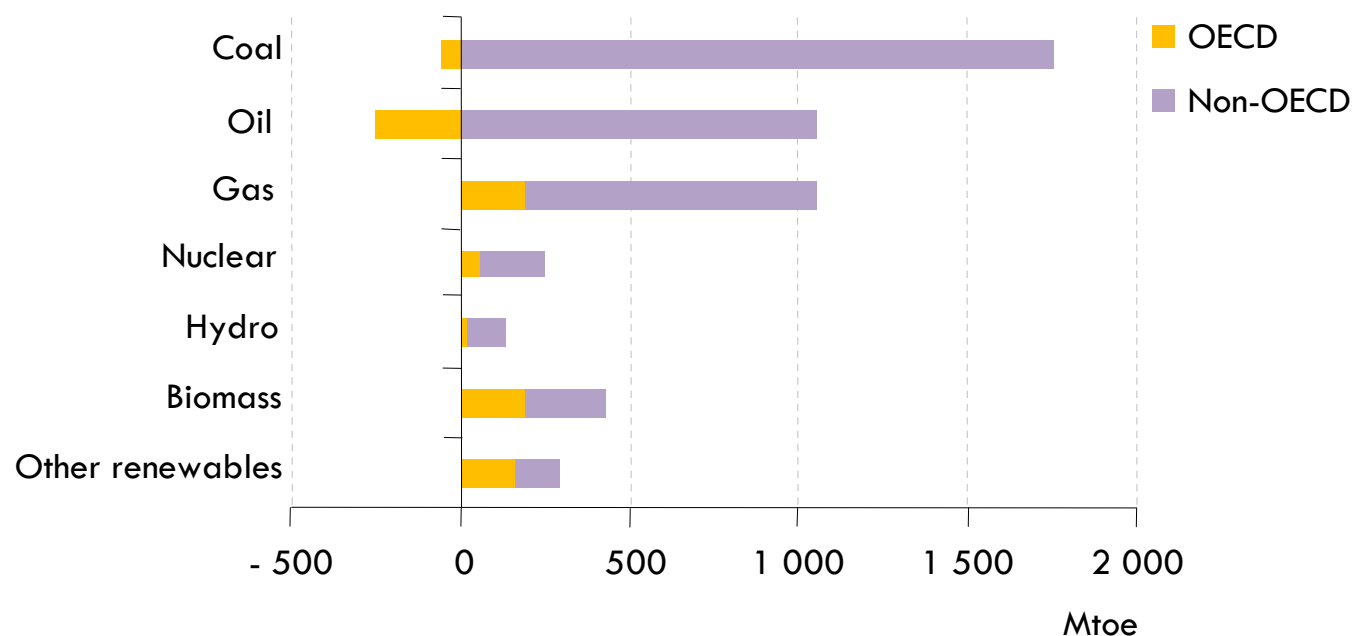


# Global Energy Outlook:

## Key trends, challenges and responses

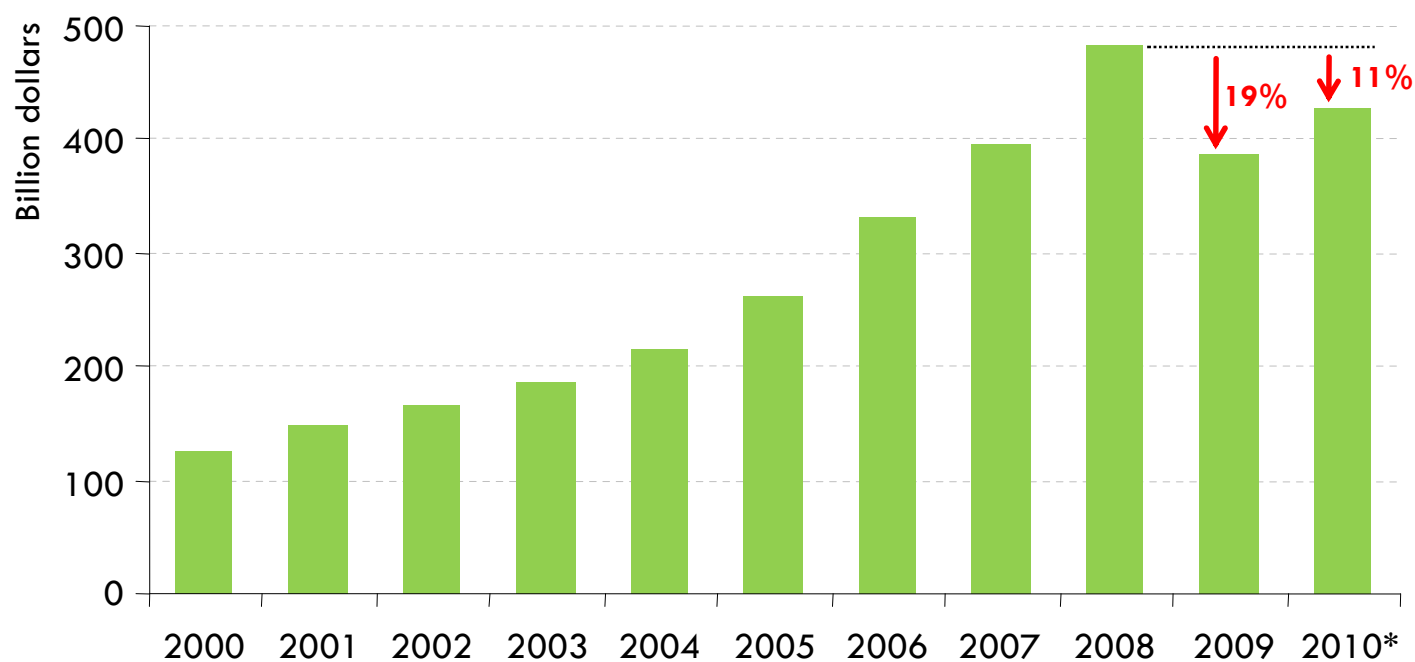
**Dr. Fatih Birol**  
**IEA Chief Economist**

# Change in primary energy demand in the Reference Scenario, 2007-2030



*Fossil fuels account for 77% of the increase in world primary energy demand in 2007-2030, with oil demand rising from 85 mb/d in 2008 to 88 mb/d in 2015 & 105 mb/d in 2030*

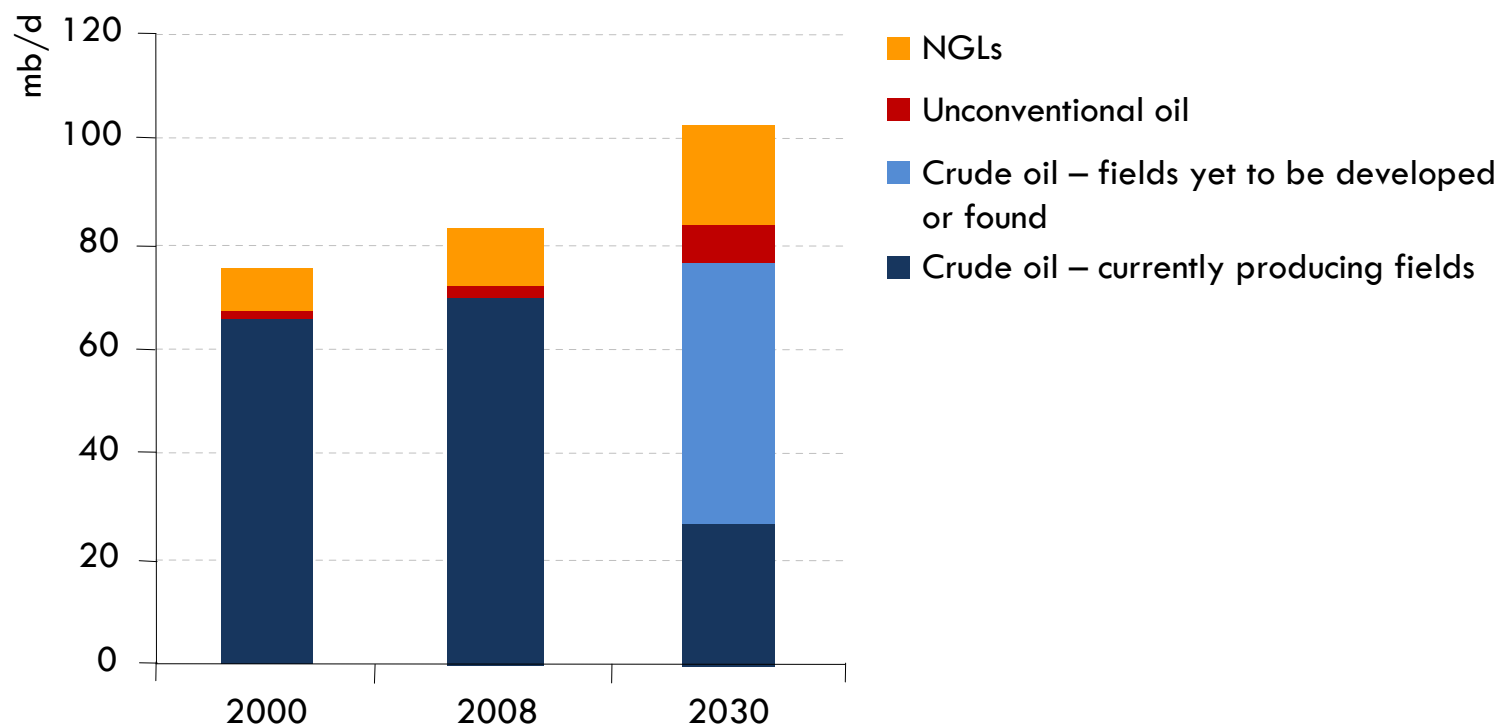
# Worldwide upstream oil & gas capital expenditures



\* Estimated spending

*Global upstream spending fell in 2009, for the first time in a decade, by over \$90 billion in 2009, but is set to bounce back by around 10% in 2010 on current plans*

# Oil production in the Reference Scenario



*Sustained investment is needed mainly to combat the decline in output at existing fields, which will drop by almost two-thirds by 2030*

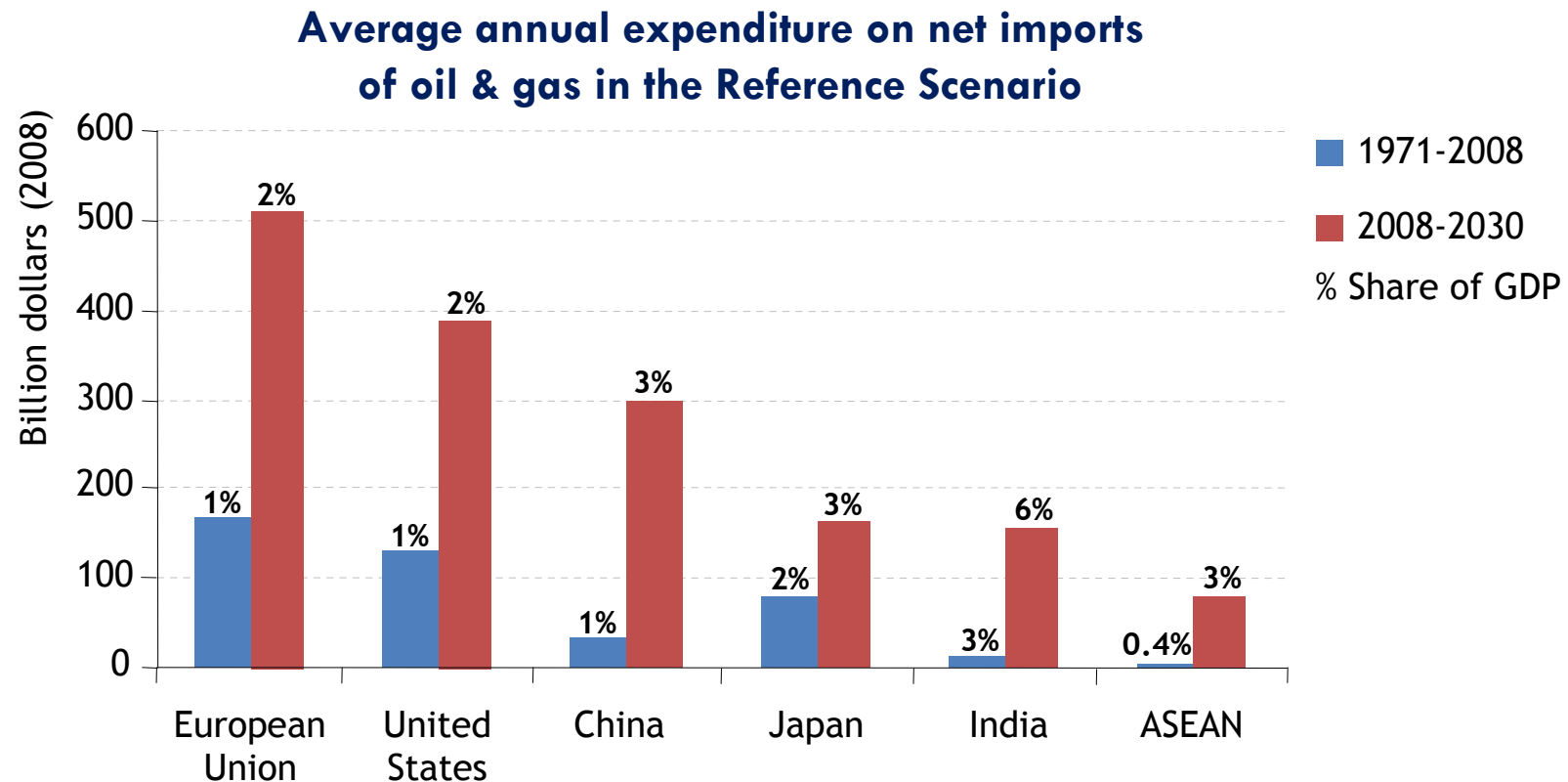


## **An uncertain future for Iraqi oil**

- **Iraq: a decisive driver of global oil markets in the coming decade?**
- **Iraqi oilfields are mostly technically straightforward and relatively cheap to develop**
- **The very rapid capacity expansion claimed by politicians is overly optimistic**
- **But even a modest achievement – e.g. a doubling of current production – would have a significant impact on global oil markets**
- **Main challenges: security, infrastructure, water and personnel**

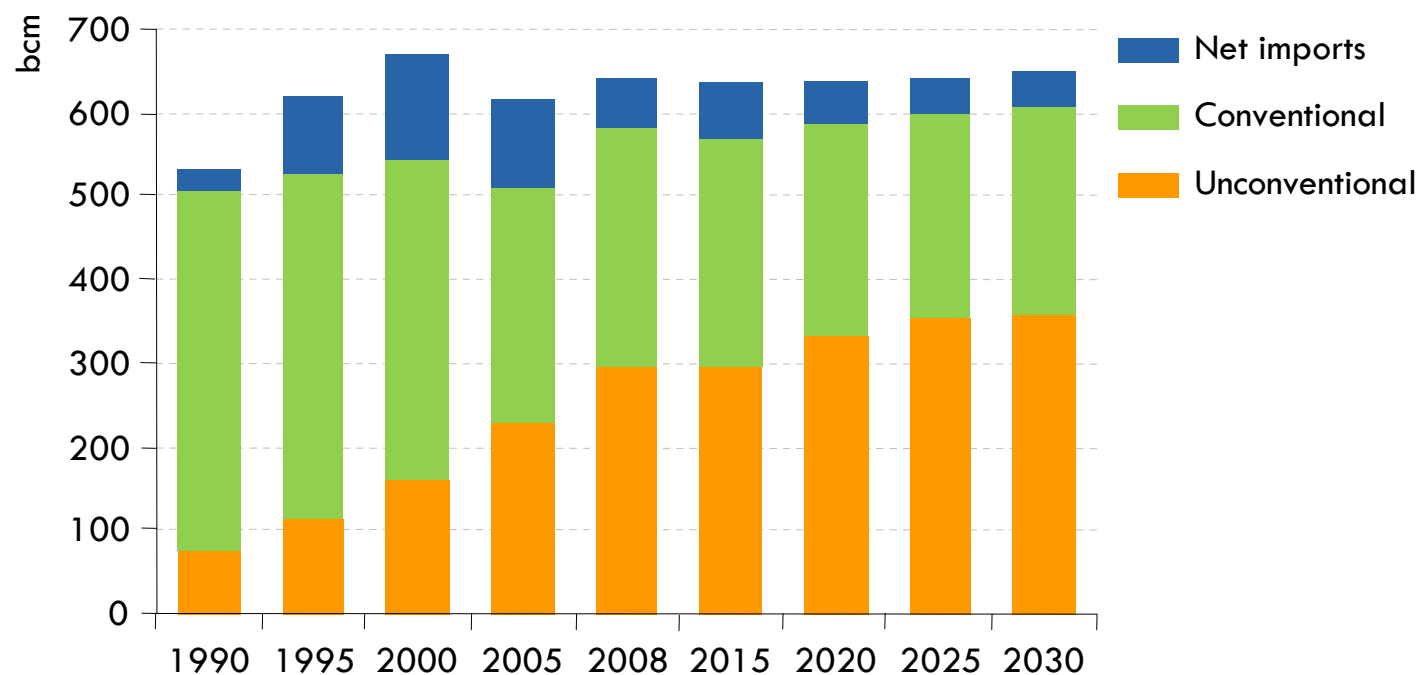


# The era of cheap energy is over



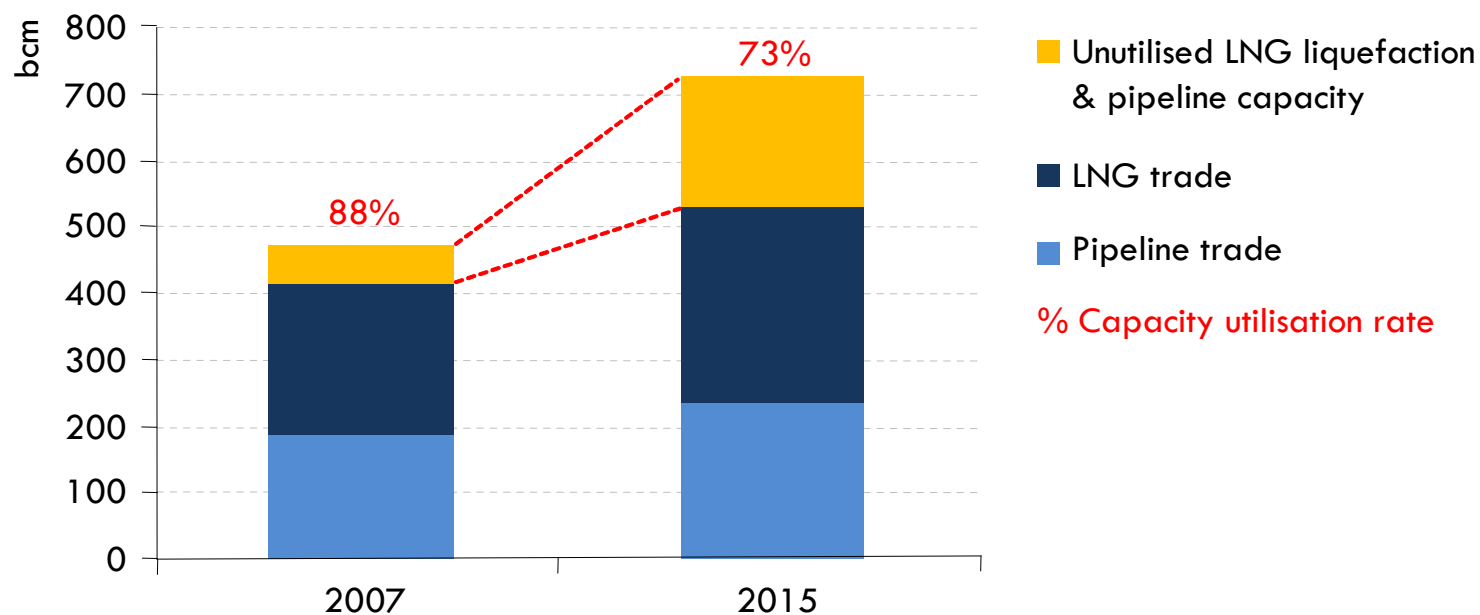
***The Reference Scenario implies persistently high spending on oil & gas imports – another key reason to pursue alternative energy policies***

# US natural gas supply in the Reference Scenario



*Mainly as a result of shale gas production growth, US gas output grows gradually through to 2030, outstripping US demand & squeezing US net imports*

# Natural gas transportation capacity



*A glut of gas is developing – reaching 200 bcm by 2015 – due to weaker than expected demand & plentiful US unconventional supply, with far-reaching implications for gas pricing*

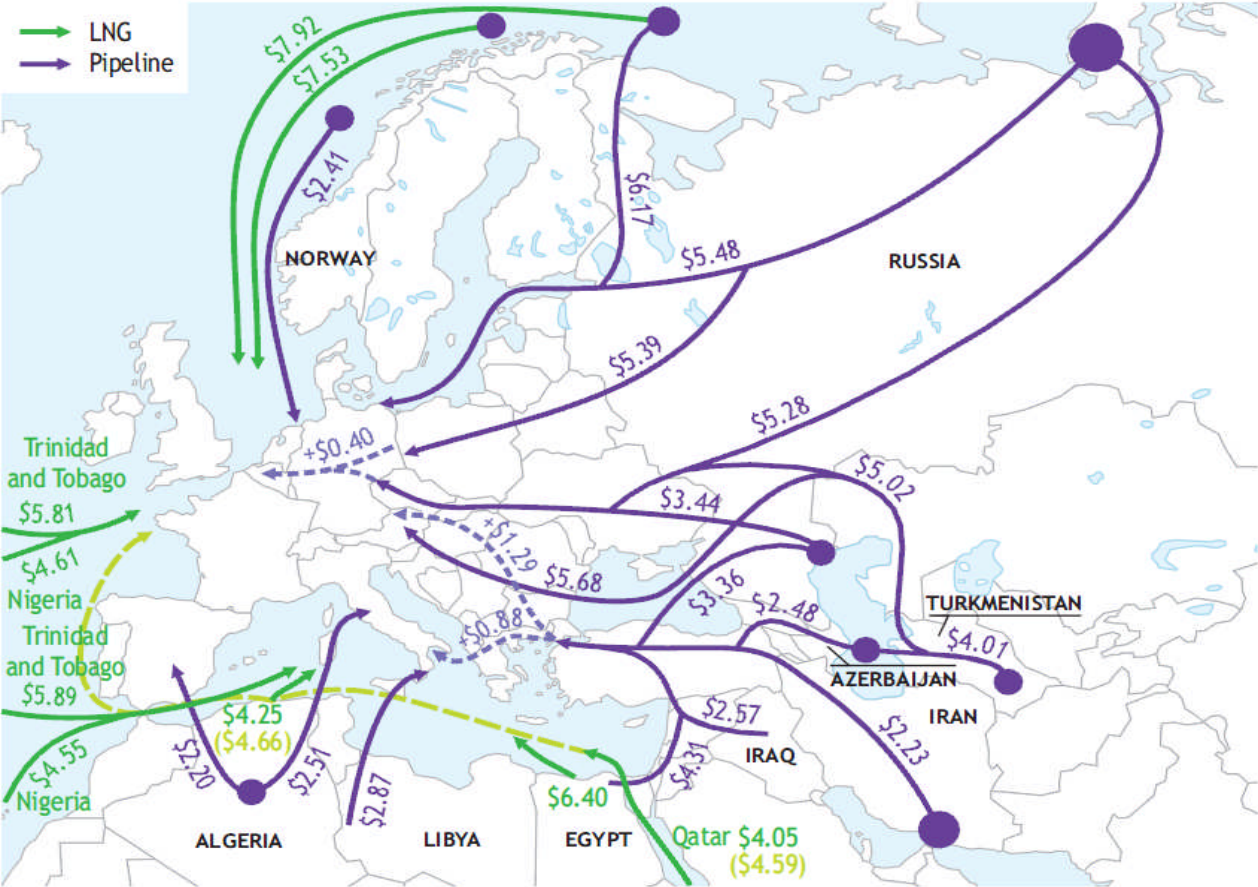




## More on natural gas

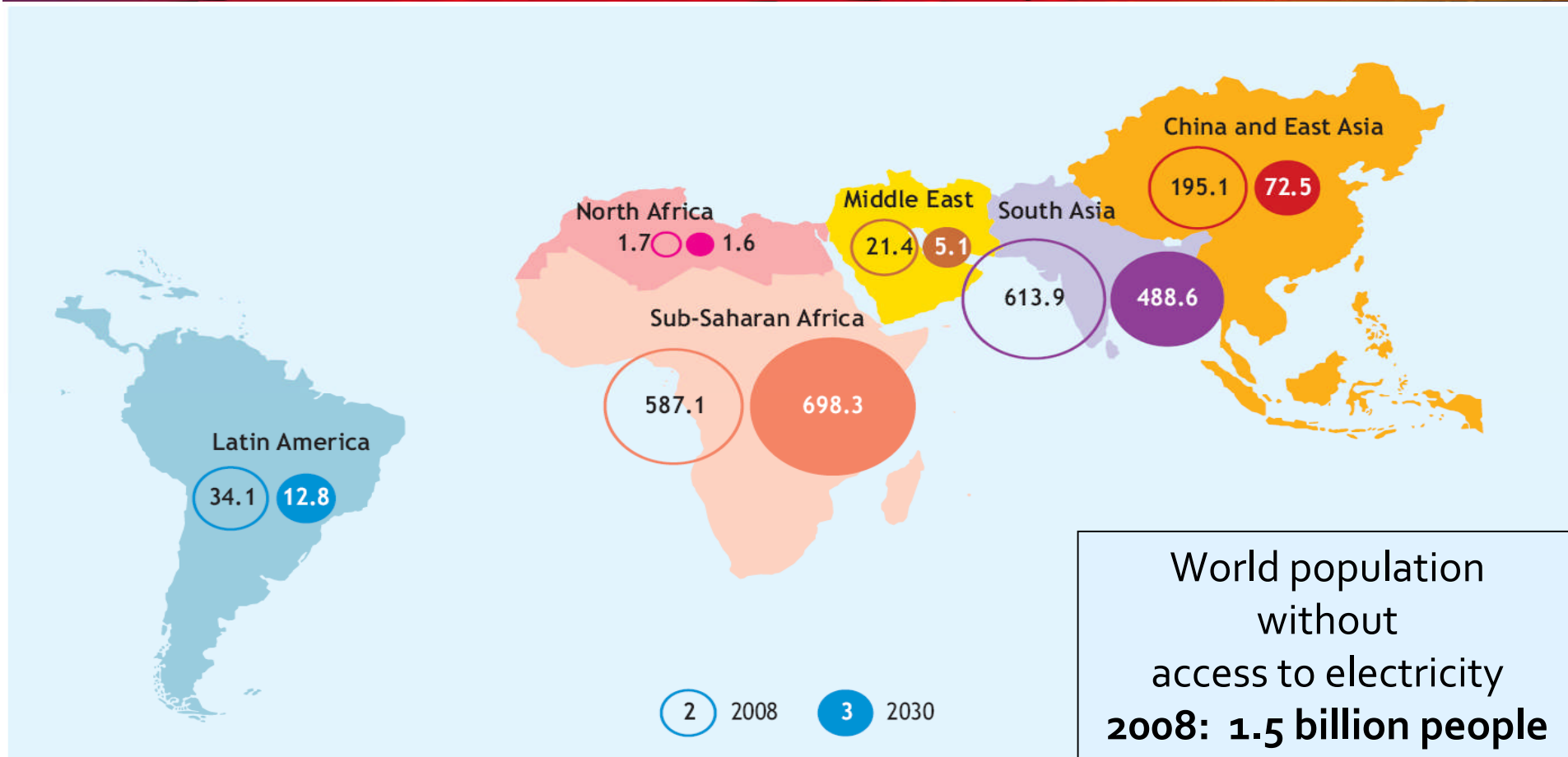
- Pace of global economic recovery is key to gas and electricity demand prospects
- North American gas prices – downward pressure to continue?
- Pressure on oil-indexed pricing – more innovative gas pricing formulae?
- Growing interest in LNG in Europe and Asia
- More unconventional gas: can the North American success story be replicated elsewhere ?

**Indicative costs for potential new sources of gas delivered to Europe, 2020 (\$/MBtu)**



***Although indigenous resources are limited & output is declining, Europe is geographically well placed to secure gas supplies from a variety of external sources***

# Number of people without access to electricity in the Reference Scenario (millions)



The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

World population without access to electricity  
2008: 1.5 billion people  
2030: 1.3 billion people

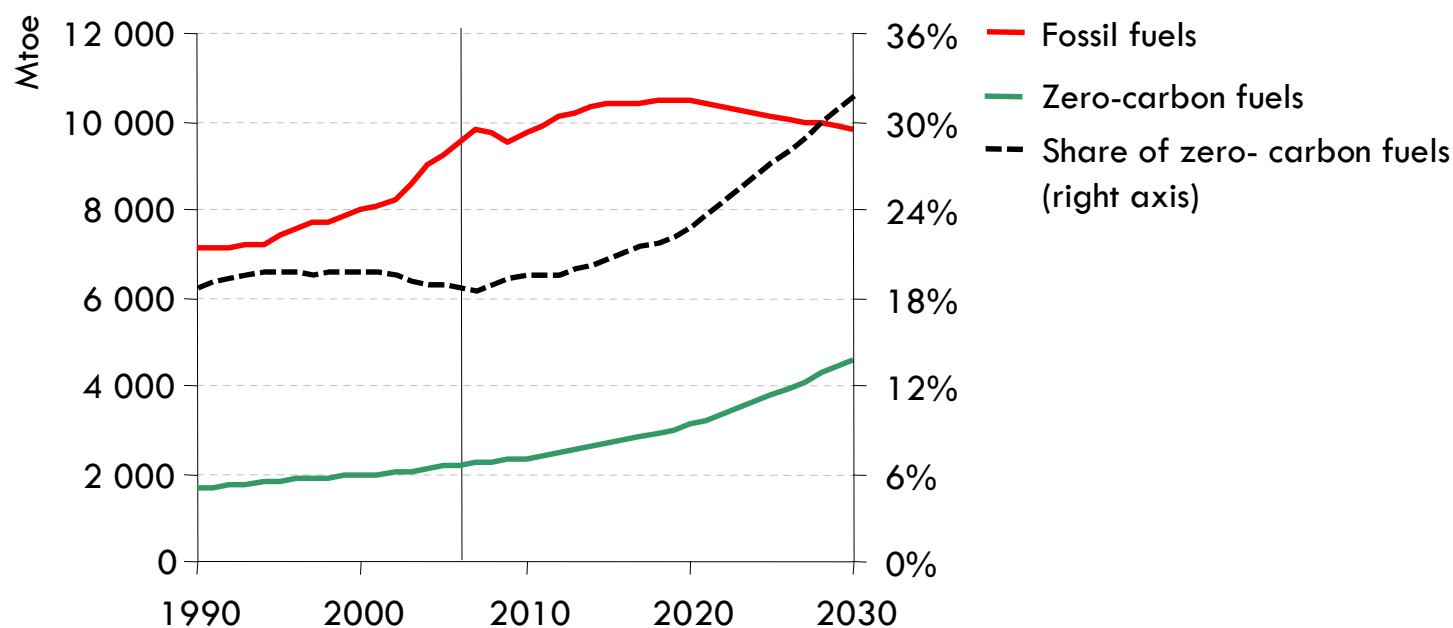
***\$35 billion per year more investment than in the Reference Scenario would be needed to 2030 – equivalent to just 5% of global power-sector investment – to ensure universal access***



A world map showing temperature anomalies. The map uses a color gradient from dark red to yellow to represent different levels of warming. Darker red areas are concentrated in the mid-latitude oceans and parts of the landmasses, while yellow areas are seen in some high-latitude regions and parts of the tropical oceans. The text 'WEO 450 Scenario' is overlaid in the center of the map.

# *WEO* 450 Scenario

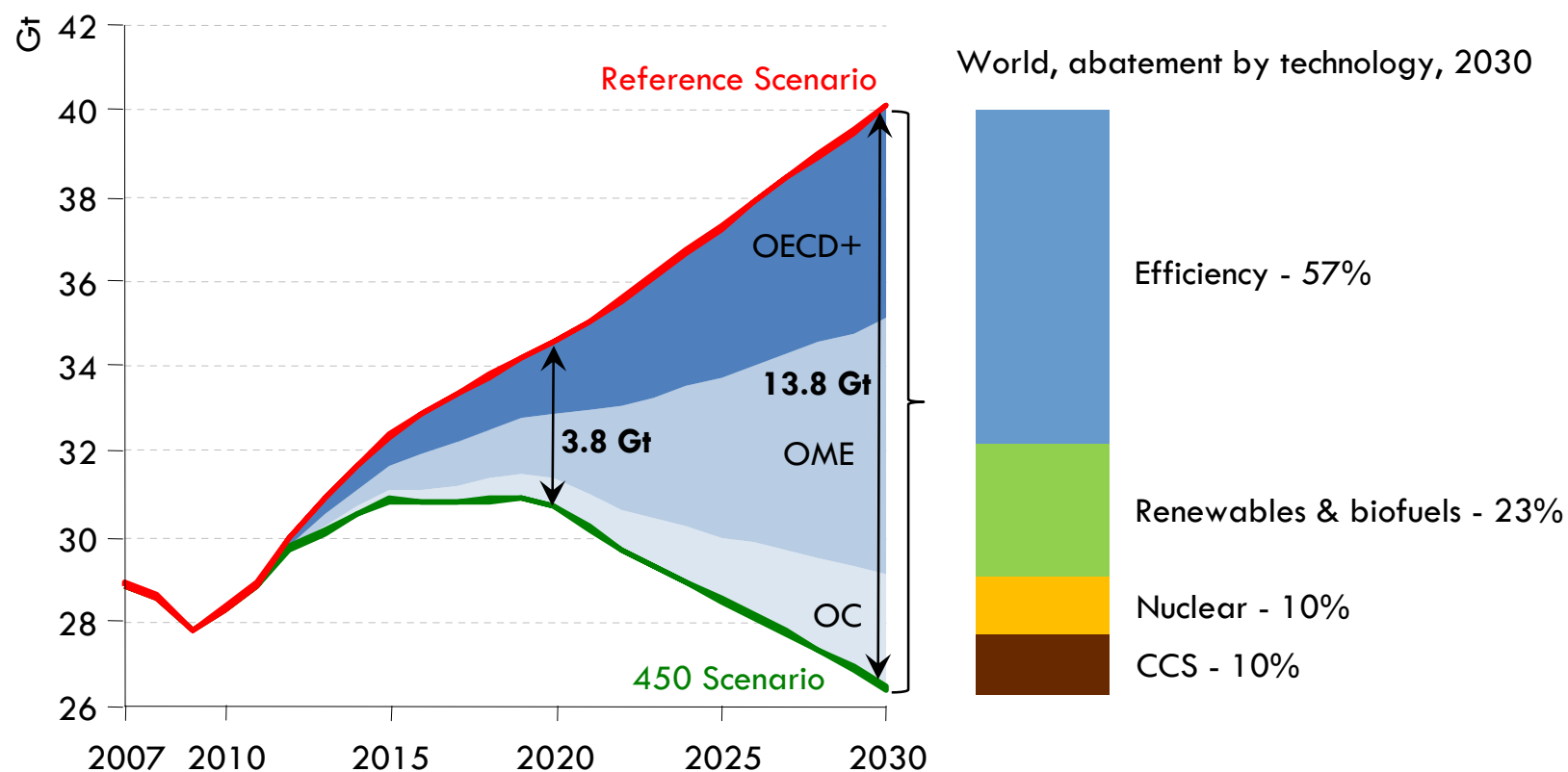
# World primary energy demand by fuel in the 450 Scenario



*In the 450 Scenario, demand for fossil fuels peaks by 2020, and by 2030 zero-carbon fuels make up a third of the world's primary sources of energy demand*

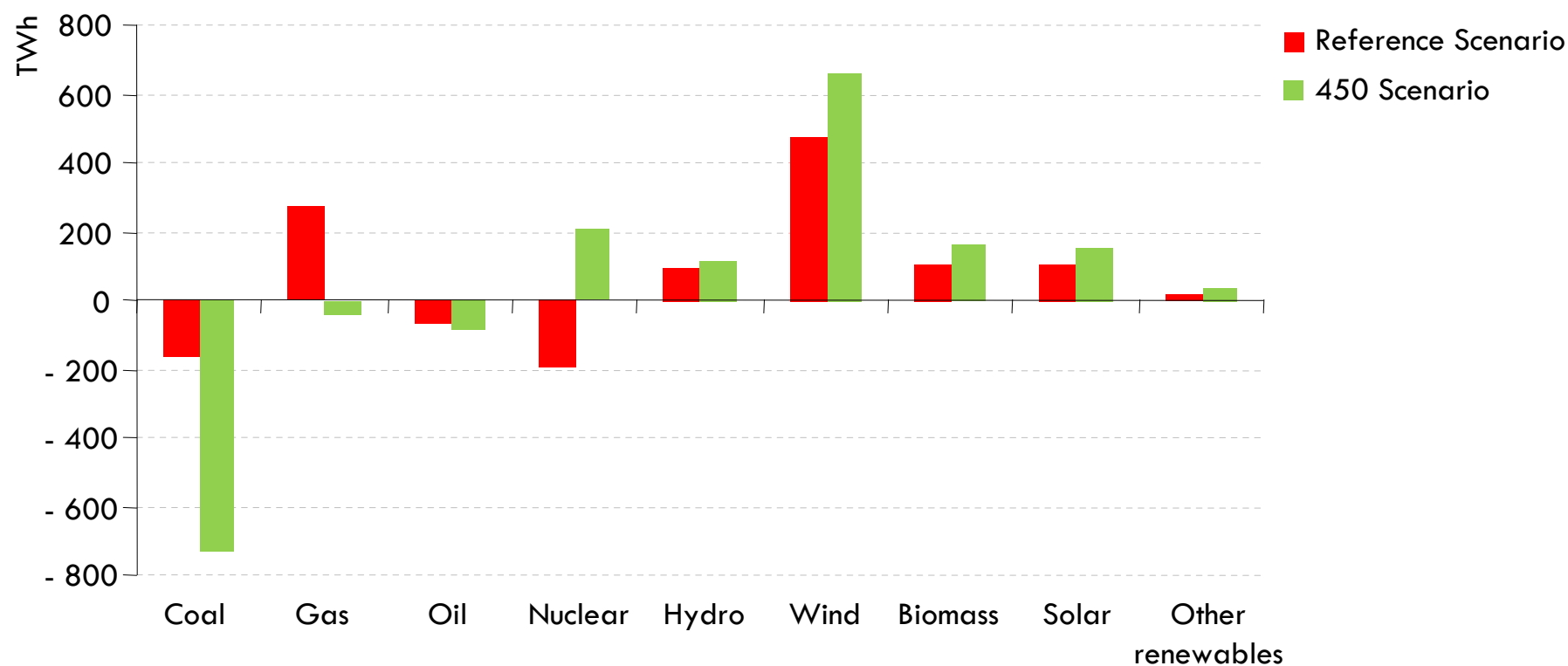


# World abatement of energy-related CO<sub>2</sub> emissions in the 450 Scenario



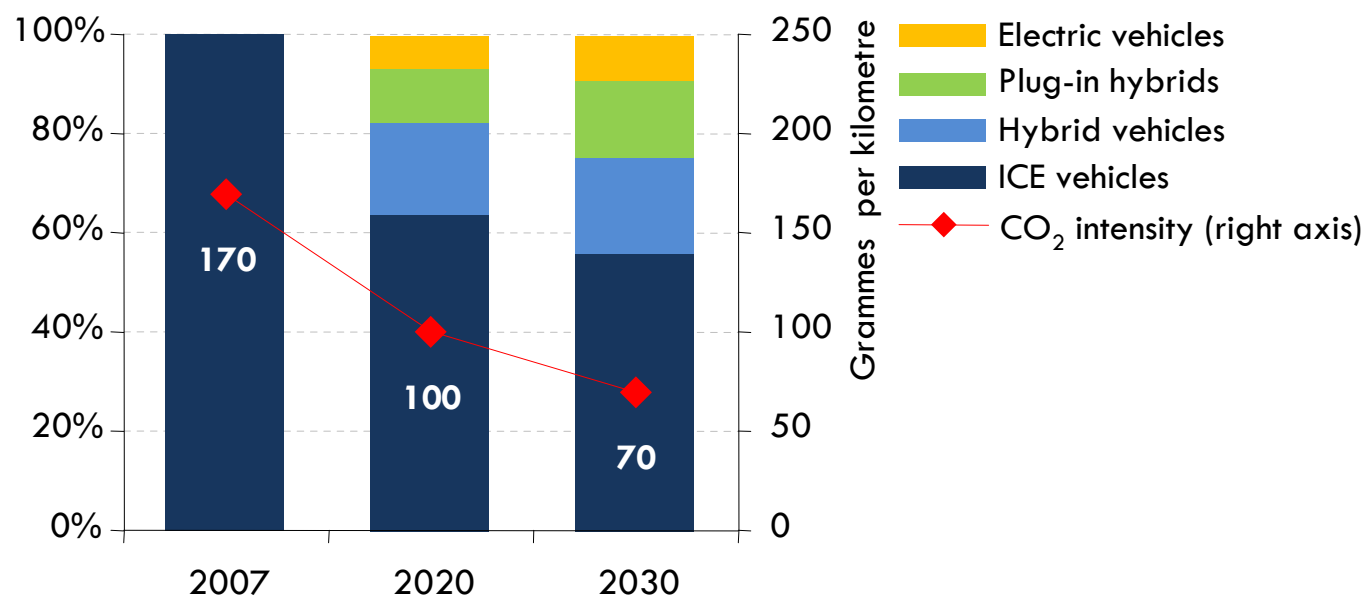
*An additional \$10.5 trillion of investment is needed in total in the 450 Scenario, with measures to boost energy efficiency accounting for most of the abatement through to 2030*

# Incremental EU electricity production by scenario, 2007-2030



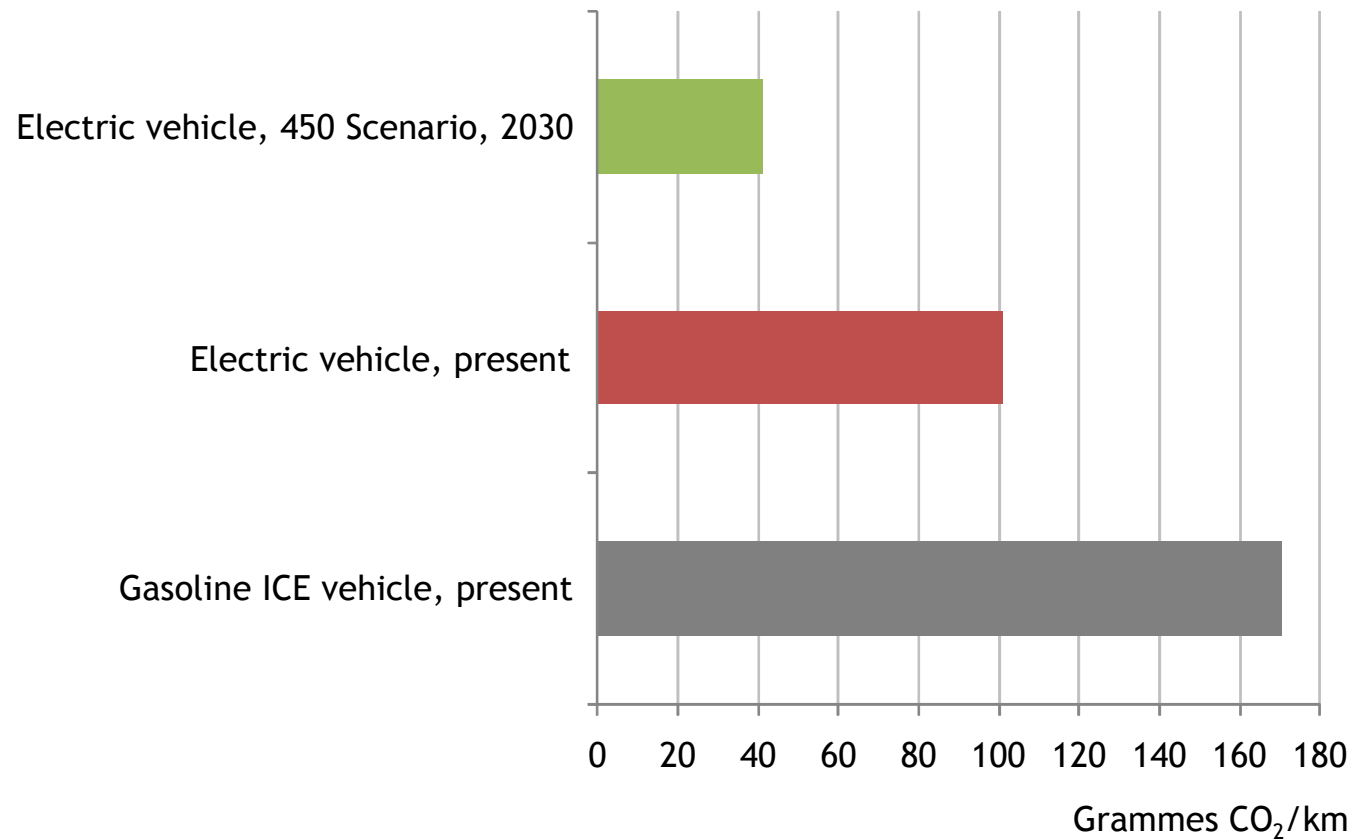
***Renewables, nuclear and plants fitted with CCS account for 80% of electricity generation in EU in 2030 in the 450 Scenario, up from 44% today***

# European Union passenger vehicle sales & average new vehicle CO<sub>2</sub> intensity in the 450 Scenario



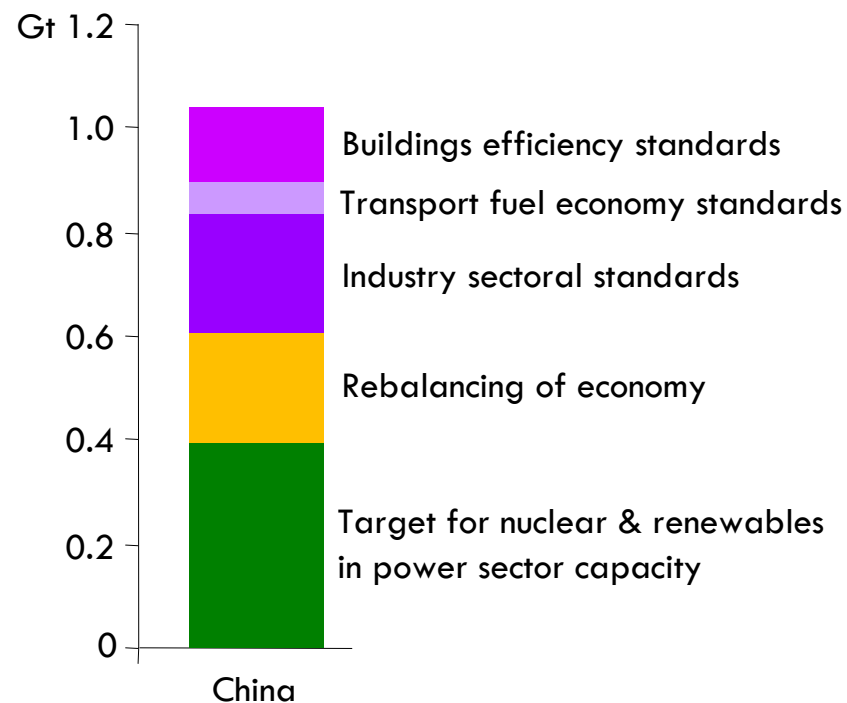
*The already strong policy action to reduce CO<sub>2</sub> emissions in EU road transport must be further strengthened in order to reach a 450 trajectory.*

# Global CO<sub>2</sub> emissions from the power sector and the use of electric cars



*Electric cars only are not enough: a holistic approach is required, reducing CO<sub>2</sub> emissions of the power generation system too...*

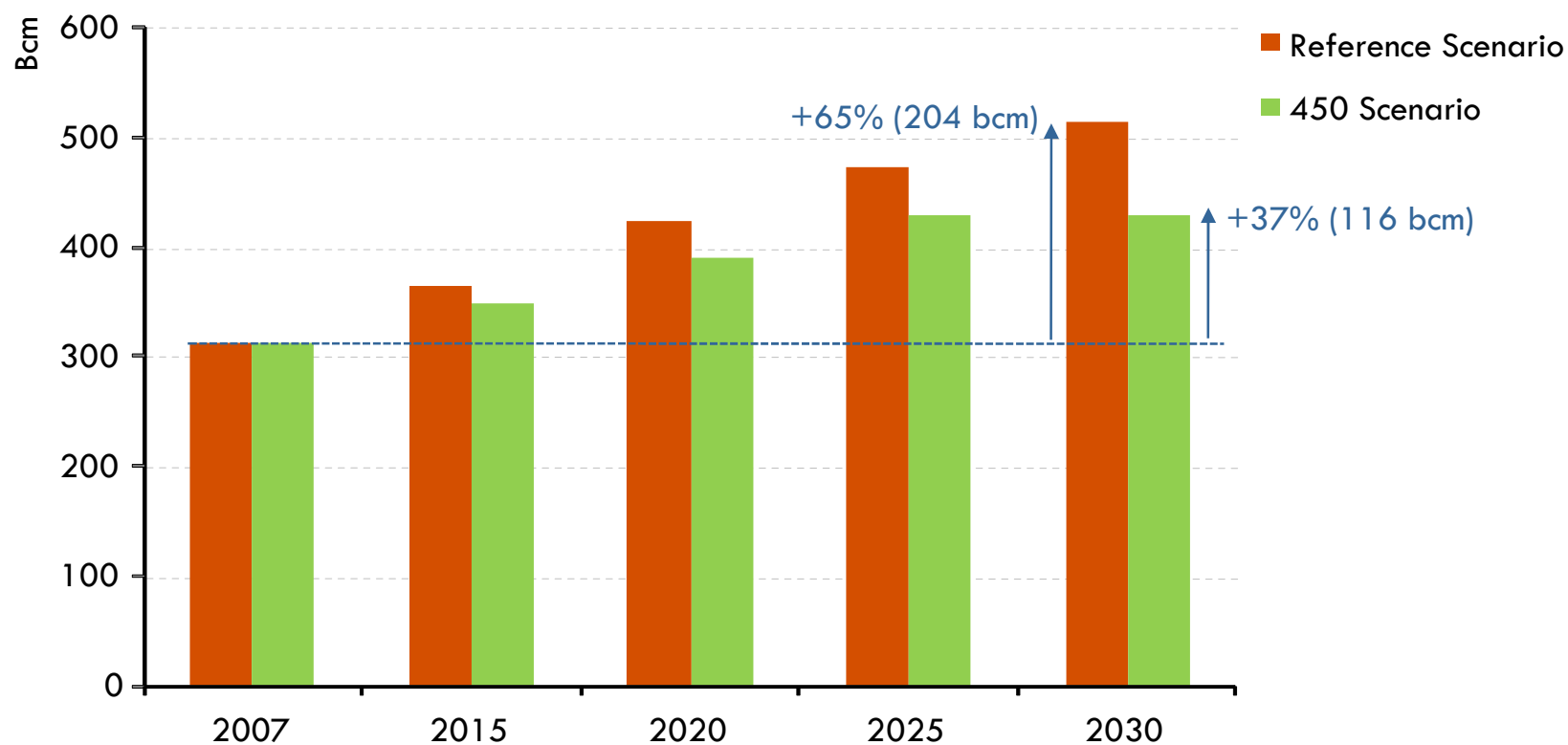
## China's abatement in the 450 Scenario, 2020



*Policies already under consideration in China would save 1 Gt compared with the Reference Scenario in 2020 – a 34% intensity improvement from 2011 to 2020*



# EU primary natural gas imports by scenario



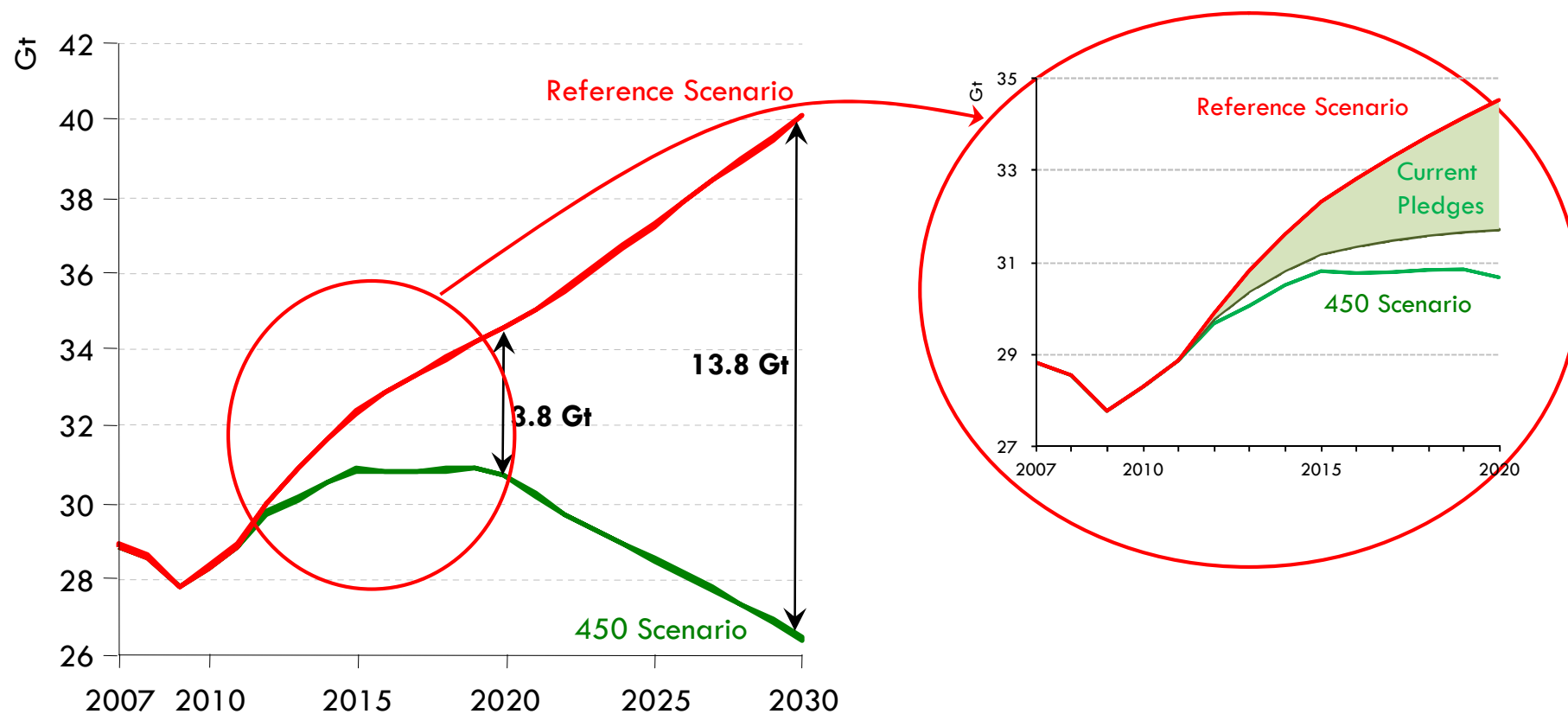
*EU gas imports continue to grow in the 450 Scenario, but plateaus by around mid-2020s*



# What does the Copenhagen Accord entail?

- A politically significant step towards a legally binding deal:
  - > *Recognises the need to limit the global temperature increase to 2 °C*
  - > *Sets a goal of mobilising \$100 billion/year of funding for mitigation & adaptation from developed to developing countries by 2020*
  - > *Several countries made pledges by 2020;*
- The Conference took note of the Accord, but not binding and no guarantee of real action
- Will the accord pave the way for a much stronger deal later to ensure that the 2°C goal is achieved?

# World abatement of energy-related CO<sub>2</sub> emissions in the 450 Scenario



*Current pledges point in the right direction but further efforts would be needed to reach the 450 Scenario*



## Summary & conclusions

- The financial crisis has halted the rise in global energy use, but its long-term upward path will resume soon *on current policies*
- Oil investment has fallen sharply, posing questions on medium term supply
- A sizable glut of natural gas is looming
- A 450 path requires massive investments but would bring substantial benefits
- Natural gas can play a key role as a bridge to a cleaner energy future
- Copenhagen Accord takes significant steps forward on international climate policy but not sufficient to limiting temperature rise to 2 °C