

Quelles ressources en matières premières pour un système énergétique durable ?

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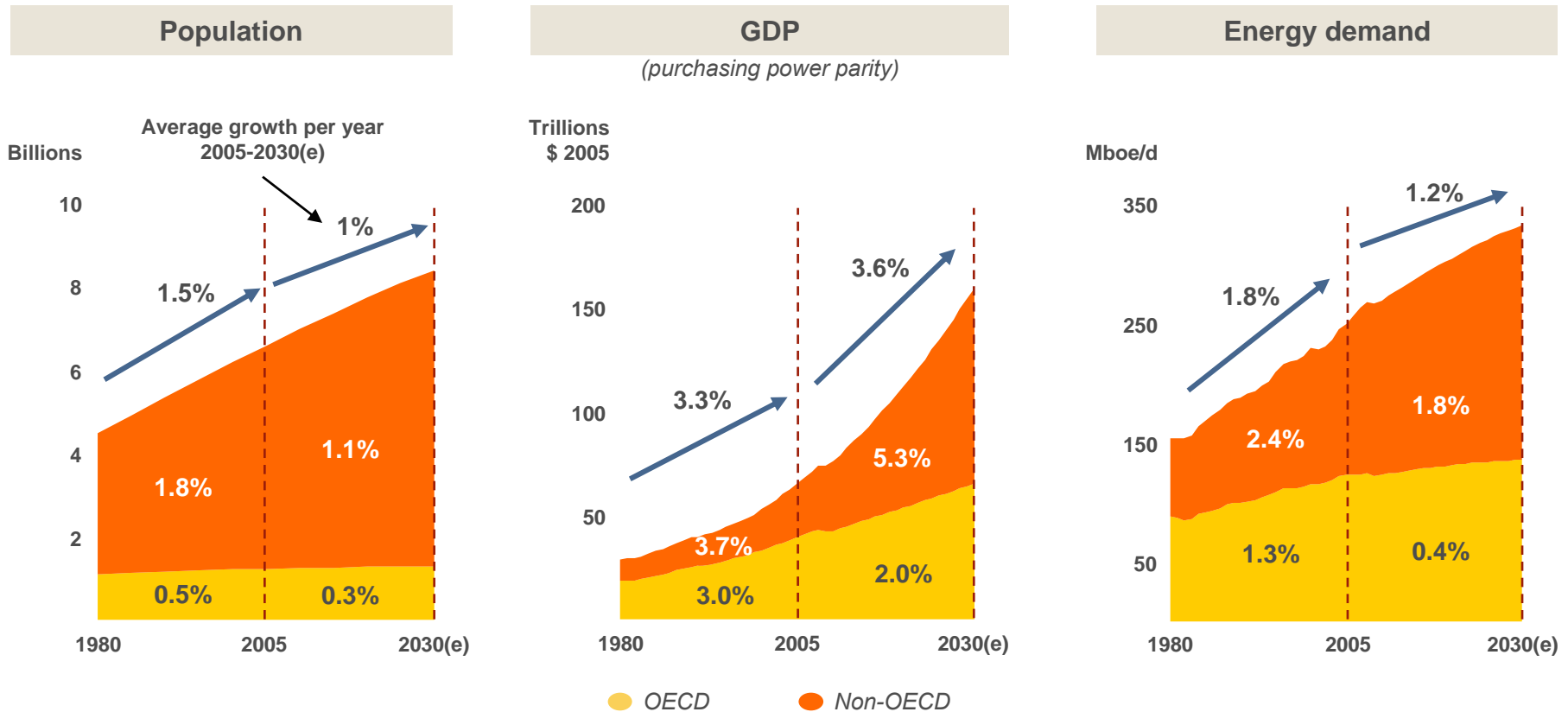
Panorama 2010 IFP

Lyon

4 février 2010



Energy demand will grow driven by emerging countries needs

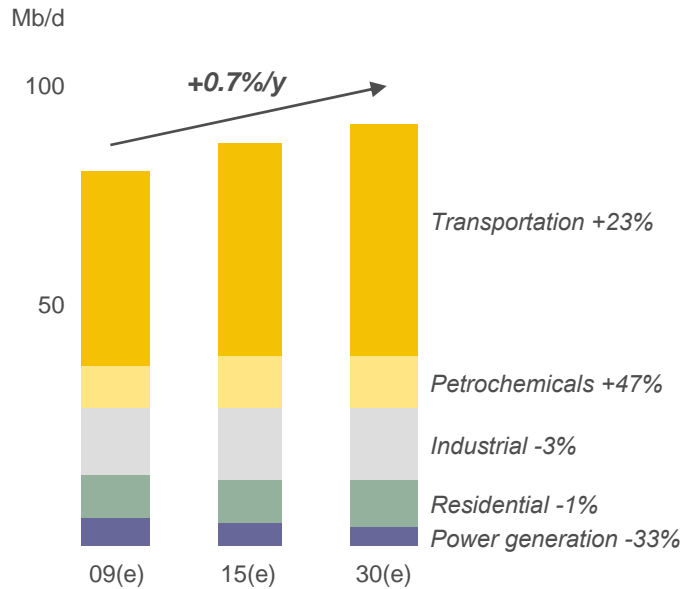


Transportation and power generation are main components in energy demand growth

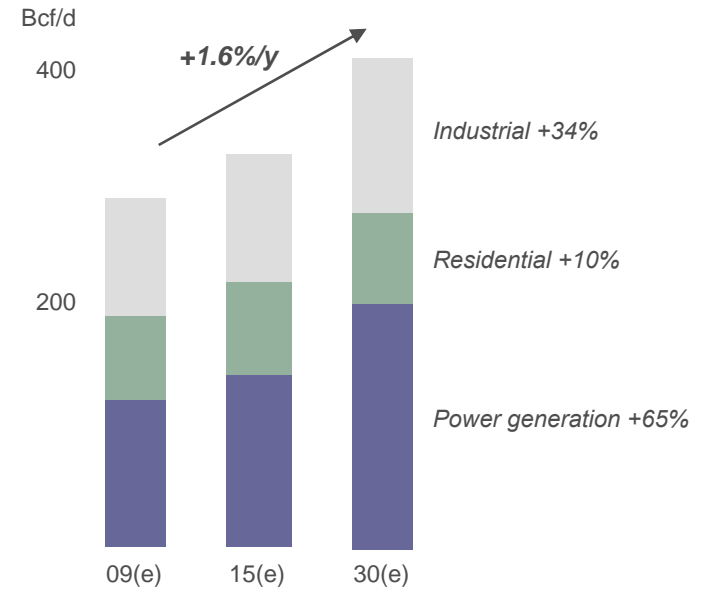
Demand growth in OECD countries needs to be limited through improved energy efficiency

Oil and gas demand driven respectively by transportation and power generation

Oil demand by sector

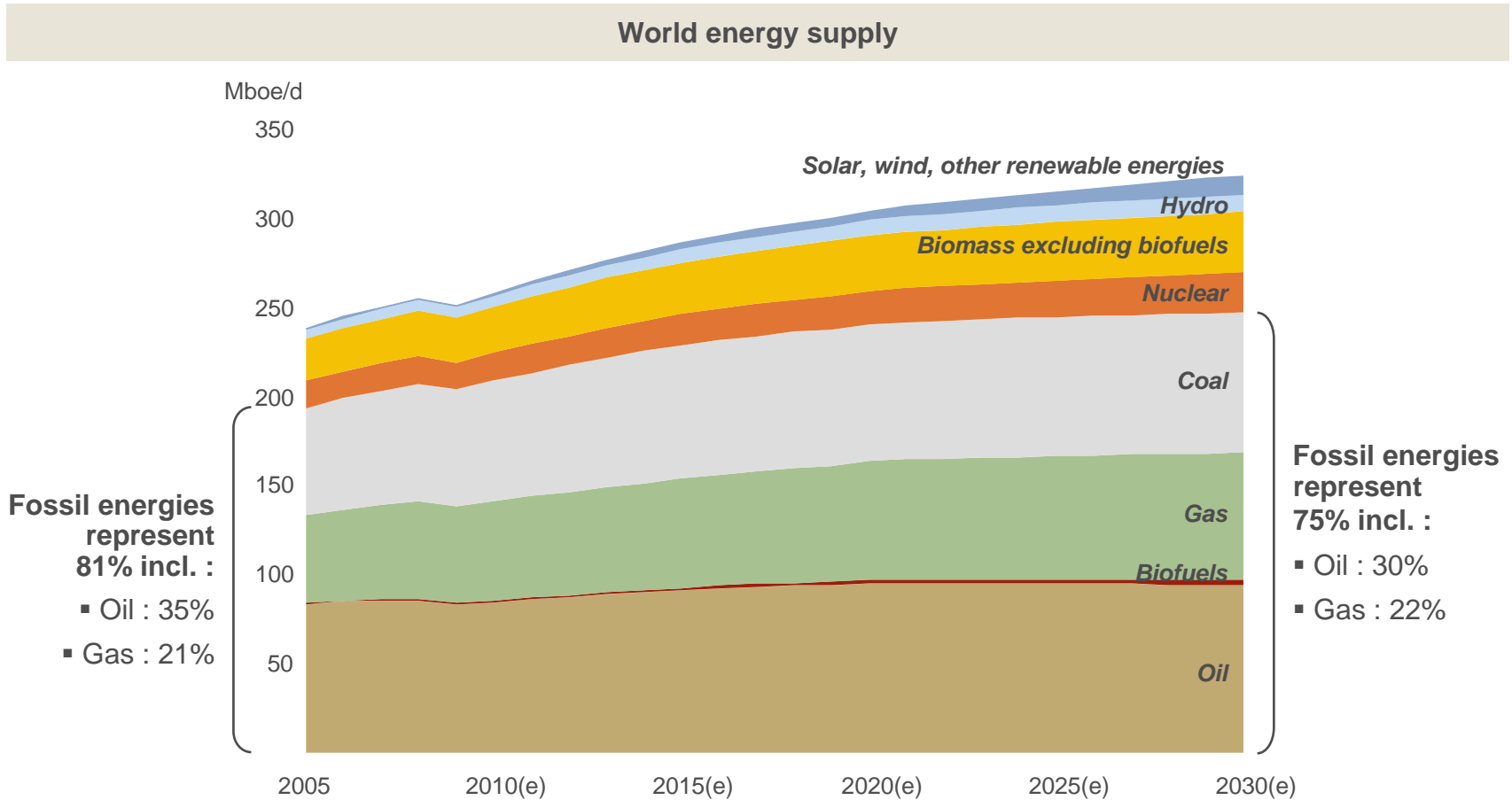


Gas demand by sector



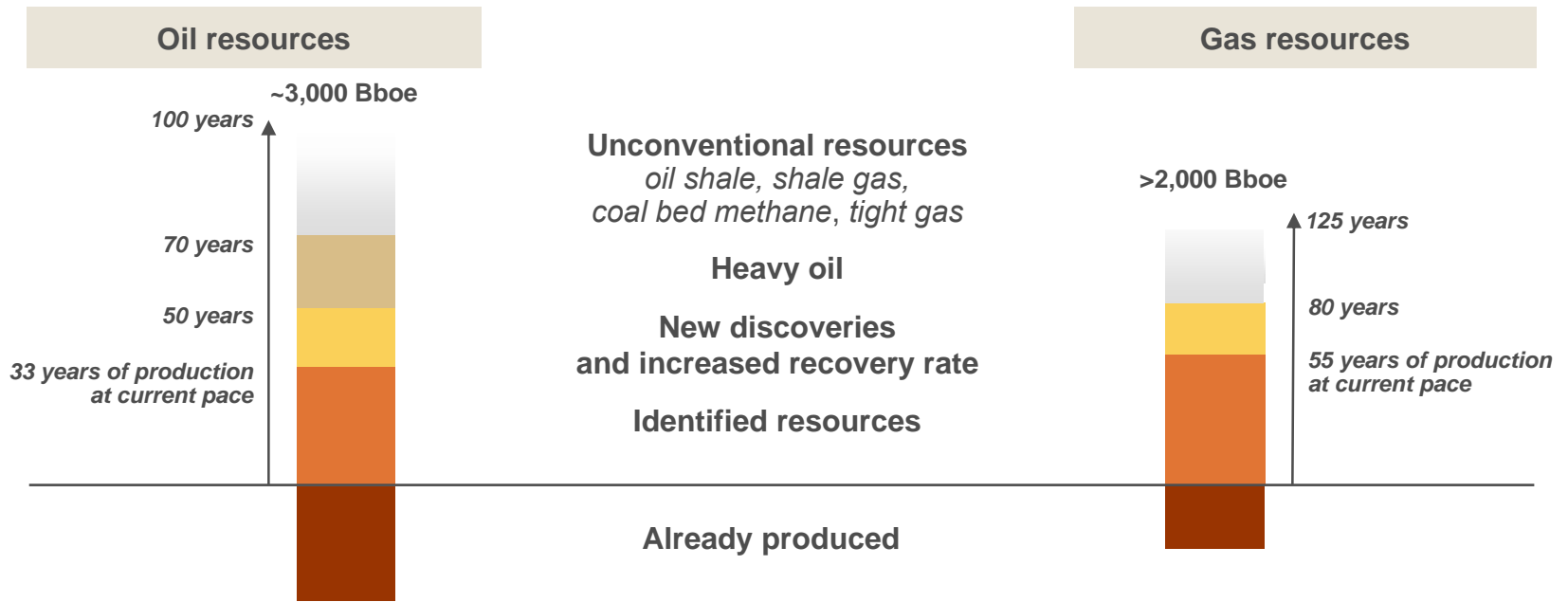
Limited supply provides support for higher oil prices
Specialization of oil and gas uses

Fossil energies still to represent 75% of energy supply in 2030



Diversification of supply is needed to satisfy the energy demand

Significant hydrocarbon resources yet to be produced



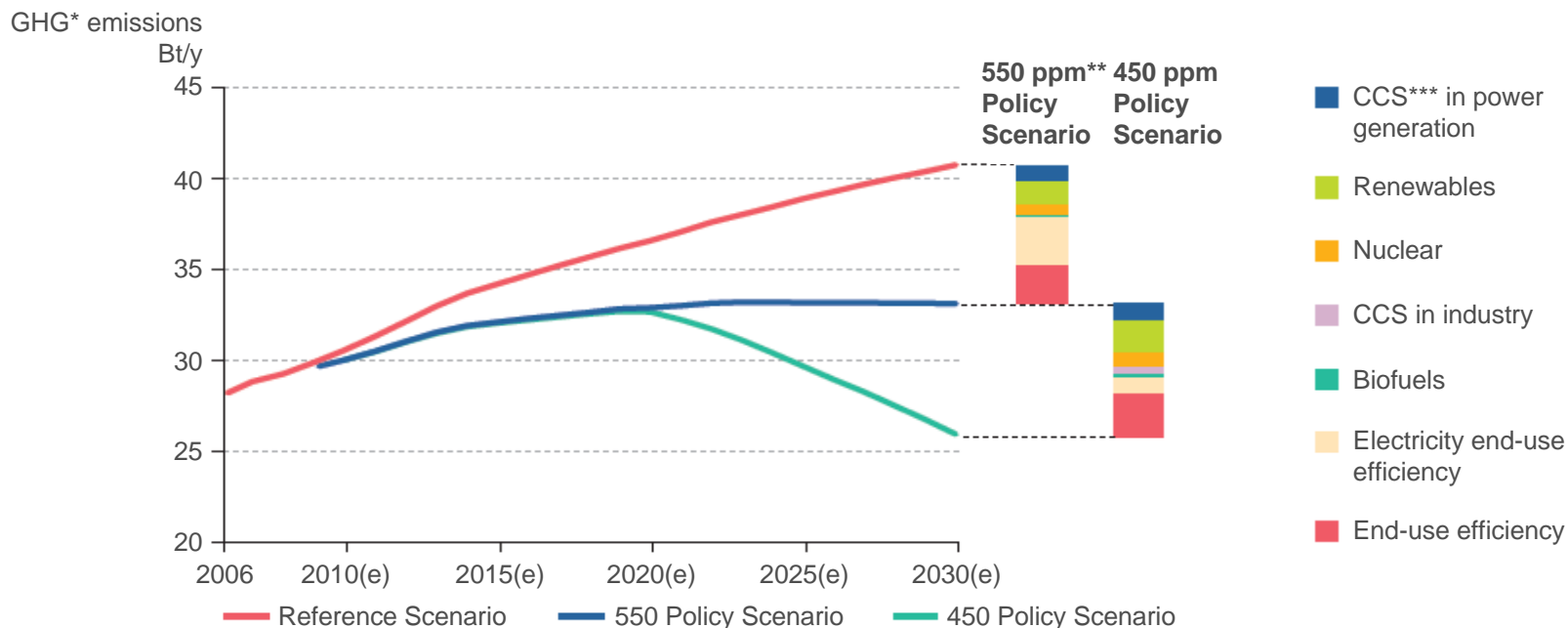
- › Conventional oil located mainly in the Middle East
- › Heavy oil concentrated in Canada and Venezuela
- › Conventional gas resources concentrated in Russia, Iran and Qatar
- › Development of shale gas production in the US driving a reevaluation of unconventional gas resources
- › Transportation and liquefaction constraints limit development of isolated gas resources

Oil and gas resources require advanced technology and large scale investment

With ample availability of oil and gas and existing infrastructure, hydrocarbons will be dominant fuel source for the next decades

Climate change : limiting greenhouse gas emissions is needed for sustainable growth

International Energy Agency climate scenarios



All technologies needed to reach CO₂ concentration targets

High costs to implement required GHG reductions

All countries must be involved, including non-OECD countries

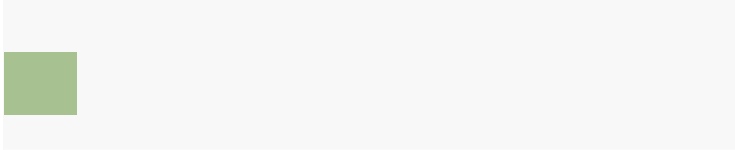
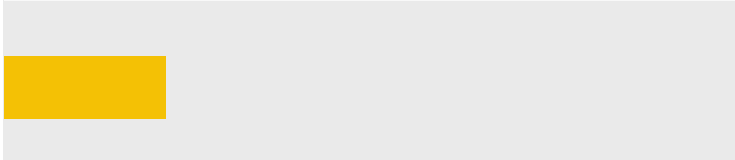
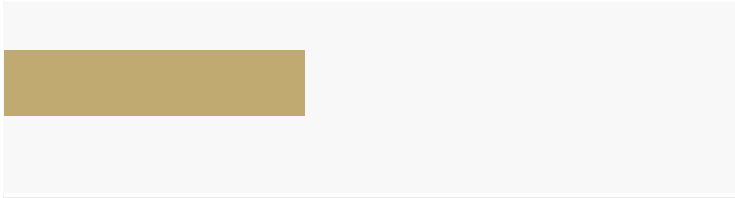
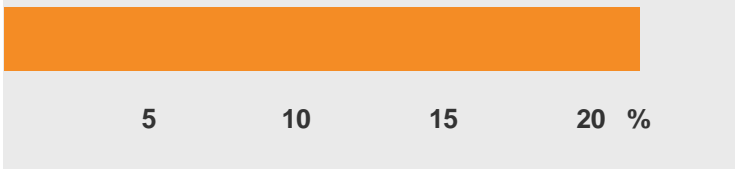
source : IEA 2008

* GHG : Greenhouse Gas expressed as CO₂ equivalent

** ppm : parts per million

*** CCS : CO₂ Capture and Storage

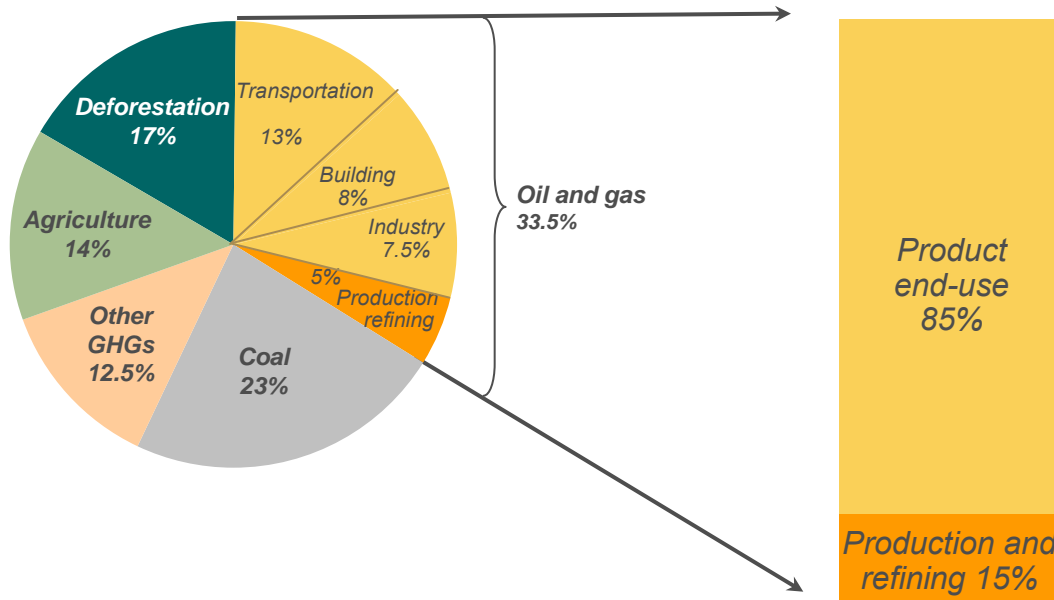
Renewables are growing fast but will still represent a limited part of the energy mix in 2030

Rate of growth pa. 2010-2030 (%)	Pros	Cons
<p>Hydro</p> 	<p>Low CO₂ intensity</p>	<p>Limited potential Environmental impact (population displacement...)</p>
<p>Biofuels</p> 	<p>Low CO₂ intensity expected from 2nd generation biofuels Complementary source for liquid fuels</p>	<p>Competition with food security for 1st generation biofuels Costs, global analysis (water...)</p>
<p>Wind</p> 	<p>Low CO₂ intensity</p>	<p>Limited technological progress High costs Acceptability Variable peak rate</p>
<p>Solar</p> 	<p>Unlimited supply Strong potential for efficiency and cost improvement Access to electricity in remote areas</p>	<p>High costs in early stages Variable peak rate</p>

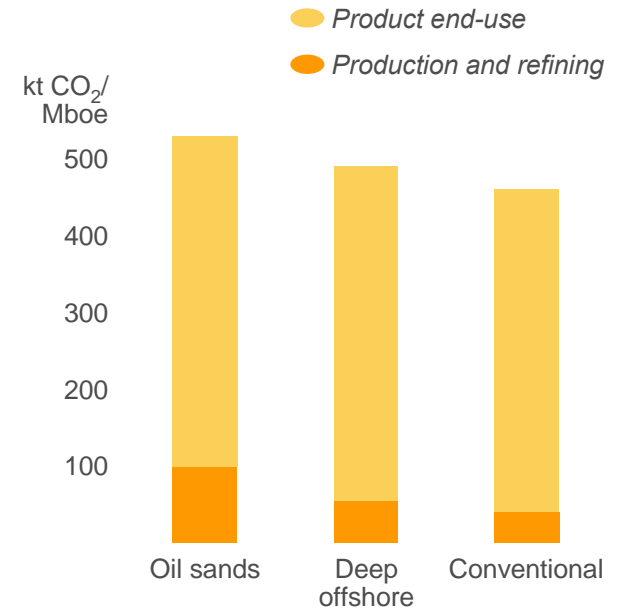
Solar : very high rate of growth but still a limited part of the power mix in 2030
Biofuels : development favored by availability of 2nd generation fuels

Oil and gas GHG emissions

Global GHG emissions by origin*



GHG emissions by oil source**

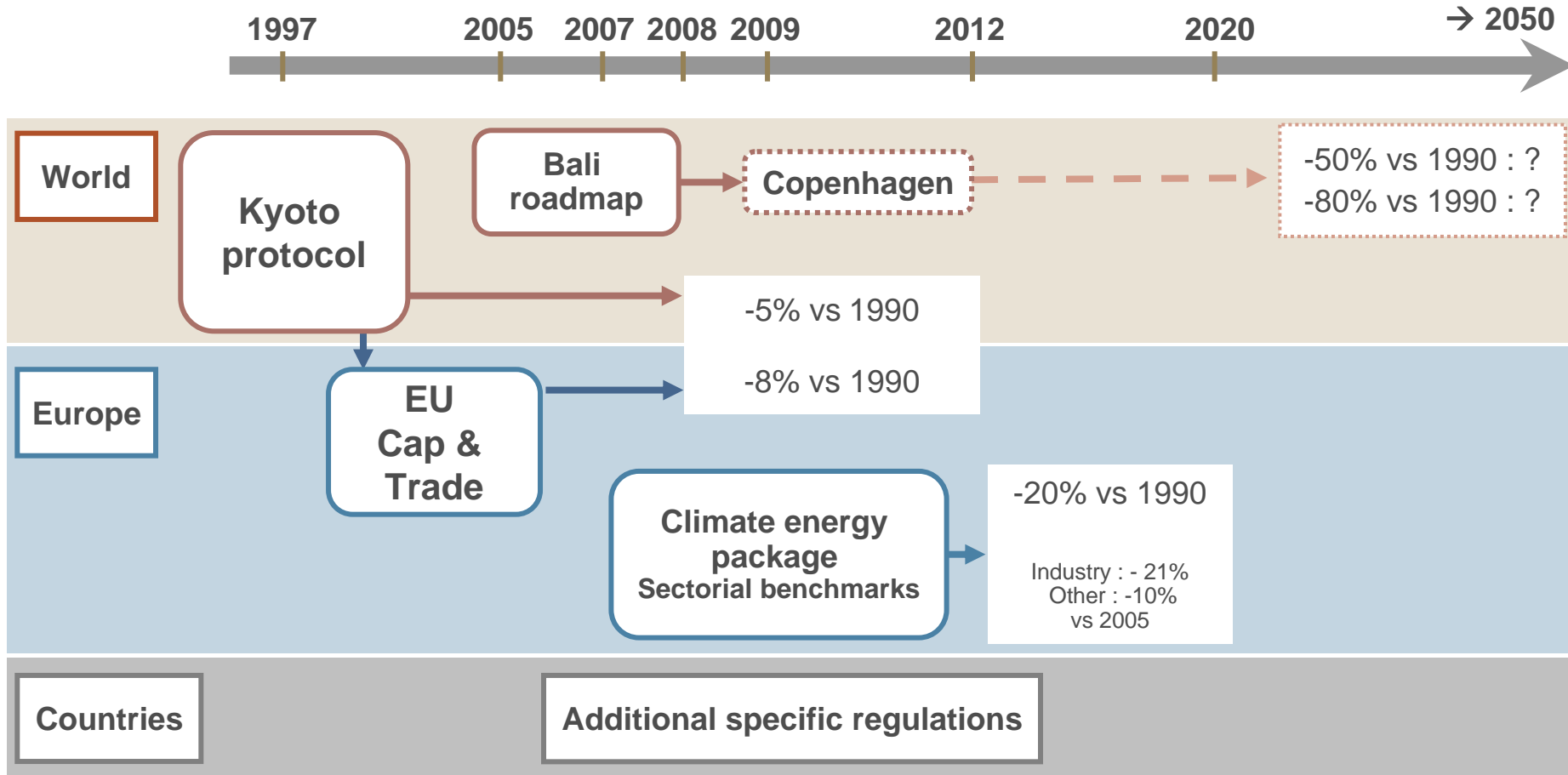


Working on solutions for production and refining
Need to work with industry and consumers
on greater efficiency in end-use phase

* International Panel on Climate Change (IPCC) 2007 and IEA 2007

** Total

Complex and evolving climate regulatory framework



International negotiations need to define global framework that is fair and avoids distortion of competition

Global O&G strategy to reduce climate impact

- **Managing greenhouse gas emissions and enhance the energy performance of our processes**
 - no flaring on new projects and flaring reduction on existing fields
 - Energy efficiency optimization both in current operations, best practices and promoting technologies
- **Develop new products / services improving life-cycle performance and designed to improve energy efficiency for our customers**
- **Secure the future of energy or broader energy supply**
 - R&D and partnerships on technology challenges :
renewables, XTL, new carriers, CO2 capture and storage (CCS)...

CO₂ capture and storage : a chain of potential technologies

Capture

For industrial units, power generation, gas treatment, LNG, gas turbines, unconventional crude production...

Post-combustion
(fuels + air)

Particularly fitted
for existing units

Oxy-combustion
(fuel + O₂)

On retrofitted
and new units

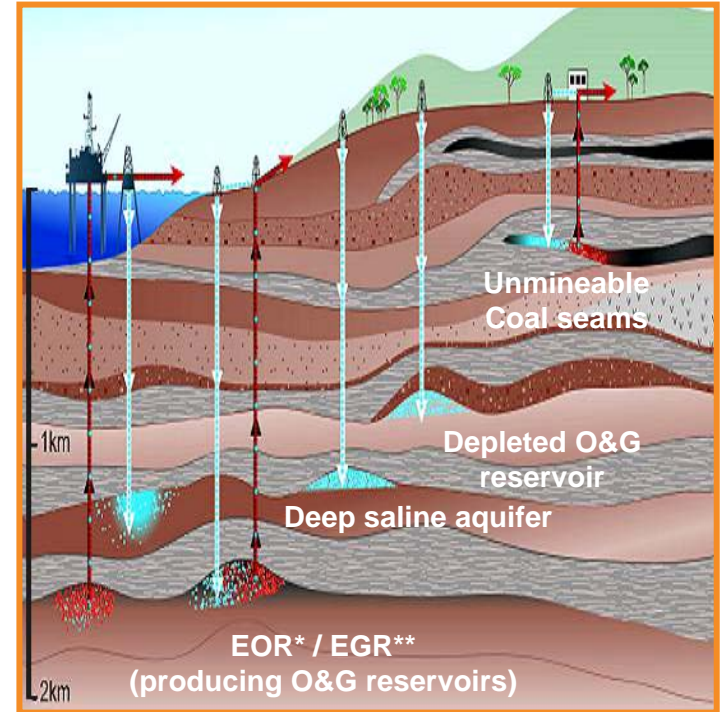
Pre-combustion

On new units

Transport



Geological storage



Committed to making CCS sustainable

Cooperation strongly needed with private and public stakeholders

Geological storage image source : IPCC

* EOR : Enhanced oil recovery

** EGR : Enhanced gas recovery

An important step :

CCS demonstration facility inaugurated in Lacq on Jan. 11th, 2010

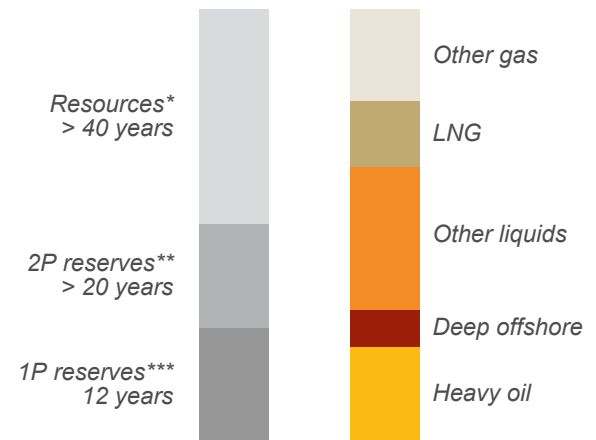
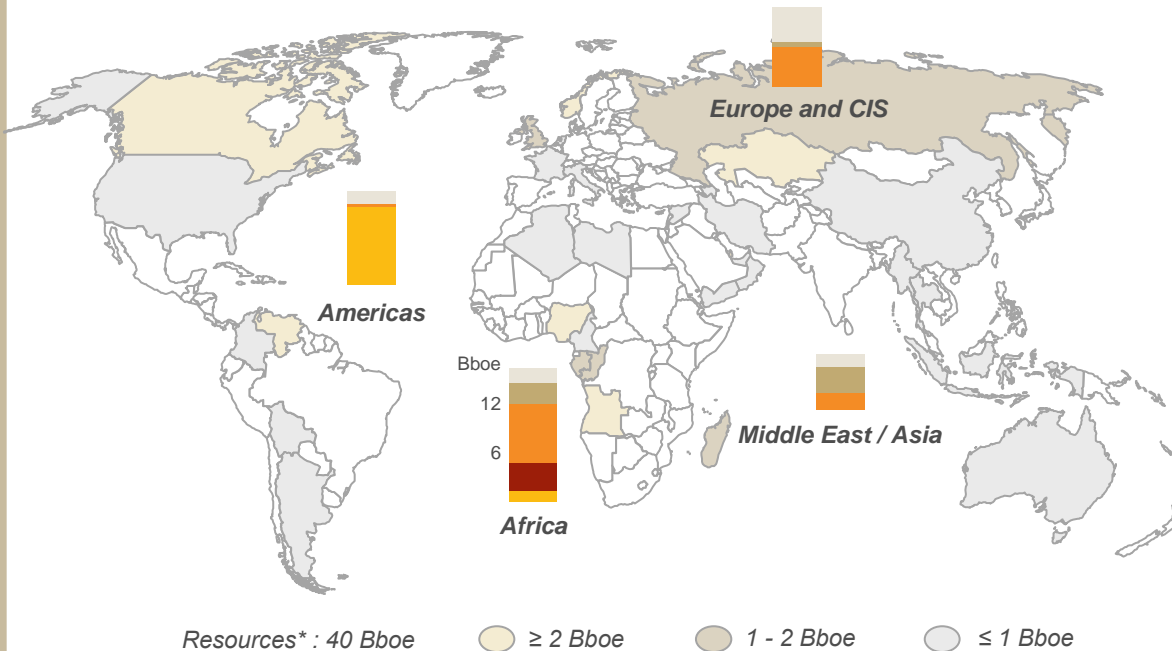


Total's core business to remain oil and gas for the long term

More than 40 years of oil and gas resources*

Resources* : 40 Bboe

(at December 31, 2008)

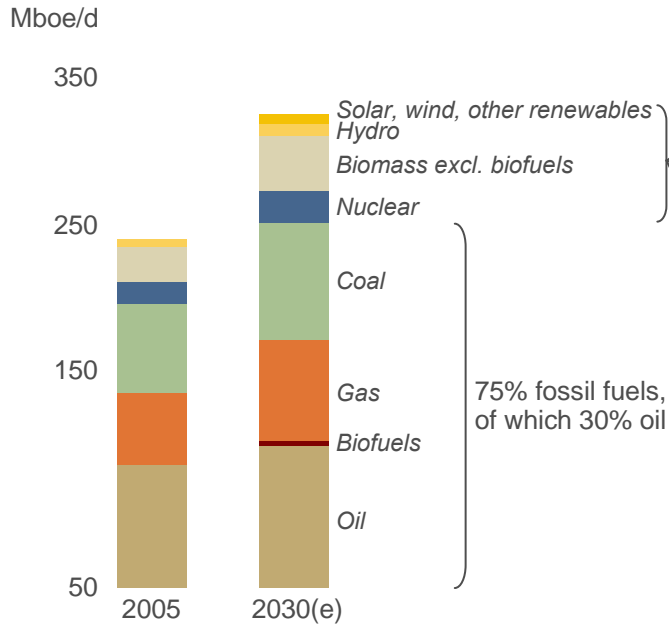


Diversified portfolio offering good risk-reward balance

* proved and probable reserves at year-end 2008 plus contingent resources (SPE-PRMS)
 ** limited to proved and probable reserves estimated at year-end 2008 using company price assumptions, covered by E&P contracts on fields that have been drilled and for which technical studies have demonstrated economic development ; also includes tar sands to be developed with mining
 *** reserves of consolidated subsidiaries (FAS 69) and share of equity affiliates and non-consolidated companies

And developing low CO₂ energies to meet the energy challenge

Global energy supply mix by 2030(e)*



Main axes selected by Total to develop low CO₂ energies

Solar	
<ul style="list-style-type: none"> > Differentiating technology > Reducing cost > Integrating along the PV** chain 	
Biomass	
<ul style="list-style-type: none"> > Strong R&D commitment for advanced biofuels 	
Nuclear	
<ul style="list-style-type: none"> > Learning via Penly EPR > Developing new projects in producing countries 	

Capitalizing on industrial assets and R&D to develop solar, nuclear and biomass
Participating in the energy diversification of oil and gas producing countries

* Total estimates
 ** PV : photovoltaic

Global strategy for sustainable energy

- Supporting growth potential in oil and gas through new technologies and investments
- Improving industry and product efficiency and reducing environmental impact
- Accelerating the development of core competencies in new energies