

BP Energy Outlook

2017 edition



Bob Dudley
Group chief executive

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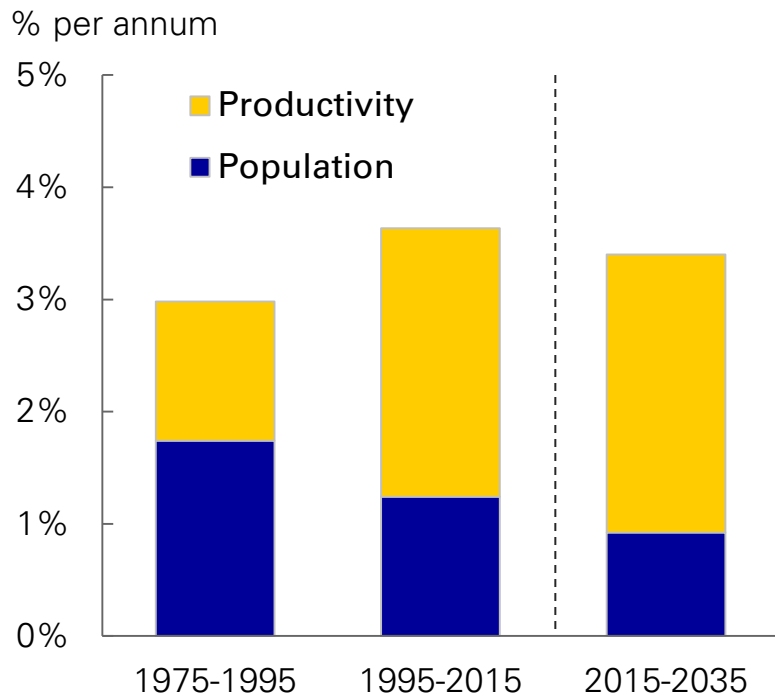


Spencer Dale
Group chief economist

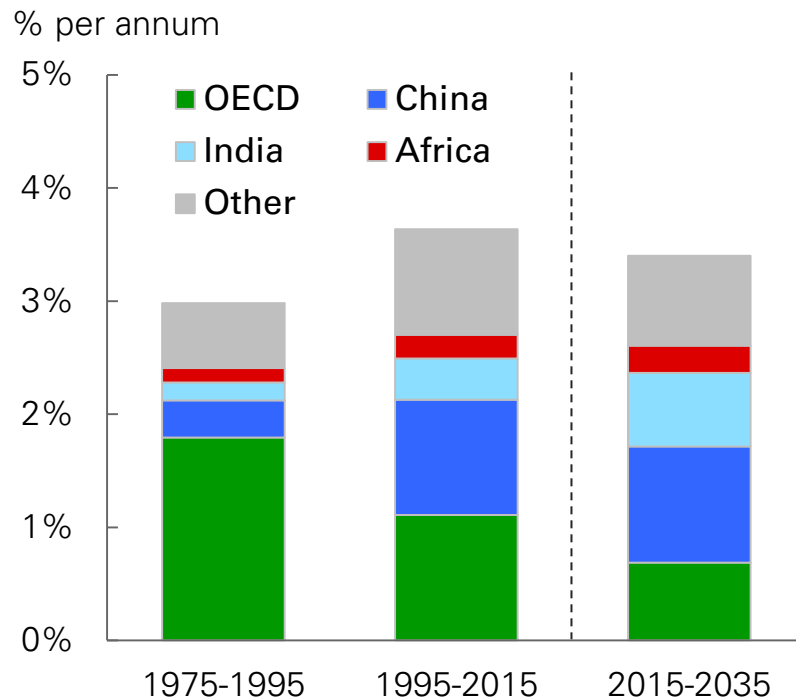
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Economic backdrop

Contributions to GDP growth by factor

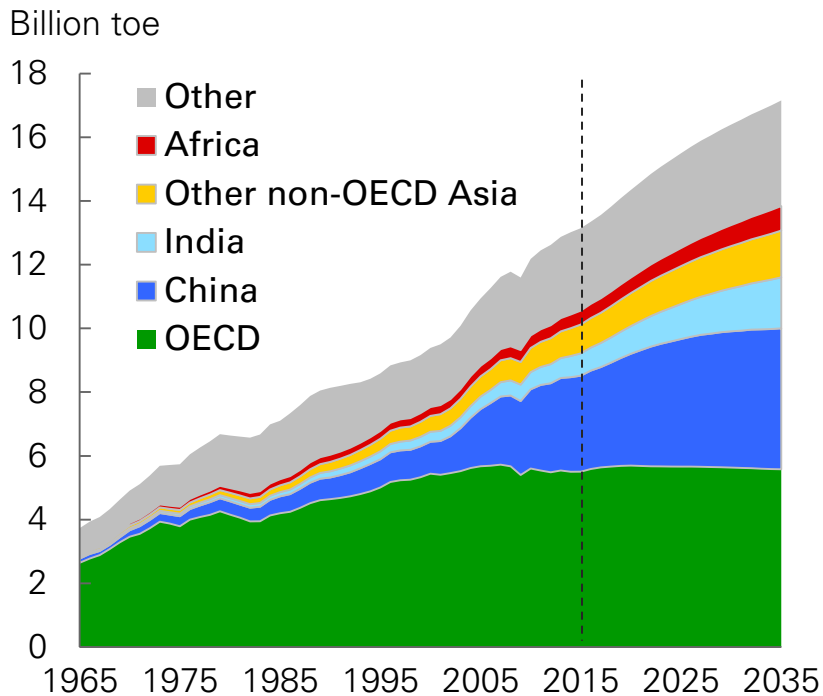


Contributions to GDP growth by region

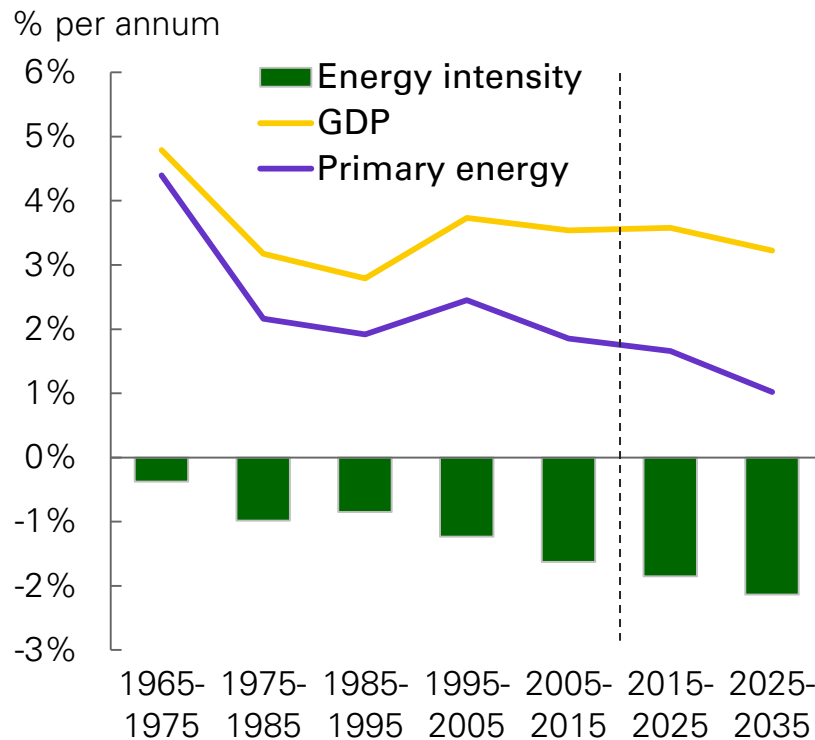


Global energy demand

Energy consumption by region



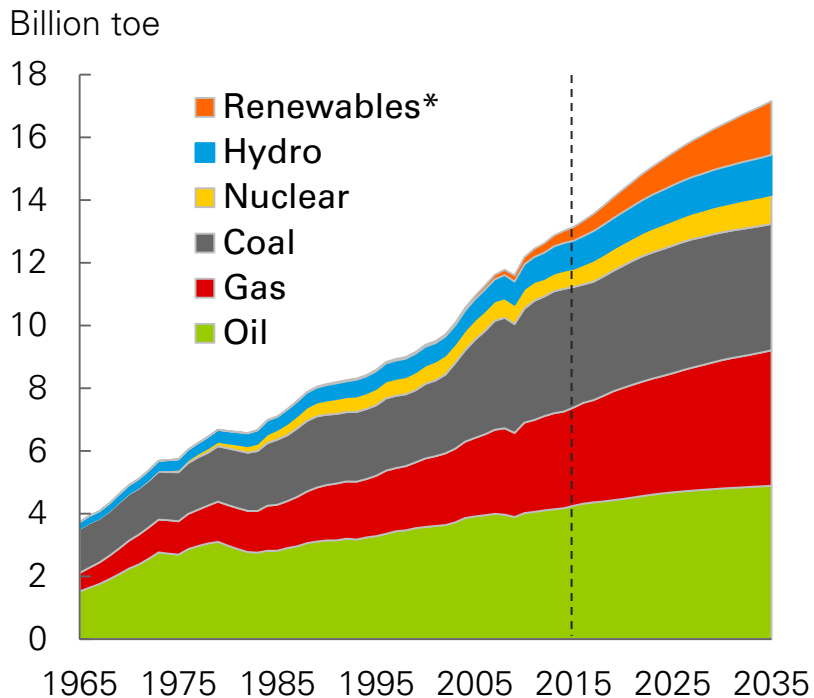
Growth in GDP and primary energy



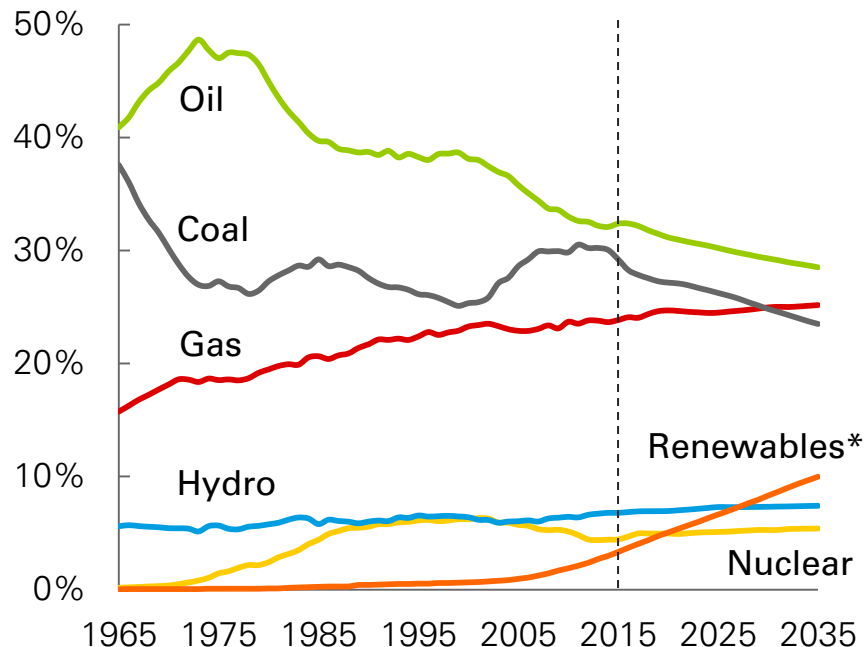
Fuel mix



Primary energy consumption by fuel



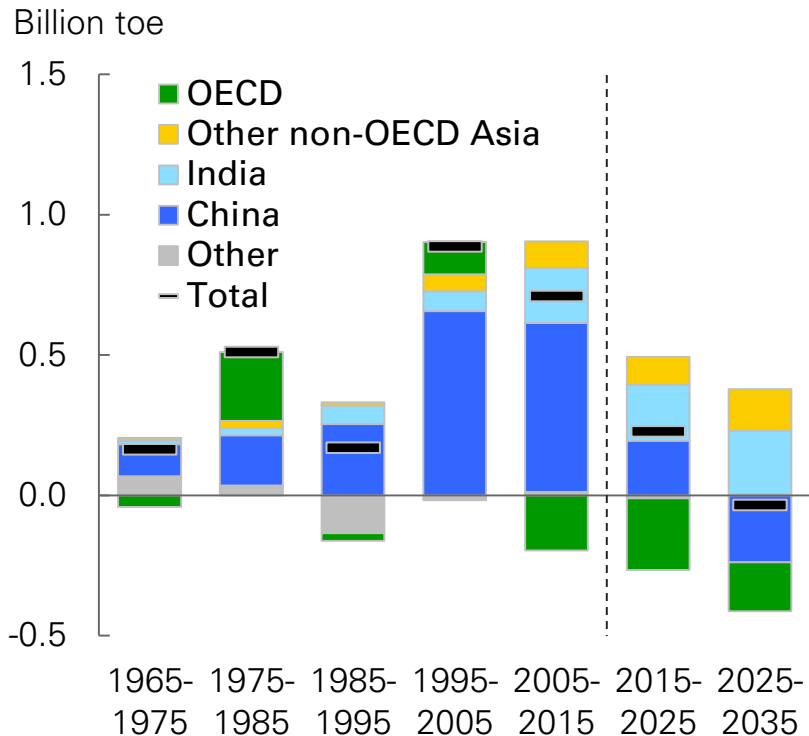
Shares of primary energy



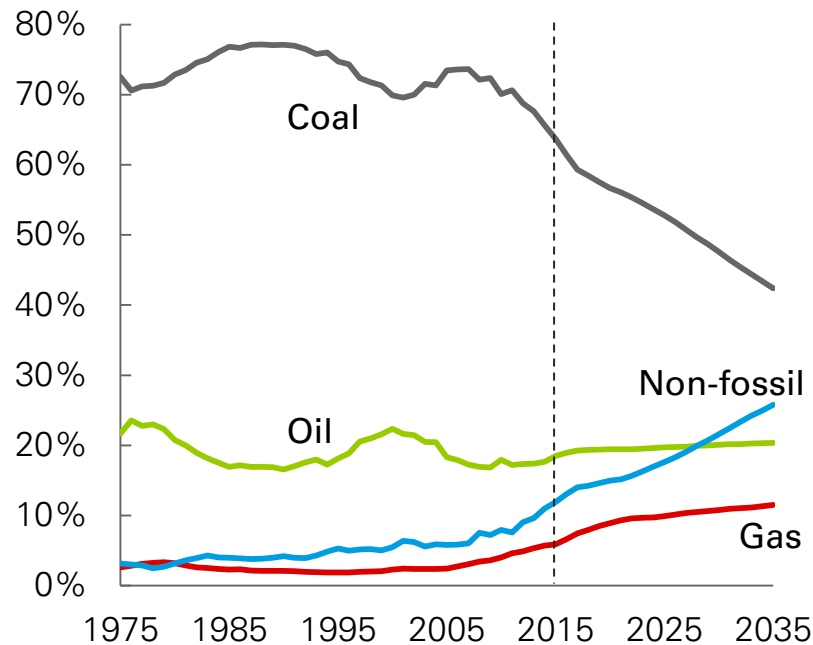
*Renewables includes wind, solar, geothermal, biomass, and biofuels

China's declining dependency on coal

Coal consumption growth by region

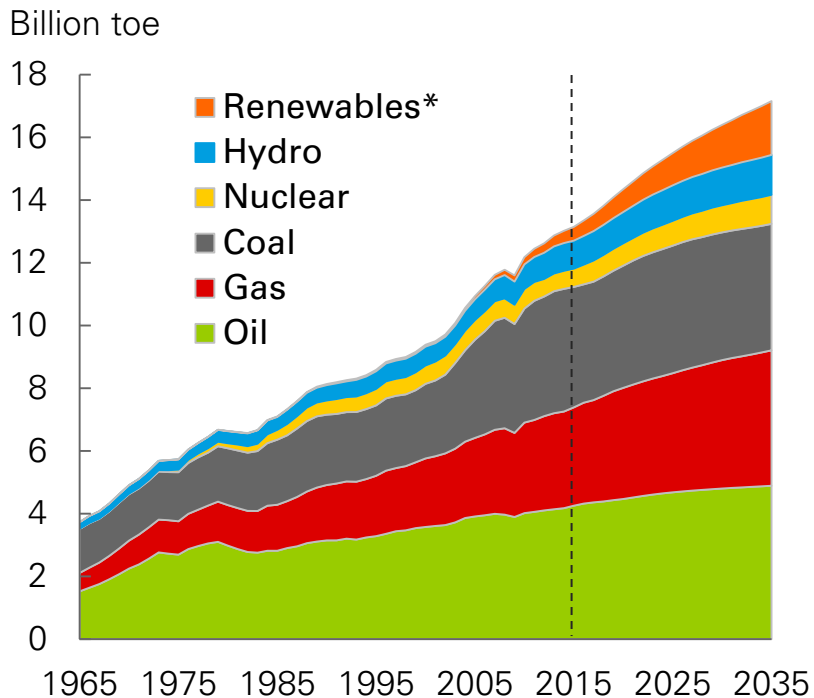


Shares of primary energy in China



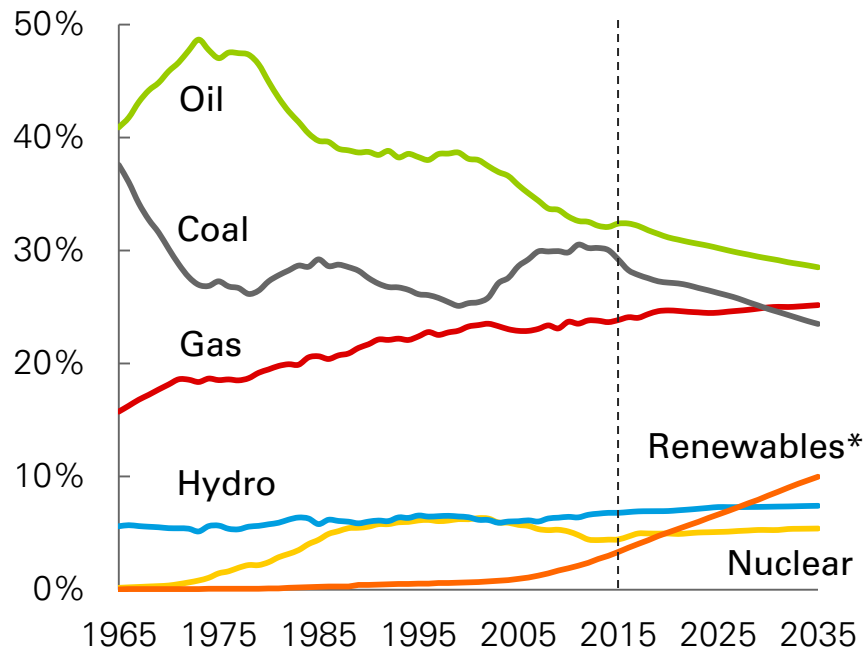
Fuel mix

Primary energy consumption by fuel



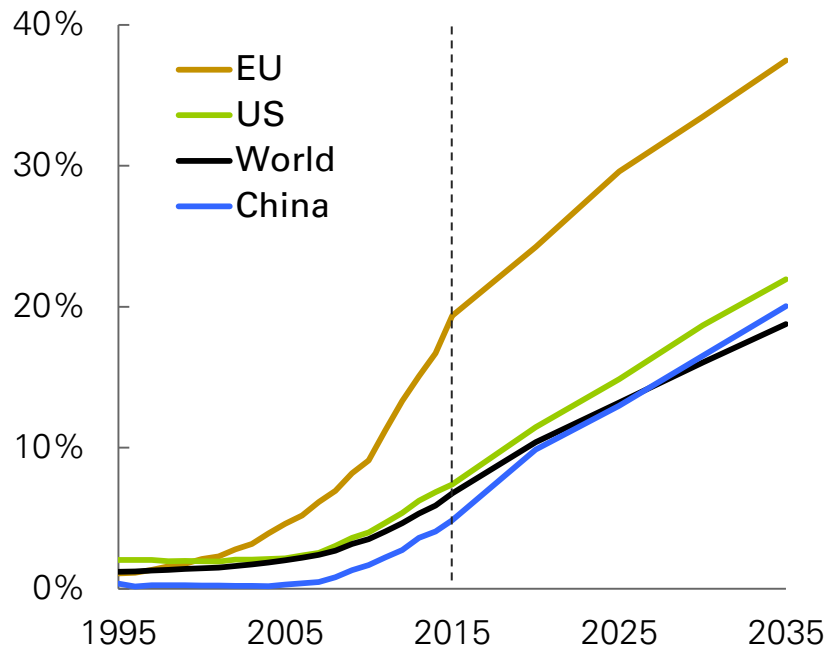
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Shares of primary energy

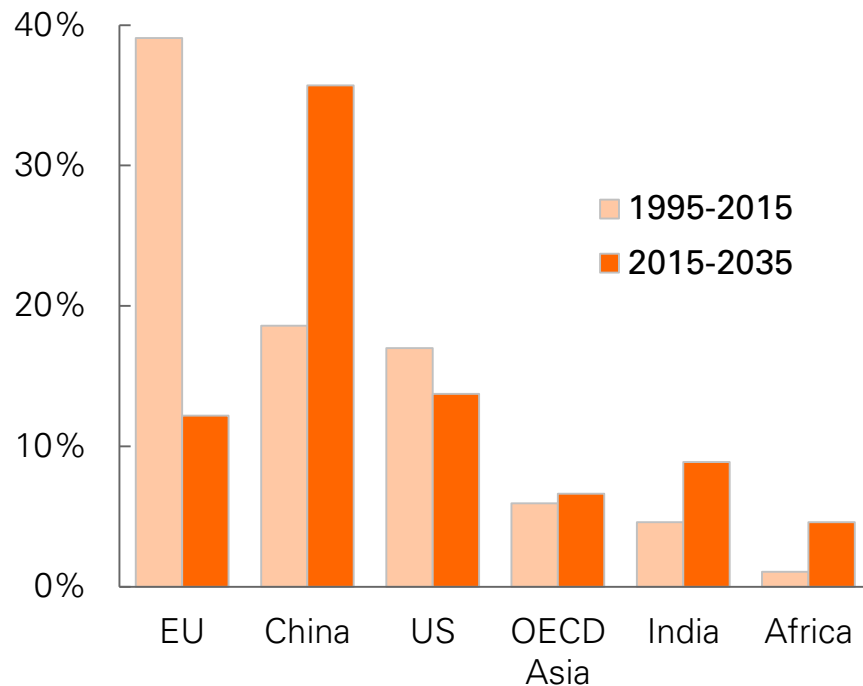


Renewables

Renewables as a share of power generation

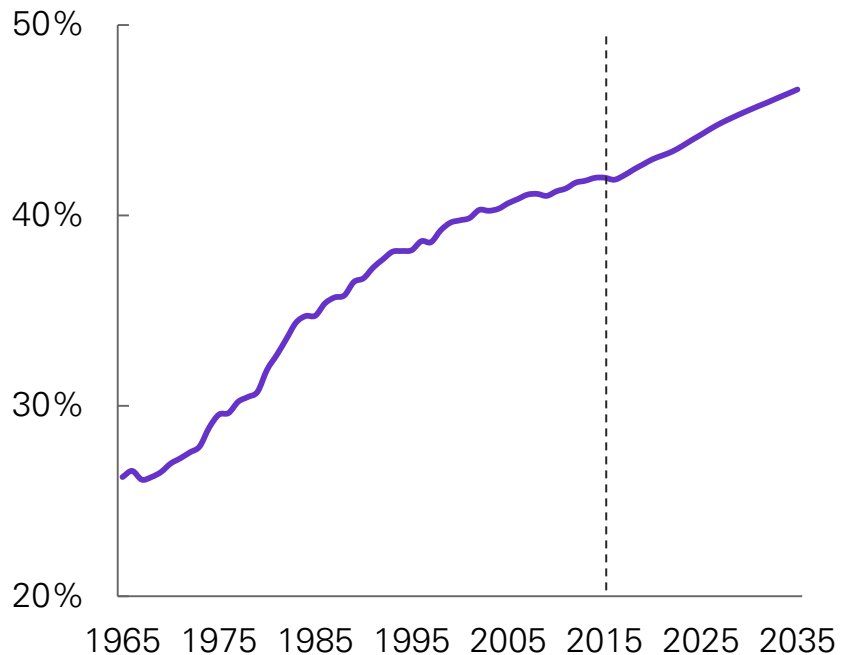


Shares of renewable power growth

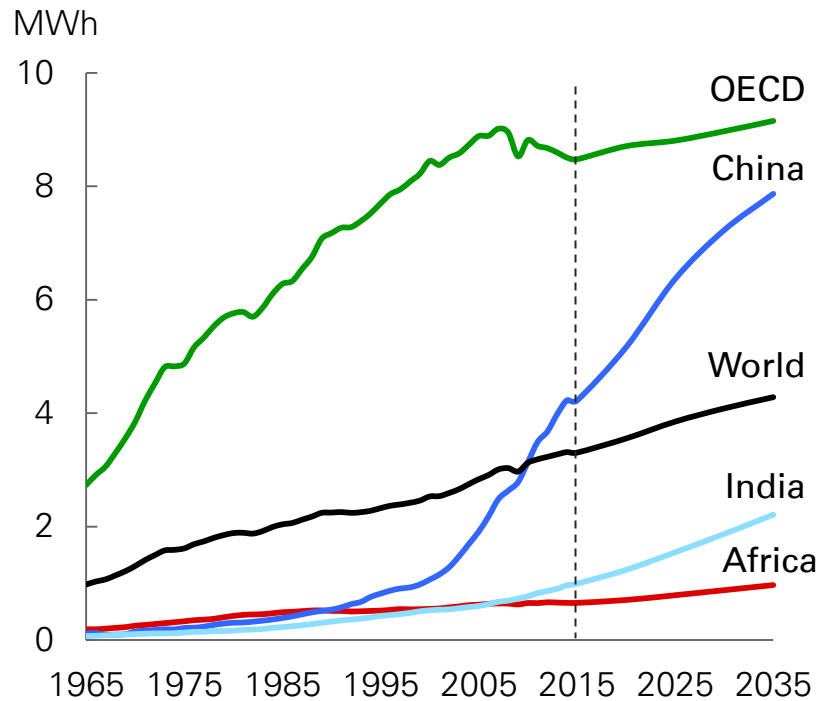


Growth of the power sector

Power sector's share of primary energy consumption



Electricity consumption per capita



Key features of the energy outlook

- Global energy demand continues to grow, driven by the burgeoning Asian middle class
- The fuel mix gradually decarbonizes with non-fossil fuels providing almost half of the increase in primary energy
- The global economy continues to electrify, with the power sector playing an ever-increasing role in shaping the energy transition

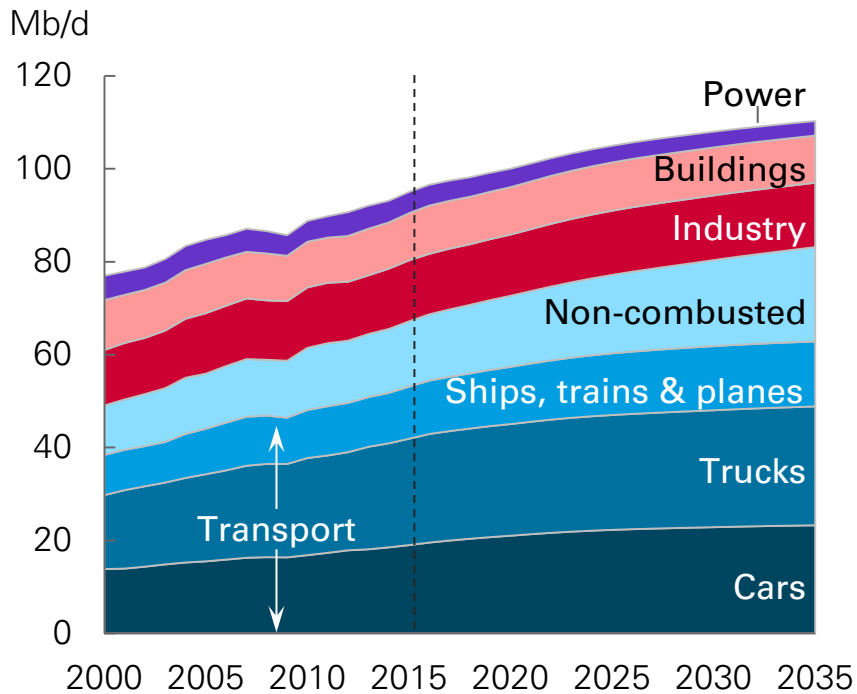
Oil

- How might electric cars and the broader mobility revolution affect oil demand?
- How might the abundance of oil resources affect the behaviour of low-cost oil producers?

Oil demand

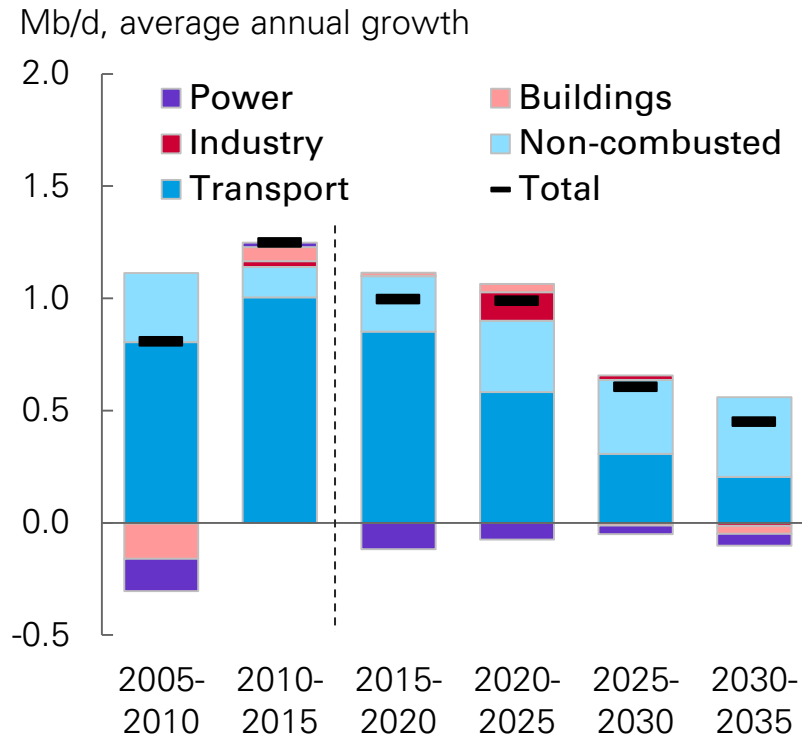


Liquids demand



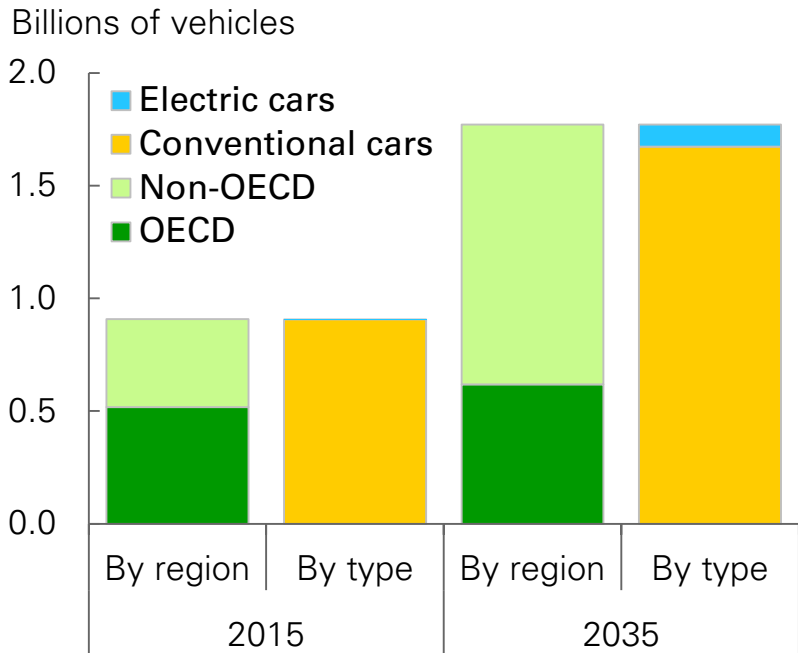
Liquids includes oil, biofuels and derivatives of coal and natural gas

Liquids demand growth

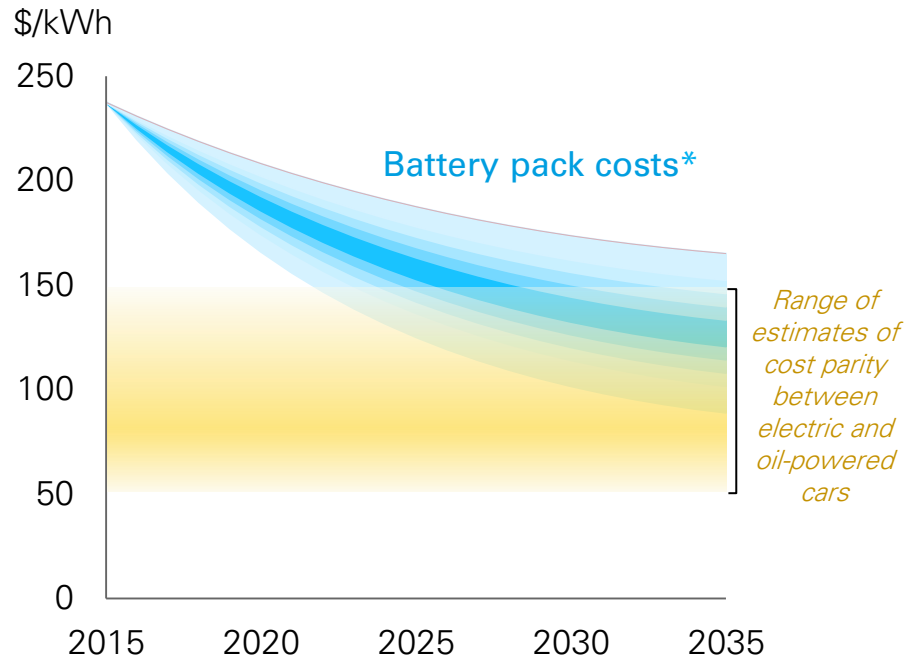


Growth of electric cars

The global car fleet: 2015-2035



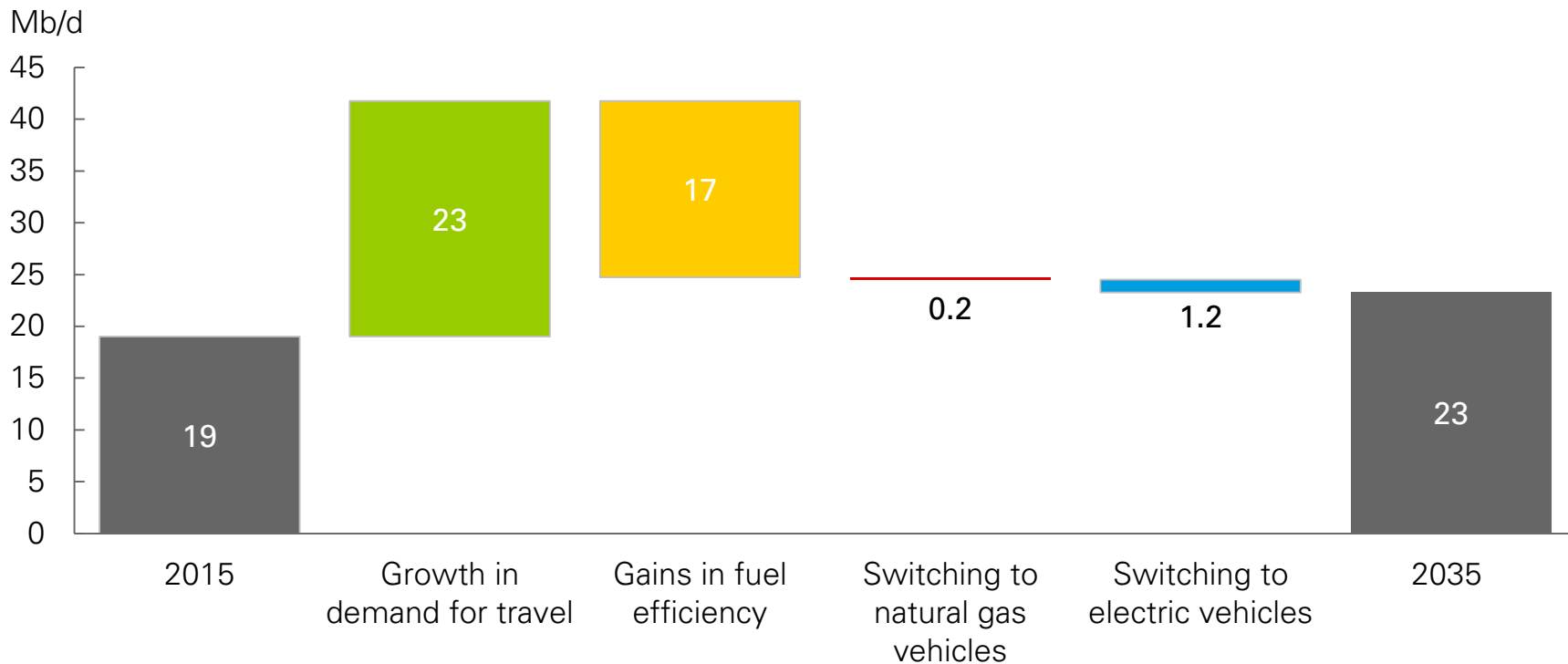
Illustrative path for battery pack costs



*For a Battery Electric Vehicle with a 60 kWh pack. Cost projections depend heavily on the degree of EV uptake, which is uncertain, so ranges should be treated as illustrative only. Current estimates of battery costs also vary widely, but this uncertainty is not shown

Liquid fuel demand from cars

Decomposing changes in liquids demand from cars: 2015-2035



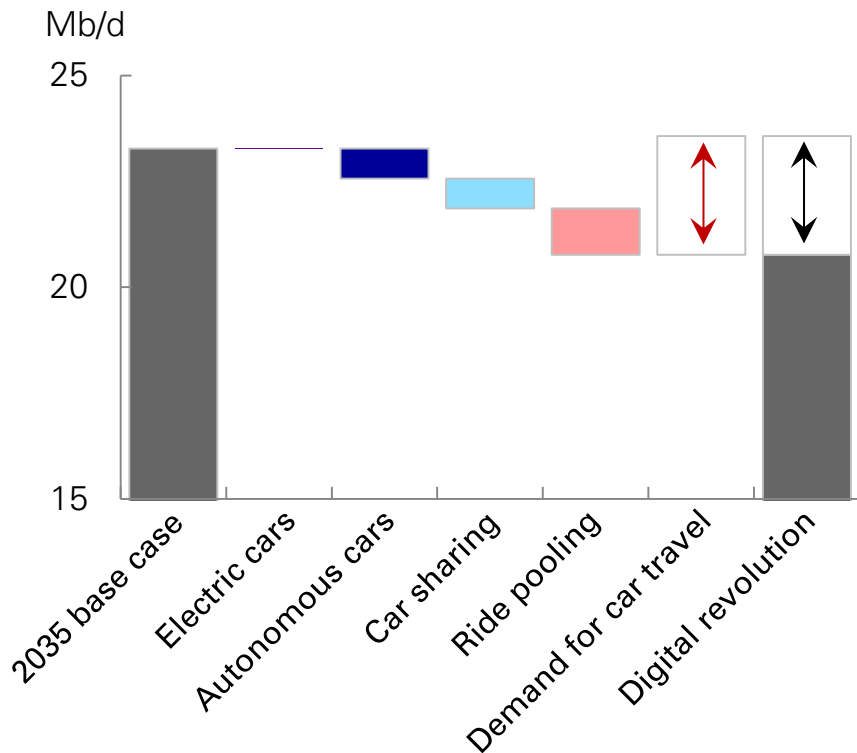
Mobility revolution

- **Electric cars:** lead to a switch away from conventional cars
- **Autonomous vehicles:** improve fuel efficiency via efficient driving
- **Car sharing:** can amplify the effects of new-technology cars
- **Ride pooling:** reduce total miles driven by pooling journeys

Mobility revolution scenarios

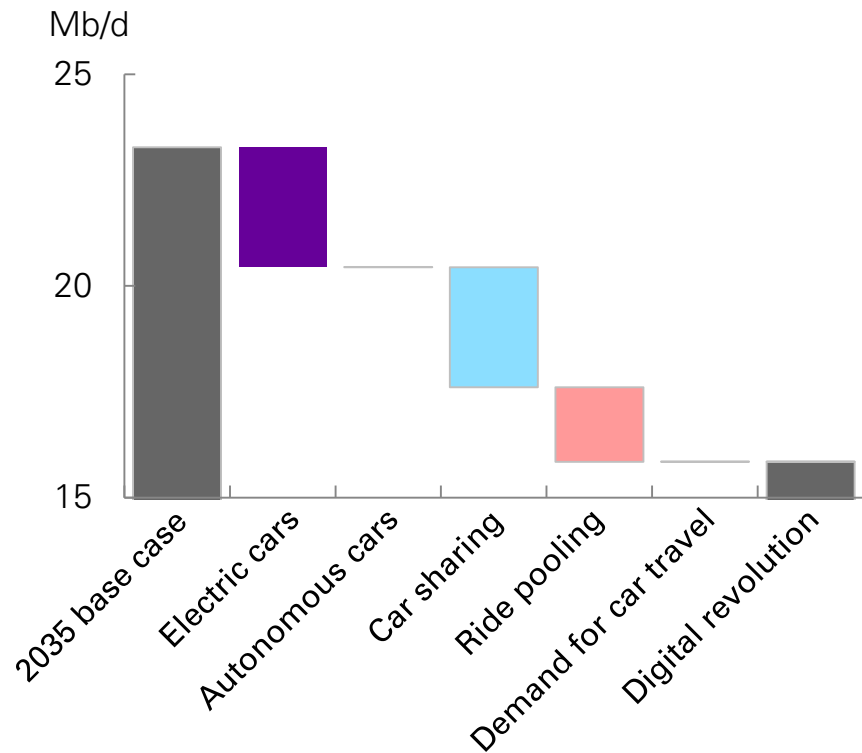
Digital revolution:

Impact on oil demand in cars in 2035



Electric revolution:

Impact on oil demand in cars in 2035

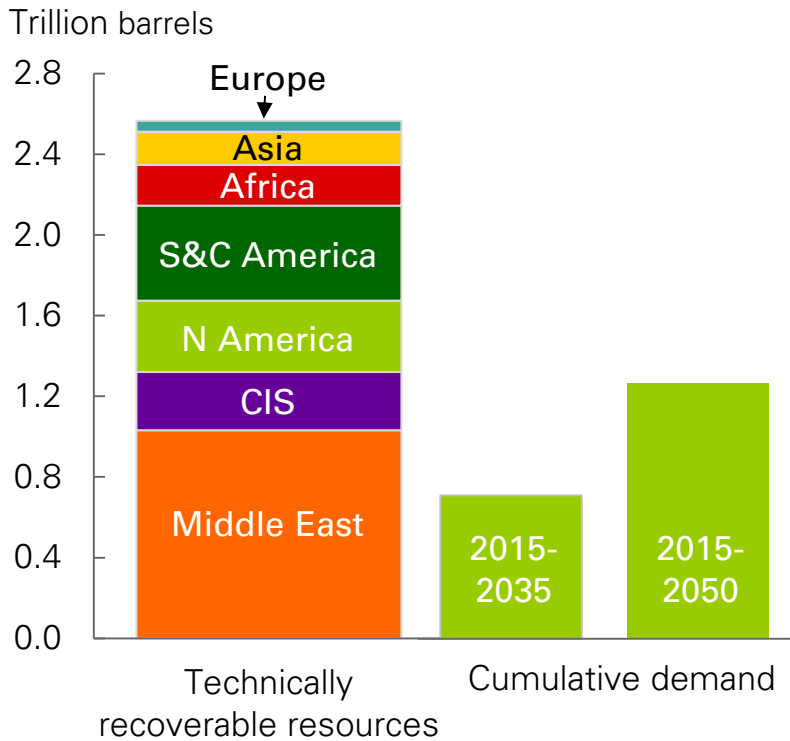


Oil

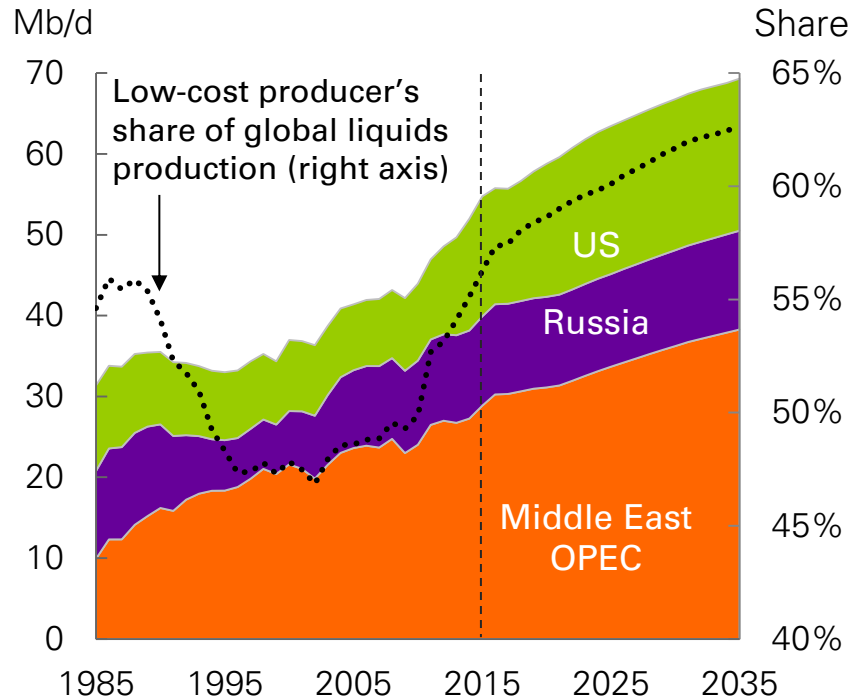
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- How might the abundance of oil resources affect the behaviour of low-cost oil producers?

Abundance of oil resources

Estimates of technically recoverable resources and cumulative oil demand



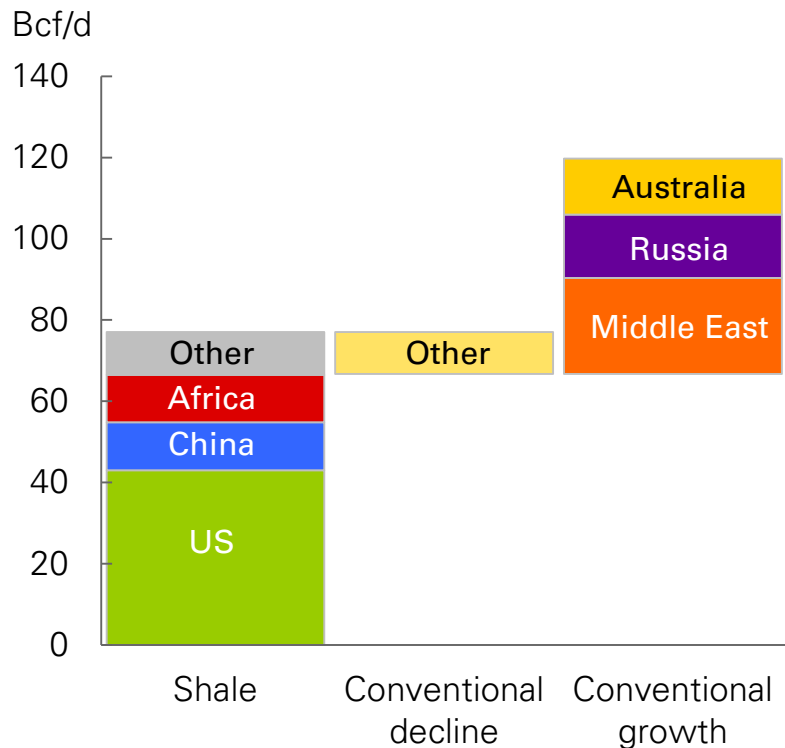
Oil supply of lower-cost producers



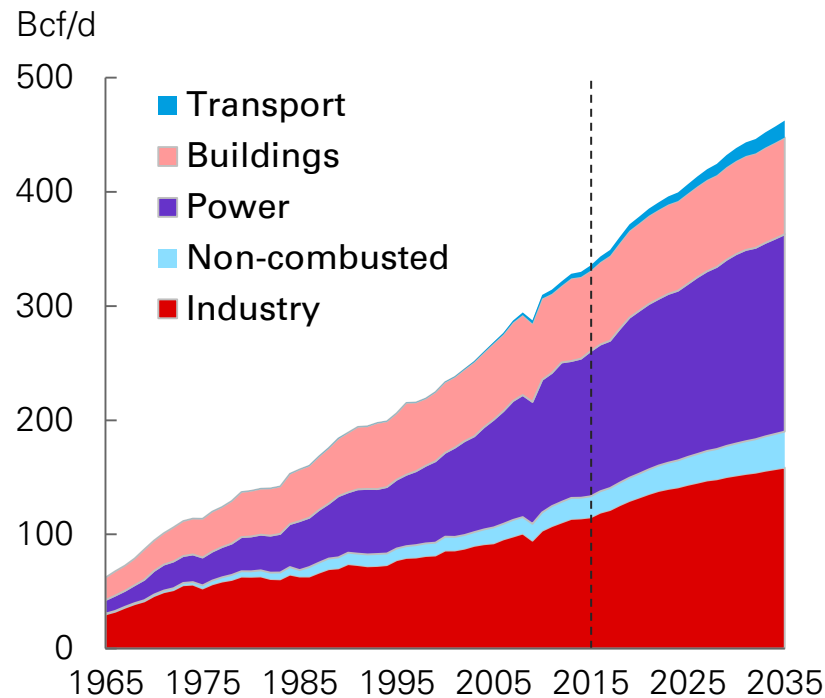
Natural gas



Gas supply growth: 2015-2035



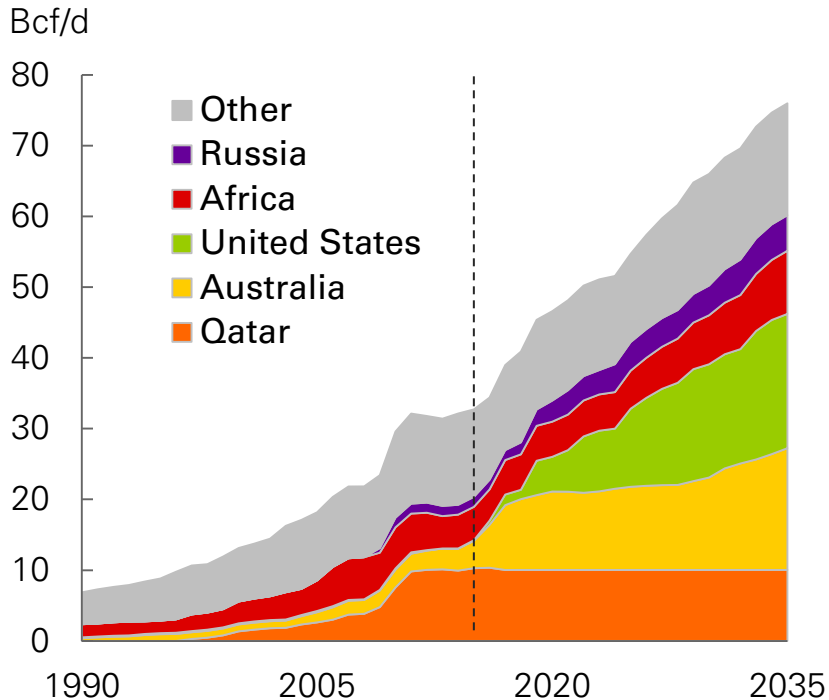
Gas consumption by sector



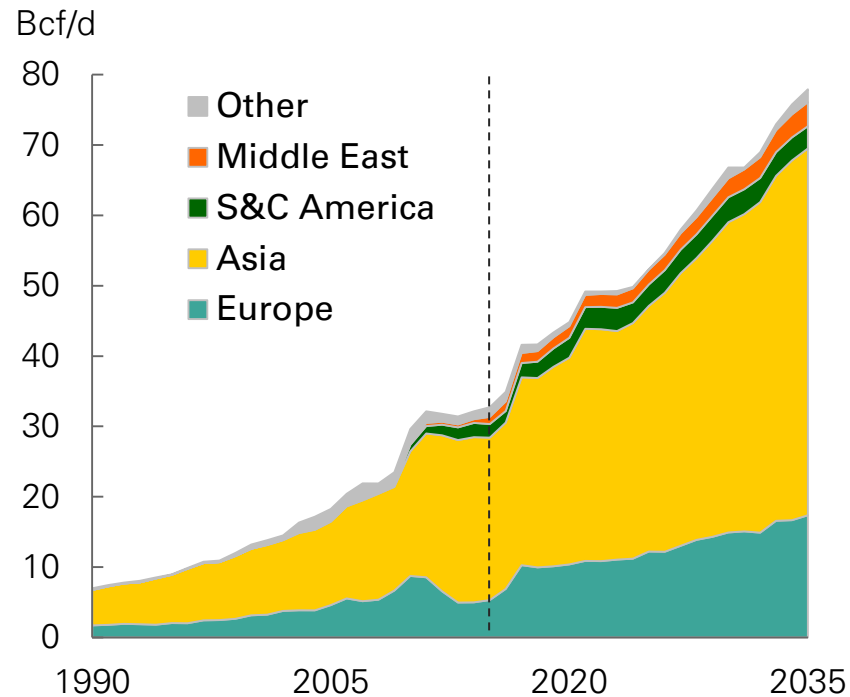
Growth of LNG



LNG supply



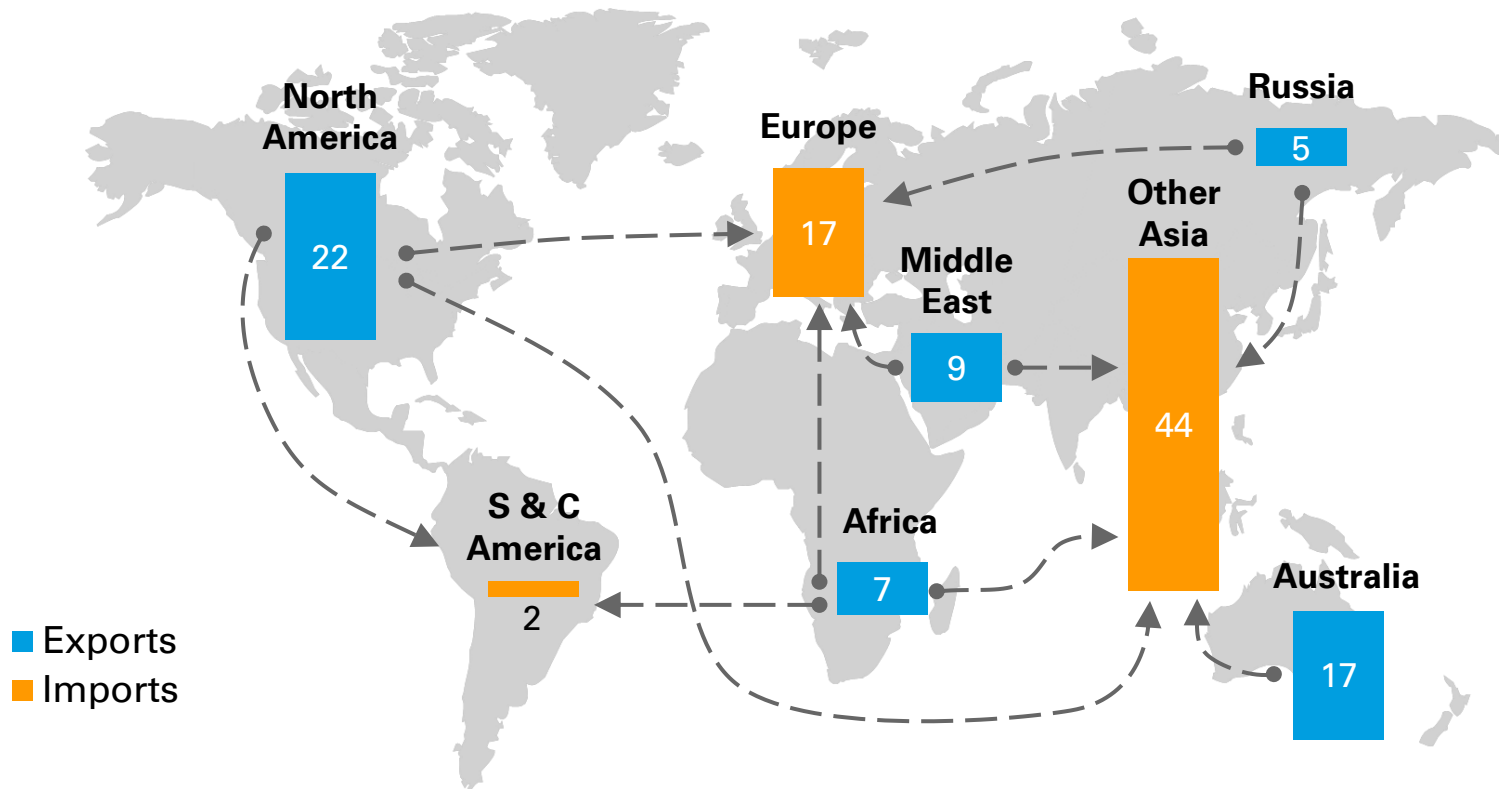
LNG demand



LNG Trade



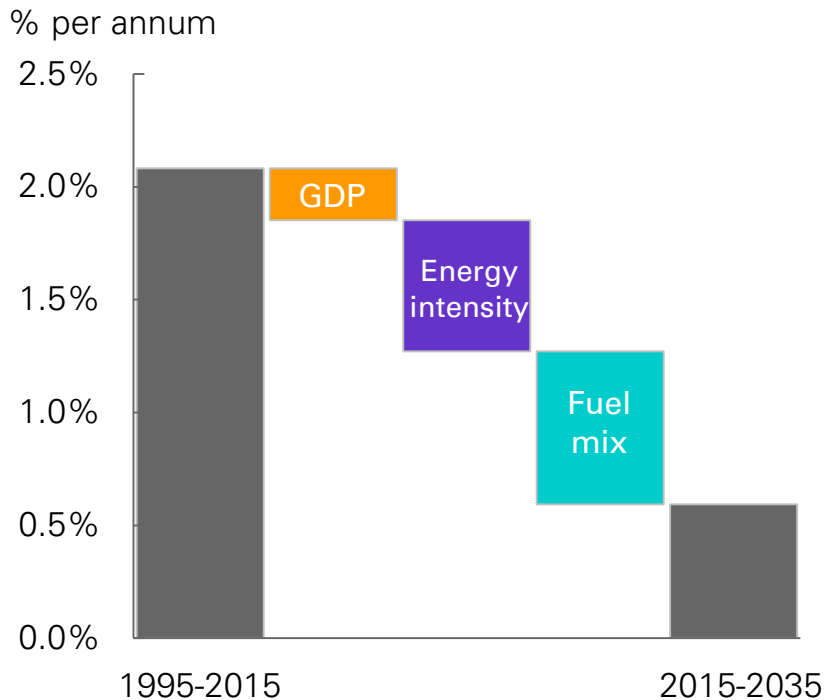
Net LNG exports and imports in 2035 (Bcf/d)



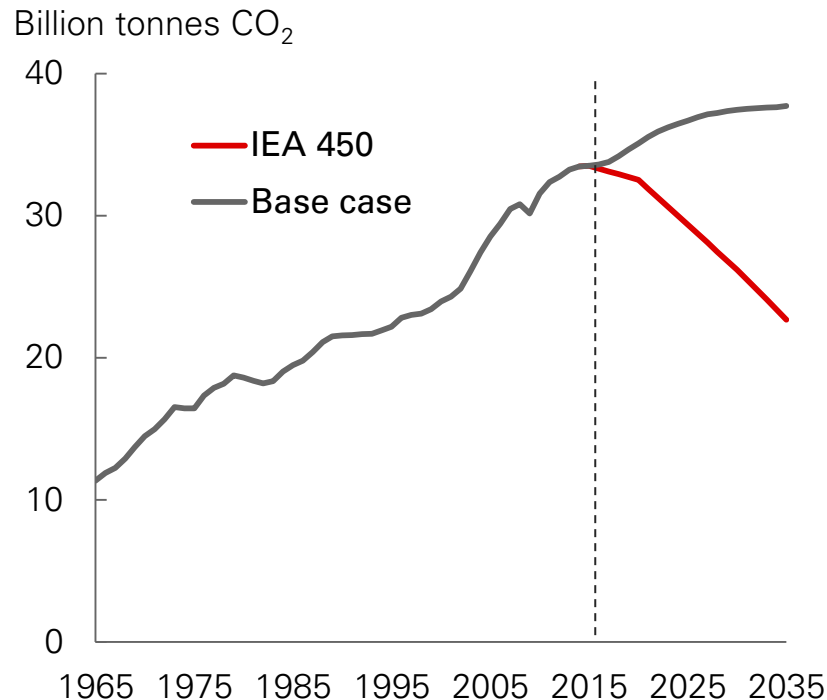
Carbon emissions

Carbon emissions

Contributions to slower growth of carbon emissions

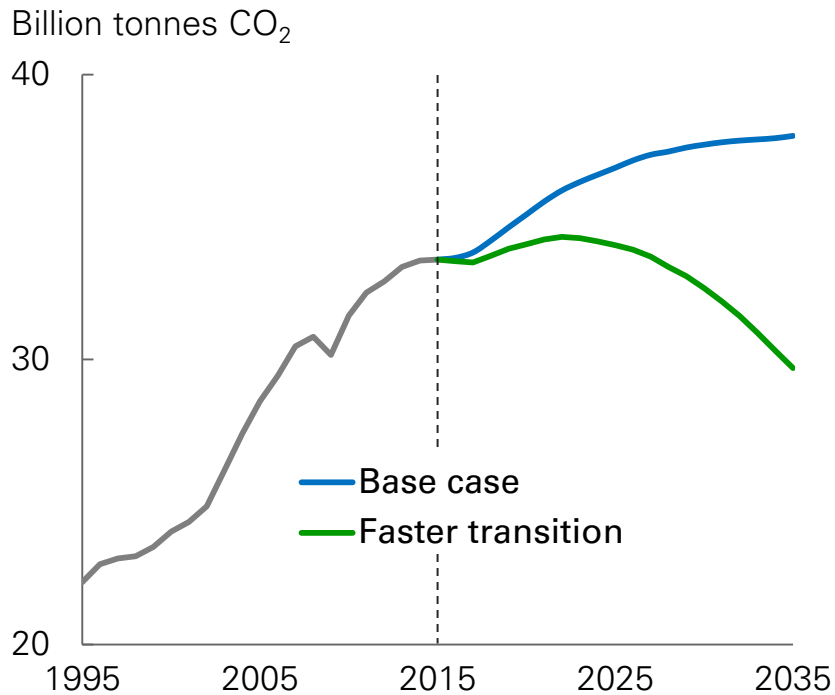


Carbon emissions

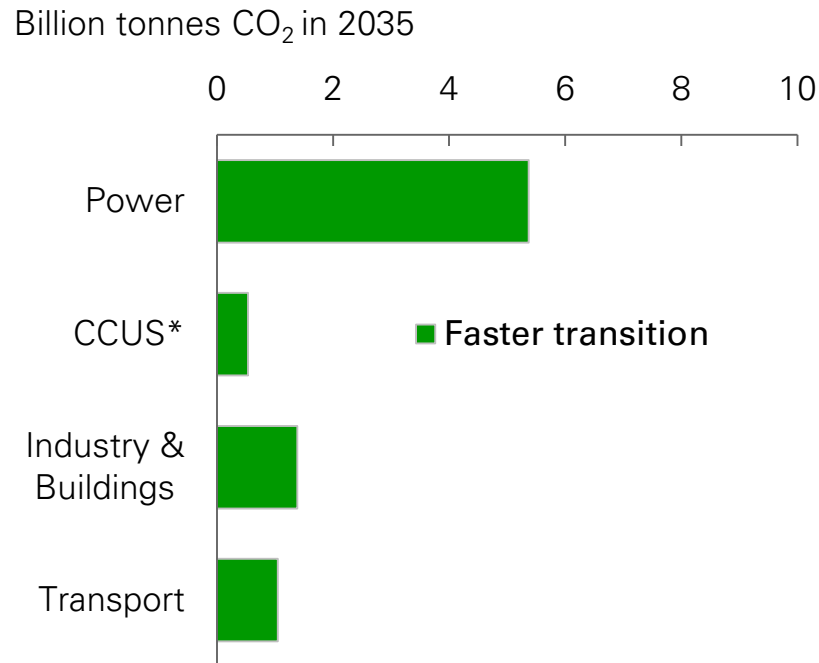


Faster transition pathways

Carbon emissions



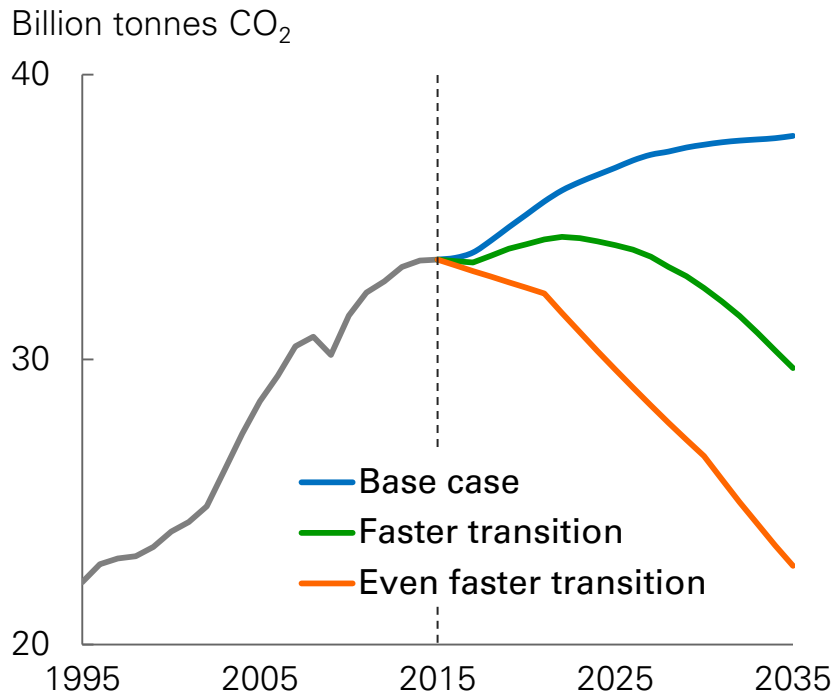
Reductions in emissions versus base case



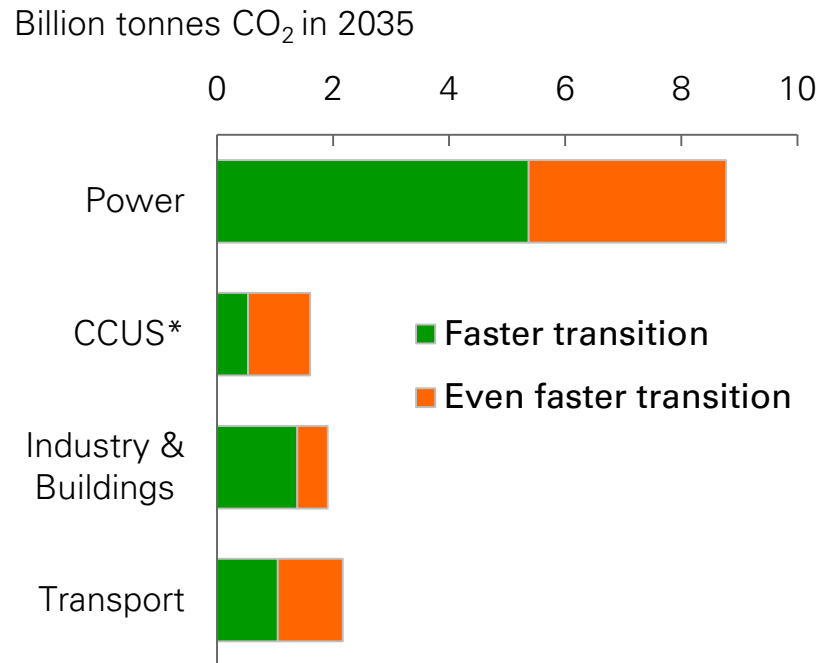
*Carbon capture, use and storage (predominantly in power sector)

Faster transition pathways

Carbon emissions



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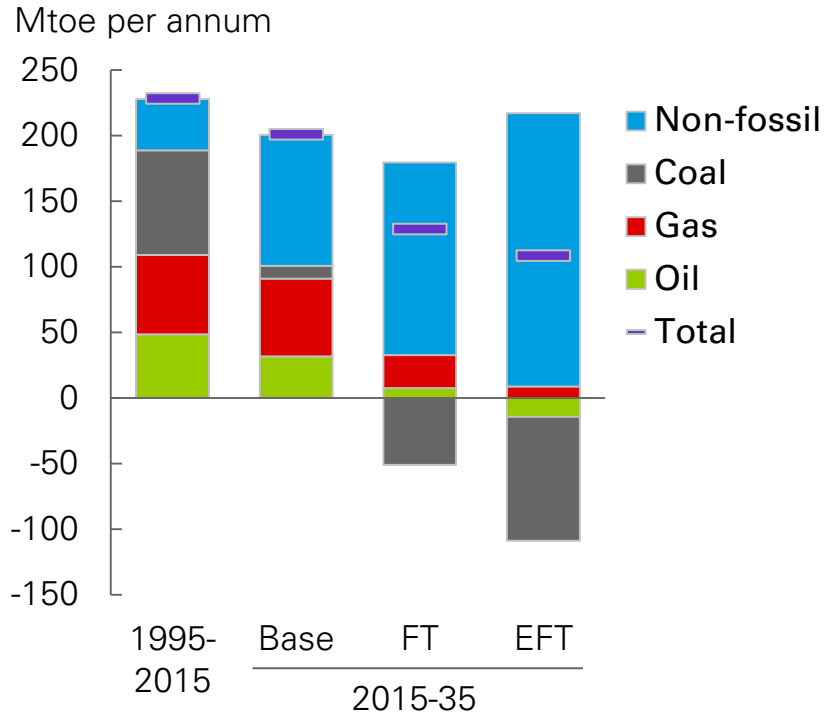


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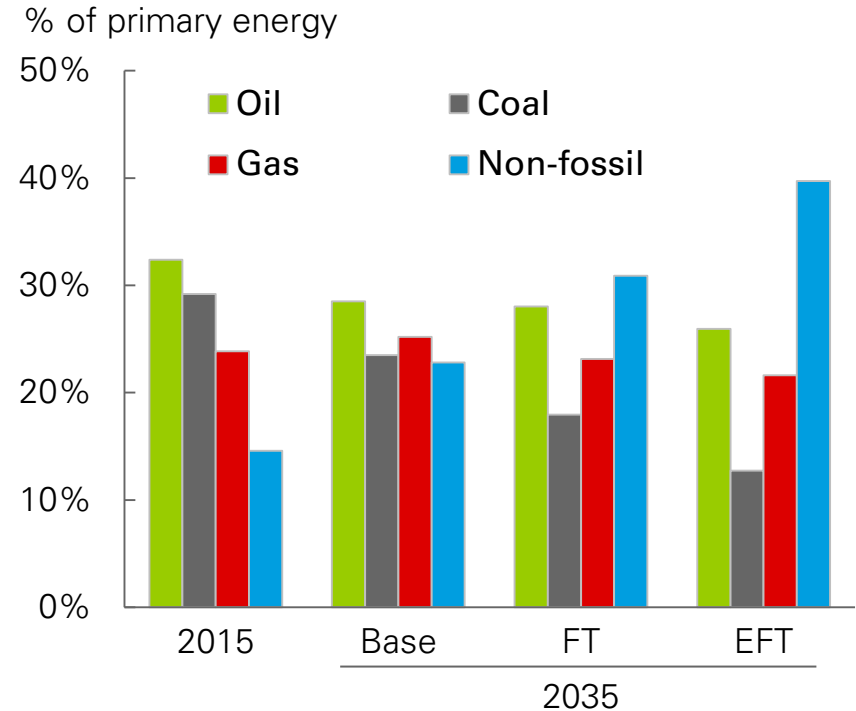
Energy outlook under alternative transition pathways



Annual demand growth by fuel



The changing fuel mix





Comparison with other low carbon scenarios

	Faster transition	Even faster transition	IEA 450	MIT 2° Base	IHS Markit 'Solar Efficiency'	Greenpeace 'Revolution'
Growth rate (% p.a.) 2015-35						
Carbon emissions	-0.7%	-2.0%	-2.0%	-2.0%	-2.8%	-3.2%
Total energy	0.9%	0.8%	0.4%	0.5%	-0.7%	-0.1%
Energy intensity	-2.4%	-2.5%	-3.0%	-2.9%	-4.0%	-3.5%
Carbon intensity	-1.5%	-2.7%	-2.3%	-2.5%	-2.1%	-3.5%
Share of total energy, 2035						
Oil & gas	51%	48%	48%	46%	51%	39%
Renewables	16%	23%	17%	29%	19%	38%
Share of abatement vs 2015						
Power sector	>100%	89%	77%	74%	58%	35%



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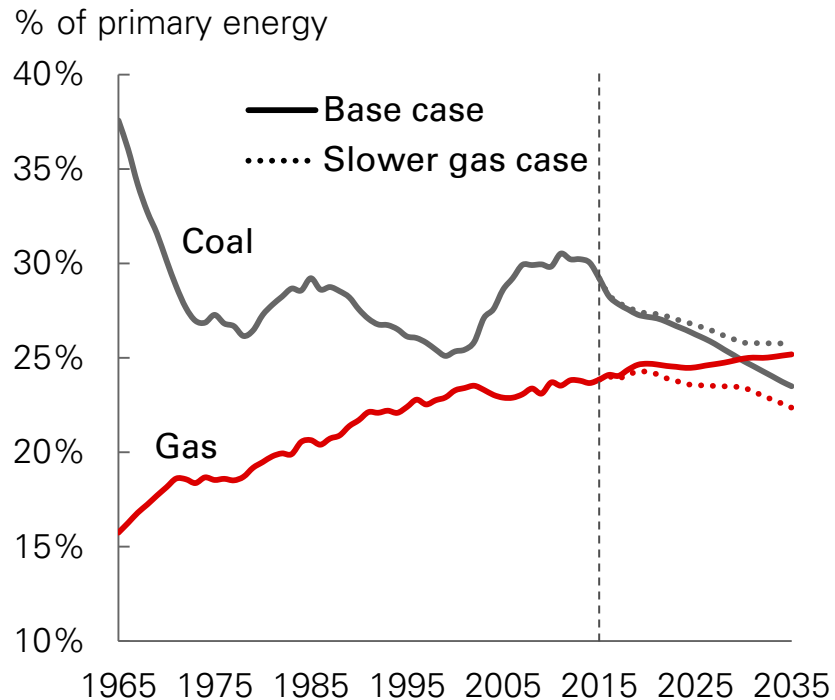


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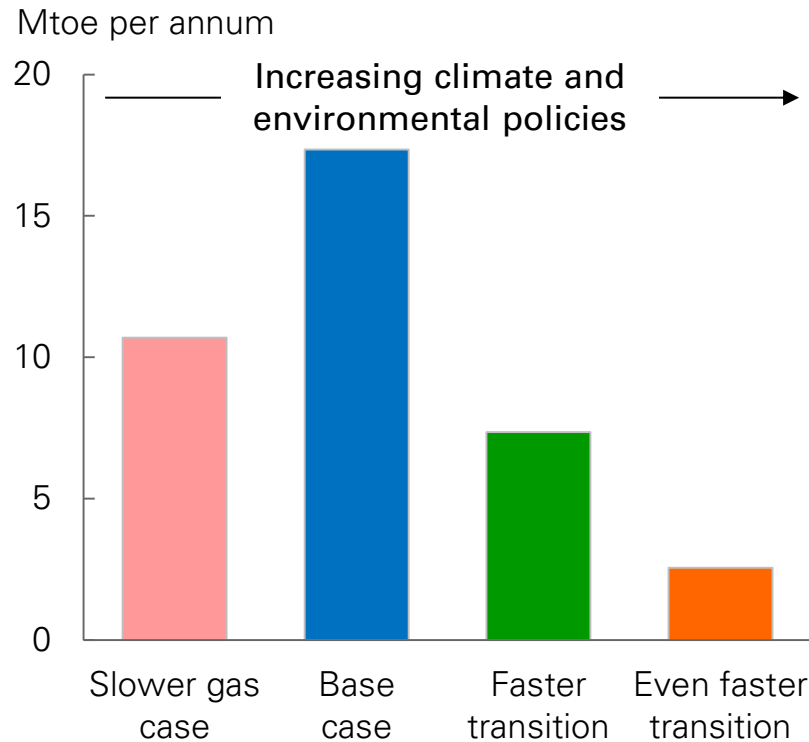
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Risks to gas demand

Global primary energy shares



Natural gas growth 2015-2035



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