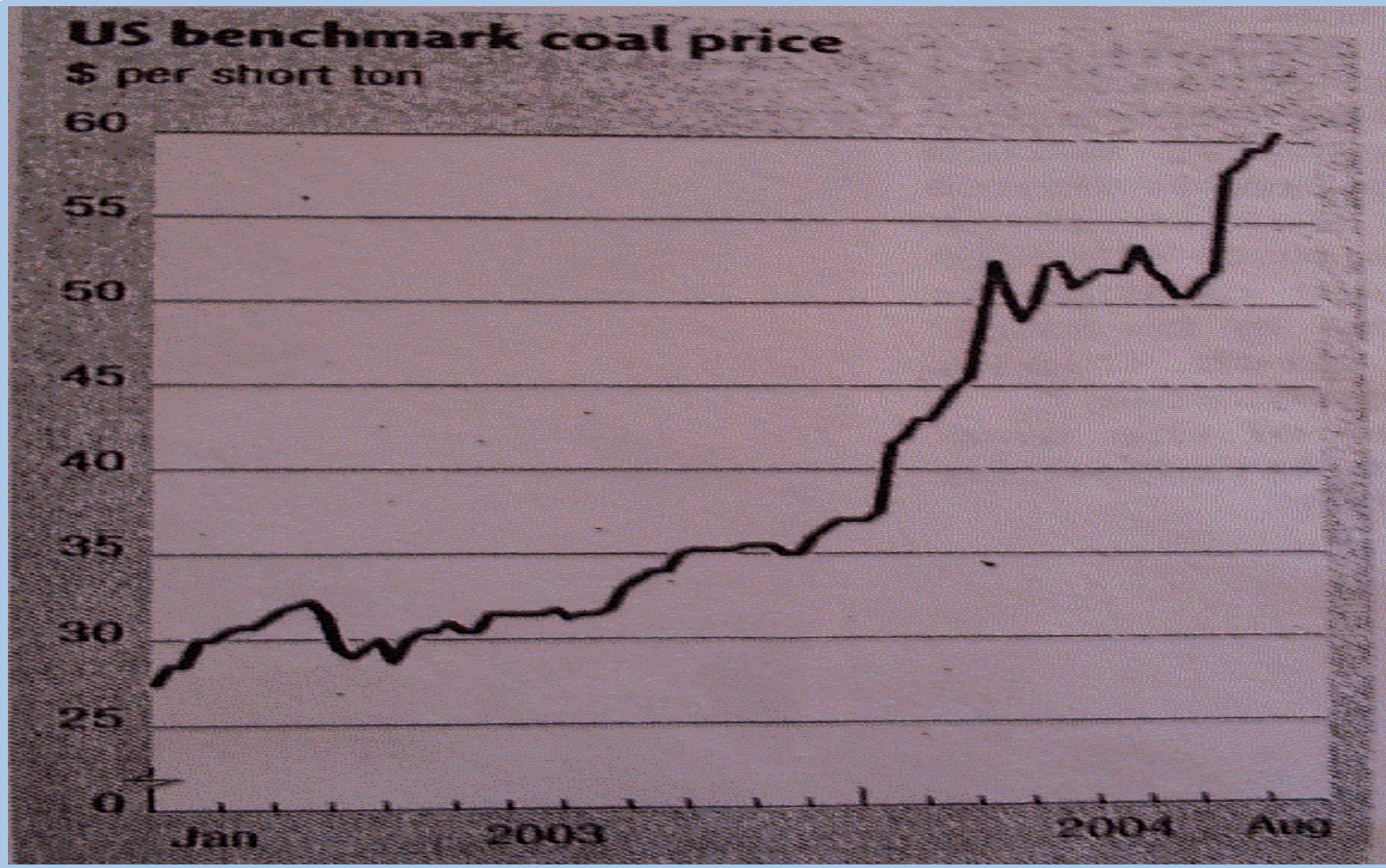
- Enough natural gas, but
- regions of demand are NOT the regions with reserves, so
- a lot of long distance transportation and transit,
- through many countries or narrow sea straits
- and production areas are more and more difficult and costly

Natural gas' competitors: oil prices

Oil prices in US$ of 2004:

- **1864: 92$/b, but at that time no oil dependent economy**
- **1980: 81$/b, economic difficulties**
- **2004: 55$/b (incl. terrorism-premium of some 7-11$/b according to minister Khalil of Algeria)**
- **Winter 2004/2005: 60+$/b if the news of a severe cold spell in North America reach the press before the news of a slackening growth in China? Or 35-40$/b if return to 'normality'?**

Natural gas' competitors: since Jan. 2003 more than doubling of US coal prices!

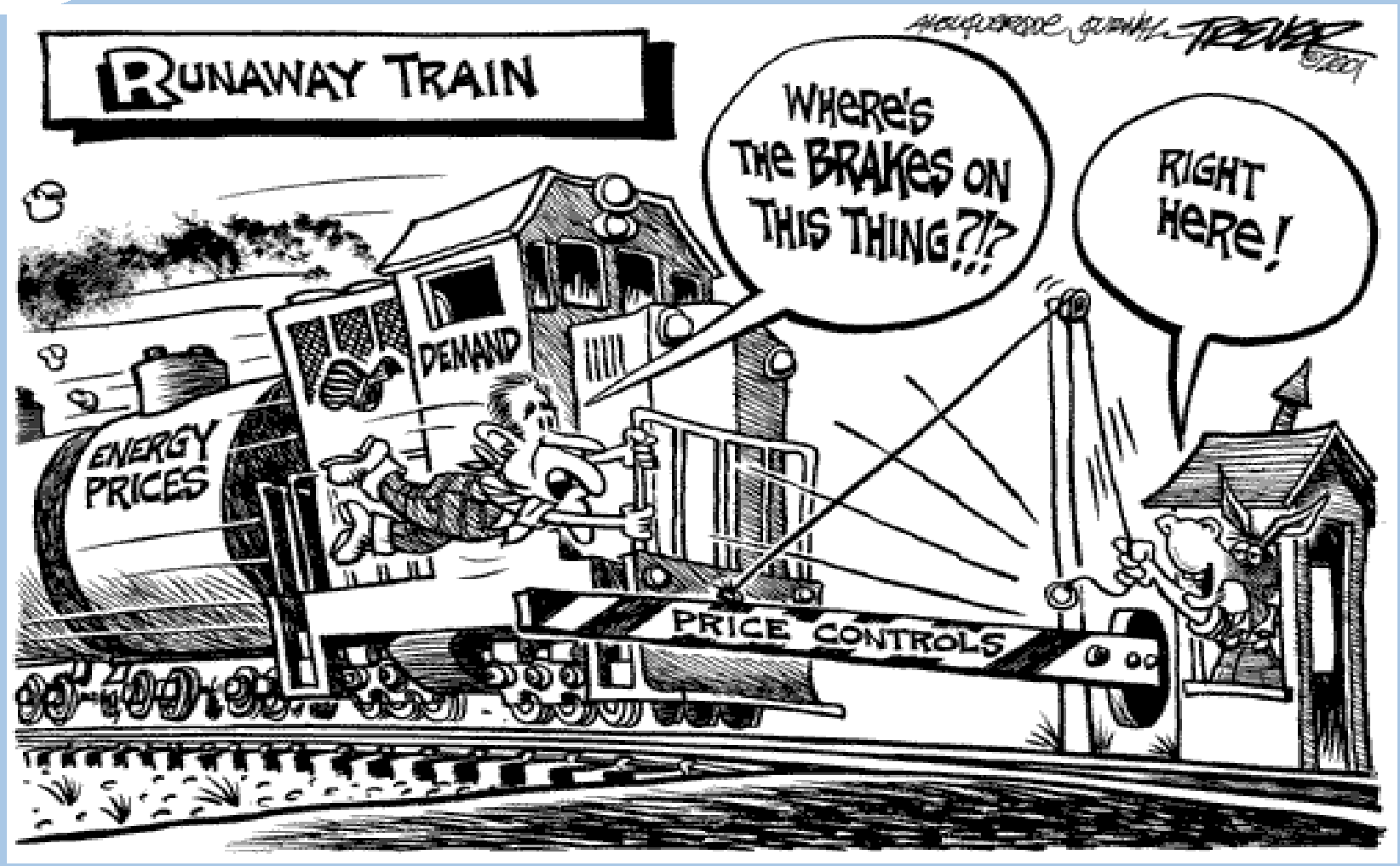


Natural Gas in a liberalised market: Spot Prices USA

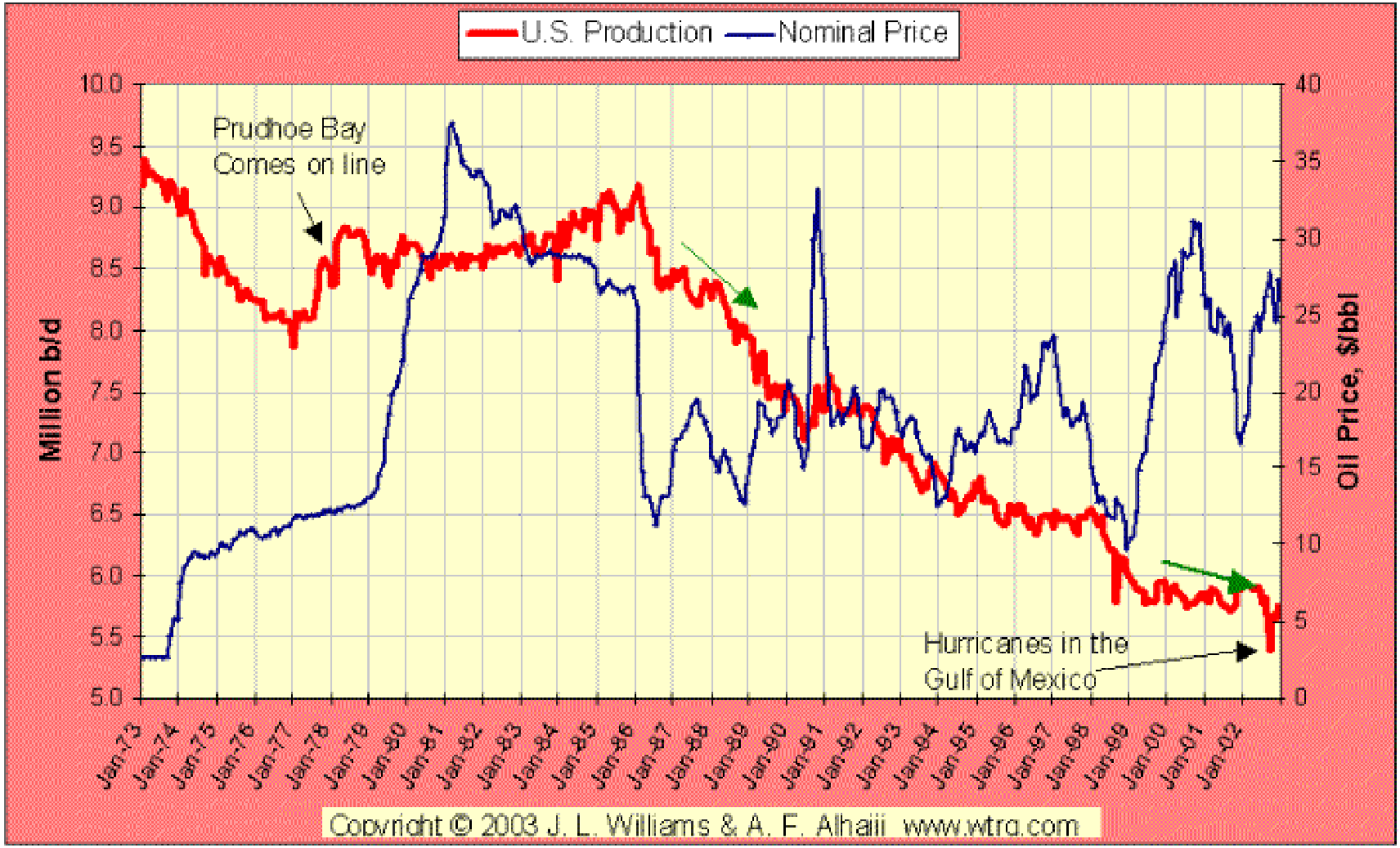
Natural Gas Spot Prices Have Risen and Fluctuated Since 1990s

	1999	2000	2001	2002	2003	2004	2005
Dollars per cubic feet	$2.33	4.37	4.19	3.43	5.8	5.96	6.14

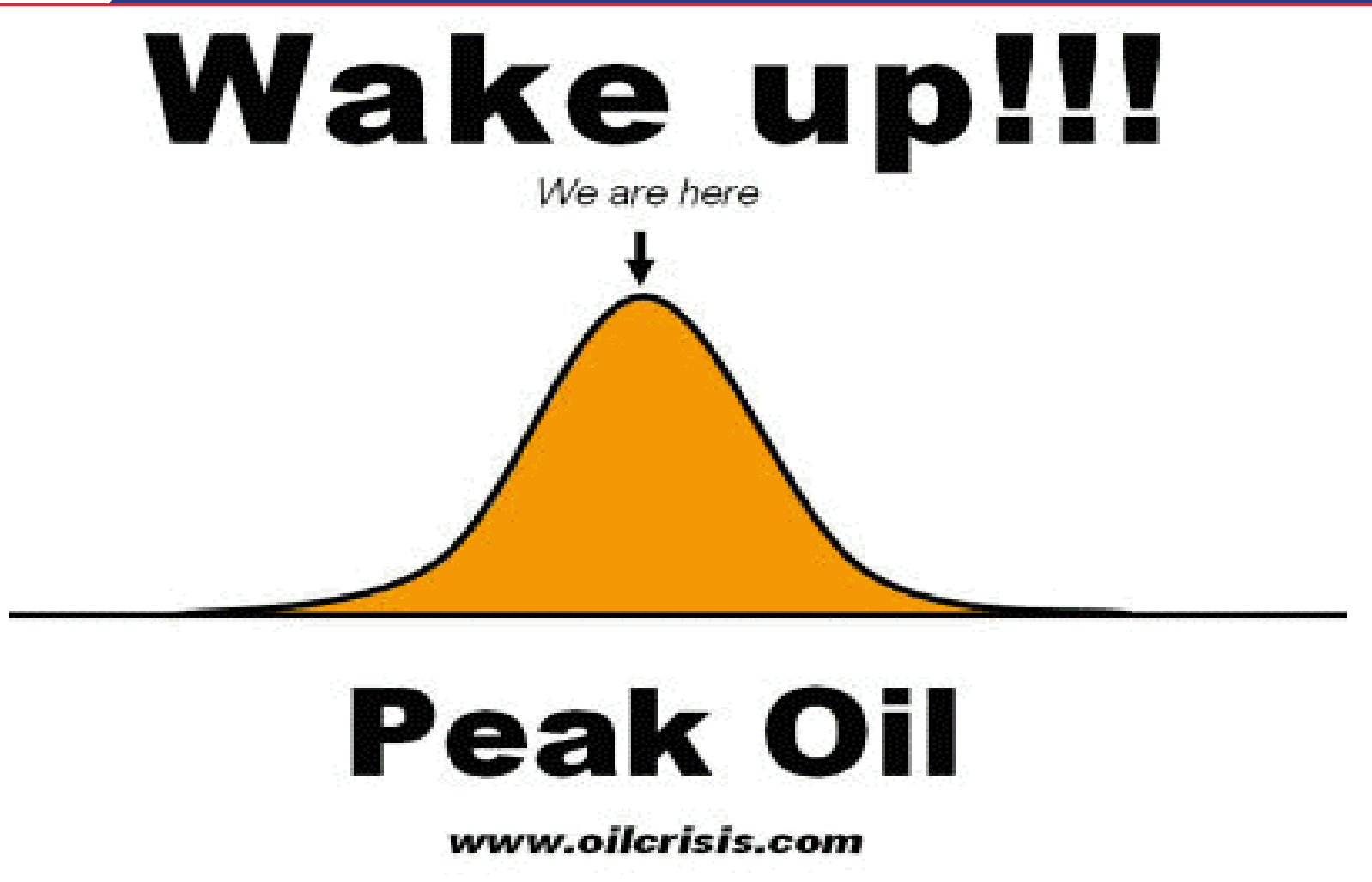
It is not only “OPEC”, but also strong demand



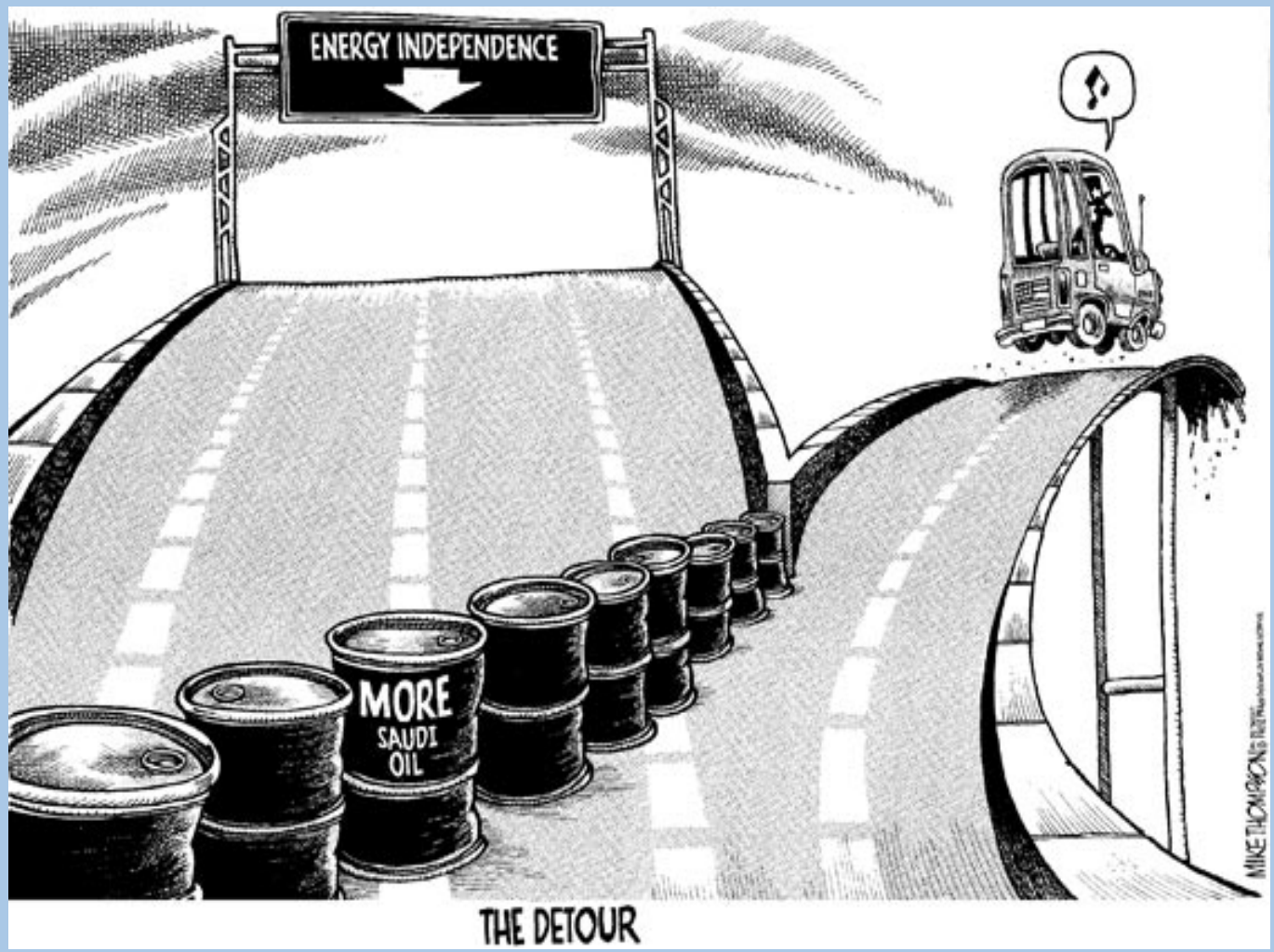
Do higher oil prices lead to more investments and supplies, or are there not enough reserves, or??



In the States you can buy these T-shirts !.....NOT for gas !



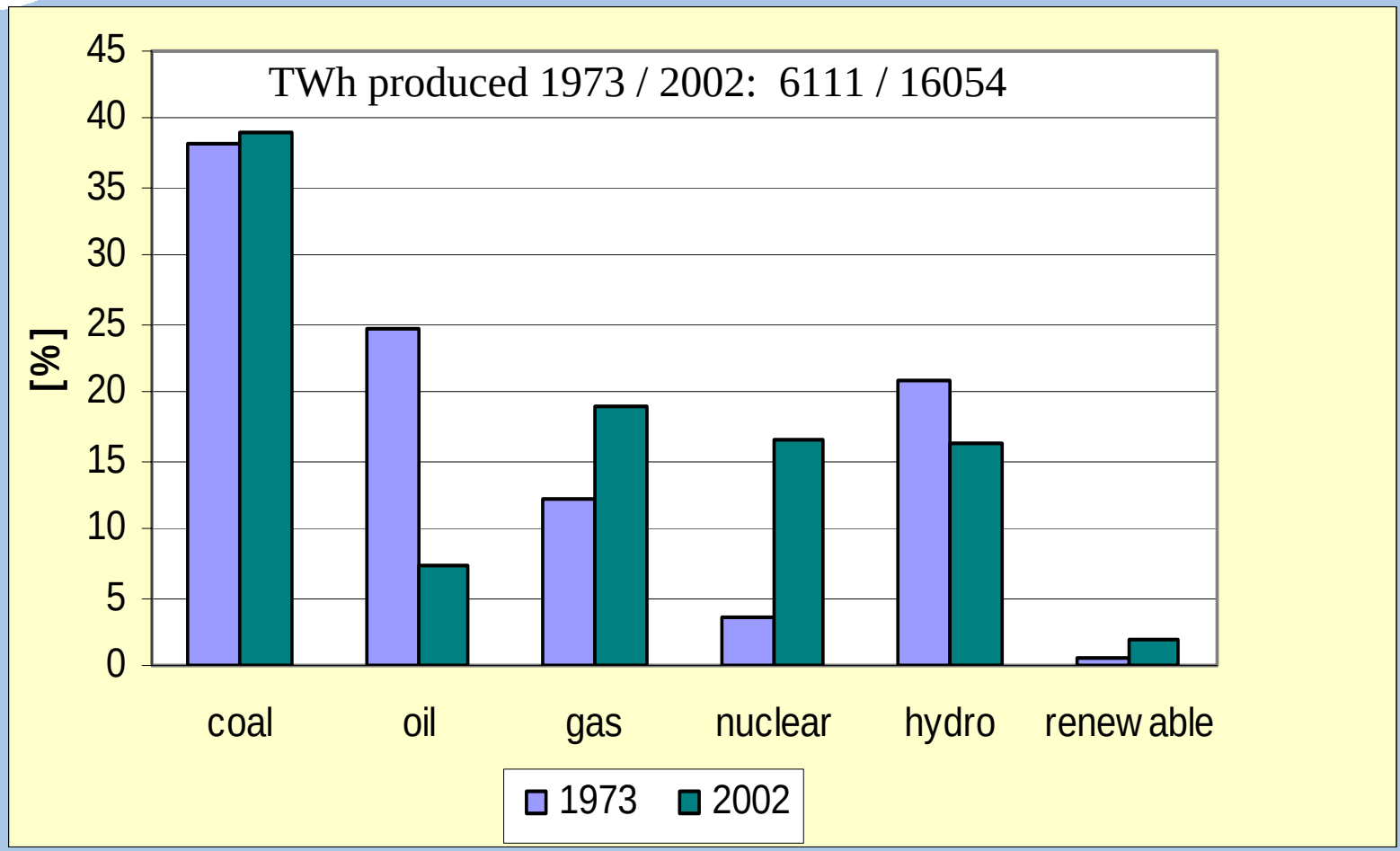
Will it be different for gas, or different for Europe ??



Natural Gas is it ...

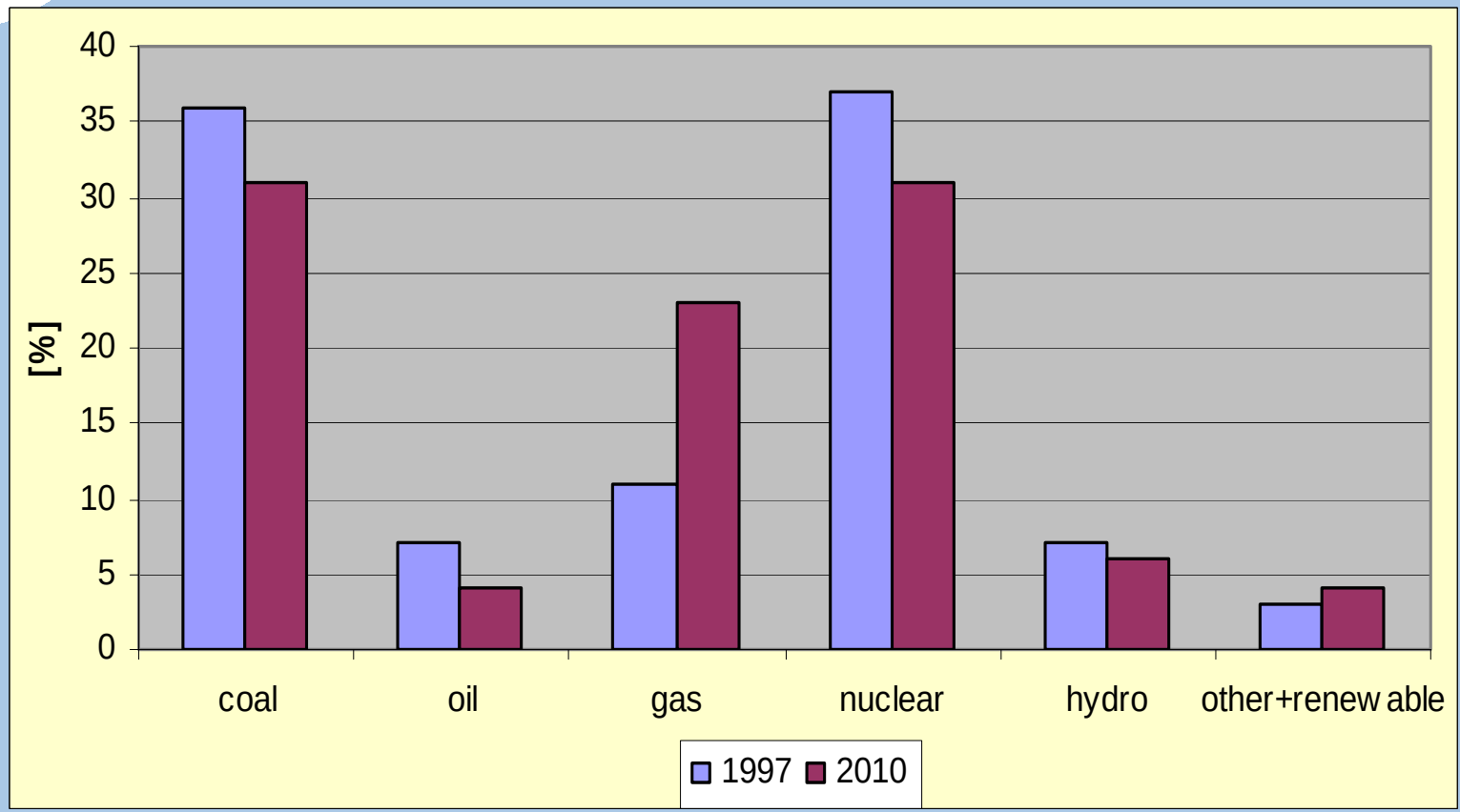
- really such a benign fuel? The fuel of choice?

Fuel mix electricity generation (global)

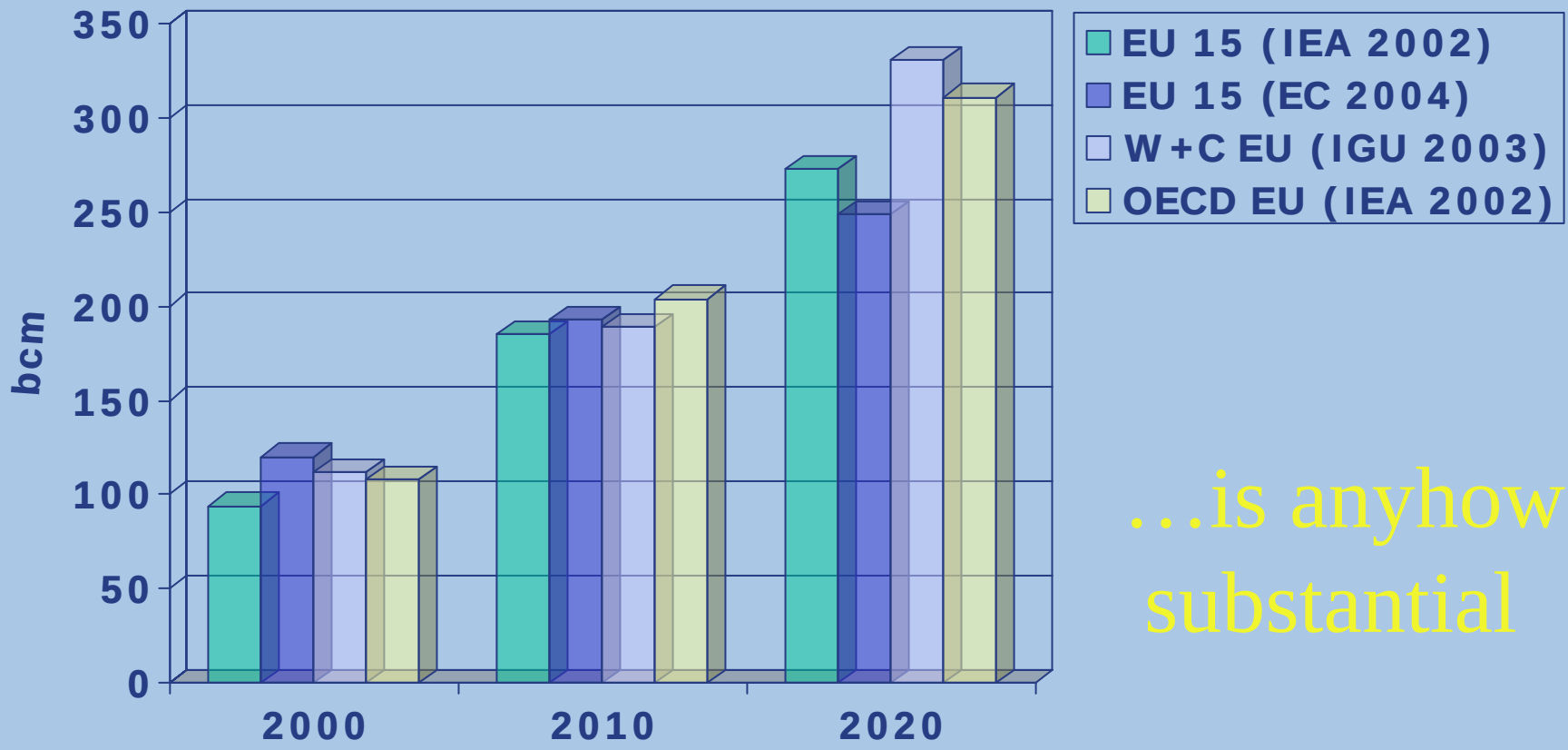


Source: IEA 2004 key world statistics

Development fuel mix in power sector OECD



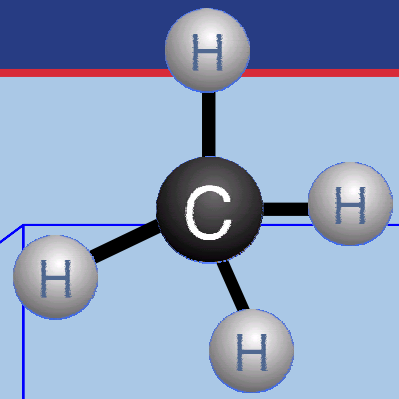
Expected gas demand power sector differs per forecasting institution and area ....



Source: Clingendael International Energy programme, report to be published

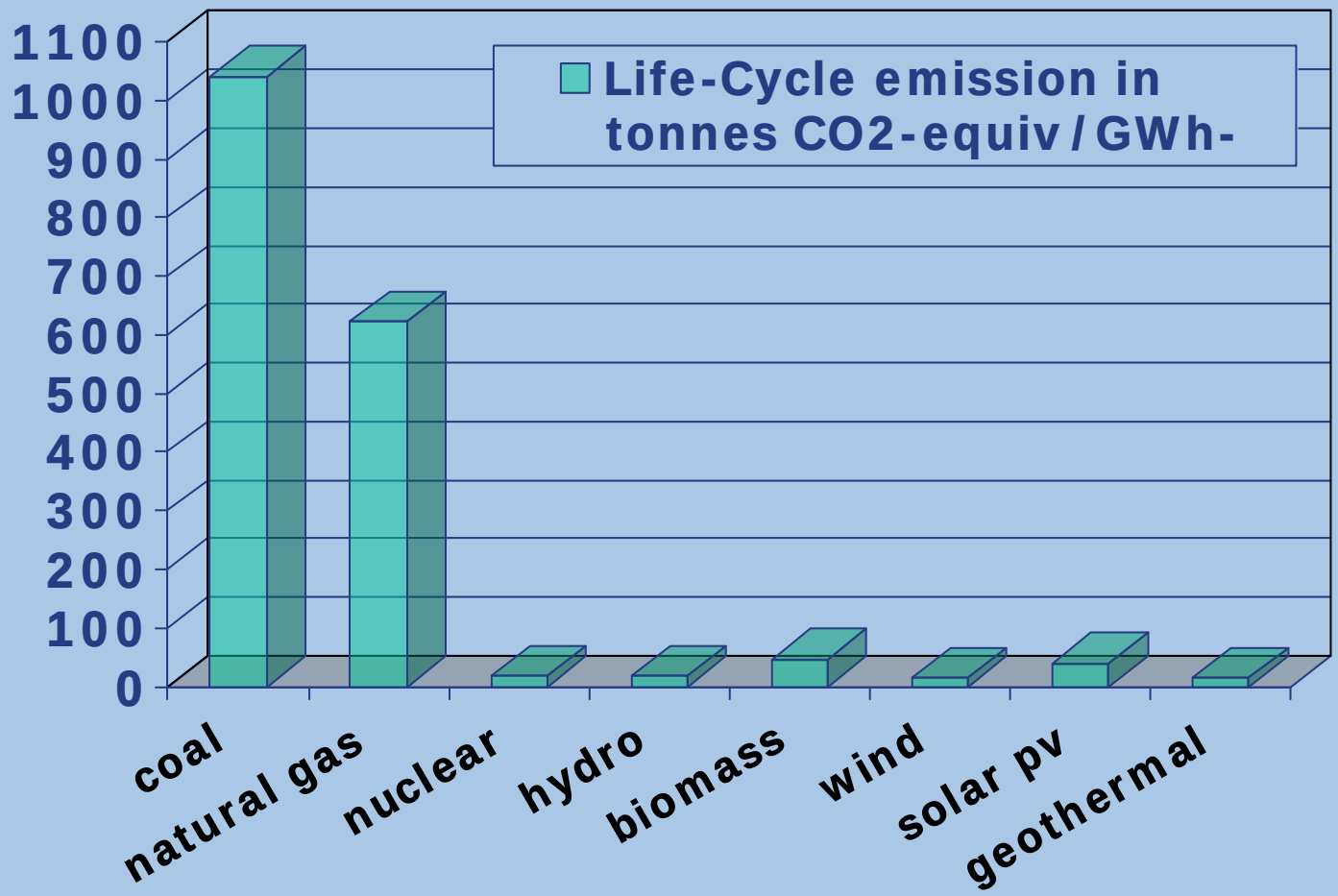
…is anyhow substantial

Natural Gas = Cleanest fossil fuel



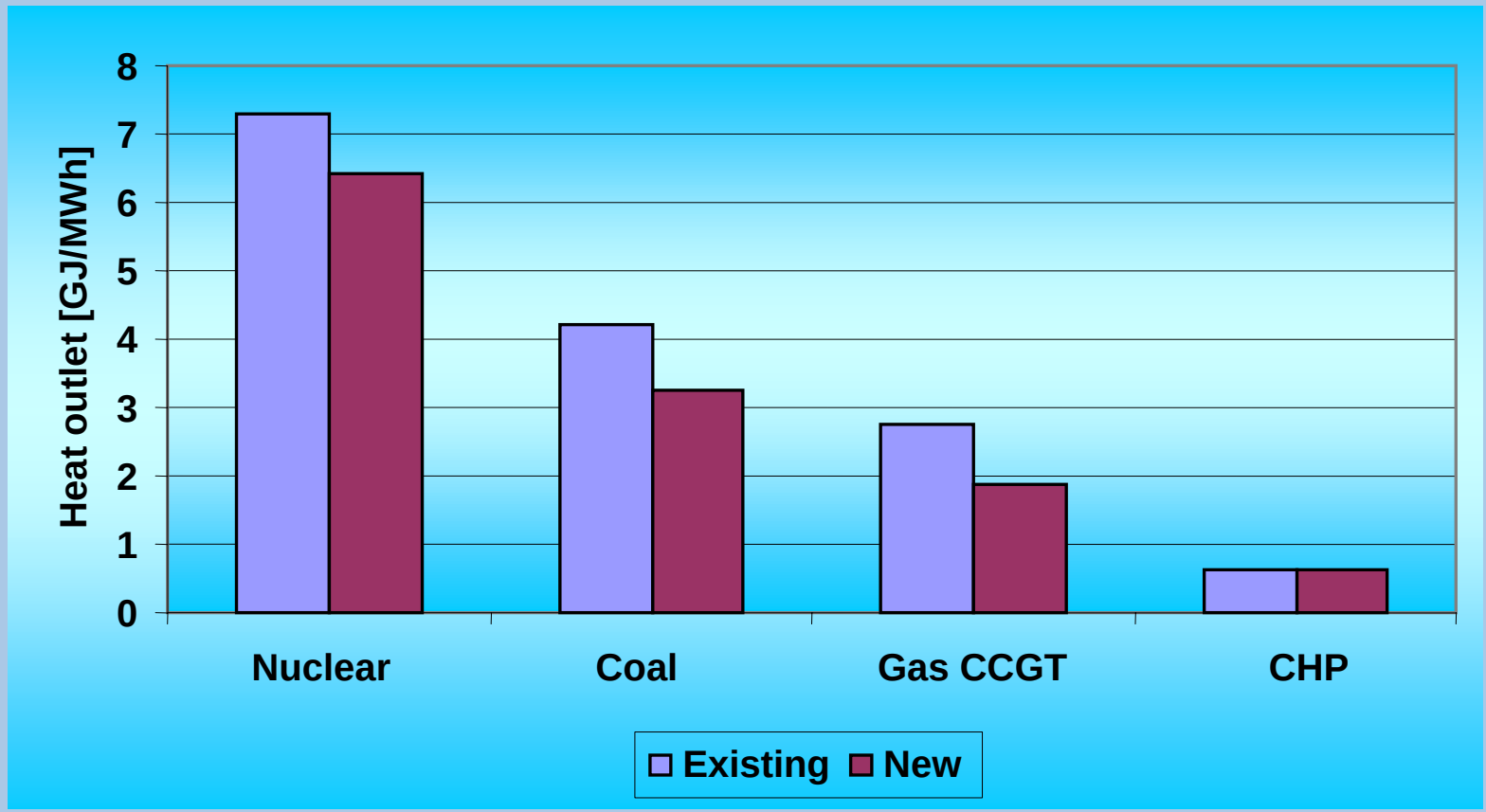
Source: IEA/BP

Another look at CO_2 emissions from power plants



Source: life-cycle assessment of electricity generation systems and applications for climate change policy analysis, Meier, 2002, published on website Nuclear Energy Institute

Natural Gas fuel of choice , Cooling water requirement per 1000 MW



Cost comparison various power generation technologies

Base load (7500 – 8000 h)	Coal	Gas (CCGT)	Nuclear
Cost per MWh, incl. fuel ($)	35 - 42	35 - 41	30 - 67
Investment per kWh ($)	820 - 1300	420 - 540	1663 - 2000
Project lead time (month)	36 - 48	20 - 40	60 - 78
Lifetime (years)	30 - 40	20 - 40	40 - 60

Source: Clingendael International Energy programme, report to be published

Future for Nuclear Power Plants?

- Option if risks accepted in society
- Very low CO_2 emission
- 1600 MWe Olkiluoto NPP planned to be commissioned in 2009
  - Equals 2 bcm gas per annum

    (compared with high efficiency gas fired power station operating 6000hrs/yr)

So..

- **What about Europe...?**

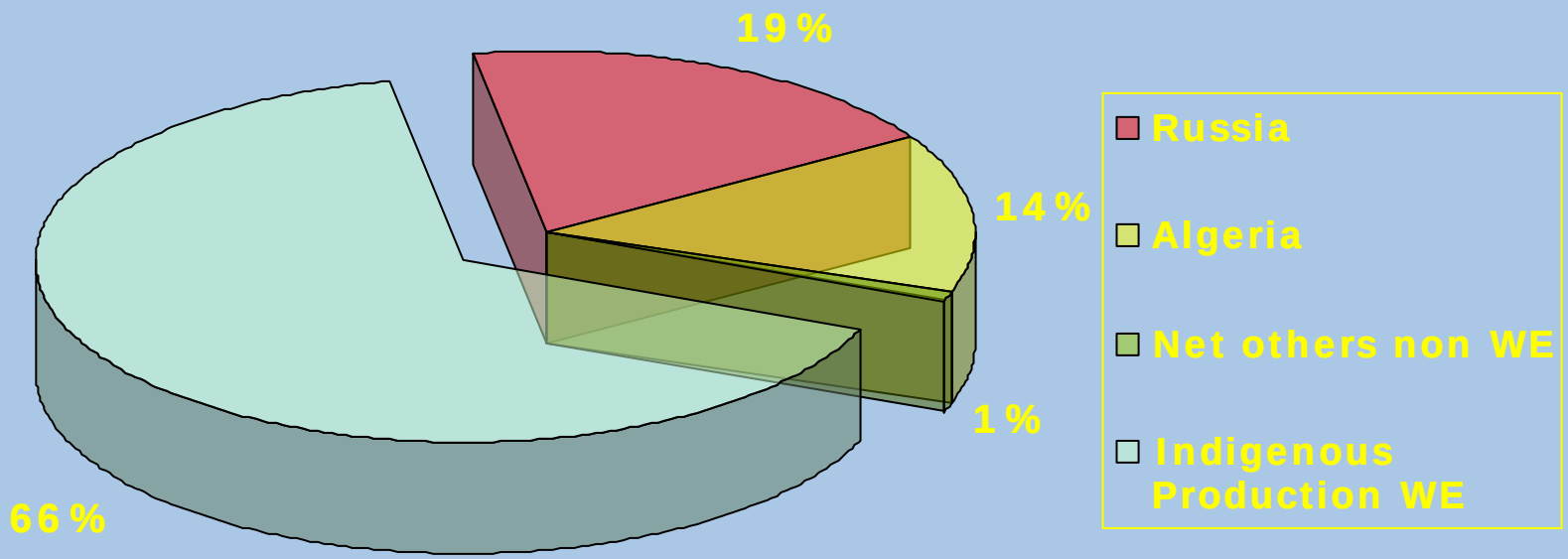
European energy themes

Liberalisation
'doing it the right way'

Environment
'Kyoto'

Security of supply
'Increasing import dependency'

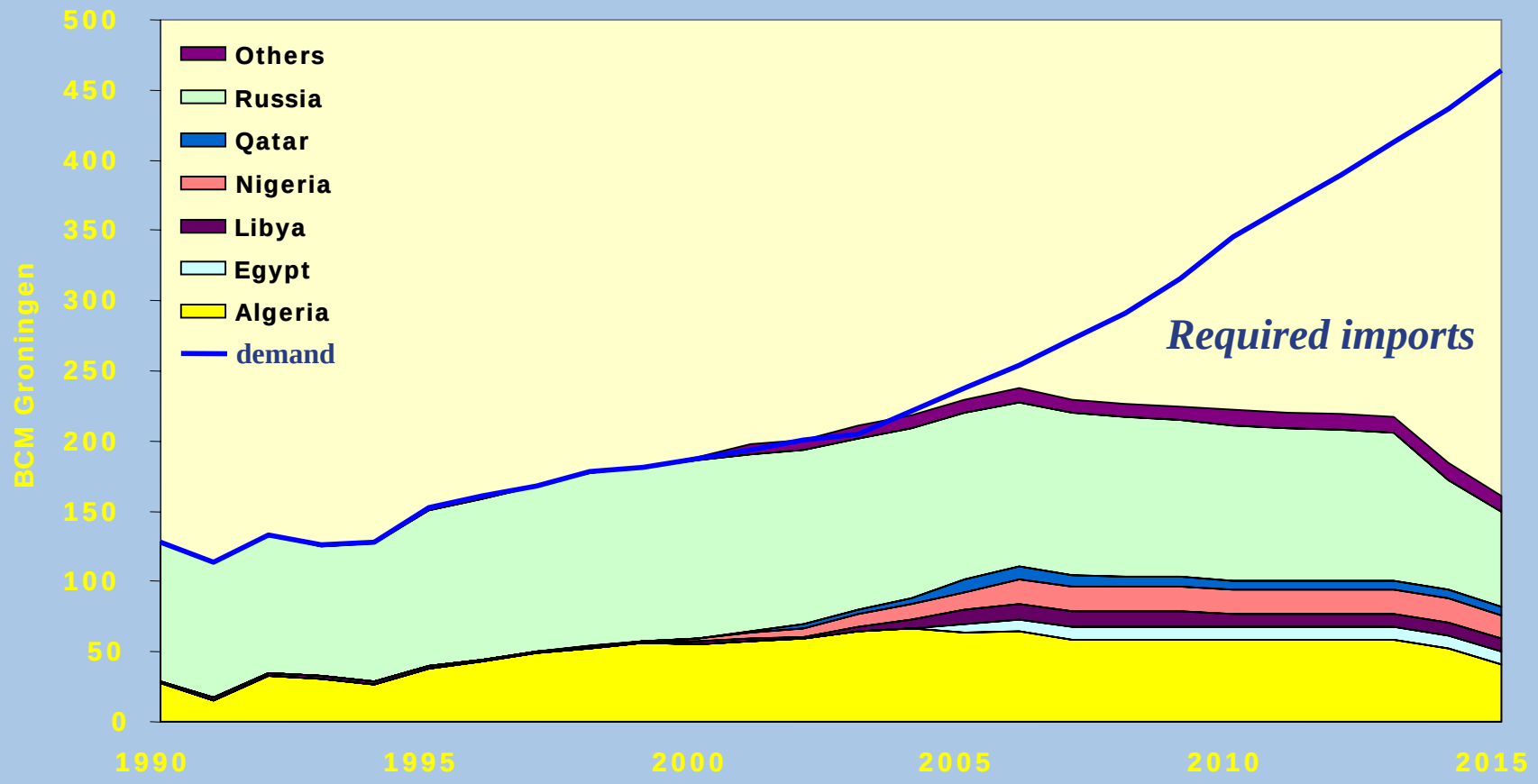
Breakdown of Western Europe's Natural Gas Supplies



EUROGAS Member Countries and EU15

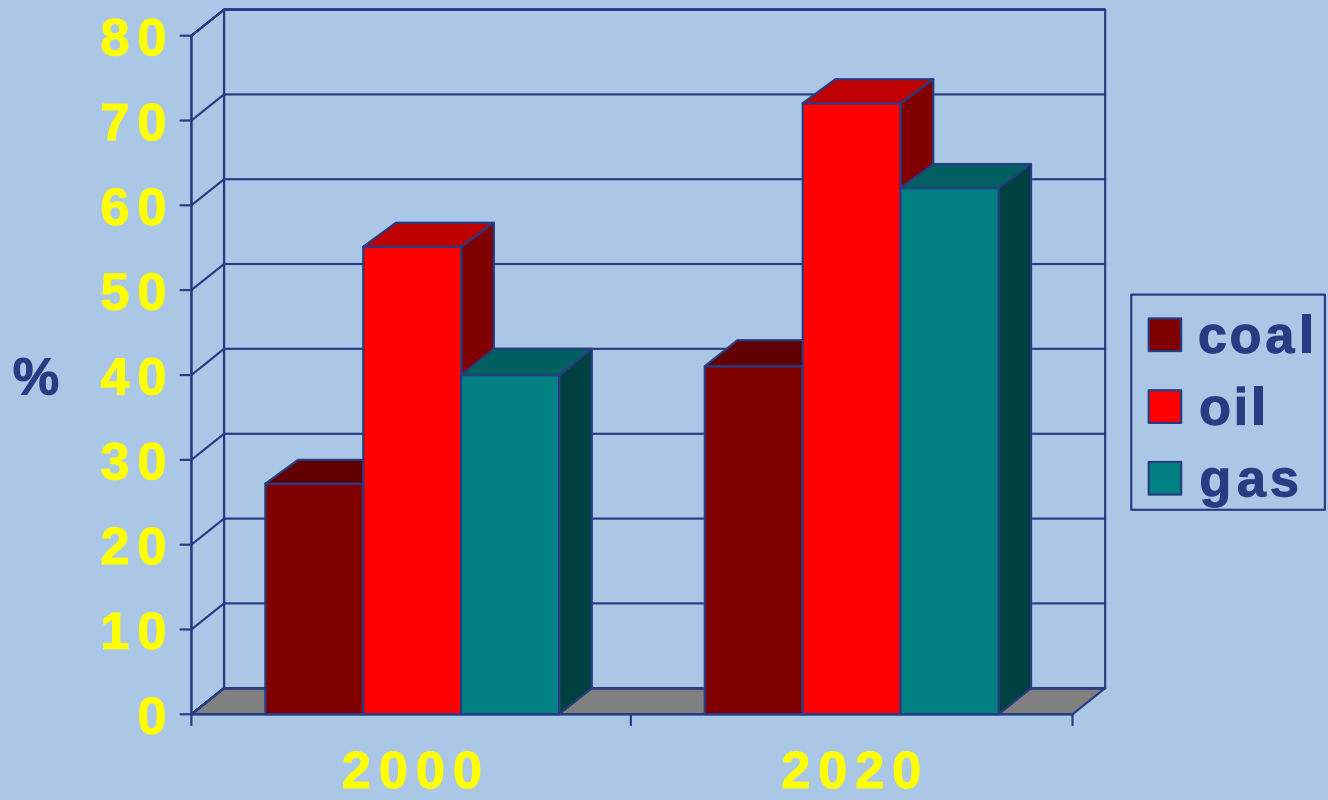
European Demand for Gas Imports Grows

Long Distance, High Transportation Costs



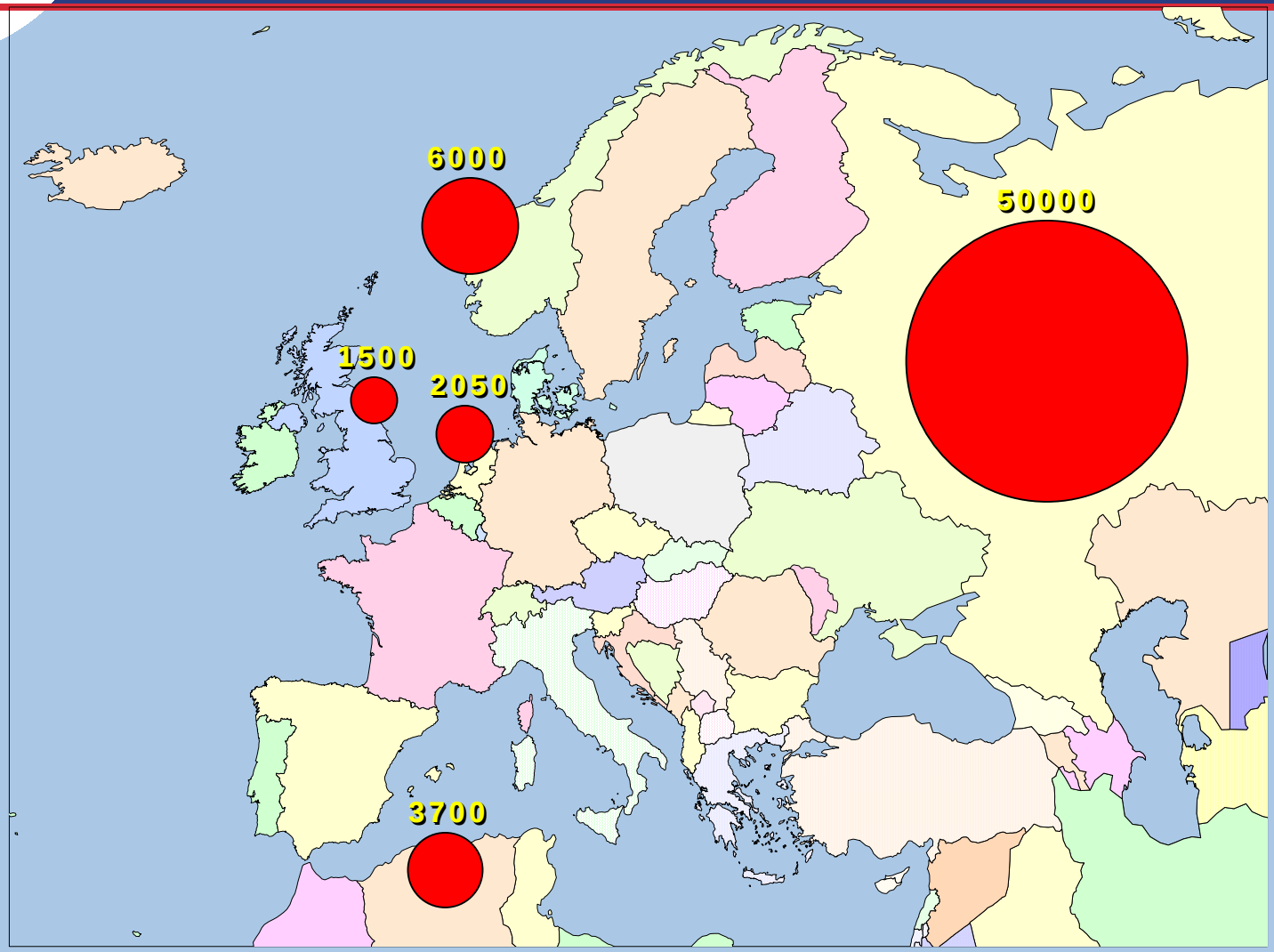
source: Gasunie, 2003

EU energy import dependency



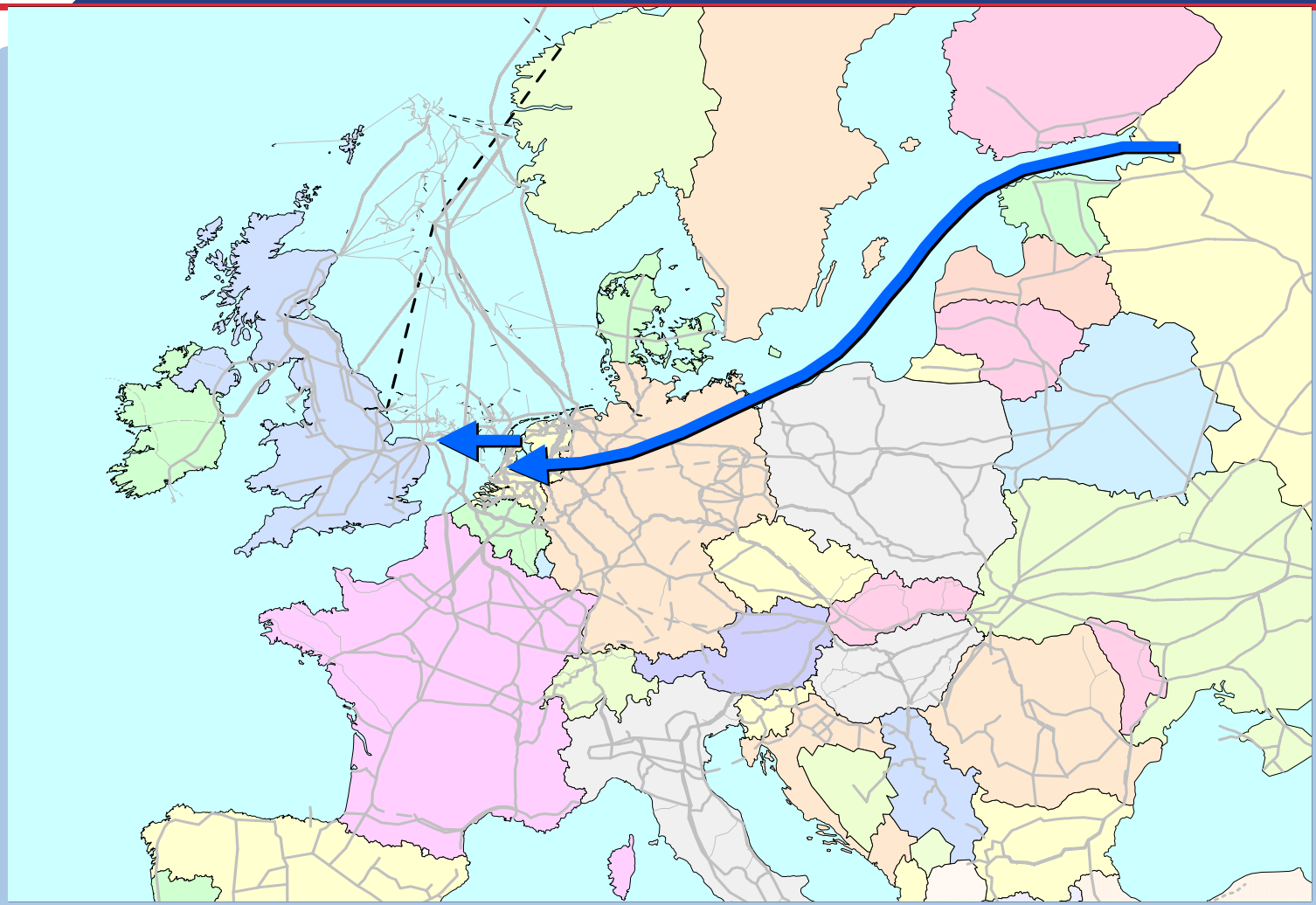
(EU green paper)

Reserves in and around Europe
(bcm)

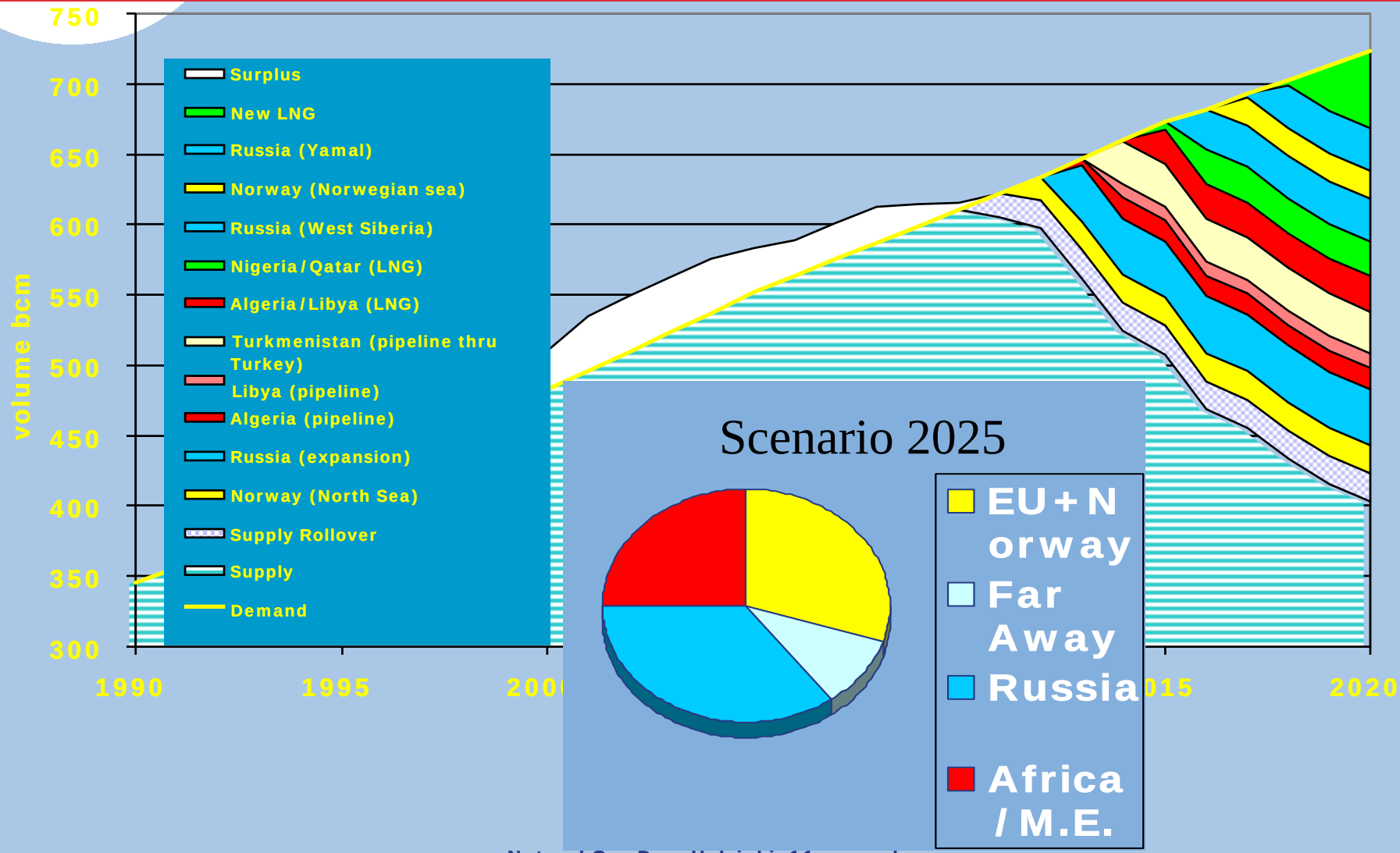


Also new pipelines: NTG to Germany

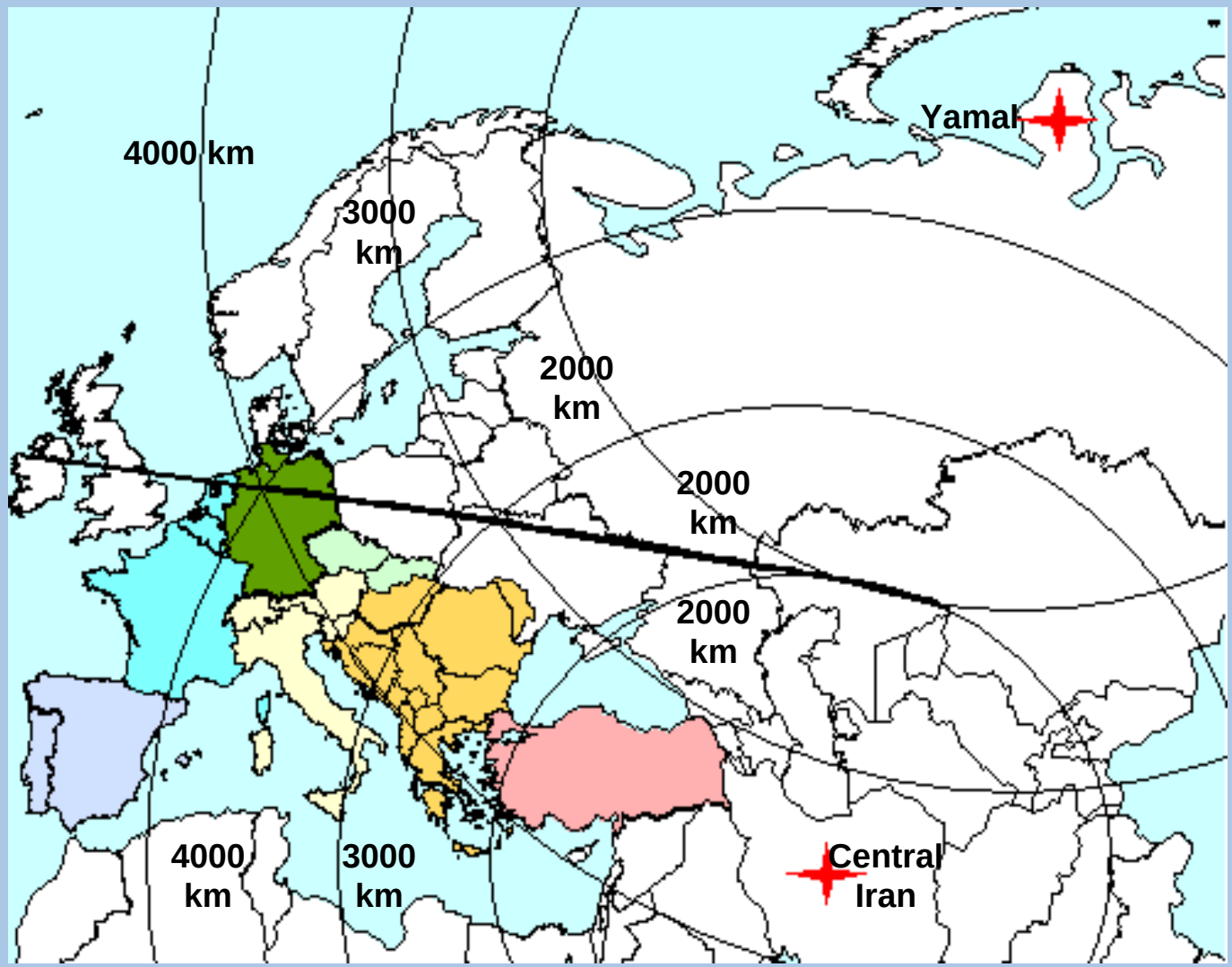
connection for Finland with W-EU?



Additional supply: from where?



How to diversify in Europe ?!



Europe's security of supply (1)

- Growing import dependency rate is of concern;
- Business world can take and will take care of the business issues, but
- Close cooperation with Europe's policymakers is required;
- Will the EU-RF energy dialogue succeed speedily??

Europe's security of supply (2)

- There is gas enough on the globe and with nowadays cost levels and price levels it can be brought to the market if:
- Europe can put in place a firm competitive position vis-à-vis the suppliers; suppliers must be convinced price-wise and policy-wise that Europe is a profitable and acceptable market
- A position which is based upon a good cooperation and understanding between the business world and Europe's policymakers

Europe's security of supply (3)

- Not only Europe likes to diversify its supplies; the only cost-effective way to cope with the security of supply issue,
- Also the suppliers like to diversify their sales portfolios;
- Long term contracts will remain Europe's backbone for pipeline gas and LNG;
- LNG will increasingly connect the present separated gas markets in the world;
- Some 9% of LNG sales are at present spot-sales, and it is expected to grow to some 20% in the coming years.

What about the climate..?

- The best supply is the saved m3,

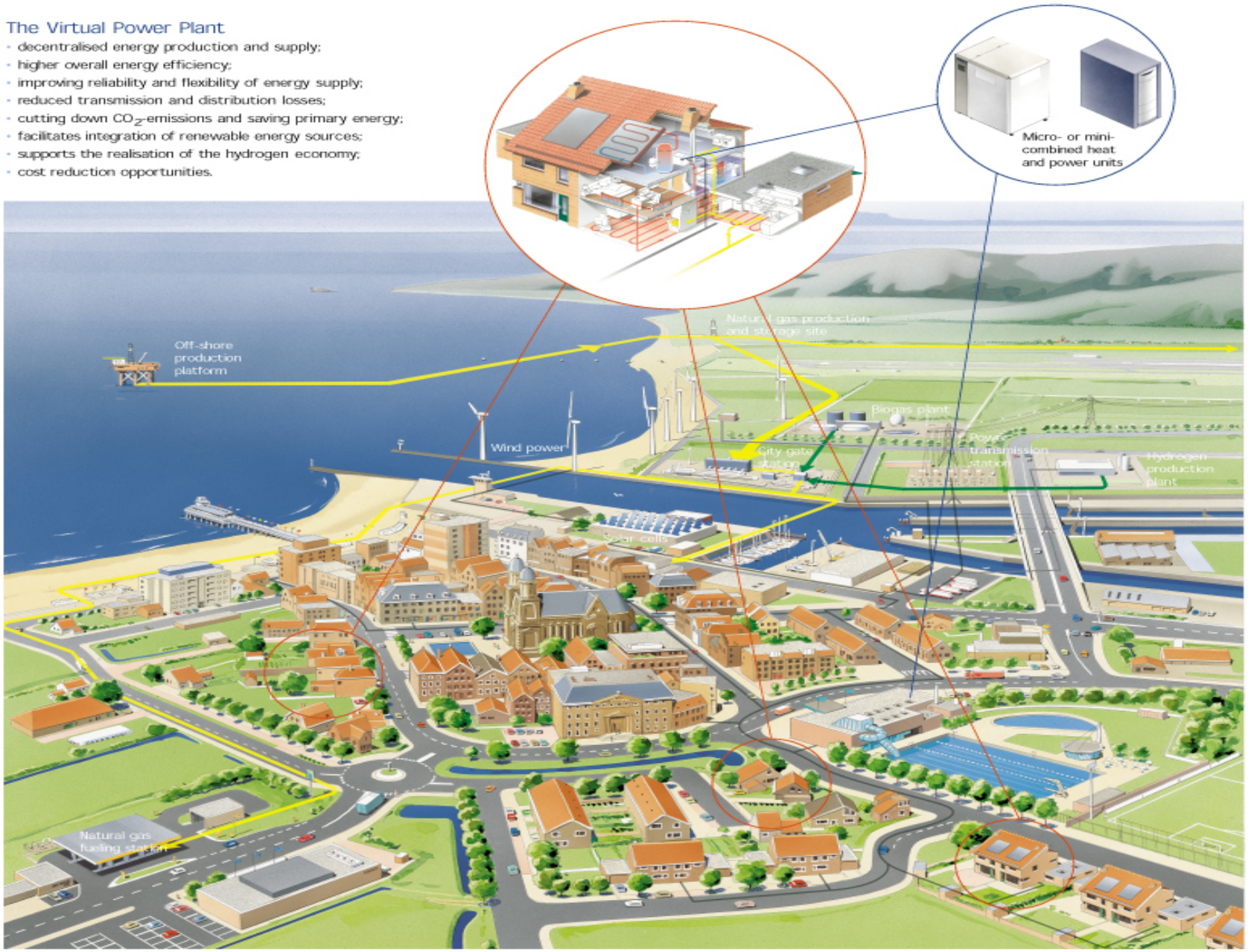
some suggestions.....

Some ideas on enhancing CO_2 reduction: Natural Gas, CO_2 Capture & Storage

- Decentralized gas combustion in high efficiency boilers and CHP's for domestic and small industrial users
  - Requires development of gas appliances like small CHP's; gas competes with electricity
- Centralized coal, oil or gas combustion in large boilers, i.e. power plants, in combination with CO_2 capture & storage
  - Coal, oil compete with gas
- Gas industry is in excellent position to develop CO_2 storage in empty gas and oil fields:
  - Storage technology is available
  - Fields and their characteristics are known
- Development together with electricity and/or coal producers?!

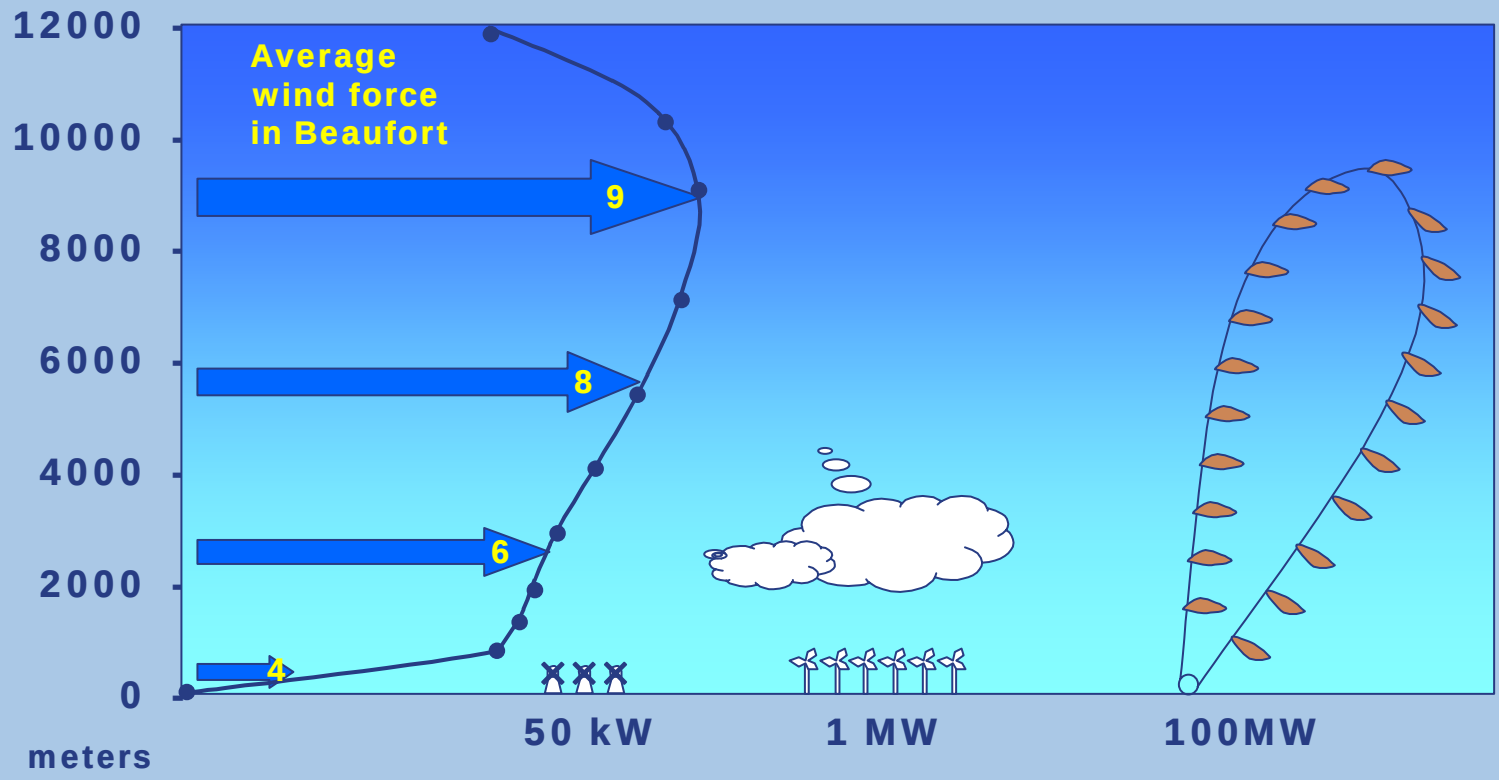
The Virtual Power Plant

- decentralised energy production and supply;
- higher overall energy efficiency;
- improving reliability and flexibility of energy supply;
- reduced transmission and distribution losses;
- cutting down CO_2-emissions and saving primary energy;
- facilitates integration of renewable energy sources;
- supports the realisation of the hydrogen economy;
- cost reduction opportunities.



Energy technologies of the 21st century

Ladder mill, the next generation of wind energy



Three generations of wind mills

IGU 2006

Congratulations with your 30’th anniversary !

See you in Amsterdam at the

World Gas Conference

June 5 – 9, 2006 !