

Competing for Energy sources-EU-BRIC

Colette Lewiner

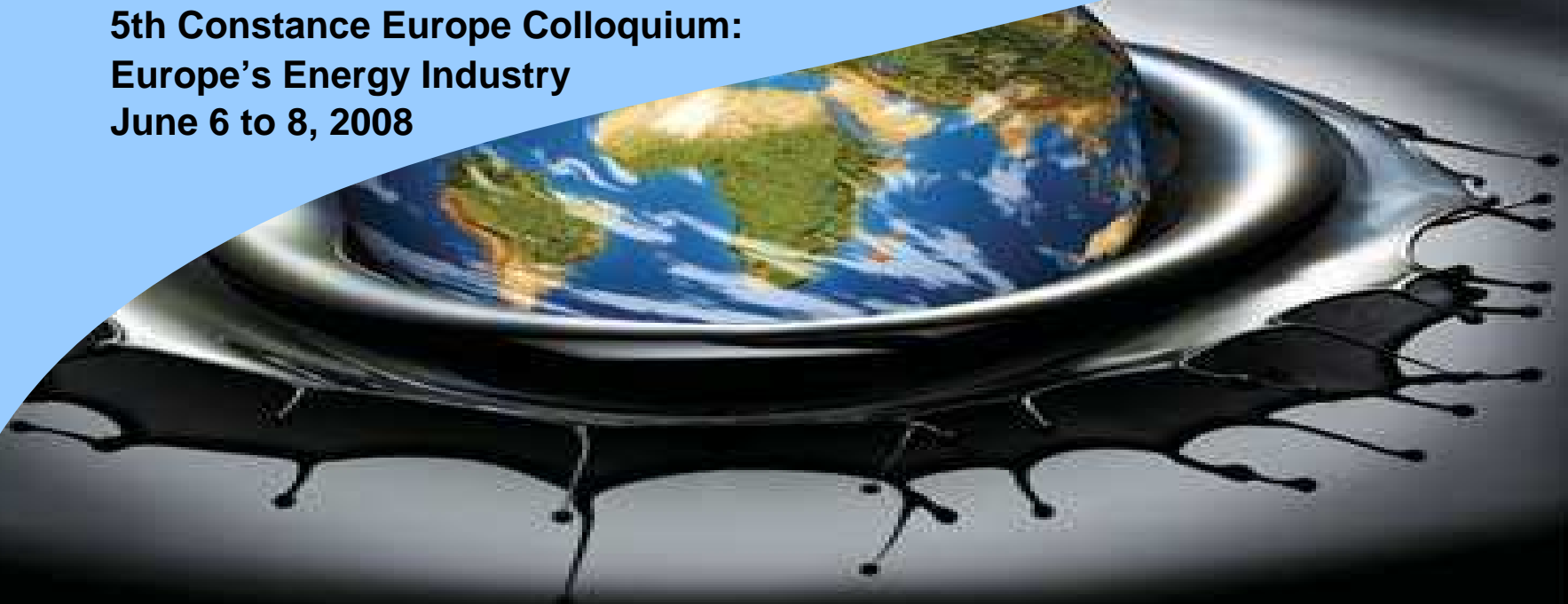
Global VP, Energy, Utilities and Chemicals

Capgemini

5th Constance Europe Colloquium:

Europe's Energy Industry

June 6 to 8, 2008



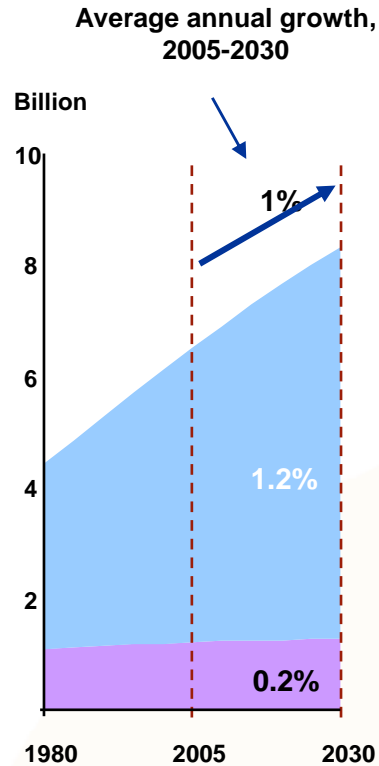
Agenda

- **Energy Global Outlook**
 - Oil
 - Coal
 - Gas
- **BRIC Countries supply/demand balance**
 - Common features but
 - Diverse energy supply/demand situations
- **Europe's challenges:**
 - Gas security of supply
- **A shift in power in Oil and Gas resources access**
 - Nationalistic attitudes:
 - The new Seven sisters
 - China oil and gas strategy: a case in point
- **Energy and climate change equations: how to solve both ?**
 - How to achieve significant energy savings?
 - How to optimize our energy mix ?

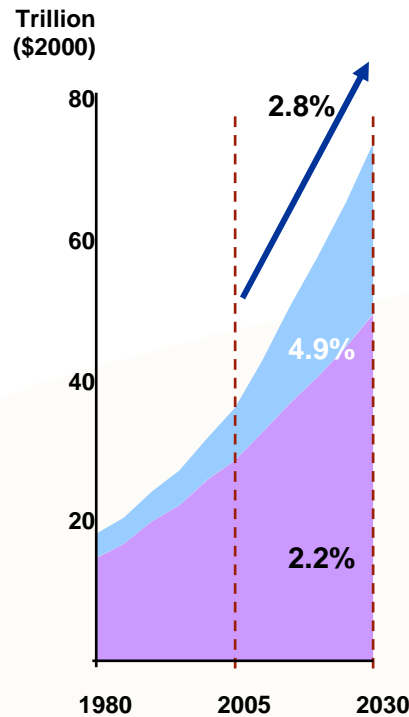
Strong growth will have big impact on global energy demand 2030

● OECD ● Non-OECD

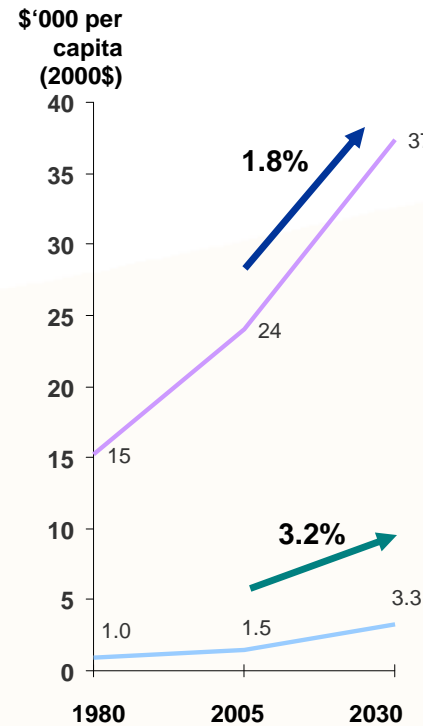
Population



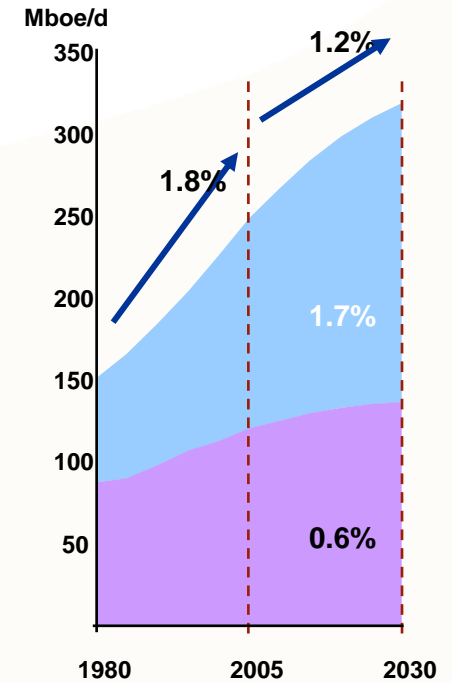
GDP (at constant exchange rates)



Per capita GDP



Energy demand



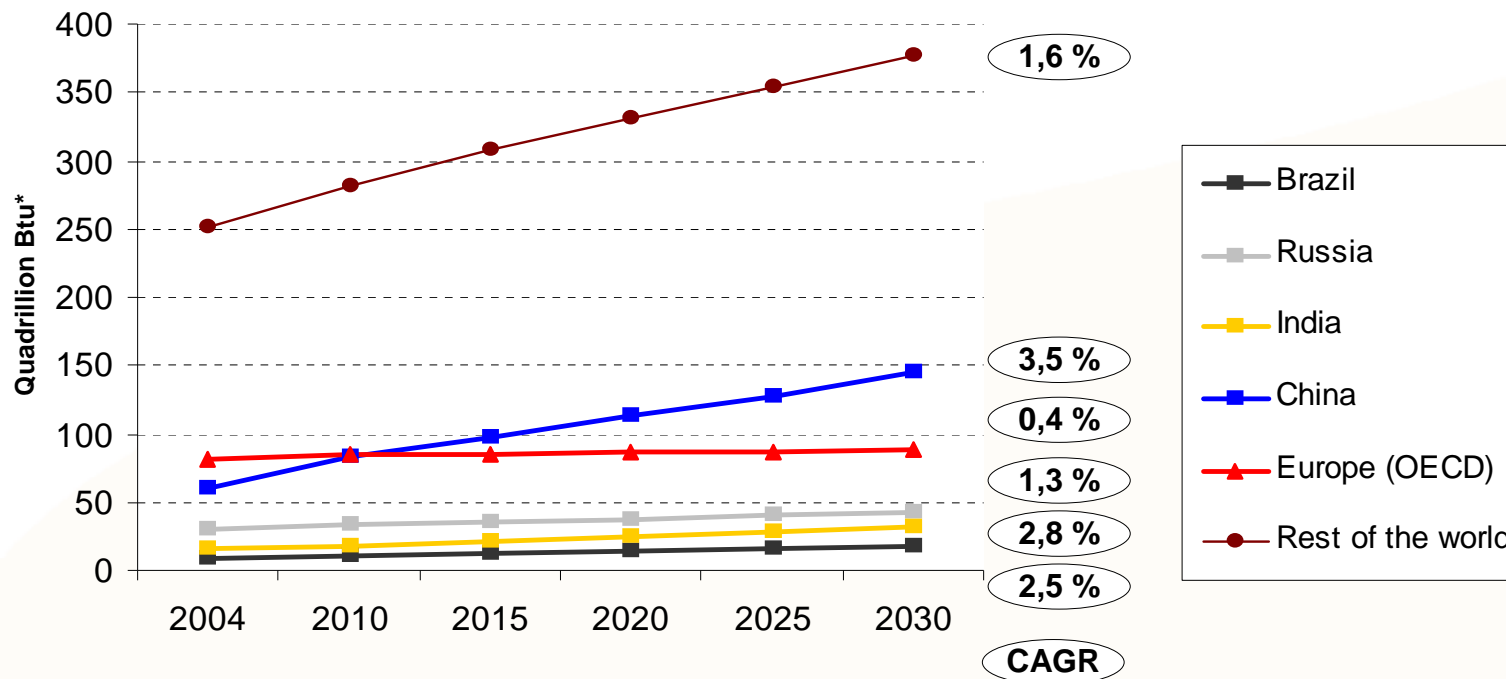
Despite high energy growth, Brasil, China and India have much lower energy per capita consumption than N.A

Source: United Nations, *World Population Prospects 2006*; IEA; Total.

By 2030, primary energy consumption will grow much faster in BRIC countries than in Europe, driven by China's growth at 3,5% CAGR

- Total primary energy CAGR is forecasted to be 1,8% in the world until 2030
 - Europe and North America (1,2%) is growing, but slow
- Primary energy consumption will increase strongly in all BRIC countries :
 - China will surpass Europe in 2010 and will go up to more than 140 quadrillion Btu in 2030

Primary energy consumption forecast in Europe and BRIC countries



China is the fastest growing and largest energy consumer of all countries/regions in the world

* British thermal unit

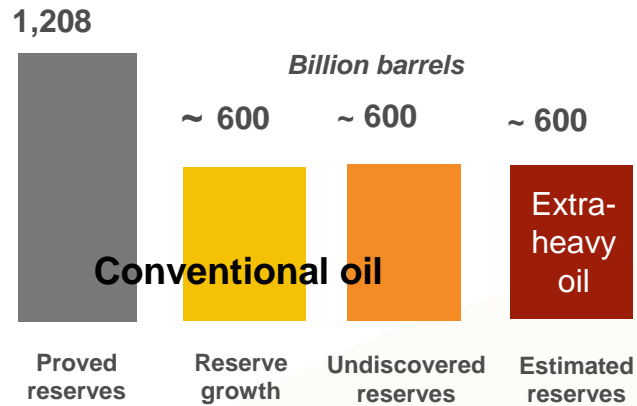
Source: EIA international energy outlook 2007

At current consumption, the proven oil reserves lasts for another 44 years (excluding heavy oil)



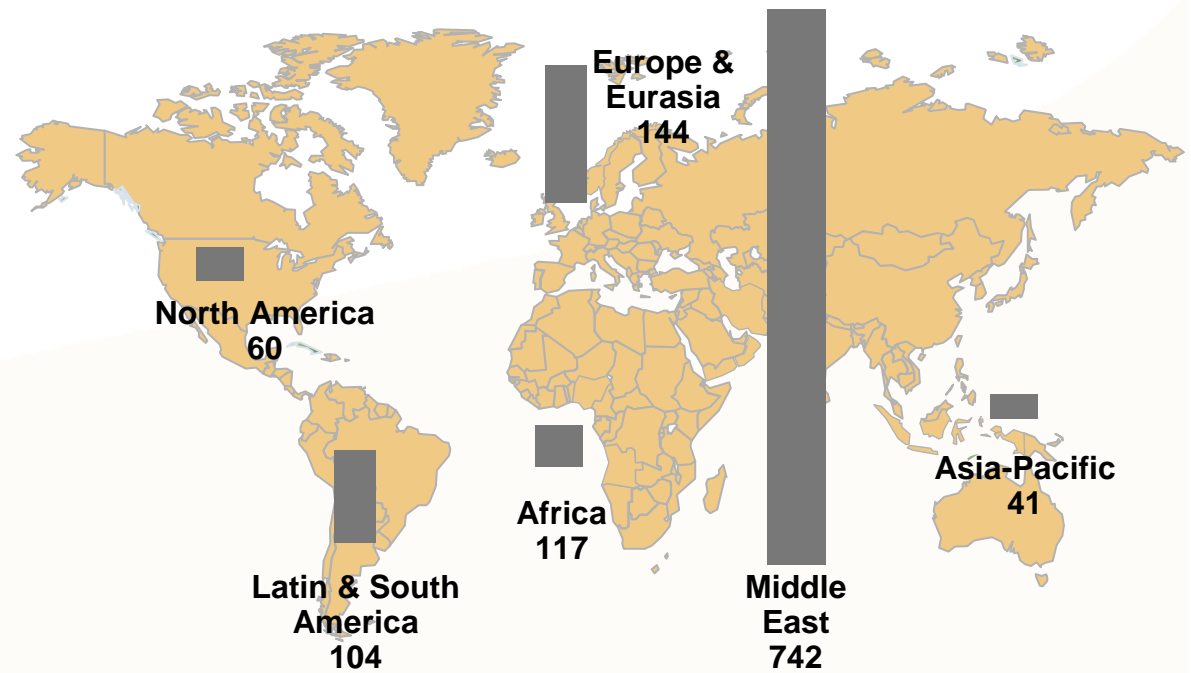
Oil resources

(Bn barrels, as of 31/12/2006)



Proved reserves

(Bn barrels, as of 31/12/2006)



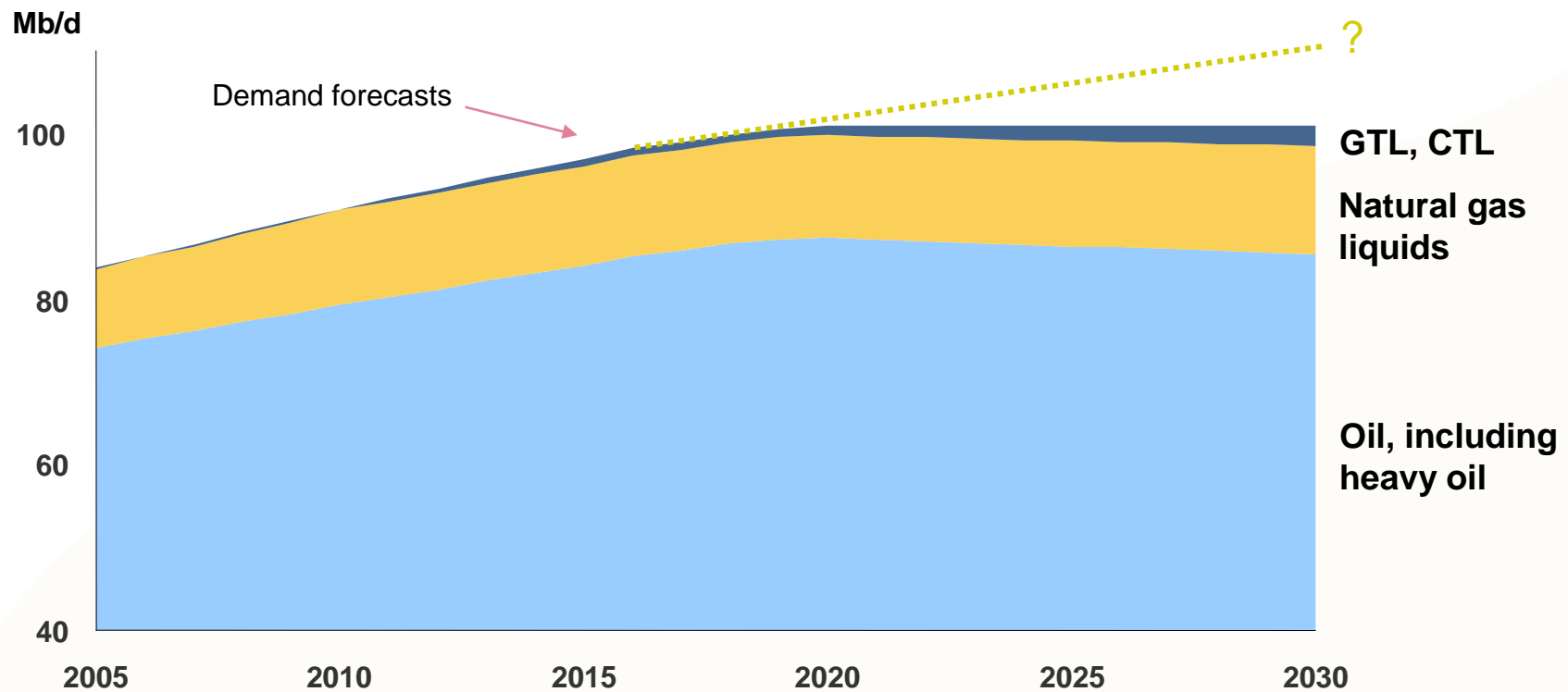
The oil reserves are mainly concentrated to the Middle East

Source: BP Statistical Review 2007, Total

Oil production should peak at 100 Mb/d: substitute products needs to be found



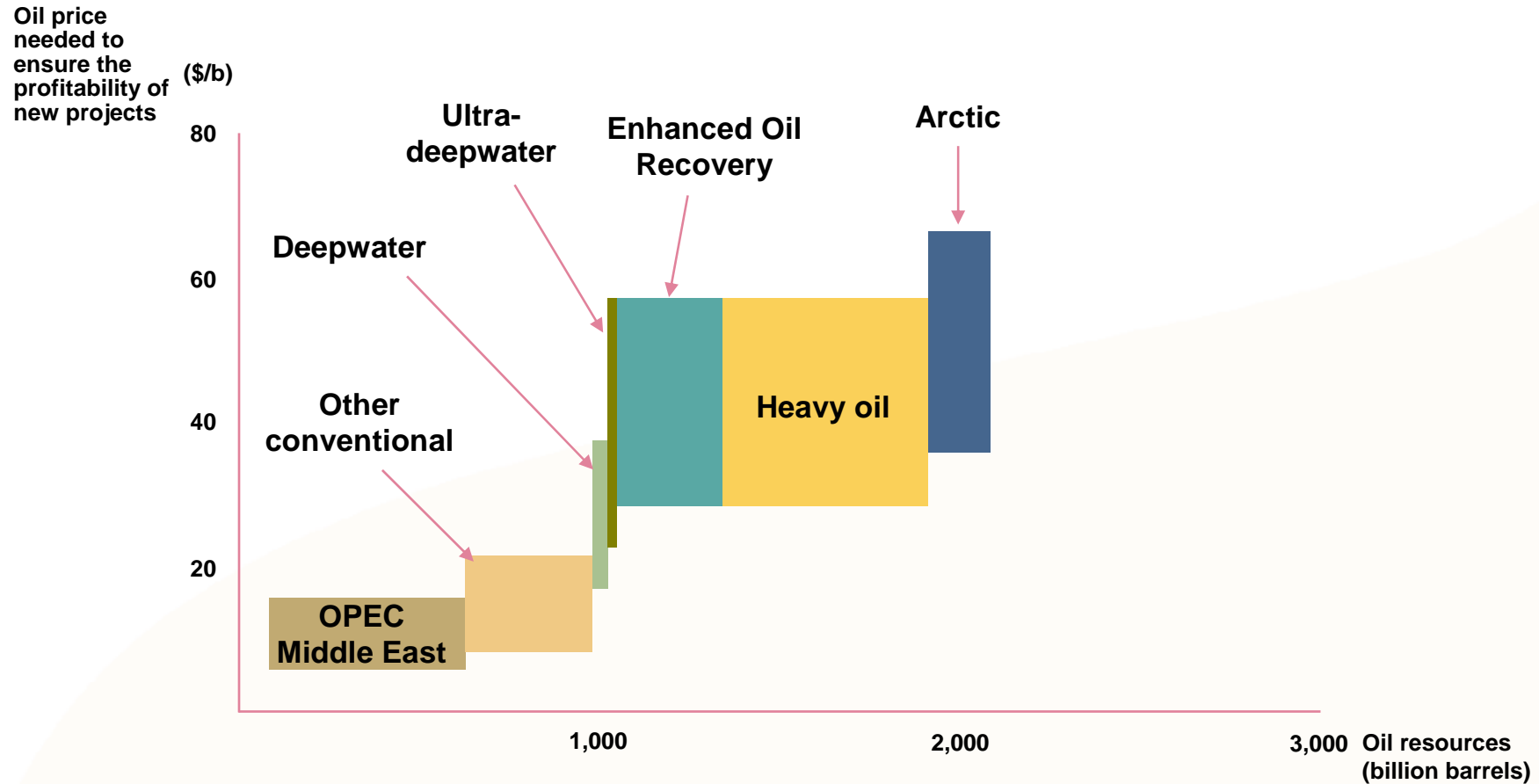
Forecast liquid hydrocarbon supply and demand*



*Excluding biofuel

Source: IEA, *World Energy Outlook 2006*; Total.

Tight supply pushing prices upward



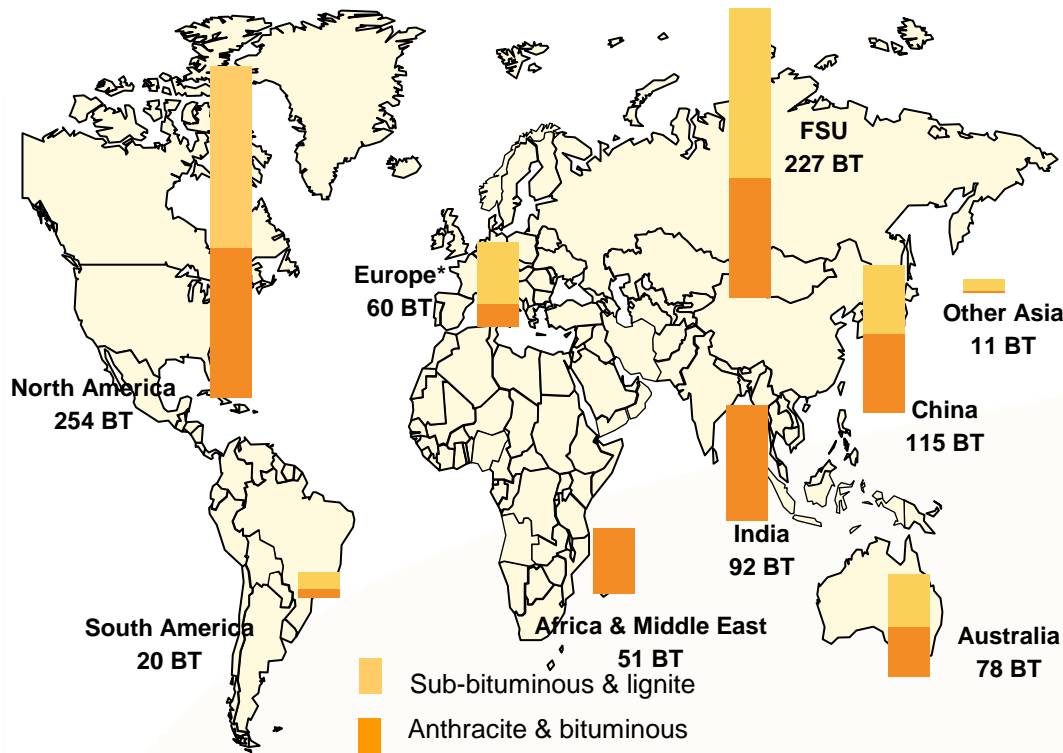
Source: IEA, Total.

Abundant coal reserves: some 146 years with current consumption



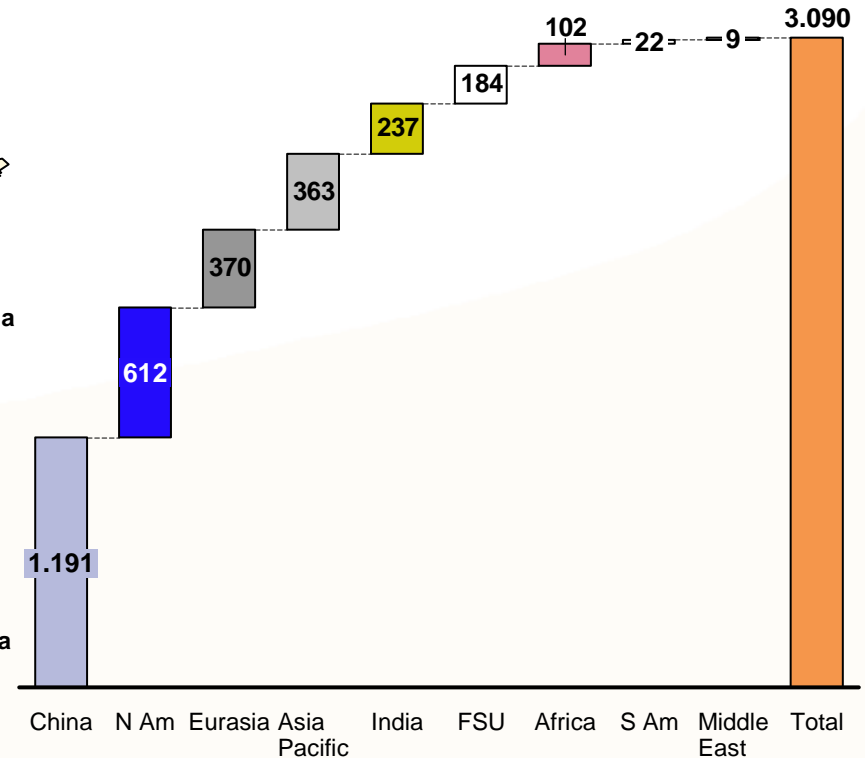
Reserves

(Bn ton, as of 31/12/2006)



Global Demand (2006)

(M toe*, as of 31/12/2006)



*1 toe = 1.6 ton of coal or 2.5 ton of lignite

Proved coal reserves at end 2006 ~ 909 bn ton coal
Estimated resources > 6 times proved reserves

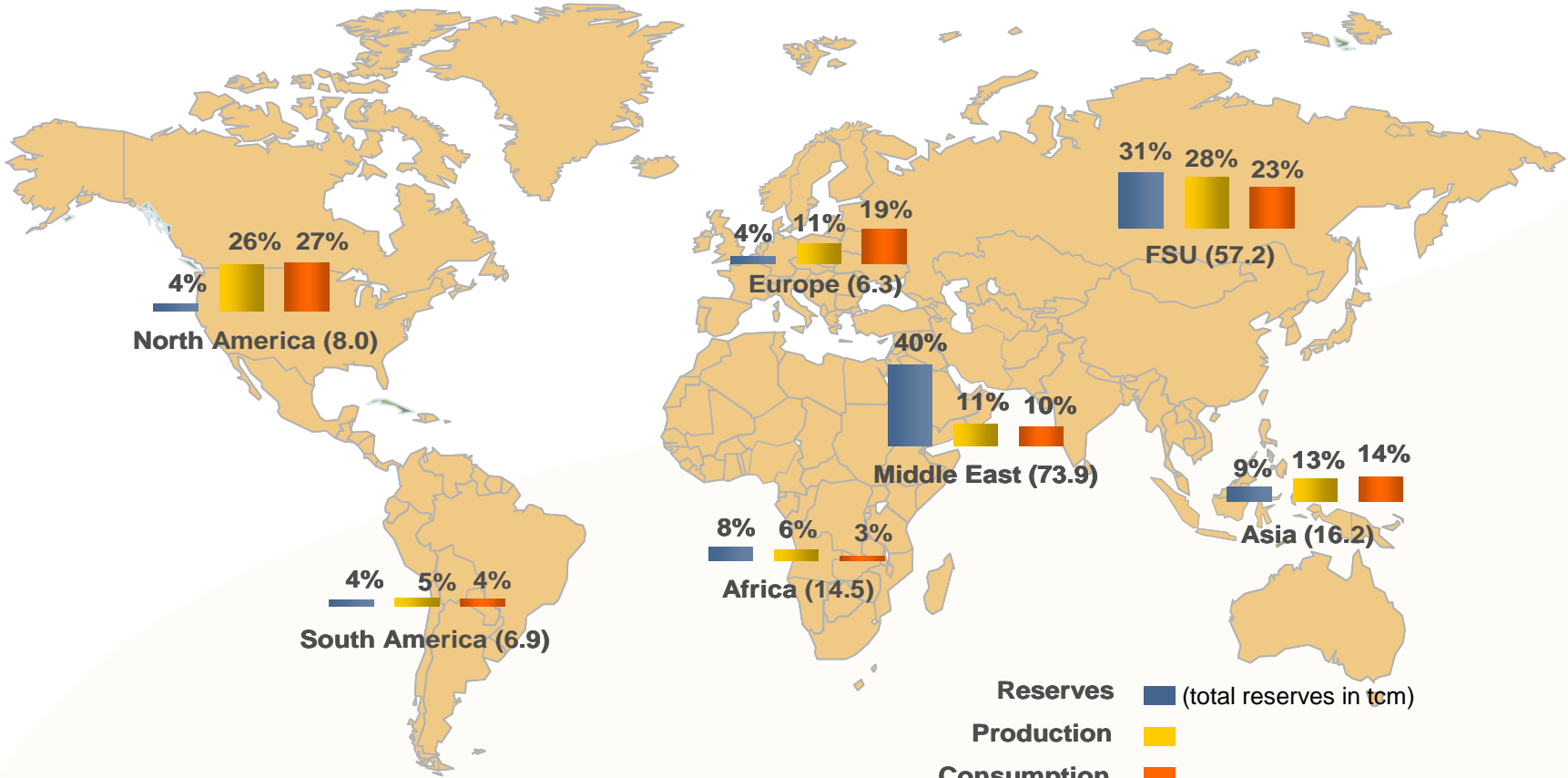
*EU-27

Source: BP Statistical Review of World Energy, 2007.

Gas: 63 years left of the global reserves

End-2006 Reserves = 183 tcm*

2006 Consumption = 2.9 tcm

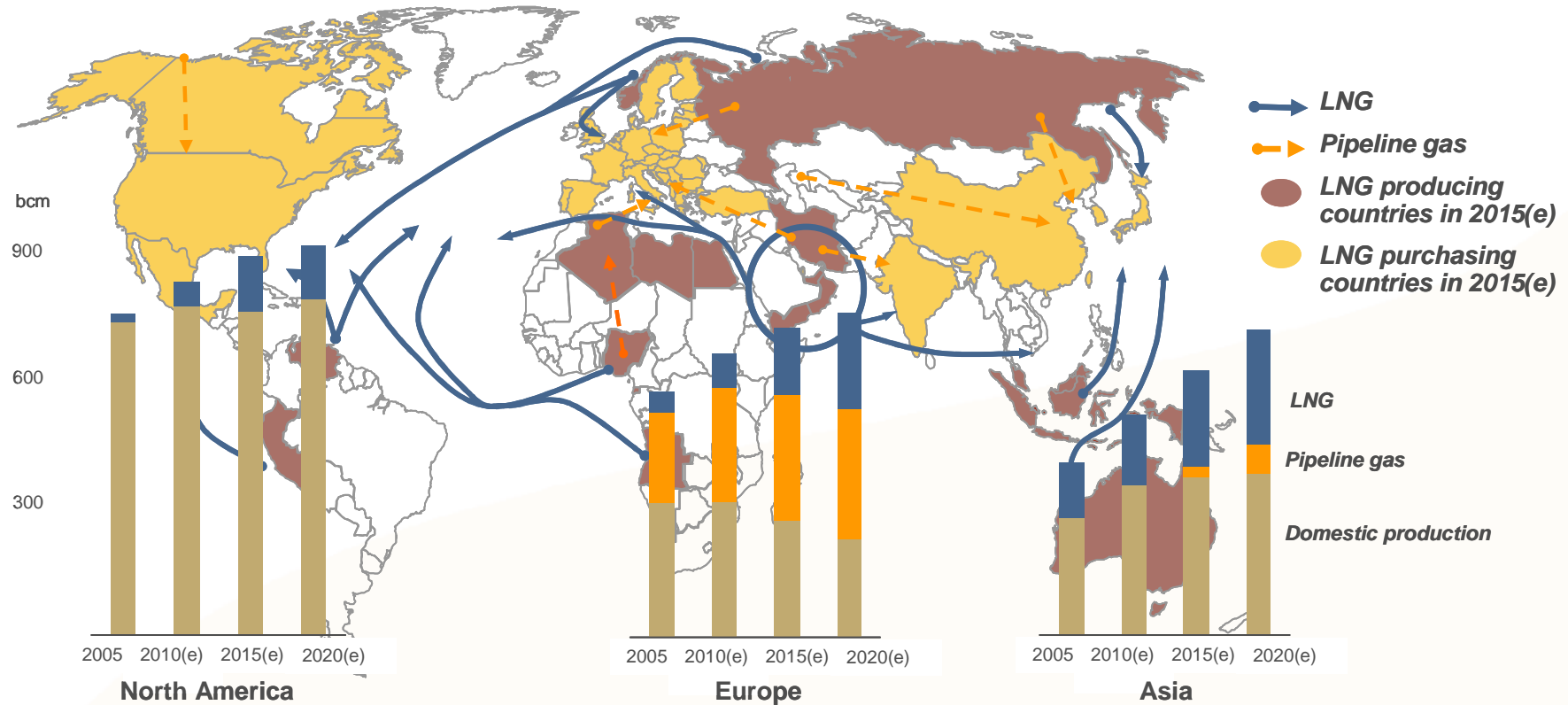


*tcm = trillion cubic meters

There has been an 25% increase of the proved reserves in the last 10 years

Source: BP Statistical Review of World Energy, 2007, Cedigaz

All the main market areas become shorter in gas: LNG will become the gas market maker, worldwide



LNG growth, 2005-2020: + 8% a year

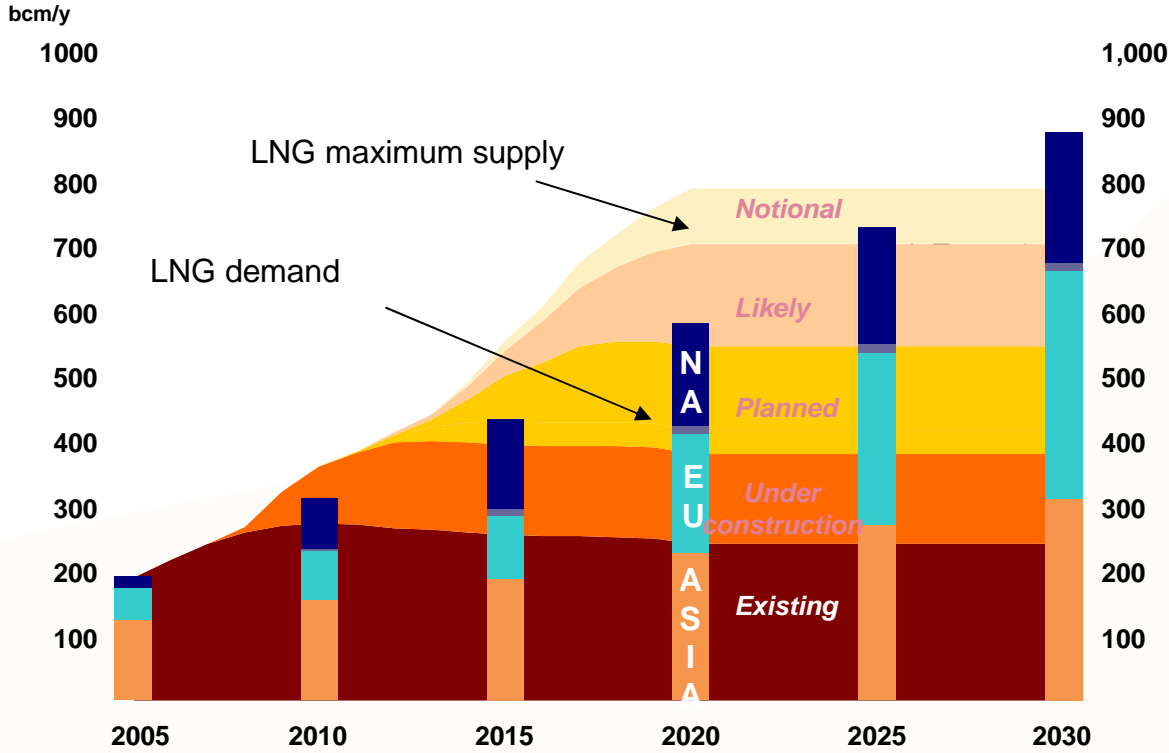
- Atlantic Basin: + 11% a year
- Pacific Basin: + 6% a year

Asia: surging demand in China and India

Source: Total

However, LNG will become a scarce resource

- Many projects will be commissioned around 2010
 - Limited growth beyond 2020:
 - Need to fill existing facilities
 - New plants need 25 to 30-year supply
 - Growth of local demand
- Higher costs and environmental or administrative constraints are delaying Final Investment Decision
- Delays result in a tighter situation in the medium run and will lower growth in the longer run



LNG is a global market favored by overcapacity in re-gasification infrastructure and shipping overcapacity

Source for supply: Total.
Source for demand: IEA, Total.

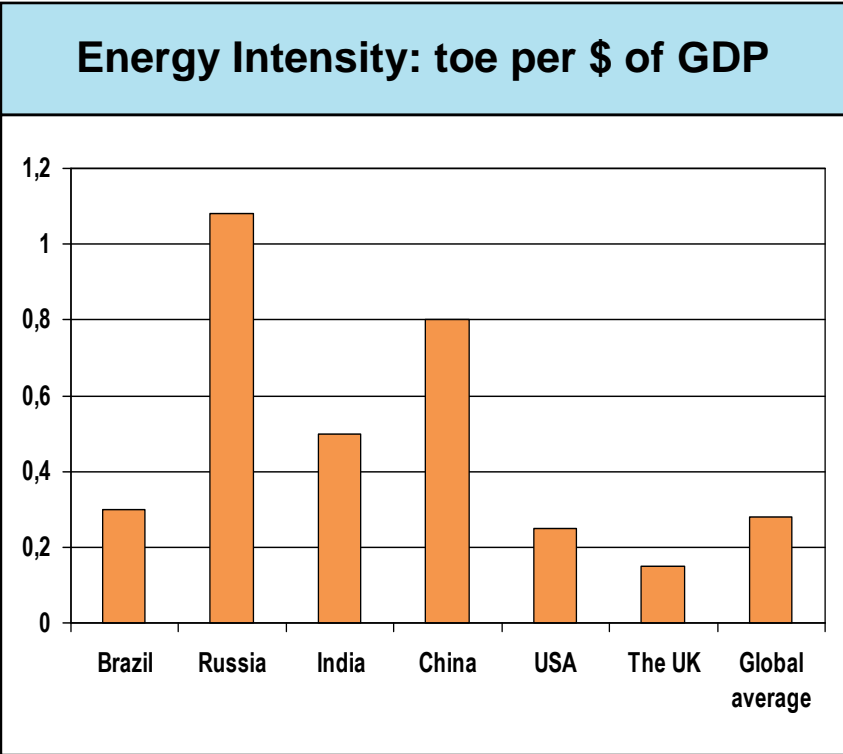
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BRIC countries have a lot in common

Features of the BRICs

- High economic growth
- High energy demand growth
- Amount for 42% of global population but only 9% of global GDP
- Except Russia, have low primary energy consumption per capita
- All have above average energy intensity indicating inefficient energy utilisation



National O&G Companies in BRIC have made significant efforts to boost their upstream sectors and increase their domestic Oil and Gas production level

Source: Datamonitor

The ability to meet domestic energy demand growth through indigenous resources vary widely between BRIC's

Oil

- In India and China, growth in **Oil** supply has been outweighed by demand growth thus increasing their status as net oil importer

Gas

- Ongoing upstream expansion in China has allowed it to become in the late 90's and early 2000's a **Gas** exporter.
- However these efforts have been outpaced by the demand growth and China has become a net importer of **Gas**.
- India's **Gas** importations should increase

Coal

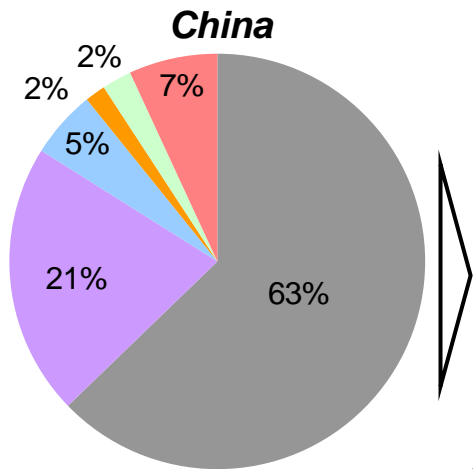
- China was a **Coal** exporter, it is now stopping its exportations and could become a marginal coal importer
- India is a **Coal** marginal importer however its imports level should increase

| | Oil | Gas | Coal |
|---------------|-----------------------|----------------------|----------------------|
| | Self sufficiency (%) | Self sufficiency (%) | Self sufficiency (%) |
| Brazil | 100%- Self Sufficient | 50%- Importer | Self Sufficient |
| Russia | 350% - Exporter | 140%- Exporter | Exporter |
| India | 30%- Importer | 80%- Importer | Importer |
| China | 50% - Importer | 105%-Self Sufficient | Exporter |

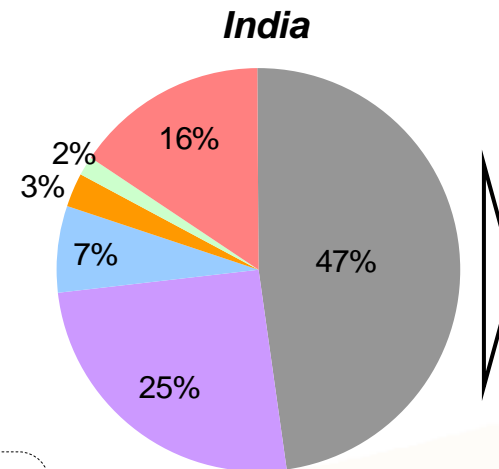
2005 situation

Source: Datamonitor

BRIC's energy mix varies from one country to the other

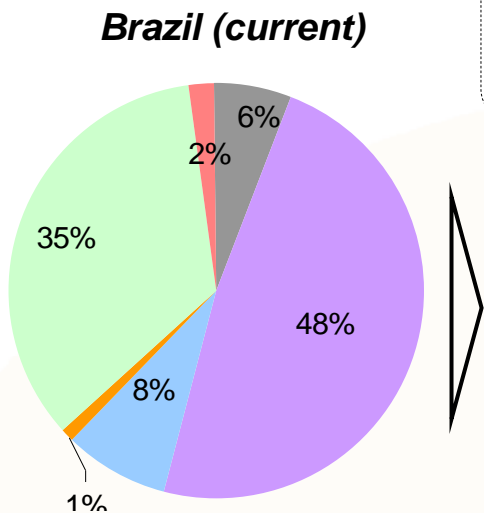


Coal (dominant), and **oil** are the main energy sources

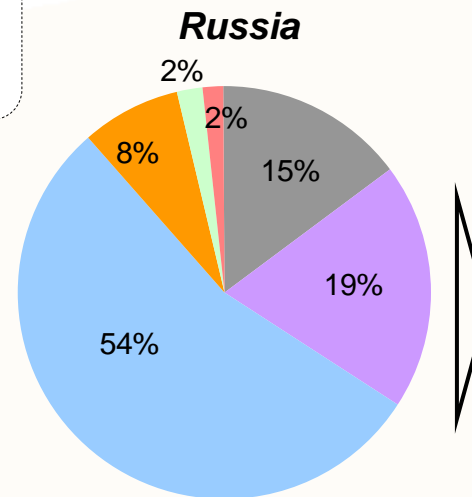


Coal (dominant) and **oil** are the main energy sources

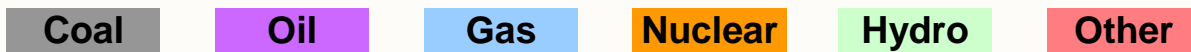
BRIC countries primary energy demand mix in 2030 (current for Brazil)



Oil and hydro are the main energy sources



Gas is the dominant energy source



Source: IEA world energy outlook 2007, EIA Energy Analysis

Brazil's efforts in upstream are paying dividends



Actors

- Petrobras, the state controller player dominates the upstream (95% of crude production) midstream and downstream.
- Thanks to its technical performances (deep water exploration and production) and investments, Petrobras has transformed Brazil's situation as a oil poor country to, by a narrow margin, a net exporter (in 2005)

Oil

- Very large recent offshore discoveries (Tupi -5bn and 8bn b /d- and Carioca-up to 33bn b/d-) could transform Brazil in an oil exporting country
- However these new discoveries are difficult to exploit (Tupi: 300km offshore, 7000m below the surface and a 2km salt barrier)

Gas

- Despite rapid expansion of its upstream sector and an annual gas production growth of nearly 10% over the past 5 years, Brazil remains a net gas importer.
- Imports comes mainly from neighboring Bolivia

While mainly focused on the domestic market, national companies are becoming more influential: Petrobras deployment in the US, Gazprom network agreements in Europe and ambitions in Asia

Russia is a large Gas and significant Oil exporter with a nationalistic behaviour



Actors

- Private companies (Yukos, Russneft) under threat had to sell their assets to government controlled companies (Gazprom & Rosneft). Since then Yukos and Russneft's oil fields have decreased.
- Gazprom is now the leading company, strongly backed by Russian government.

Gas

- Second largest worldwide gas reserves (27% of proven reserves), and is the primary gas exporter to the EU
- Gazprom is diversifying its portfolio by building pipelines towards Asia (€12 bn investment for China pipeline)
- Difficulties to increase gas output quickly enough to maintain exports while satisfying an increasing domestic demand
- International expertise still needed (Total and Statoil participation in Shtokman field)

Oil

- Russia has developed a strong nationalistic attitude: Shell forced to sell control of Sakhaline field and TNK-BP forced to do the same for Kovytko.
- Heavy taxes and lack of investments are leading to oil output decrease: (1% decrease in Q1 2008)

Russia starts to pay the price for its nationalistic energy strategy

China and India have somewhat similar situations: - depending heavily on domestic Coal and Oil and Gas imports



Actors

- China has large and powerful NOCs, the largest CNPC (Petrochina's mother Company) having 1.6 employees and being present in 26 countries
- Indian Companies (ONGC, Petronet and Reliance) play a key role in Upstream, however the Indian upstream fiscal regime and policy has been successful in attracting foreign investment (from U.K, Russia, Italy..)

Coal

- India and China rely heavily on coal (75% of electricity generation in China and 64% in India) They account for 45% of global coal use and that proportion is set to grow

Oil

- China's demand is 7.5 m b/d and rose about 5% last year (NA demand 23.6 m b/d rose only 1%)

Gas

- China's consumption should grow by more than 9 % from 2005 to 2015

China and Indian Oil companies are expanding worldwide (and competing) to access enough Oil & Gas reserves to fill their countries' needs.

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European gas increasing dependency on Russia is a threat

Transit gas pipelines countries between Russia & former CIS countries and EU are the new battle ground:

- To decrease its dependency on Gazprom the EU is promoting Nabucco pipeline linking Europe to Azeri gas fields via Turkey. It could also allow in the future importations from Iran and Iraq. This project (3 300 km, 30bcm/y) is threatened by the lack of gas supply and undermined by Russia's south Stream sponsored pipeline.
- In June 07, ENI and Gazprom agreed to develop the "Southstream" gas pipeline linking Russia to Bulgaria through the Black Sea and avoiding Russian gas transit through Ukraine.
- This project (900 km, 30 bcm/y, 10 bn Euros investment) has the big advantage of linking a gas supplier (Gazprom) to consumers (Italy, Greece and other European transit Countries).
- The Nordstream project built to avoid Russian gas transit through Poland, is encountering opposition from neighbouring countries

EU imports 25% of its gas from Russia. This percentage should reach 50% in 2030

Pipelines of the Black Sea and current projects*

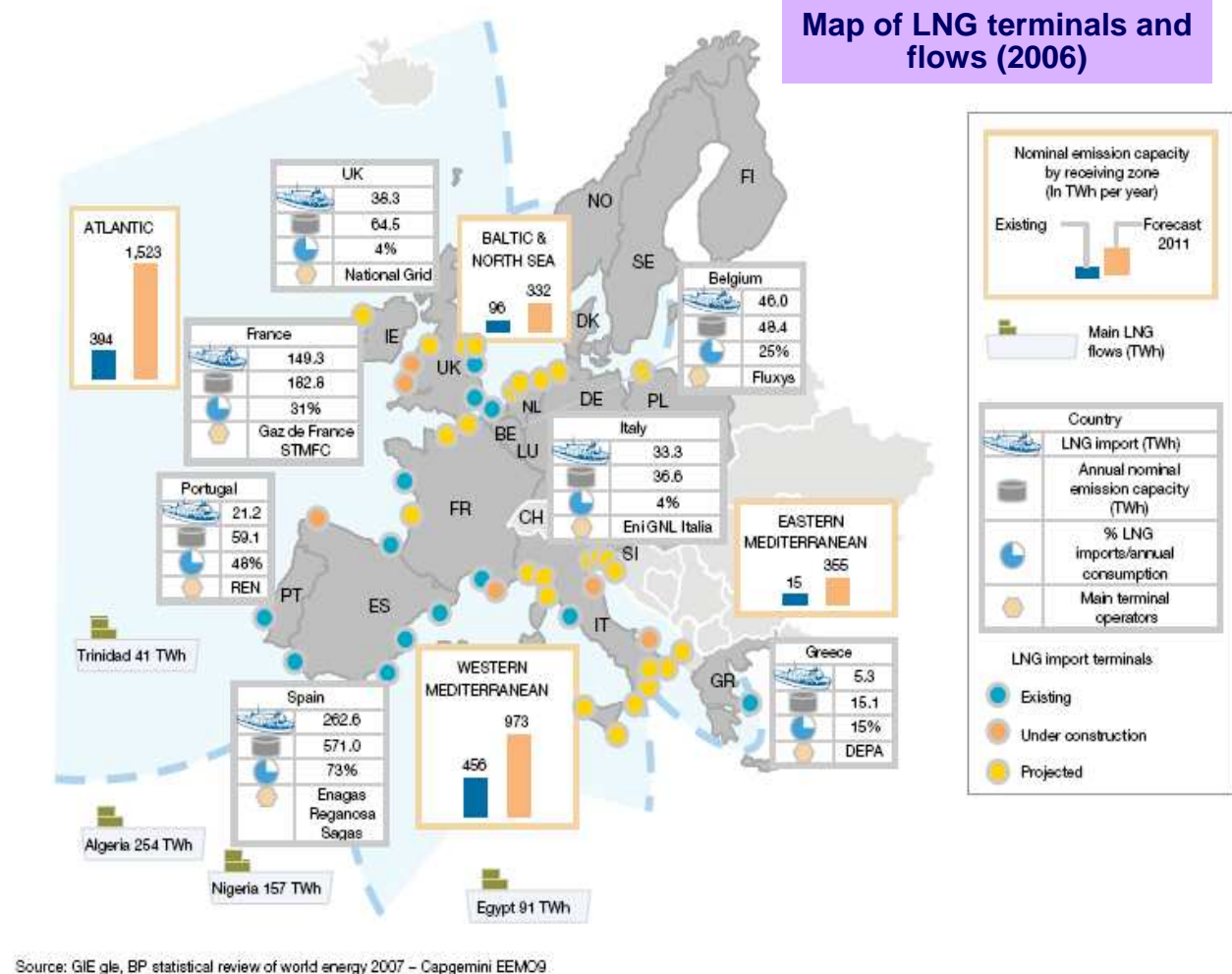


Nabucco and Southstream*



To increase its gas security of supply, Europe has to develop LNG imports, Gas storages, interior gas market fluidity and exchanges

- LNG allows access to 60% of Worldwide gas reserves
- 7% share of LNG in EU Gas supply in 2007
- LNG imports to Europe increased by 17%
 - #1 importer: Spain (37.2%)
 - #2 importer: France (26.8%)
- Main Sources of LNG in Europe:
 - Algeria: 37%
 - Nigeria: 26%
- To diversify their gas sources, many EU States are planning important increases of their LNG (re-Gas) capacities



LNG is an international market , the question is how to attract LNG ships to Europe versus Asia and America?

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While short-sighted, nationalistic attitudes are spreading

- **High oil prices are triggering nationalist attitudes characterized by :**
 - Increasing the share of the oil output benefits for oil producing countries
 - Increasing taxes
 - Limiting the Major's share in fields or pushing them out of the country.
- **Recent cases:** (for Russia see above)
 - **Venezuela:** the oil field liberalized development approach, started in 1990, ended with Hugo Chavez election in 1998. In May 2007 the Venezuelan government took control of the Orinoco oil installations completing this "re-nationalisation" process.
 - PDVSA controls now at least 60% of the shares in all Orinoco basin. Many foreign Companies having stakes in this field have accepted to sign new agreements with PDVSA However Exxon-Mobil is suing the Venezuelan government seeking billions \$ in compensation.
 - Venezuela is the fifth worldwide oil exporter.
 - **Bolivia** has followed Venezuela policy: on May 1 2006 President Evo Morales ordered the military to occupy Bolivia's natural gas fields and YPFB the national Company took control. Since, all foreign Companies present (Petrobras, Total, Repsol and BG Group)) have entered into new agreements.
 - Bolivia is the second largest gas reserves in South America .
- **History** has demonstrated that the resulting extra profits are used- at the best- to finance other sectors and are rarely returning to the oil and gas industry.
 - As examples: President Hugo Chávez, of **Venezuela**, spends two-thirds of PDVSA's budget on his populist social programmes, with almost \$7bn being funnelled in that direction by 2005, compared with the \$77m spent in 1997 by the previous government,
 - In **Russia** too little of Gazprom's earnings goes towards upgrading Russia's antiquated, leaking pipeline system, 30 per cent of which needs replacing.
- **Oil and Gas Major Companies, tend to leave** these countries, thus depriving them from badly needed technical and financial resources.

Nationalistic policies end result is a decrease of the oil and gas output worsening the already tense global supply and demand situation

Despite record results Oil and Gas majors model is threatened

Major's are facing many issues

- Threatened by Nationalistic attitudes
- More risky and difficult to find and extract oil and gas
- Restricted access to reserves, many of them don't reach their reserve replacement goal
- Cut of exploration spending between (1998 and 2000)in real terms
- Their production is declining
- Their shareholders push for short term views
- More regulations to comply to: Health, Safety, Environment, CO2...
- Aging workforce and scarcity of resources

Majors have to change their business model

- Better optimization of existing assets, specially in upstream
- Better optimization of their value chain
- Earning better access to National Oil Company rights
- Boost their gas activities
- Develop their "new oils", "green hydrocarbons" and even enter into nuclear

56% of the Majors' increased operating cash flow was spent in share buy back programs demonstrating the lack of acceptable investment projects

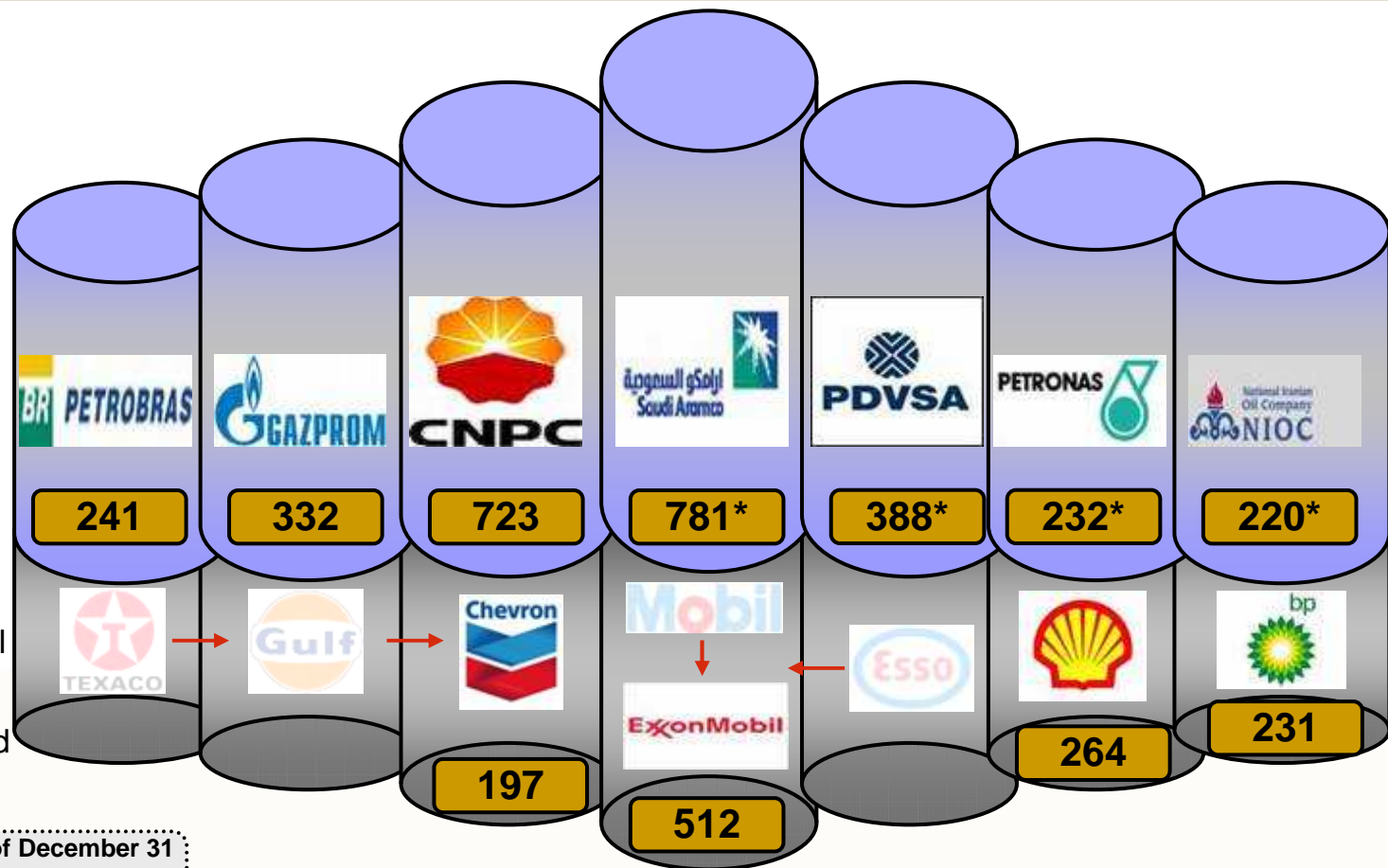
The global oil and gas market is changing and there are new seven sisters dominating it

The new seven sisters

- As defined by the FT in 2007
- These are the most influential – not biggest oil & gas players

The old seven sisters

- As defined by Enrico Mattei in 1940s - after break up of Standard Oil
- Shrank to four in the 1990s
- Produce ~ 10% and hold just 3% of reserves.



241 Market cap as of December 31 2007, bn \$
*December 2006

The new Seven sisters are state-owned and control 1/3 of global oil and gas production, and more than 1/3 of the total oil and gas reserves.

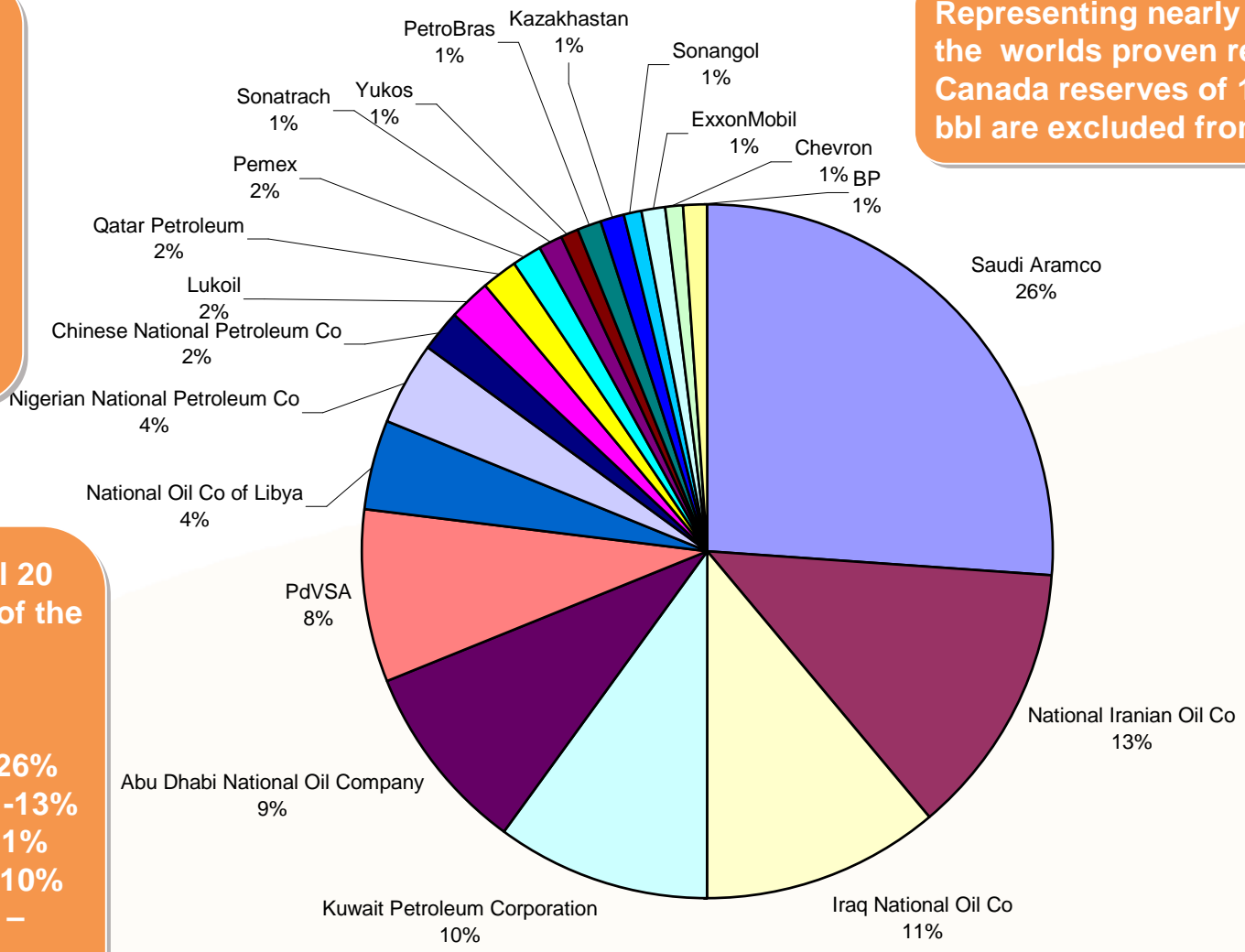
Source: FT's Non-Public 150, 2006,

National Oil companies control around 95% of the worldwide oil reserves

***Only 3 private companies in top 20 -account for only about 4% of the worldwide Oil & Gas reserves**

ExxonMobil, Lukoil & BP

Representing nearly 80% of the worlds proven reserves. Canada reserves of 179 billion bbl are excluded from chart

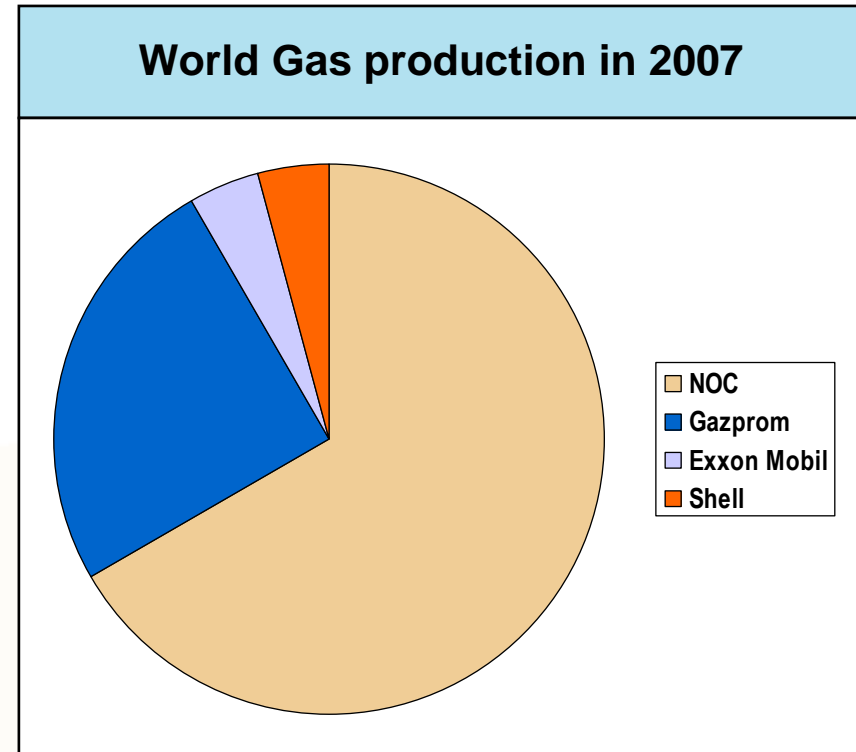


30% of the Global 20 account for 65% of the Worldwide oil reserves

- Saudi Aramco- 26%
- Nat'l Iranian Oil -13%
- Iraq Nat'l Oil – 11%
- Kuwait Petrol – 10%
- Abu Dhabi Nat'l – 9%
- PdVSA- 8%

NOCs dominate also the Gas market

- Gas remains high on the political agenda in producing and consuming countries – due to the recent resource nationalism and skyrocketing commodity prices.
- Nearly **80%** of world gas is produced by 100% state owned companies
- Gazprom is far in front of everybody and should stay ahead in the years to come
- In 2007 gas production levels for major listed companies decreased while independent North American pure players have increased by 5% their output



Gas producing companies will have either to invest heavily or undertake further mergers and acquisitions.

China National Oil & Gas Companies have a multifaceted strategy

- Big national companies (CNPC, Sinopec and CNOOC) backed by their government
- Large E&P efforts and dynamic deployment of new technologies in mainland China are producing good results
 - Contrary to other regions oil output climbed to 3.8 m b/d in 2007
 - China is now the 5th oil producing country near to Iran (4 mb/d)
- Bullish in signing agreements with oil producing countries:
 - Saudi (for 400 000 b/d),
 - Qatar & Australia for LNG
 - But also “bad guys” as Iran (2 bn Oil deal) and Sudan
- A focused investment in Africa (ex Angola, Sudan, Congo and now Nigeria) where Chinese investment fund is pouring billions of Euros in exchange for access to Oil and Gas fields
- A competing strategy with oil majors (ex Unocal) but at the same time cooperation (30 years agreement signed with Chevron)
- Chinese funds entered TOTAL and BP capital for around 1%. A welcomed move.

While questionable on the Human Rights perspective, China strategy is probably not bad for overall Oil & gas supply by exploiting new resources

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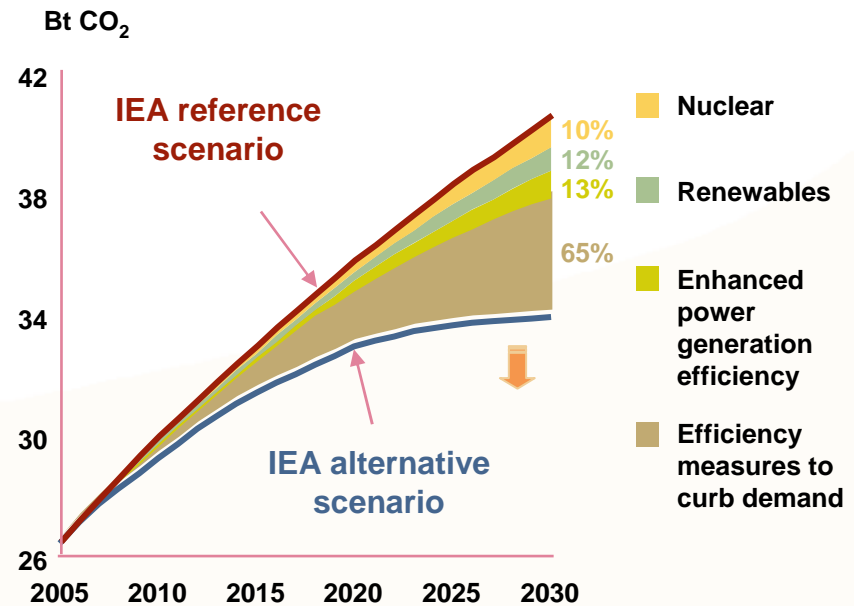
How to limit our energy consumption and our CO2 emissions?

- **Energy consumption:** increase from BRICs and other developing countries will not be balanced by the stabilization of developed world countries' resulting in an overall 1.2% per year growth
- Our planet **fossil fuel resources are limited:** 40 years in Oil, 60 years in Gas, 146 years in Coal.

We need to use them cautiously

- We have to **limit our Green House Effect Gases** (including CO2) emissions in order to avoid global warming which would be very damageable for our planet
- Fossil fuels consumption leads to CO2

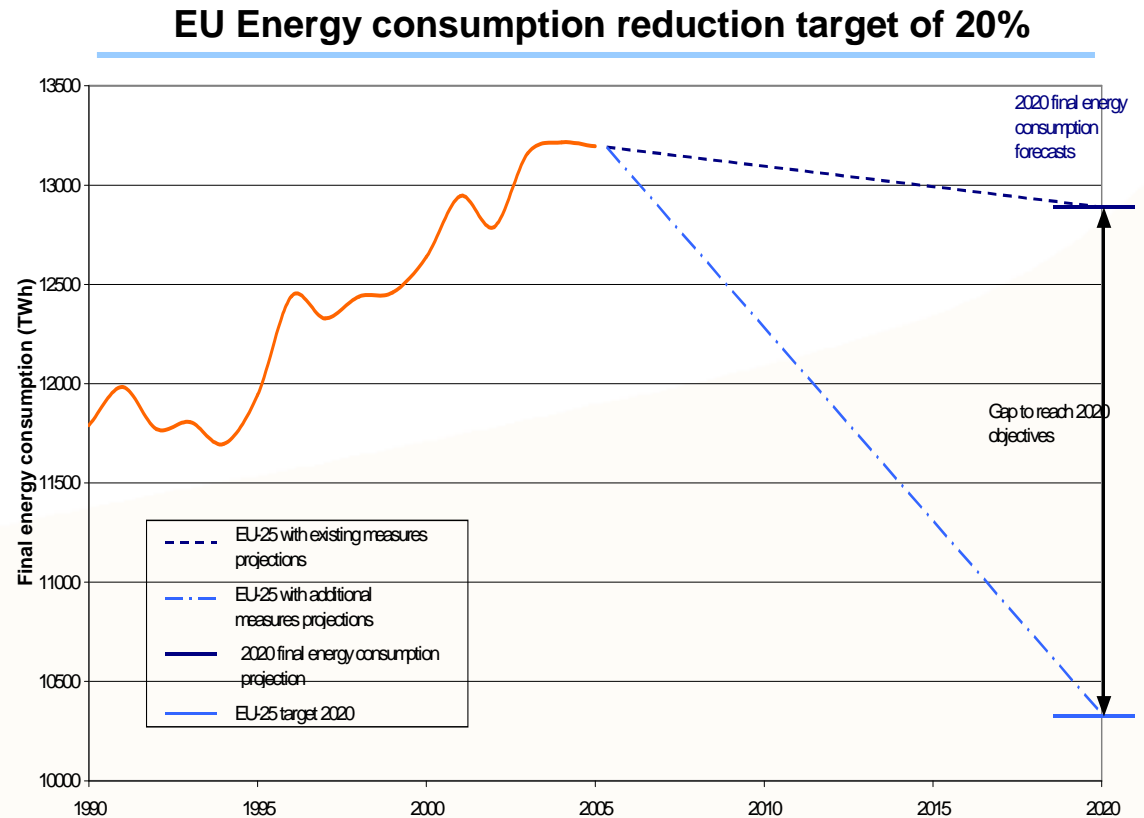
CO2 emissions: potential savings



Energy savings together with renewable and nuclear energy production and Carbon Capture and Storage (CCS) development are needed.

Savings are THE key to our planet's Energy and Climate Change threat

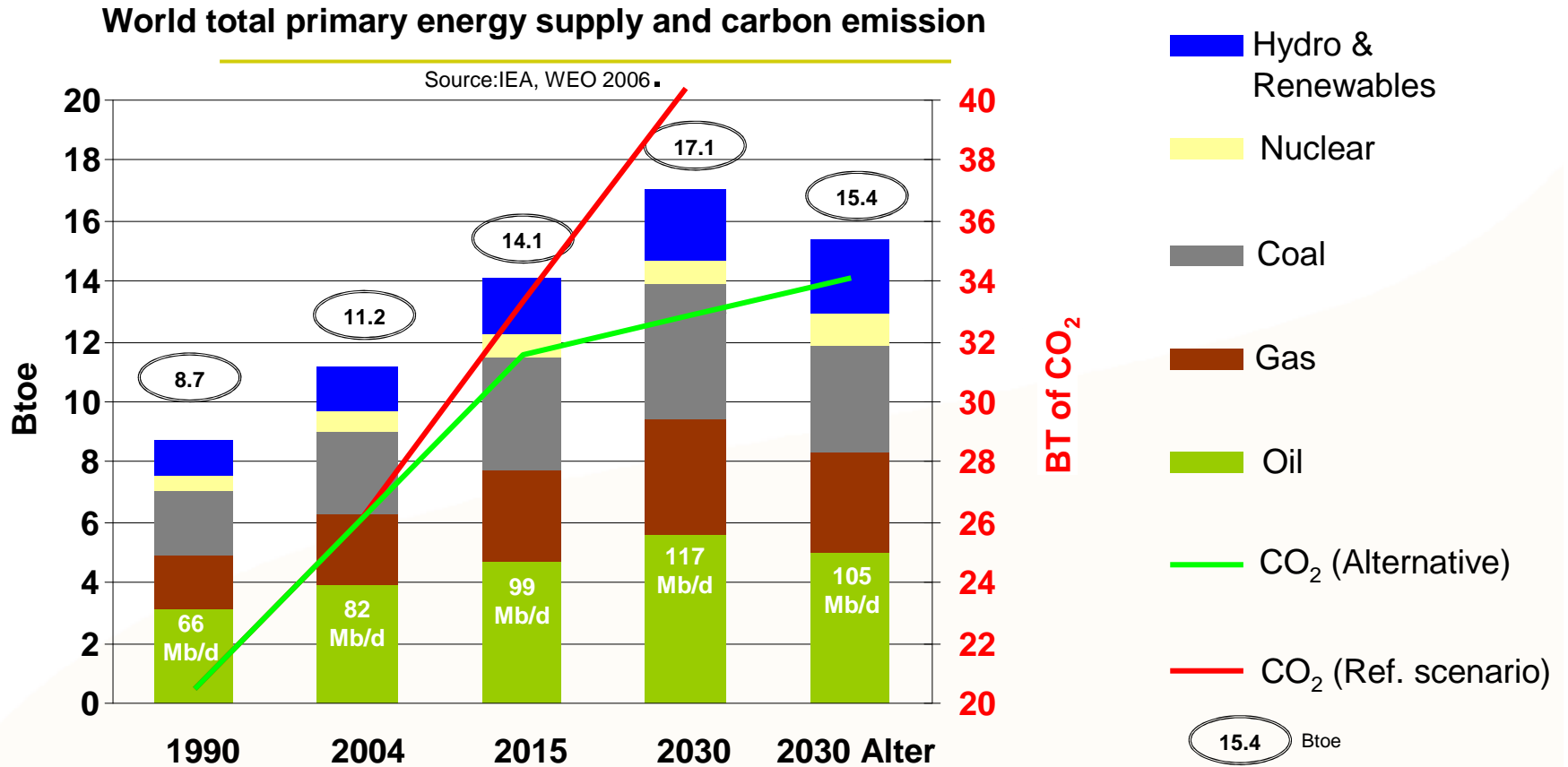
- **However, energy consumption continues to grow:** In the EU-25, the growth in total electricity consumption from 1999 to 2004 was more than 10%.
- **Energy efficiency measures include:**
 - Regulatory measures for buildings isolation, transportation (car and trucks)
 - **Rewarding mechanisms for energy conscious individuals or institutions:** Smart meters, Time of Use tariffs..
 - **R&D and innovation funding followed by regulations to accelerate the usage of new the technologies and devices:** Light Emitting Diodes (LED) , Hardware and software energy savings devises, automatic switch offs for computers...



source: European Commission / Institute for Environment and Sustainability, 2007).

To revert the present trend, and achieve energy savings strong political will and funding are needed

2030 world energy supply: CO₂ a major concern



EU roadmap of 20% CO₂ emissions reductions by 2020 is good. These efforts will have negligible impact unless other developed regions follow and a realistic mechanism for BRICs is adopted