International Energy Agency

World Energy Outlook 2010

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The context: *A time of unprecedented uncertainty*

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- The worst of the global economic crisis appears to be over – *but is the recovery sustainable?*
- Oil demand & supply are becoming less sensitive to *price* – *what does this mean for future price movements ?*
- Natural gas markets are in the midst of a revolution – *will it herald a golden era for gas?*
- Copenhagen Accord & G-20 subsidy reforms are key advances – *but do they go far enough & will they be fully implemented ?*
- Emerging economies will shape the global energy future – *where will their policy decisions lead us ?*

Overview of WEO-2010 scenarios

- *New Policies Scenario* is the central scenario in *WEO-2010*
  - > *assumes cautious implementation of recently announced commitments & plans, even if yet to be formally adopted*
  - > *provides benchmark to assess achievements & limitations of recent developments in climate & energy policy*
- *Current Policies Scenario* takes into consideration only those policies that had been formally adopted by mid-2010
  - > *equivalent to the Reference Scenario of past Outlooks*
- The *450 Scenario* sets out an energy pathway consistent with the goal of limiting increase in average temperature to 2°C

International oil price assumptions

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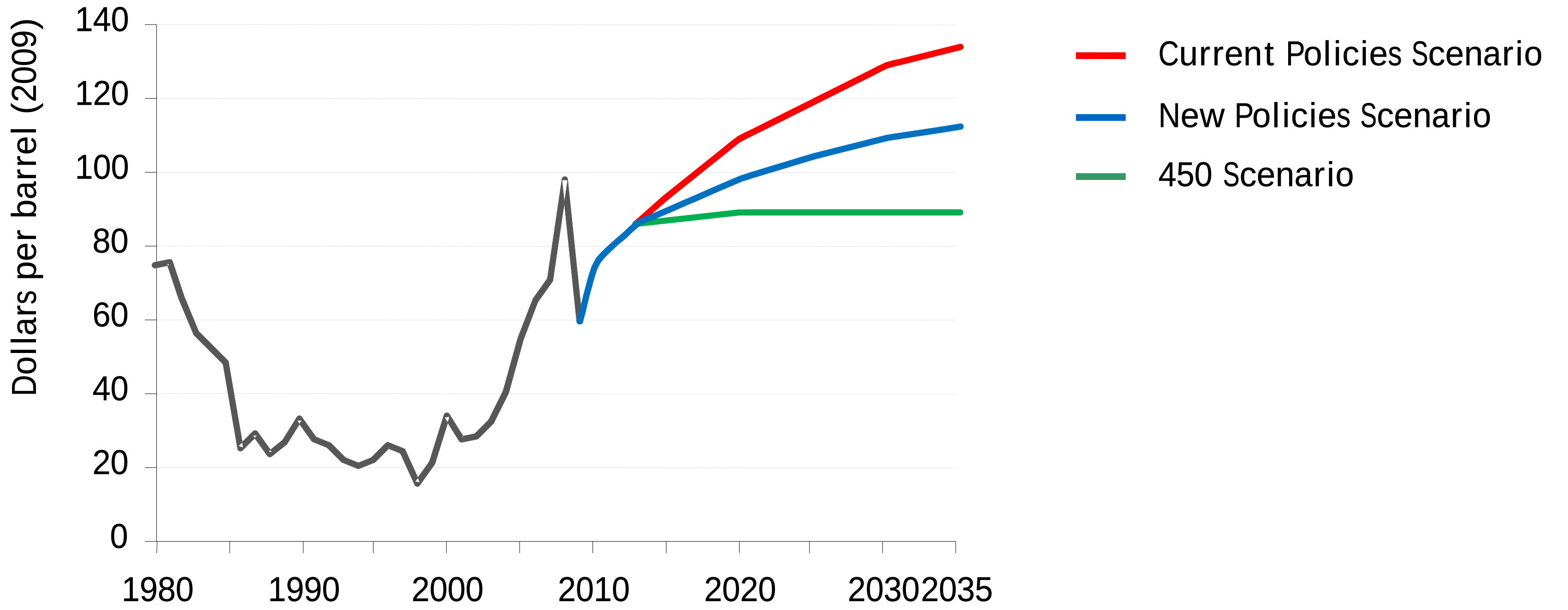

Scenario	CO_2 price in 2035 ($/ tCO_2)	International oil price in 2035 ($/bbl)	Effective oil price in 2035 ($/bbl)
Current Policies	42 in EU	135	152 in EU
New Policies	50 in OECD	113	134 in OECD
450 Scenario	120 in OECD	90	139 in OECD

The age of cheap oil is over, though policy action could bring lower international *prices than would otherwise be the case*

World primary energy demand by fuel in the New Policies Scenario

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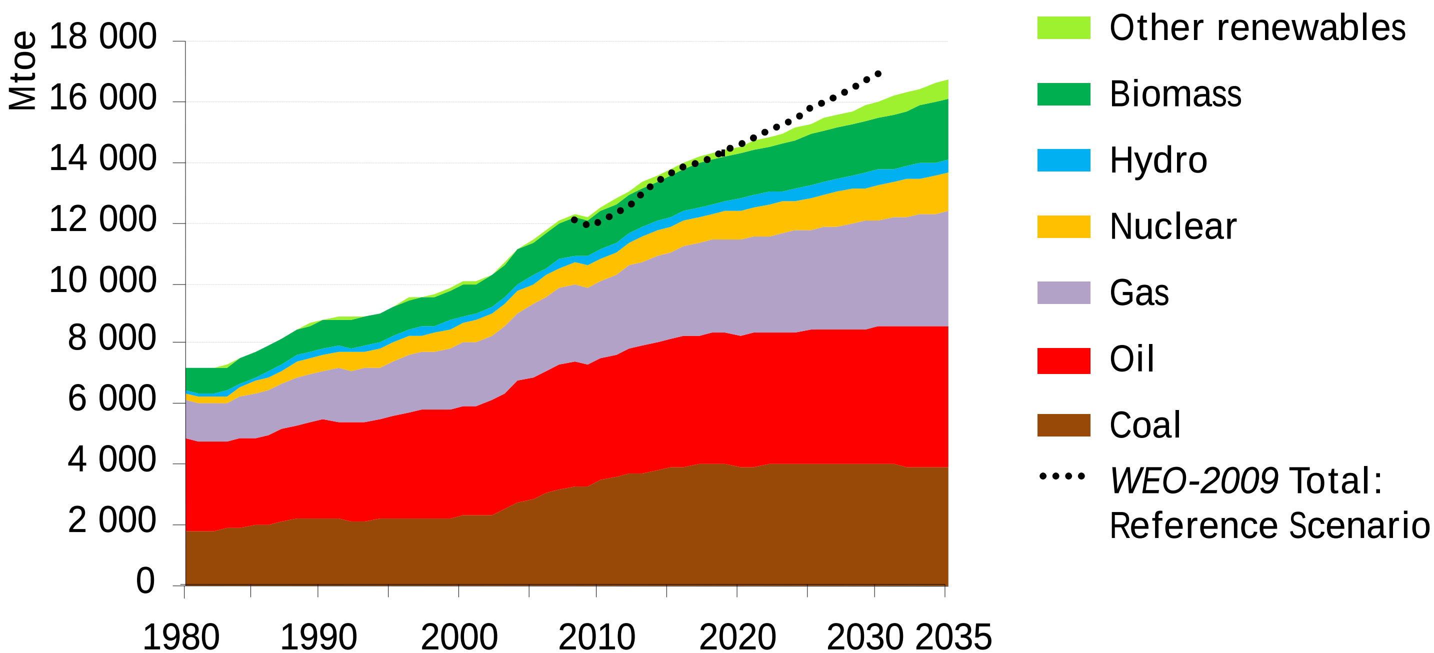

Fossil fuels maintain a central role in the primary energy mix in the New Policies Scenario, but their share declines, from 81% in 2008 to 74% in 2035

Recent policy commitments, if implemented, would make a difference

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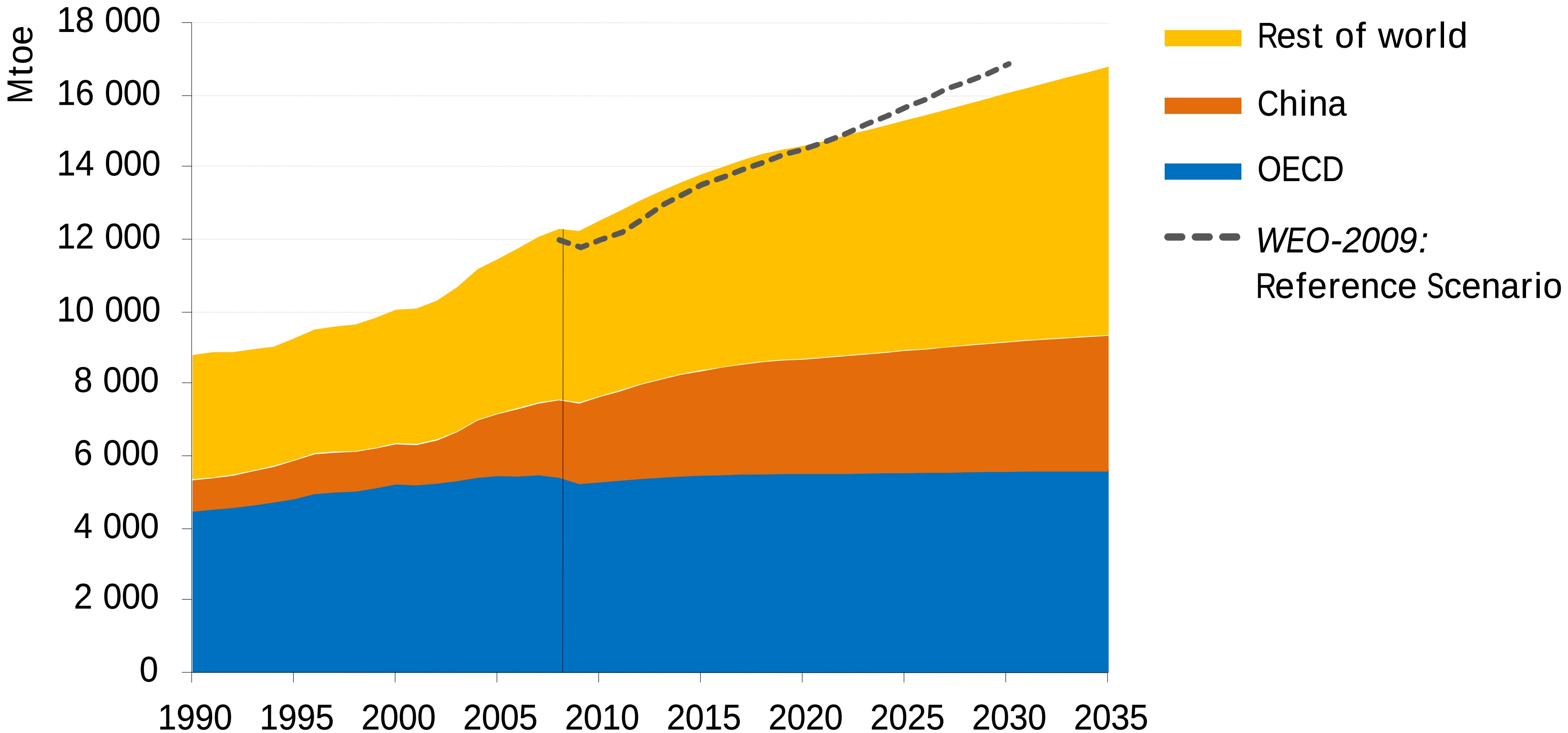
World primary energy demand by region in the New Policies Scenario



Global energy use grows by 36%, with non-OECD countries – led by China, where demand surges by 75% – accounting for almost all of the increase

Fossil-fuel subsidies are distorting price signals

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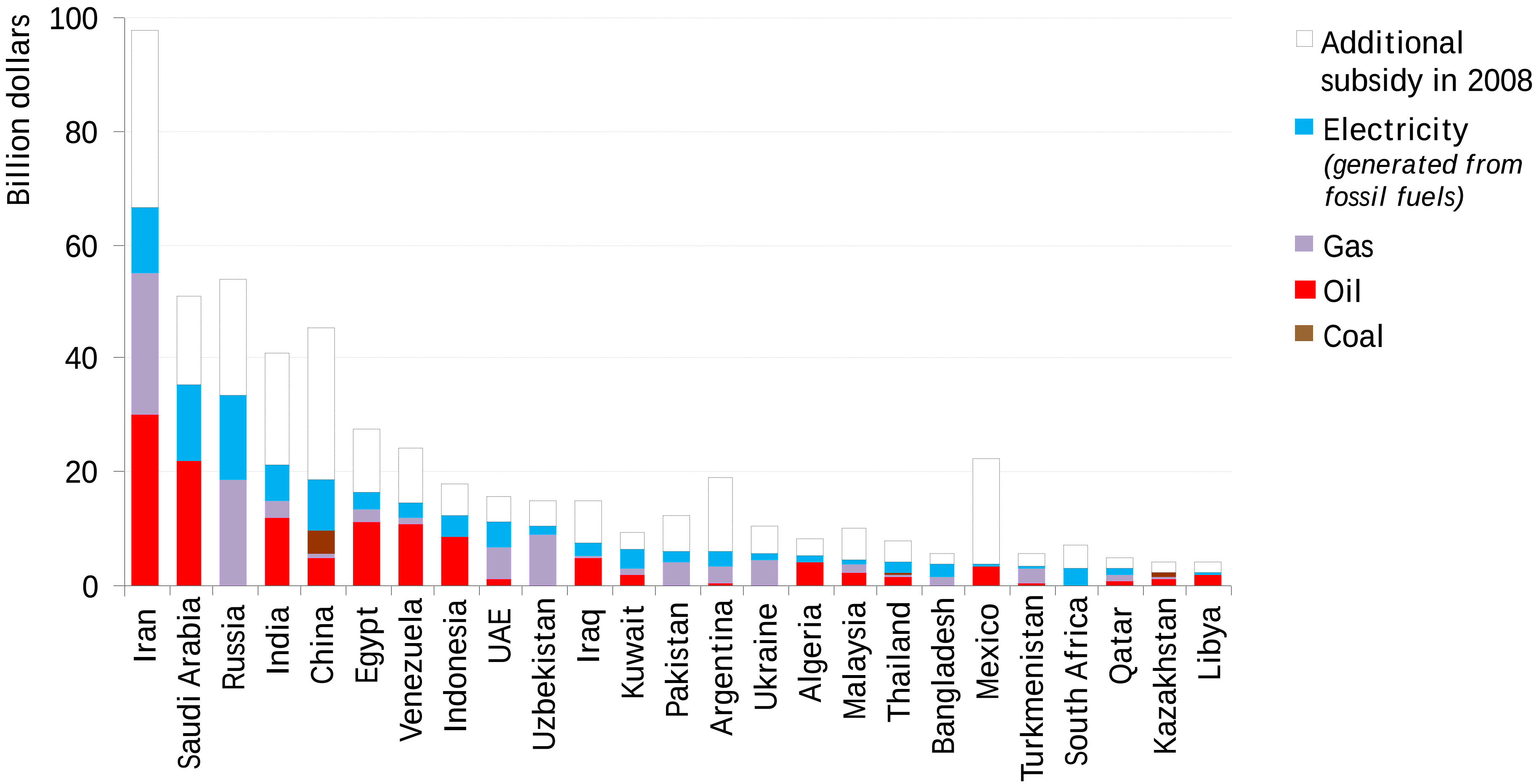
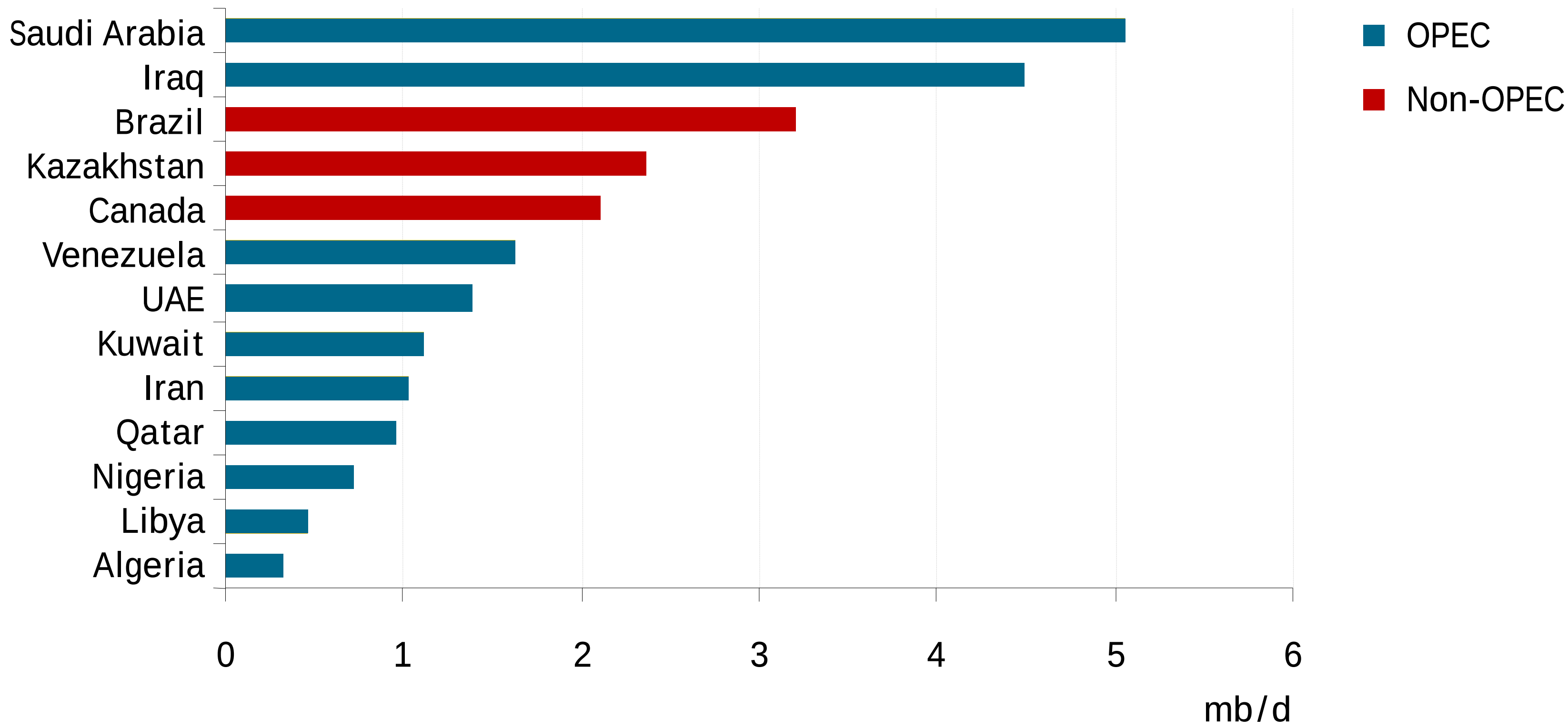
Economic value of fossil-fuel consumption subsidies by country, 2009



Fossil-fuel consumption subsidies amounted to $312 billion in 2009, down from $558 billion in 2008, with the bulk of the fall due to lower international prices

More oil from fewer producers

Incremental oil production by key country in the New Policies Scenario, 2009-2035



Production rises most in Saudi Arabia & Iraq, helping to push OPEC's market share from 41% today to 52% by 2035, a level last seen prior to the first oil shock of 1973-1974

A golden age for gas?

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- Gas is set to play a key role in meeting the world's energy needs
  - *demand rises by 44%, led by China & Middle East*
- Unconventional gas accounts for 35% of the increase in global supply to 2035, with new non-US producers emerging
- Gas glut will peak soon, but may dissipate only very slowly
- The glut will keep pressure on gas exporters to move away from oil-price indexation, notably in Europe
- Lower prices could lead to stronger demand for gas, backing out renewables & coal in power generation

Coal remains the backbone of global electricity generation

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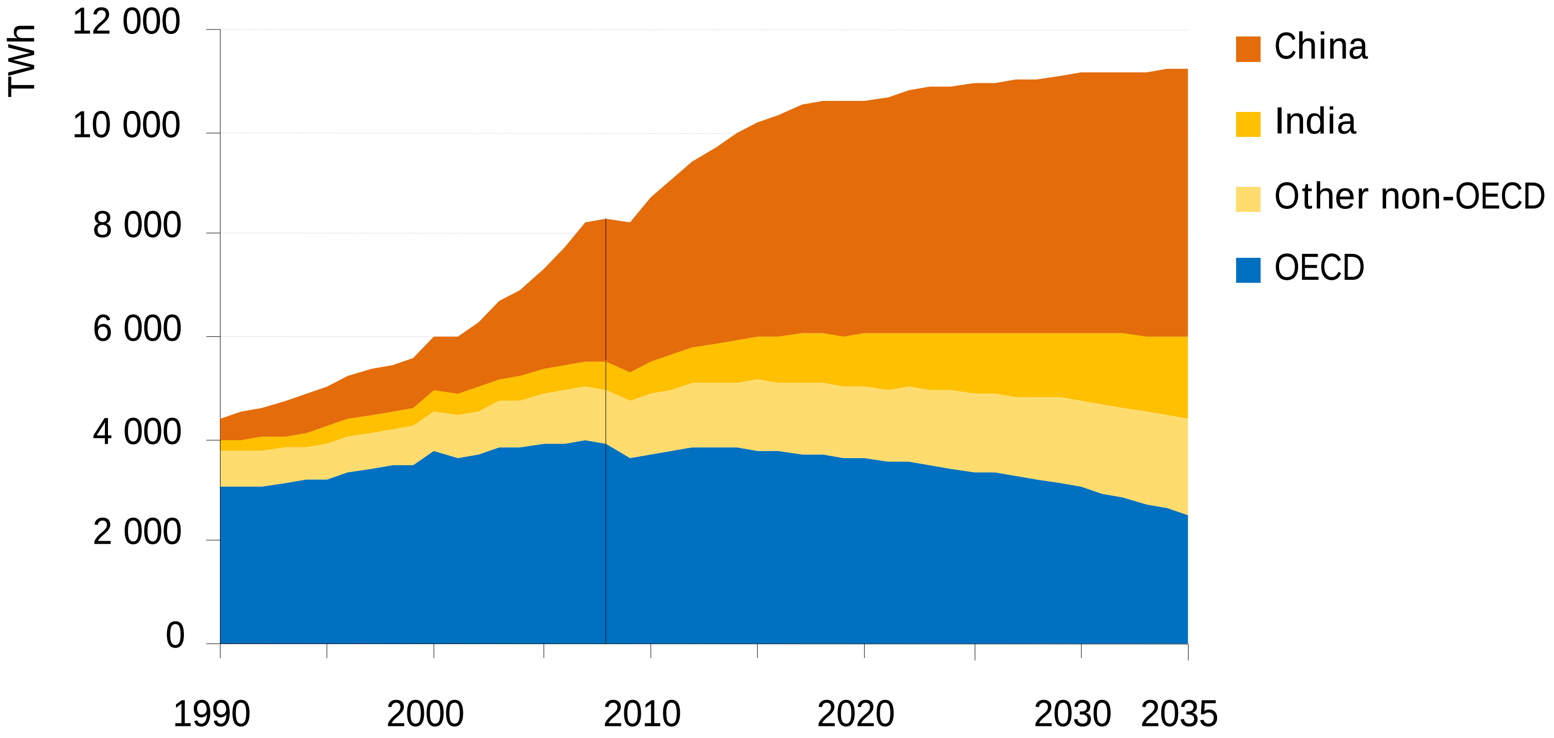
Coal-fired electricity generation by region in the New Policies Scenario



A drop in coal-fired generation in the OECD is offset by big increases elsewhere, especially China, where 600 GW of new capacity exceeds the current coal-fired capacity of the US, EU & Japan

Renewables enter the mainstream….

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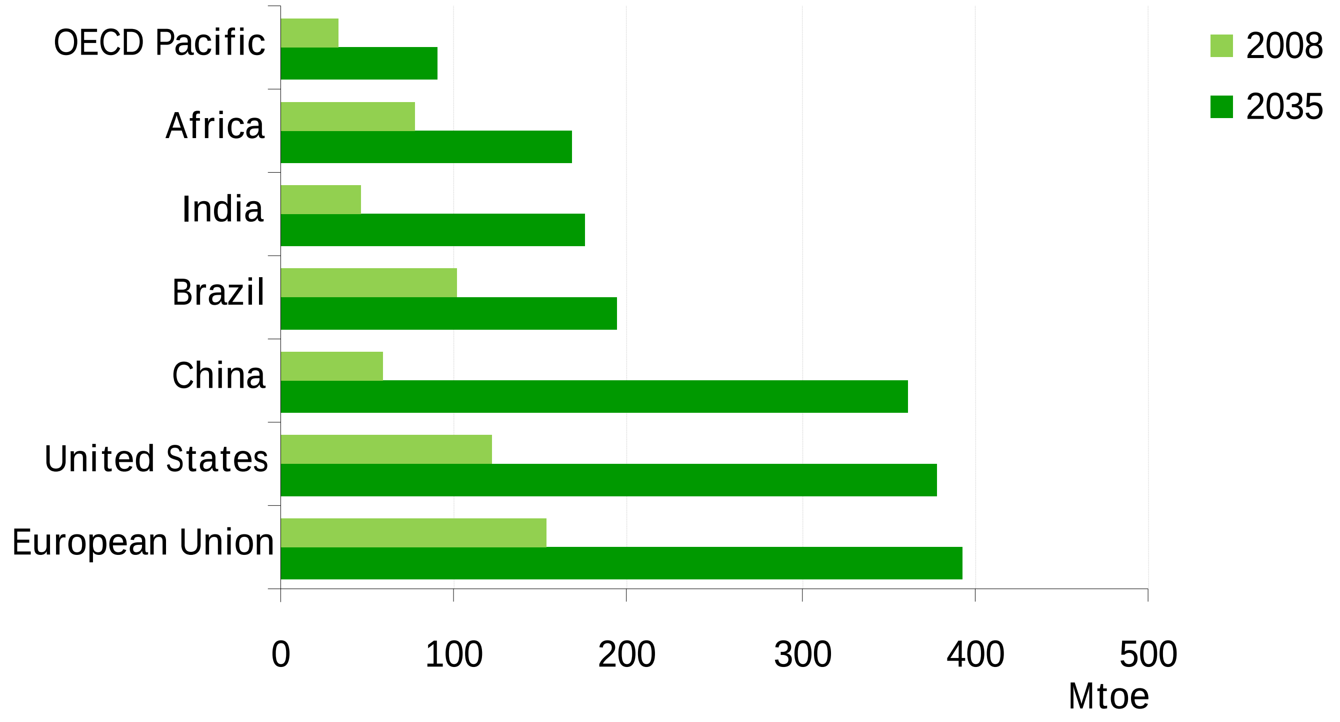
Renewable primary energy demand in the New Policies Scenario



The use of renewable energy triples between 2008 & 2035, driven by the power sector where their share in electricity supply rises from 19% in 2008 to 32% in 2035

....but only if there is enough government support

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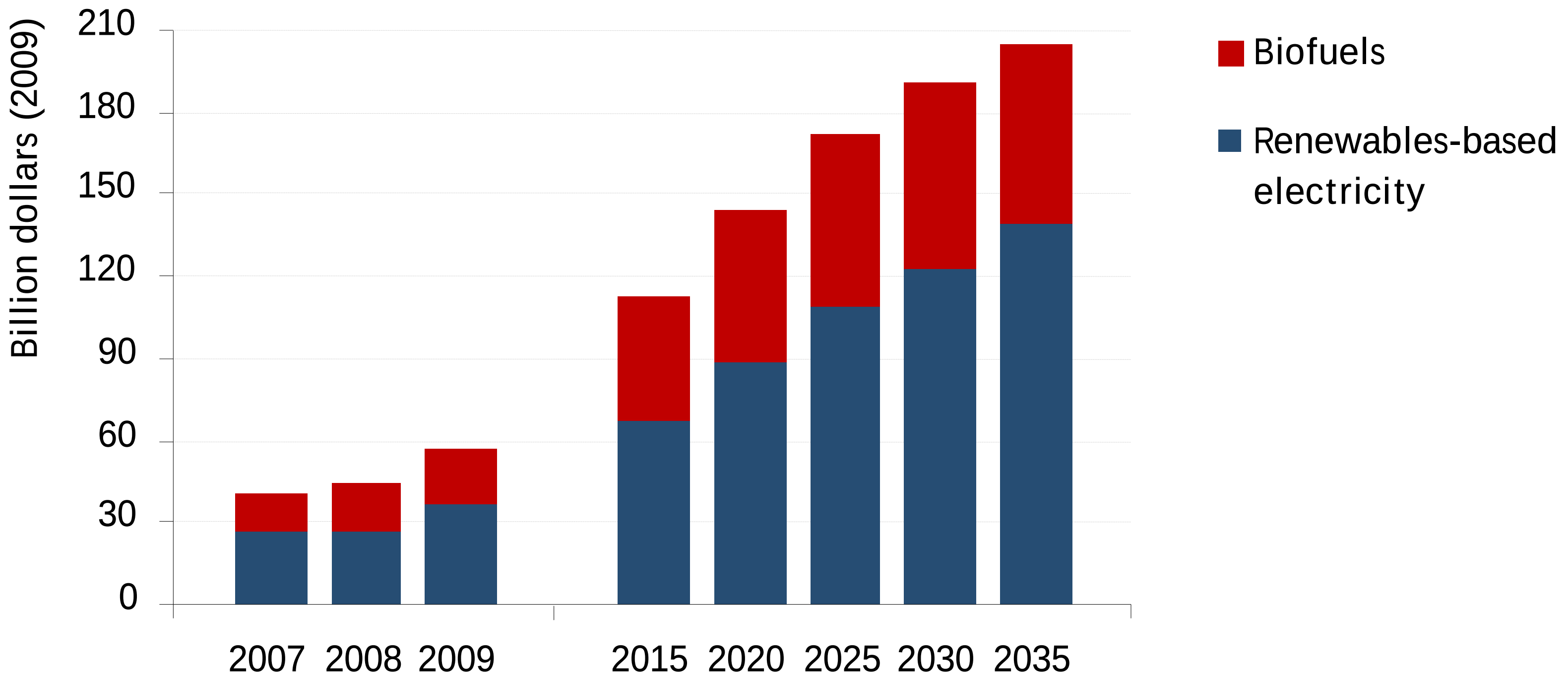
Annual global support for renewables in the New Policies Scenario



Government support remains the key driver – rising from $57 billion in 2009 to $205 billion in 2035 – but higher fossil-fuel prices & declining investment costs also spur growth

China becomes the market leader in low-carbon technologies

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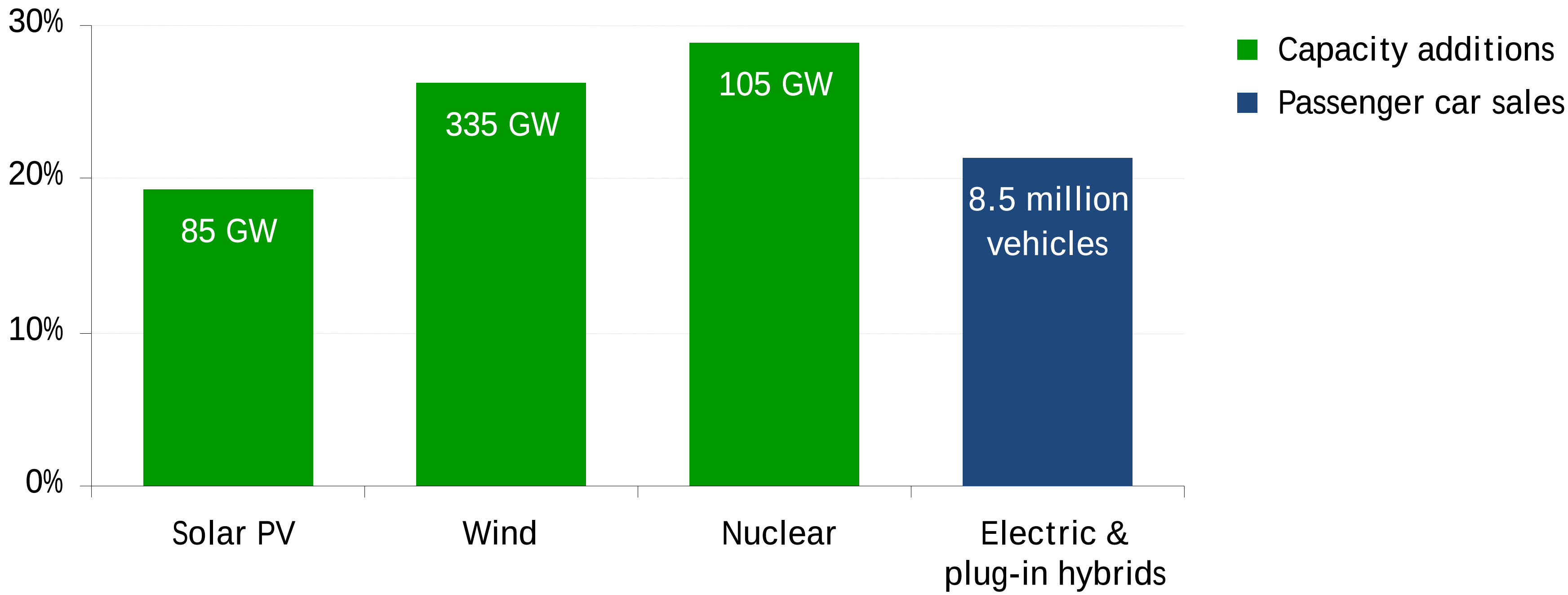
China's share of cumulative global additions to 2035 for selected technologies



Given the sheer scale of China's market, its push to expand the role of low-carbon energy technologies is poised to play a key role in driving down costs, to the benefit of all countries

The 450 Scenario: *A roadmap from 3.5°C to 2°C*

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- The 450 Scenario sets out an energy pathway consistent with limiting the increase in temperature to 2°C
- Assumes vigorous implementation of Copenhagen Accord pledges to 2020 & much stronger action thereafter
- The failure of the Copenhagen Accord pledges:
  - *As many lack transparency, there is 3.9 Gt of uncertainty over the level of abatement pledged to 2020*
  - *As many lack ambition, the cost of achieving the 2 °C goal has increased by $1 trillion in 2010-2030 compared with* WEO-2009

The 450 Scenario: *Abatement by technology*

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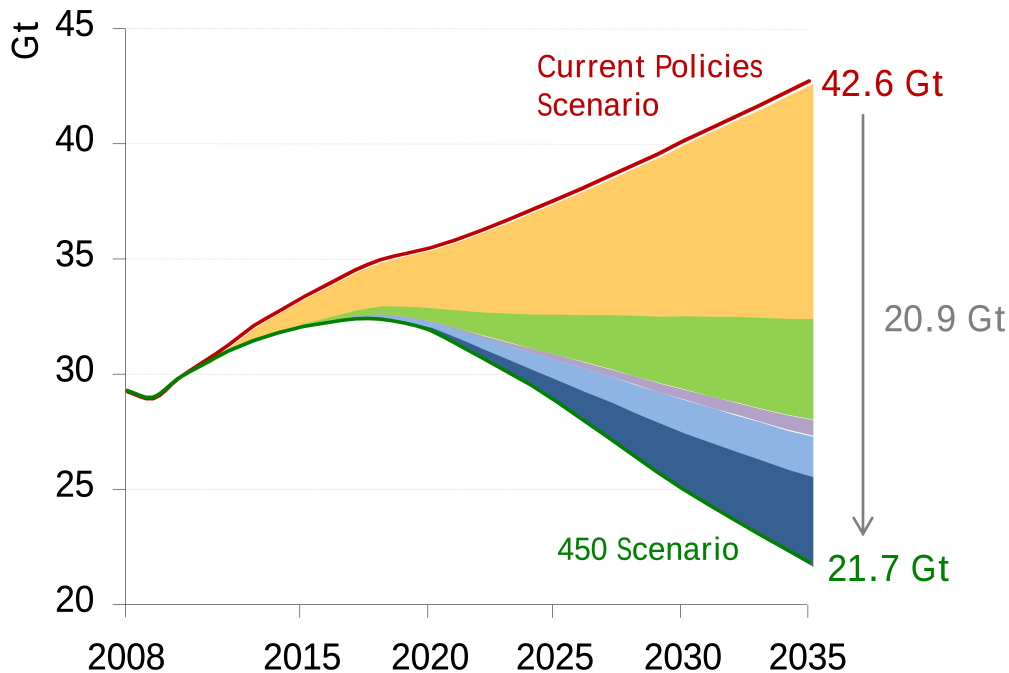
World energy-related CO2 emission savings by technology in the 450 Scenario relative to the Current Policies Scenario

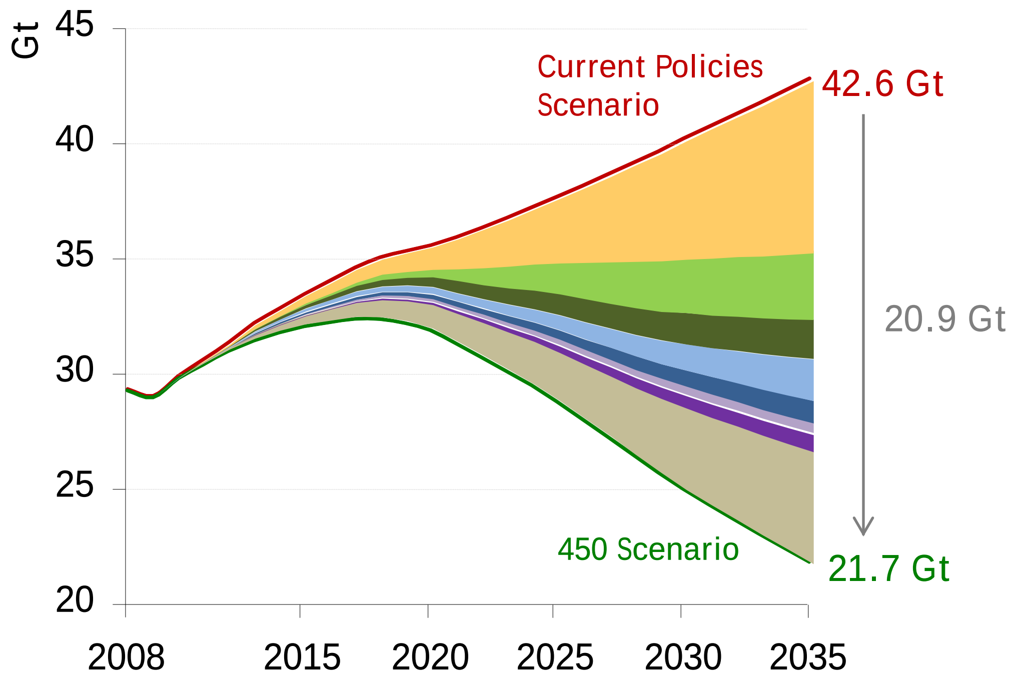


Share of cumulative abatement between 2010-2035	
Efficiency	53%
Renewables	21%
Biofuels	3%
Nuclear	9%
CCS	15%

In the 450 Scenario, compared with the Current Policies Scenario, efficiency measures provide 53% of the necessary abatement, but renewables, CCS & nuclear are also crucial

The 450 Scenario: *Abatement by country*

World energy-related CO2 emission savings by country in the 450 Scenario relative to the Current Policies Scenario



Share of cumulative abatement between 2010-2035	
China	33%
United States	15%
European Union	9%
India	8%
Middle East	5%
Russia	3%
Japan	3%
Rest of world	24%

In the 450 Scenario, compared with the Current Policies Scenario, China & the US account for 48% of the cumulative emission abatement that is needed in 2010-2035

Low ambition to 2020 makes faster and deeper cuts necessary afterwards

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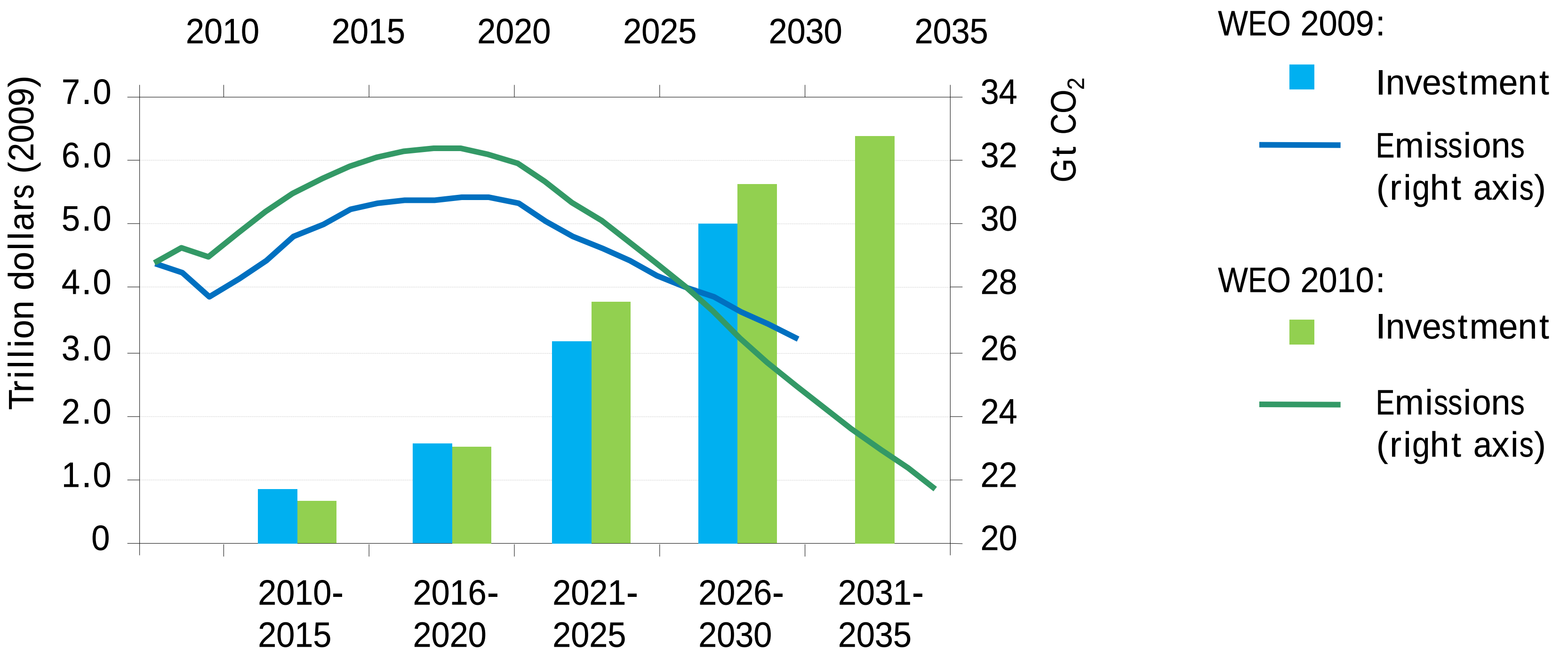

Overall, this year's 450 Scenario will cost $1 trillion more than last year's by 2030, and requires a total of $18 trillion in investment by 2035

Achieving the 2°C goal will require rapid decarbonisation of global energy

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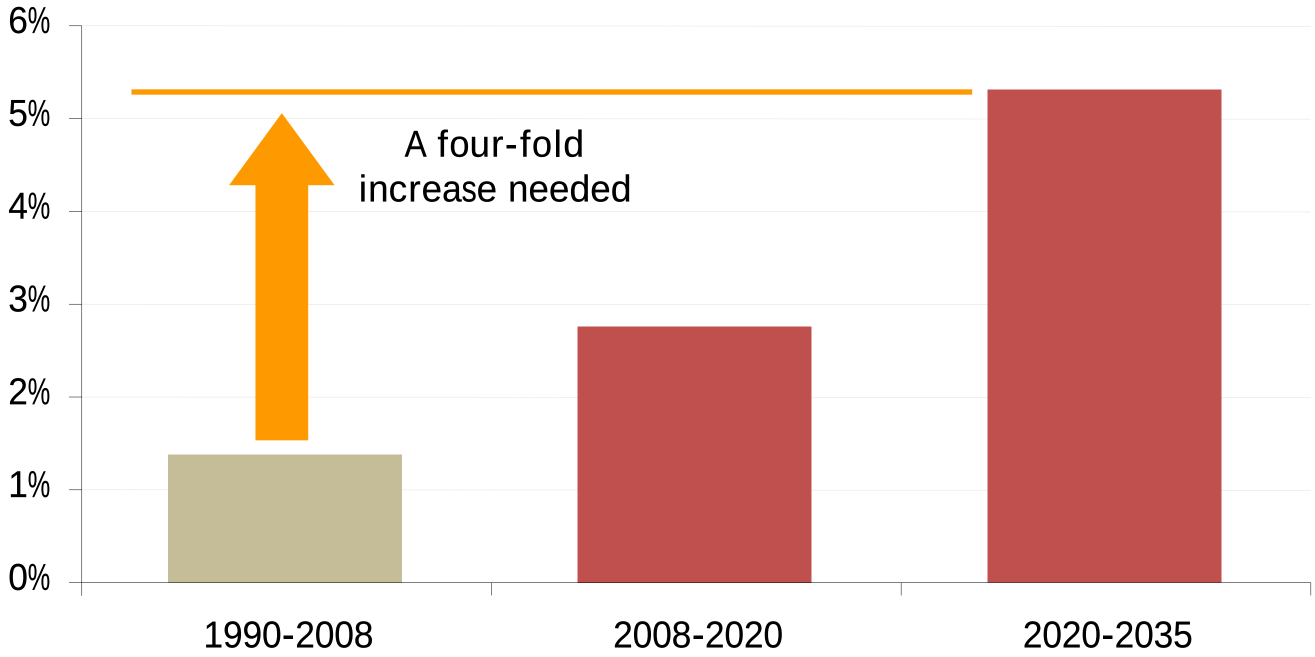
Average annual change in CO_2 intensity in the 450 scenario



Carbon intensity would have to fall at twice the rate of 1990-2008 in the period 2008-2020 & almost four times faster in 2020-2035

A fundamental change is needed in power generation

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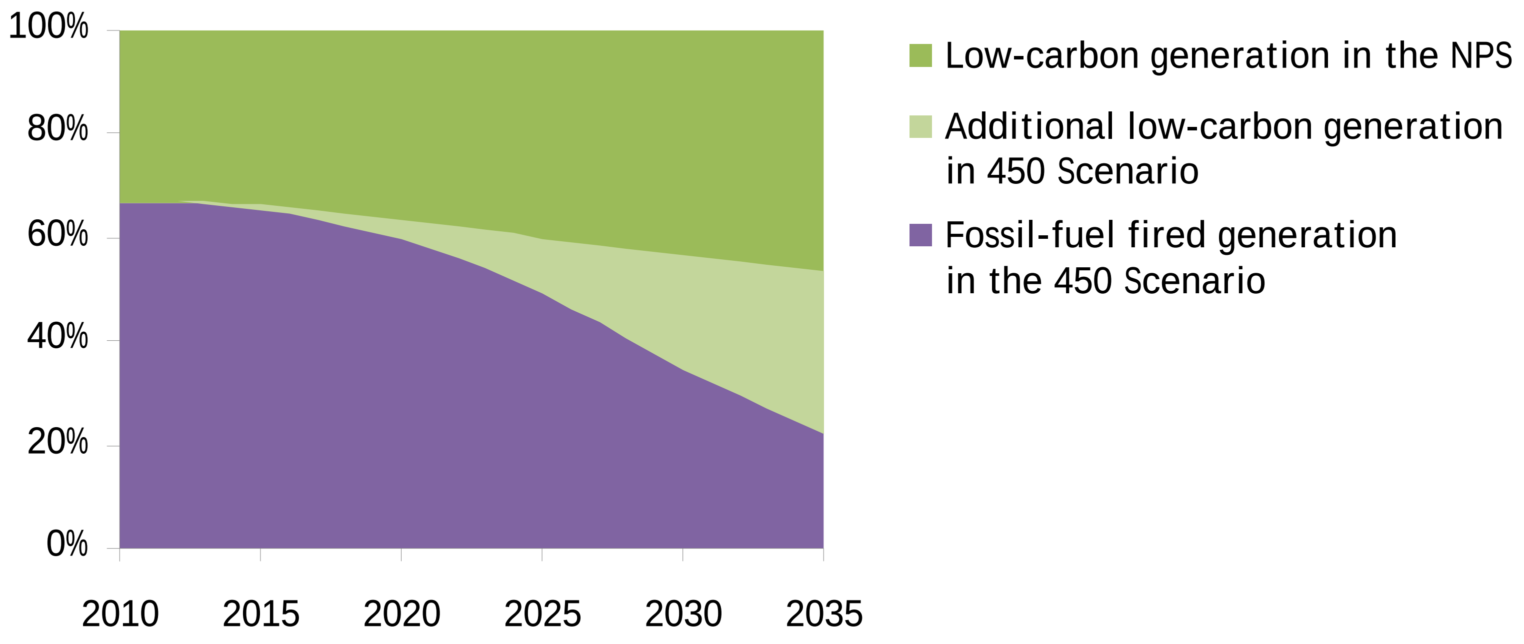
Share of world electricity generation by type and scenario



Low-carbon technologies account for over three-quarters of global power generation by 2035 in the 450 Scenario, a four-fold increase on today

… and also in transport

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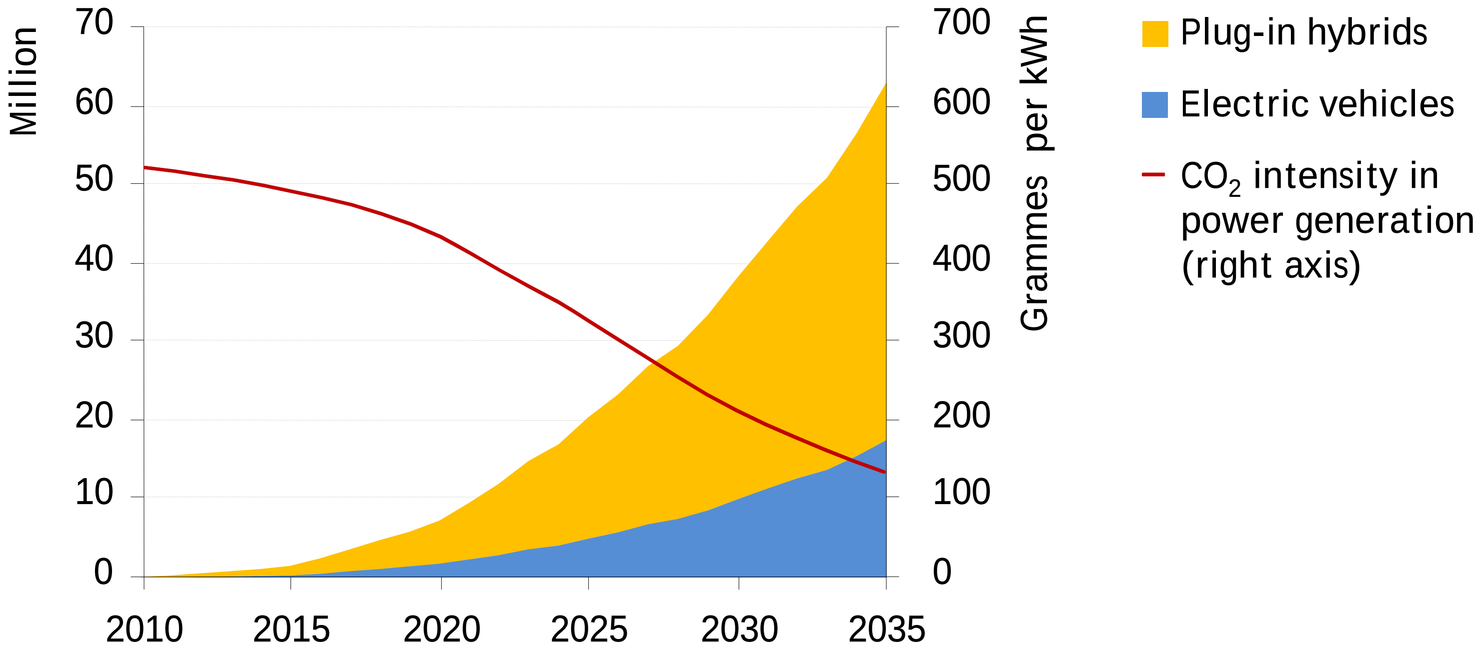
Sales of plug-in hybrid and electric vehicles in the 450 Scenario & CO2 intensity of the power sector



Plug-in hybrids & electric vehicles reach 39% of light-duty vehicle sales by 2035, making a big contribution to CO_2 abatement, thanks to a major decarbonisation of the power sector

Will peak oil be a guest or the spectre at the feast?

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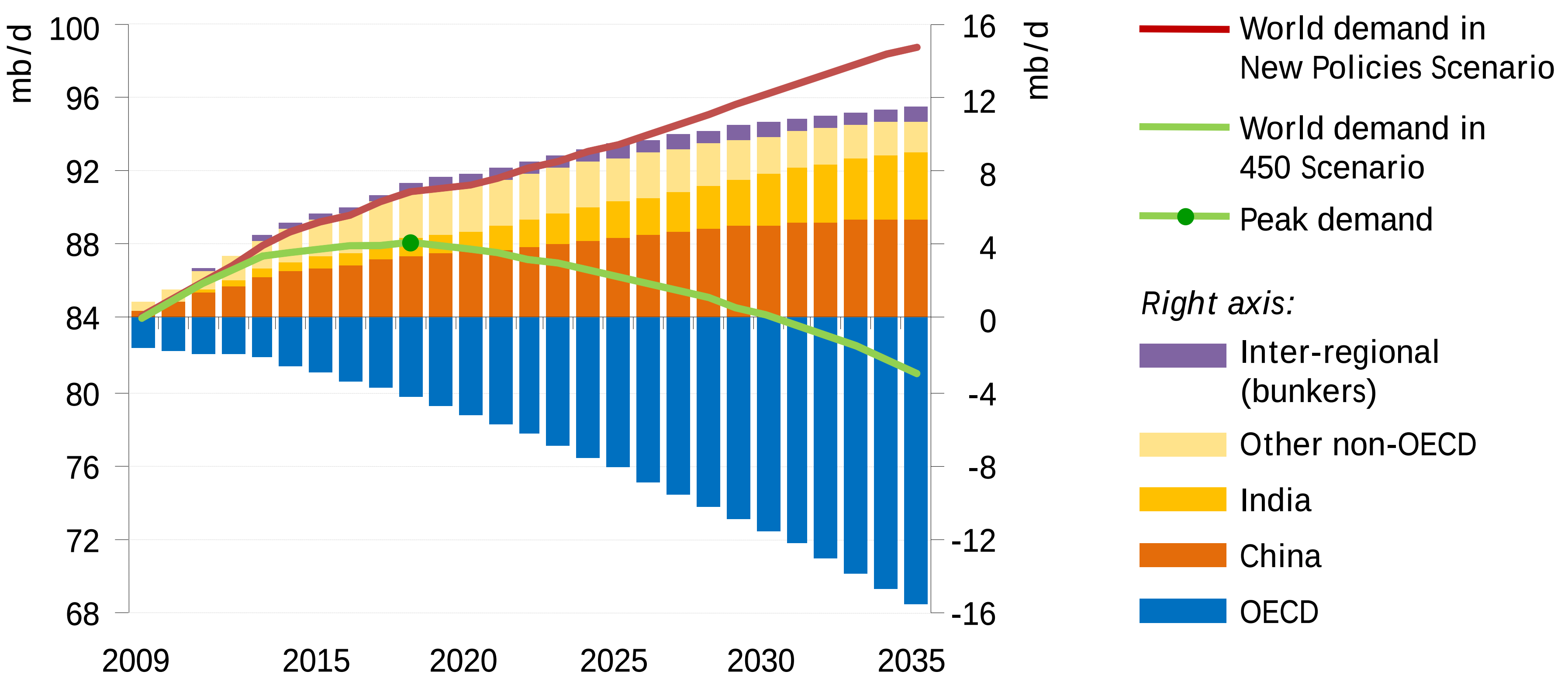
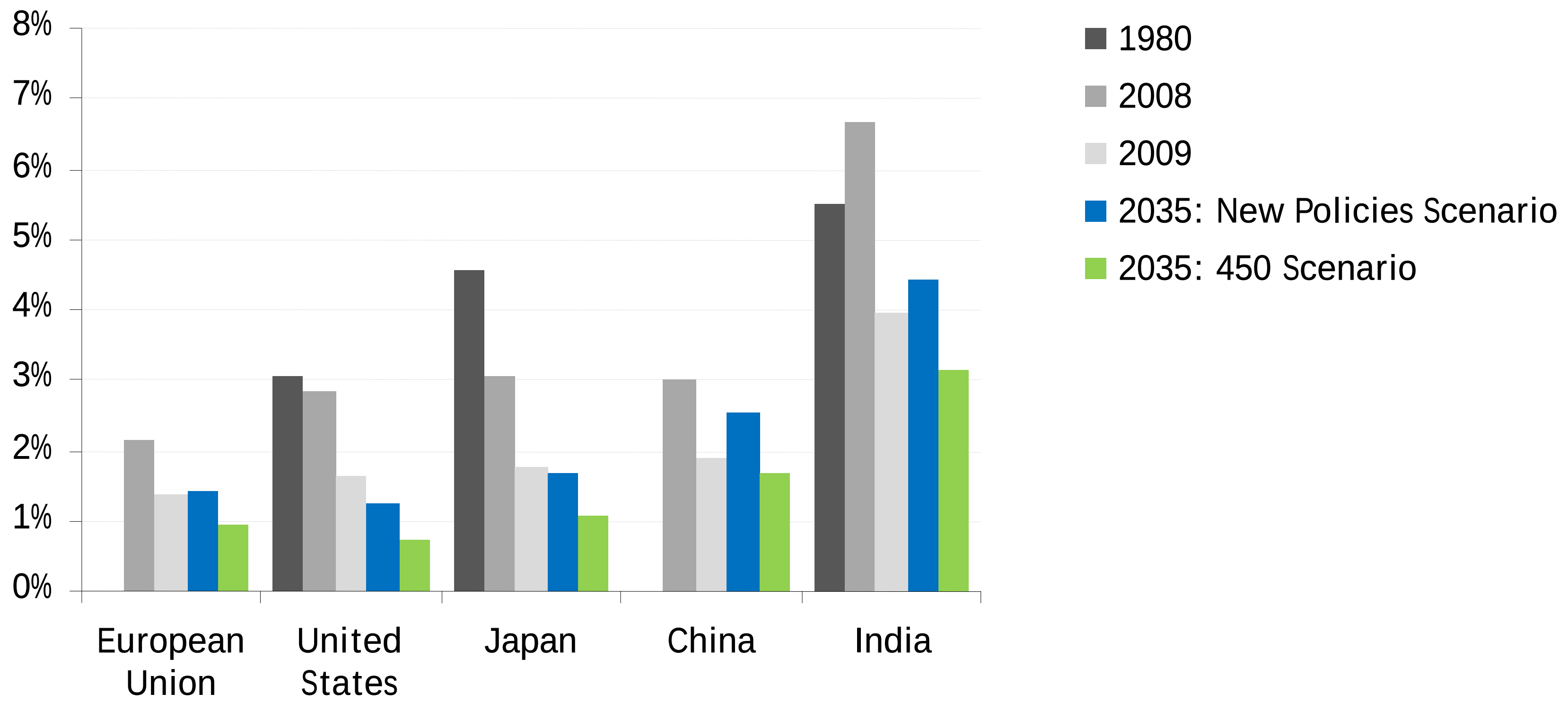
Oil demand in the 450 Scenario



Oil demand peaks at 88 mb/d before 2020 & falls to 81 mb/d in 2035, with a plunge in OECD demand more than offsetting continuing growth in non-OECD demand

Combating climate change will bring economic benefits as well as costs

Oil-import bills as share of GDP in selected countries



In the 450 Scenario, annual spending on oil imports in 2035 by the five largest importers is around $560 billion, or one-third, lower than in the New Policies Scenario

Summary & conclusions

- Recently announced policies can make a difference, but fall well short of what is needed for a secure & sustainable energy future
- Lack of ambition in Copenhagen has increased the cost of achieving the 2°C goal & made it less likely to happen
  - *Unless commitments are <u>fully</u> implemented by 2020, it will be all but impossible to achieve the goal*
- The age of cheap oil is over, though policy action could bring lower <u>*international*</u> prices than would otherwise be the case
- Renewables are entering the mainstream, but long-term support is needed to boost their competitiveness
- Getting the prices right
  - *phasing-out fossil-fuel subsidies, is the single most effective measure to cut energy demand*
  - *Pricing CO_2 through the carbon market*

Drivers of abatement in the 450 Scenario

- **OECD countries**
  - > *Increased deployment of renewables and nuclear*
  - > *Development of CCS technology*
- **Middle East**
  - > *Phase-out of fossil fuel subsidies*
  - > *Efficiency measures*
- **China**
  - > *Efficiency measures*
  - > *Development of CCS for coal*
  - > *Wide deployment of electric vehicles*
- **Other Countries**
  - > *Efficiency measures*
  - > *Promote renewables*
- **CCS will require CDM**