# World Energy Outlook 2008

**Pieter Boot**
**Director**
**Office of Sustainable Energy Policy and Technology**

**National Energie Forum 2008**
**Amsterdam, Wednesday 26 November 2008**





## The context

- Soaring energy prices to mid-2008, followed by a collapse – what will it mean for demand?
- How will the financial crisis & economic slowdown affect energy demand & investment?
- Will economic worries divert attention from strategic energy-security & environmental challenges?
- Are we setting ourselves up for a supply-crunch once the economy is back on its feet?
- Will negotiators at COP-15 in Copenhagen in 2009 have the political support needed to succeed?

**Table 1.1 • Major new energy-related policy initiatives adopted between mid-2007 and mid-2008**

| Country/region | Policy/measure | Implementation in the Reference Scenario |
|---|---|---|
| European Union | European Commission integrated energy and climate action plan | $30/t $CO_2$ price (in year-2007 prices) in the EU trading scheme sectors is assumed<br>Increased use of renewable energy<br>Improved energy efficiency<br>Increased use of biofuels in transport |
| United States | Energy Independence and Security Act | Tightened corporate average fuel-economy standards, resulting in lower transport-fuel intensity<br>Increase in biofuels consumption<br>Tougher appliance standards and incentives result in lower energy intensity in buildings and industry |
| Japan | Revision of Act on the Rational Use of Energy<br><br>Revision of Law on Global Warming Countermeasures | Improved energy efficiency and reduced $CO_2$ emissions in the residential/services and other sectors (both measures) |
| China | Renewable Energy Development Plan<br><br>Revision of Law on Energy Conservation | Increased use of renewable energy<br><br>Improved energy efficiency |

Note: More details about the policies in the Reference Scenario can be found at the WEO website www.worldenergyoutlook.org.



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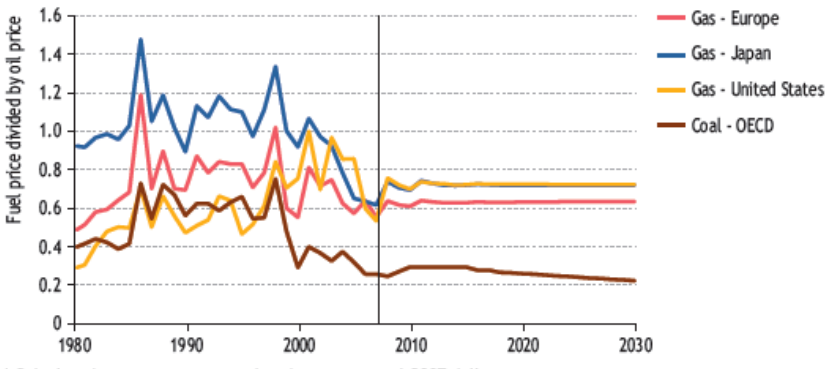
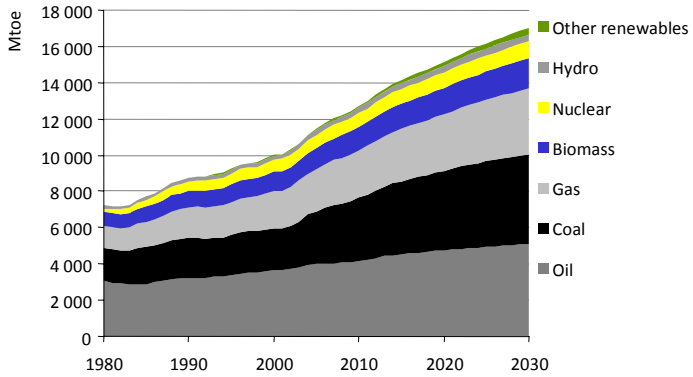
**Figure 1.5 • Assumed natural gas and coal prices relative to crude oil***




* Calculated on an energy-equivalent basis using real-2007 dollars.

# World primary energy demand in the Reference Scenario: this is unsustainable!



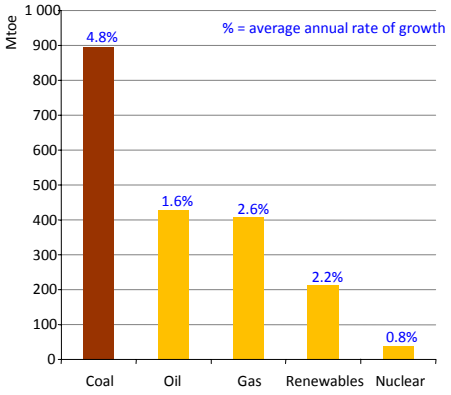

***World energy demand expands by 45% between now and 2030 – an average rate of increase of 1.6% per year – with coal accounting for more than a third of the overall rise***



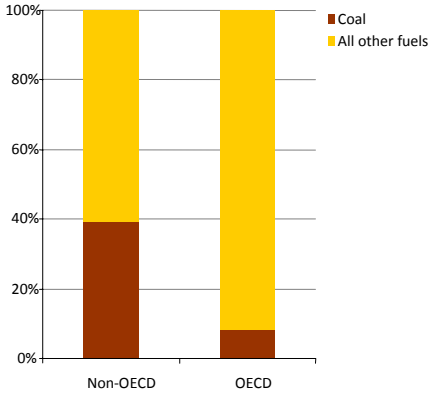


# The continuing importance of coal in world primary energy demand

**Increase in primary demand, 2000 - 2007**

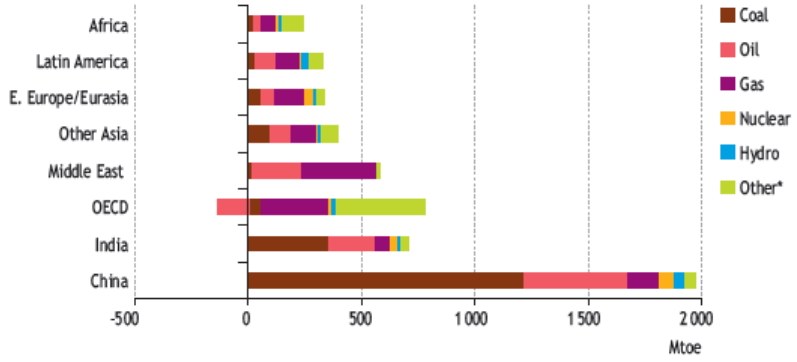



**Shares of incremental energy demand Reference Scenario, 2006 - 2030**




***Demand for coal has been growing faster than any other energy source & is projected to account for more than a third of incremental global energy demand to 2030***

**Figure 2.3 ● Incremental primary energy demand by fuel in the Reference Scenario, 2006-2030**




* Other includes biomass and waste, and other renewables.





**Figure 3.2 ● Oil intensity by region in the Reference Scenario**

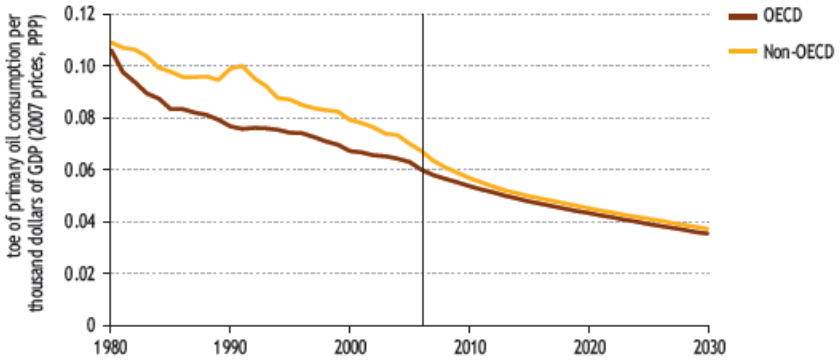


**Figure 4.6 • Main net inter-regional natural gas trade flows in the Reference Scenario, 2006 and 2030**
(billion cubic metres per year)

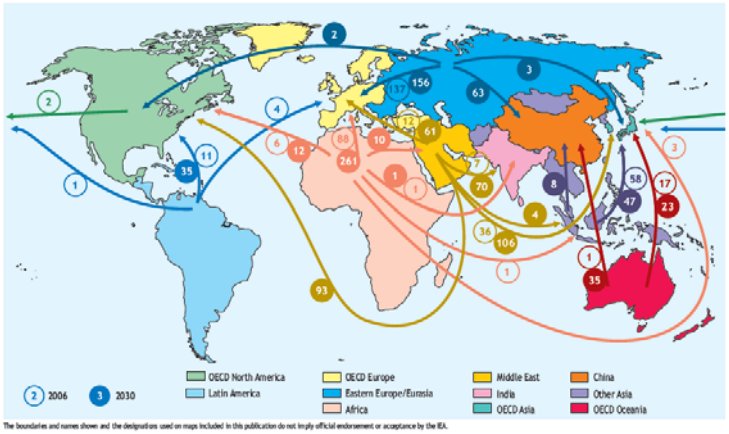









**Figure 6.3 • World electricity generation by fuel in the Reference Scenario**

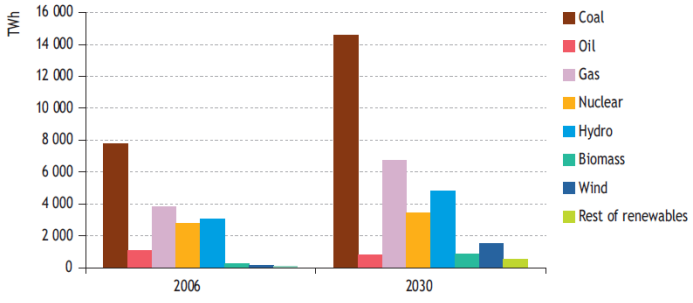
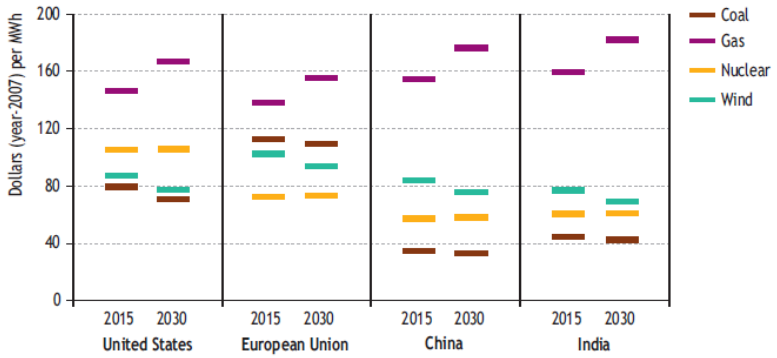


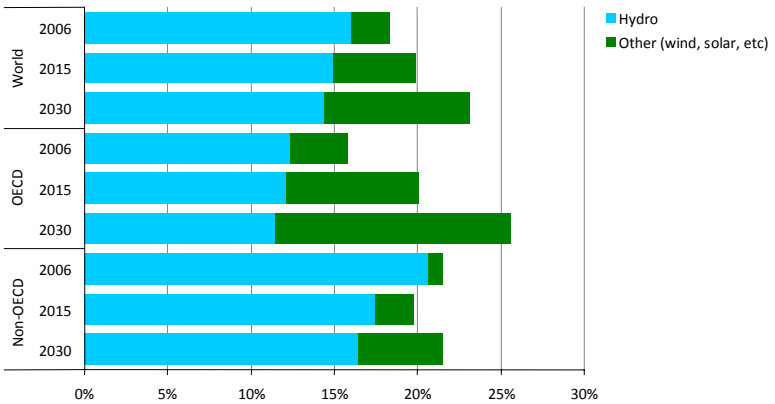
**Figure 6.8 • Electricity generating costs in selected regions**





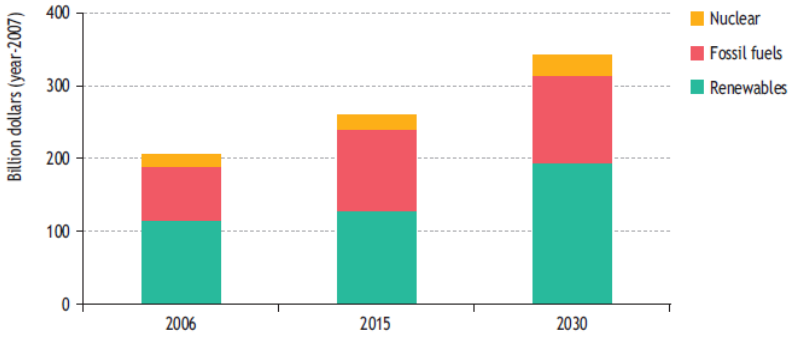



# Share of renewables in electricity generation in the Reference Scenario




*Soon after 2010, renewables become the 2nd-largest source of electricity behind coal, thanks to government support, prospects for higher fossil-fuel prices & declining investment costs*

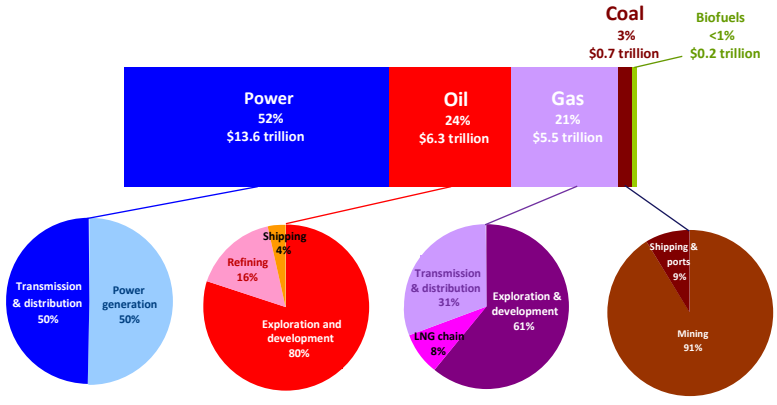
**Figure 7.9 • World investment in new power-generation plants by fuel in the Reference Scenario**








# Cumulative energy-supply investment in the Reference Scenario, 2007-2030



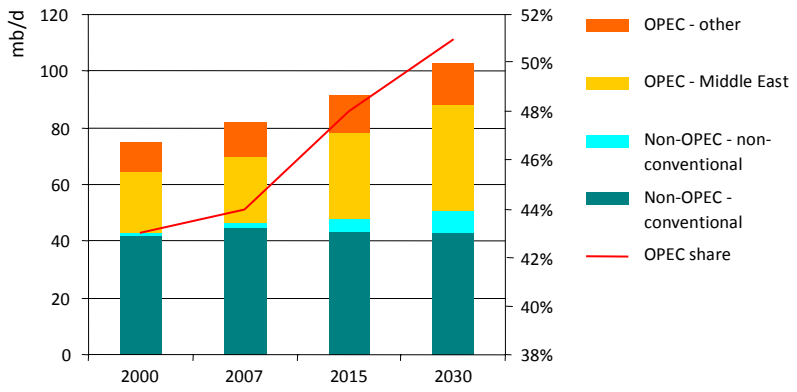

***Investment of $26 trillion, or over $1 trillion/year, is needed, but the credit squeeze could delay spending, potentially setting up a supply-crunch once the economy recovers***

# Oil Supply Prospects



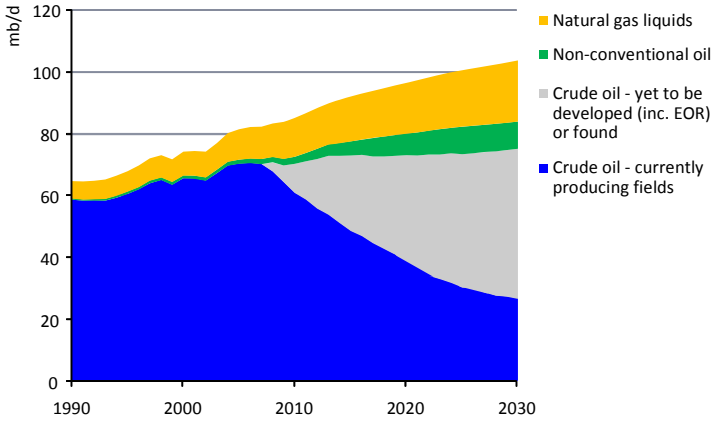


## World oil production by OPEC/non-OPEC in the Reference Scenario




***Production rises to 104 mb/d in 2030, with Middle East OPEC taking the lion's share of oil market growth as conventional non-OPEC production declines***

# World oil production by source in the Reference Scenario

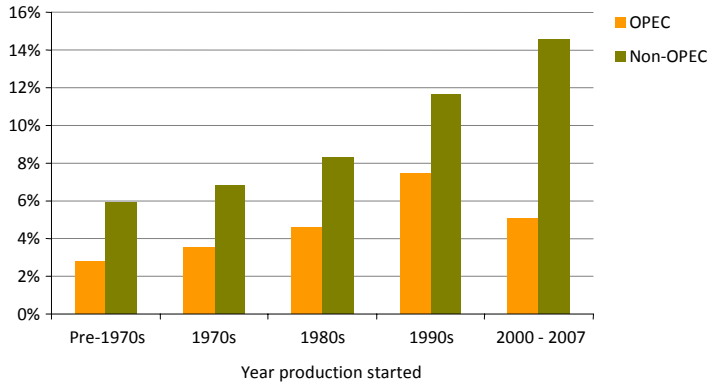



***64 mb/d of gross capacity needs to be installed between 2007 & 2030 – six times the current capacity of Saudi Arabia – to meet demand growth & offset decline***



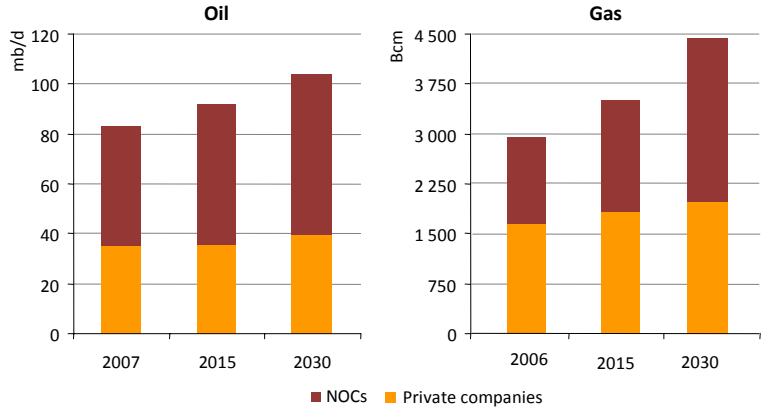


# Average observed oilfield decline rates




***The production-weighted average decline rate worldwide is projected to rise from 6.7% in 2007 to 8.6% in 2030 as productions shifts to smaller oilfields, which tend to decline faster***

# A sea change: world oil & gas production by company type in the Reference Scenario



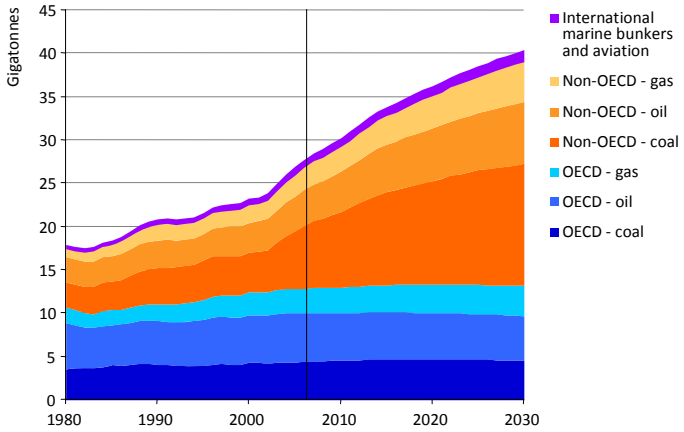

***Almost 80% of the projected increase in output of both oil & gas comes from national companies – on the assumption that investment is forthcoming***





# Post-2012 climate-policy scenarios

# Energy-related $CO_2$ emissions in the Reference Scenario



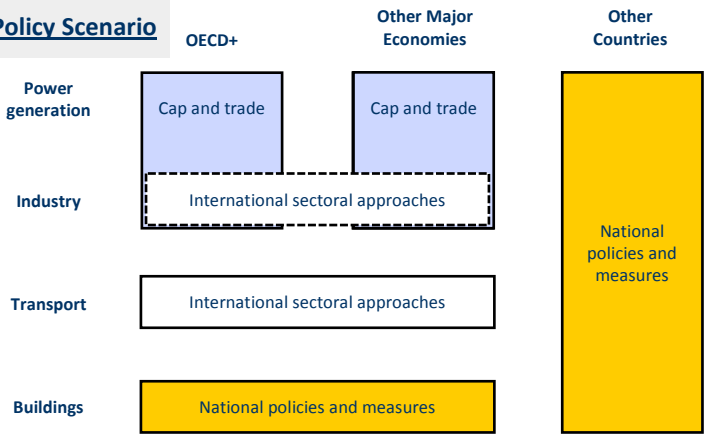

***97% of the projected increase in emissions between now & 2030 comes from non-OECD countries – three-quarters from China, India & the Middle East alone***





# Copenhagen: a plausible post-2012 global climate-change policy regime

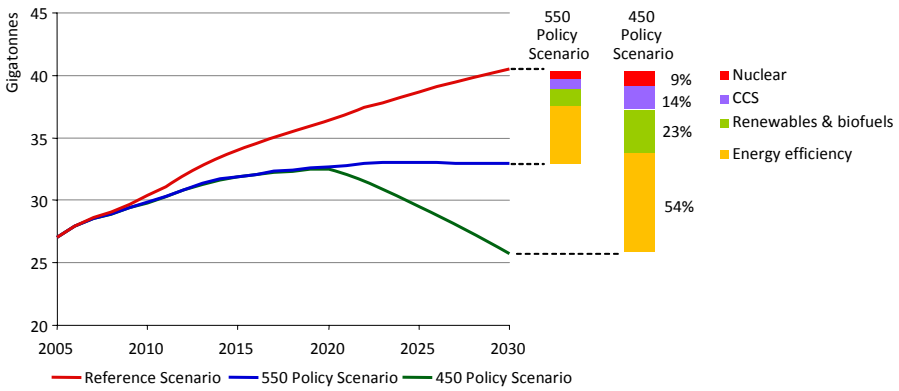
**The 450 Policy Scenario**




***A combination of policy mechanisms – reflecting nations' varied circumstances & current negotiating positions – is a realistic outcome at the Copenhagen COP at end-2009***

# Reductions in energy-related $CO_2$ emissions in the climate-policy scenarios



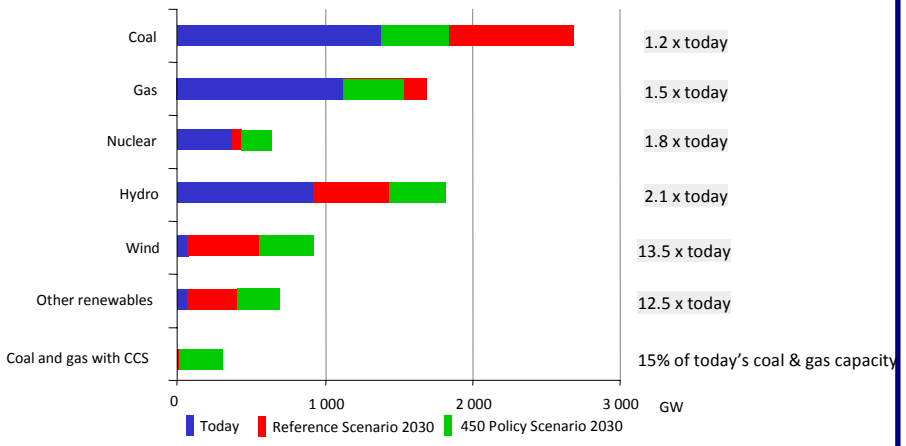



***While technological progress is needed to achieve some emissions reductions, efficiency gains and deployment of existing low-carbon energy accounts for most of the savings***



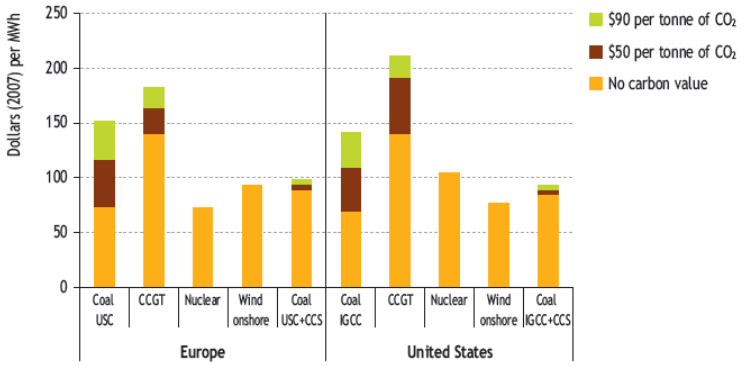
# Total power generation capacity today and in 2030 by scenario






***In the 450 Policy Scenario, the power sector undergoes a dramatic change – with CCS, renewables and nuclear each playing a crucial role***

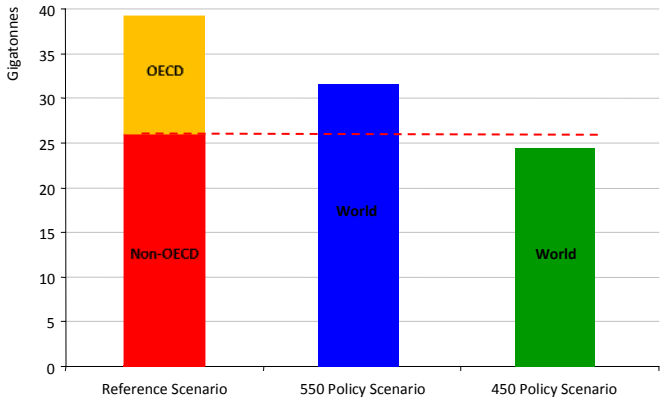
**Figure 19.5** ● Electricity generating costs in Europe and the United States assuming different carbon prices in the 550 Policy Scenario, 2030








# World energy-related $CO_2$ emissions in 2030 by scenario




***OECD countries alone cannot put the world onto a 450-ppm trajectory, even if they were to reduce their emissions to zero***

## Key results of the post-2012 climate-policy analysis



### 550 Policy Scenario

- Corresponds to a c.3°C global temperature rise
- Energy demand continues to expand, but fuel mix is markedly different
- $CO_2$ price in OECD countries reaches $90/tonne in 2030
- Additional investment equal to 0.25% of GDP

### 450 Policy Scenario

- Corresponds to a c.2°C global temperature rise
- Energy demand grows, but half as fast as in Reference Scenario
- Rapid deployment of low-carbon technologies – particularly CCS
- Big fall in non-OECD emissions
- $CO_2$ price in 2030 reaches $180/tonne
- Additional investment equal to 0.6% of GDP





# Summary & Conclusions

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- Current energy trends are patently unsustainable — socially, environmentally, economically
- Oil will remain the leading energy source but...
  - The era of cheap oil is over, although price volatility will remain
  - Oilfield decline is the key determinant of investment needs
  - The oil market is undergoing major and lasting structural change, with national companies in the ascendancy
- To avoid "abrupt and irreversible" climate change we need a major decarbonisation of the world's energy system
  - Copenhagen must deliver a credible post-2012 climate regime
  - Limiting temperature rise to 2°C will require significant emission reductions in all regions & technological breakthroughs
  - Mitigating climate change will substantially improve energy security
- The present economic worries do not excuse back-tracking or delays in taking action to address energy challenges