



International
Energy Agency

WORLD ENERGY OUTLOOK

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World Energy Outlook 2011

Dan Dorner
16th National Energy Conference
Athens, 23 November 2011

The context: fresh challenges add to already worrying trends

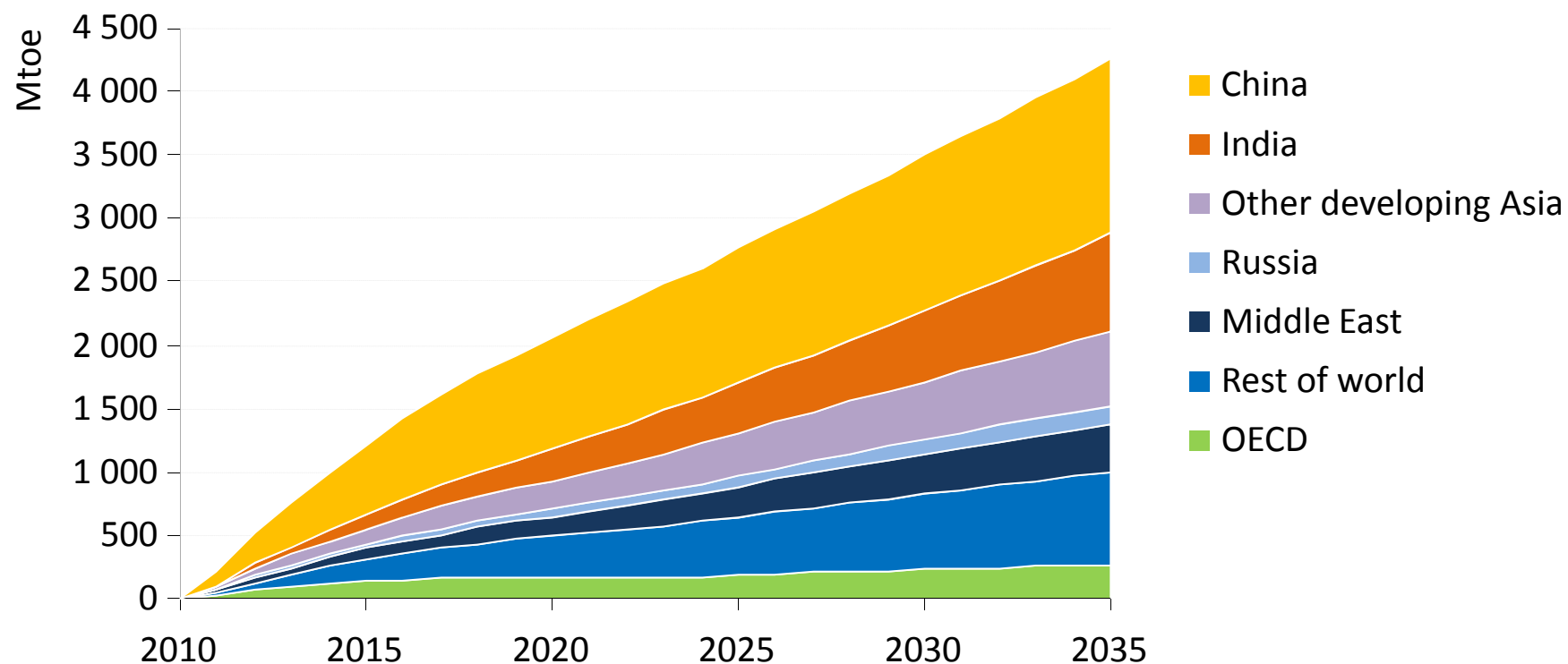
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- Economic concerns have diverted attention from energy policy and limited the means of intervention
- Post-Fukushima, nuclear is facing uncertainty
- MENA turmoil raised questions about region's investment plans
- Some key trends are pointing in worrying directions:
 - *CO₂ 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

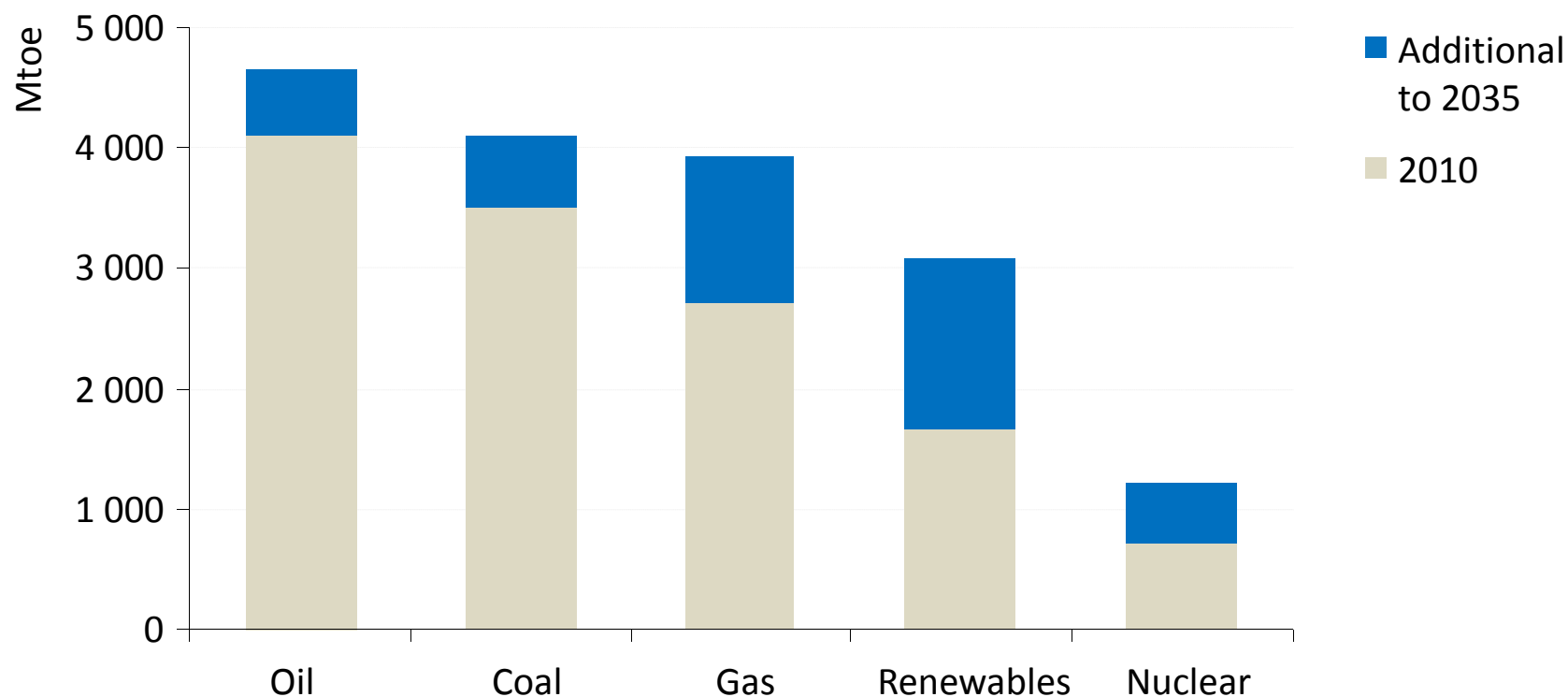


Global energy demand increases by one-third from 2010 to 2035, with China & India accounting for 50% of the growth

Natural gas & renewables become increasingly important

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World primary energy demand

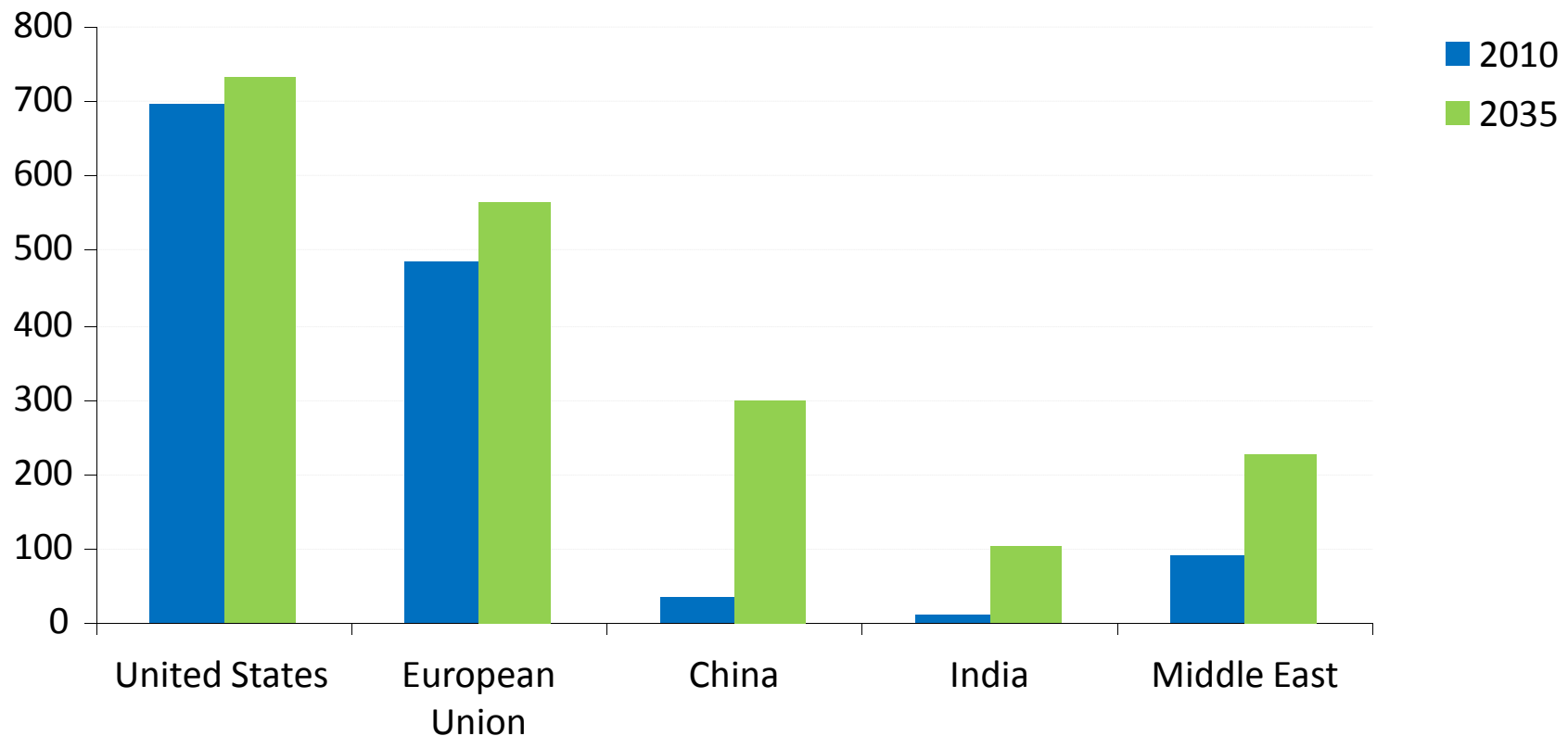


Renewables & natural gas collectively meet almost two-thirds of incremental energy demand in 2010-2035

*Oil demand is driven higher
by soaring car ownership*

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Vehicles per 1000 people in selected markets

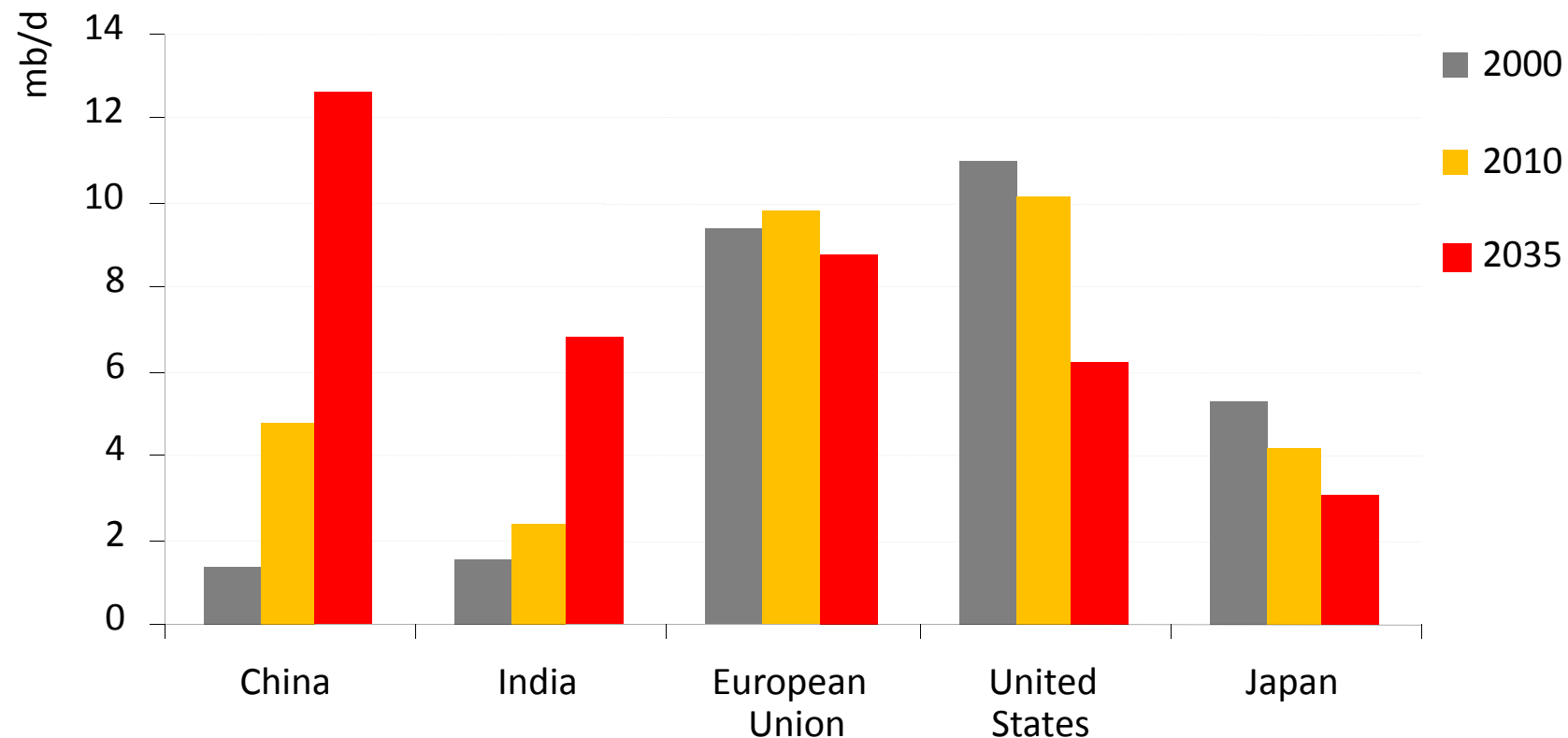


***The passenger vehicle fleet doubles to 1.7 billion in 2035; most cars are sold
outside the OECD by 2020, making non-OECD policies key to global oil demand***

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

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Net imports of oil



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?

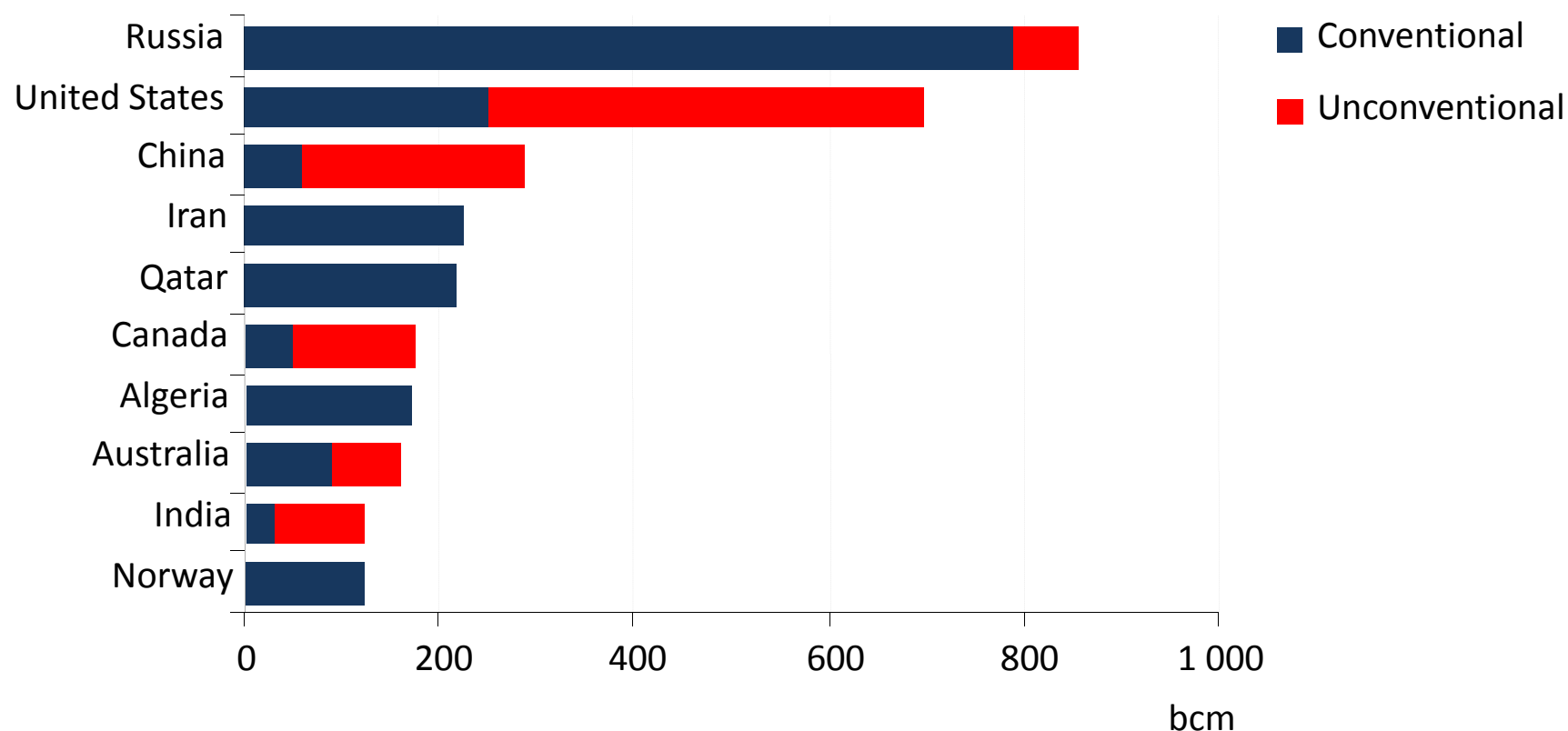
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- MENA is set to supply the bulk of the growth in oil output to 2035, requiring investment of over \$100 billion/annum
- ‘Deferred Investment Case’ looks at near-term investment falling short by one-third
 - *possible drivers include new spending priorities, higher perceived risks, etc*
- MENA output 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

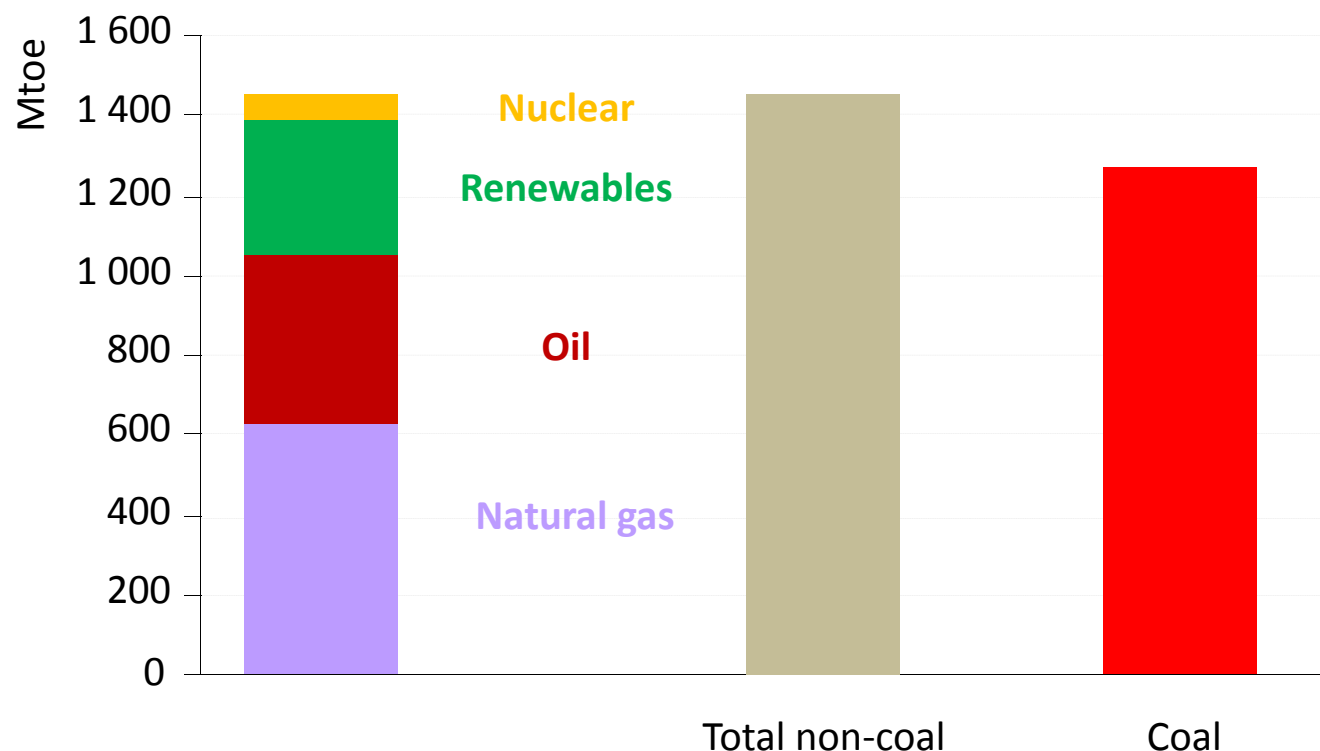


Unconventional natural gas supplies 40% of the 1.7 tcm increase in global supply, but best practices are essential to successfully address environmental challenges

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

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Growth in global energy demand, 2000-2010

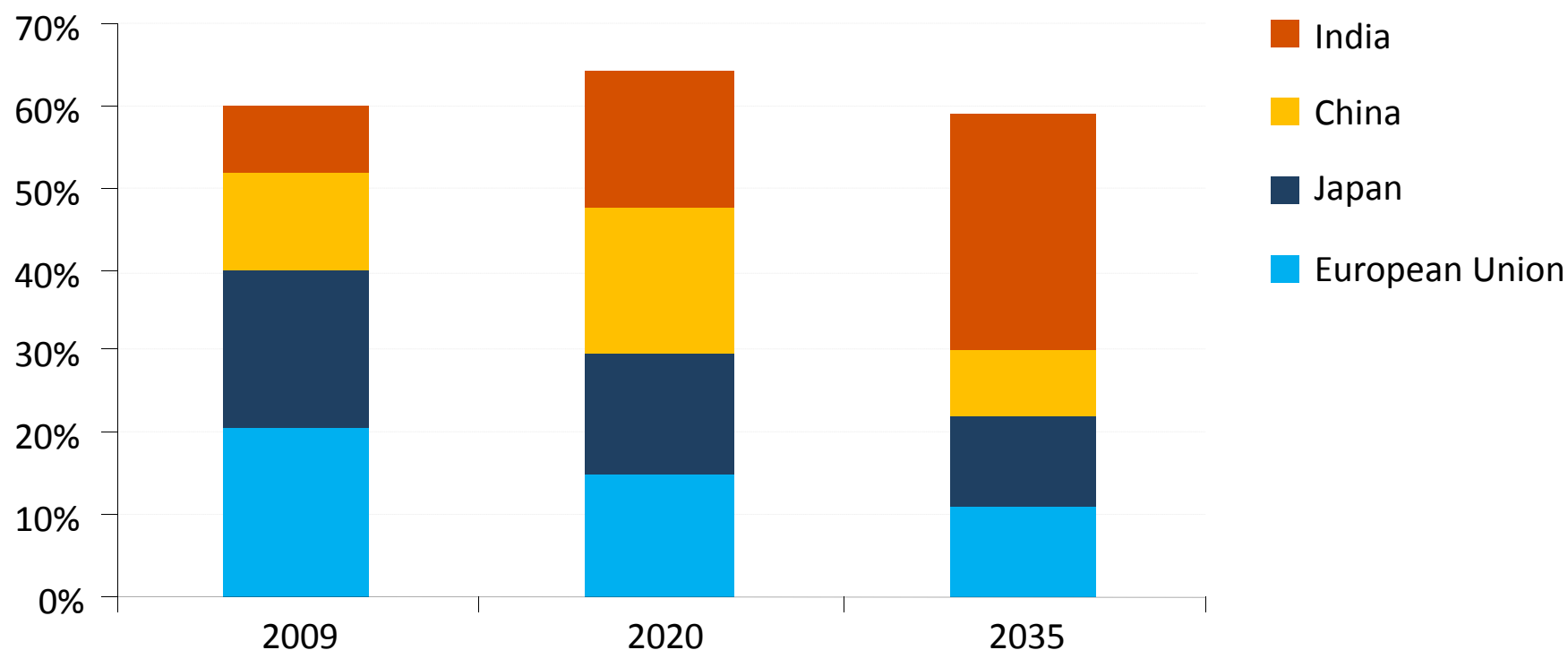


Coal accounted for nearly half of the increase in global energy use over the past decade, with the bulk of the growth coming from the power sector in emerging economies

Asia: the arena of future coal trade

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Share of global hard coal trade



***International coal markets & prices become increasingly sensitive to developments in Asia;
India surpasses China as the biggest coal importer soon after 2020***

Second thoughts on nuclear would have far-reaching consequences

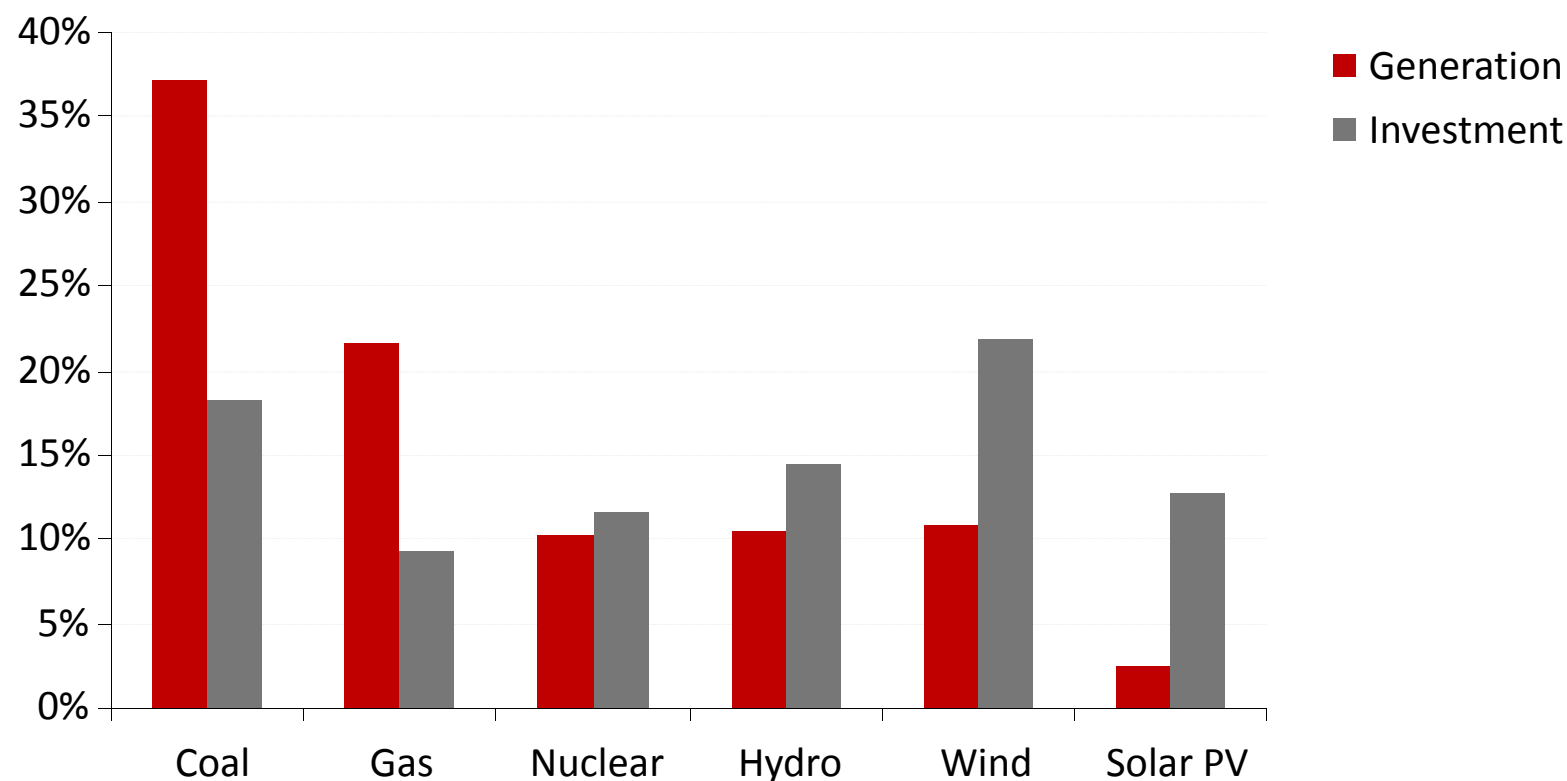
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- “Low Nuclear Case” examines impact of nuclear component of future energy supply being cut in half
- Gives a boost to renewables, but increases import bills, reduces diversity & makes it harder to combat climate change
- By 2035, compared with the 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 CO₂ emissions increase by 6.2%*
- Biggest implications are for countries with limited energy resources that planned to rely on nuclear power

Power investment focuses on low-carbon technologies

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Share of new power generation and investment, 2011-2035

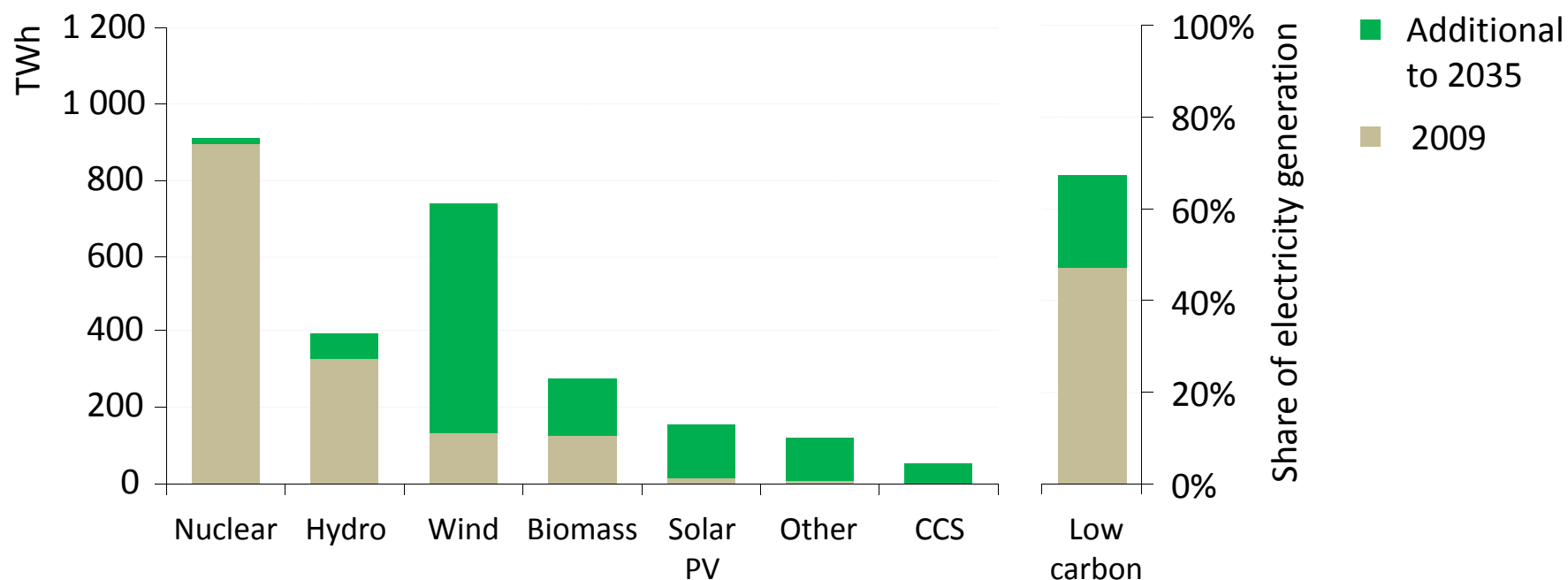


Renewables are often capital-intensive, representing 60% of investment for 30% of additional generation, but bring environmental benefits & have minimal fuel costs

EU moving towards cleaner forms of electricity generation

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Electricity generation from low-carbon sources in the European Union

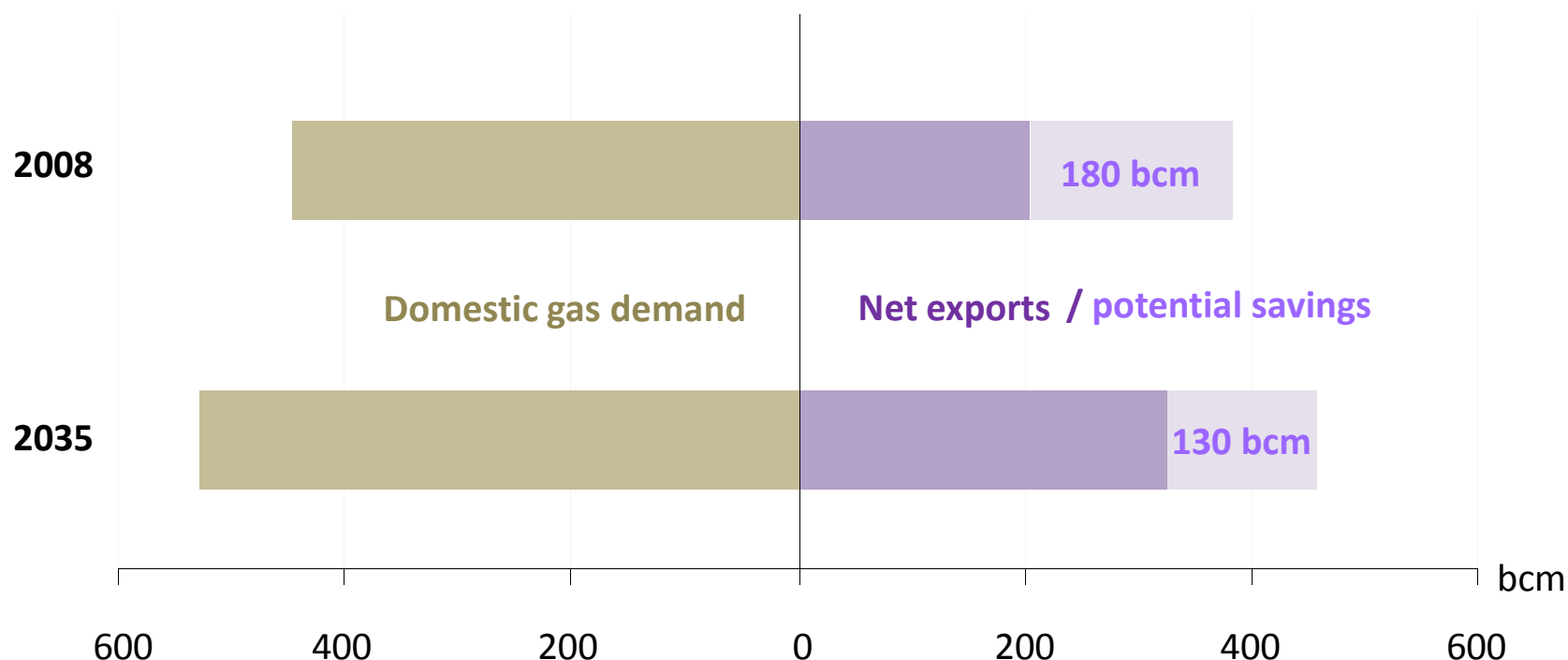


***Wind spearheads the low-carbon contribution to the EU electricity sector:
the share of generation from low-carbon technologies rises to two-thirds in 2035***

Realising Russia's potential for energy savings would have a big impact

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Natural gas savings from raising efficiency (to comparable OECD levels)

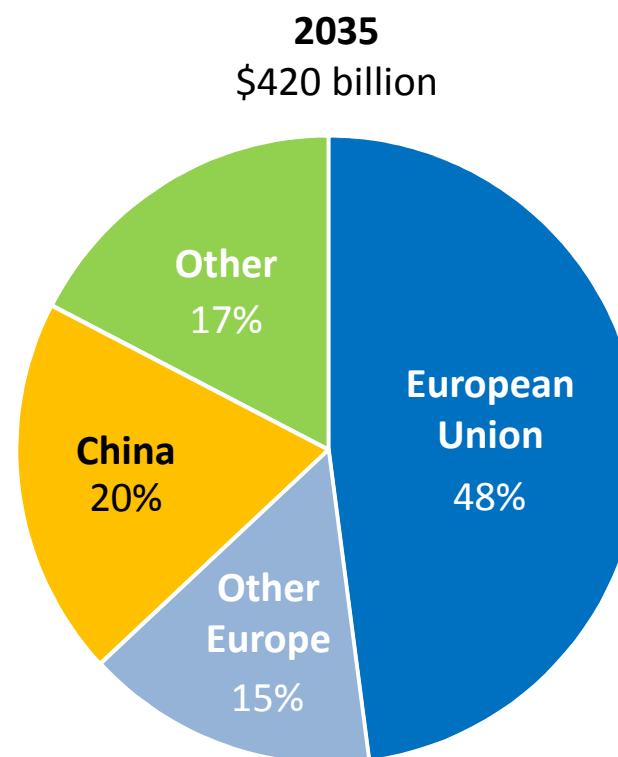
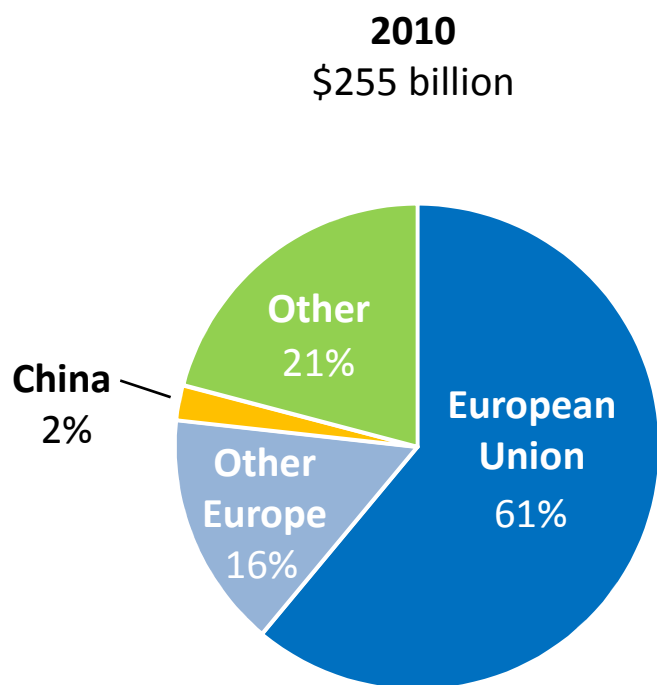


Russia's total energy savings potential is close to the primary energy used in a year by the UK; new efficiency policies bring results, but the savings potential remains large even in 2035

Russia remains a cornerstone of the global energy economy

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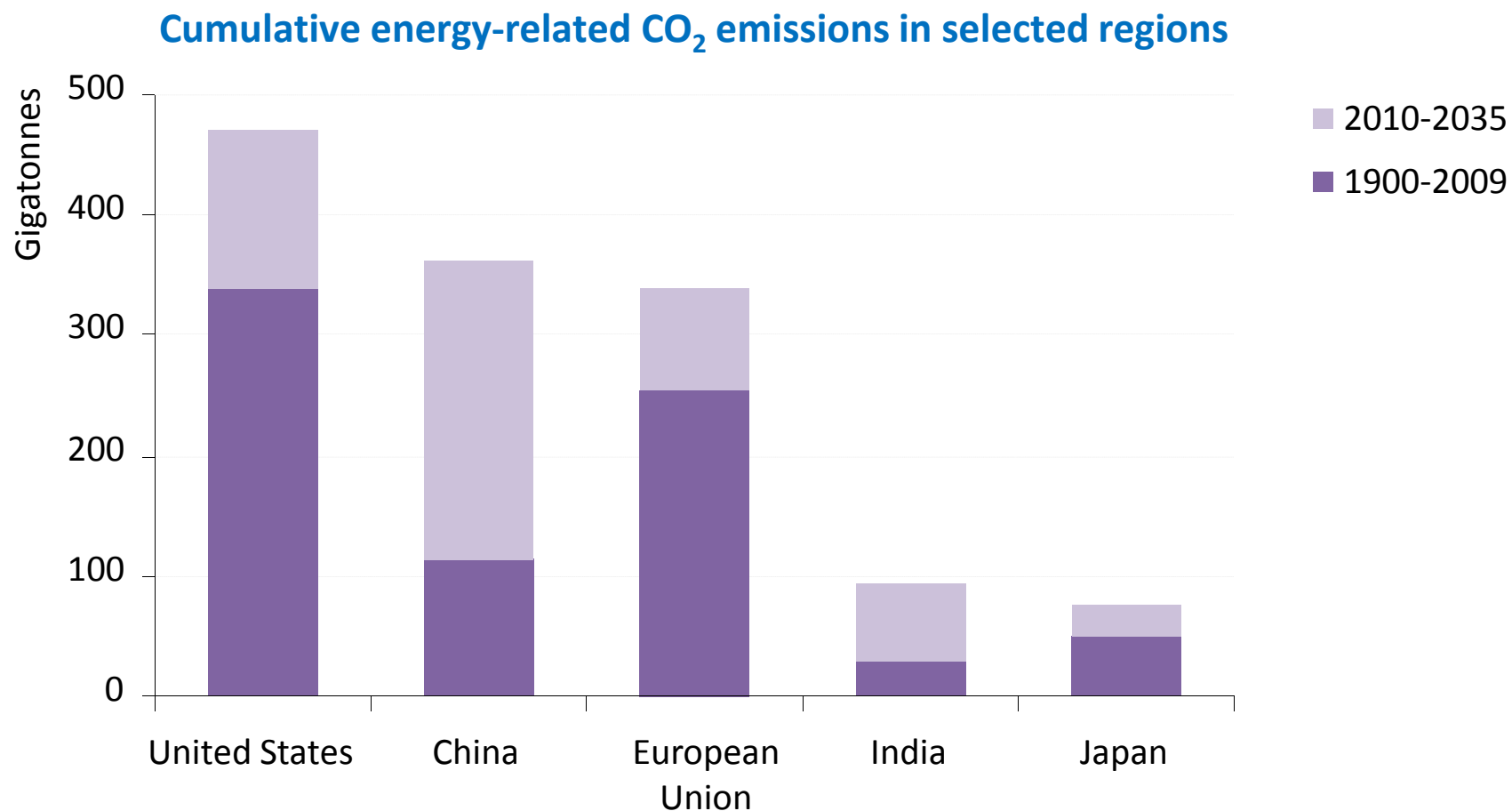
Russian revenue from fossil fuel exports



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

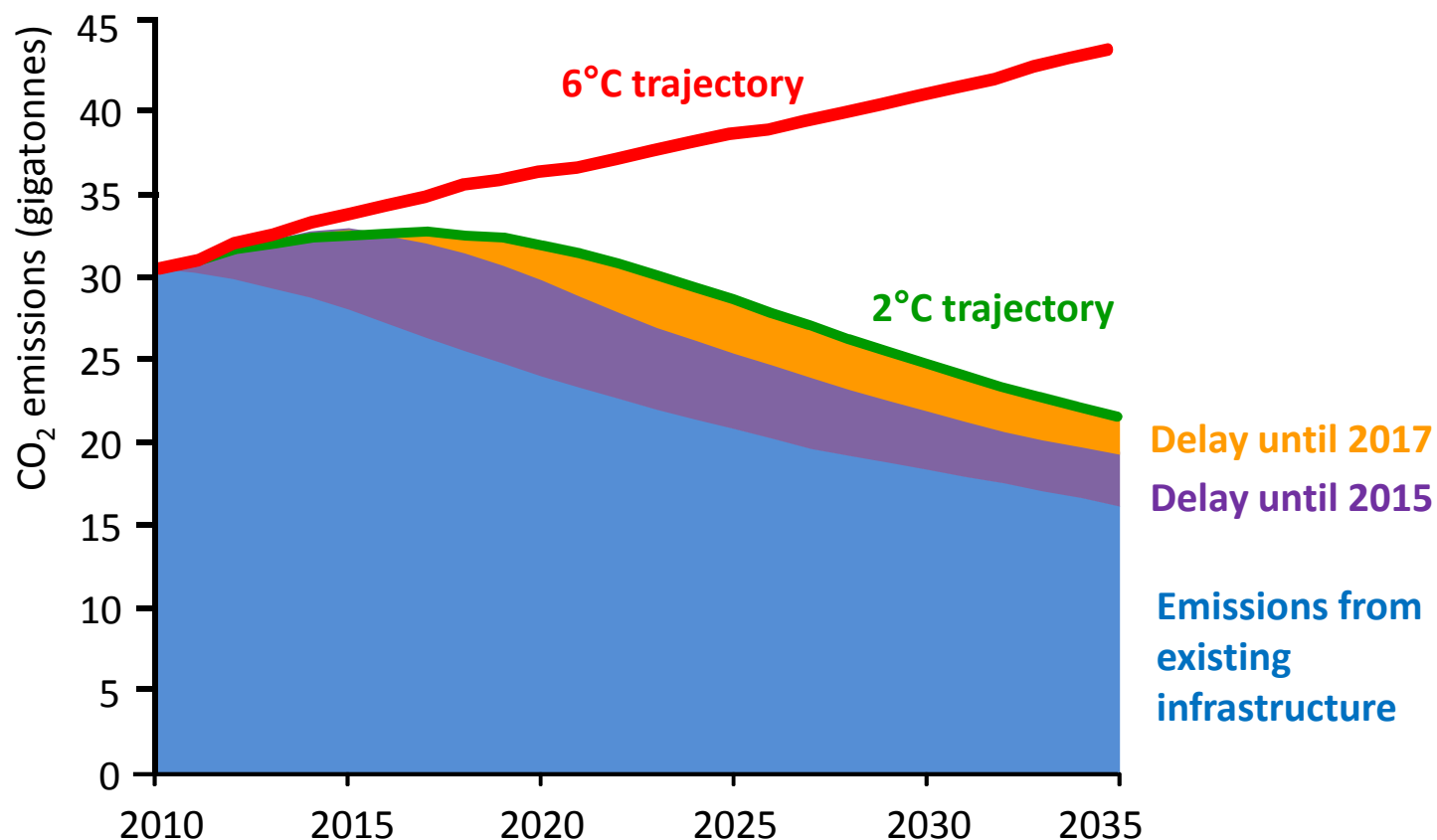
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By 2035, cumulative CO₂ emissions from today exceed three-quarters of the total since 1900, and China's per-capita emissions match the OECD average

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

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Without further action, by 2017 all CO₂ emissions permitted in the 450 Scenario will be “locked-in” by existing power plants, factories, buildings, etc

*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
- Power sector investment will become increasingly capital intensive with the rising share of renewables
- The world needs Russian energy, while Russia needs to use less
- Despite steps in the right direction, the door to 2°C is closing