International Energy Agency

WORLD ENERGY OUTLOOK 2011

A glimpse into our energy future

Ministry of Knowledge Economy & Korea Energy Economics Institute

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The context: fresh challenges add to already worrying trends

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- Economic concerns have diverted attention from energy policy and limited the means of intervention
- Post-Fukushima, nuclear is facing uncertainty
- MENA turmoil raised questions about region's investment plans
- Some key trends are pointing in worrying directions:
  - *CO_2 emissions rebounded to a record high*
  - *energy efficiency of global economy worsened for 2nd straight year*
  - *spending on oil imports is near record highs*

Emerging economies continue to drive global energy demand

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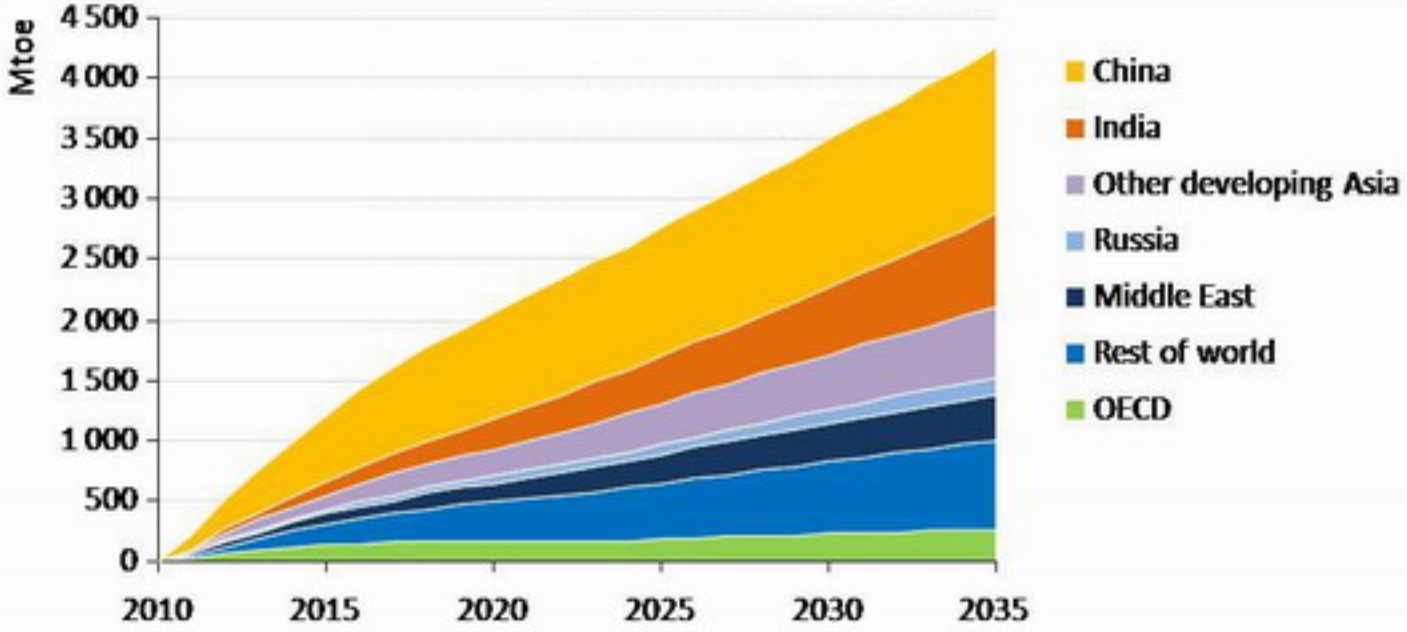
Growth in primary energy demand



Global energy demand increases by one-third from 2010 to 2035, with China & India accounting for 50% of the growth

Natural gas & renewables become increasingly important

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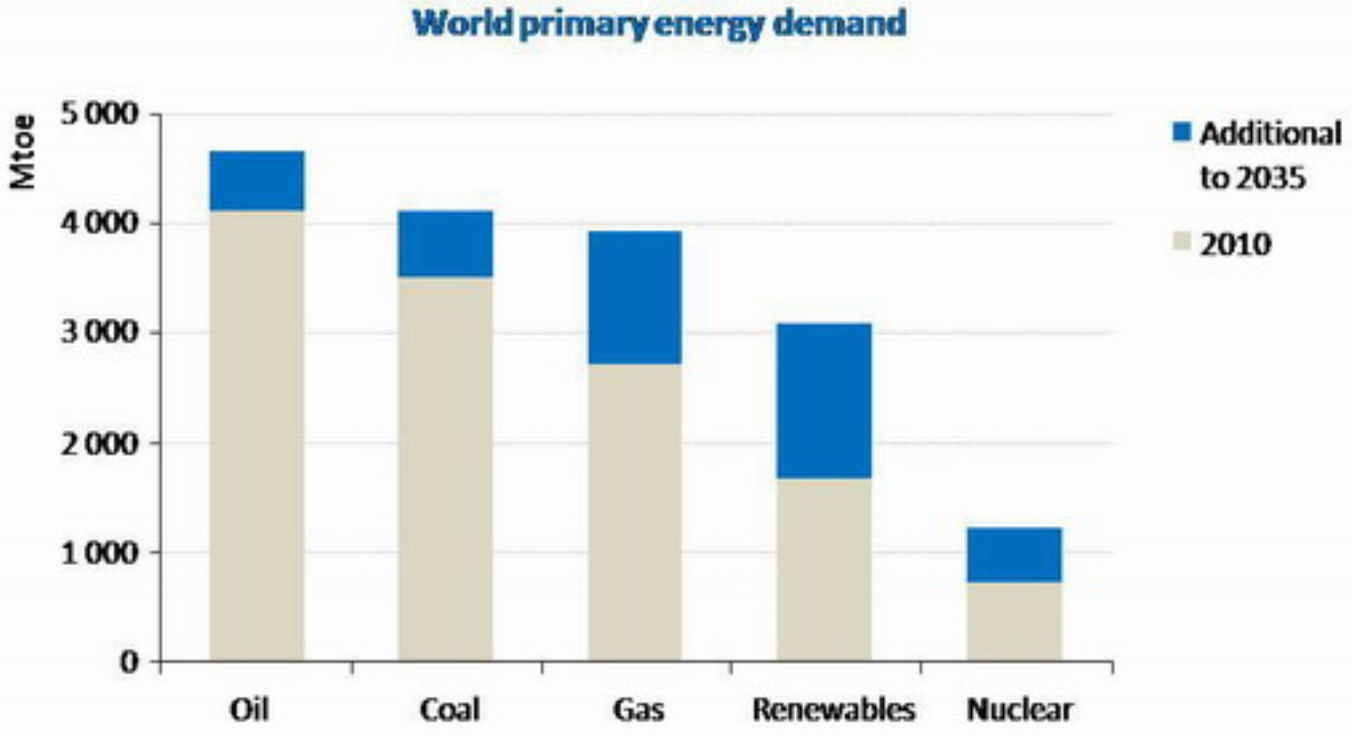

Renewables & natural gas collectively meet almost two-thirds of incremental energy demand in 2010-2035

Iraq is the largest source of oil supply growth

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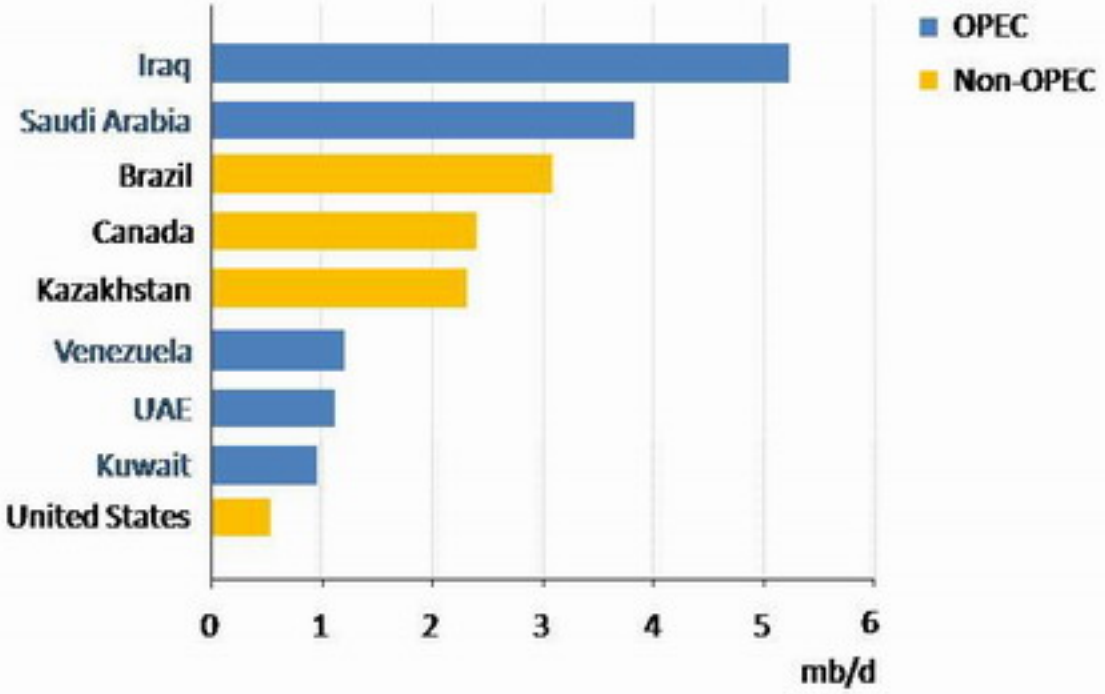
Major changes in world liquids supply in the New Policies Scenario, 2010-2035



The rise in MENA production is over 90% of the growth in global oil output to 2035 while companies operating elsewhere turn increasingly to more difficult & costly sources

Changing oil import needs are set to shift concerns about oil security

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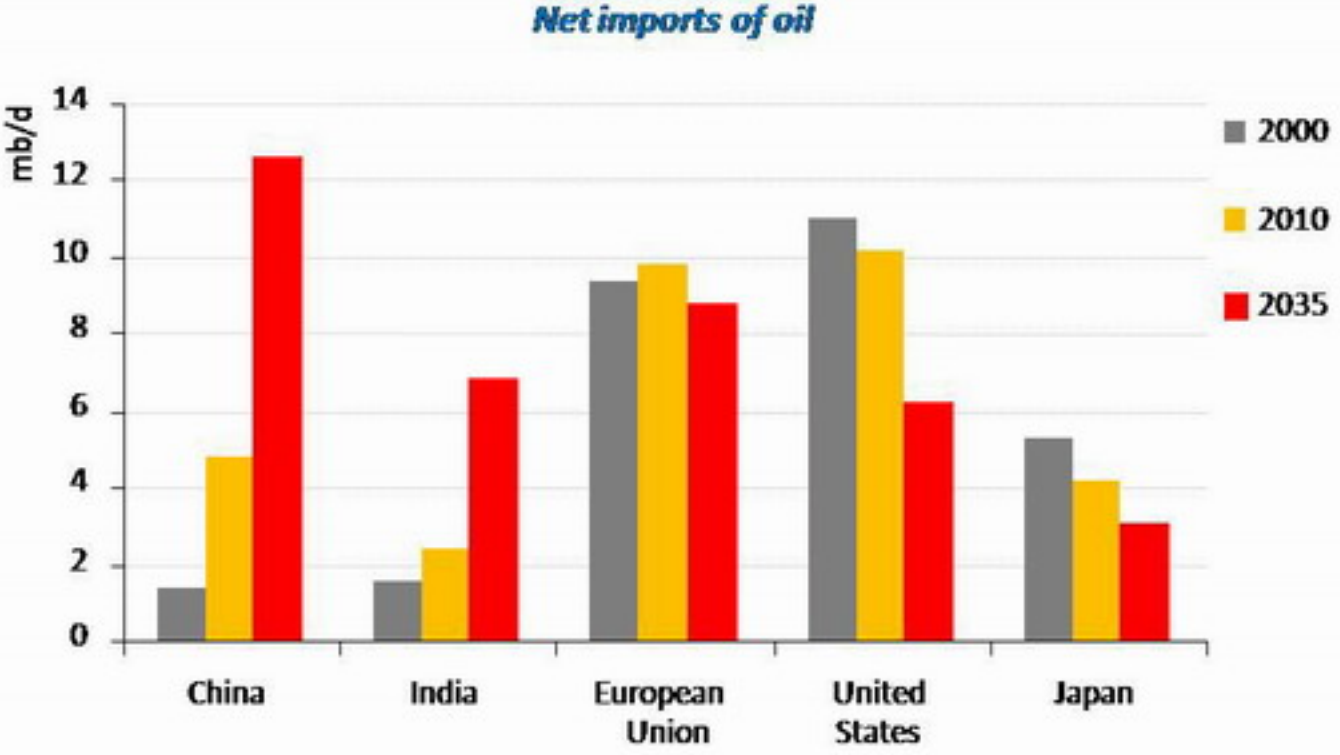

US oil imports drop due to rising domestic output & improved transport efficiency: EU imports overtake those of the US around 2015; China becomes the largest importer around 2020

What impact would deferred investment in MENA have on markets?

- MENA is set to supply the bulk of the growth in oil output to 2035, requiring investment of over $100 billion/annum
- 'Deferred Investment Case' looks at near-term investment falling short by one-third
  - *possible drivers include new spending priorities, higher perceived risks, etc*
- MENA production falls 3.4 mb/d by 2015 and 6.2 mb/d by 2020
- Consumers face a near-term rise in oil prices to $150/barrel
- MENA earns more initially, but then less as market share is lost

Golden prospects for natural gas

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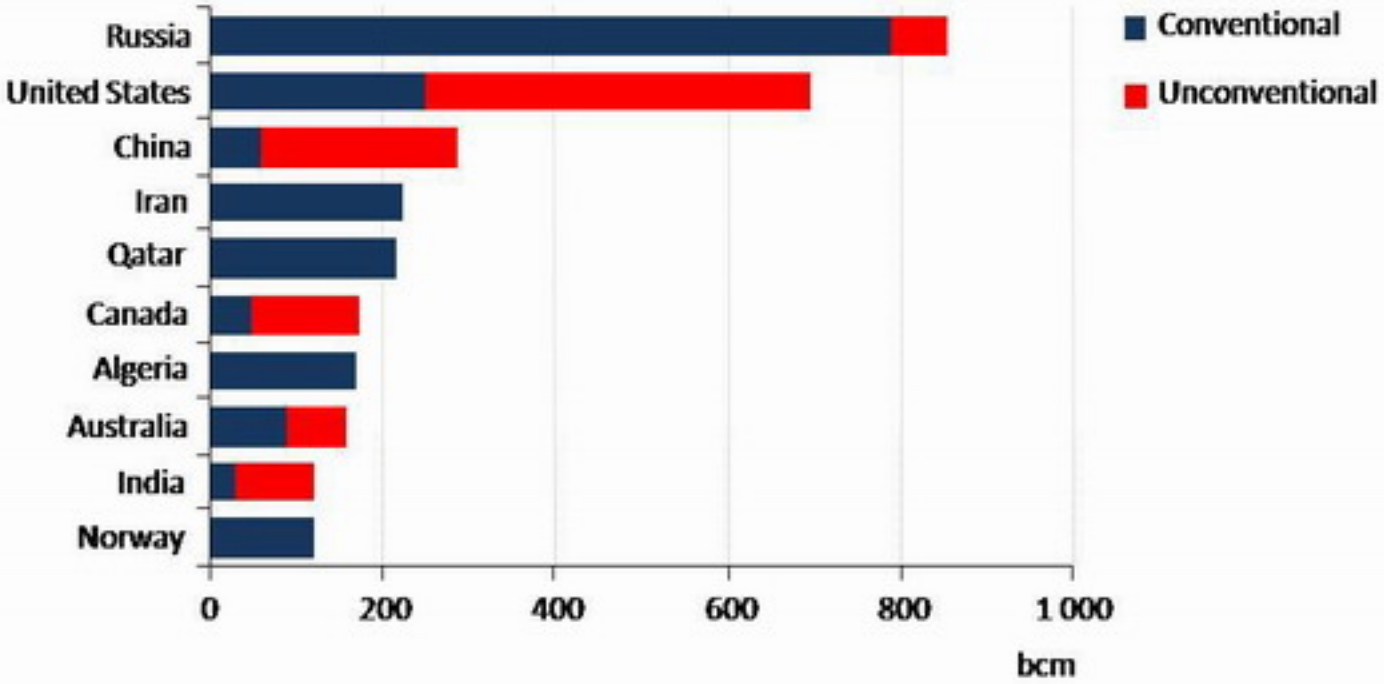
Largest natural gas producers in 2035



Unconventional natural gas supplies 40% of the 1.7 tcm increase in global supply, but best practices are essential to successfully address environmental challenges

Coal won the energy race in the first decade of the 21st century

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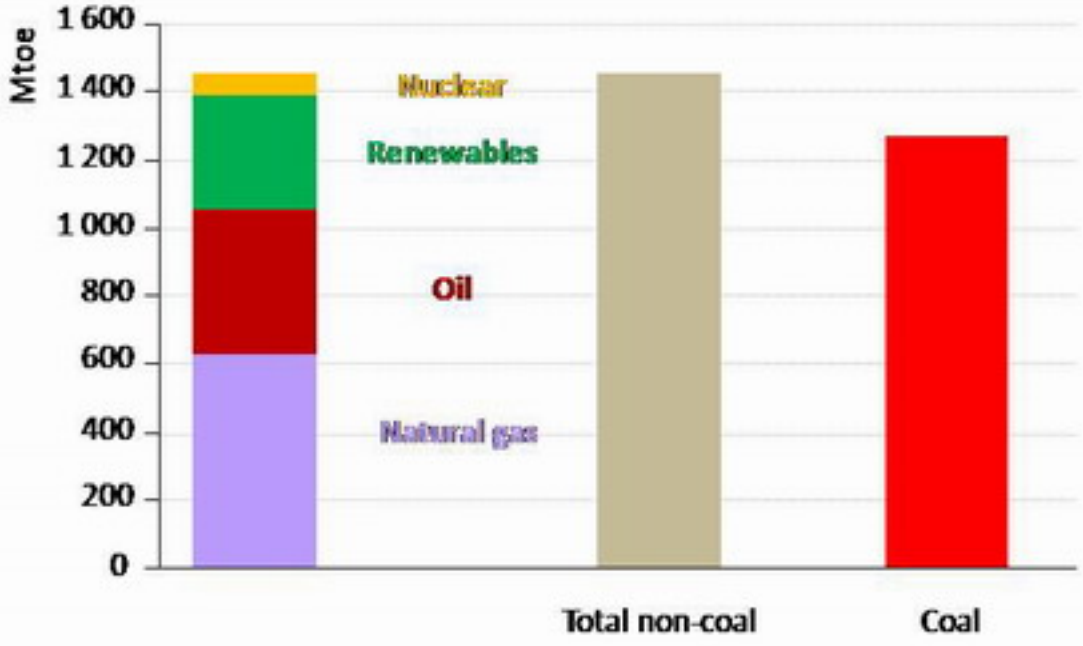
Growth in global energy demand, 2000-2010



Coal accounted for nearly half of the increase in global energy use over the past decade, with the bulk of the growth coming from the power sector in emerging economies

Second thoughts on nuclear would have far-reaching consequences

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- "Low Nuclear Case" examines impact of nuclear component of future energy supply being cut in half
- Gives a boost to renewables, but increases import bills, reduces diversity & makes it harder to combat climate change
- By 2035, compared with the New Policies Scenario:
  - *coal demand increases by twice Australia's steam coal exports*
  - *natural gas demand increases by two-thirds Russia's natural gas net exports*
  - *power-sector CO_2 emissions increase by 6.2%*
- Biggest implications are for countries with limited energy resources that planned to rely on nuclear power

Fossil-fuel subsidies remain costly

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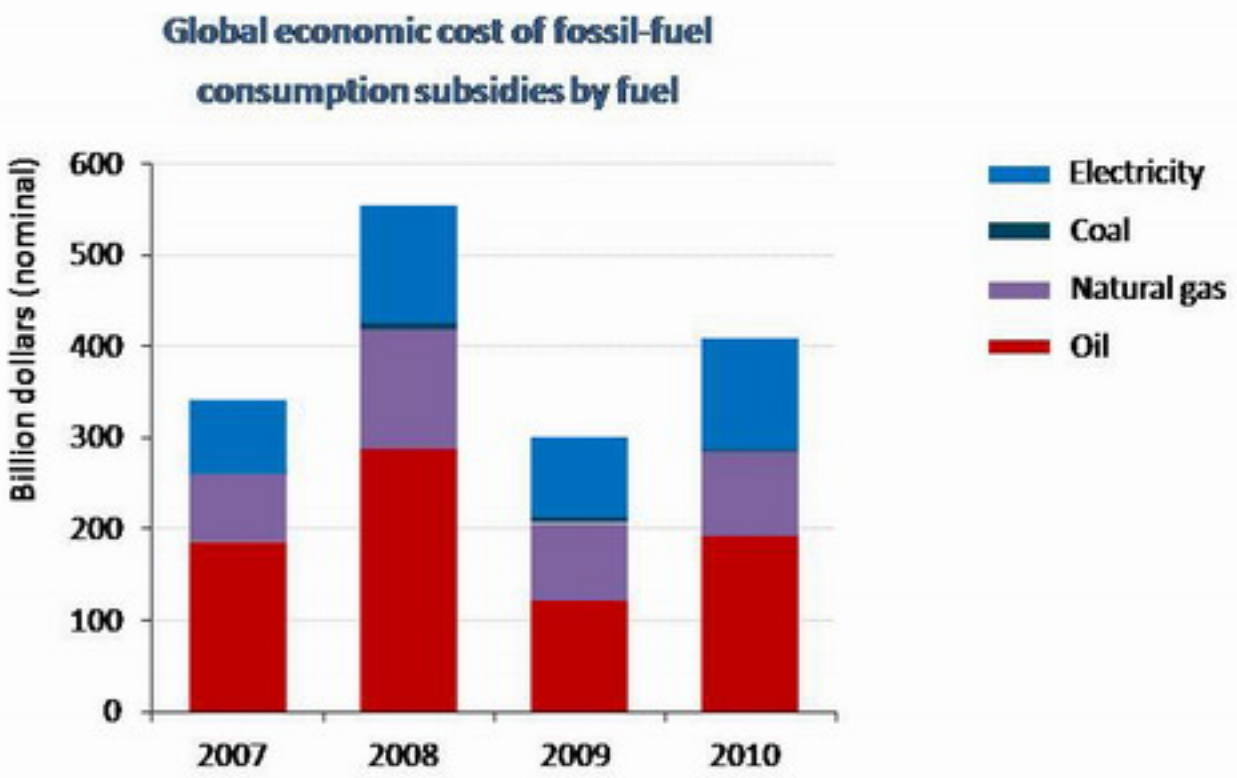

Fossil-fuels subsidies amounted to $409 billion in 2010 – with negative consequences on energy efficiency, environment and penetration of renewable energy.

The majority of energy subsidies still go to fossil fuels

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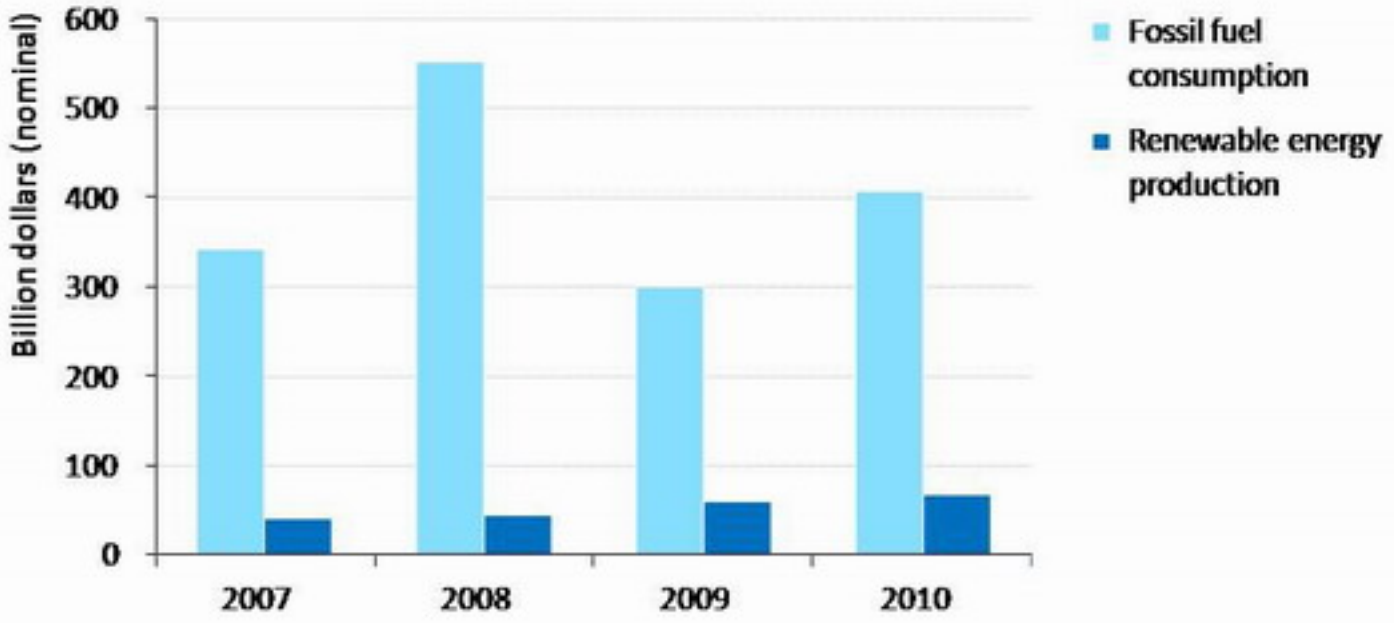
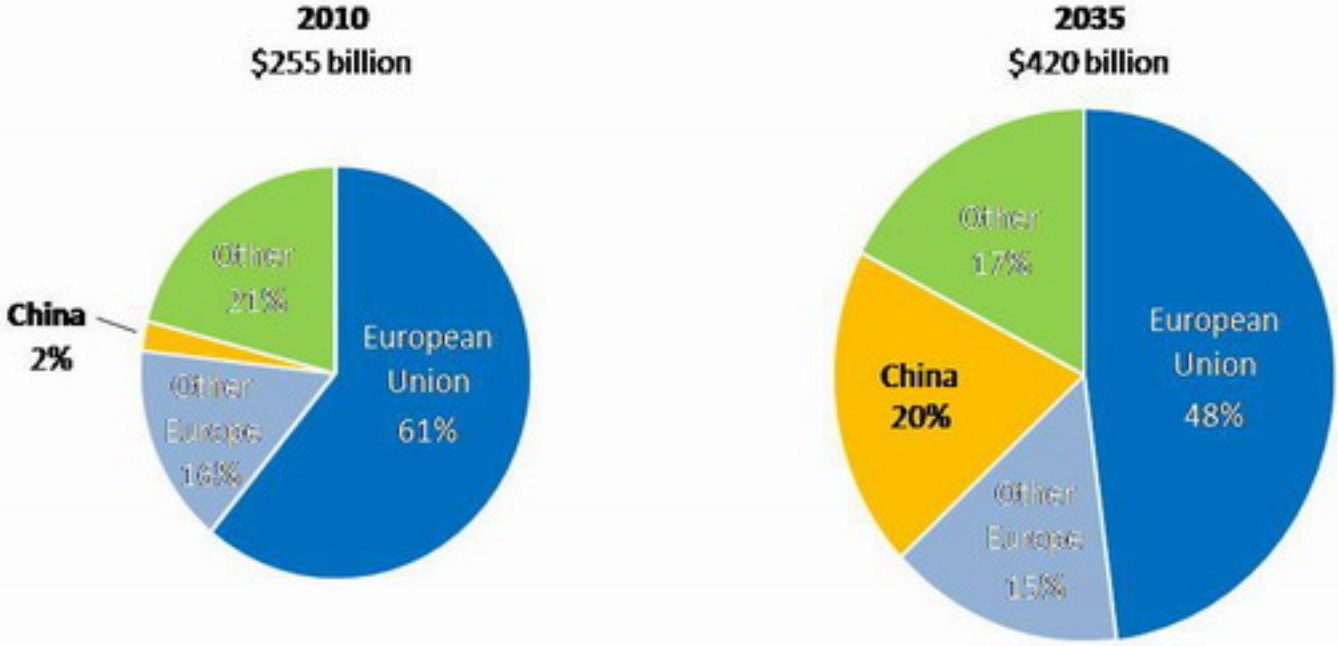
World subsidies to fossil fuels consumption & renewable energy



Fossil-fuels subsidies amounted to $409 billion in 2010 – down from the peak of $550 billion in 2008 but still much larger than subsidies to renewables, which reached $66 billion in 2010

Russia remains a cornerstone of the global energy economy

Russian revenue from fossil fuel exports



An increasing share of Russian exports go eastwards to Asia, providing Russia with diversity of markets and revenues

Energy is at the heart of the climate challenge

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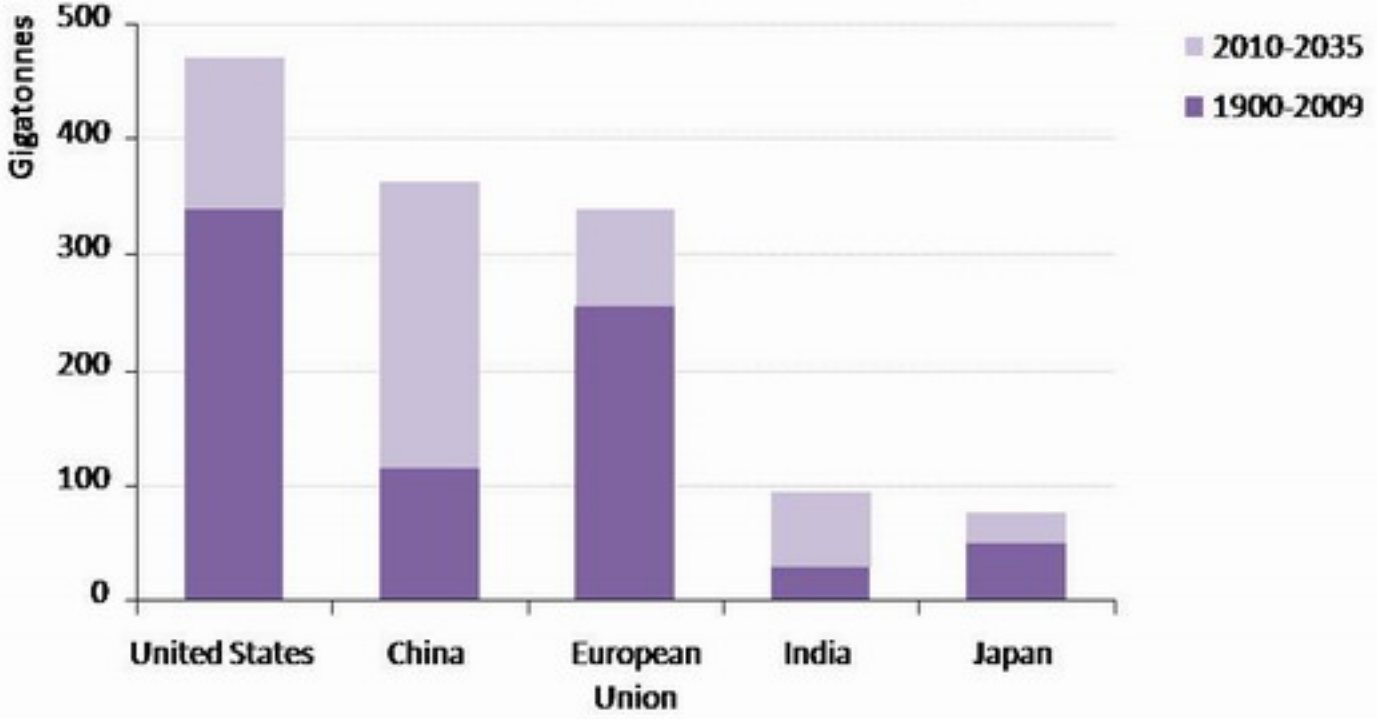
Cumulative energy-related CO_2 emissions in selected regions



By 2035, cumulative CO_2 emissions from today exceed three-quarters of the total since 1900, and China's per-capita emissions match the OECD average

The door to 2 ° C is closing, but will we be "locked-in" ?

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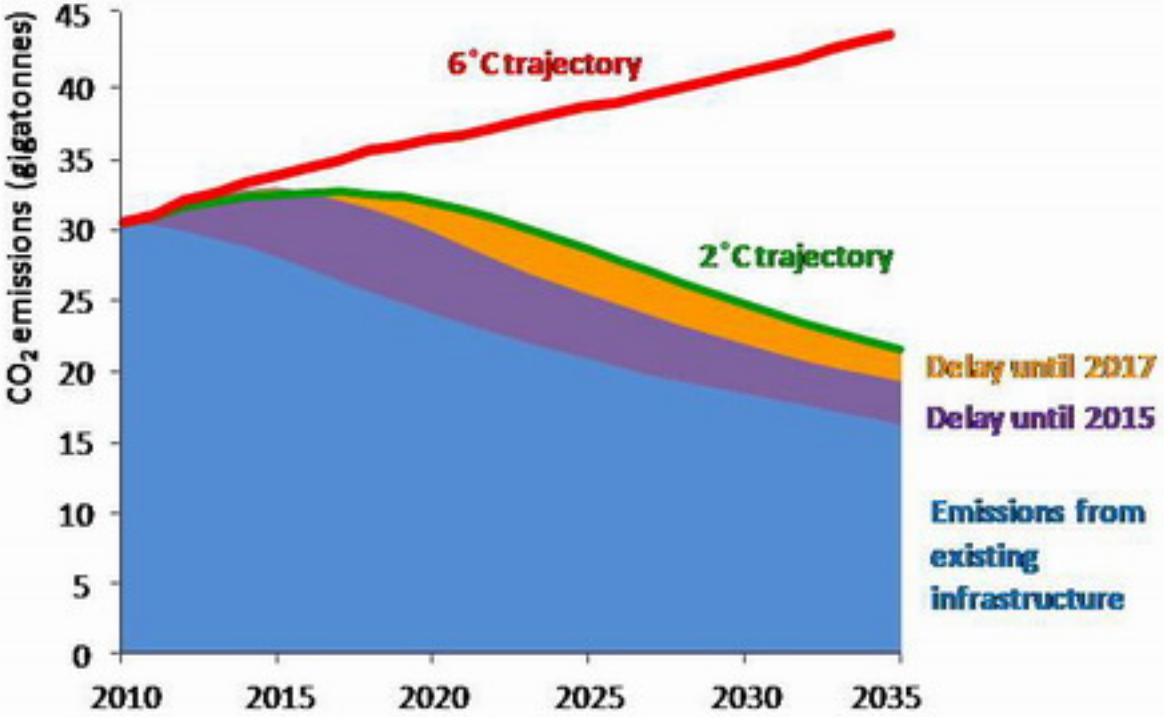

Without further action, by 2017 all CO_2 emissions permitted in the 2 °C Scenario will be "locked-in" by existing power plants, factories, buildings, etc

Energy poverty is widespread

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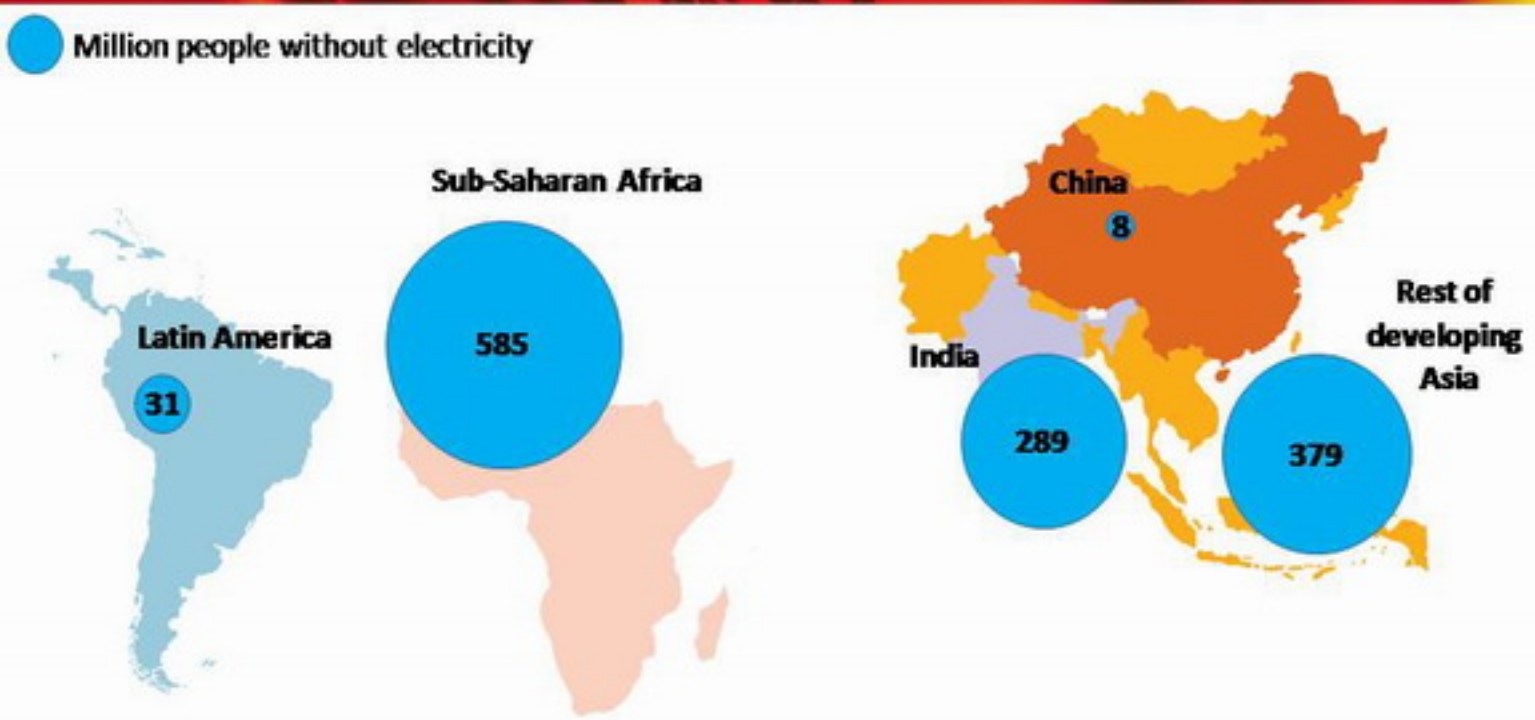

1.3 billion people in the world live without electricity

If we don't change direction soon, we'll end up where we're heading

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- In a world full of uncertainty, one thing is sure: rising incomes & population will push energy needs higher
- Oil supply diversity is diminishing, while new options are opening up for natural gas
- Coal – the "forgotten fuel" – has underpinned growth, but its future will be shaped by uptake of efficient power plants & CCS
- Any big shift away from nuclear power would increase import bills, threaten energy security & make it harder to combat climate
  - ***regional/international collaboration on safety is now more crucial than ever***
- Despite steps in the right direction, the door to 2°C is closing