

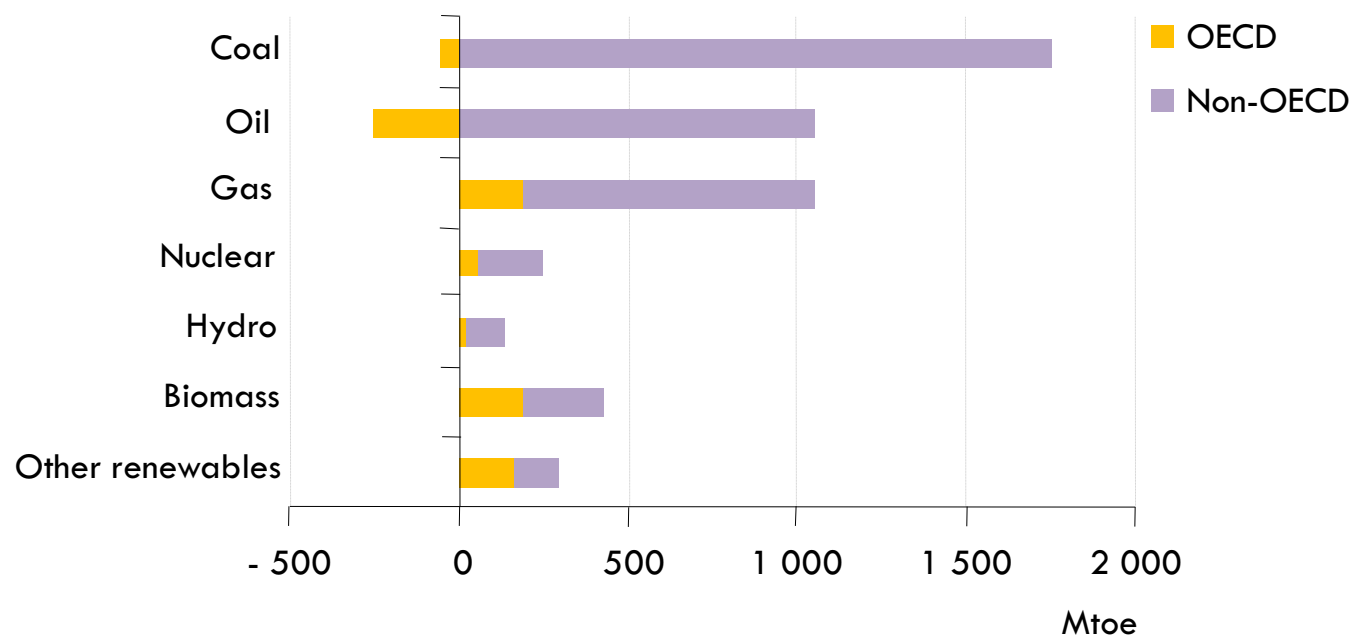


**Energy and Sustainability Policies : The European Challenge**  
**Seville, 14 January 2010**

*Energy and climate after Copenhagen*

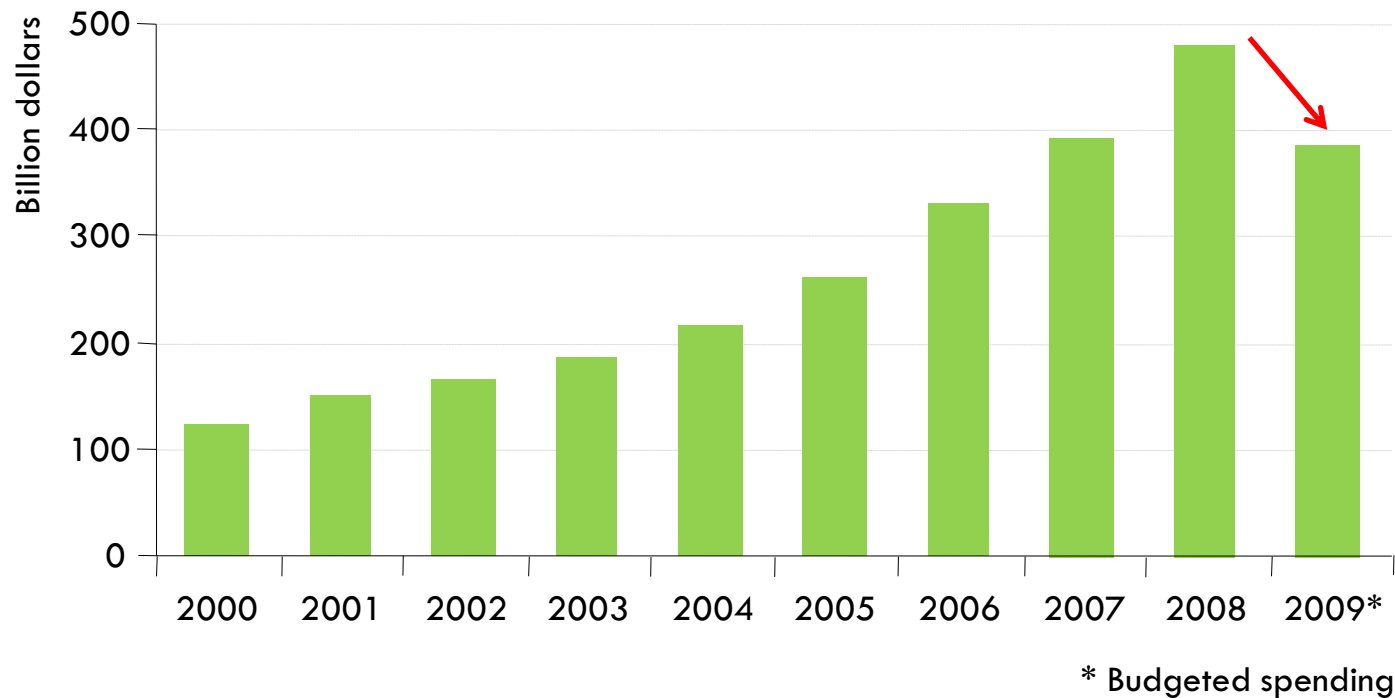
**Nobuo Tanaka**  
**Executive Director**  
**International Energy Agency**

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



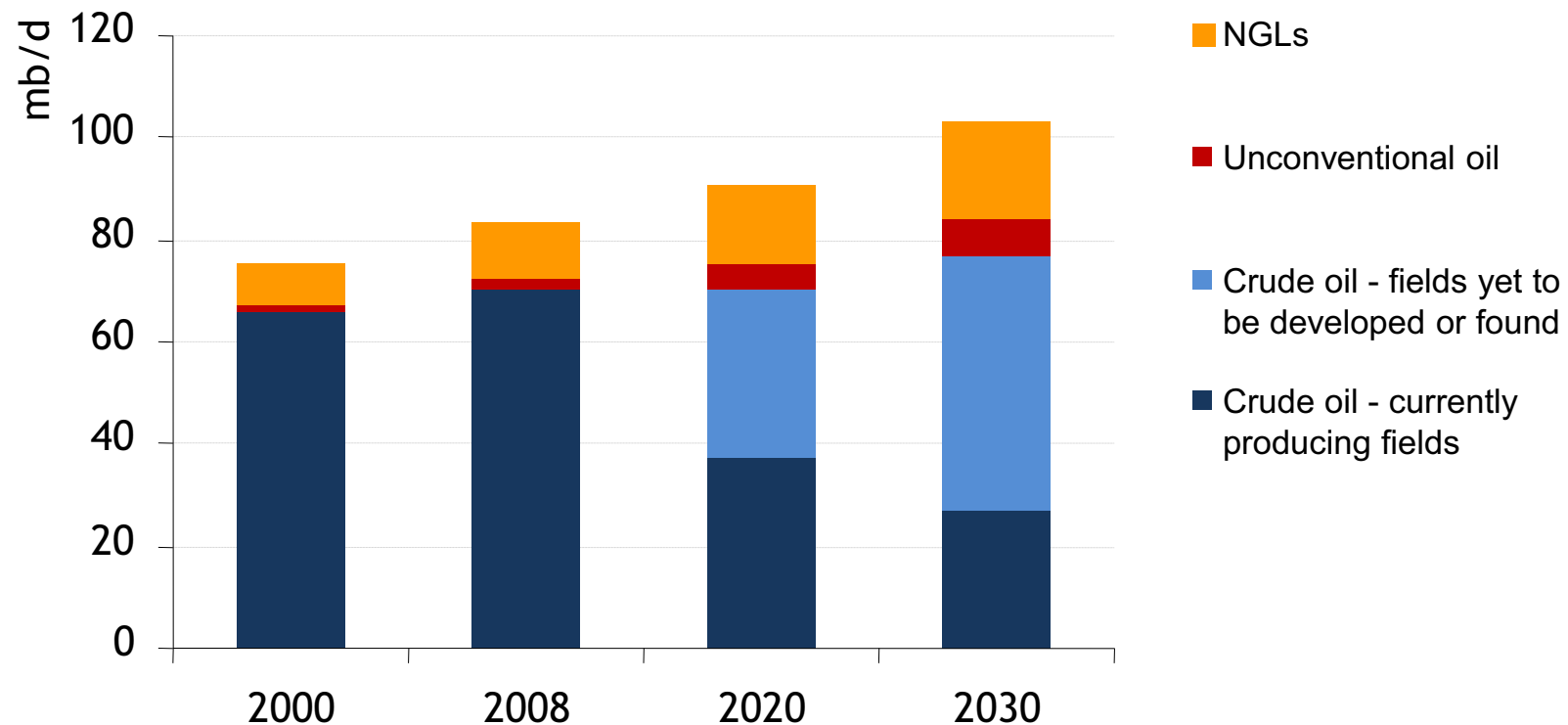
■ **Fossil fuels account for 77% of the increase in world primary energy demand in 2007-2030, with oil demand rising from 85 mb/d in 2008 to 88 mb/d in 2015 & 105 mb/d in 2030**

# Worldwide upstream oil & gas capital expenditures



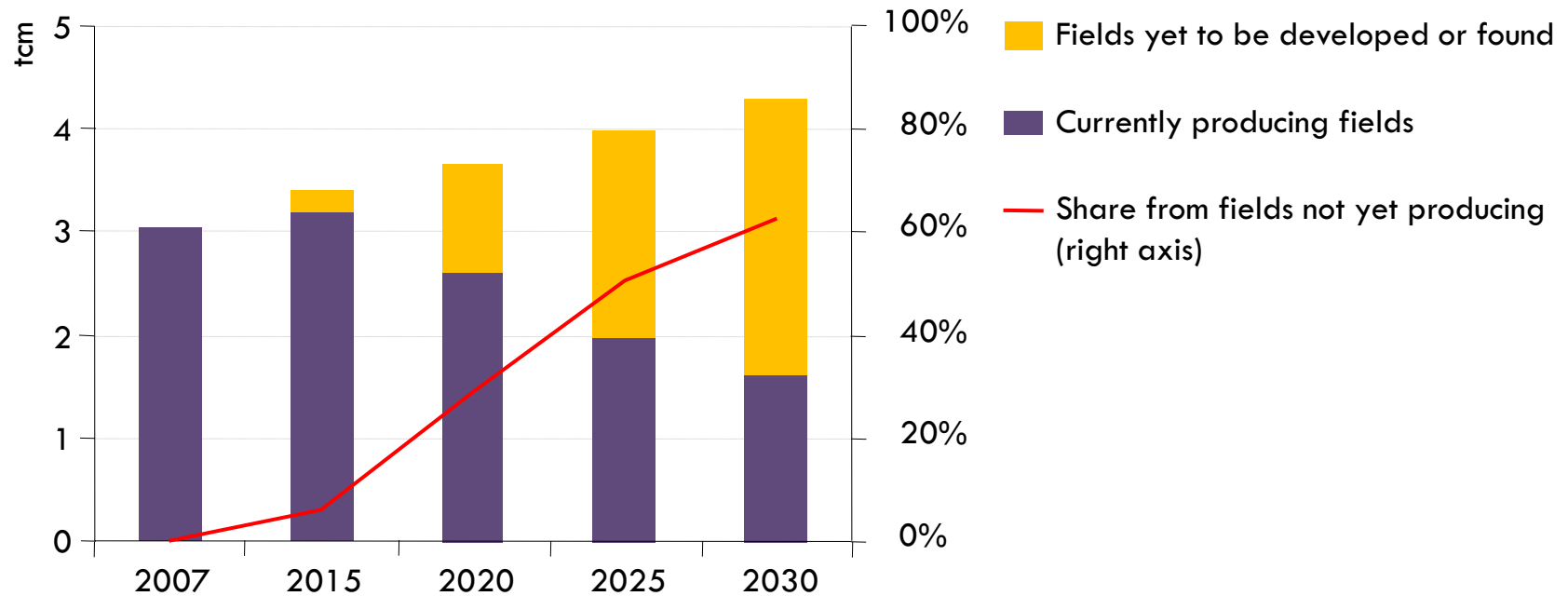
***Global upstream spending is budgeted to fall by over \$90 billion, or 19%, in 2009; the first fall in a decade***

# Oil production in the Reference Scenario



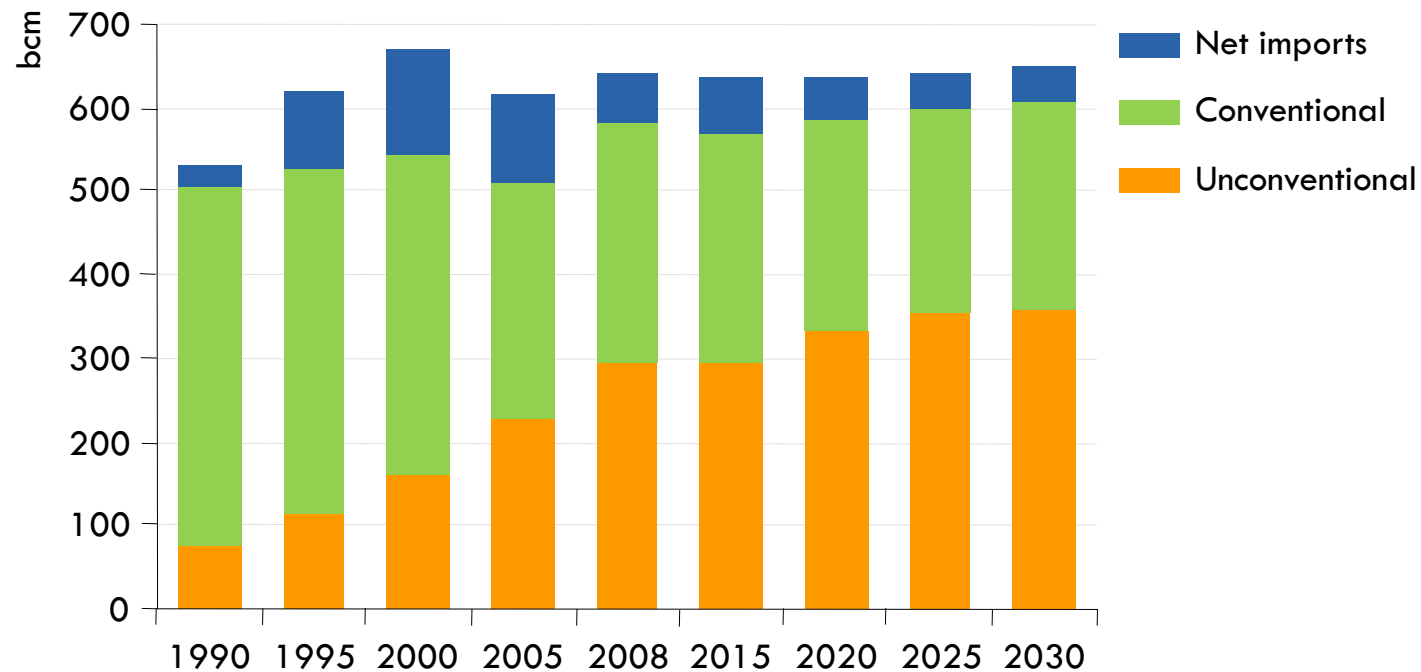
■ *Sustained investment is needed mainly to combat the decline in output at existing fields, which will drop by almost two-thirds by 2030*

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



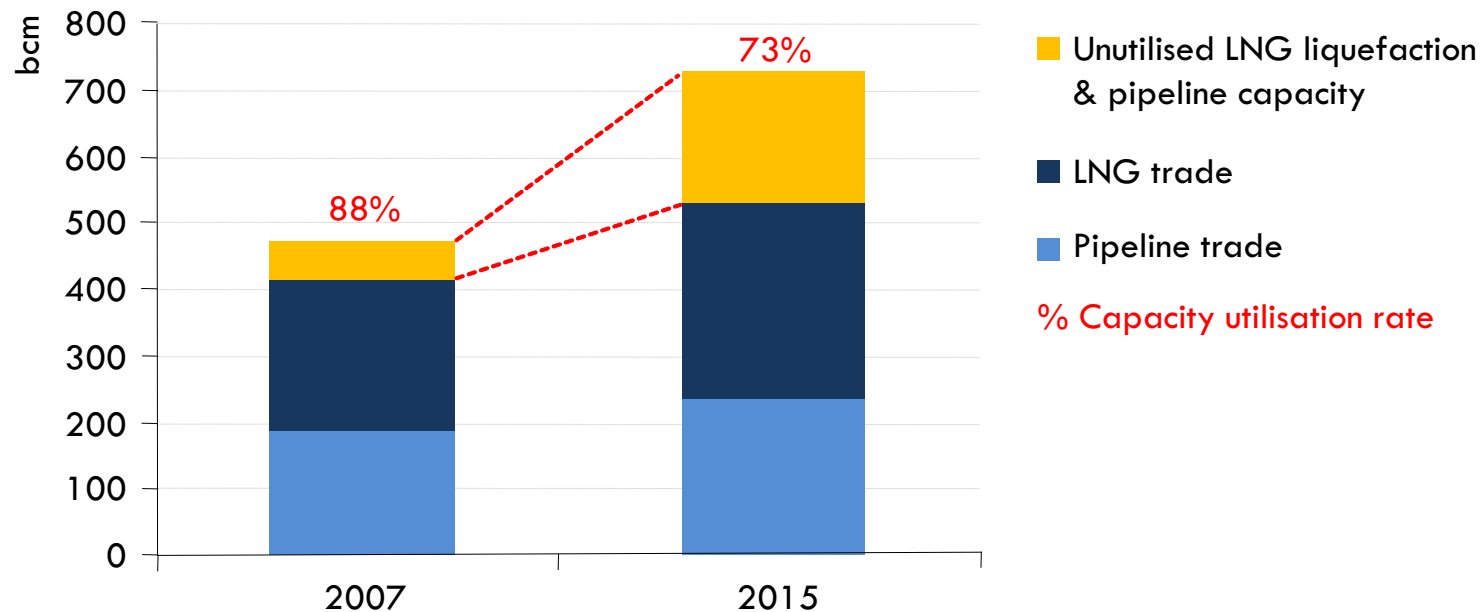
■ **Additional capacity of around 2 700 bcm, or 4 times current Russian capacity, is needed by 2030 – half to offset decline at existing fields & half to meet the increase in demand**

# US natural gas supply in the Reference Scenario



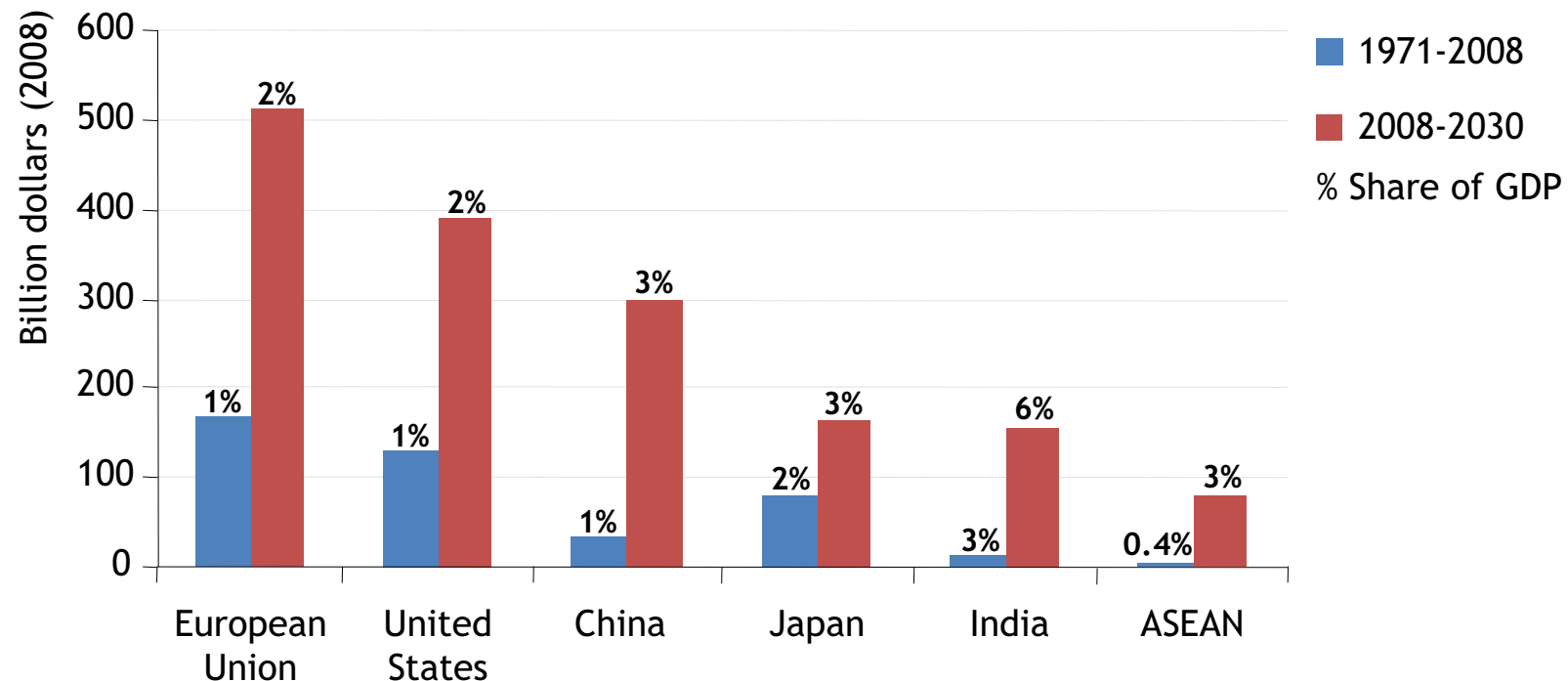
■ *Thanks mainly to shale gas, US gas output grows gradually through to 2030, outstripping demand & squeezing imports*

# Natural gas transportation capacity



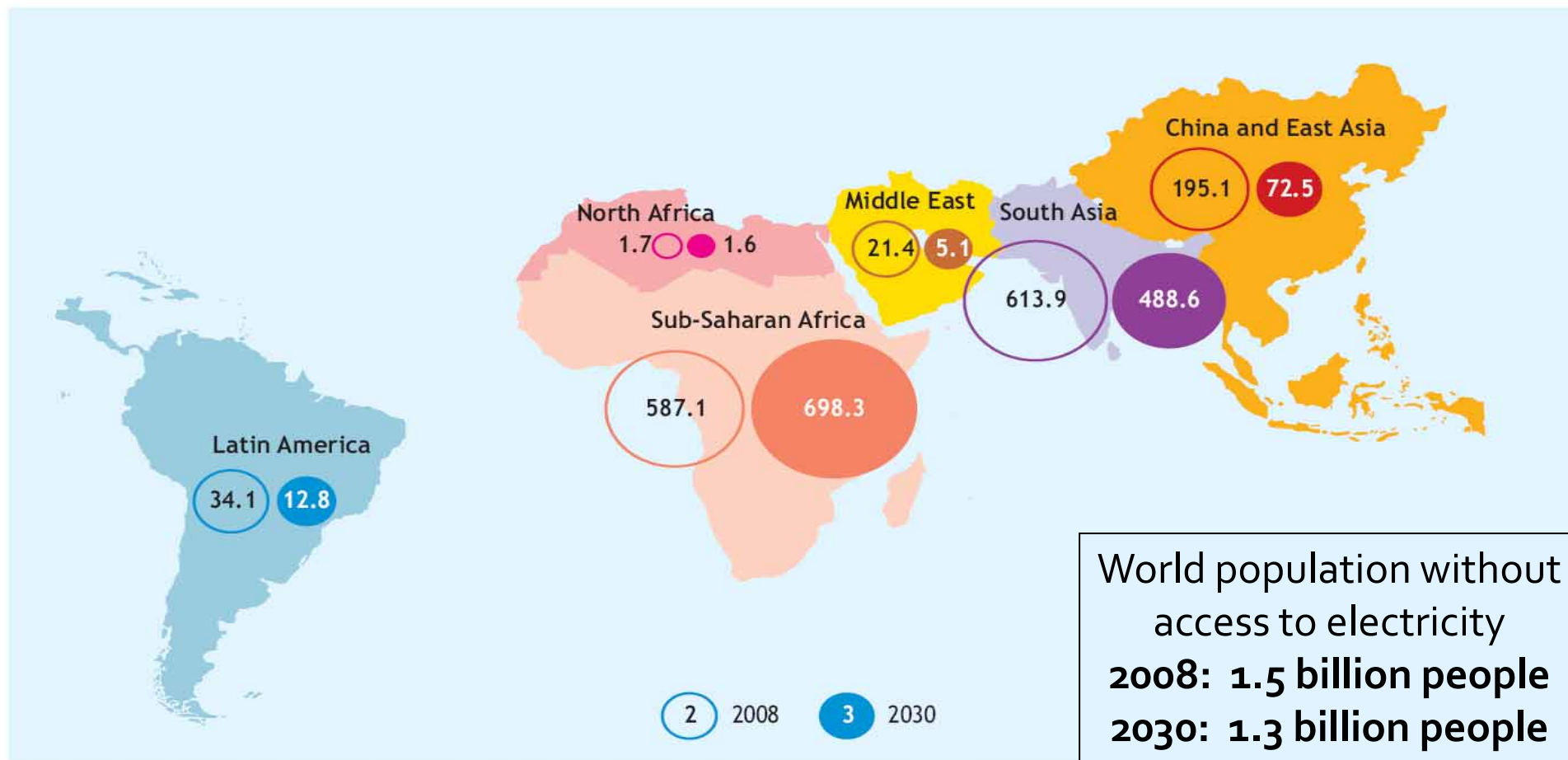
■ ***A glut of gas is developing – reaching 200 bcm by 2015 – due to weaker than expected demand & plentiful US unconventional supply, with far-reaching implications for gas pricing***

# 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)



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.

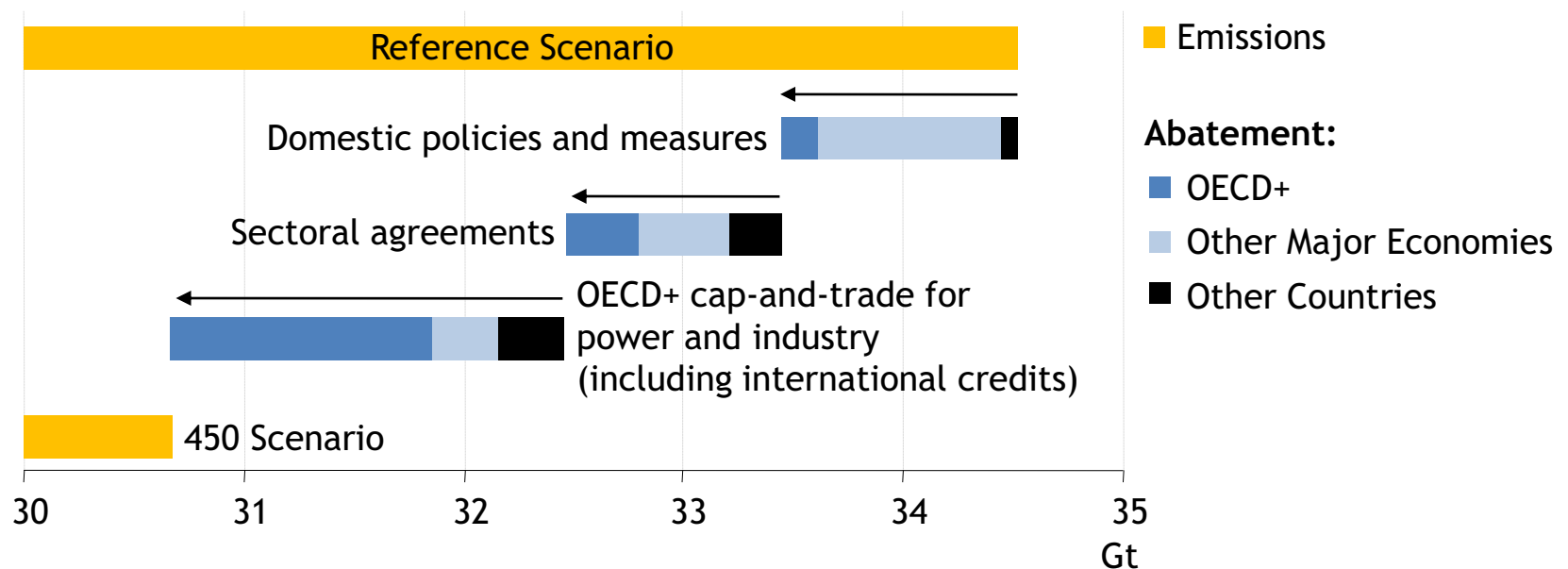
***\$35 billion per year more investment than in the Reference Scenario would be needed to 2030 – equivalent to just 5% of global power-sector investment – to ensure universal access***

# The policy mechanisms in the 450 Scenario



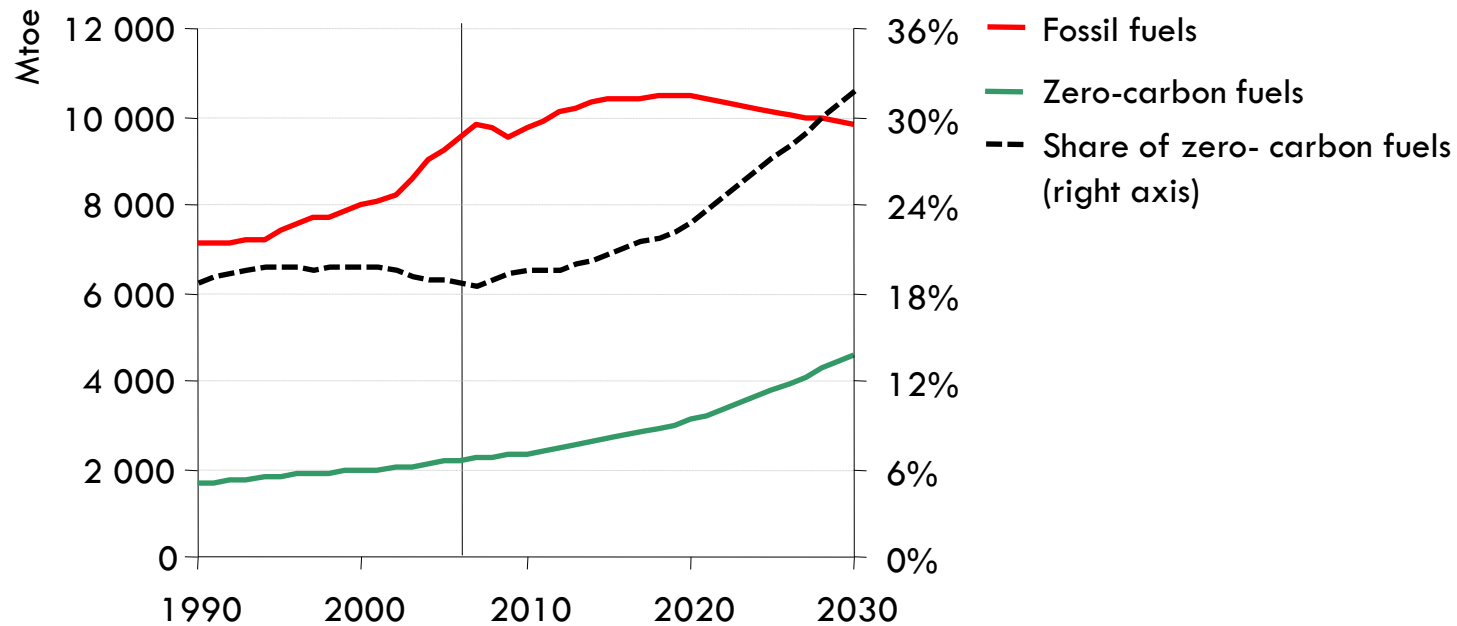
- A combination of policy mechanisms, which best reflects nations' varied circumstances & negotiating positions
- We differentiate on the basis of three country groupings
  - > *OECD+: OECD & other non-OECD EU countries*
  - > *Other Major Economies (OME): Brazil, China, Middle East, Russia & South Africa*
  - > *Other Countries (OC): all other countries, including India*
- 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*

# Abatement by policy type in the 450 Scenario relative to the Reference Scenario, 2020



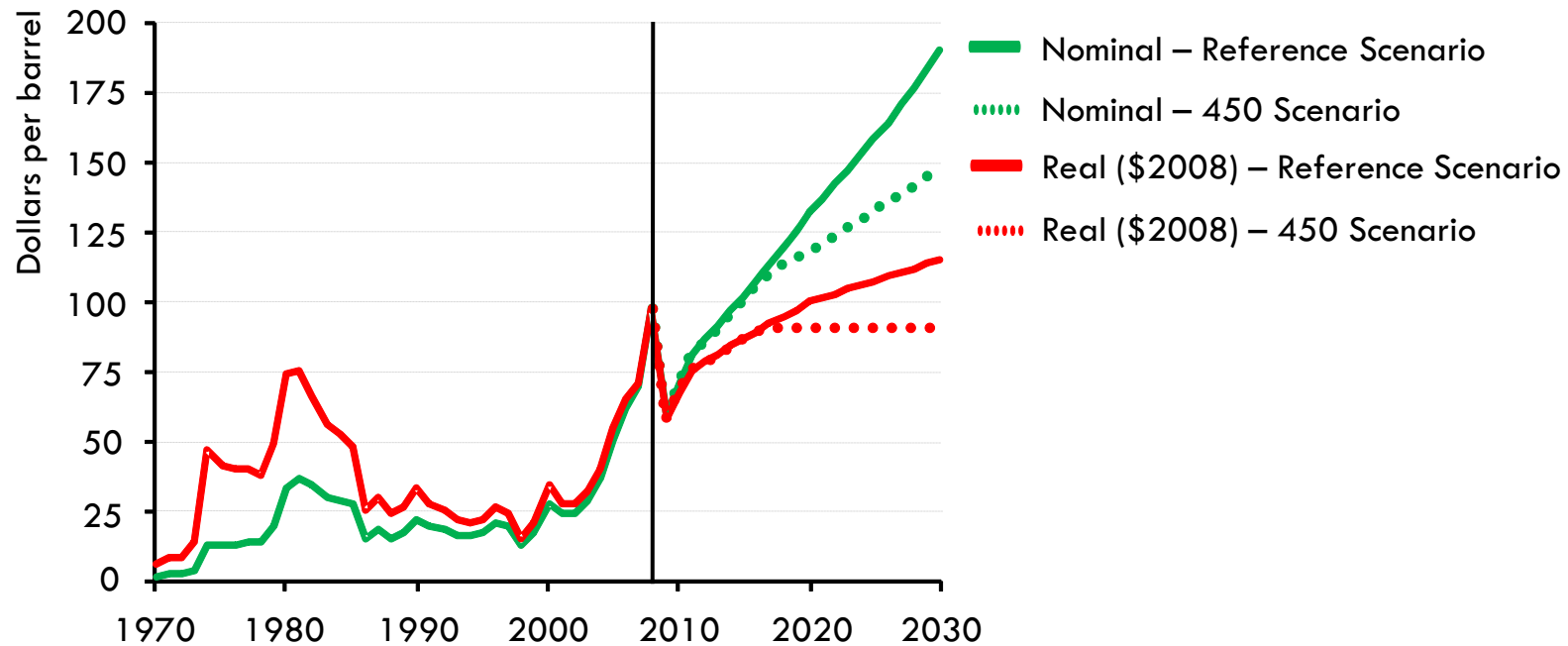
- *After realising the abatement potential of policies & measures and sectoral approaches, cap-and-trade in OECD+ yields a further 1.8 Gt*

# World primary energy demand by fuel in the 450 Scenario



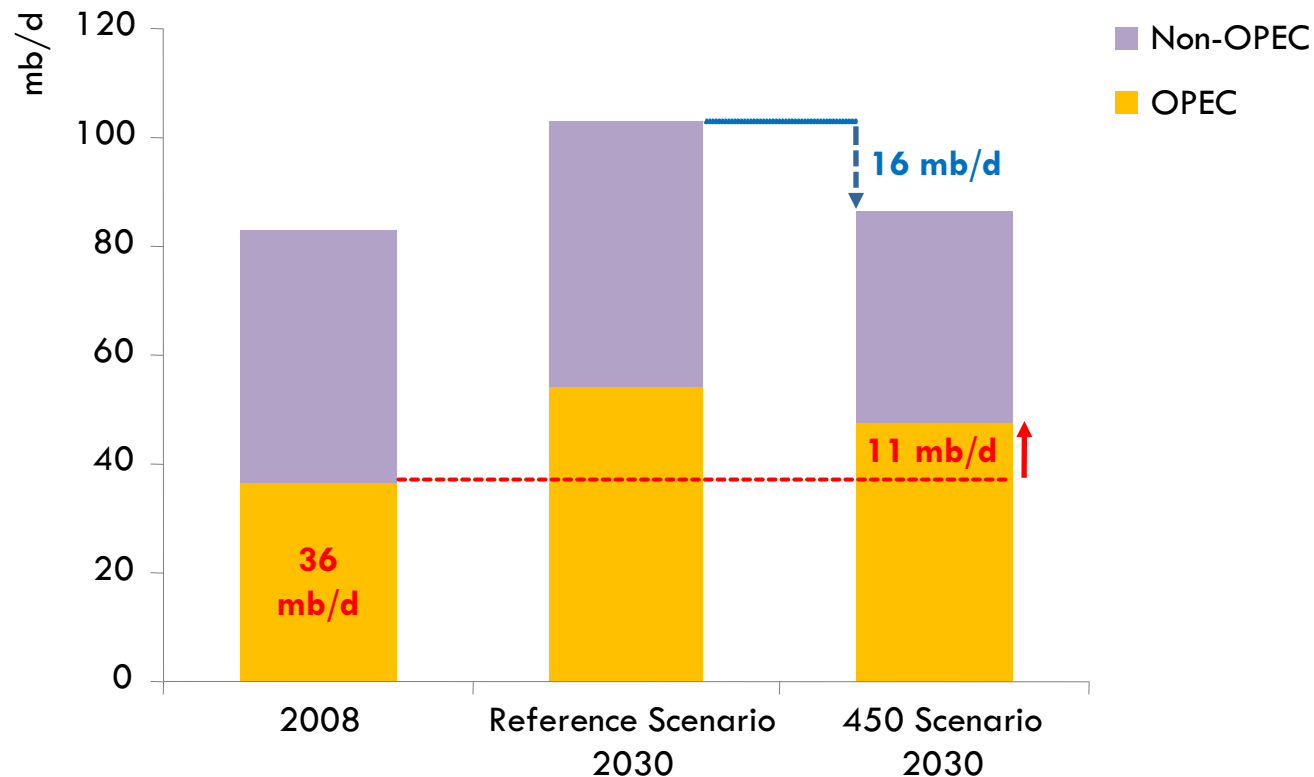
■ *In the 450 Scenario, demand for fossil fuels peaks by 2020, and by 2030 zero-carbon fuels make up a third of the world's primary sources of energy demand*

# Average IEA crude oil import price



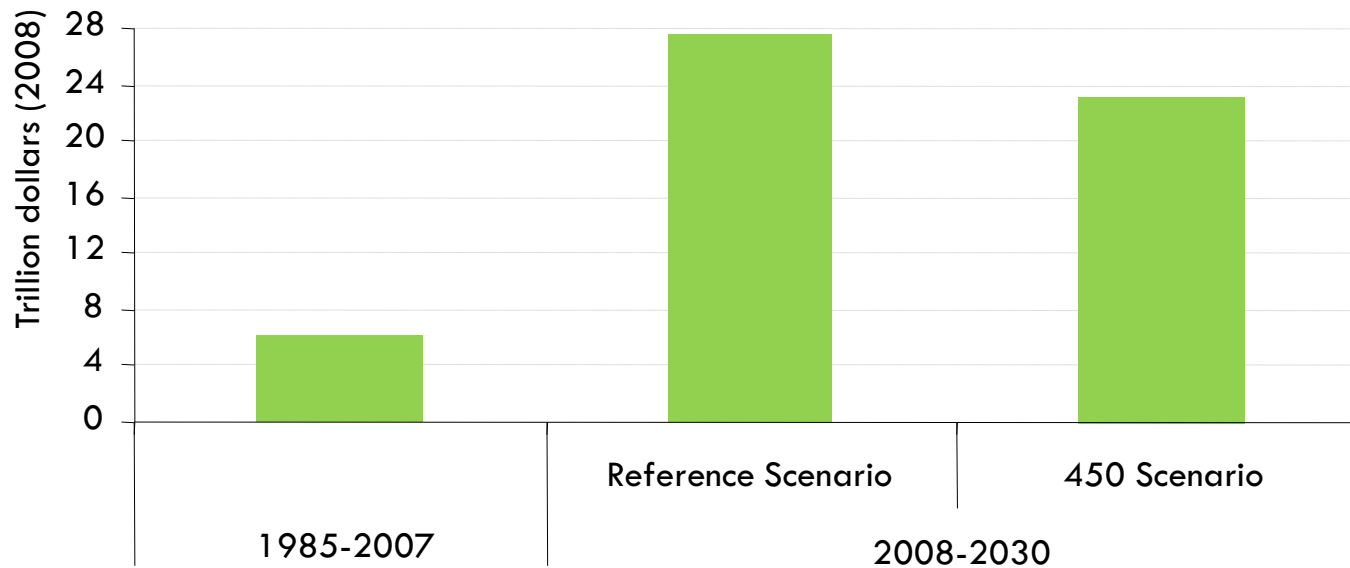
■ *The oil price in real terms is assumed to rebound from around \$60 per barrel in 2009 with the economic recovery, reaching \$100 by 2020 & \$115 per barrel by 2030 in Reference Scenario*

# World oil production by scenario



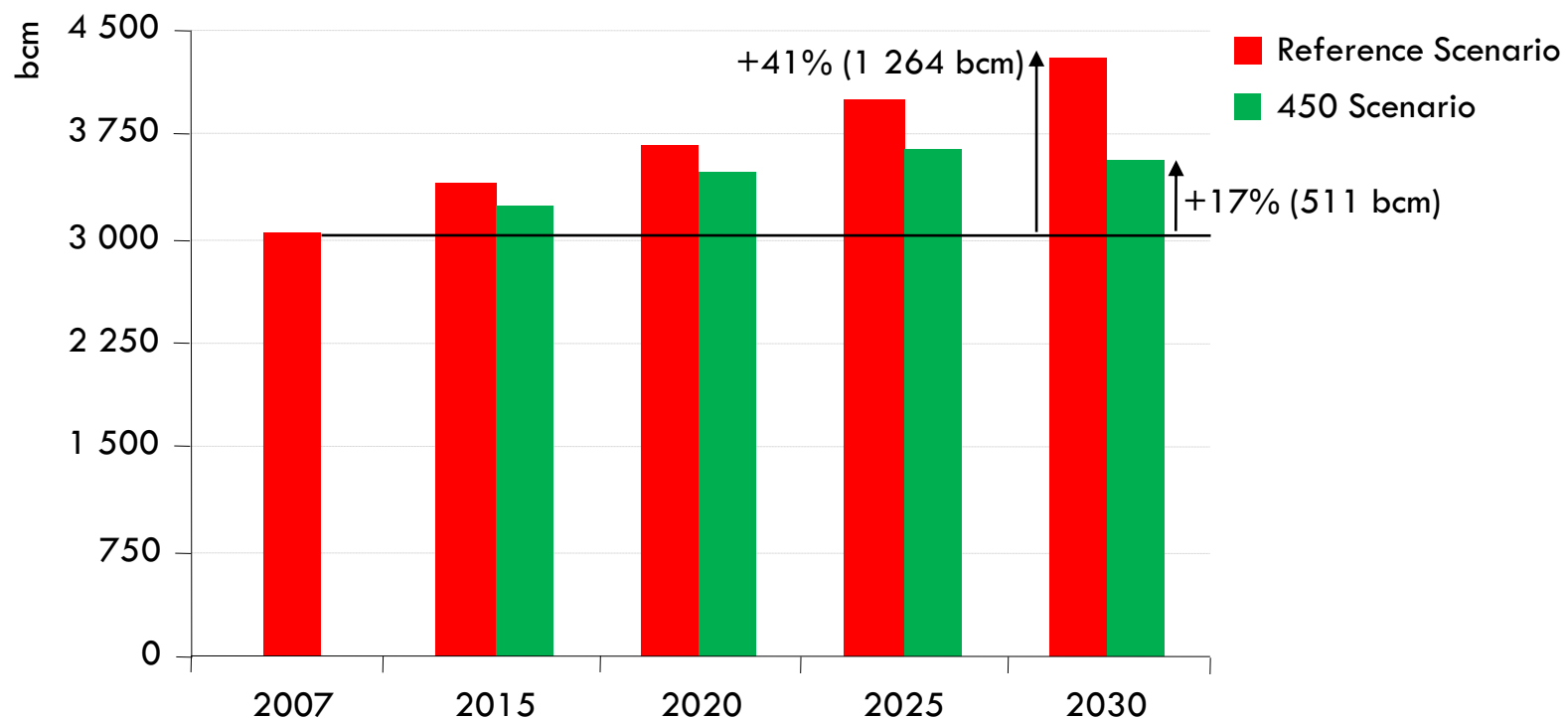
*Curbing CO<sub>2</sub> emissions would also improve energy security by cutting oil demand, but even in the 450 Scenario, OPEC production increases by 11 mb/d between now and 2030*

# Cumulative OPEC oil export revenues by scenario



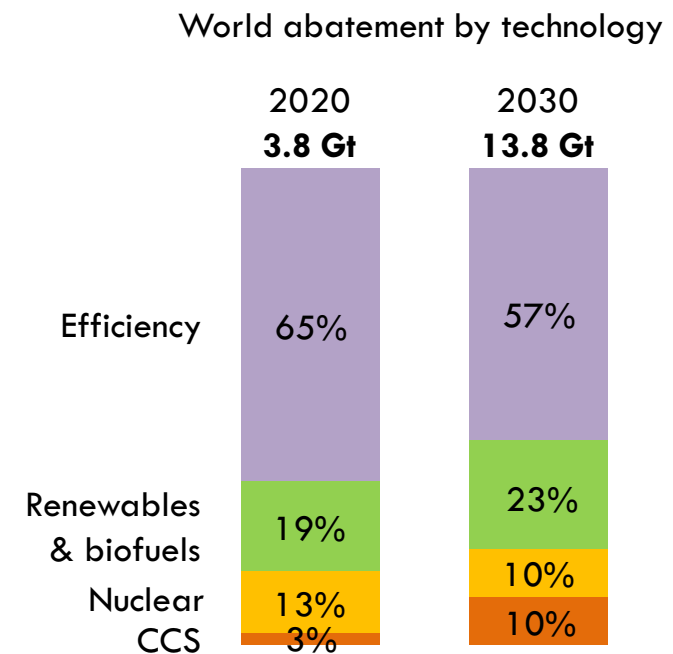
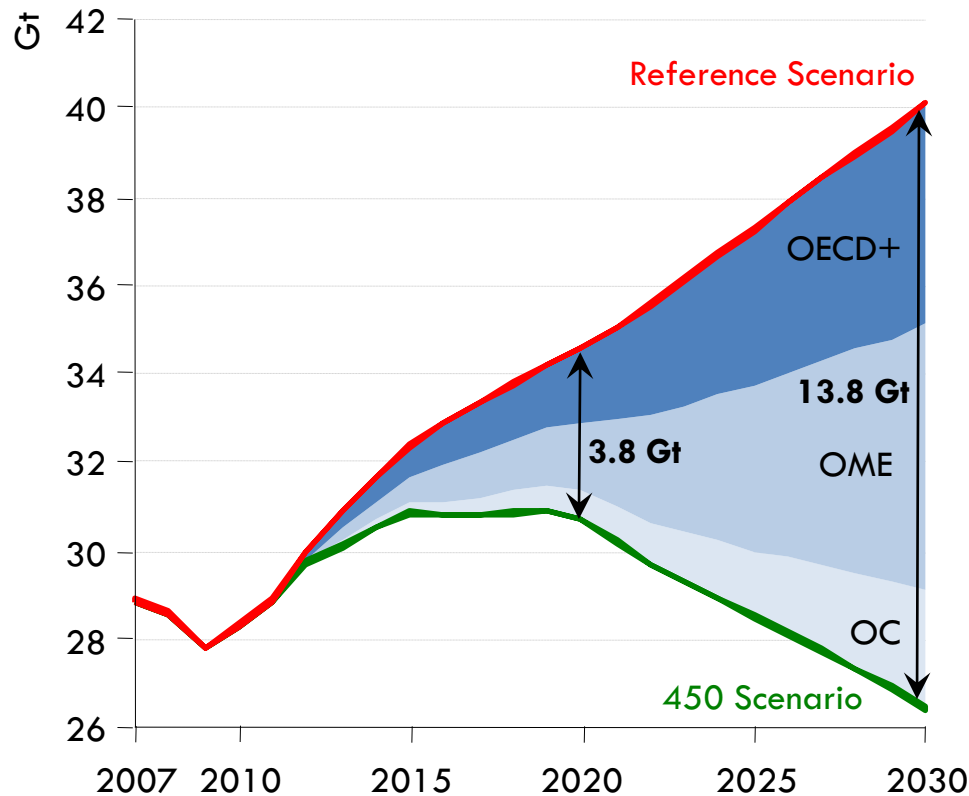
- *Though slightly lower than in the Reference Scenario, OPEC revenues in the 450 Scenario are over four times as high as in the last 20 years*

# World primary natural gas demand by scenario



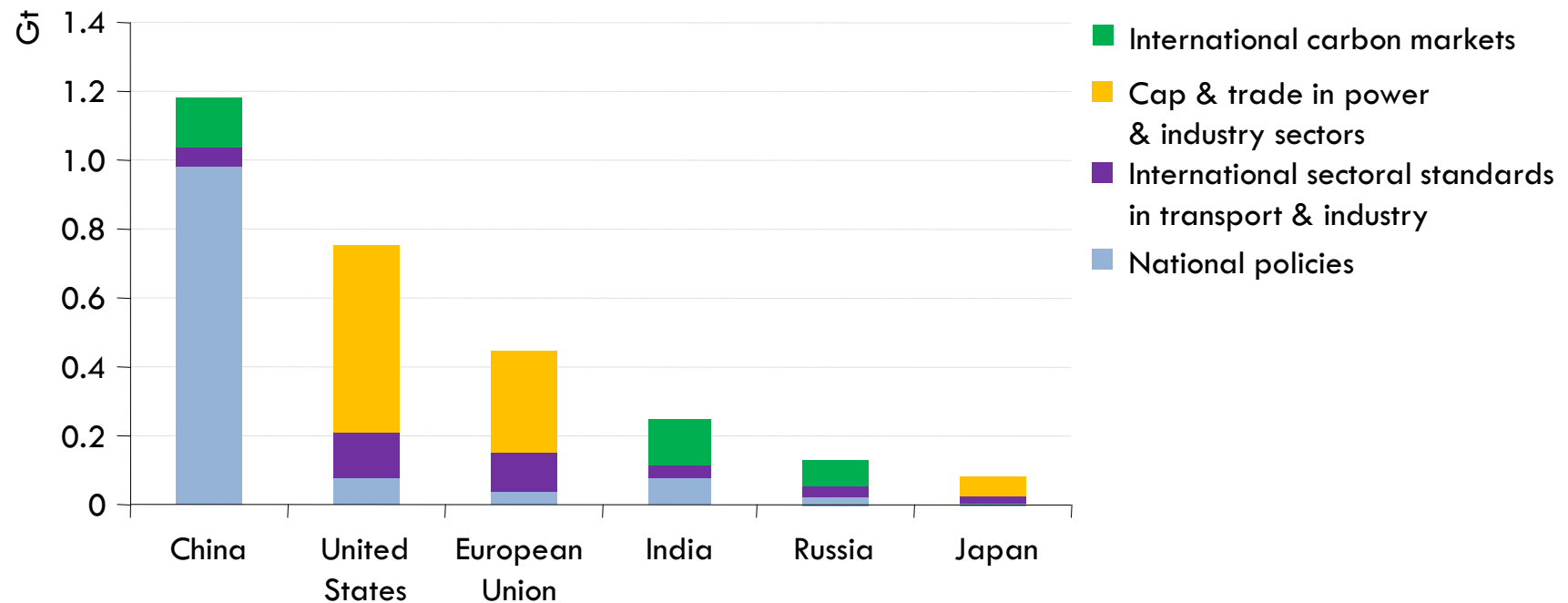
**■ Gas demand continues to grow in both scenarios, peaking by around 2025 in the 450 Scenario & highlighting the potential role of gas as a transition fuel to a clean energy future**

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



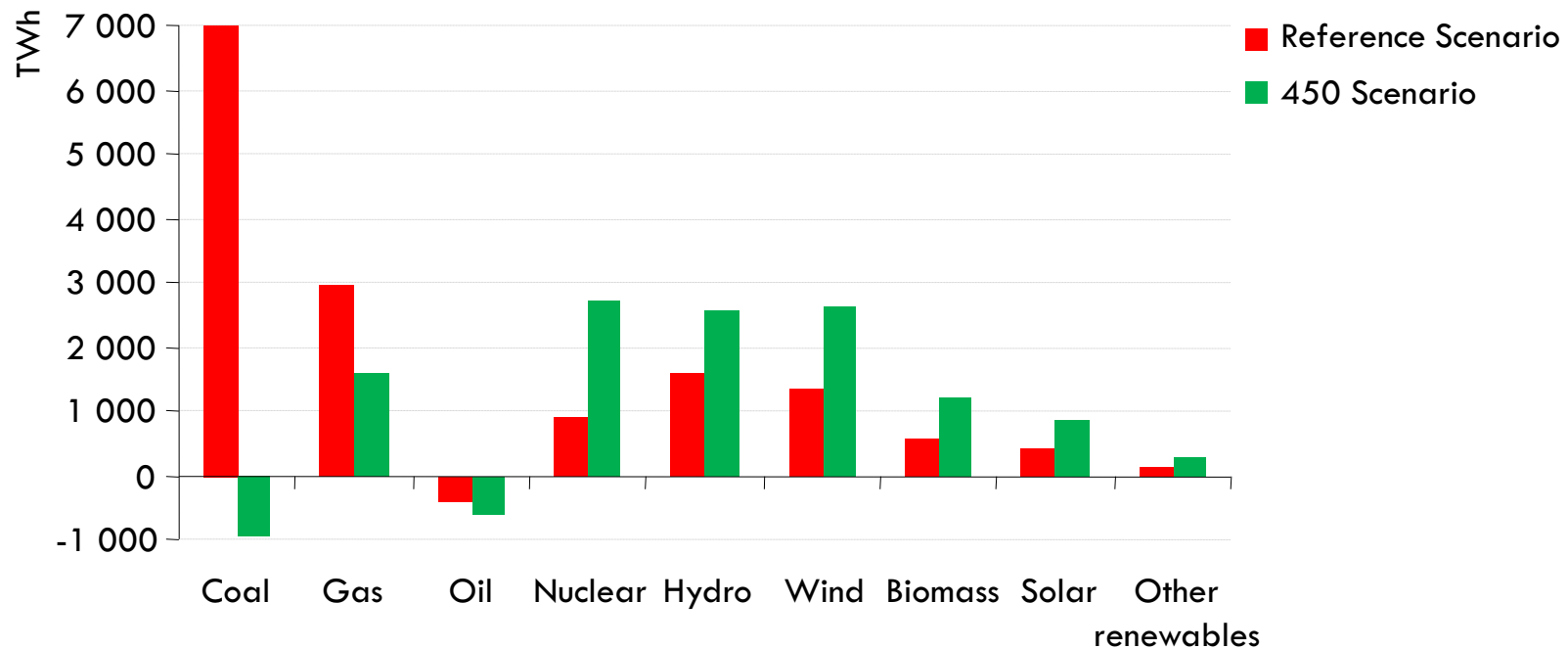
■ An additional \$10.5 trillion of investment is needed in total in the 450 Scenario, with measures to boost energy efficiency accounting for most of the abatement through to 2030

# Abatement in the 450 Scenario by key emitters, 2020



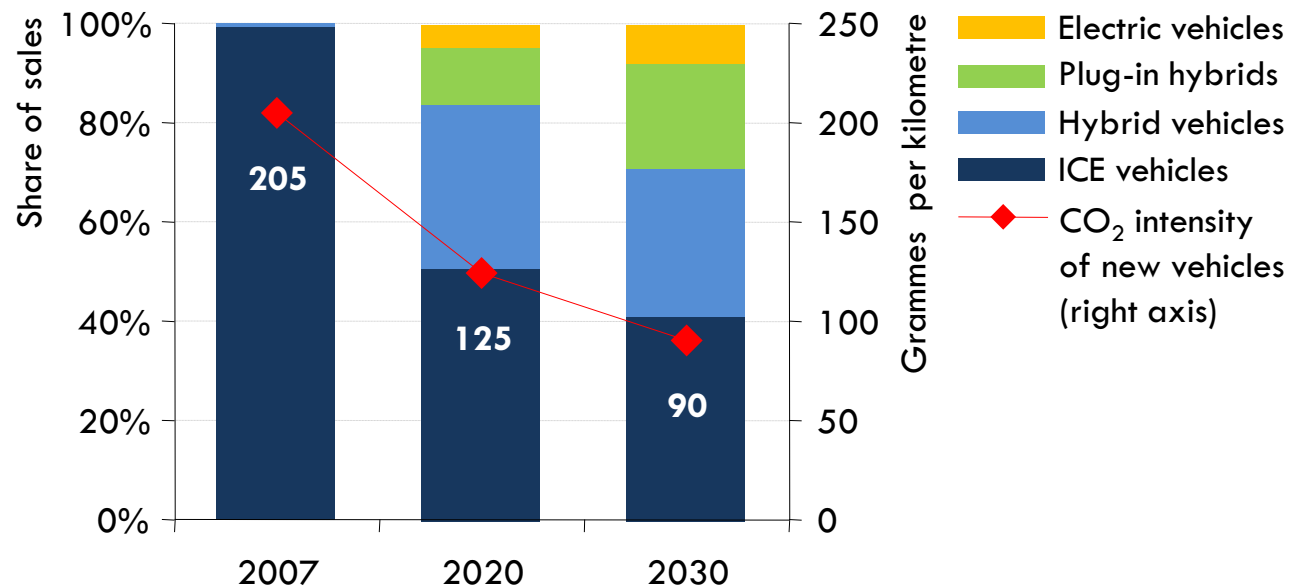
***China, the United States, the European Union, India, Russia & Japan account for almost three-quarters of the 3.8 Gt reduction in the 450 Scenario***

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



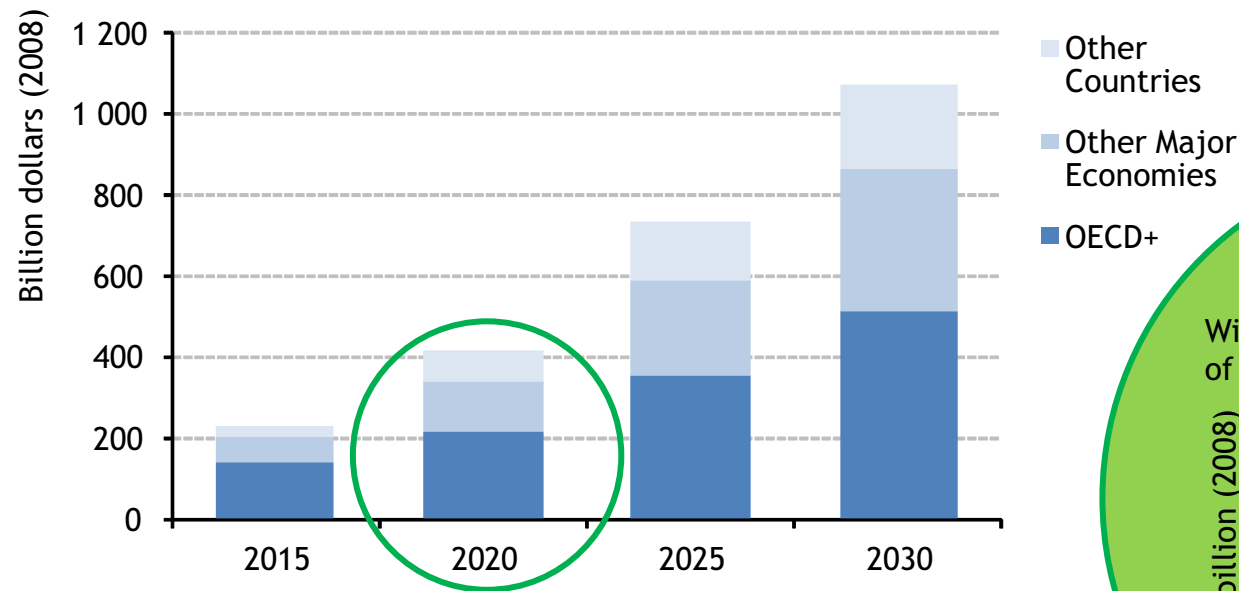
■ **Renewables, nuclear and plants fitted with CCS account for around 60% of electricity generation globally in 2030 in the 450 Scenario, up from less than one-third today**

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

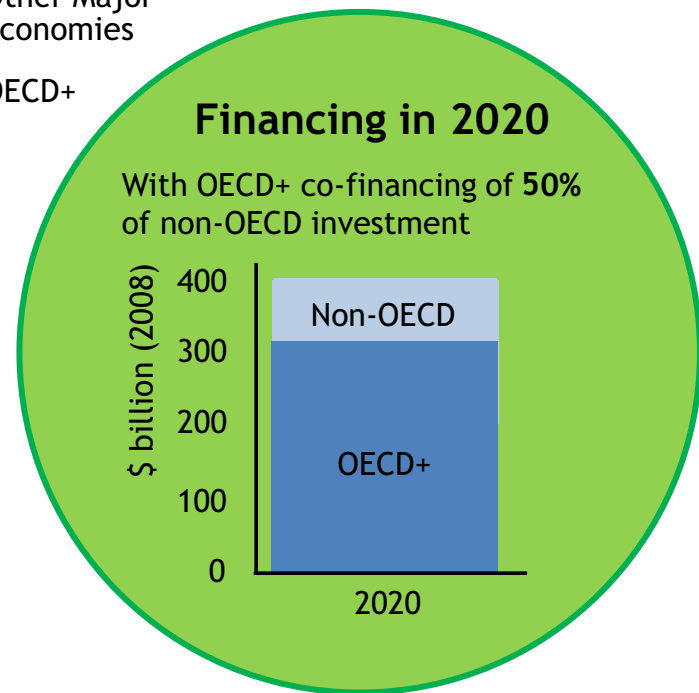


■ **Improvements to the internal combustion engine & the uptake of next-generation vehicles & biofuels lead to a 56% reduction in new-car emission intensity by 2030**

# Additional investment in the 450 Scenario relative to the Reference Scenario, by region

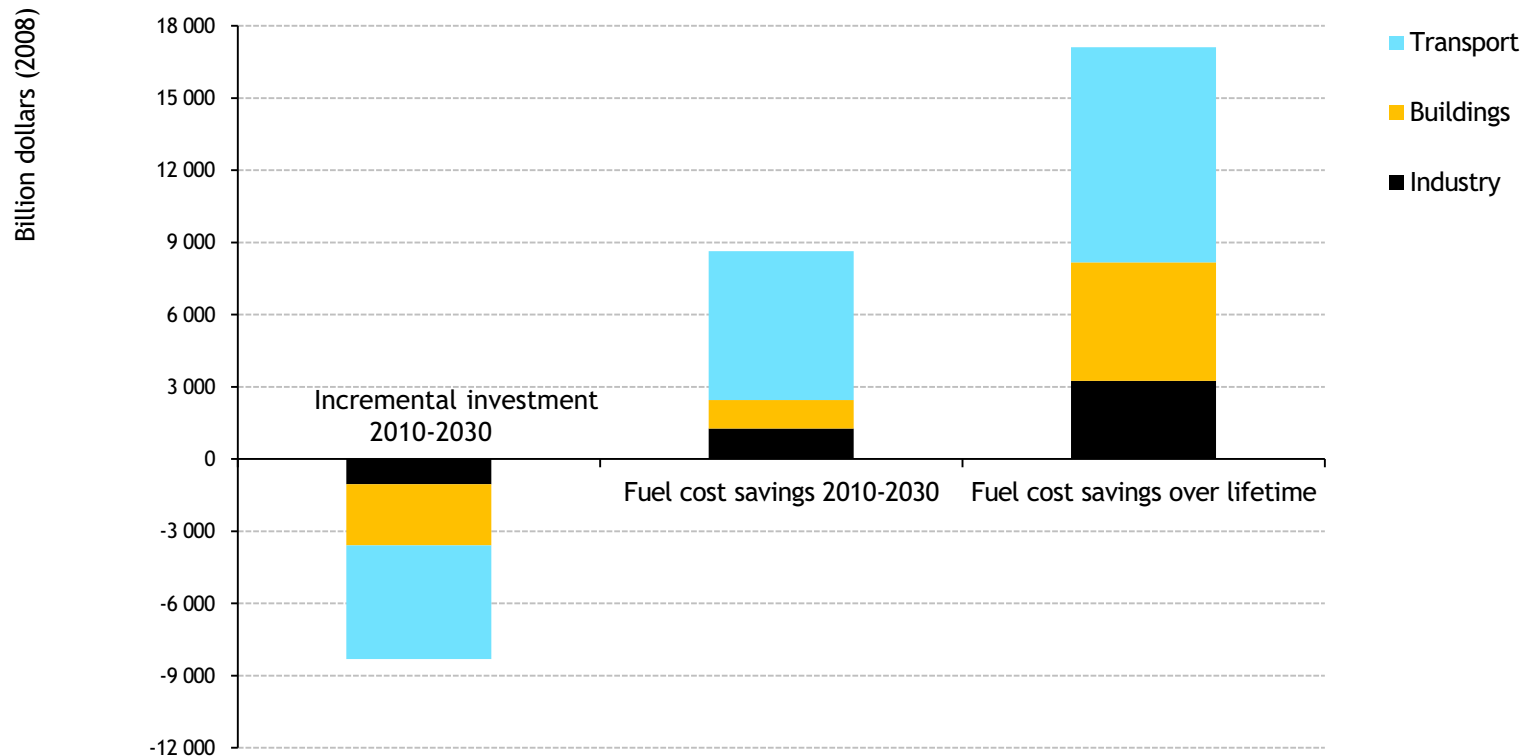


Source: Early excerpt of WEO 2009 for Bangkok UNFCCC meeting



*The 450 Scenario sees \$10 trillion of additional investment to the Reference Scenario, costing 0.5% of GDP in 2020 and 1.1% of GDP in 2030*

# Additional investment and fuel cost savings in the 450 Scenario vs. the Reference Scenario



***Fuel costs saving in industry, buildings and transport of \$8.6 trillion over the 2010-30 period more than offset these sectors additional investment of \$8.3 trillion***

***Energy efficiency needs a major policy push – its low cost potential is essential to establish the feasibility of ambitious climate goals***

Source: IEA analysis, and World Energy Outlook 2009

# IEA 25 energy efficiency policy recommendations across 7 priority areas



## 1. Across sectors

- 1.1 Measures for increasing investment in energy efficiency;
- 1.2 National energy efficiency strategies and goals;
- 1.3 Compliance, monitoring, enforcement and evaluation of energy efficiency measures;
- 1.4 Energy efficiency indicators;
- 1.5 Monitoring and reporting progress with the IEA energy efficiency recommendations themselves.

## 2. Buildings

- 2.1 Building codes for new buildings;
- 2.2 Passive Energy Houses and Zero Energy Buildings;
- 2.3 Policy packages to promote energy efficiency in existing buildings;
- 2.4 Building certification schemes;
- 2.5 Energy efficiency improvements in glazed areas.

## 3. Appliances

- 3.1 Mandatory energy performance requirements or labels;
- 3.2 Low-power modes, including standby power, for electronic and networked equipment;
- 3.3 Televisions and “set-top” boxes;
- 3.4 Energy performance test standards and measurement protocols.

## 4. Lighting

- 4.1 Best practice lighting and the phase-out of incandescent bulbs;
- 4.2 Ensuring least-cost lighting in non-residential buildings and the phase-out of inefficient fuel-based lighting.

## 5. Transport

- 5.1 Fuel-efficient tyres;
- 5.2 Mandatory fuel efficiency standards for light-duty vehicles;
- 5.3 Fuel economy of heavy-duty vehicles;
- 5.4 Eco-driving.

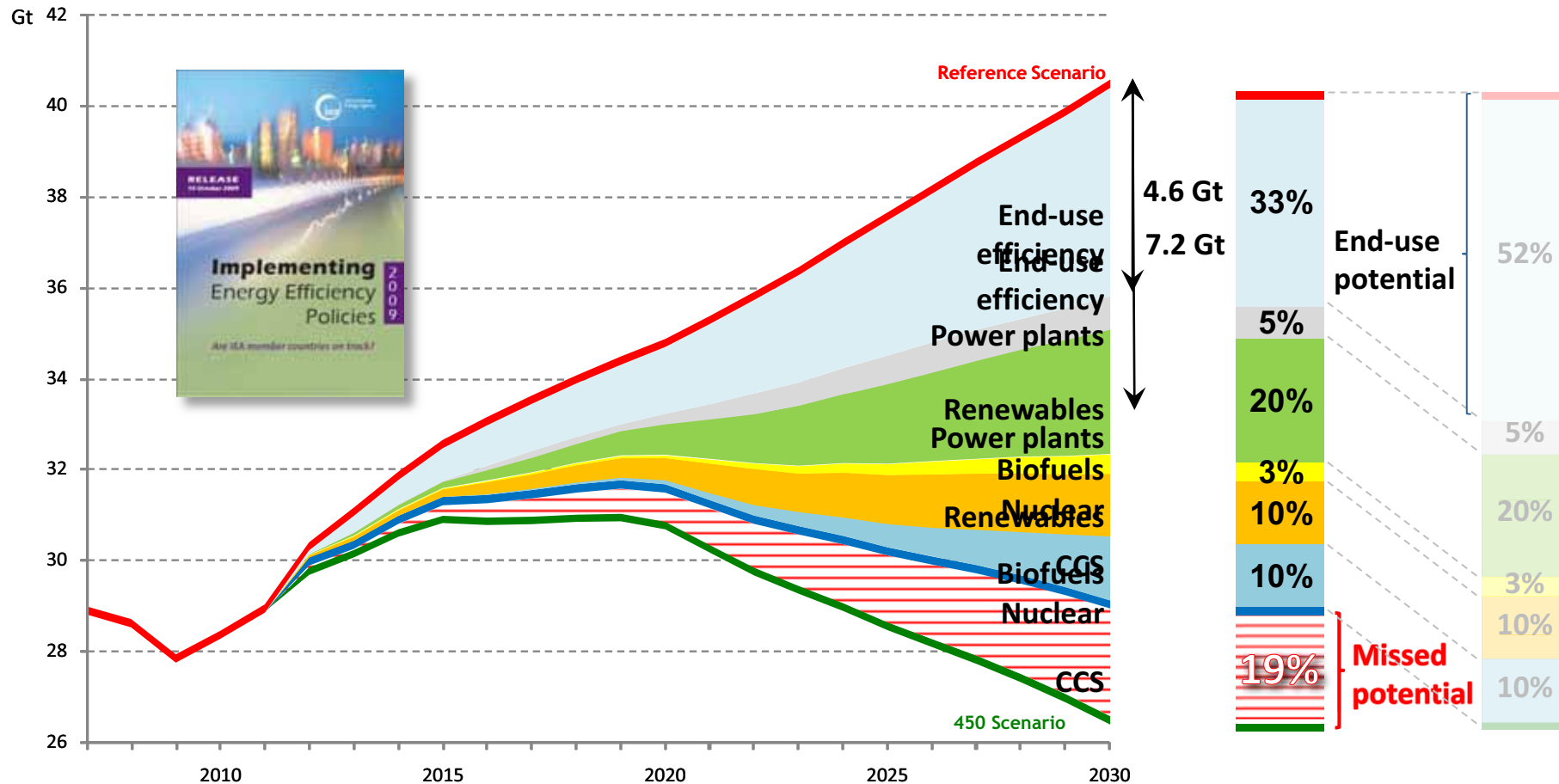
## 6. Industry

- 6.1 Collection of high quality energy efficiency data for industry;
- 6.2 Energy performance of electric motors;
- 6.3 Assistance in developing energy management capability;
- 6.4 Policy packages to promote energy efficiency in small and medium-sized enterprises.

## 7. Utilities

- 7.1 Utility end-use energy efficiency schemes

# Energy efficiency in the 450 Scenario: we can't miss a vital opportunity

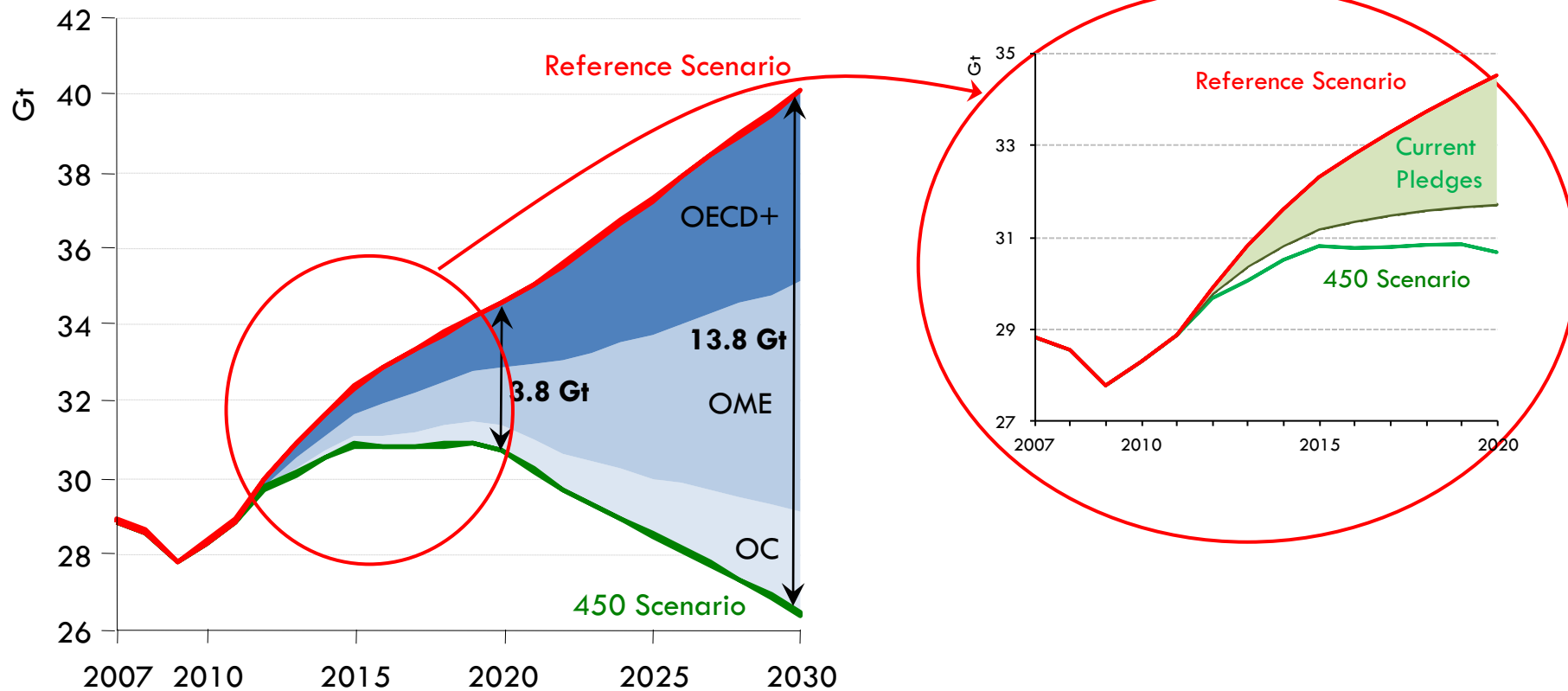


*Current levels of implementation are insufficient, leading to 2.5 Gt of missed potential by 2030. 450 scenario will not be achieved.*

# Copenhagen outcome

- Copenhagen Accord takes significant steps forward on international climate policy
- Next steps: developed and developing country pledges (31 January 2010)
- Operational details of the Accord (Fund, Mechanism, market approaches, etc.)
- Integration of the Accord's elements into UNFCCC

# Copenhagen and the 450 Scenario



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

# Copenhagen: Energy sector implications



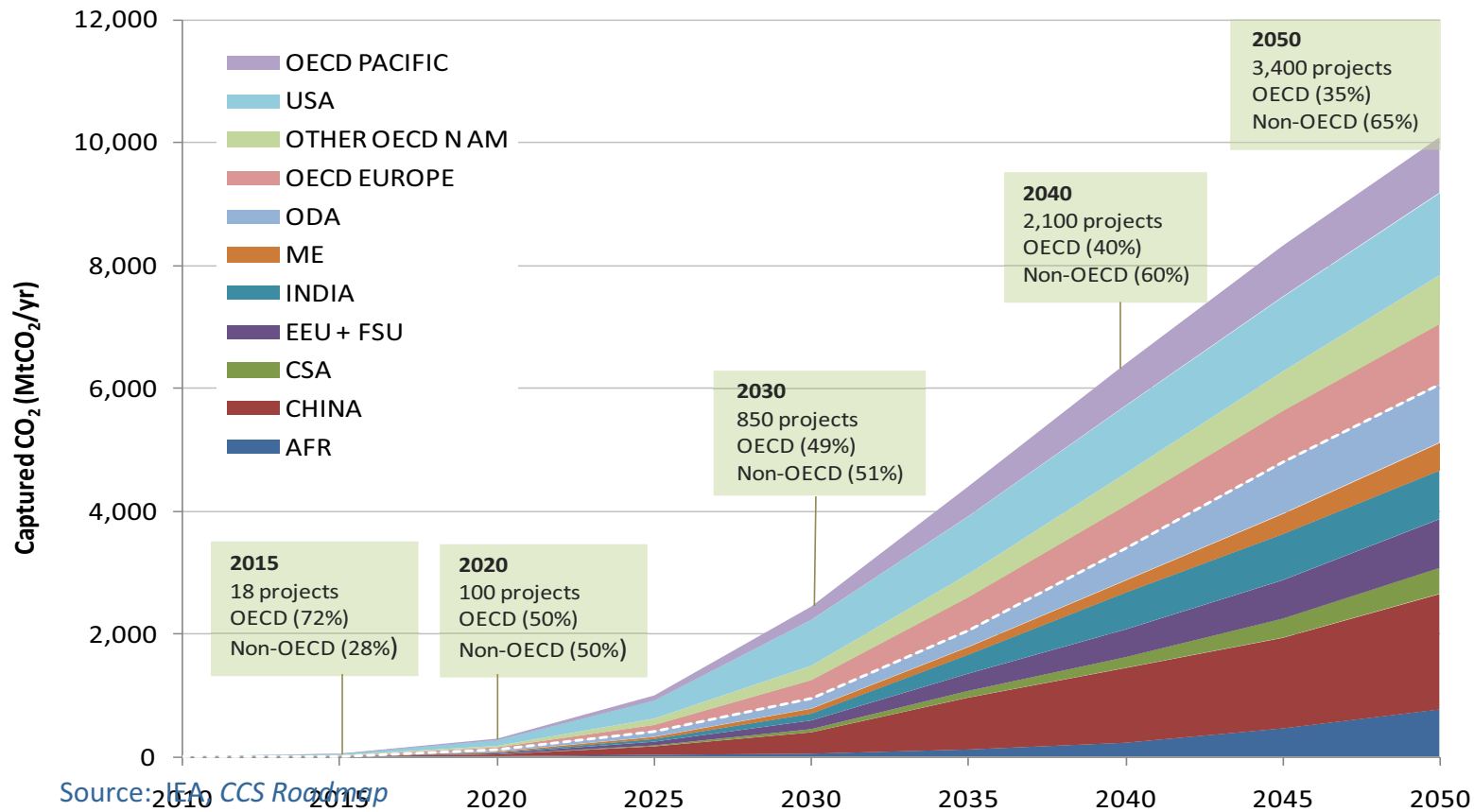
- A political endorsement, at highest level, of the fight against climate change, with new institutions and new funding
  - Important pledges made by developing countries
  
- No explicit treatment of energy, *but*
  - An ambitious end-goal (2°C) with massive energy sector implications
  - Energy is at the core of most developing countries' current climate change activities
  - Market approaches are recognised – the energy sector needs a CO<sub>2</sub> price to make appropriate investment decisions
  
- Copenhagen Green Climate Fund + Technology Mechanism
  - What areas in energy sector require support?
    - ◆ *Electricity and energy efficiency policy should be priority areas*
    - ◆ *Will funding move and be effective early enough?*
  - Role of energy sector expertise in these discussions?

# How do we get there from here? Low Carbon Energy Technology Roadmaps



- Based on scenario to halve CO<sub>2</sub> emissions by 2050
- Establish a baseline of technology status today
- Create technical, policy, legal, financial, and public acceptance milestones and priority near-term actions
- Create a process for stakeholder collaboration
  - > Special developing country focus on engagement, national roadmaps
- Identify partners for implementation
- Roadmaps developed: CCS, electric vehicles, wind, cement sector
- Roadmaps coming soon: solar PV, Concentrating Solar Power
- Roadmaps for 2010: smart grids, biofuels, nuclear power, EE buildings, Geothermal energy
- Working closely with the MEF
  - > RD&D mapping exercise for the 8 MEF technology areas
  - > Collaboration between the IEA roadmaps and MEF Action Plans

# CCS: A roadmap to 2050

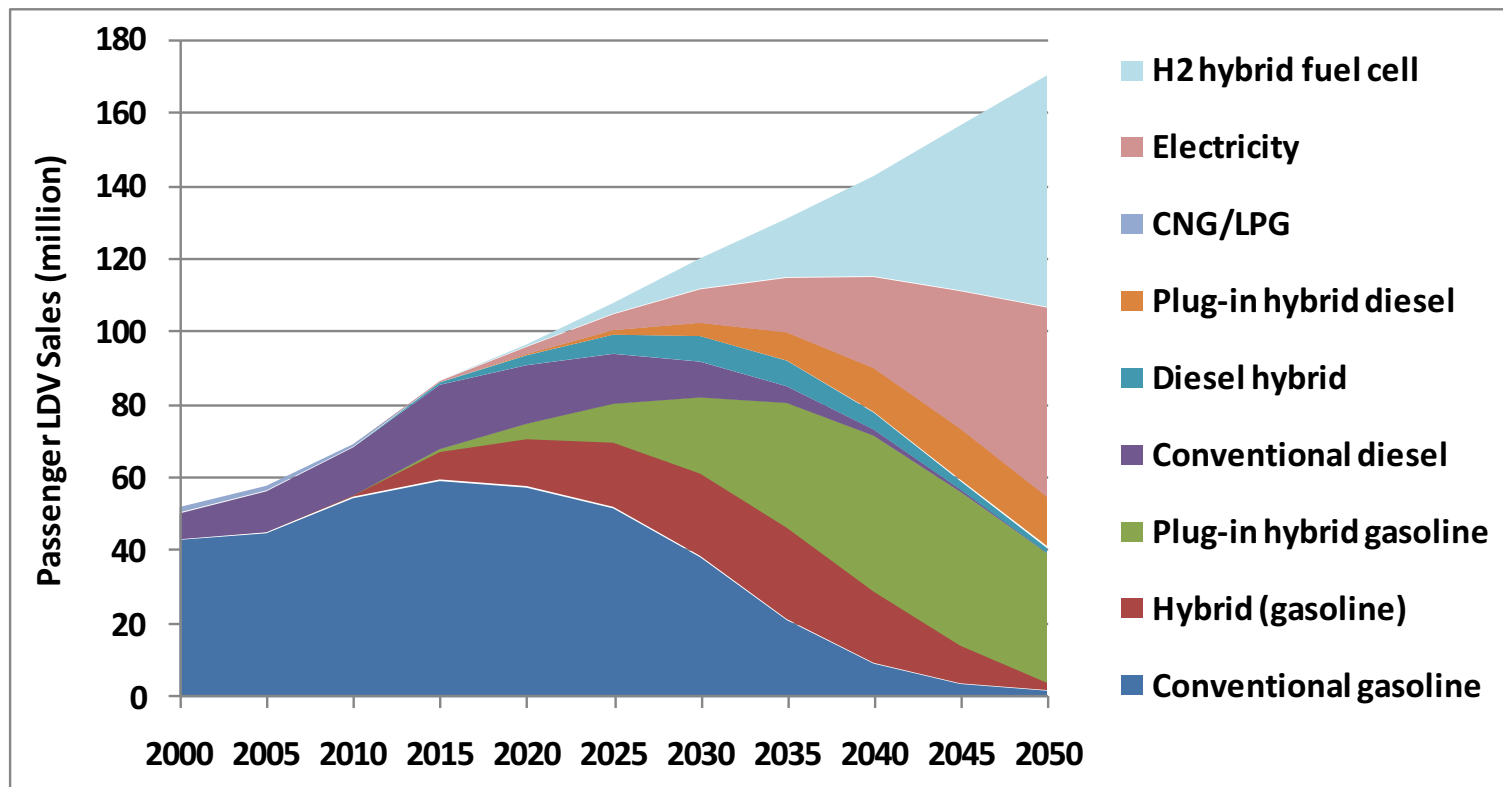


**CCS will require additional investment of 2.5-3 trn by 2050**

# Electric vehicles: A roadmap to 2050



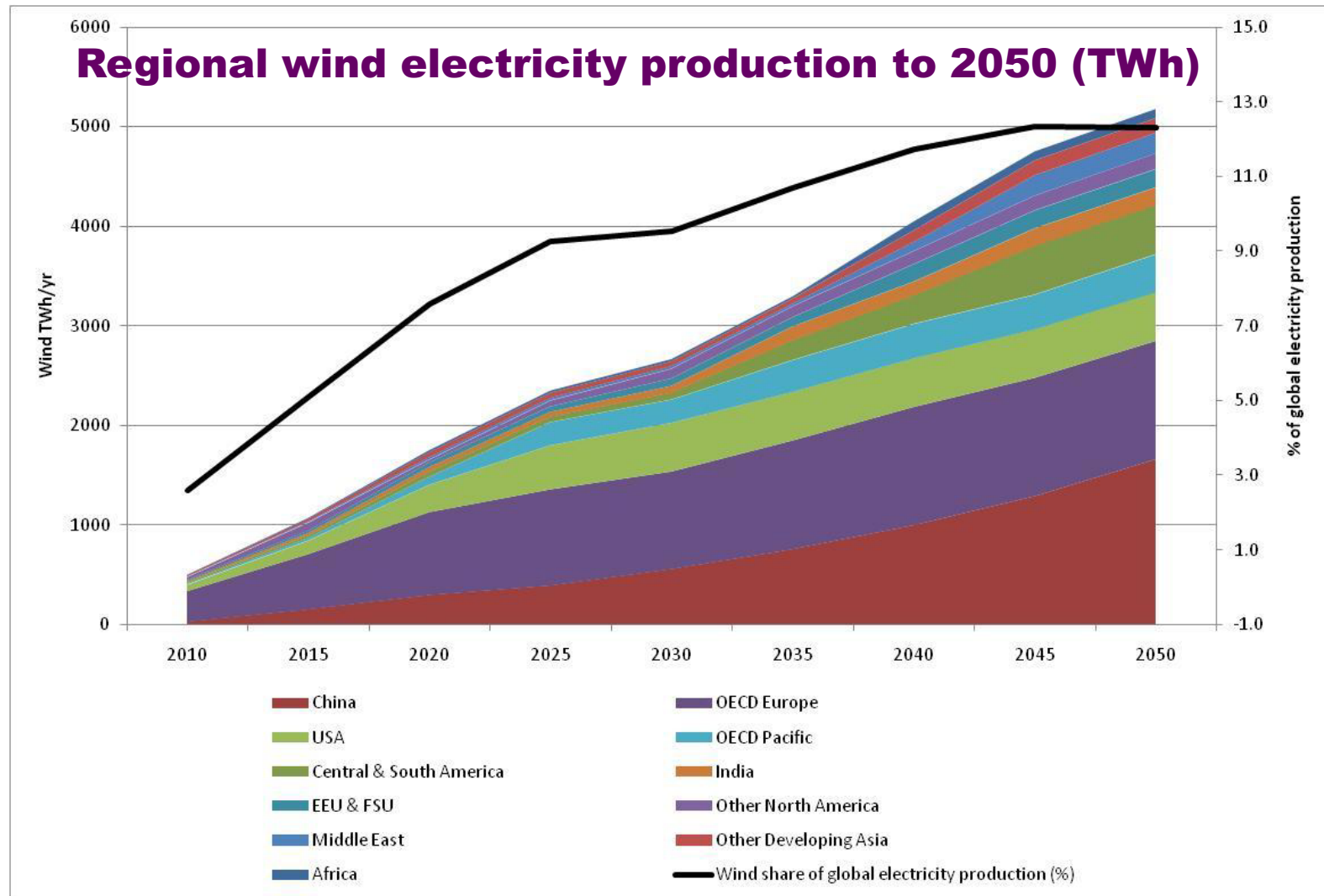
*Light-duty vehicle sales by technology type to 2050, ETP BLUE Map Scenario*



Source: IEA, *EV Roadmap*

*Unprecedented rates of change in market penetration of advanced technologies*

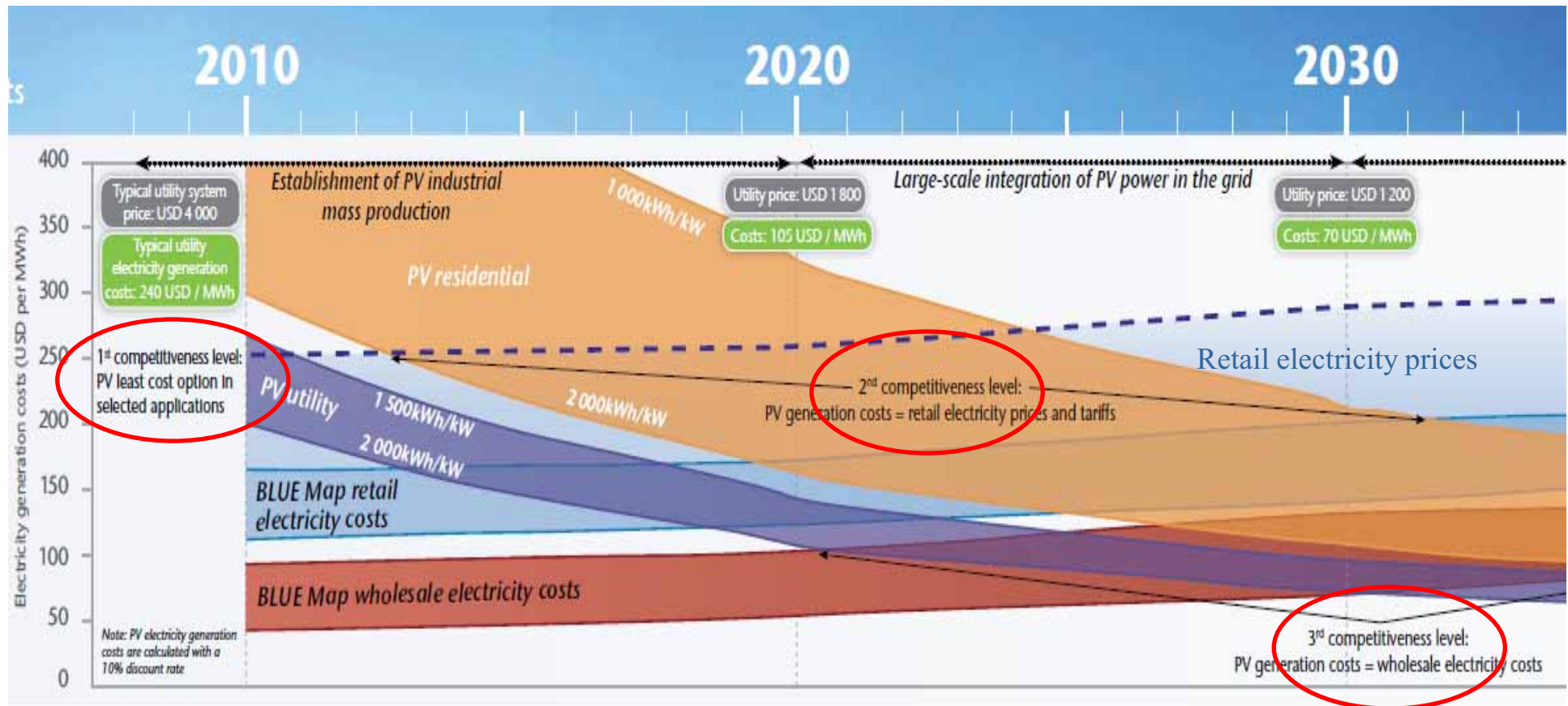
# Wind roadmap targets



Source: IEA, Wind Energy Roadmap (forthcoming).

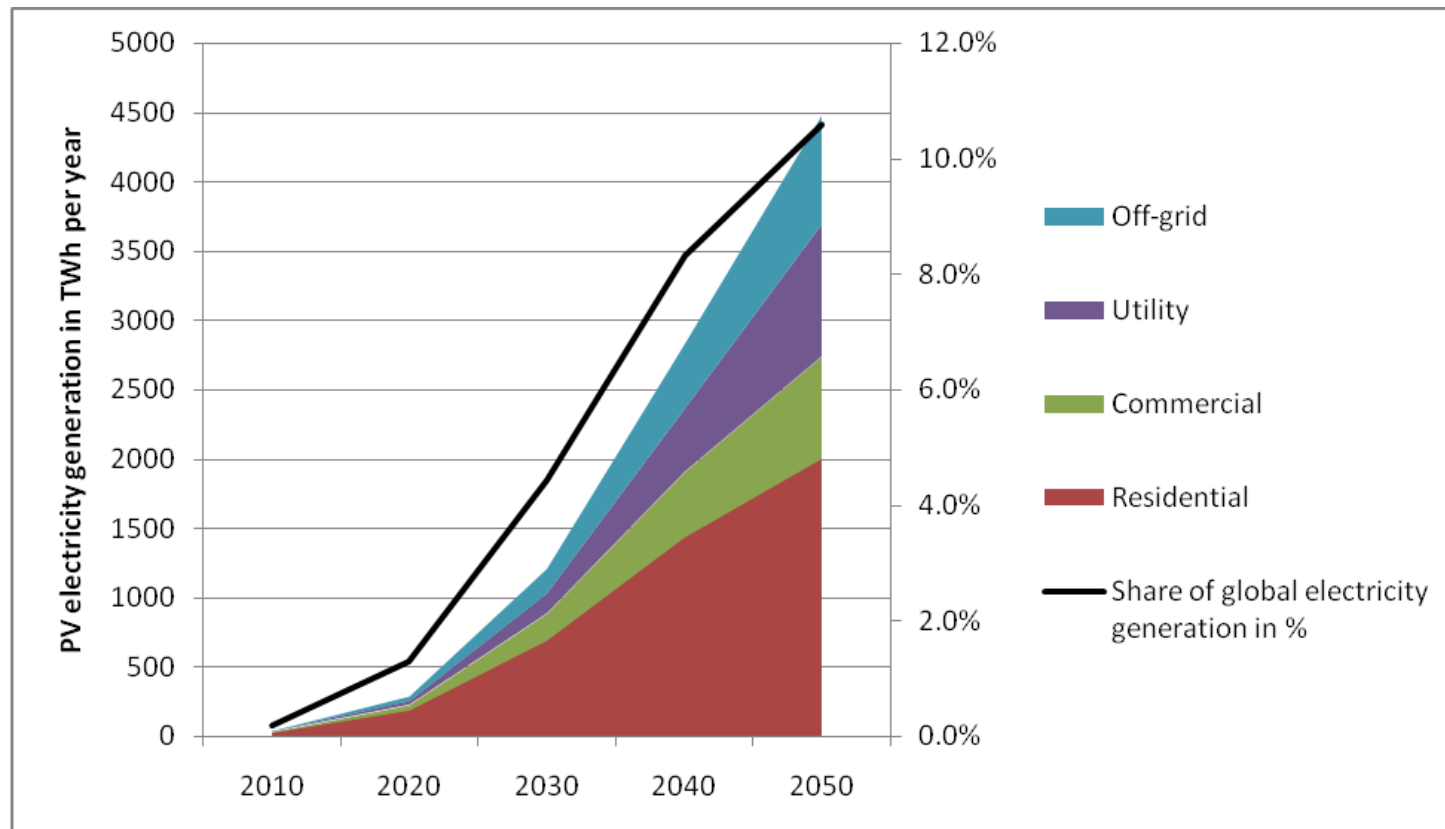
**Wind has the potential to provide 12% of global electricity production in 2050**

# PV deployment and competitiveness levels



# Solar PV Roadmap Vision Scenario

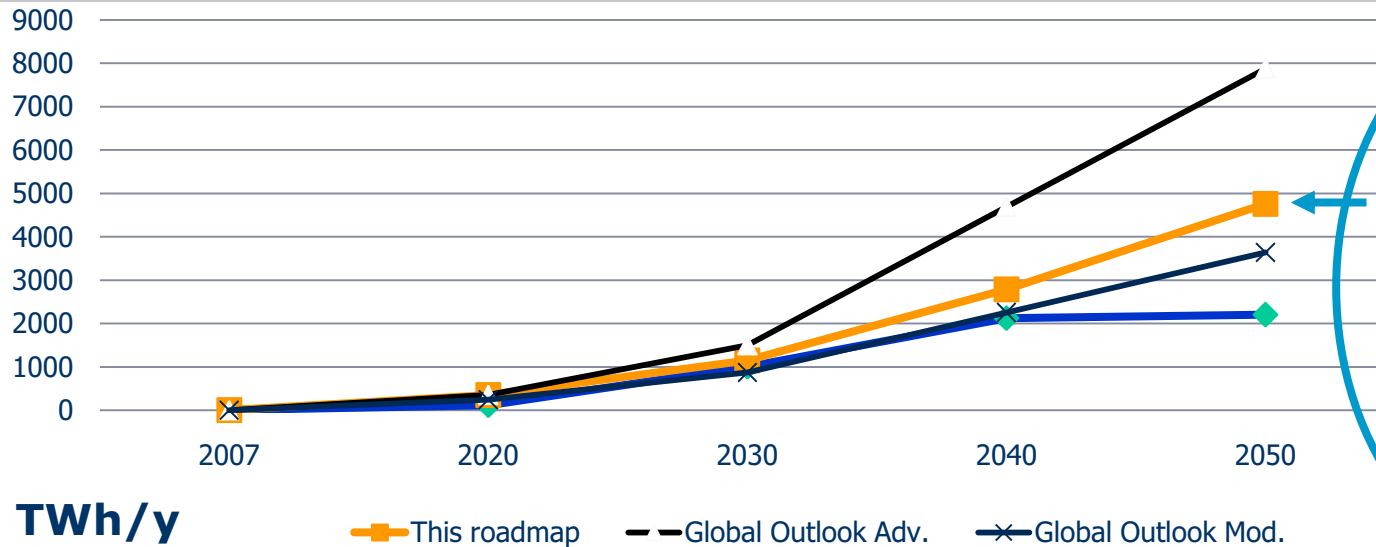
## Solar PV electricity production by end-use sector (TWh/yr)



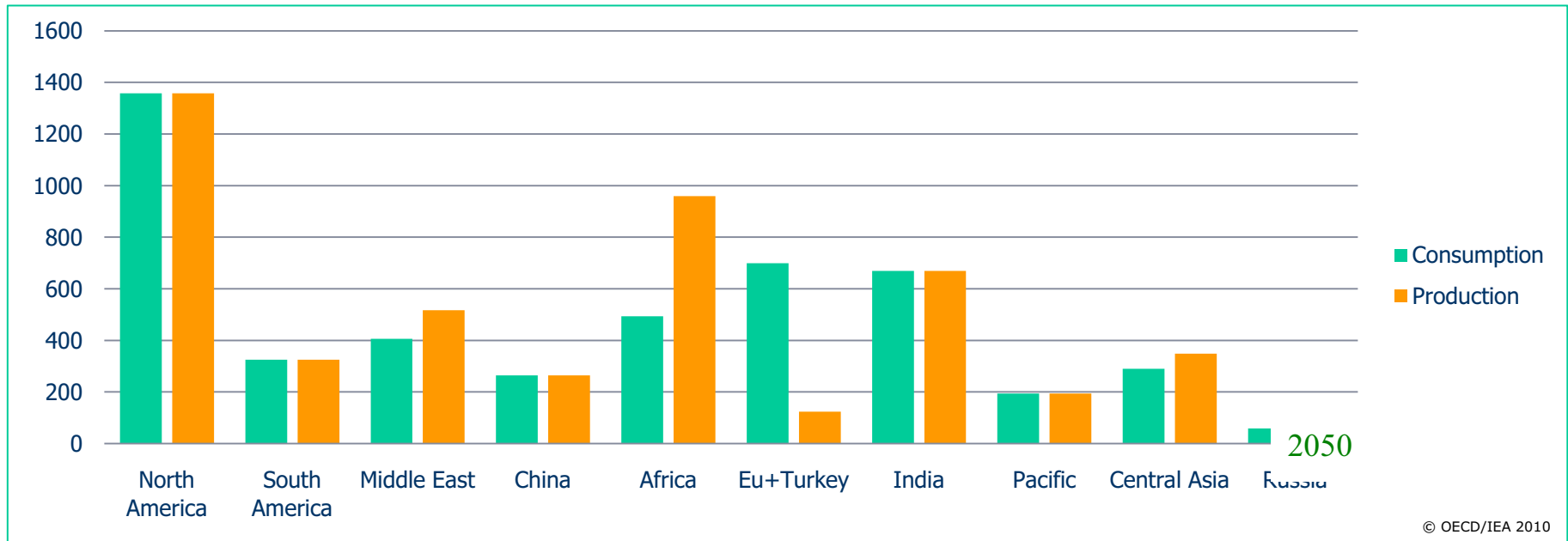
Source: IEA, Solar PV Roadmap (2009).

**PV provides 5% of global electricity generation in 2030, 11% in 2050**

# Concentrating solar power Roadmap preliminary results



11% global electricity by 2050, of which 9.5% solar only



- The financial crisis has halted the rise in global fossil-energy use, but its long-term upward path will resume soon *on current policies*.
  - > Don't miss the window of opportunity.
- Tackling climate change & enhancing energy security require a massive decarbonisation of the energy system
  - > Energy Efficiency is the low hanging fruit
  - > Energy Technology is the key towards 2050
- 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 bills
  - > Much less air pollution & huge health benefits
- Natural gas can play a key role as a bridge to a cleaner energy future
- After Copenhagen: Energy sector stays at the heart of the matter
  - > IEA analyses pre-COP remain valid
- The challenge is enormous – but it can and must be met
  - > Each year of delay adds \$500 billion to mitigation costs

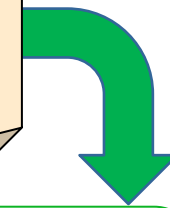
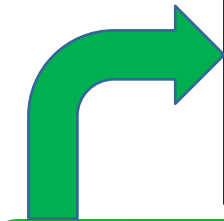
# Finding solutions together

## Evolving IEA activities in partnership with the private sector



### IEA projects with private sector

- Energy Technology Roadmaps
- Low-Carbon Energy Technology Platform
- Energy Business Council
- Chief Technology Officers Roundtable
- Energy Efficiency Analysis
- International Technology Research Groups
- Sustainable Transport Modeling



### Participation Opportunities

- Workshops & Networks
- Peer Reviews
- Seconding personnel to IEA
- Data verification
- Sharing expertise
- Funding contributions

### Partnership Benefits

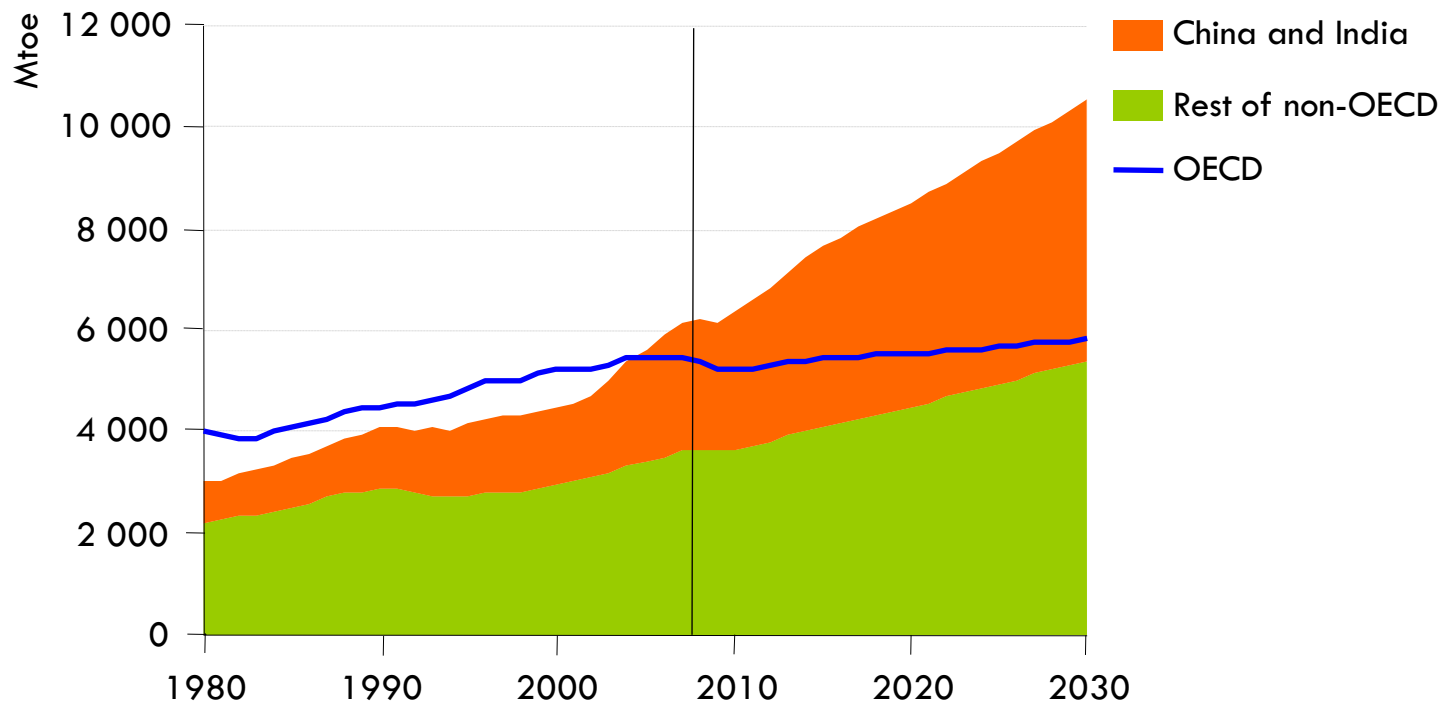
- Shared resources & risks
- Increased credibility
- Faster results
- Greater project scale
- Harmonization of standards
- Networking

*IEA activities in partnership with the private sector are continually evolving.*

*For more information, write to [partnerships@iea.org](mailto:partnerships@iea.org)*

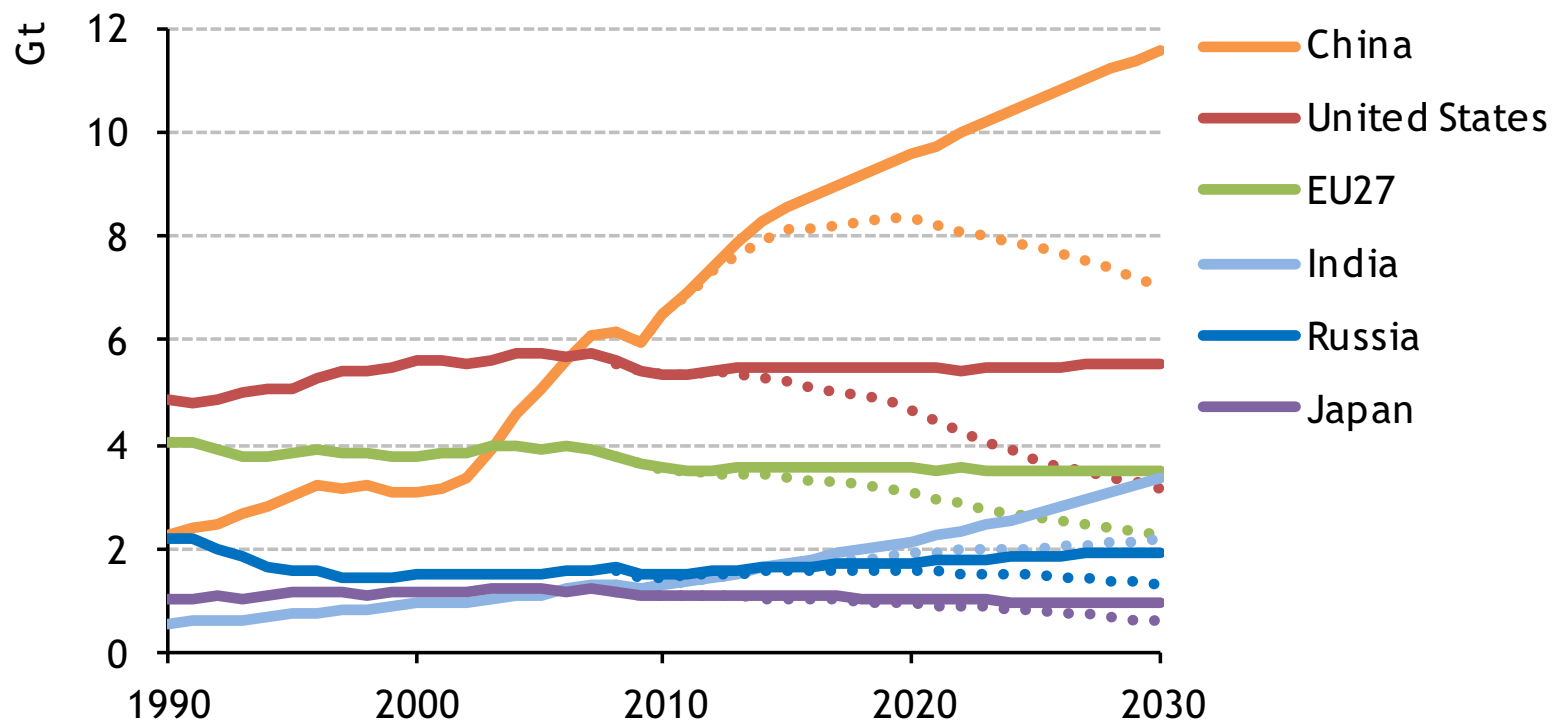
# ANNEX

# World primary energy demand in the Reference Scenario



■ *Non-OECD countries account for 93% of the increase in global demand between 2007 & 2030, driven largely by China & India*

# Energy-related CO<sub>2</sub> emissions by scenario



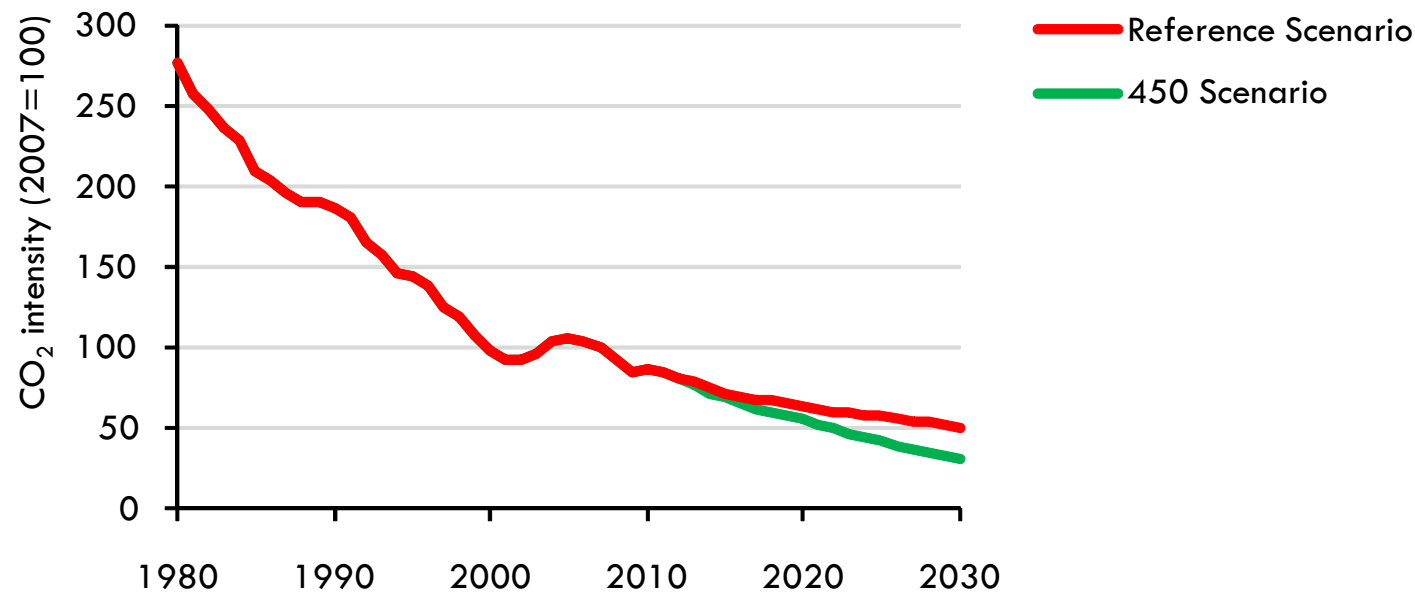
*The OECD sees a decline in emissions in the Reference Scenario, while, in the 45 Scenario, China's emissions peak by 2020, although India's continue to rise beyond 2030*

# Emissions in 2020 in the 450 Scenario – comparison with announced targets

	Announced emissions reduction target for 2020	Relative to 1990 emissions		Relative to 2005 emissions		Abatement in 450 Scenario v Reference Scenario (Mt)
		Target	450 Scenario	Target	450 Scenario	
US	-17% v 2005	-1 %	-3 %	-17 %	-18 %	749
EU	-20%/-30% v 1990	-20 %	-23 %	-18 %	-21 %	444
Japan	-25% v 1990	-25 %	-10 %	-34 %	-21 %	84
Russia	-10% to -25% v 1990	-10 %	-27 %	+29 %	+5 %	134
China	-		+275 %		+65 %	1 178
India	-		+224 %		+66 %	249
OECD+	-		-4 %		-17 %	1 656
Non-OECD+	-		+107 %		+41 %	2 194
World	-		+46 %		+13 %	3 850

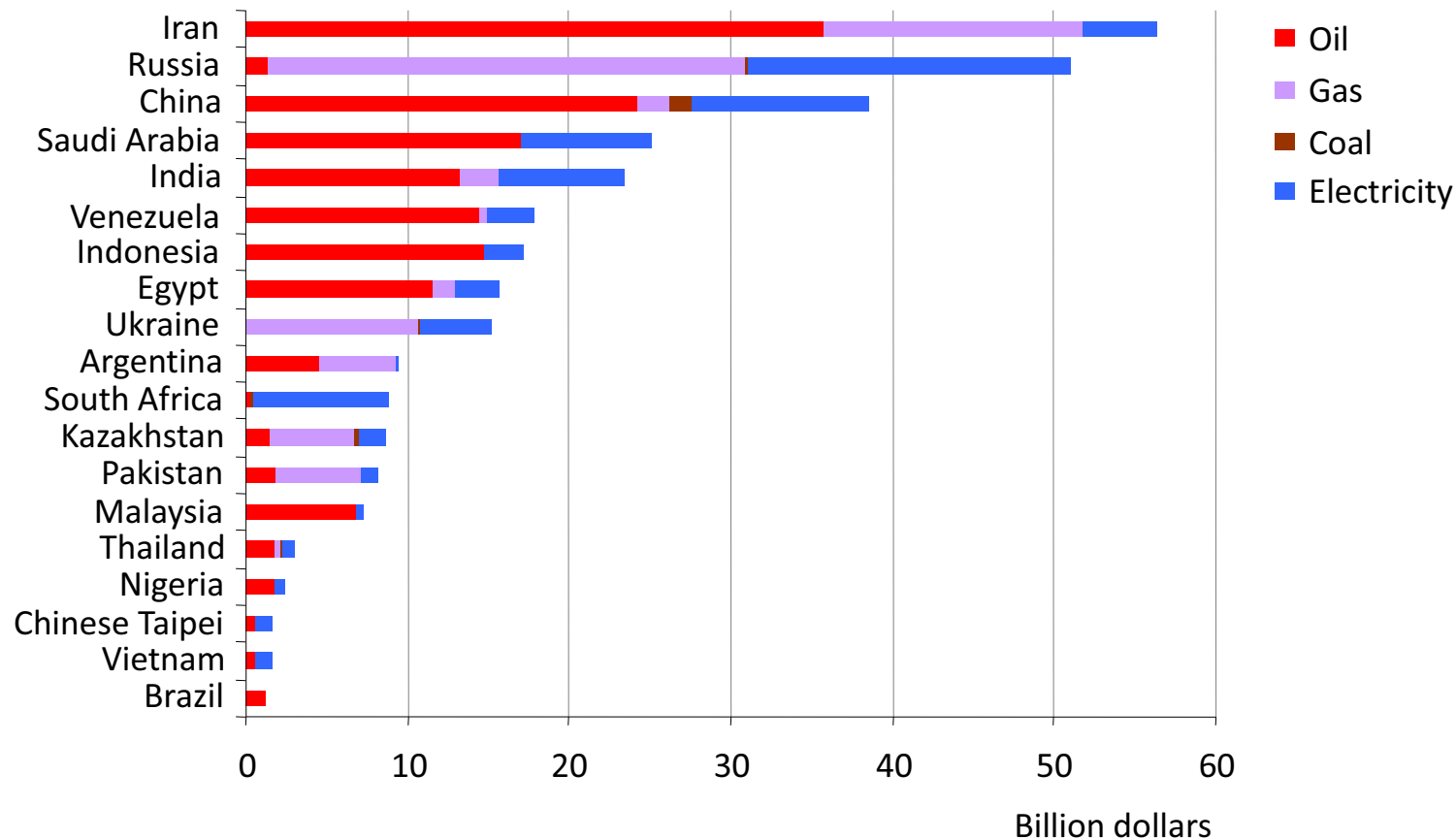
***Existing pledges for 2020 – if met – could put the world in line with a 550 trajectory... assuming global action to hold emissions at this level & a subsequent decline***

# China's energy-related CO<sub>2</sub> intensity in the Reference and 450 Scenarios



- *Having fallen by almost 4% a year since 1980, China's CO<sub>2</sub> intensity declines by a further 37% in the Reference Scenario and 44% in the 450 Scenario between 2007 and 2020*

# Energy subsidies in non-OECD countries, 2007



*Energy subsidies in the 20 largest non-OECD countries hit \$310 billion in 2007 – creating, in many cases, an unsustainable economic burden & exacerbating environmental effects*