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# **Gas Within a Sustainable Future**

**Thierry Desmarest**

June 7, 2006

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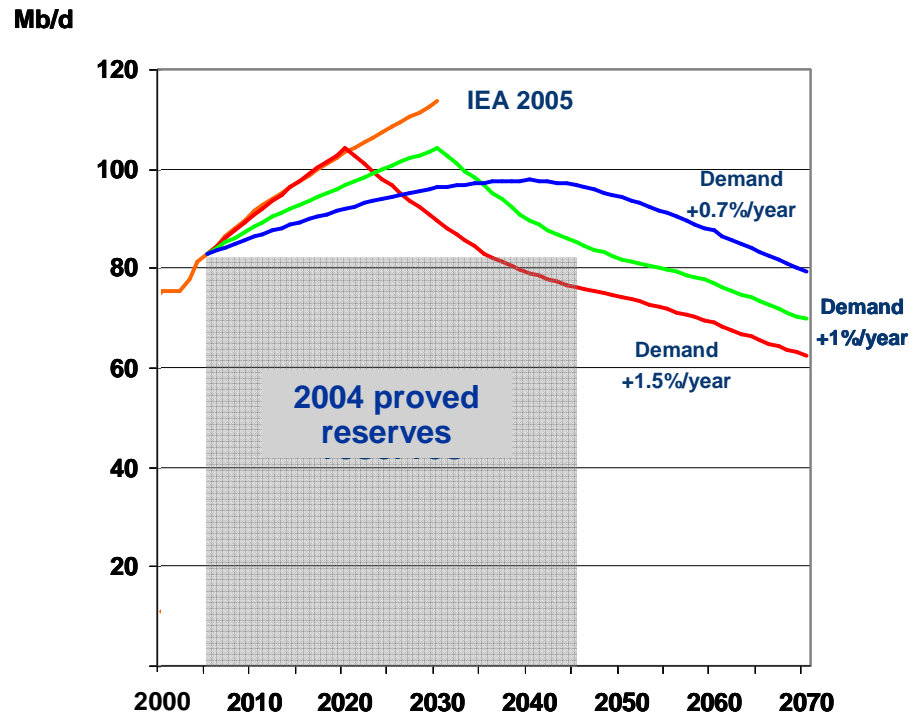
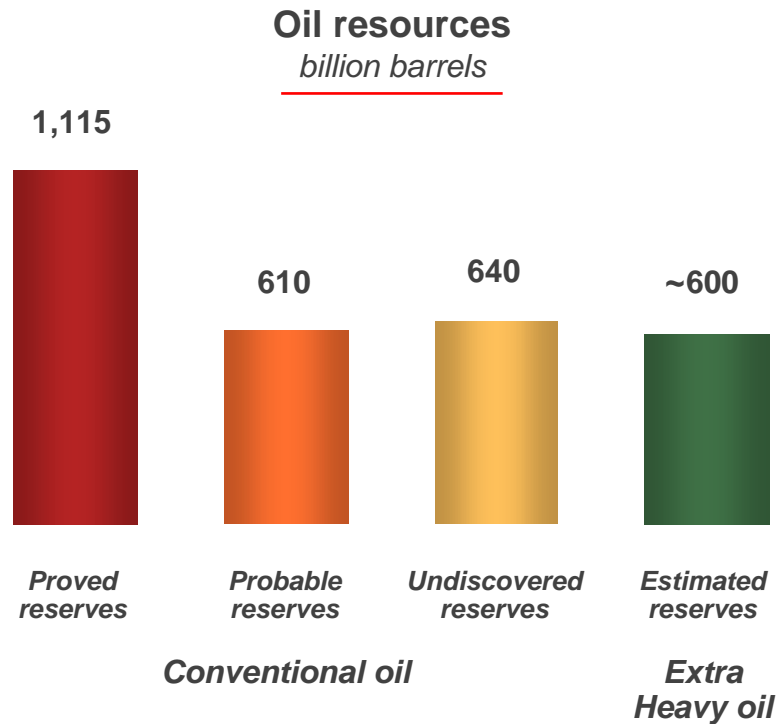
# Introduction Oil Challenges



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# Oil resources are still significant, but production growth is less certain



- Proved conventional reserves equal 40 years of today's demand
- Proved + probable conventional reserves equal 60 years of today's demand

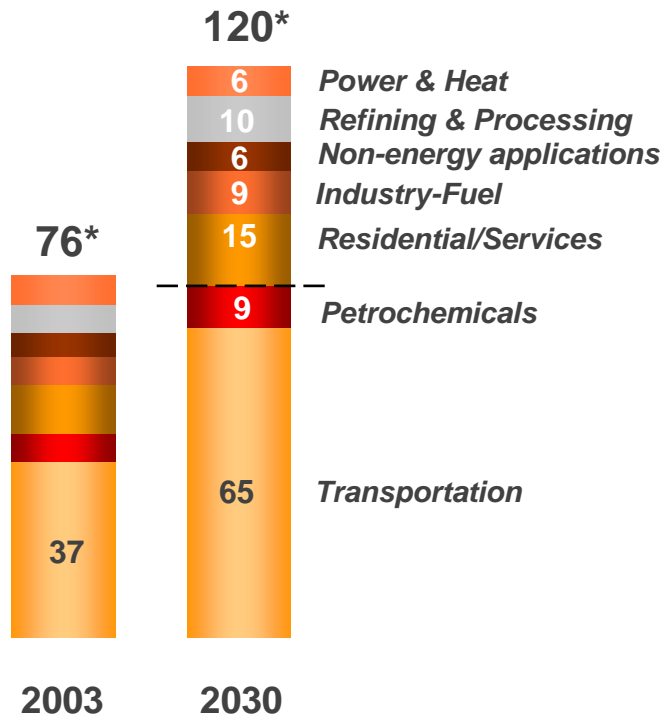
***Reducing oil demand growth to below 1% per year would be the best solution***

Sources : O&G Journal 2005, USGS, IEA



# Higher prices should concentrate oil demand on transportation

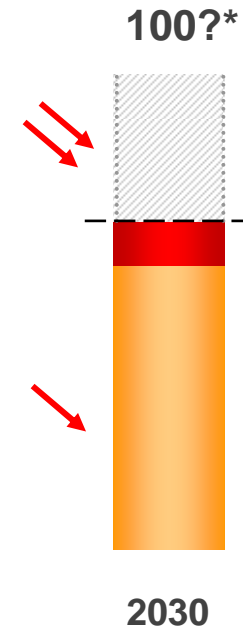
## IEA base case



## Main solutions

- Concentrate oil use on transportation and petrochemicals
- Step up energy efficiency

## More sustainable scenario



\* Worldwide oil consumption (Mboe/d)

Sources : IEA, World Energy Outlook 2004 Reference scenario; Total



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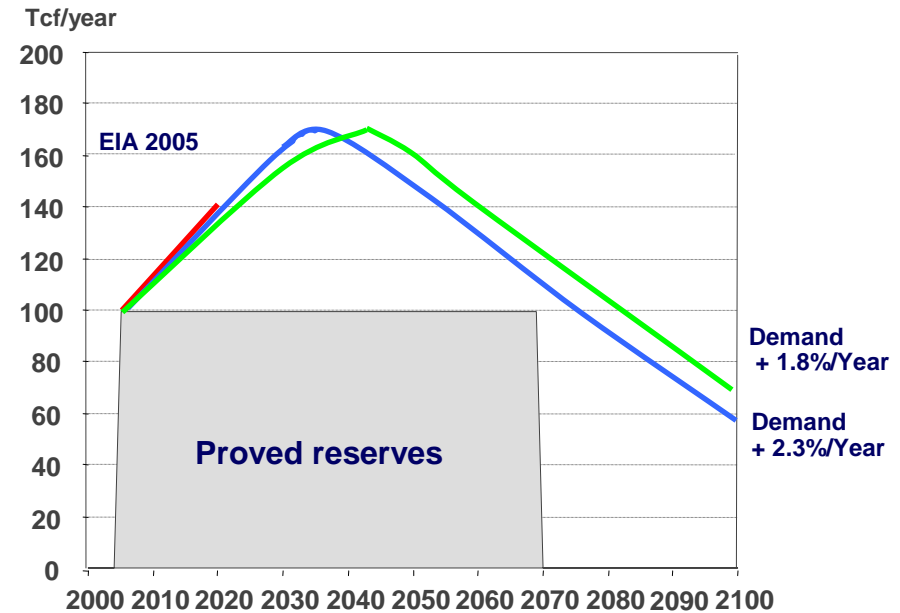
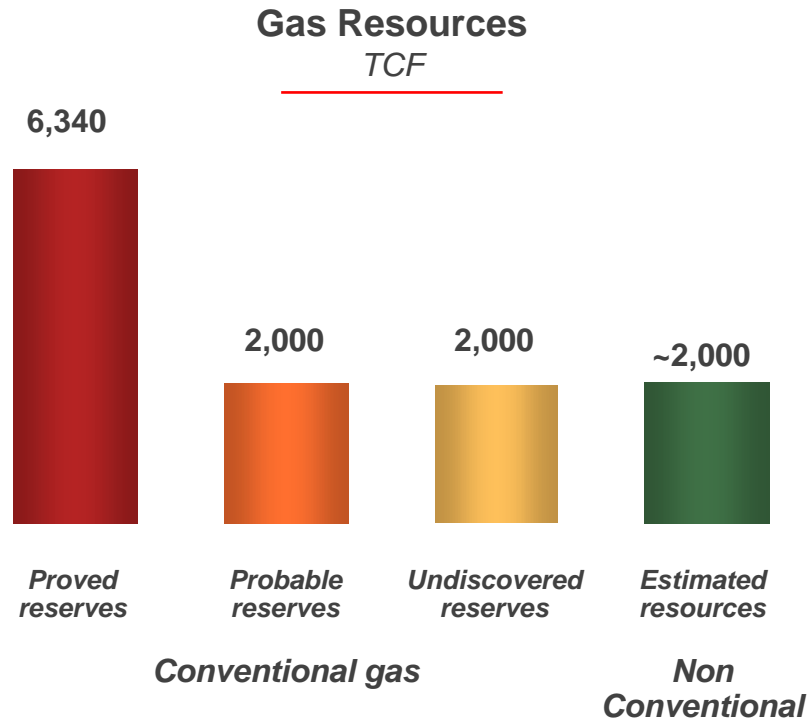
## Gas Challenges



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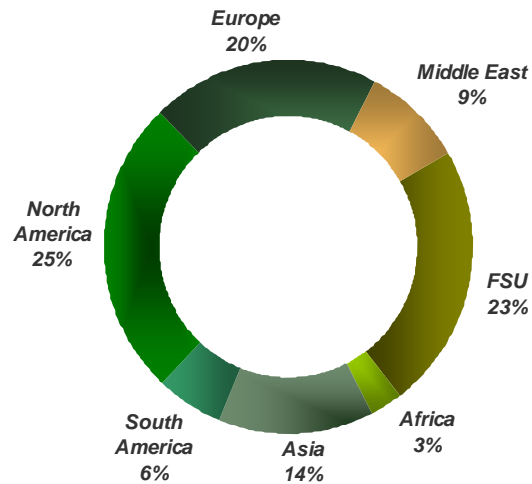
# Gas resources are abundant...



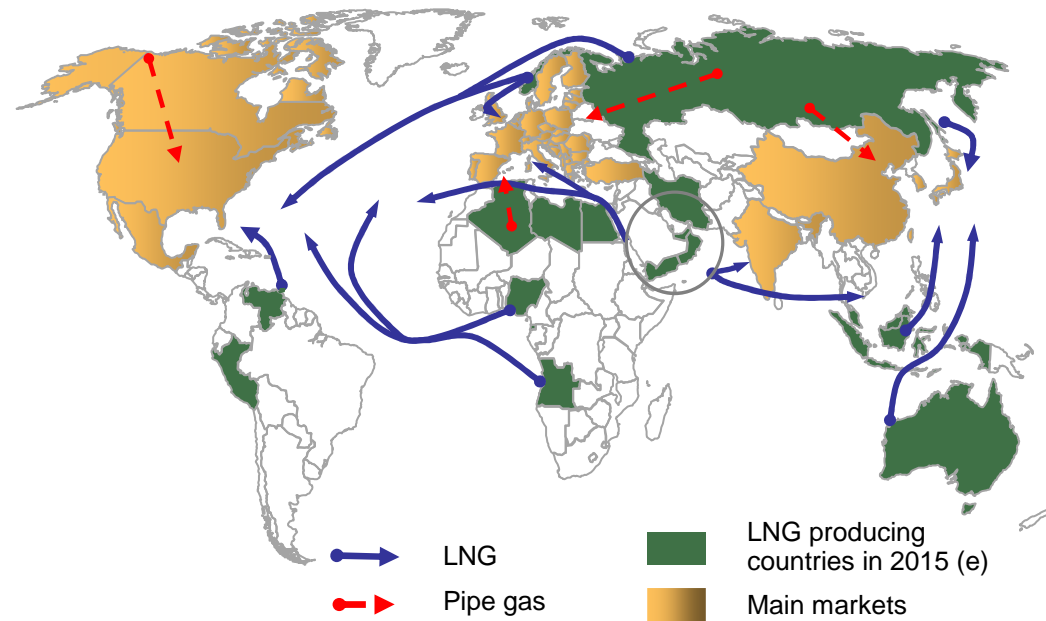
- Proved conventional reserves equivalent to 65 years of today's demand
- Proved + probable conventional reserves equivalent to 80 years of today's demand
- Potential of non conventional resources difficult to assess. 2,000 Tcf is no more than an order of magnitude

# ... But far from main markets

2004 demand = 98 TCF



Long-term gas flows



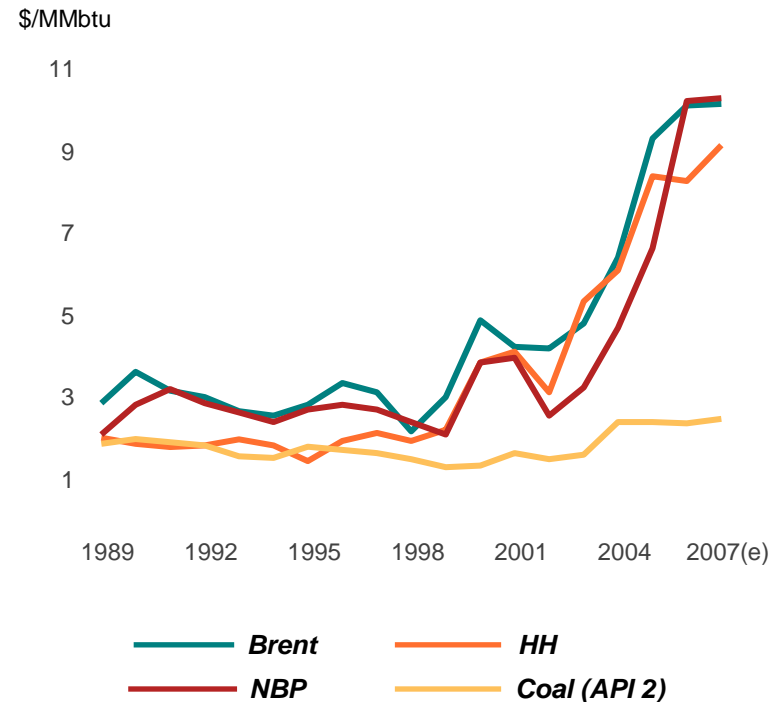
- Nearly 2/3 of reserves concentrated in Russia, Iran and Qatar
- Most gas reserves far from main markets
- Gas markets supply requires huge investments in logistics

Source: CEDIGAZ

# Uncertainty about the sustainability of gas demand growth

Hydrocarbon prices  
1989 – 2007(e)

- Average spot gas prices multiplied by 3 since 2000
- Coal more competitive excl. Co<sub>2</sub> cost
- Nuclear competitiveness enhanced



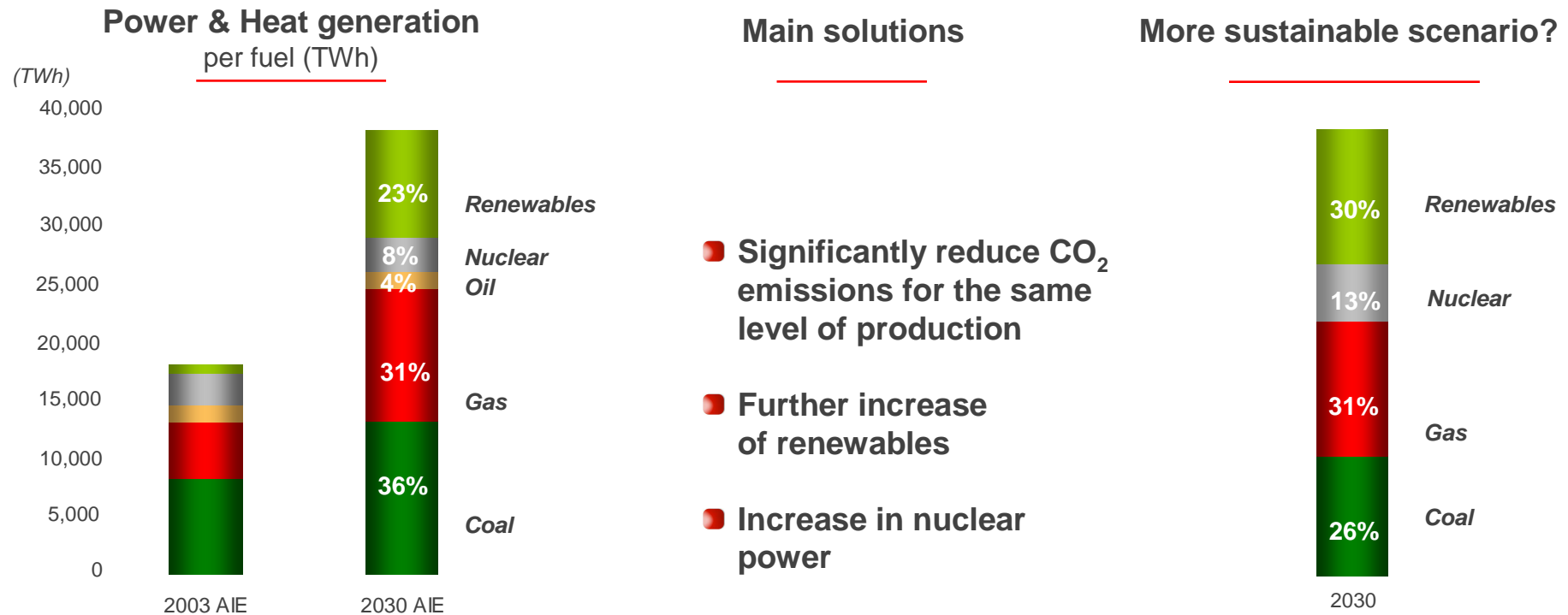
**Gas, coal and nuclear are the main competitors in power generation  
Which will be the winner?**

\*Based on 2005 average prices, Brent at 55\$/b





# Towards a more sustainable scenario for power generation



Sources: IEA, World Energy Outlook 2004 base case, Total



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## Connecting New Producing Areas and Consumer Countries

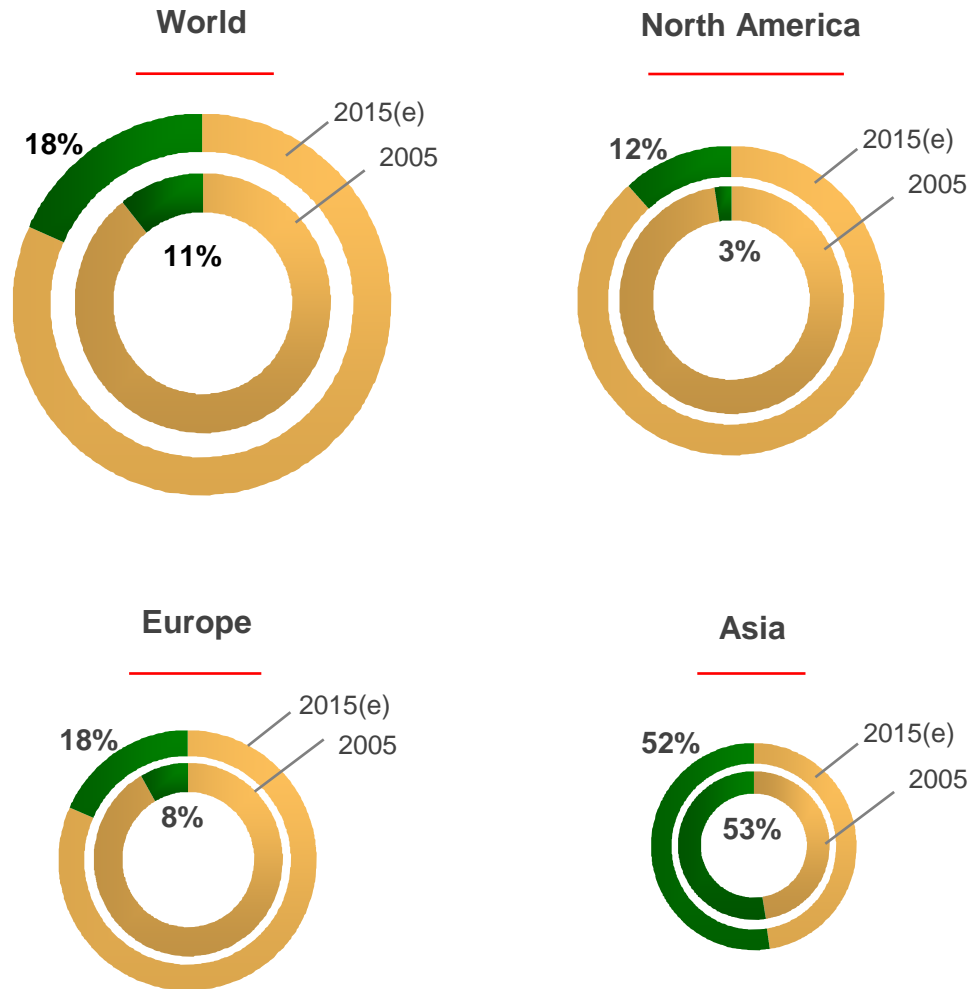


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# Strong growth in LNG demand to 2015

## Share of LNG in gas demand

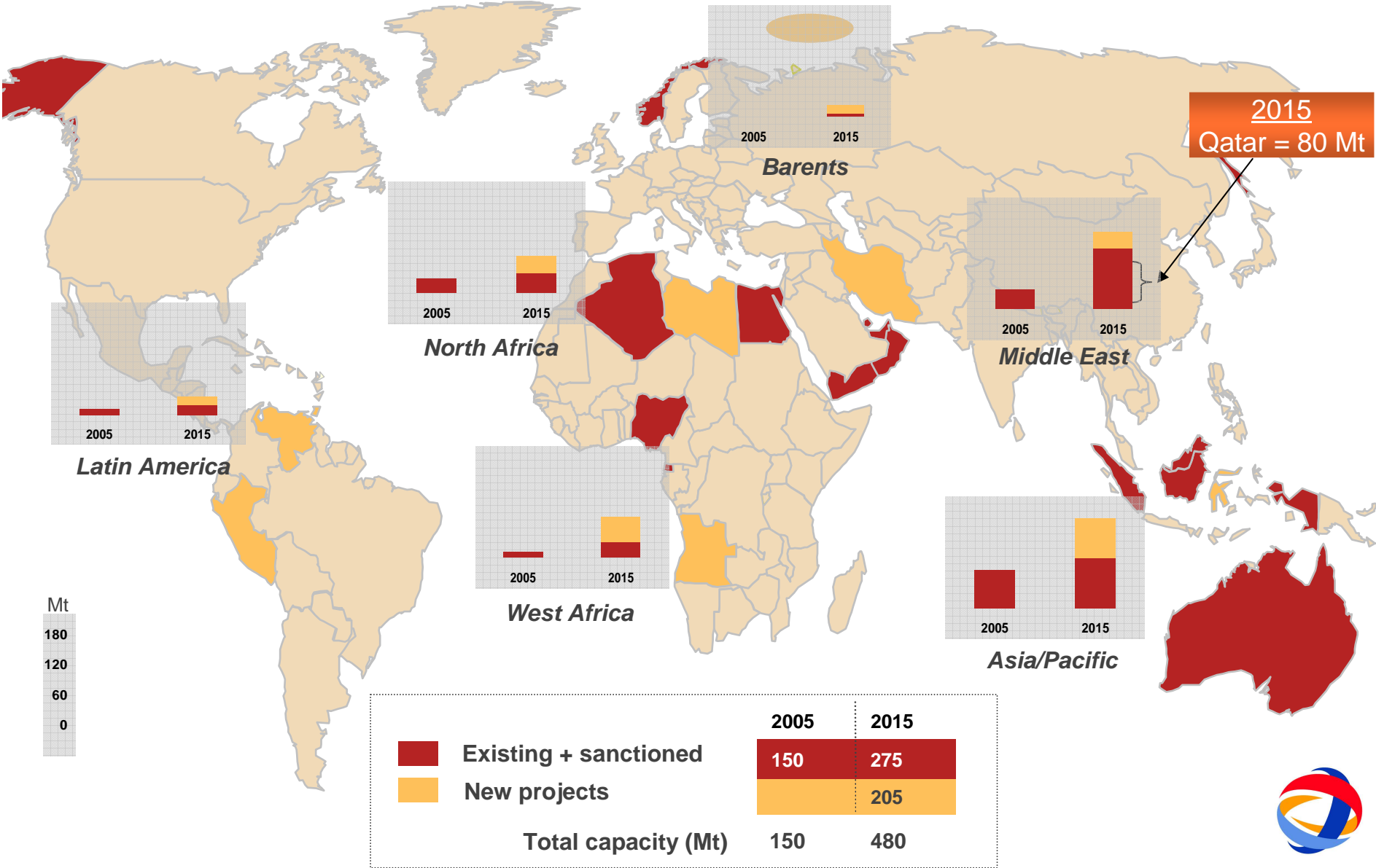


- LNG growth, 2005-2015: + 9% per year
- Growth of LNG imports in all markets
- Asia still LNG's biggest market



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# World LNG projects: emergence of the Middle-East



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## Total's Contribution to World Gas Supply

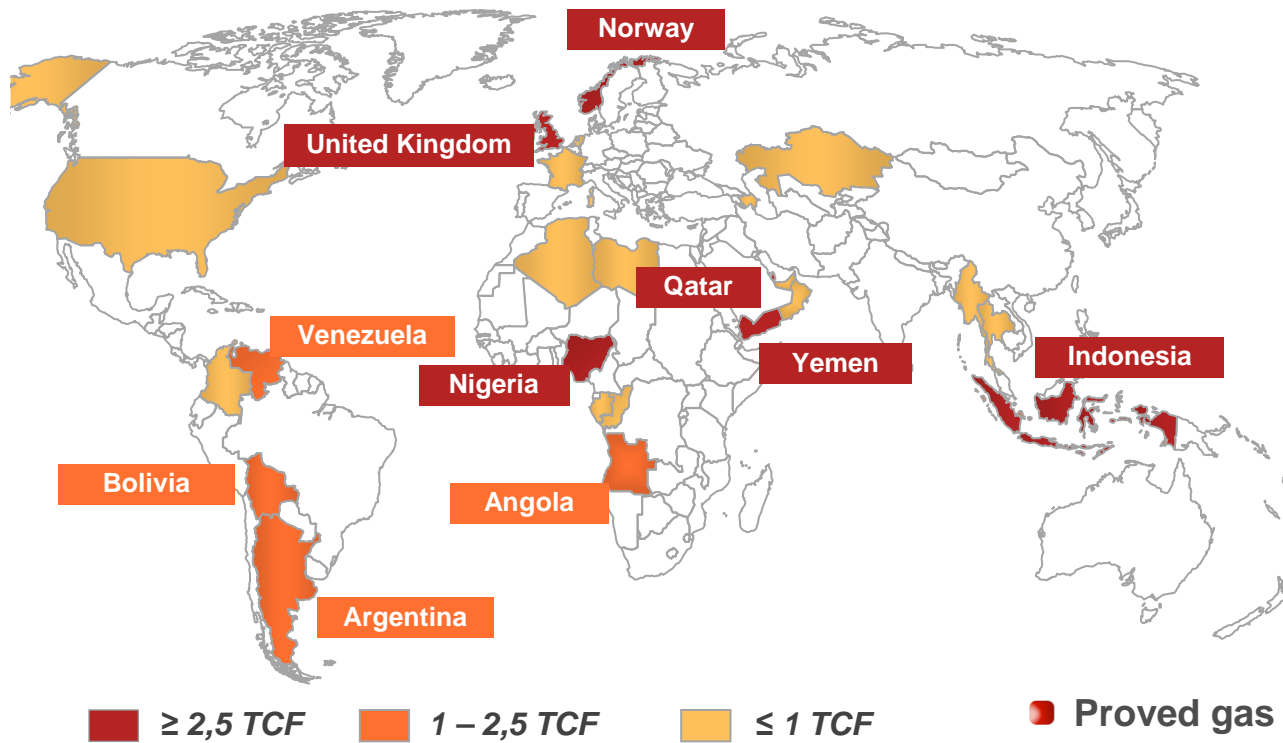


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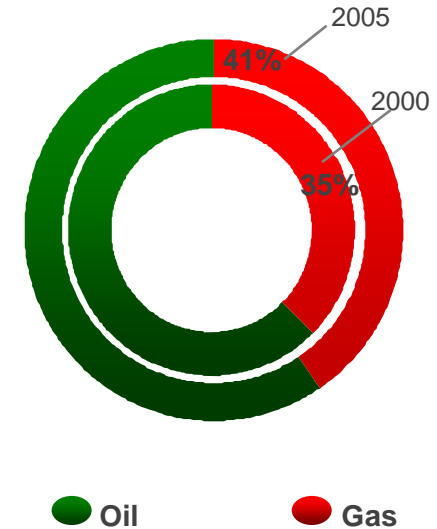
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# Total gas reserves are growing

Gas proved and probable reserves 2005



Proved reserves split\*

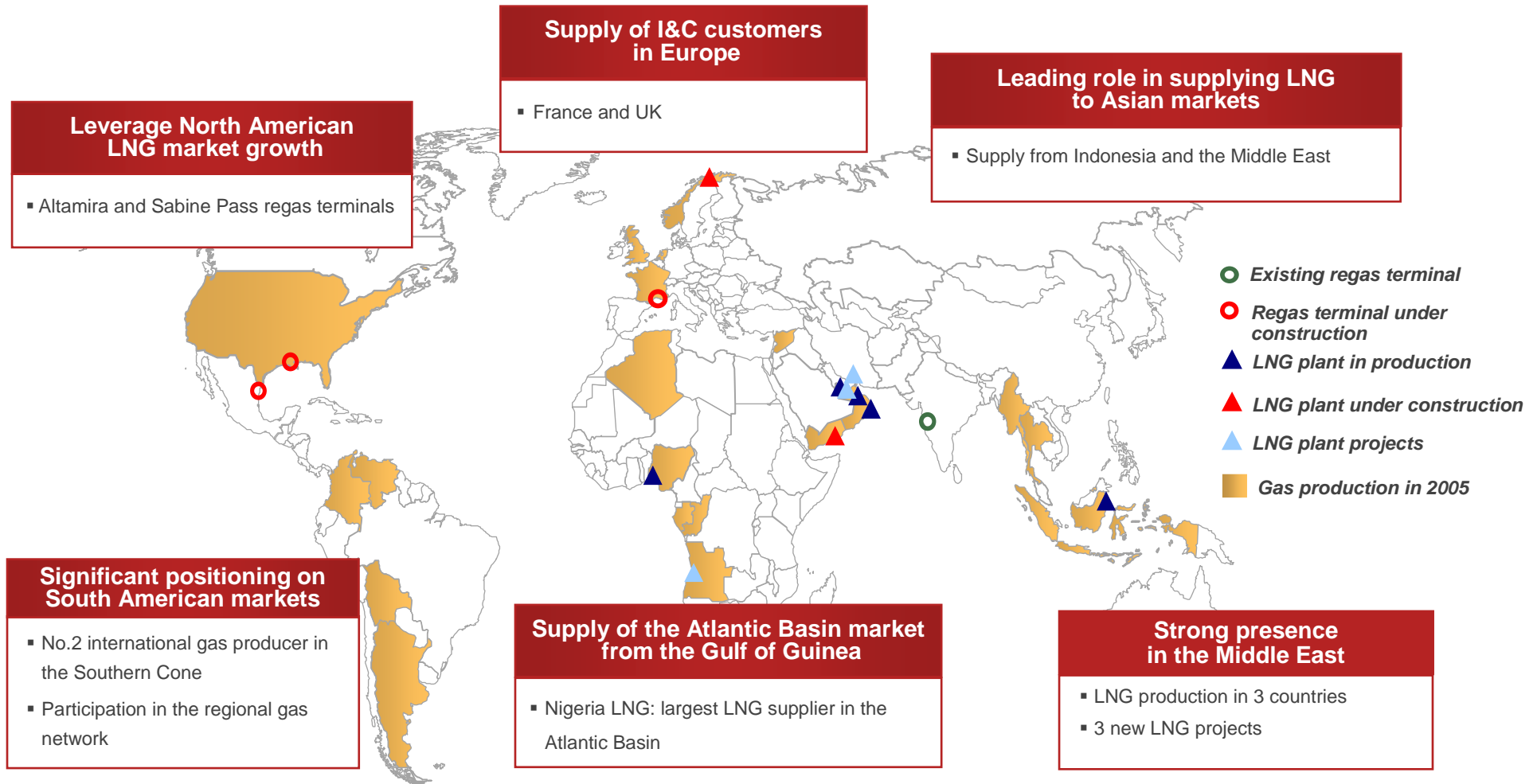


Proved gas reserves: 35% ↗ 41% in 5 years

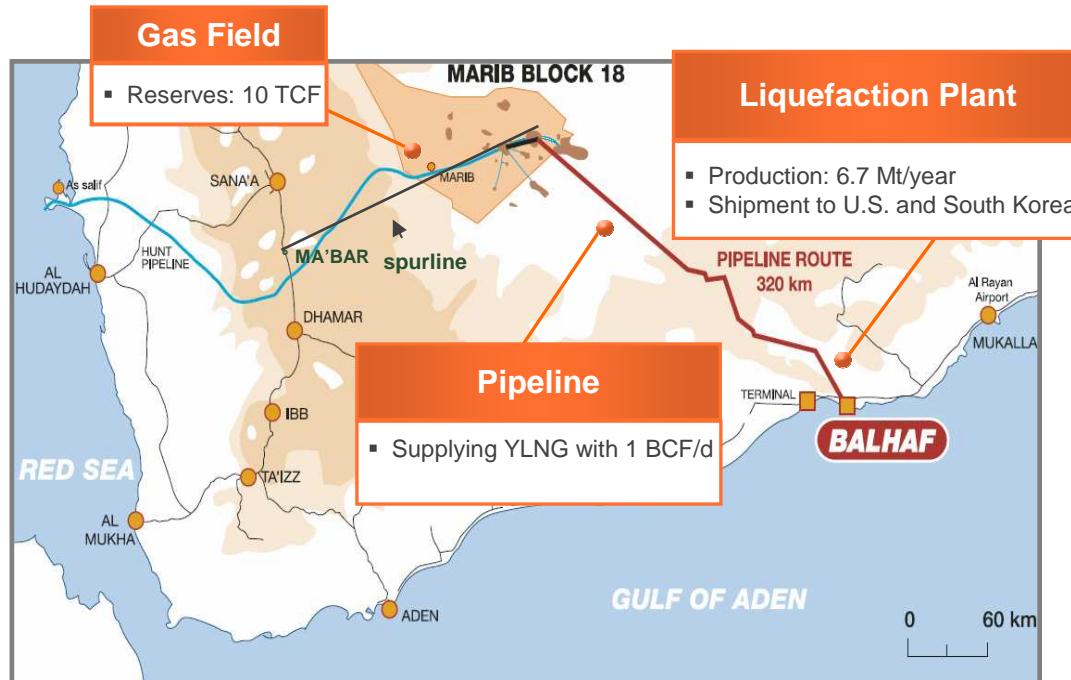
Proved gas reserves: 21 TCF ↗ 25 TCF

\*1 P Sec reserves

# Total: global positions to support gas market growth



# Yemen LNG, a new LNG operator



## Yemen LNG (Total: 39.62%)

- Operations led by Total
- Capex: approx. \$3.7 billion
- Production start-up end-2008
- 20-year sales contracts
  - Kogas 2 Mt/year (South Korea)
  - Suez 2.5 Mt/year (U.S.)
  - Total 2 Mt/year (U.S.)
- Production plateau: 1.1 BCF/d



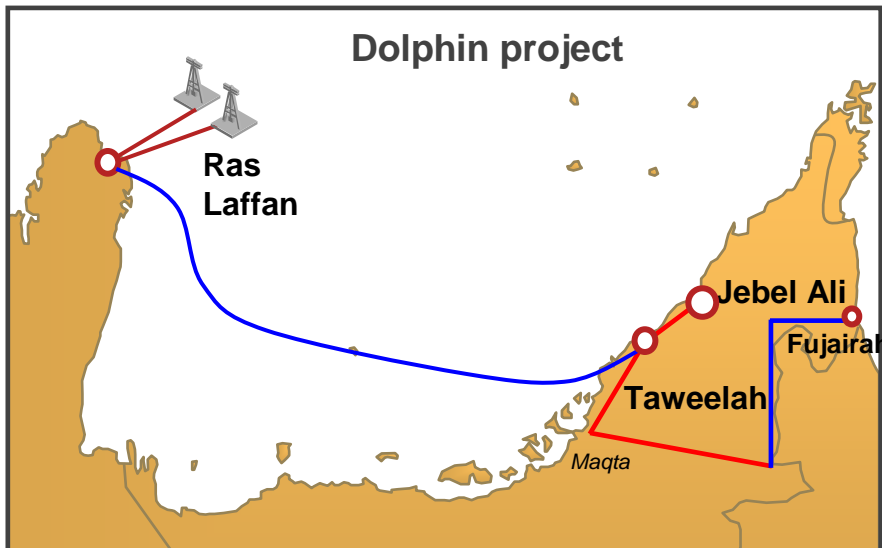
**Implementing Total's LNG growth strategy**  
**Consolidating long-standing positions in the Middle East**



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# Dolphin: example of a large integrated gas project



## Ras Laffan refinery (10%\*)

- Capacity: 146 kb/d
- Launched in 2005
- Startup: 2007(e)

## Qatofin petrochemicals (22%\*)

- Largest ethane cracker in the world (1.3 Mt/y)
- Launched early 2005
- Startup: 2008(e)

## Taweelah power/desalination plant (20%\*)

- Power capacity: 1,430 MW
- Desalination capacity: 380,000 cu.m/d



- Dolphin (Total: 24.5%)**
  - Operations led by Dolphin Energy Ltd
  - Capacity > 2 BCF/d
  - First gas: H1 2007
- Vertical integration of:**
  - Upstream production
  - Gas transmission
  - Condensate refinery
  - Ethylene petrochemical plant
  - Gas marketing and distribution
  - Power generation
- 25-year sales contracts**
- Technological expertise with long-distance multiphase transportation**

*An integrated gas project spanning several countries*

— New pipelines



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\* Total share

# Nigeria's Akpo, a new step: deep offshore to supply NLNG



- Total operator (24%)
- Approx. 600 Mb of condensate + 1 TCF of gas to supply NLNG\*
- Production capacity:
  - 175 kb/d of condensates
  - 300 MCF/d gas export
- Main milestones:
  - Discovery in 2000
  - Project sanction: 2005
  - Project startup: end 2008

\* Proved and probable reserves

# Gas-to-Liquids: how much potential?

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- Today LNG netback > GTL netback

Unresolved issues:

- Future gas prices disconnected from oil prices?
- Managing project complexity and costs?
- Improving low energy efficiency (around 50%) and minimizing GHG emissions?



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***Total's position: GTL R&D is worthwhile  
R&D program underway with partners from industry and academia,  
including Velocys***

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# A brilliant and challenging future for gas?

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- **Gas benefits: clean, abundant and historically reliable**
- **Gas challenges:**
  - High prices
  - Huge investments
  - Security of supply
- **Towards global, interconnected, deregulated markets**
- **Partnerships, across the gas chain, will be a plus**

