



World Energy Perspectives

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GRTgaz

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Summary

- I Energy/Climate**
- II World energy perspectives**
- III European Ambitions**
- IV Investments amidst uncertainties**
- V Corporate challenges**

“The New energy Crisis: Climate, Economics and Geopolitics”

- **Edited by Jean-Marie CHEVALIER with contributions of:**

Marie-Claire AOUN, Nadia CAMPANER, Michel CRUCIANI, Patrice GEOFFRON, Askar GUBAIDULLIN, Iva HRISTOVA, Jan Horst KEPPLER, Delphine LAUTIER, Sophie MERITET, Nadia OUEDRAOGO, Stéphane ROUHIER, Fabienne SALAUN, Yves SIMON, C. Pierre ZALESKI

- **Palgrave English edition 2009**
- **“Les nouveaux défis de l'énergie: climat, énergie, géopolitique” (Economica, 2009)**

Some Significant Events

- **The Stern review**
- **“An inconvenient truth” (Al Gore)**
- **IEA 2006 outlook: “The energy future we are creating is unsustainable”**
- **November 2006: European blackout**
- **December 2007: The Alarming IPCC Report**
- **2006-2009: The question of Russian gas**
- **2008-2009: The European Climate Energy Package**

The growing awareness of global warming and the urgency to act



October 2008

Update of Climate Change since IPCC 2007

Stefan Rahmstorf

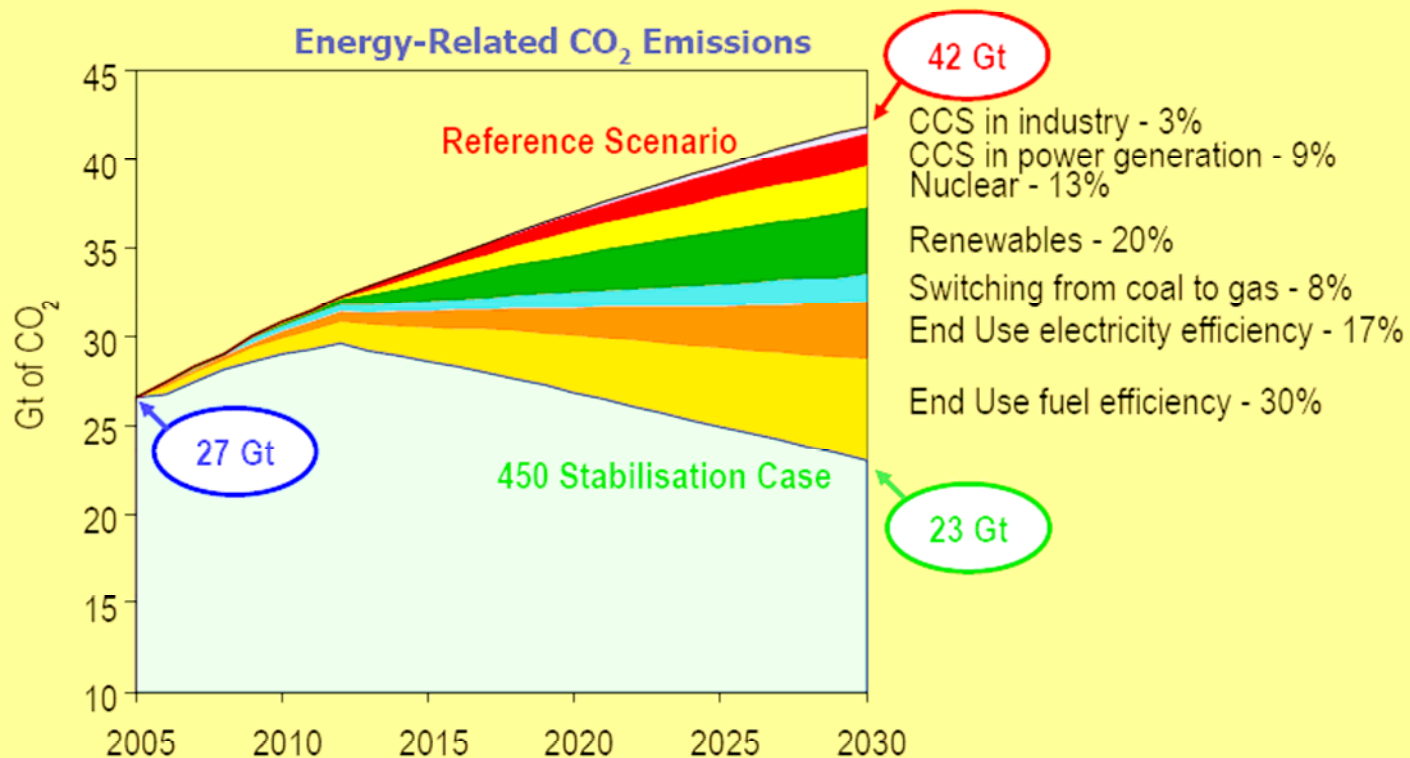
**Potsdam Institute for Climate Impact
Research**

- 1. Rise of CO2 emissions and concentration higher than expected**
- 2. Temperature rises more than expected**
- 3. Arctic ice loss more rapid than expected**
- 4. Rise of sea level higher than expected**
- 5. Tropical storms more frequent, more violent**

Copenhagen December 2009

- **European Union + United States**
 - **Improving Efficiency**
 - **Developing Renewables**
 - **Emissions Reduction**
- **A single world ETS?**
- **Carbon Tax?**
- **A US-China agreement (coal)?**
- **Green Fund**

CO₂ Emissions - 450 Stabilisation Case

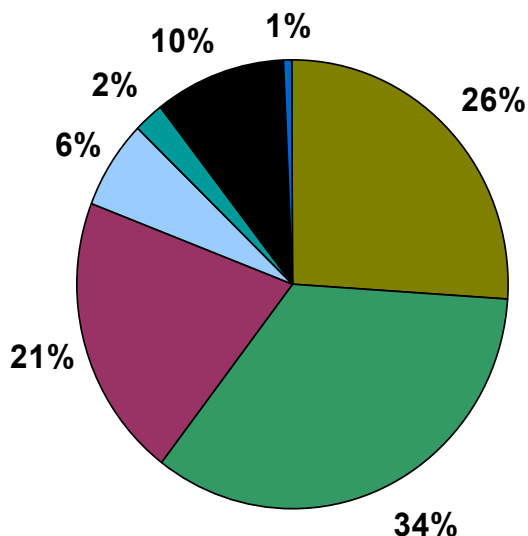


Stabilising greenhouse-gas concentration at 450 ppm would require emissions to be reduced to 23 Gt in 2030

World Energy Balance

2006

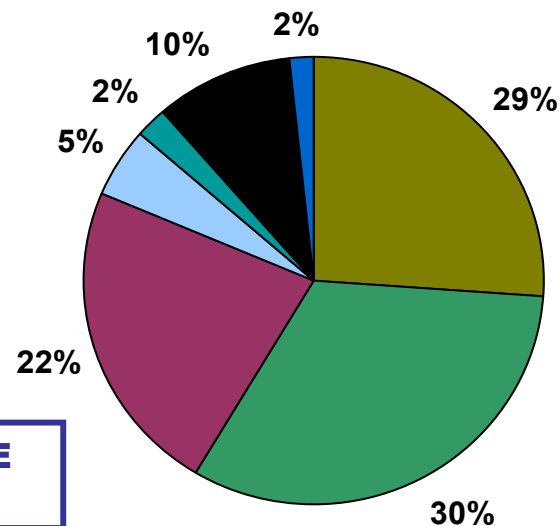
12 Gtoe



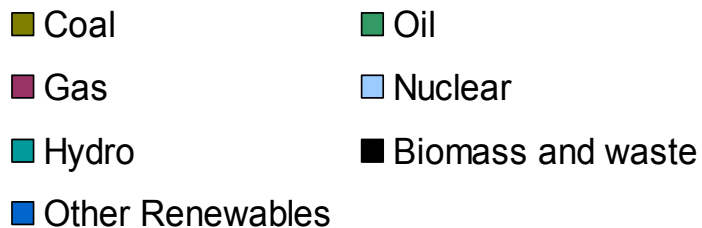
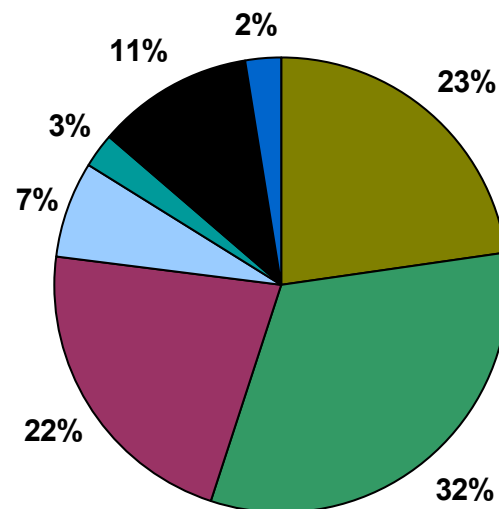
**CLIMATE CHANGE
UNCERTAINTIES**

2030

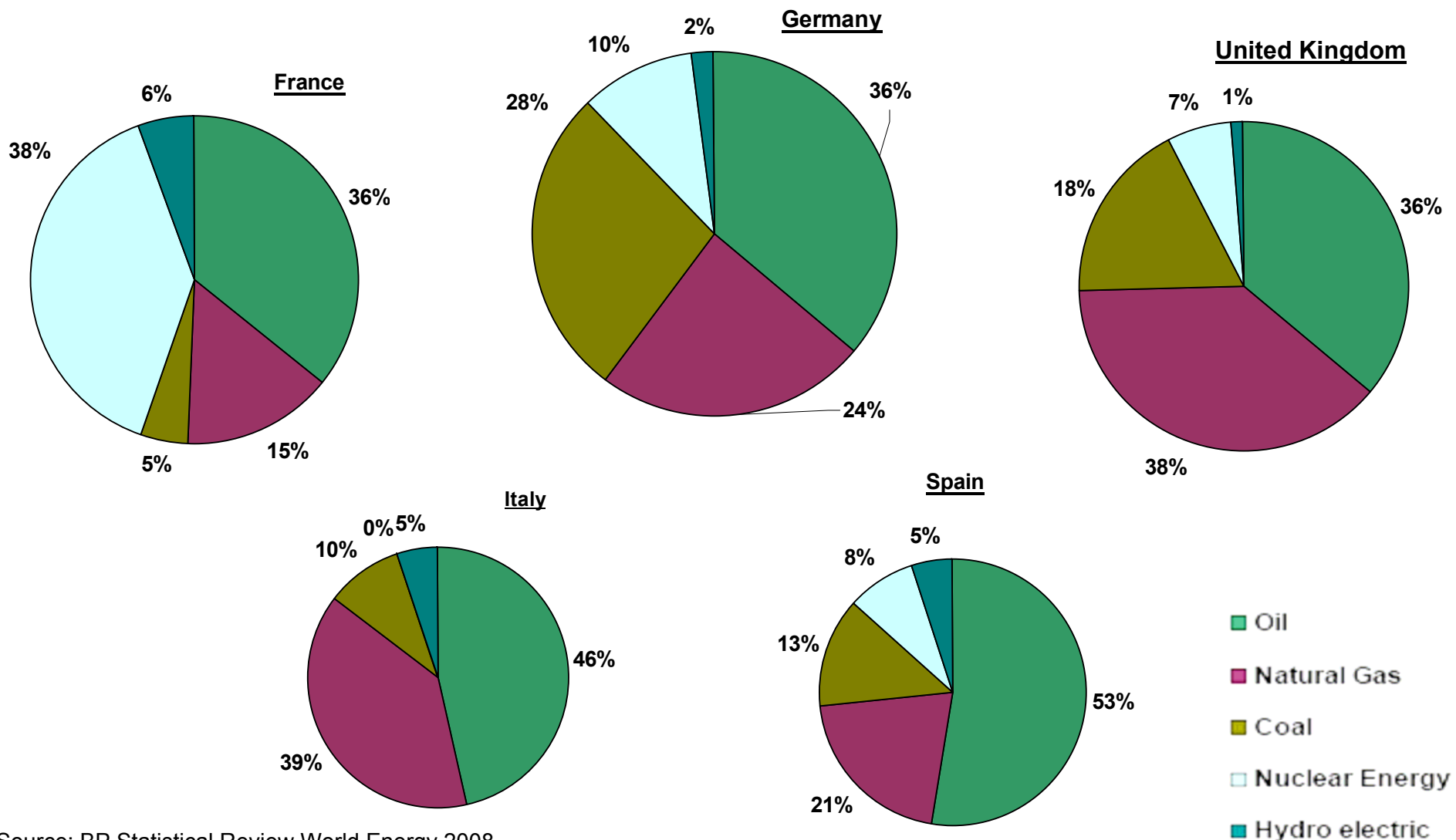
Reference Scenario 17 Gtoe



Alternative Scenario 15 Gtoe



European Energy Diversities



USA, China & Europe

	USA	CHINE	UE
Population (million)	297	1 304	459
% of World population	5%	20%	7%
Primary Energy Consumption (million toe)	2 337	1 554	1715
% of World Energy Consumption	22%	15%	16%
Energy consumption / capita (toe)	8	1.1	3.7
Nb. of vehicles (million)	223	13	229*
Foreign oil dependency	50%	50%	77%
Oil imports 2005 (Mbd)	13.5	3.4	13.3

European Standards for China

➤ **Vehicles**

641

➤ **Gas oil and gasoline consumption**

17Mb/d

World reserves of oil, gas and coal

	Pétrole	Gaz	Charbon
Réserves (en Gtoe)	180	162	606
Ratio Réserves/ Production (en années)			
2007	50	62	134
1973	31	48	na
Concentration des réserves	OPEP = 70%	OPEP = 75,7% Russie Iran 57% Qatar	US = 27,1% Russie = 17,3% Chine = 12,6% Inde = 10,2% Australie = 8,6%

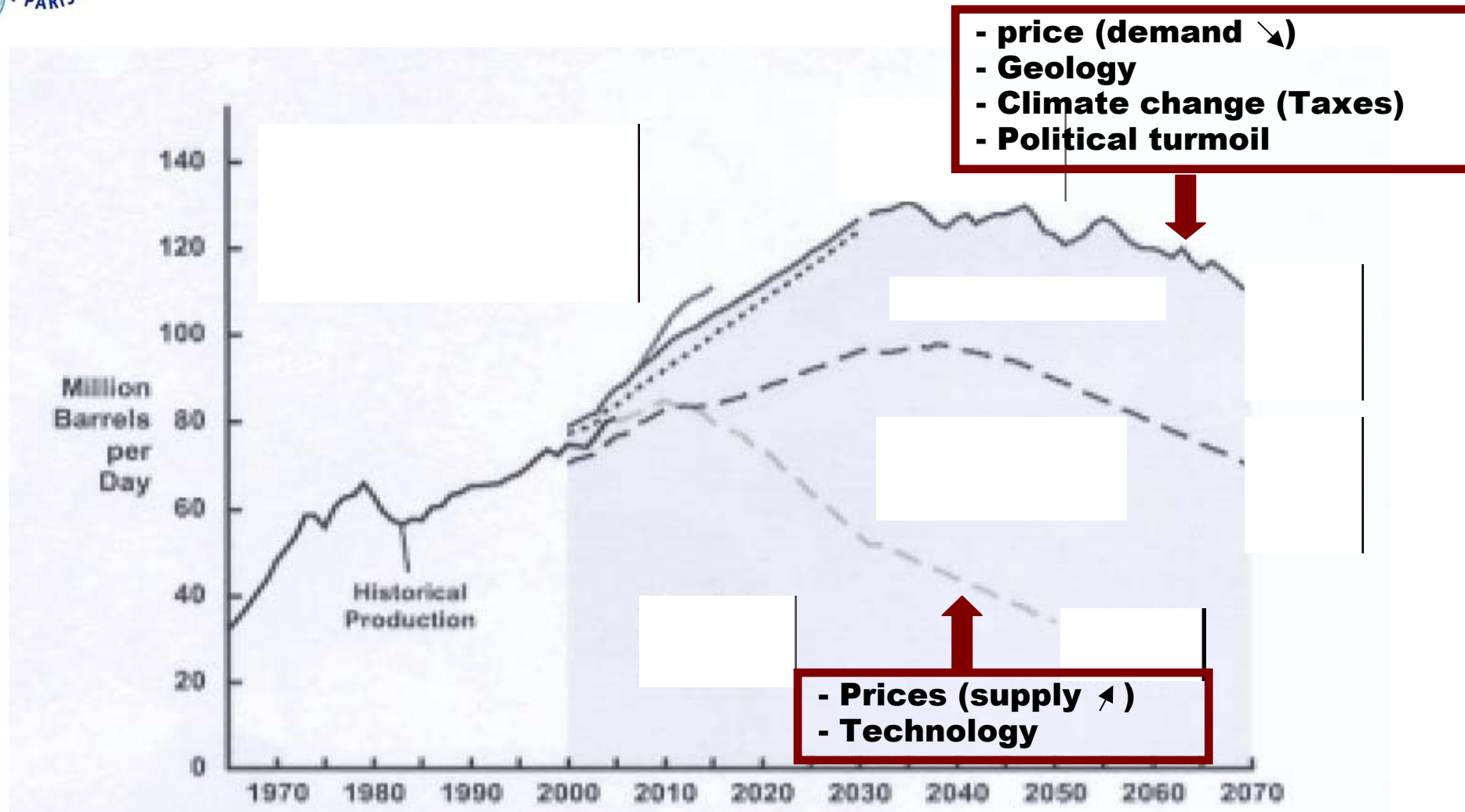
Source: BP Statistical Review of World Energy, June 2008 and BGR, 2008

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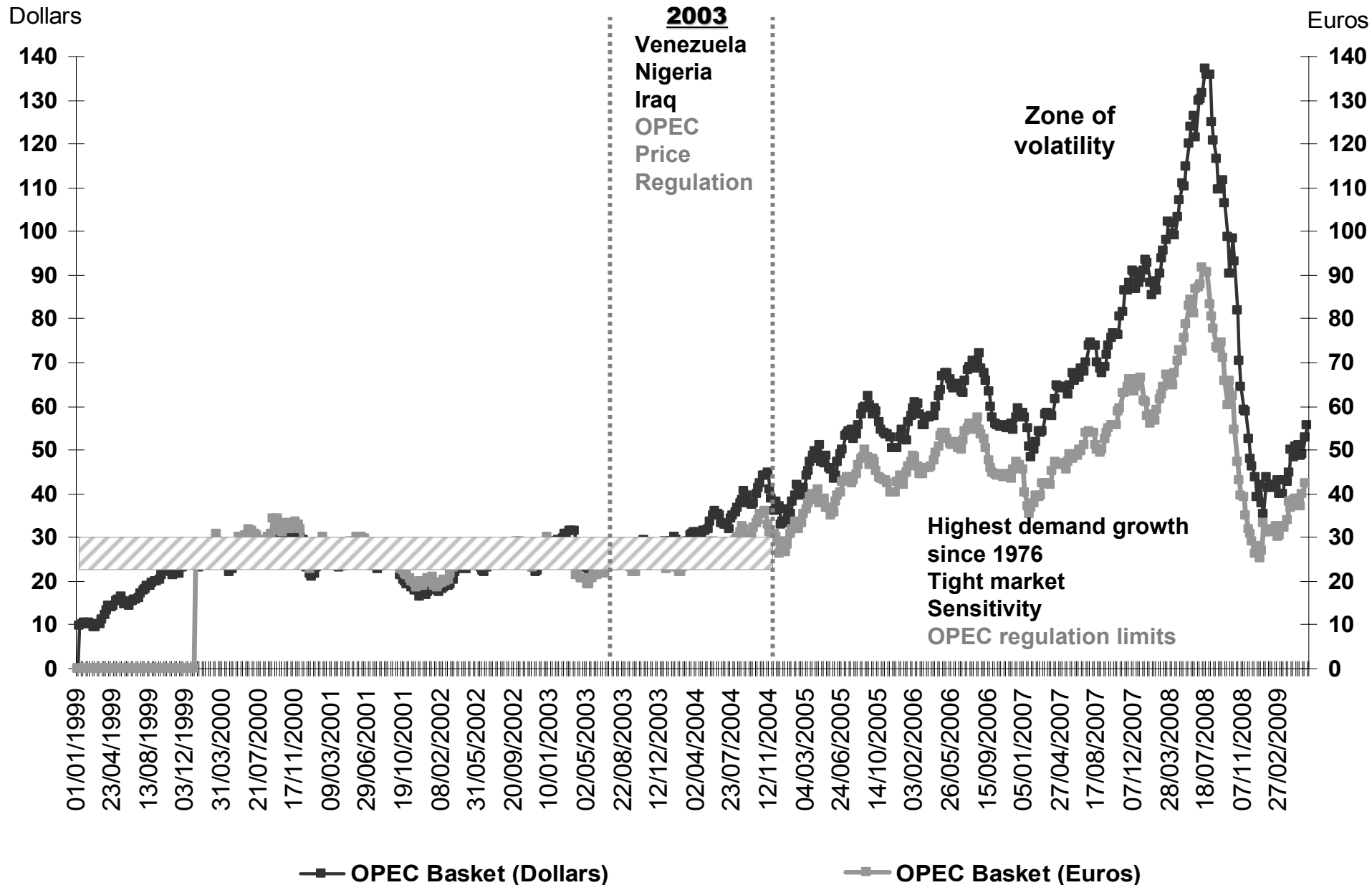
The concept of reserves

- **Proven, Recoverable reserves (at present economic and technological conditions)**
- **Reserves figures are flexible: technology – new discoveries**
 - **prices**
- **Owners do not need to discover too much**
- **Peak oil depends on:**
 - **Geology**
 - **Price**
 - **Technology**
 - **Demand patterns**
- **Uncertainty about the date and the shape of the peak (undulating plateau?)**
- **Even if peak is not for tomorrow, we have to prepare the beyond petroleum era.**

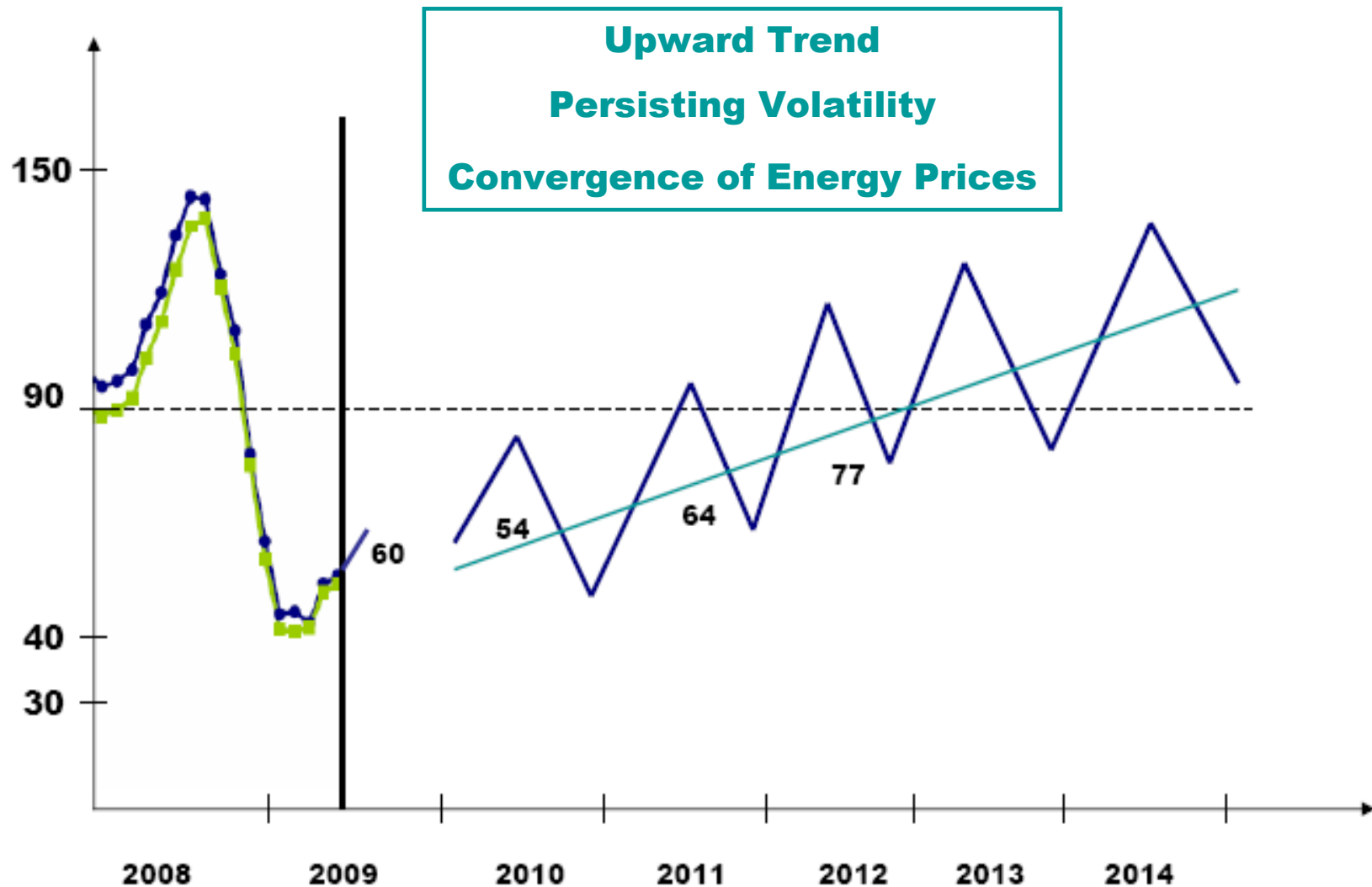
What is the Shape of the Peak Curve?



Oil Price



What Price for Oil?



The European Energy Vision

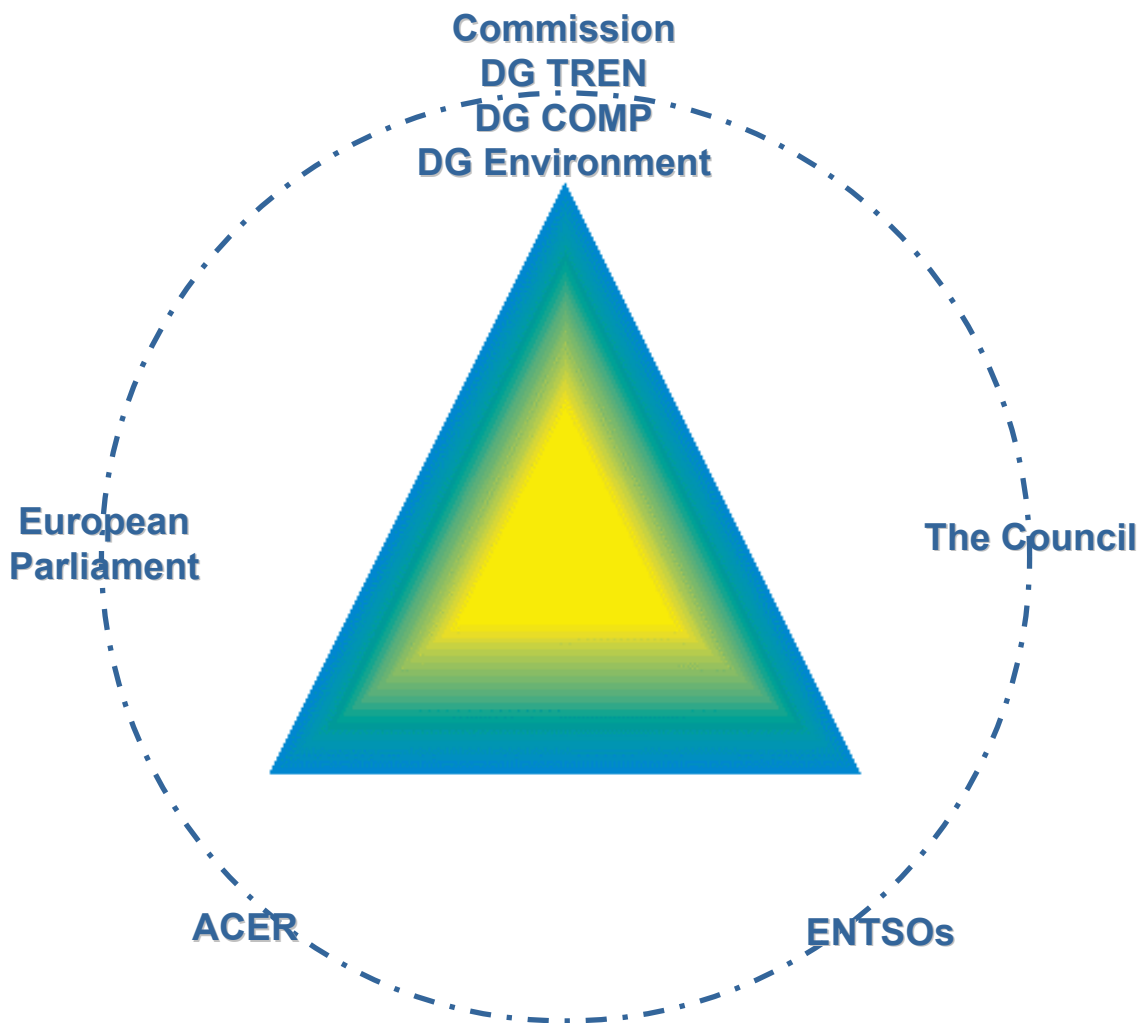
- **Reduction of GHG emissions (- 20 %)**
- **Improvement of energy efficiency (+ 20 %)**
- **Diversification of energy balances (20 % renewables)**
- **Diversification of energy suppliers**
- **Security of energy supply (oil – gas - power)**
- **From pure market competition to the “Policy Trilemma”: competitiveness – sustainability – security of supply**

**What
Impact
on
Demand ?**

The implementation of the Third Energy Package

- **Unbundling is becoming a corporate choice (OU – ISO – ITO)**
- **A New dynamic for regulation (ERGEG – ACER)**
- **A New dynamic for regulated transmission systems (ENTSOs)**
- **A New complex institutional dynamic**
- **A building step by step of a single competitive market (hubs)**
- **France Key position (plaque tournante)**

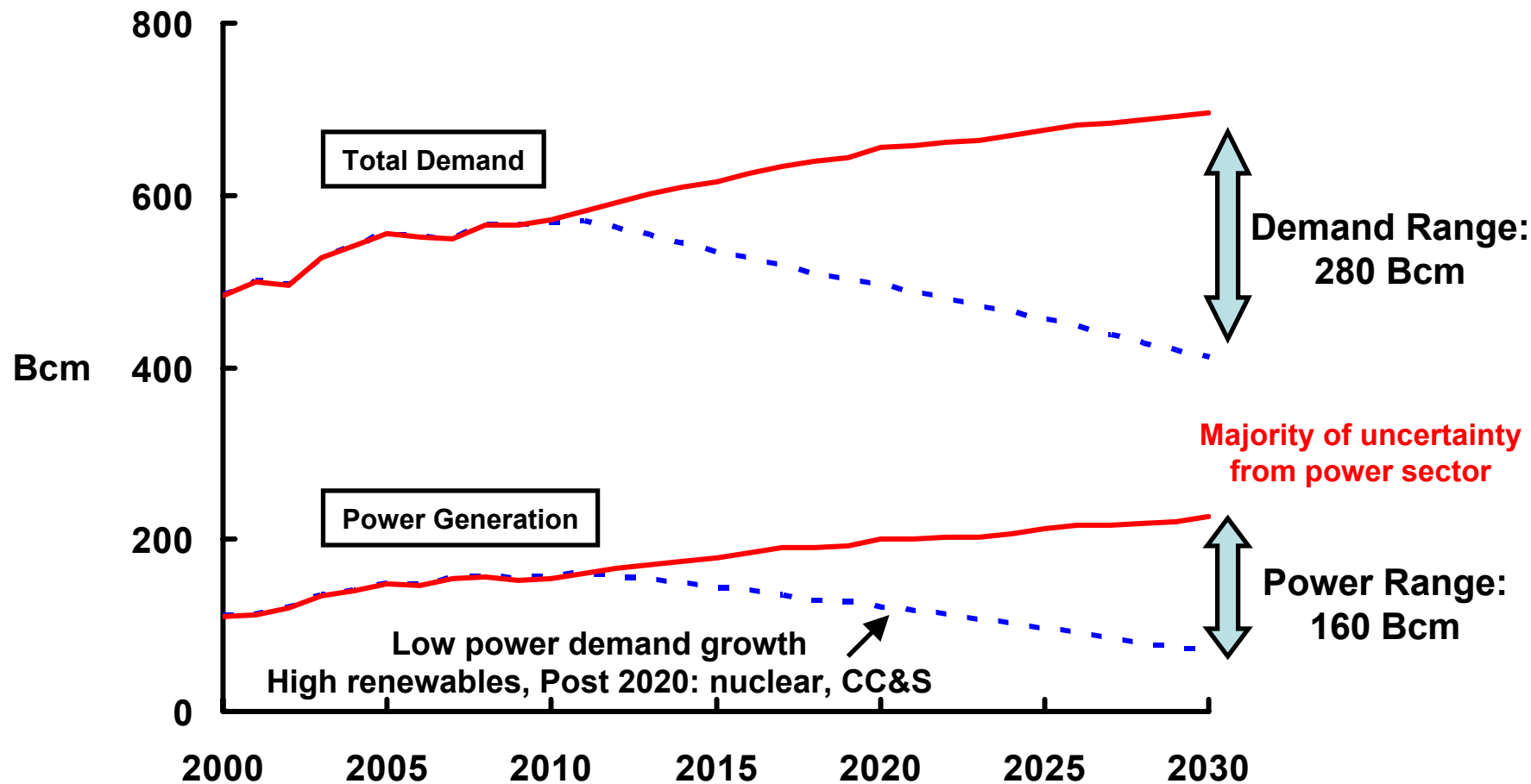
The New Institutional Dynamic



Source: Cambridge Energy Research Associates (IHS- CERA), 2009

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Gas Demand Growth—Dependent on the Success of Renewables and Efficiency Policies



- Increasing gas demand is no longer a predetermined element

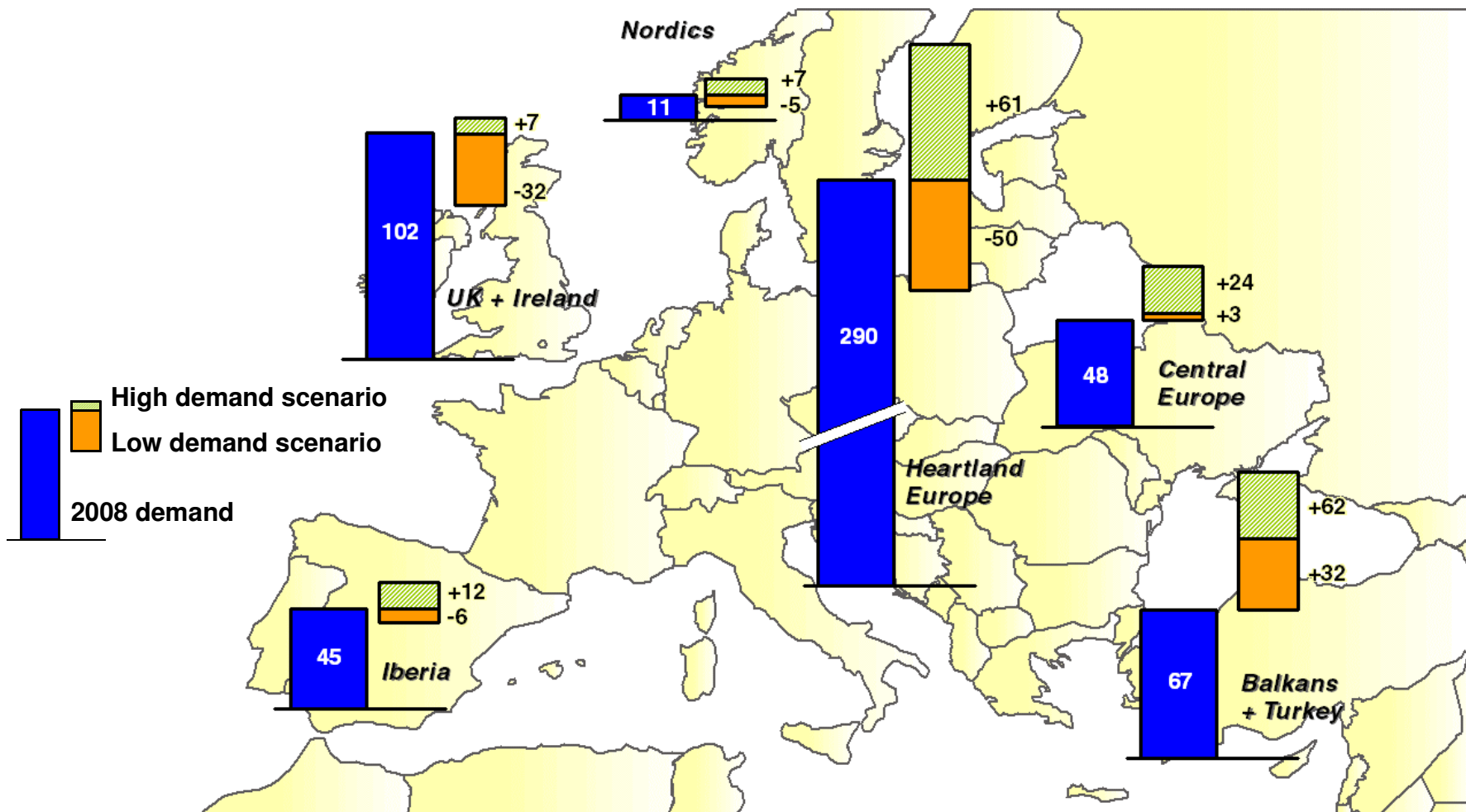
Note: Europe = EU27, Switzerland, Norway, Balkan countries and Turkey

Source: Cambridge Energy Research Associates (IHS- CERA), 2009

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Demand Growth is Highly Uncertain With a Large Disparity by Region

Incremental change in gas demand by 2030 (bcm)

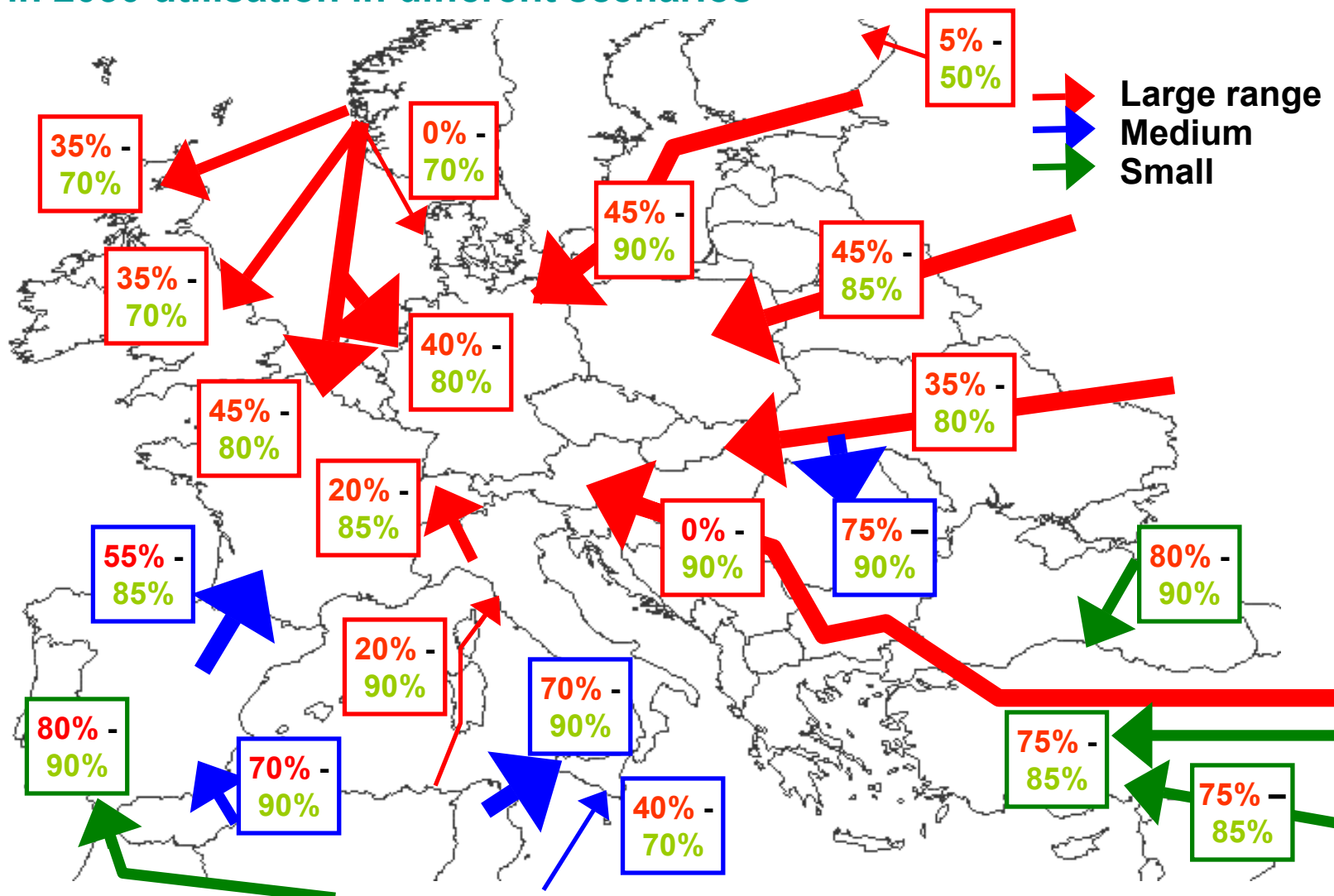


Source: Cambridge Energy Research Associates (IHS- CERA), 2009

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Supply/Demand Uncertainty - Impact Varies Across New and Existing Gas Pipelines

Range in 2030 utilisation in different scenarios



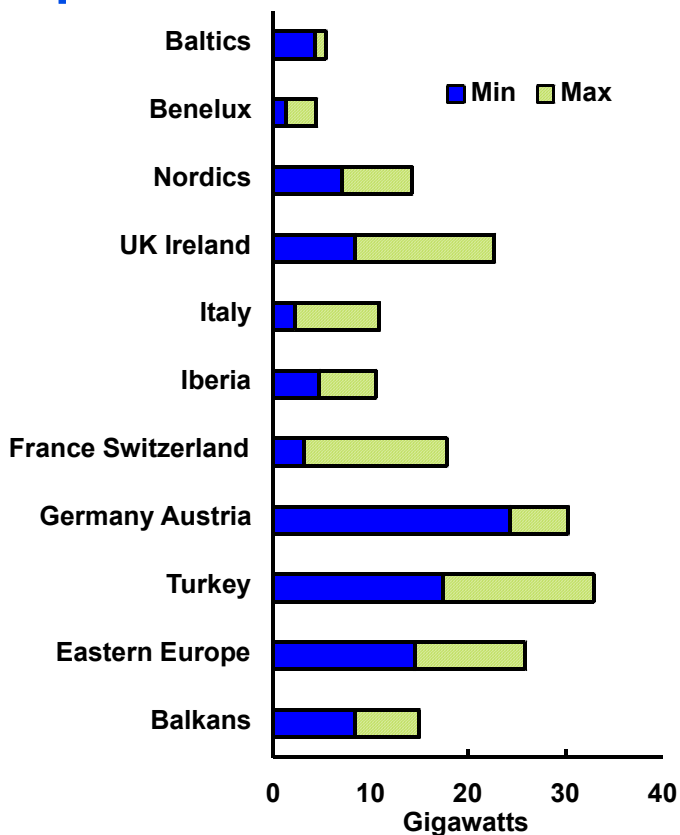


The Level of Gas Demand in 2030 is Depending on.....

- **The structure of economic recession and recovery**
- **Improvement of energy efficiency (esp. buildings)**
- **Development of renewables**
- **Reduction of GHG emissions**
- **Raise and fall of nuclear capacities**
- **The development of unconventional gas**
- **The global LNG market**

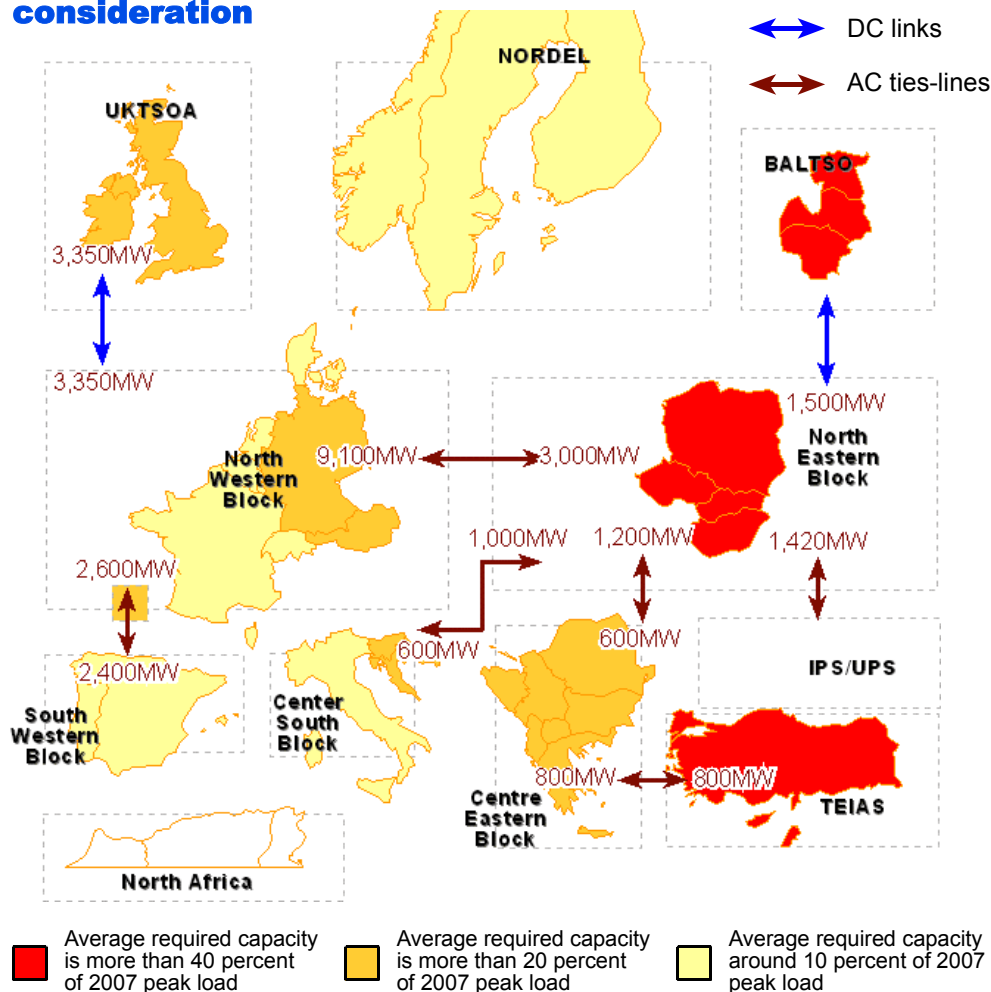
Uncertainty in Electricity infrastructure requirements

Incremental power capacity required in 2020*



* Required capacity by region has been estimated based on CERA's scenarios for demand evolution, plant retirements and regional reserve margin levels required to maintain adequate supply (including an adjustment for intermittency of specific generation technologies)

New interconnector capacity under consideration

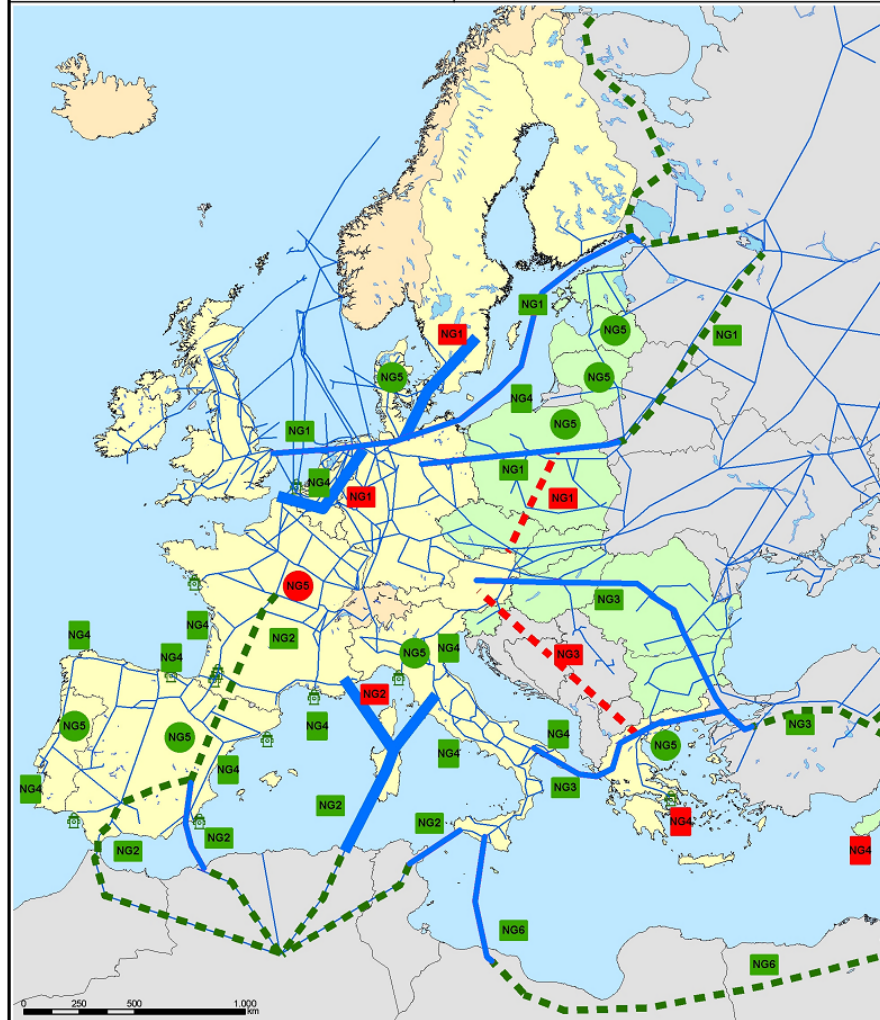


Source: UCTE, IHS- Cambridge Energy Research Associates

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Investments for the Future

- **Corporate decision amidst uncertainties = risk**
- **Regulatory incentives**
- **The need for public planning?**
- **The Ten Years planning process**
- **The risk of overcapacity (socialisation of cost ?)**
- **The need for greater cooperation between players**



— Projects of European Interest



— Projects of European Interest

© EuroGeographics 2001 for the administrative boundaries. Cartography: Eurostat - GISCO, 04/2003

Source: IHS Cambridge Energy Research Associates (CERA), 2009

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Corporate Strategic Priorities

- **The world is changing**
- **The key moment of Copenhagen**
- **From a supply sided to a demand minded approach**
- **From top down to bottom up (local communities)**
- **Opportunities for innovations (ex. Smart Grid)**
- **Flexibility - Adaptability**
- **Opportunities for arbitrage (CO₂, oil, etc)**
- **New services**