

The future of natural gas in the global energy context

*Olivier APPERT,
Chairman and CEO*

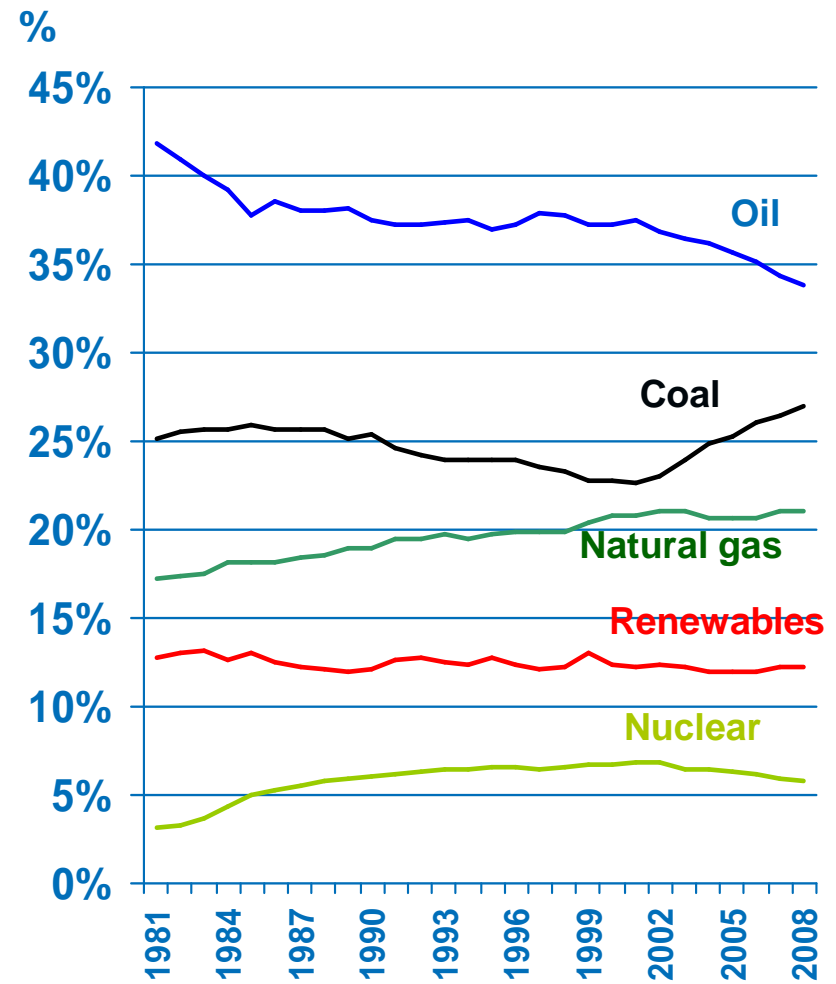
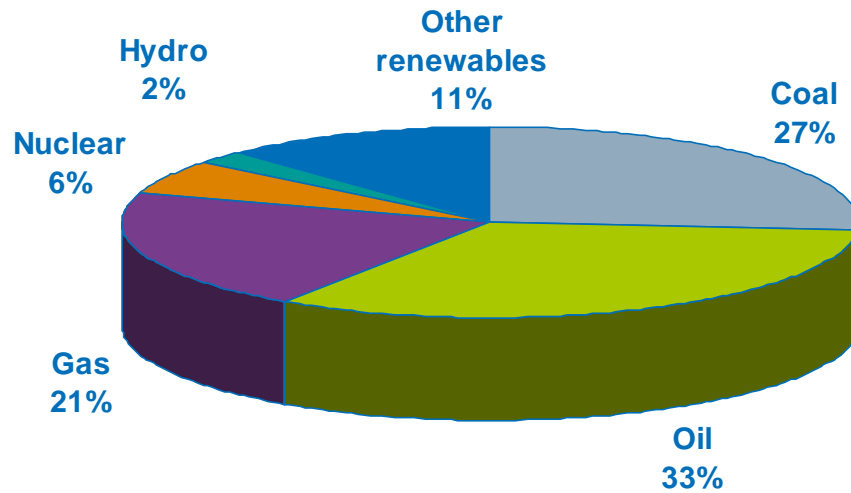
**Congrès du gaz (AFG)
14-15 septembre 2011**



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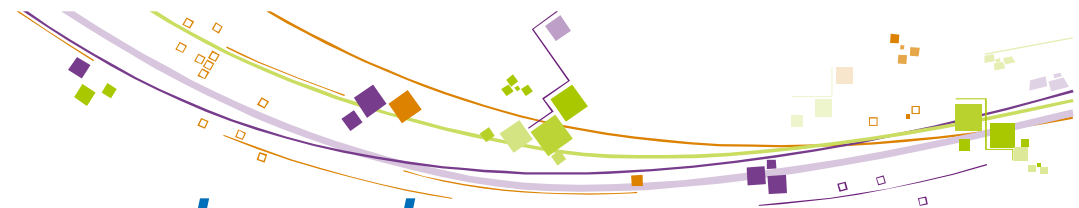
- *Natural gas market will grow*
- **Gas is faced to challenges on demand and supply**
- **Technology will contribute to solve those challenges**

The role of natural gas in the world energy mix

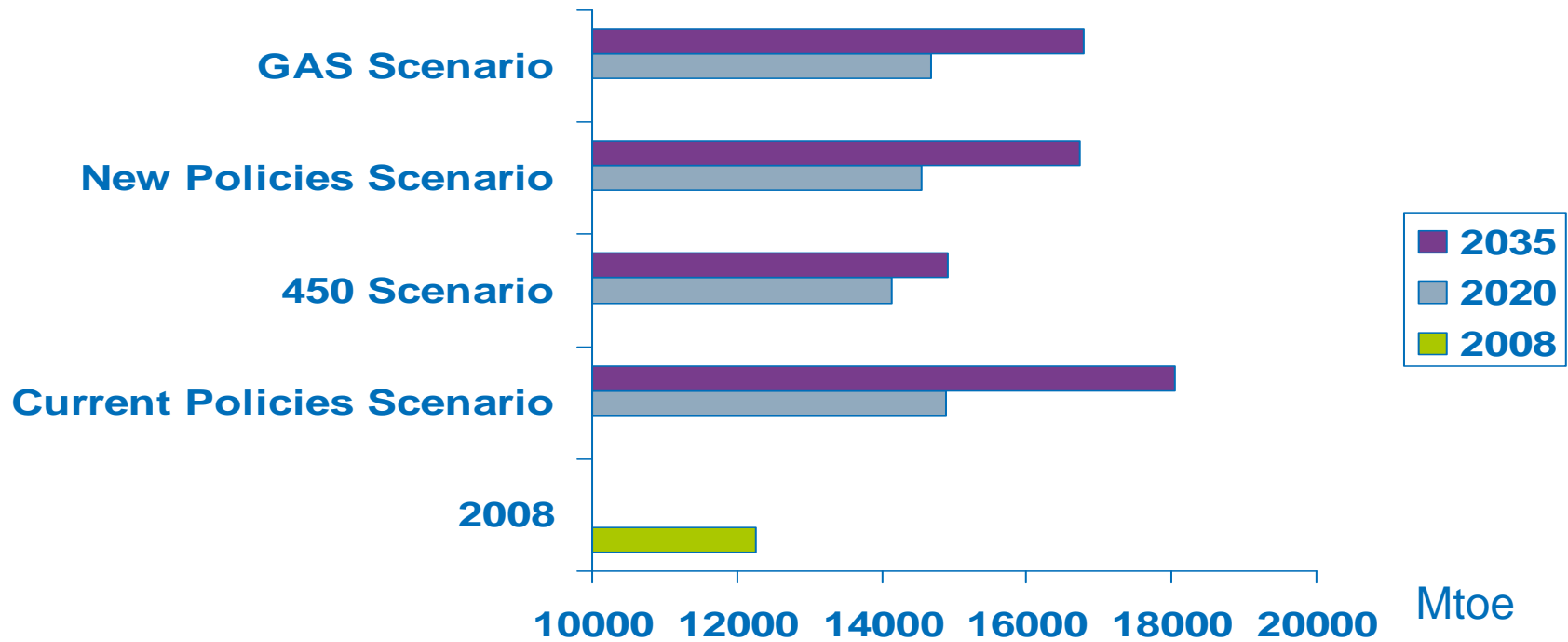


Source : IEA (June 2010)

Prospects for world primary energy demand

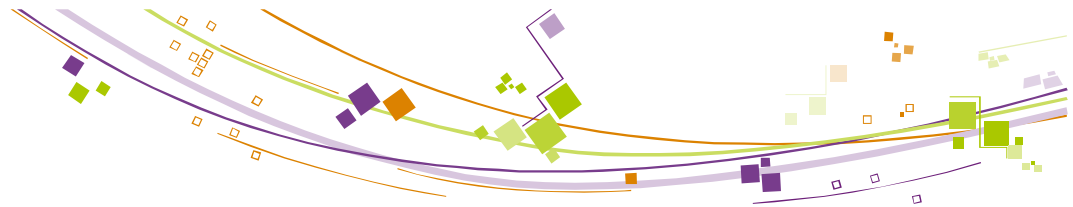


Evolution of world primary energy demand by scenario 2008-2035

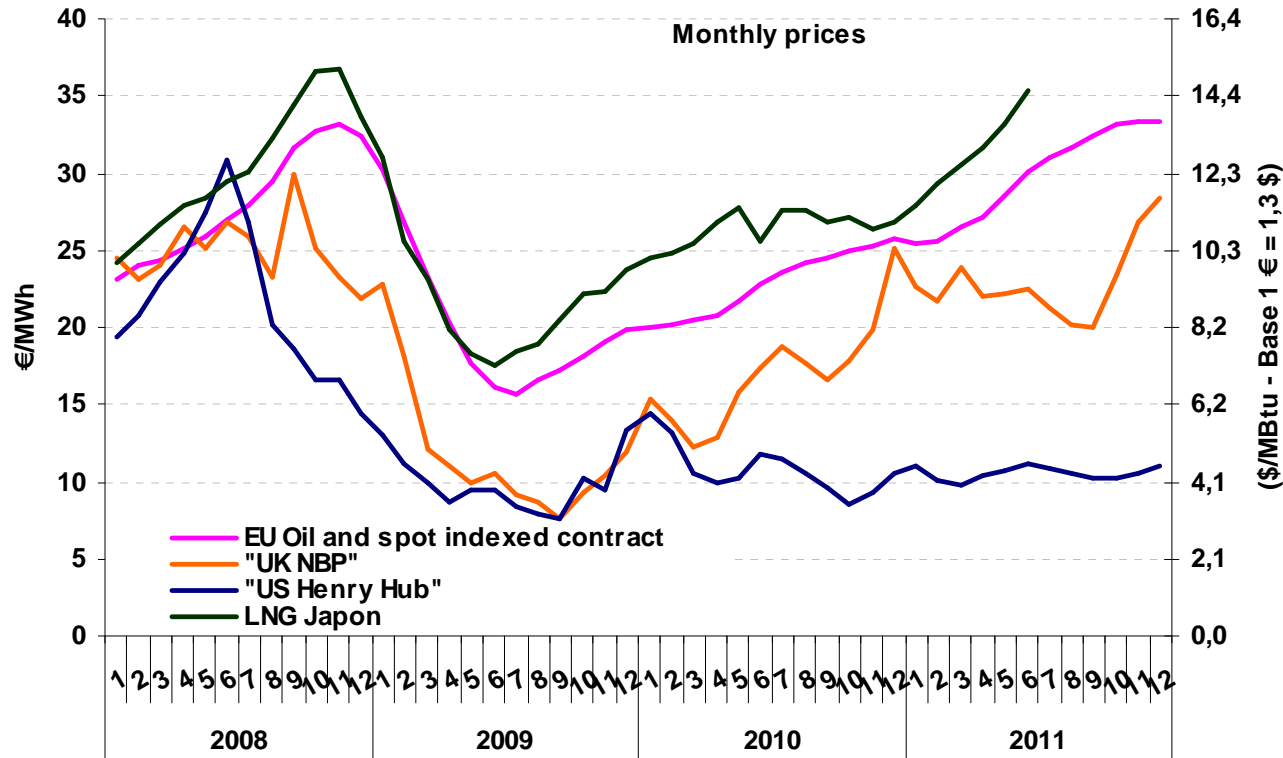


**New Policies Scenario/Gas Scenario:
2008-2035: + 36%**

Source: IEA, WEO 2010, The Golden Age of Gas Scenario

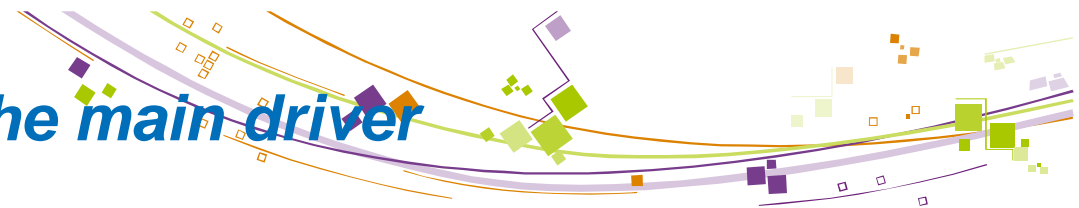


Natural gas price

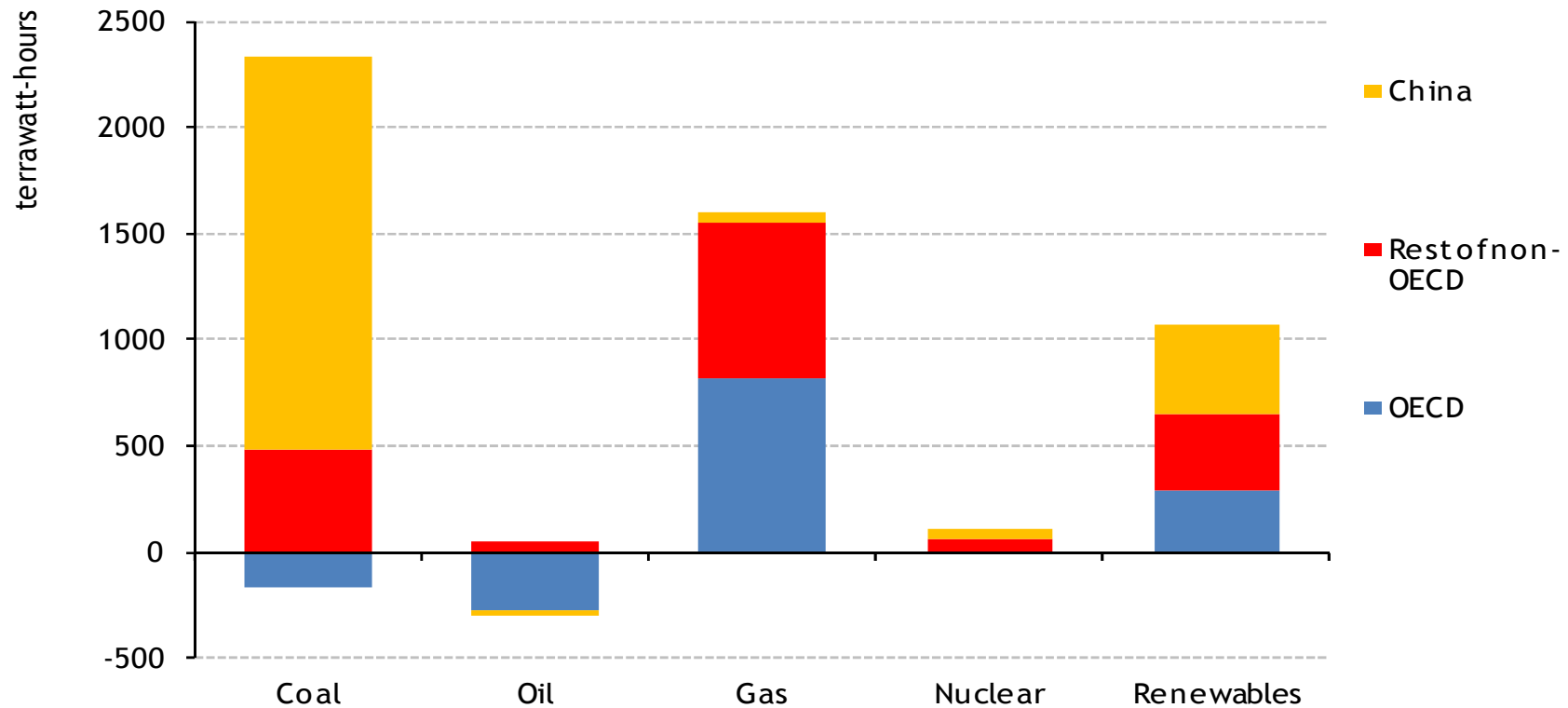


Growing regional divergence due to specific influences :

Oil (EU, Japan), Coal (UK), Shale gas (US)



World incremental power generation, 2000 – 2009*



* Estimated data for 2009

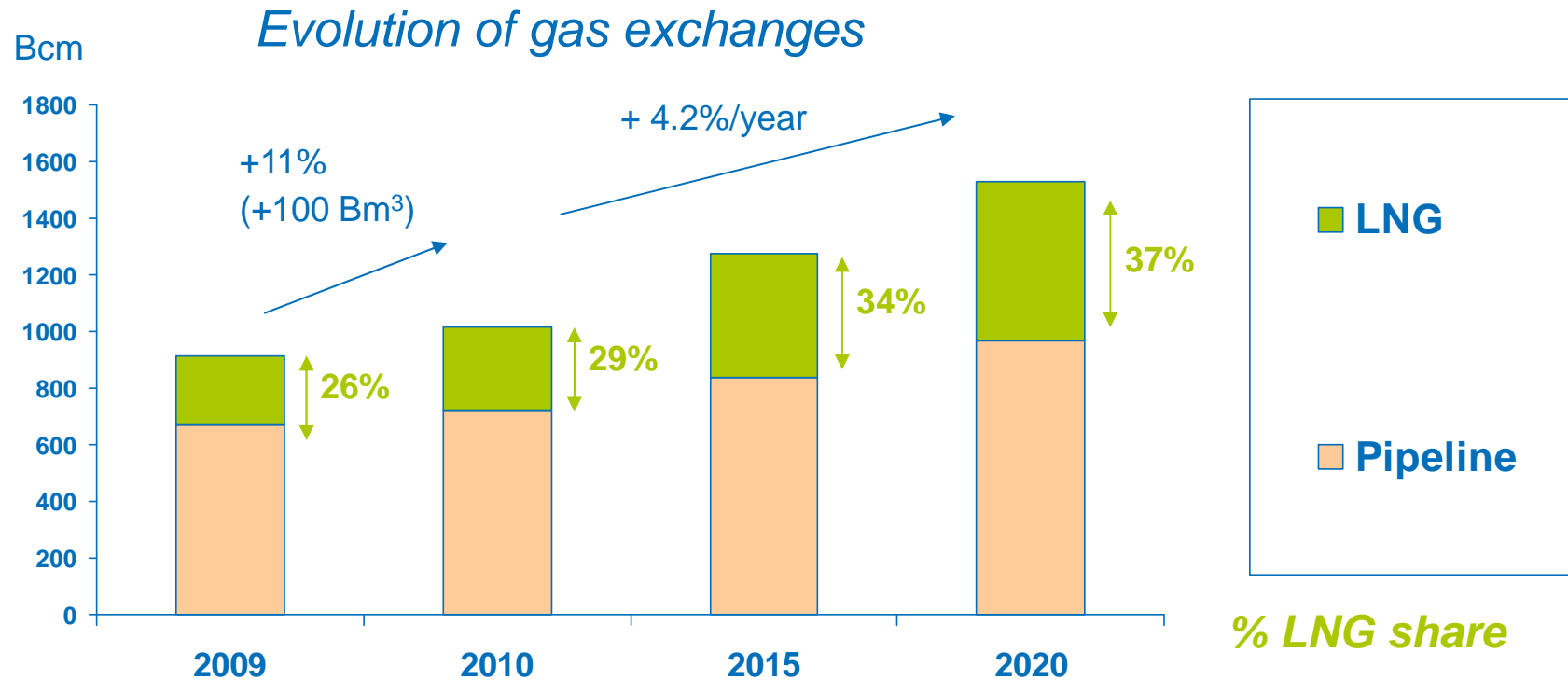


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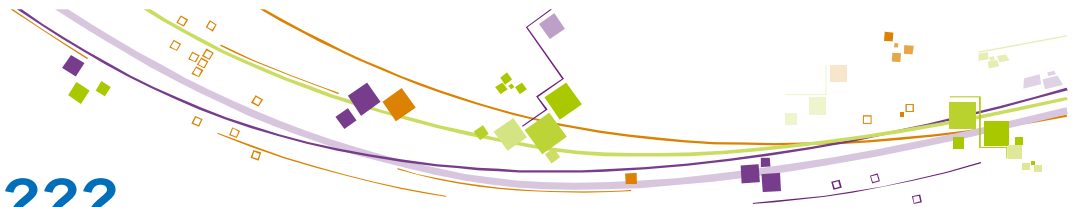
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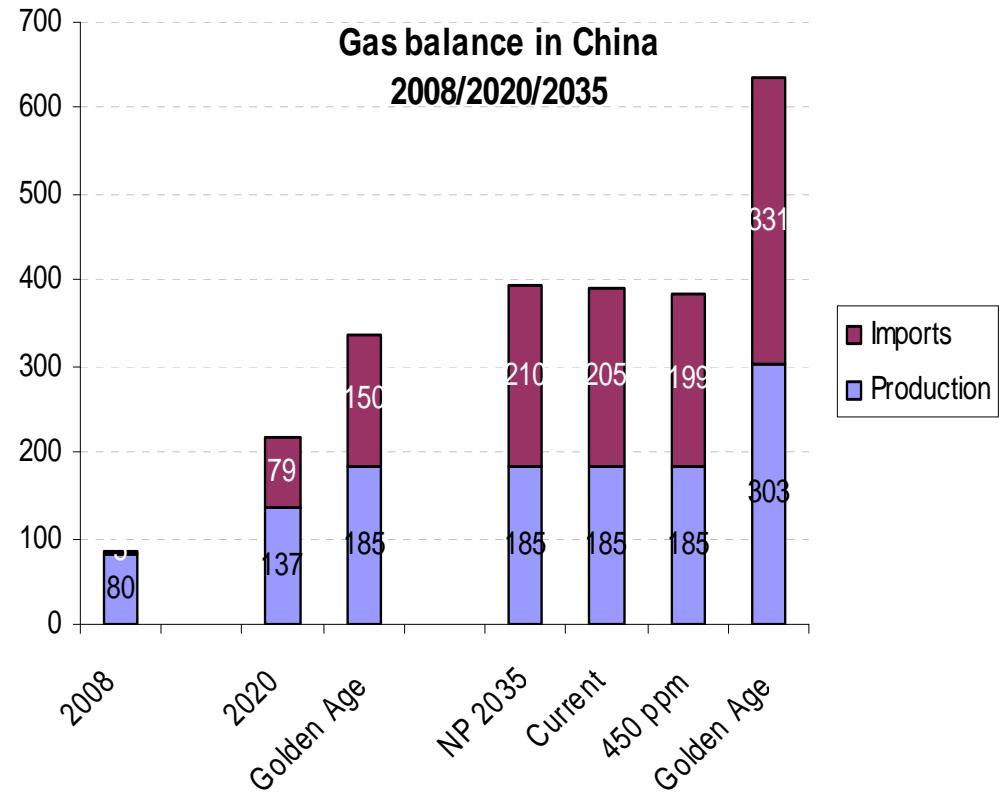
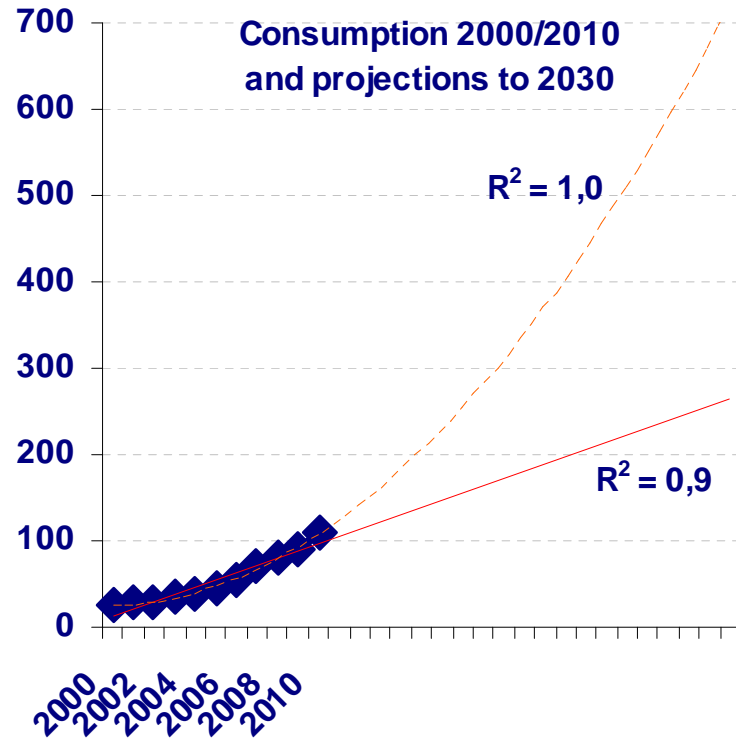
Growing role of international gas trade



→ Consequence of the distance between production and consumption centres



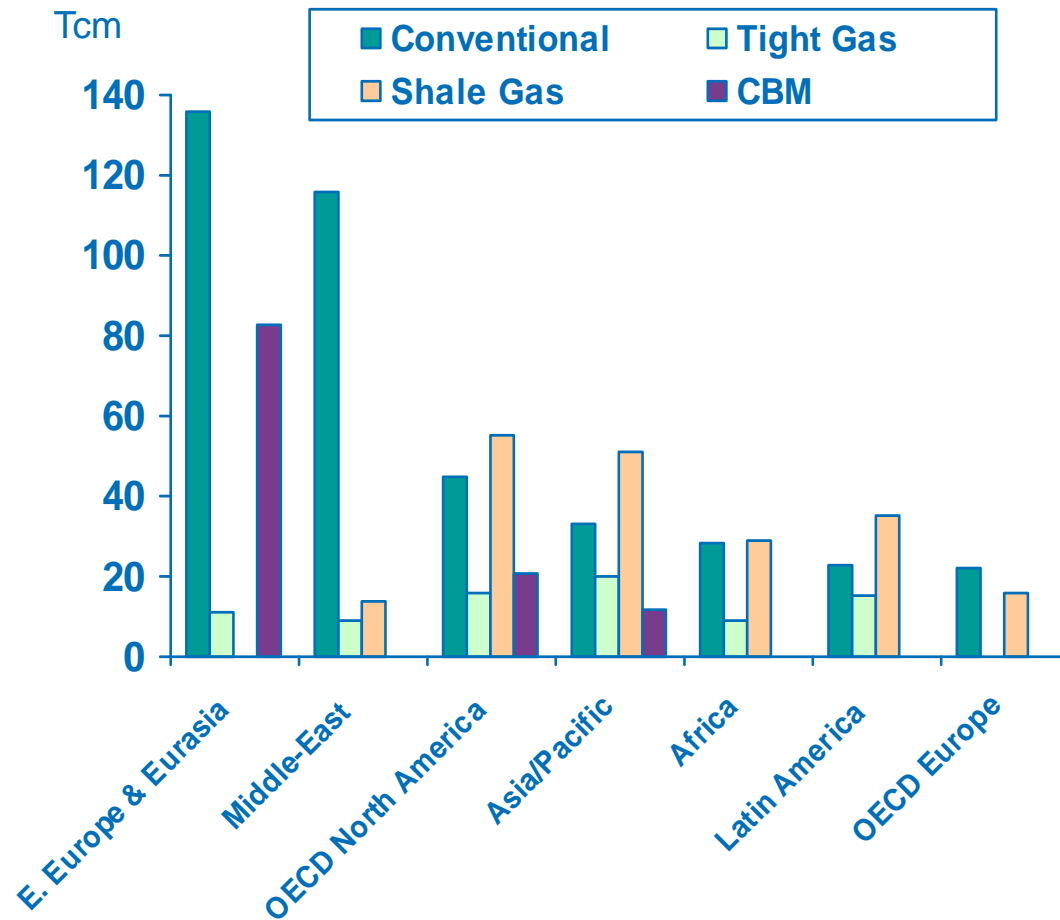
China gas balance ???



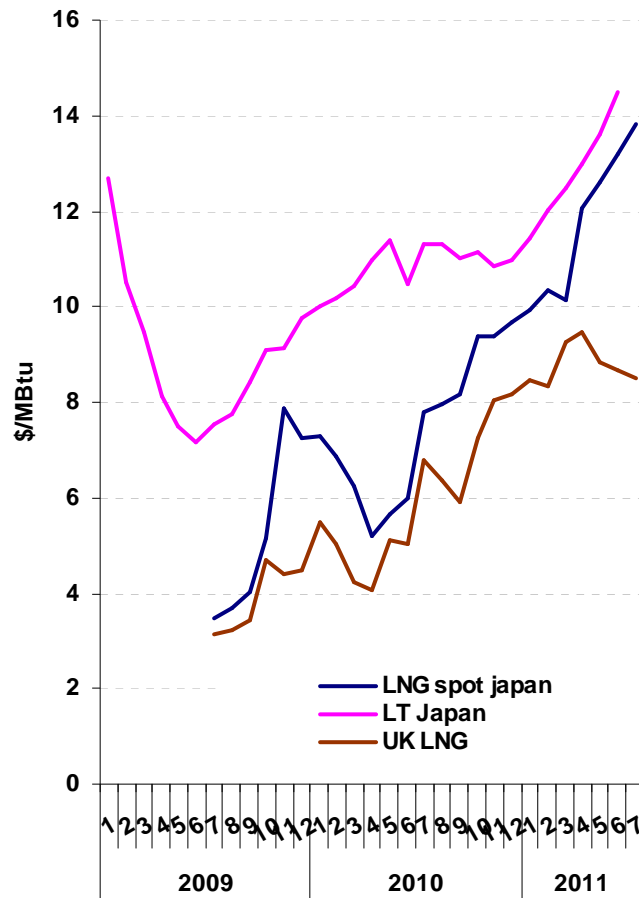
Base: WEO-2010 & 2011, Golden Age of Gas

The geopolitical importance of unconventional gas

Remaining recoverable resources of natural gas



Fukushima : short and medium to long term consequences



2011 : Japan LNG imports:

02/06 2011: + 6 Mt (7 Bcm) or + 10 % VS 2010

LNG spot in Asia under pressure

No impact in Europe

S/M term : Japan + 6 to 11 Mt/y (7 to 15 Bcm)

(Up to 20 Mt/y - No restart scenario IEEJ)

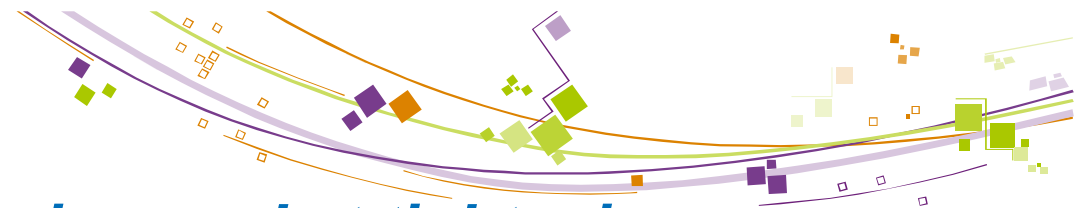
+ Germany : + 9 Bcm max in 2020

L term: Dependent on nuclear reduction

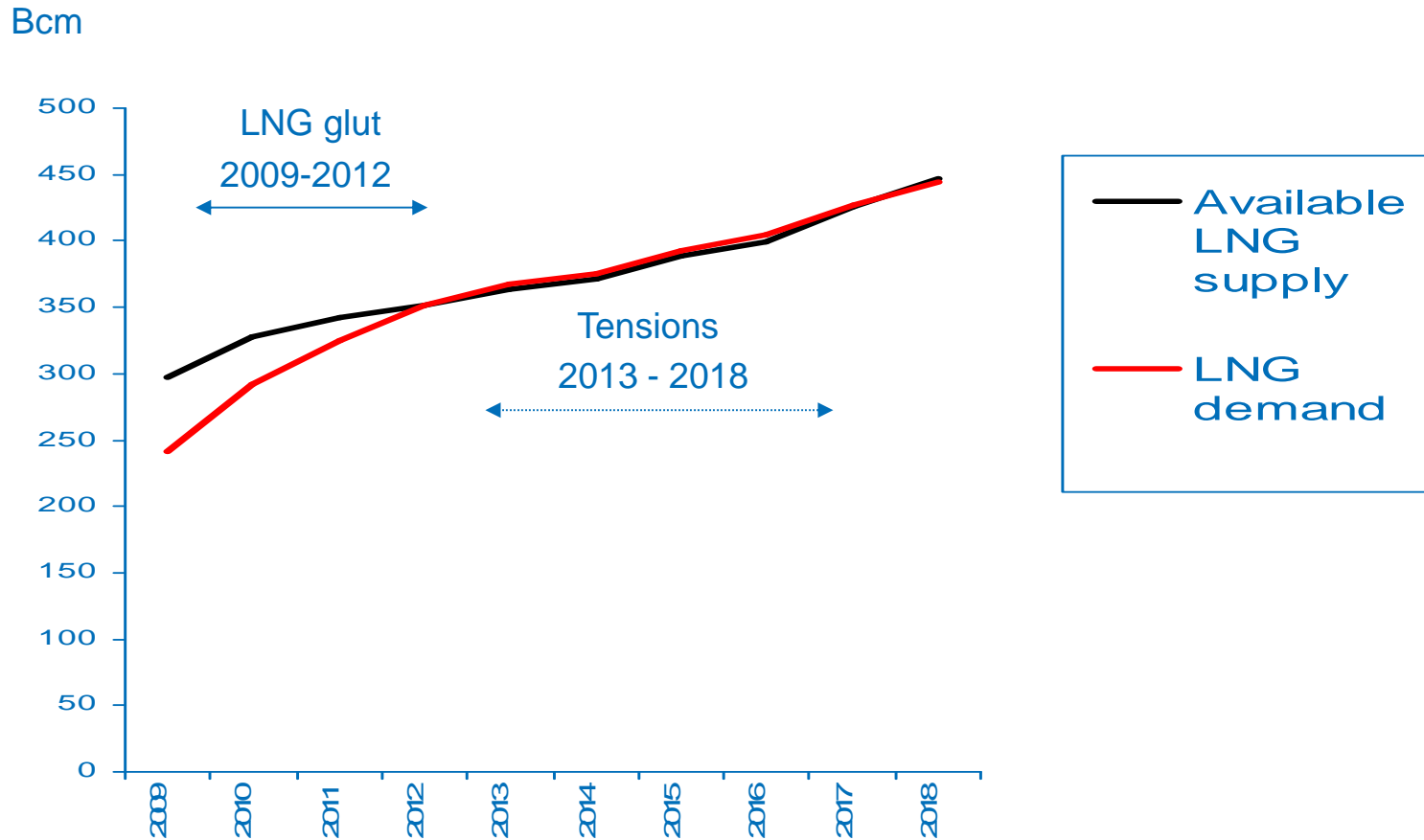
Golden Age/NP : -35 GW in 2035 → + 50 Bcm max

-10 % or 60 GW → + 80 Bcm max

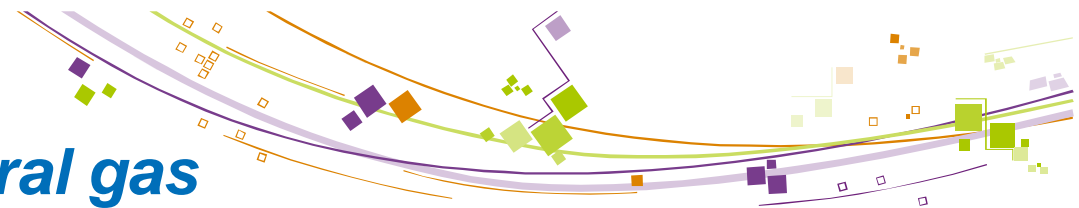
(Nuclear : 330 GW in 2008 / 610 GW in 2035)



Towards a progressive market tightening



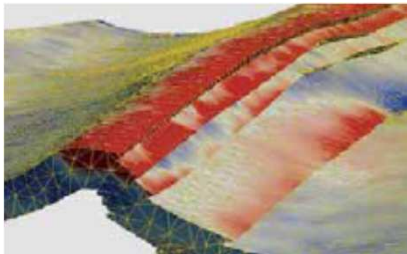
Source: Cedigaz



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Pushing back the limits in oil & gas exploration and production

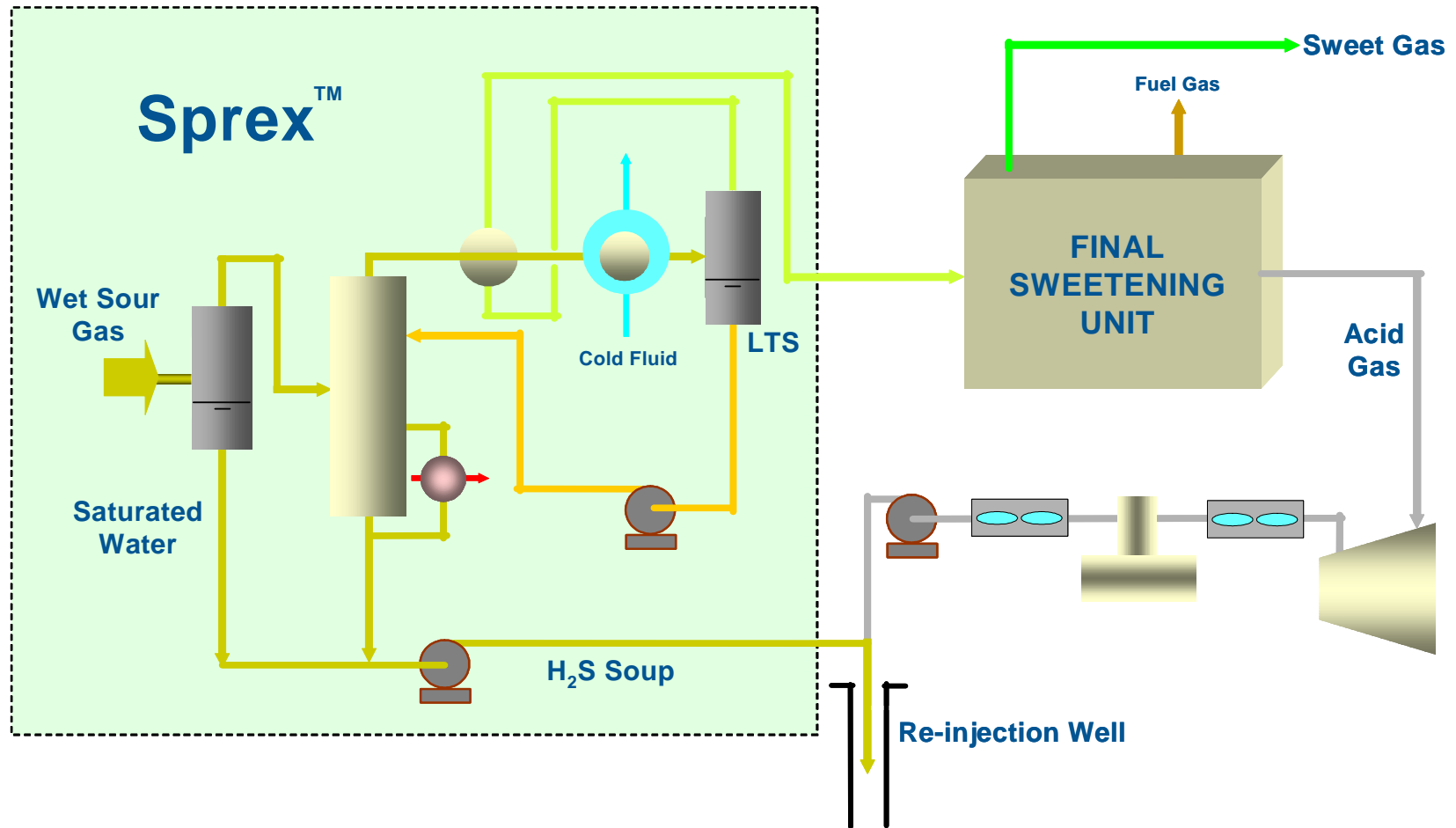


- **Increasing exploration success rates:** developing basin modelling software incorporating the quantification of uncertainties (foothill zones...)
- **Improving field recovery** (field management).
- **Developing fields in extreme environments** (Arctic, ultra-deep offshore, sour gas...)





The challenge of very sour gas



GTL Technology



- GTL pilot plant in Italy
 - ➔ **High-grade gasoil**
- Large experience in products work-out
- Reduction in the cost : integration of units and best technological choices.



EniTecnologie

Impact of oil market Renewal of interest for GTL?



Projects in North America

- **Talisman Energy / Sasol : 2 x 48 000 bbl/d (2x 3 B\$)**
Farrell Creek; Montney basin in British Columbia.
- **Envisaged by Shell**

Production costs

**70 à 100 \$/bbl for petroleum products (ROI 10 to 15%),
60 à 83 \$/bbl mini. for oil.**

Assumptions

Investments: 65 000 \$/b/d (Source Sasol)

Returns: 60% (9 Mbtu/bbl produced)

Gas: 4 à 6 \$/Mbtu (36 à 54 \$/b)

Opex: 10 \$/b

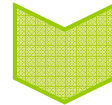
NGV engines: IFP's Experiences

VEhicule Hybride au GAz Naturel VEHGAN

Downsizing

Mild-Hybridisation

CNG engine



Urban vehicle project with very lean CO₂ emissions (<80 g/km)

Offshore liquefaction projects





Concluding remarks

- **Short term impact of the stock market crisis**
- **But on the longer term natural gas will undoubtedly play a key role in the energy transition. However, gas has to compete with other energy sources**
- **It's further growth will be conditioned by a number of challenges, including climate change. The price of the ton of CO₂ will be a key element**
- **Technology will contribute to solutions**
- **Huge challenges in developing and financing the gas industry are ahead.**