



International  
Energy Agency

***World Energy Outlook***

# ***World Energy Outlook 2009***

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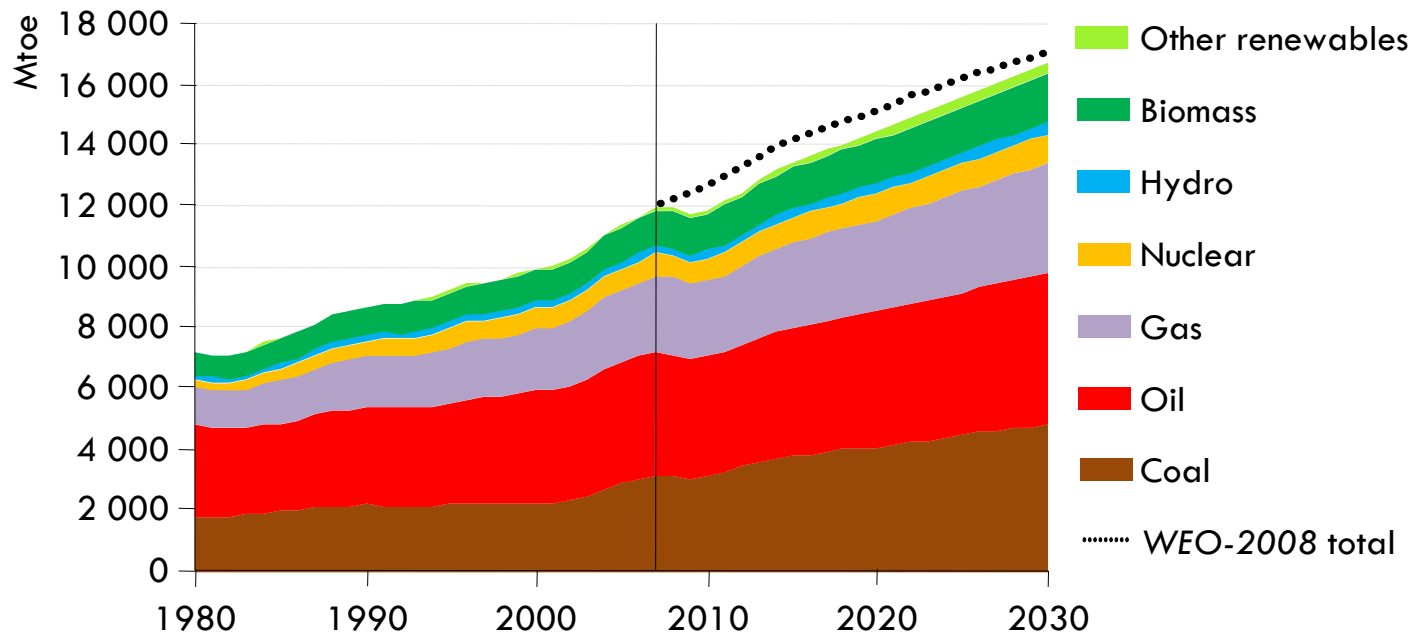
**14<sup>th</sup> National Energy Conference "Energy & Development 2009"**

**Institute of Energy for South-East Europe**

**Athens, 11 November 2009**

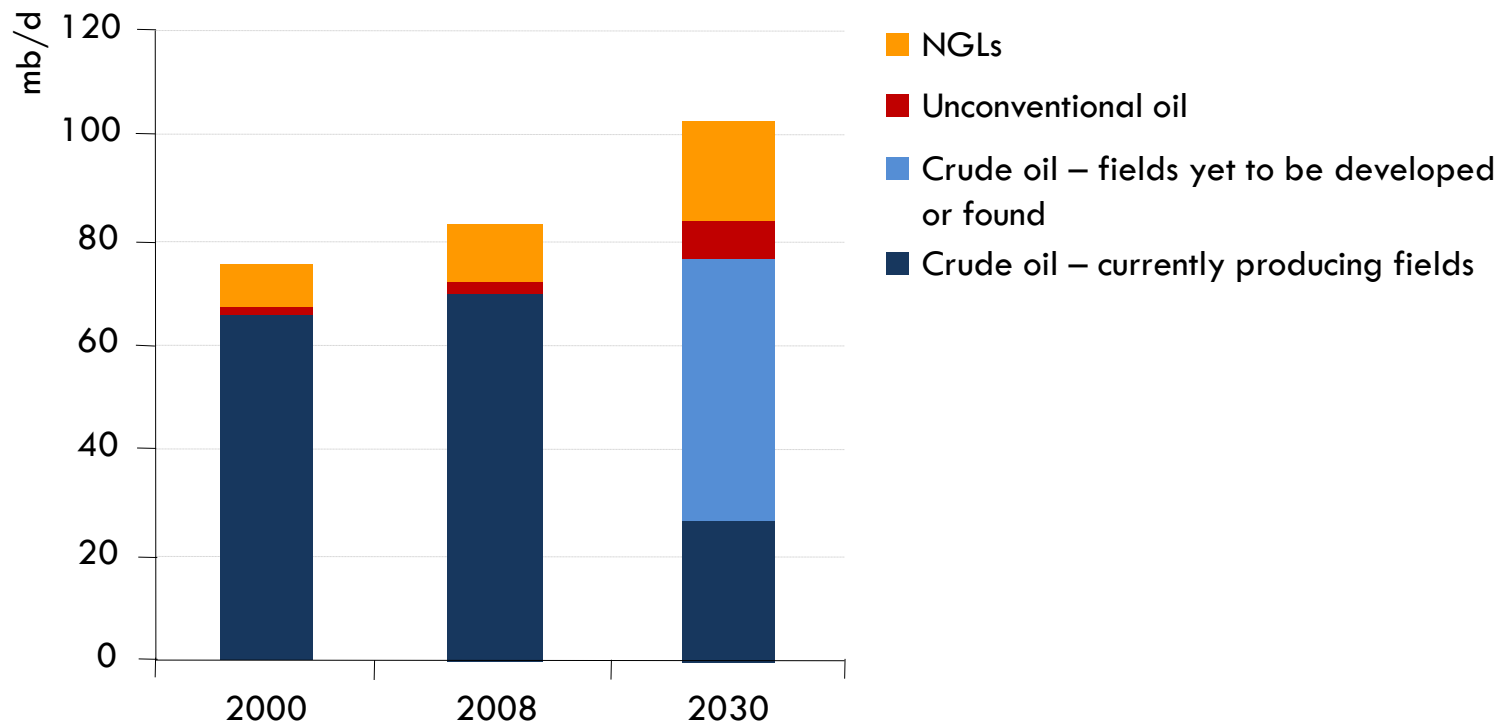
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# World primary energy demand by fuel in the Reference Scenario



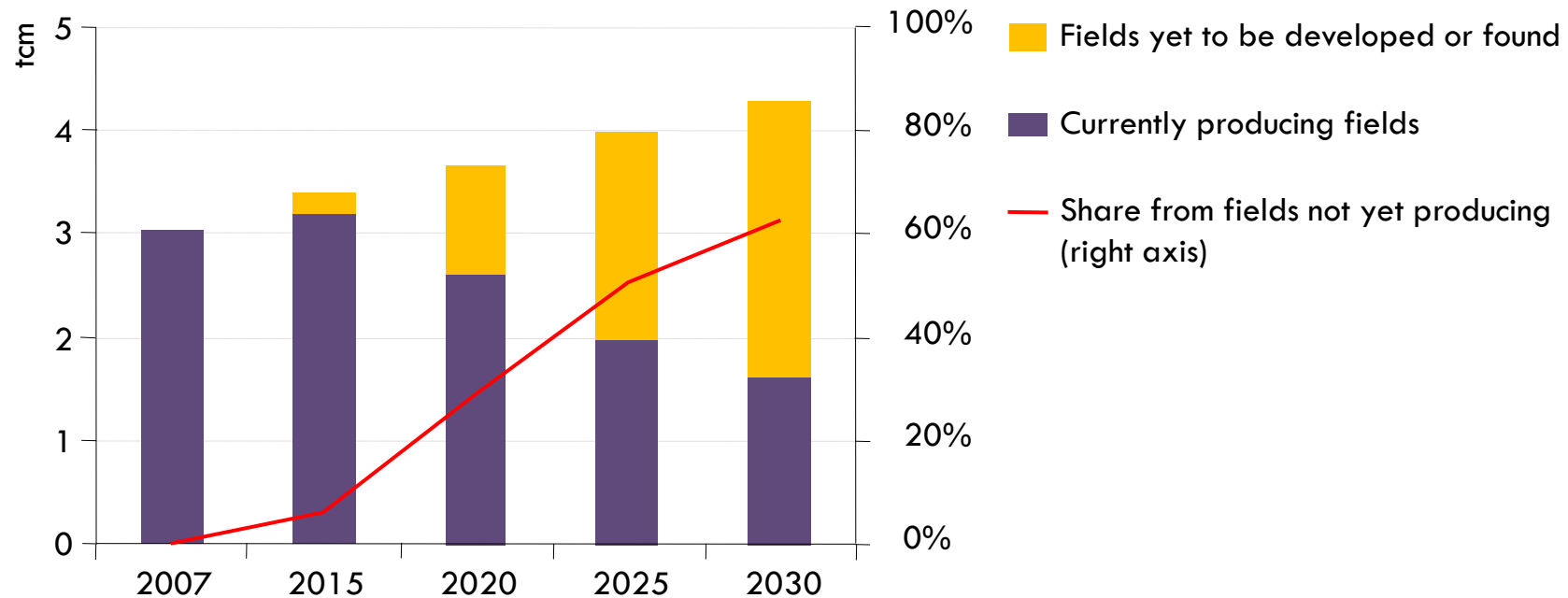
**Global demand grows by 40% between 2007 and 2030, with coal use rising most in absolute terms**

# Oil production in the Reference Scenario



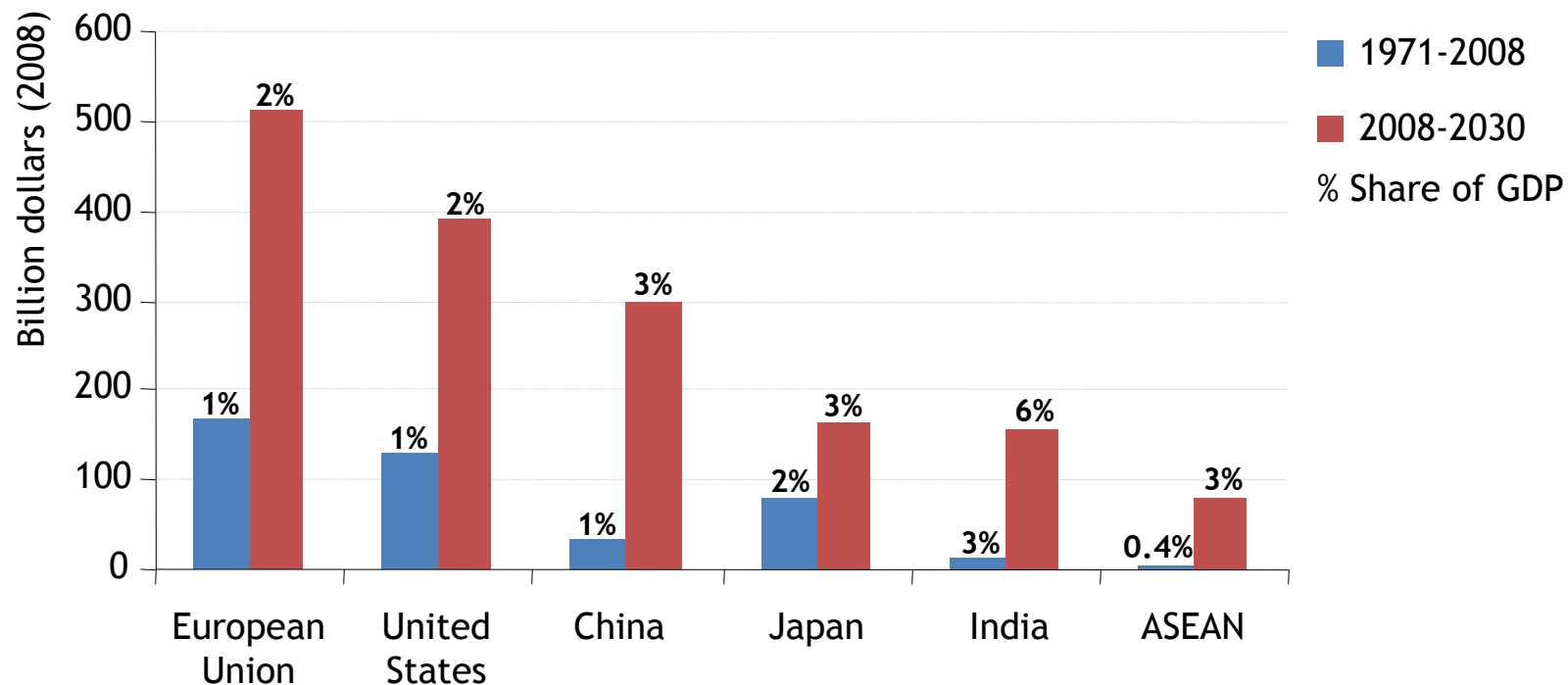
***Sustained investment is needed mainly to combat the decline in output at existing fields, which will drop by almost two-thirds by 2030***

# Impact of decline on world natural gas production in the Reference Scenario



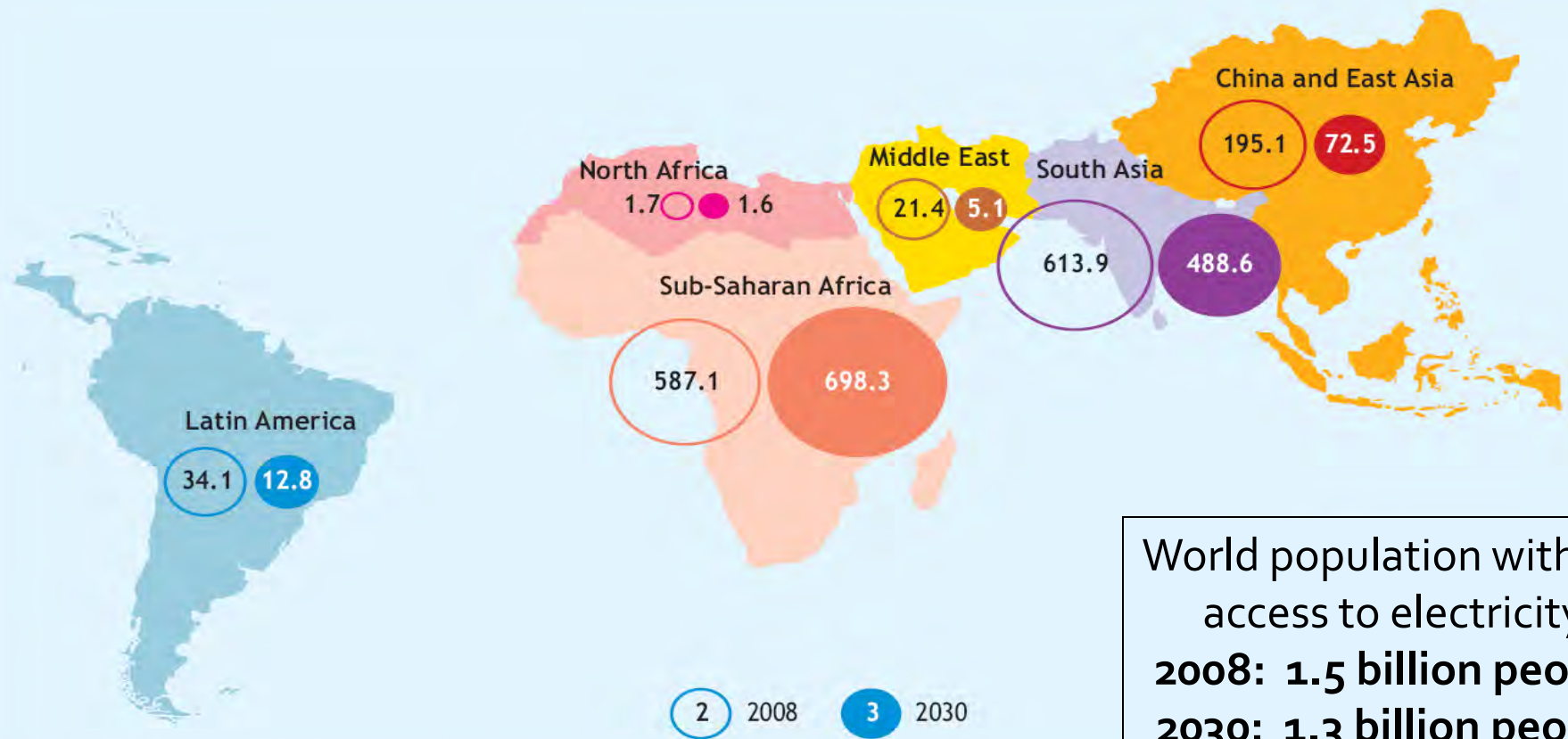
**Additional capacity of around 2 700 bcm, or 4 times current Russian capacity, is needed by 2030 – half to offset decline at existing fields & half to meet the increase in demand**

# Average annual expenditure on net imports of oil & gas in the Reference Scenario



*The Reference Scenario implies persistently high spending on oil & gas imports, with China overtaking the United States by around 2025 to become the world's biggest spender*

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



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

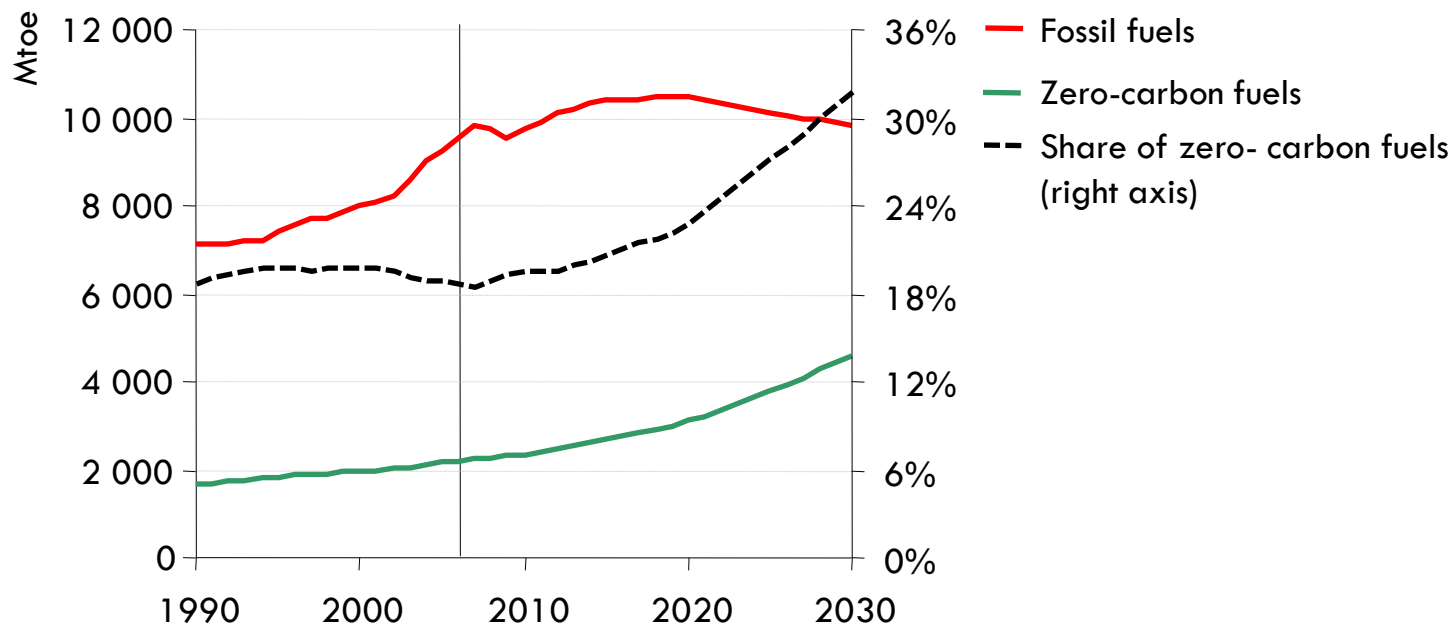
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***\$35 billion per year more investment than in the Reference Scenario would be needed to 2030 – equivalent to just 5% of global power-sector investment – to ensure universal access***

# The policy mechanisms in the 450 Scenario

- A combination of policy mechanisms, which best reflects nations' varied circumstances & negotiating positions
- We differentiate on the basis of three country groupings
  - > *OECD+:* OECD & other non-OECD EU countries
  - > *Other Major Economies (OME):* Brazil, China, Middle East, Russia & South Africa
  - > *Other Countries (OC):* all other countries, including India & ASEAN
- A graduated approach
  - > *Up to 2020, only OECD+ have national emissions caps*
  - > *After 2020, Other Major Economies are also assumed to adopt emissions caps*
  - > *Through to 2030, Other Countries continue to focus on national measures*
- Emissions peaking by 2020 will require
  - > *A CO<sub>2</sub> price of \$50 per tonne for power generation & industry in OECD+*
  - > *Investment needs in non-OECD countries of \$200 billion in 2020, supported by OECD+ through carbon markets & co-financing*

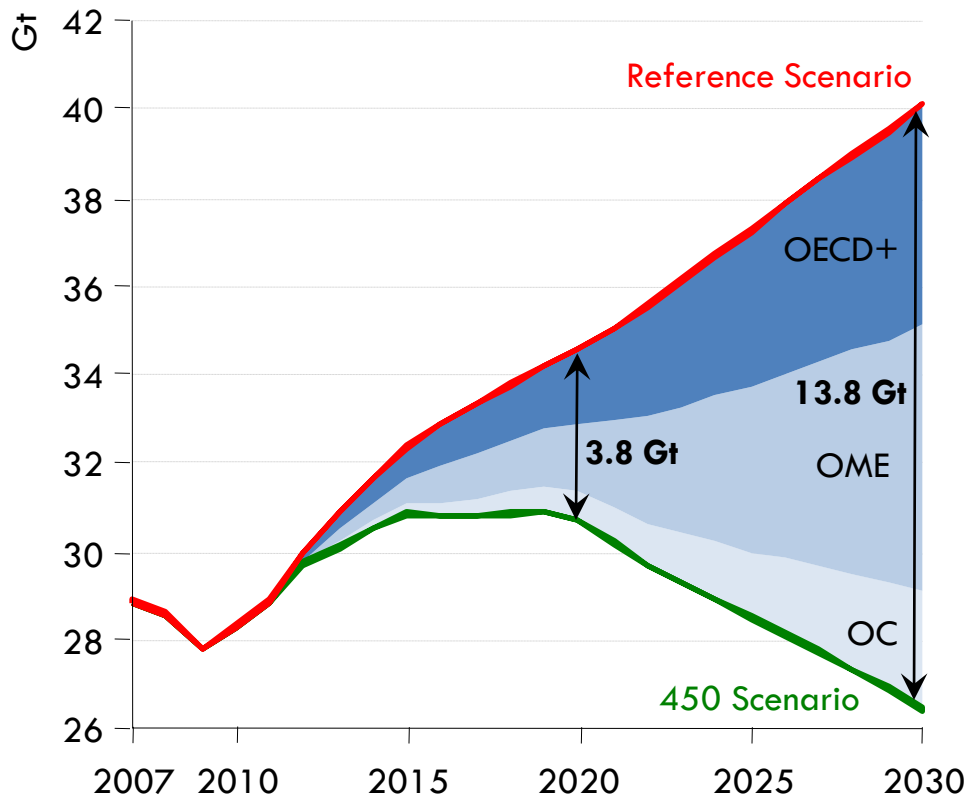
# World primary energy demand by fuel in the 450 Scenario



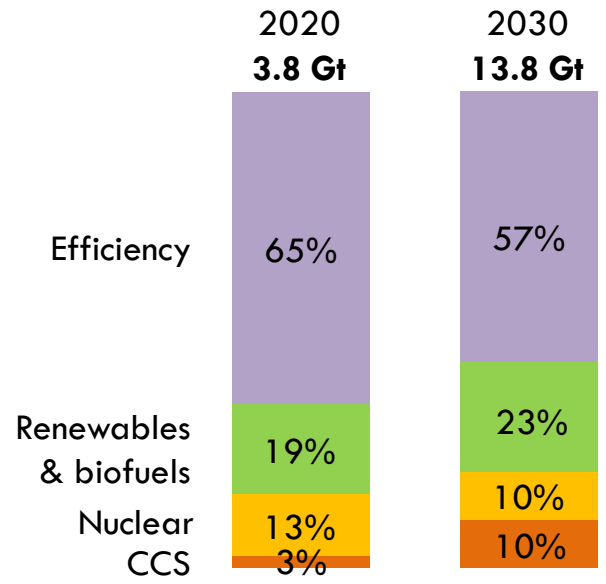
*In the 450 Scenario, demand for fossil fuels peaks by 2020, and by 2030 zero-carbon fuels make up a third of the world's primary sources of energy demand*



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

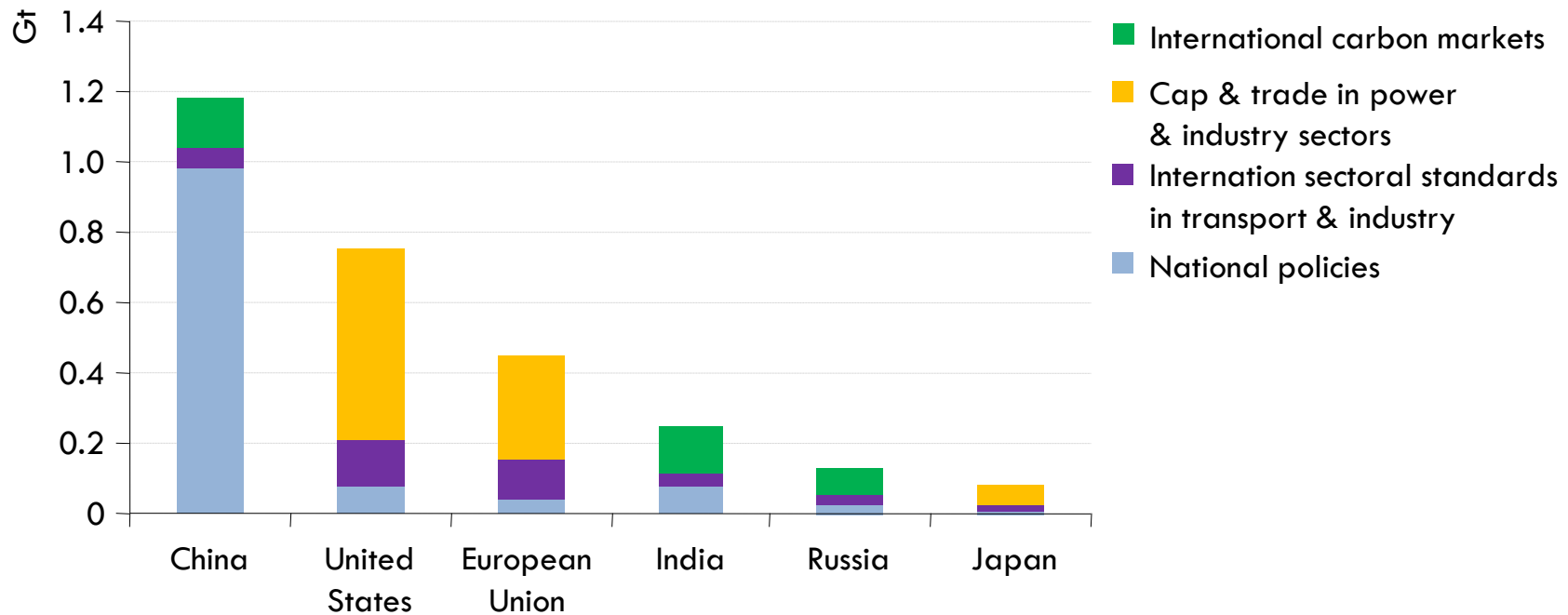


World abatement by technology



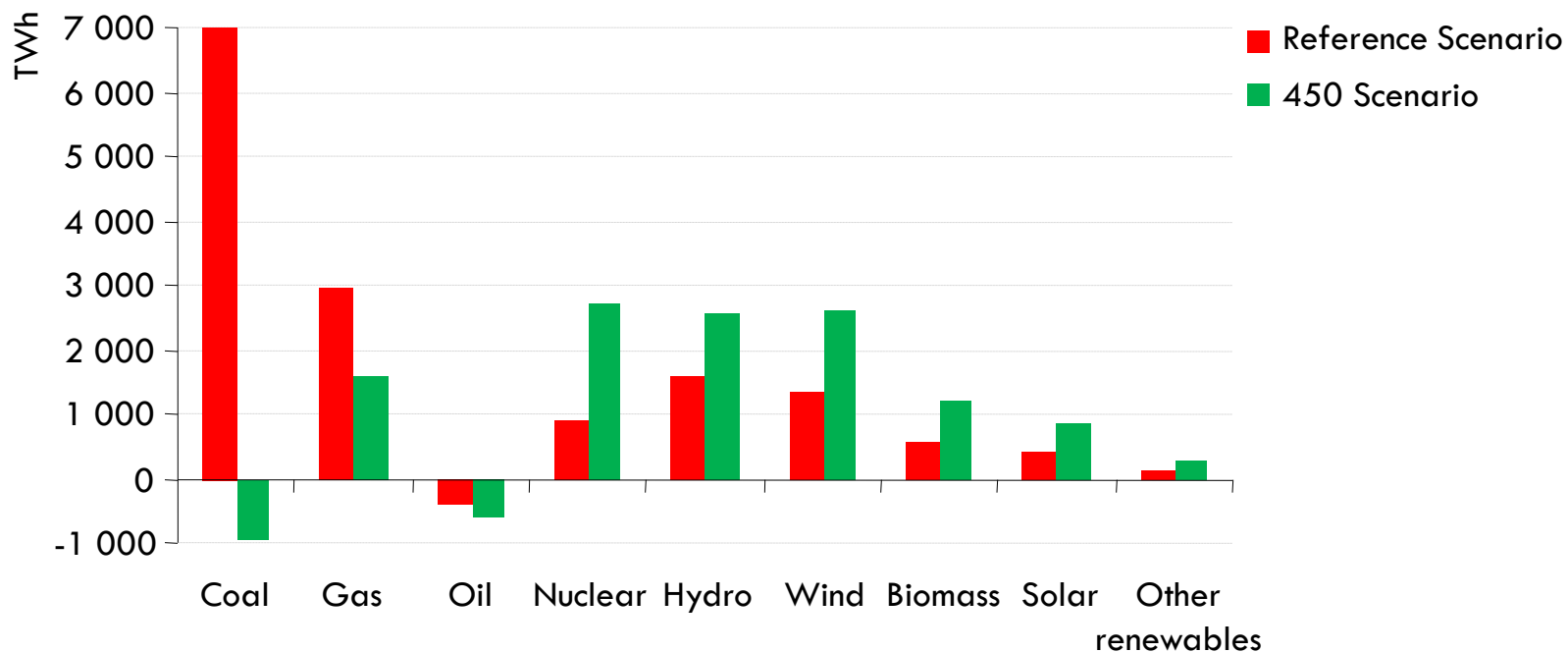
*An additional \$10.5 trillion of investment is needed in total in the 450 Scenario, with measures to boost energy efficiency accounting for most of the abatement through to 2030*

# Abatement in the 450 Scenario by key emitters, 2020



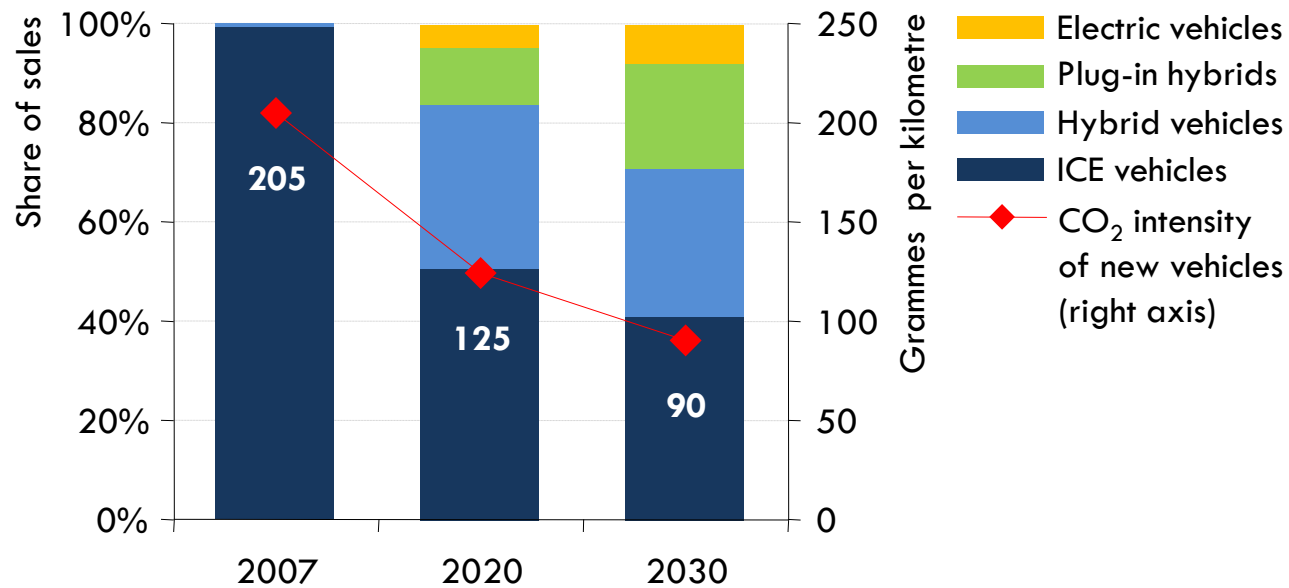
***China, the United States, the European Union, India, Russia & Japan account for almost three-quarters of the 3.8 Gt reduction in the 450 Scenario***

# Incremental world electricity production in the Reference and 450 Scenarios, 2007-2030



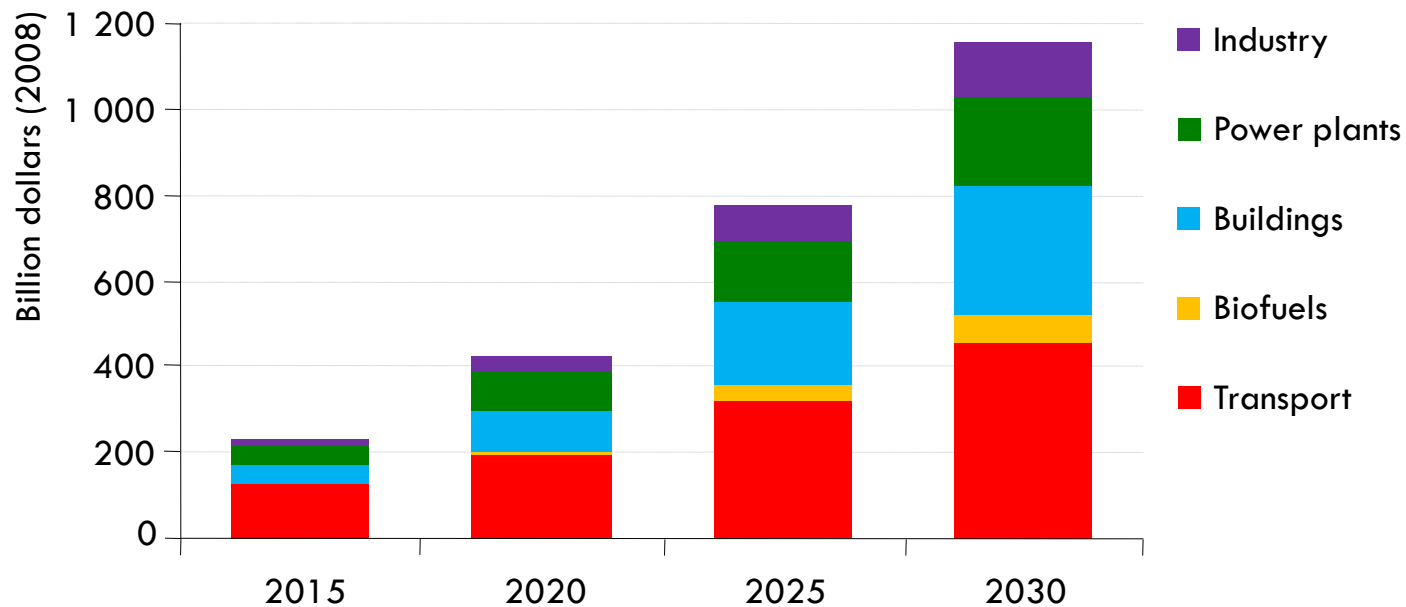
**Renewables, nuclear and plants fitted with CCS account for around 60% of electricity generation globally in 2030 in the 450 Scenario, up from less than one-third today**

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



**Improvements to the internal combustion engine & the uptake of next-generation vehicles & biofuels lead to a 56% reduction in new-car emission intensity by 2030**

# World additional investment in the 450 Scenario relative to the Reference Scenario



***\$10.5 trillion of additional investment is needed in the 450 Scenario in the period 2010-2030 compared with the Reference Scenario, costing 0.5% of GDP in 2020 & 1.1% of GDP in 2030***

# Summary & conclusions

- The financial crisis has halted the rise in global fossil-energy use, but its long-term upward path will resume soon *on current policies*
- Tackling climate change & enhancing energy security require a massive decarbonisation of the energy system
  - > *We are now on course for a 6°C temperature rise & rising energy costs*
  - > *Limiting temperature rise to 2°C will require big emission reductions in all regions*
- A 450 path towards 'Green Growth' would bring substantial benefits
  - > *Avoiding the worst effects & costs of climate change*
  - > *Energy-security benefits, lower oil & gas imports & reduced energy bills*
  - > *Much less air pollution & huge health benefits*
- *Natural gas can play a key role as a bridge to a cleaner energy future*
- The challenge is enormous – but it can and must be met
  - > *Improved energy efficiency & technology deployment are critical*
  - > *Each year of delay adds \$500 bn to mitigation costs between today & 2030*