



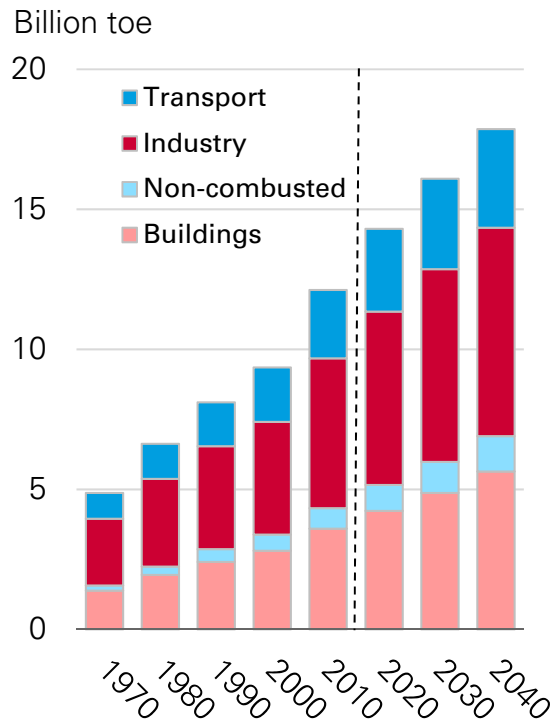
BP Energy Outlook
2019 edition

Spencer Dale
Group chief economist

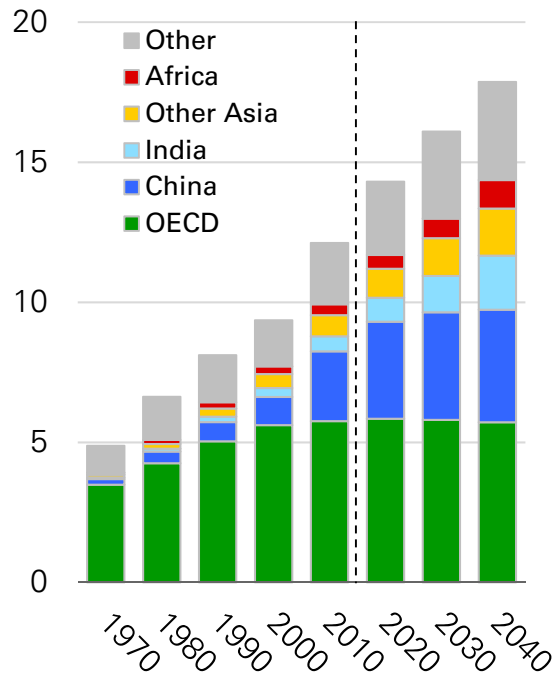
Three windows on the energy transition



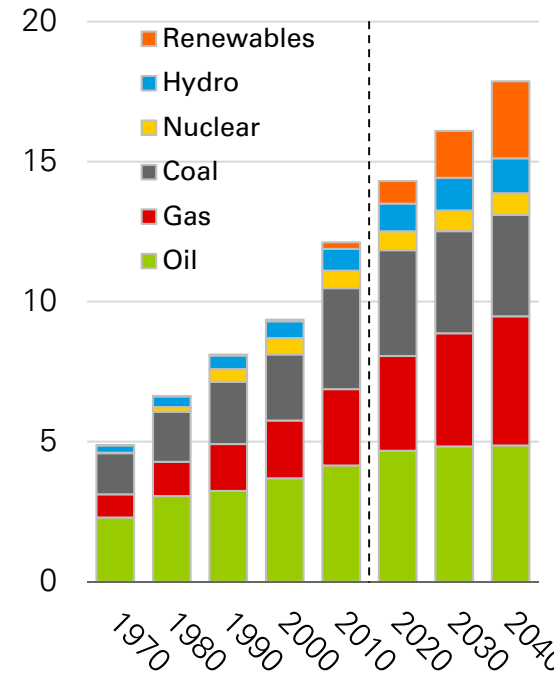
End-use sector



Region



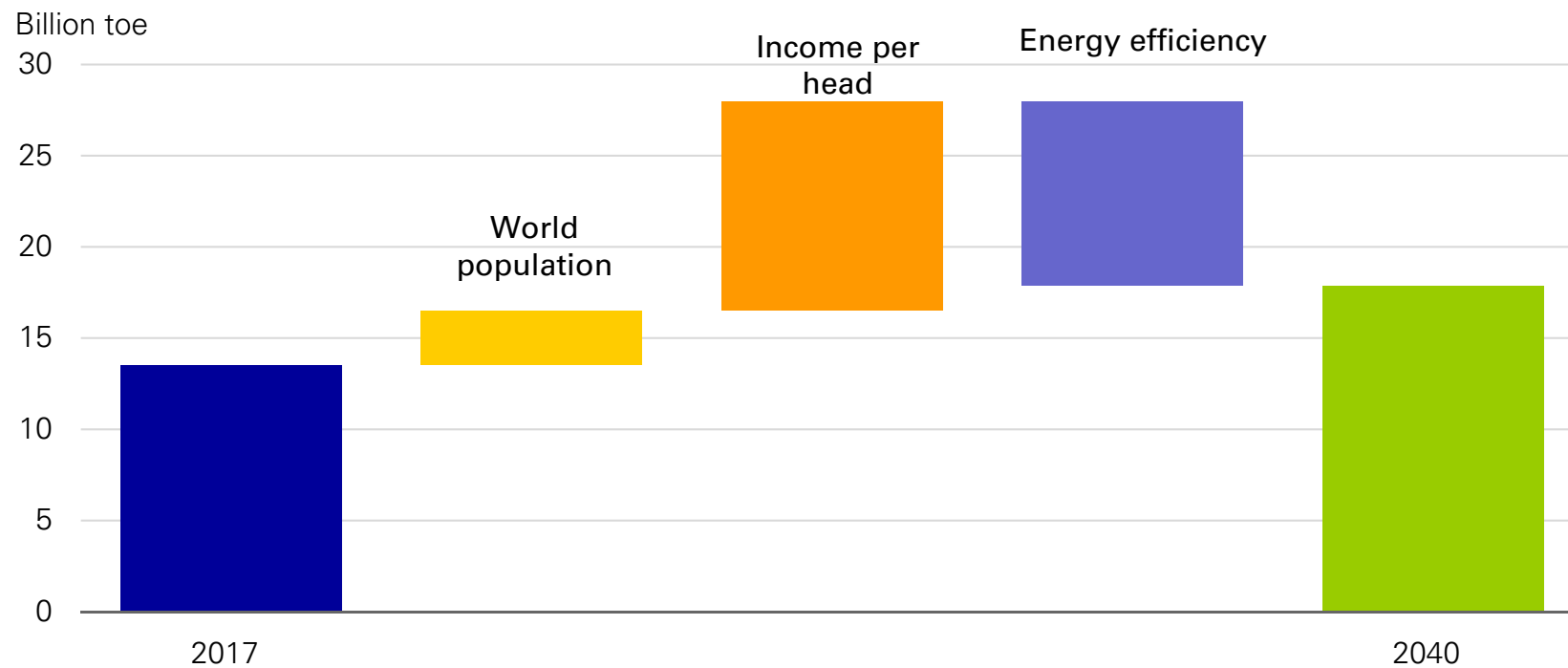
Fuel





Increase in primary energy demand

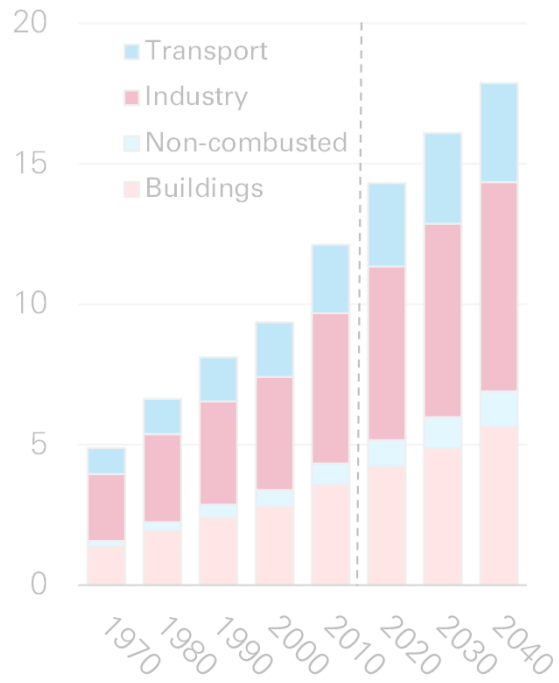
Increase in primary energy demand, 2017-2040



Three windows on the energy transition

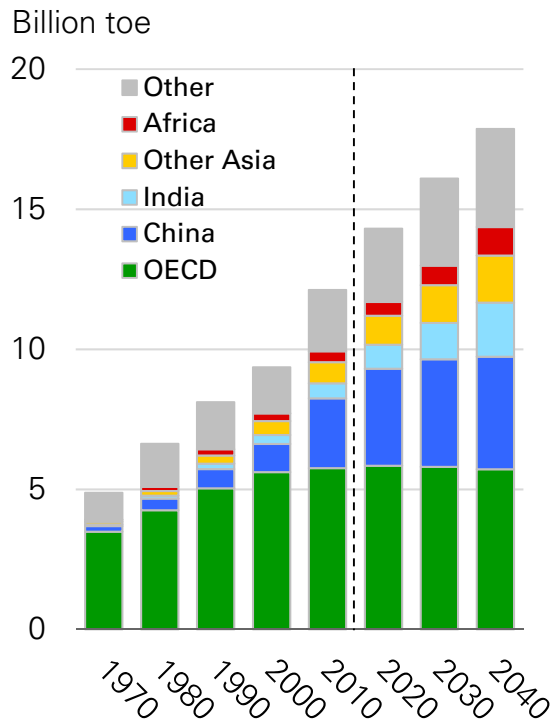


End-use sector

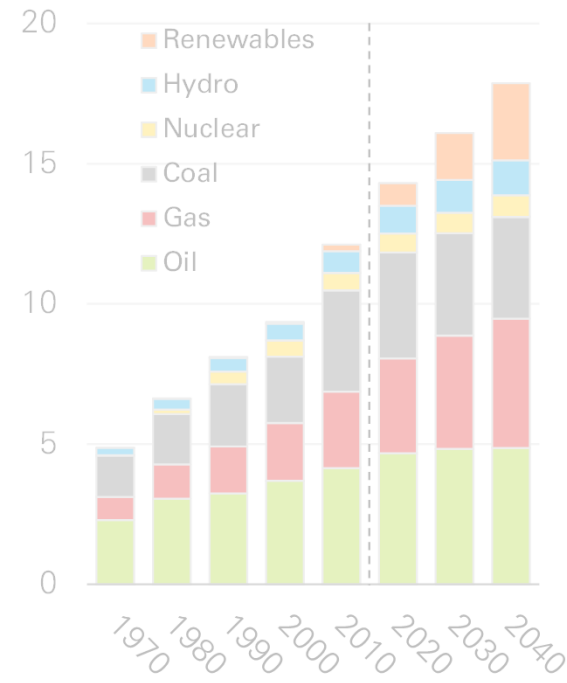


Primary energy demand

Region



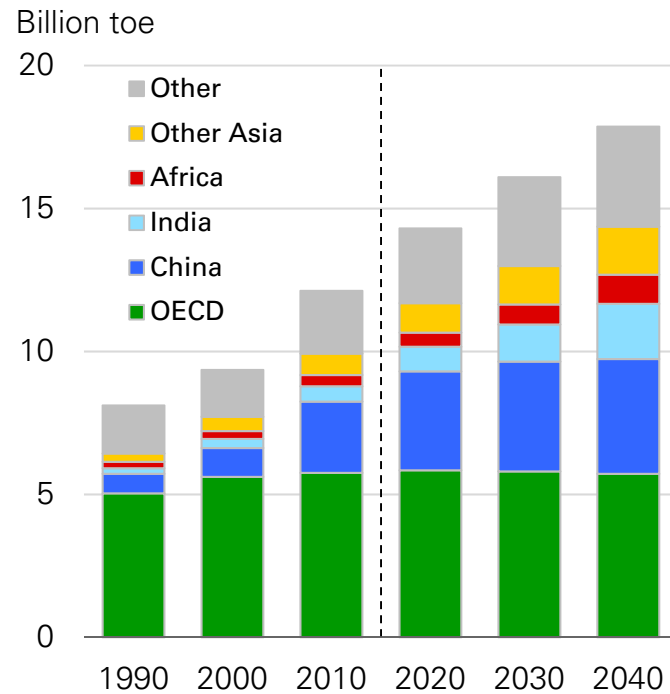
Fuel



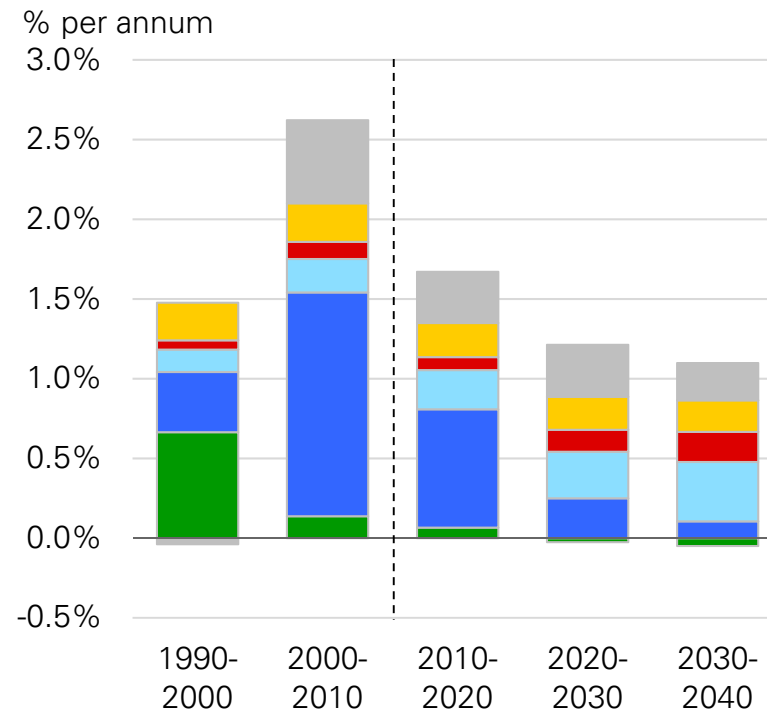


Regional energy demand

Primary energy consumption by region



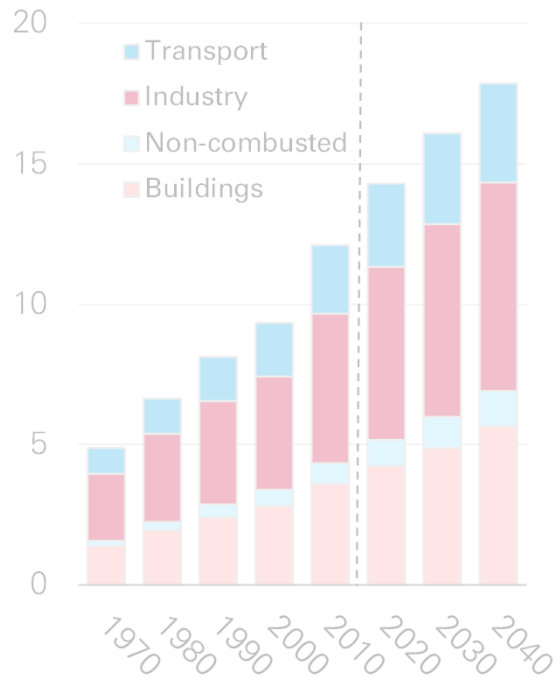
Primary energy growth and regional contributions



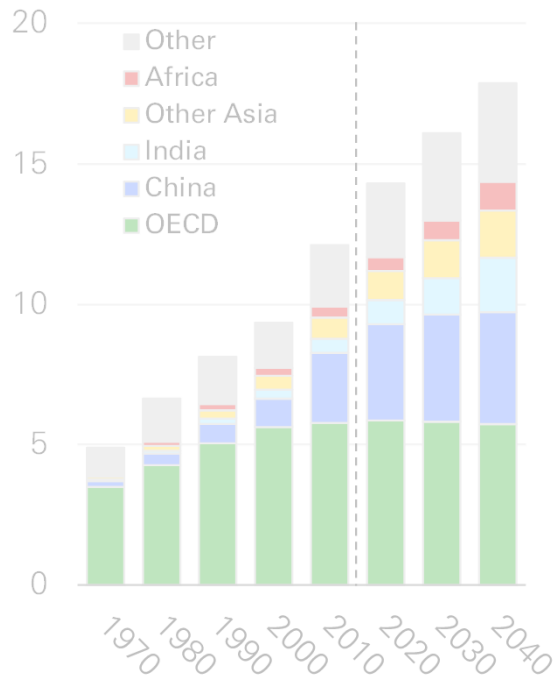
Three windows on the energy transition



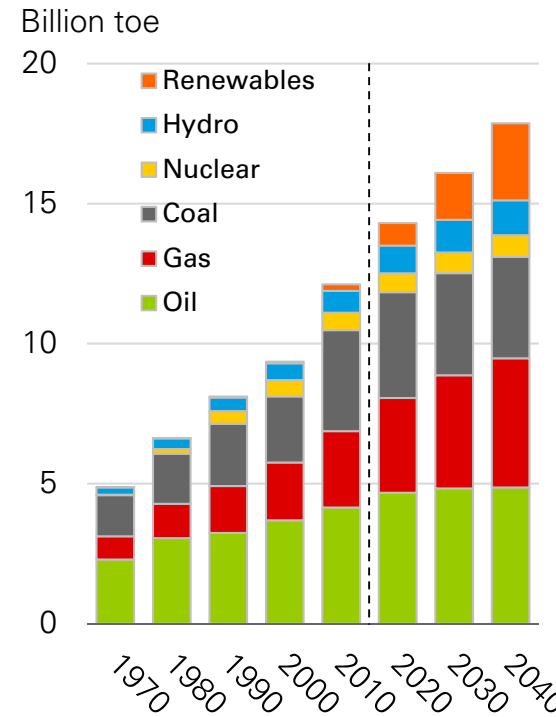
End-use sector



Region



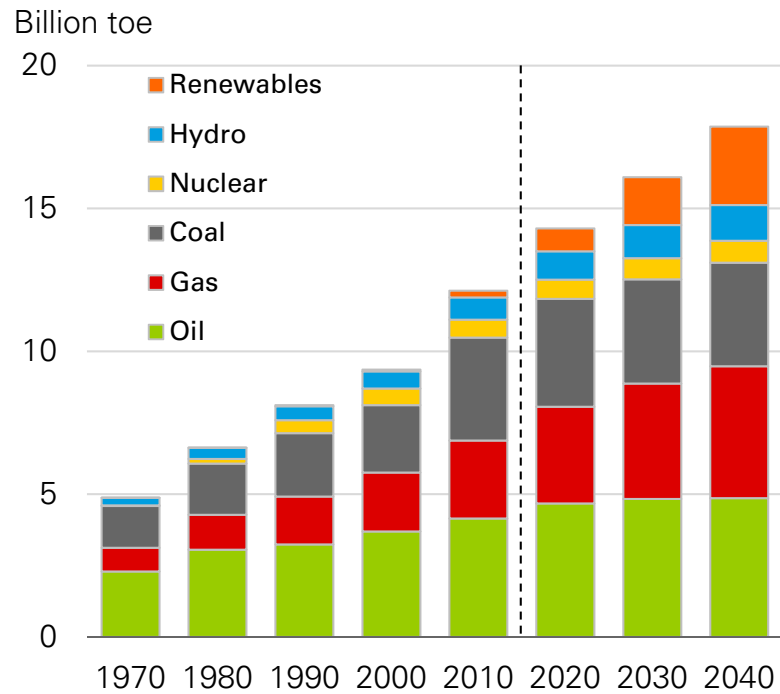
Fuel



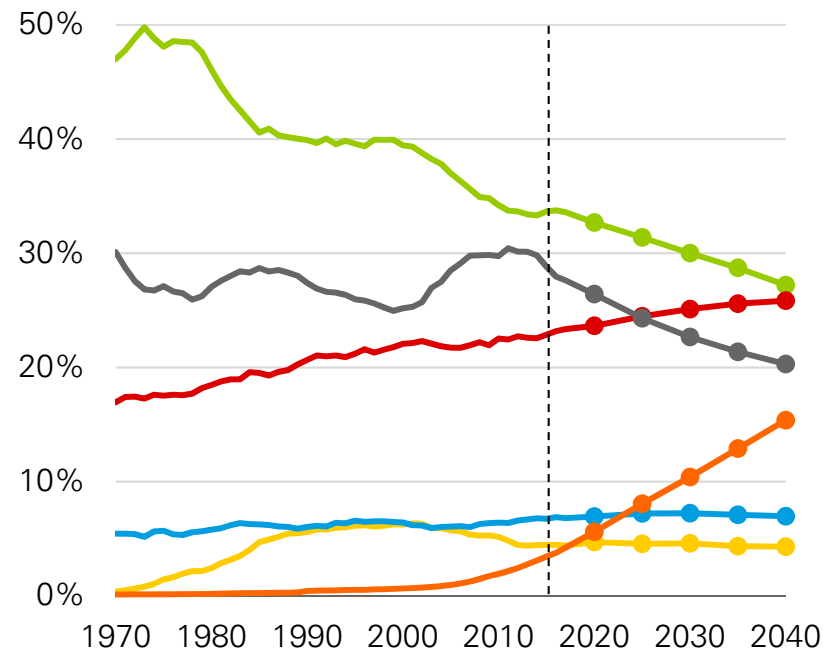
Global energy by fuel type



Primary energy consumption by fuel



Shares of primary energy





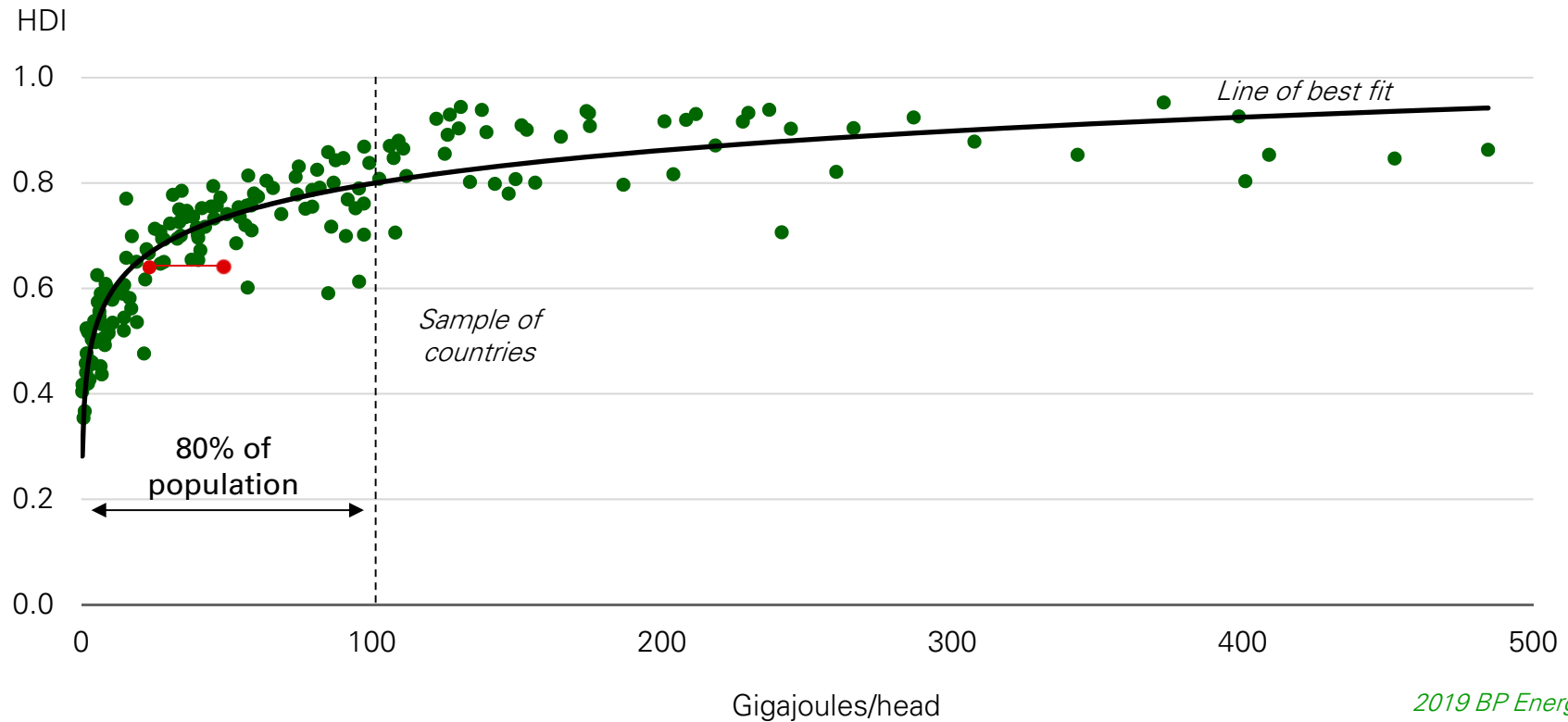
Five key questions and uncertainties

- ▶ How much 'more energy' does the world need?
- ▶ What might happen if the trade disputes escalate?
- ▶ How quickly could renewables grow?
- ▶ A low carbon energy system – what more needs to be done?
- ▶ Key issues for India's energy outlook

Human development and energy consumption



UN Human Development Index and energy consumption, 2017





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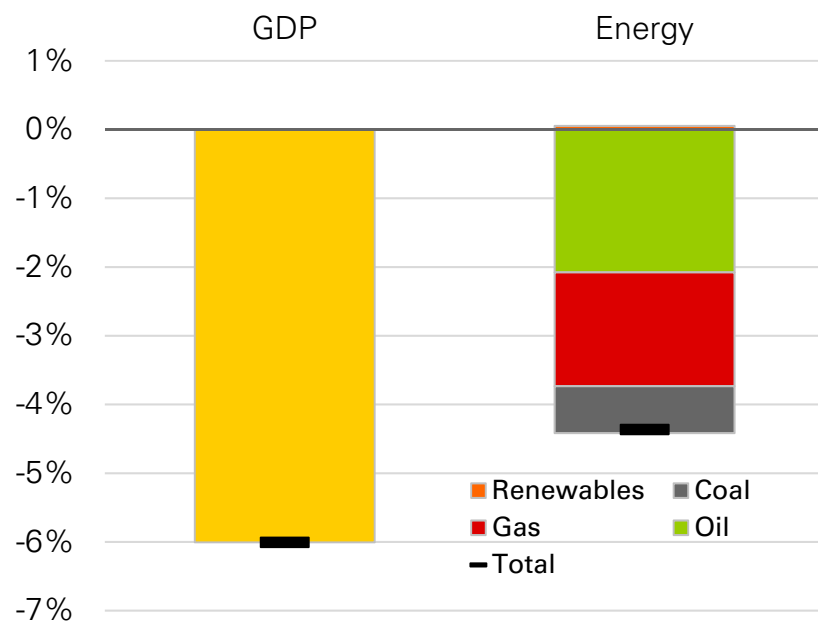
Less globalization scenario

- ▶ Reduced openness and trade leads to slight reduction in trend global GDP growth
- ▶ Concerns about energy security adds a small risk premium (10%) to imported energy

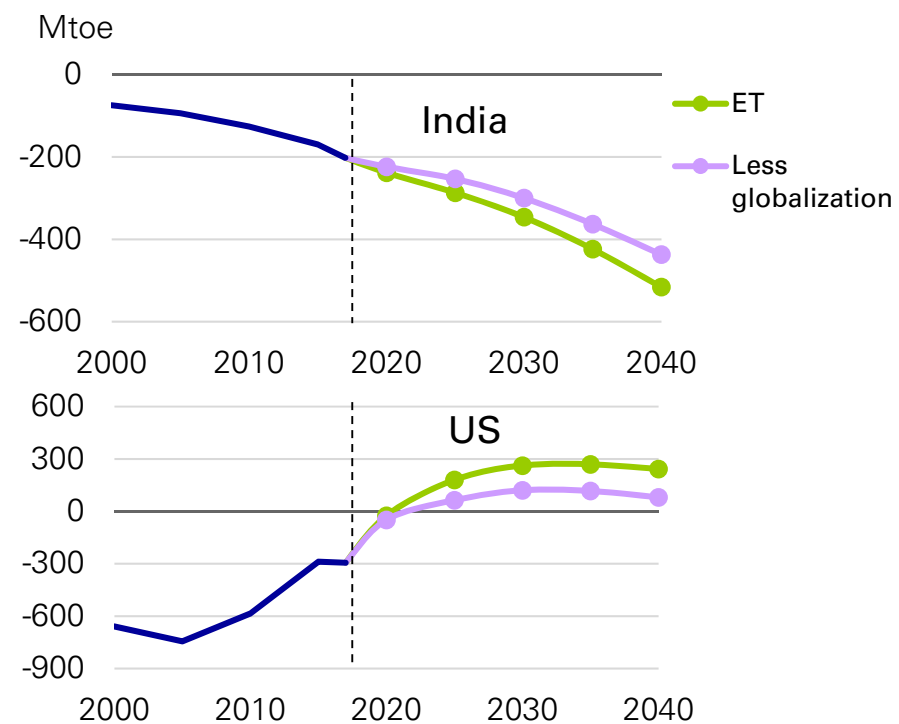


Alternative scenario: Less globalization

Difference relative to ET scenario in 2040:
Global GDP and energy



Net exports (oil & gas)





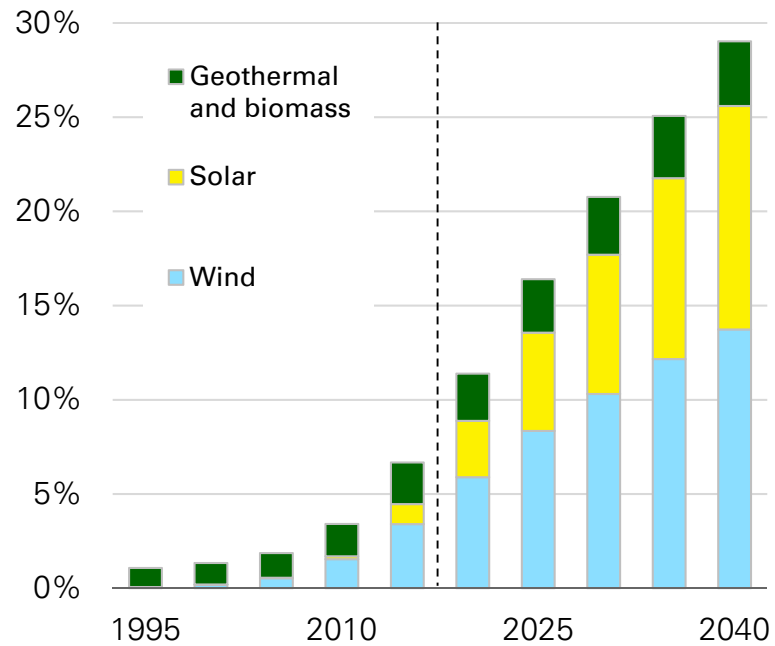
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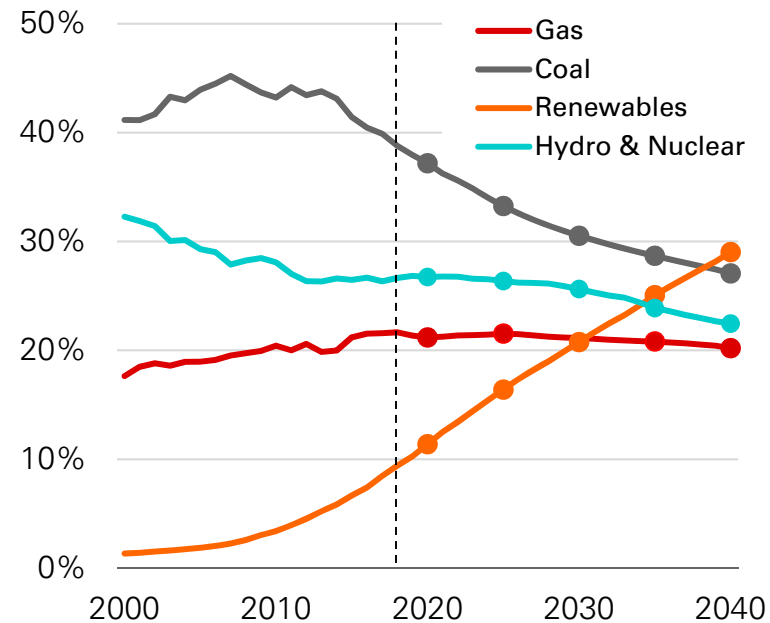
Renewable energy



Renewables share of power generation



Fuel shares in power

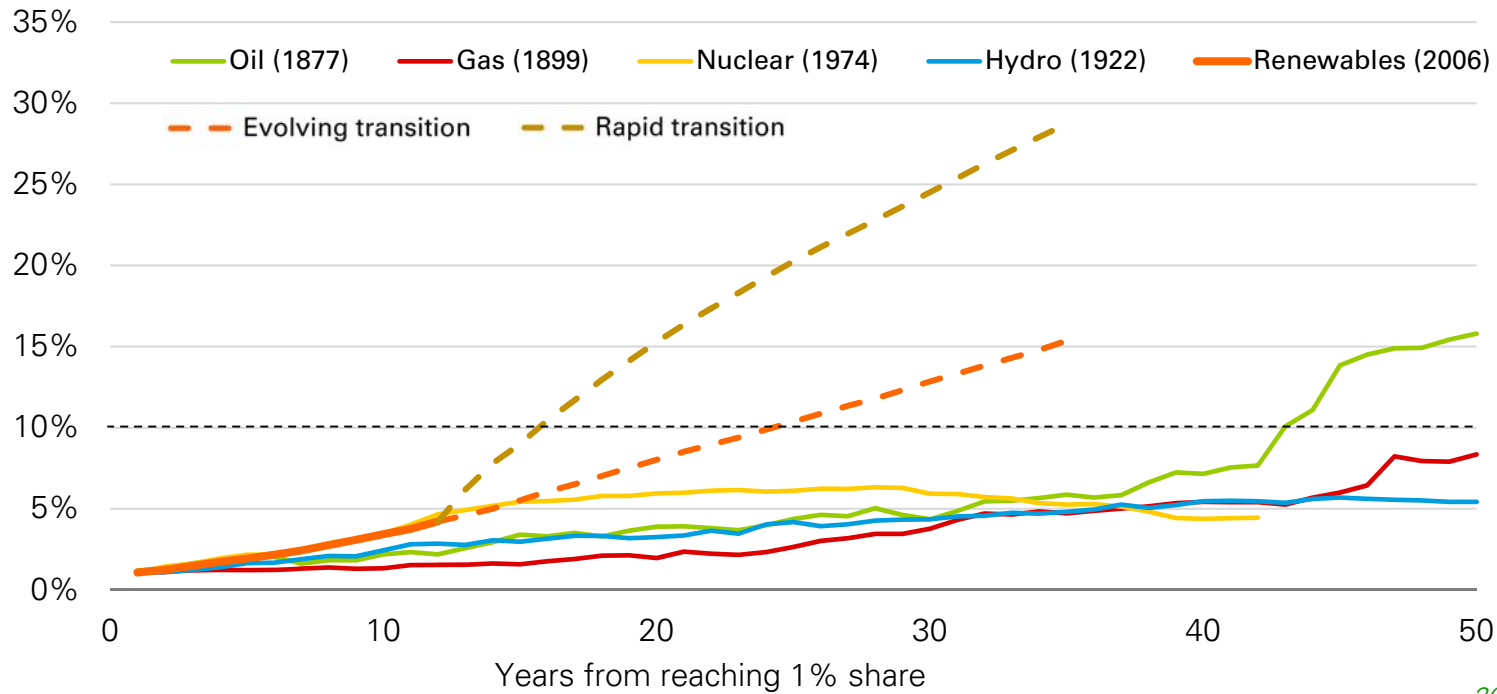


Speed of energy transition



Speed of penetration of new fuels in global energy system

Share of world energy





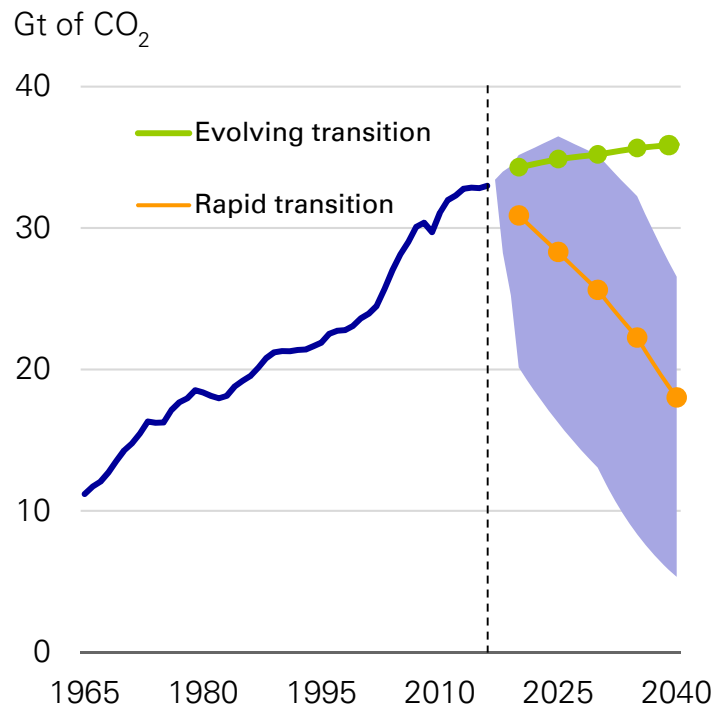
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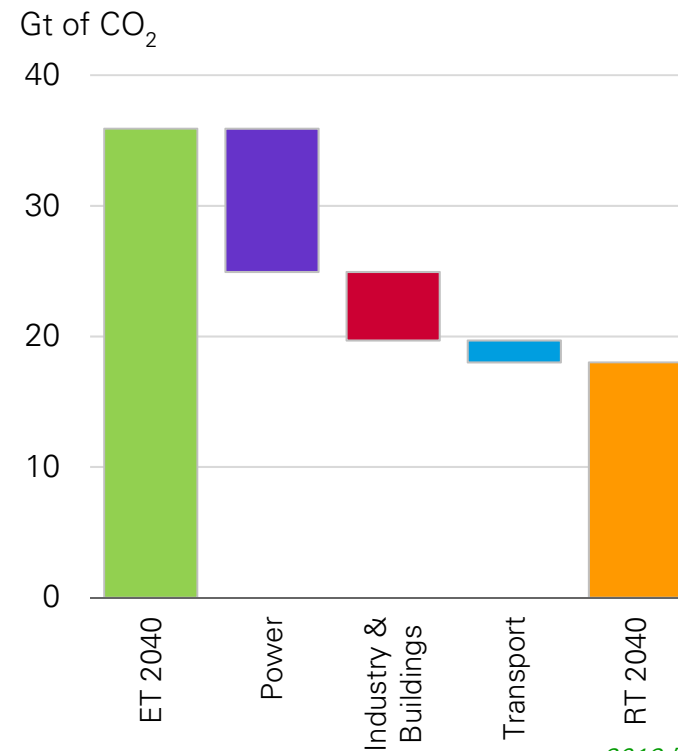
CO₂ emissions



CO₂ emissions



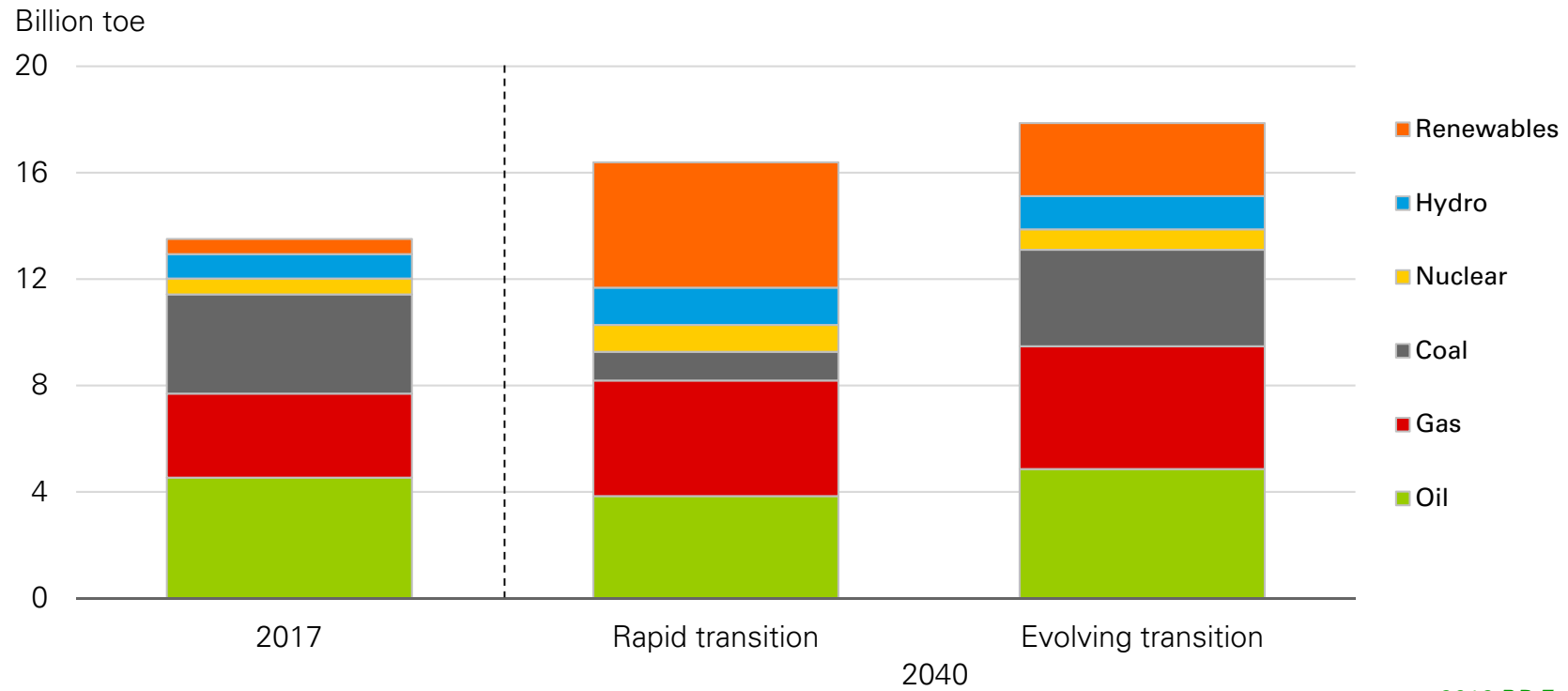
CO₂ in 2040: ET vs RT scenario



Global energy demand and fuel mix



Primary energy consumption by fuel





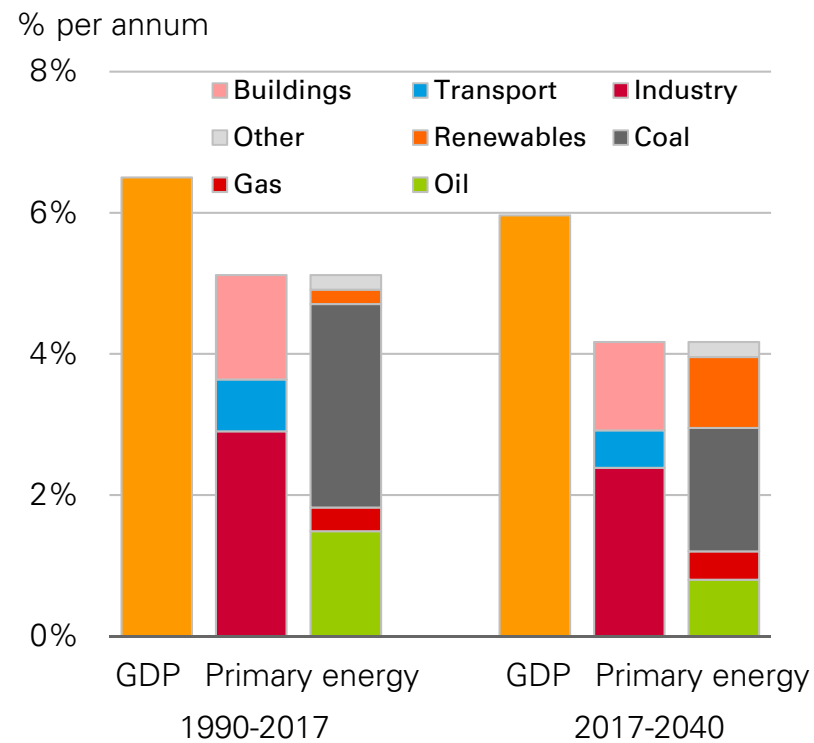
Five key questions and uncertainties

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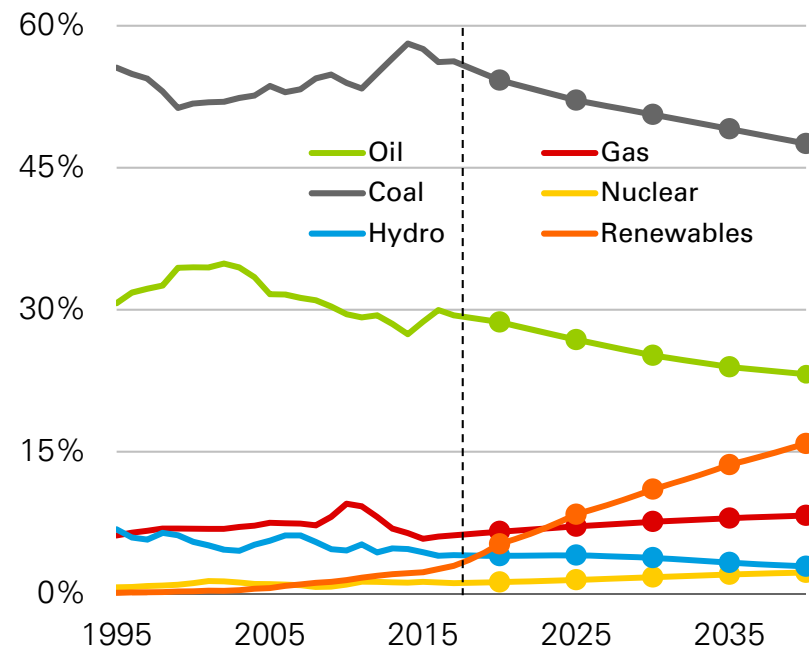


Implications for India

Growth of GDP and primary energy



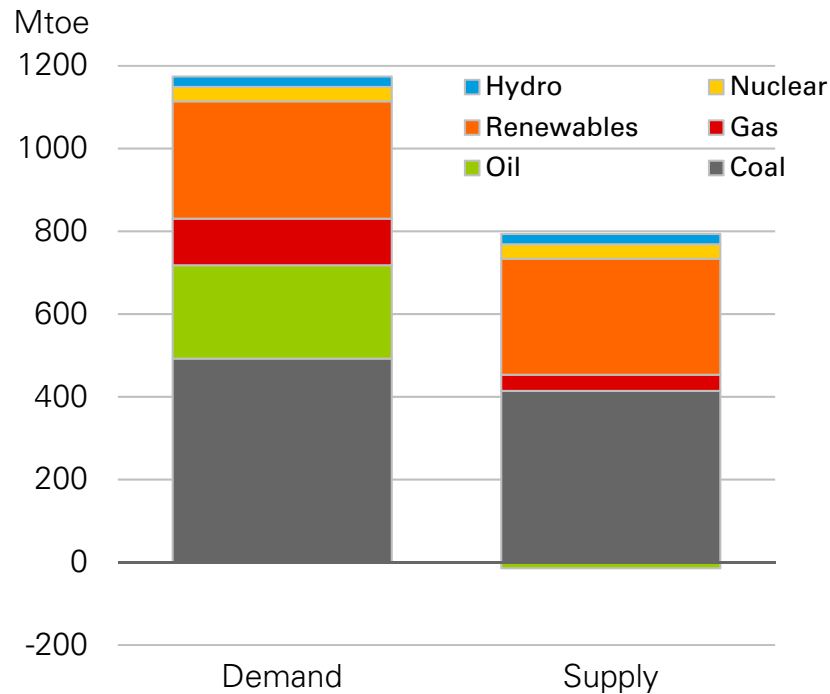
Shares of primary energy



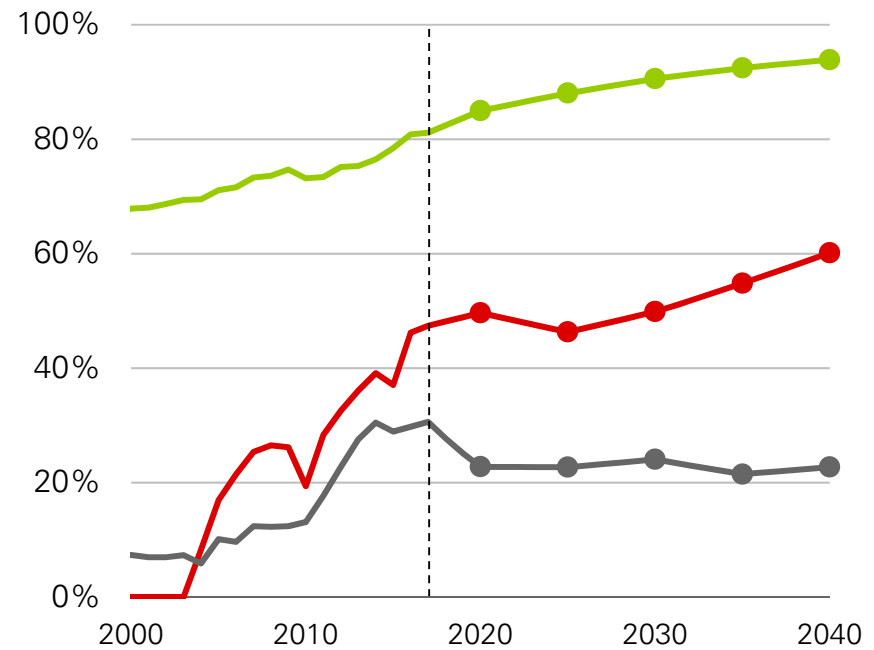
Indian energy: supply and demand balance



Primary energy supply and demand growth in the ET scenario: 2017-2040



Energy imports as a share of consumption

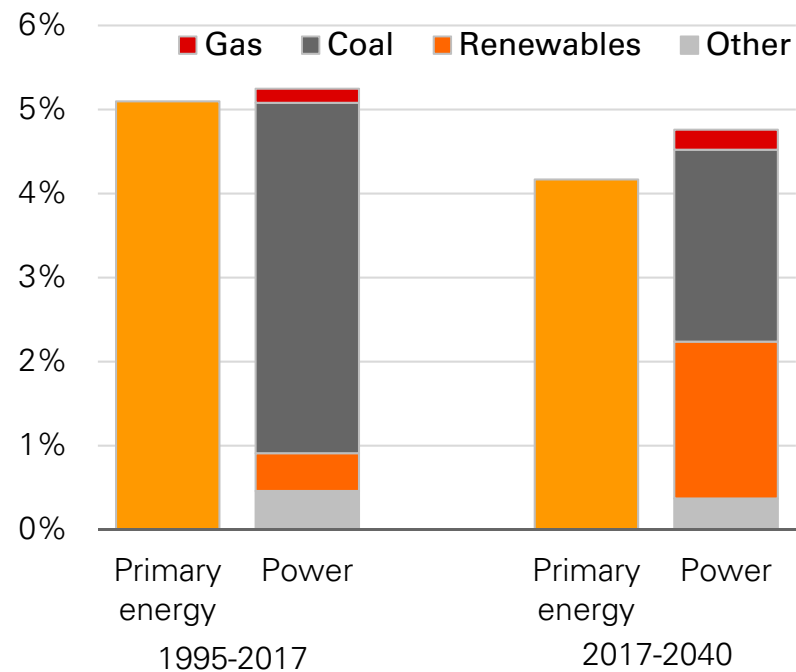




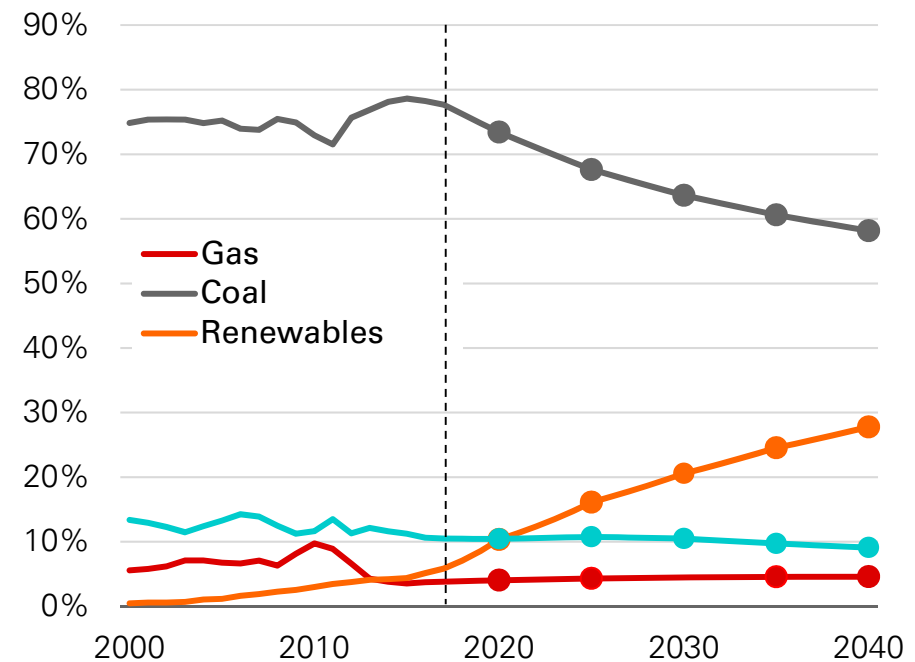
Indian power sector: demand and fuel mix

Growth in Indian primary energy and contributions to power

% per annum



India fuel shares in power generation





Alternative scenarios for gas demand in India



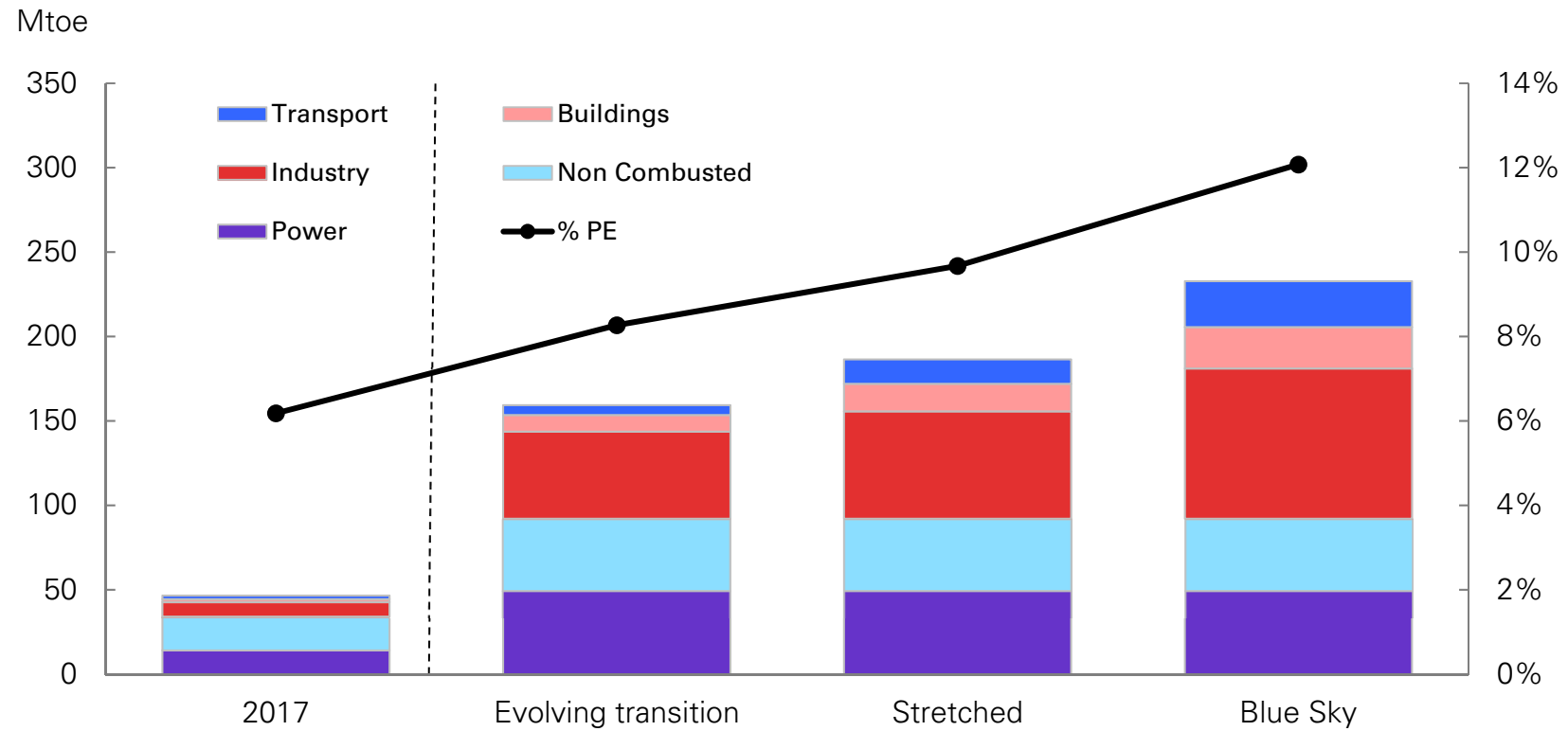
Alternative scenarios for gas demand in India

	Evolving transition	Stretch	Blue Sky
Transport (share of NGVs by 2040)	Cars < 10% Buses/trucks < 10% 6 Mtoe in 2040	Cars ~25% Buses/trucks ~ 15% 15 Mtoe in 2040	Cars ~ 50% Buses/trucks ~ 30% 27 Mtoe in 2040
Buildings	Share of gas doubling from 2% to 4% by 2040 10 Mtoe in 2040	1/3 city population connected to gas by 2040 16 Mtoe in 2040	1/2 city population connected to gas by 2040 25 Mtoe in 2040
Industry	Share of gas rising from 3% to 8% by 2040; 52 Mtoe in 2040	Share of gas increasing to 10%; 64 Mtoe in 2040	Share of gas increasing to 14%, 89 Mtoe in 2040
Share of gas in PE	8%	10%	12%

Power: share of gas in generation slightly up from 5% to 6% by 2040, 50 Mtoe in 2040

Non-combusted: gas demand increases from 20 to 42 Mtoe

Gas demand could even grow faster

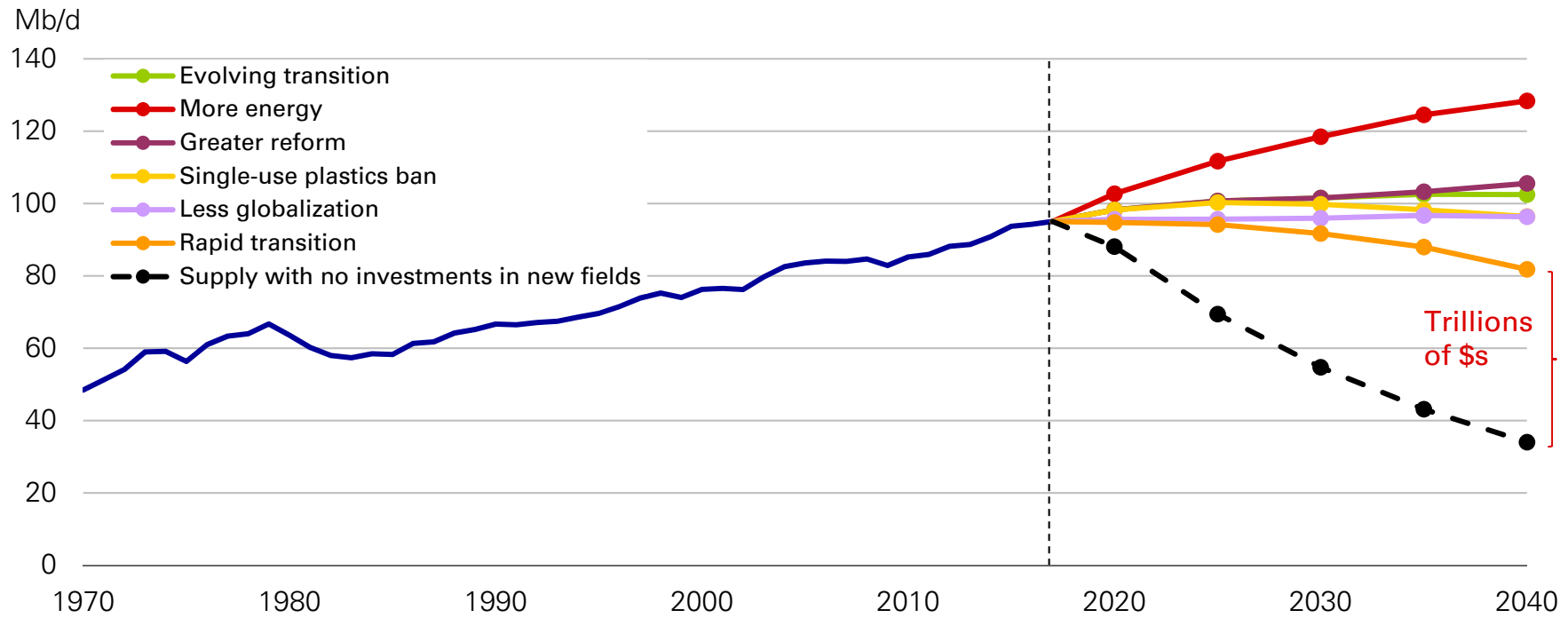




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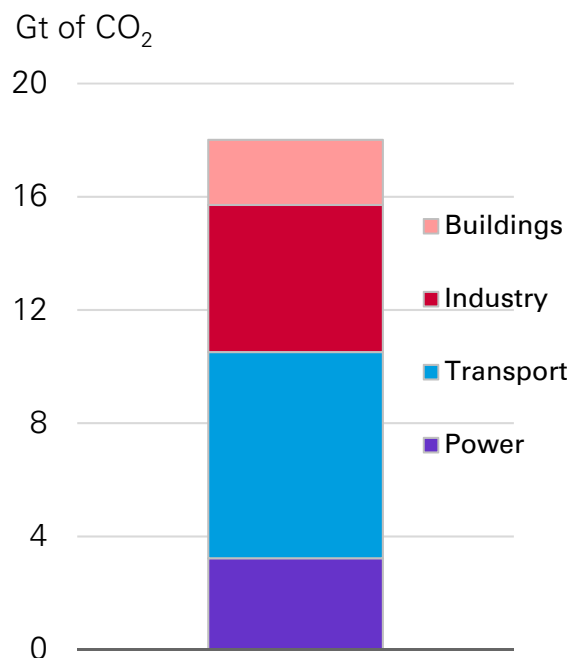
Demand and supply of oil





Hard-to-abate carbon emissions

CO₂ emissions in RT scenario in 2040



Decarbonise power sector

- Renewables
- Gas (and coal) plus CCUS
- Energy storage and demand-side-response

Other low-carbon energy sources and carriers

- Hydrogen
- Bioenergy

Efficiency

- Circular economy
- Process efficiency

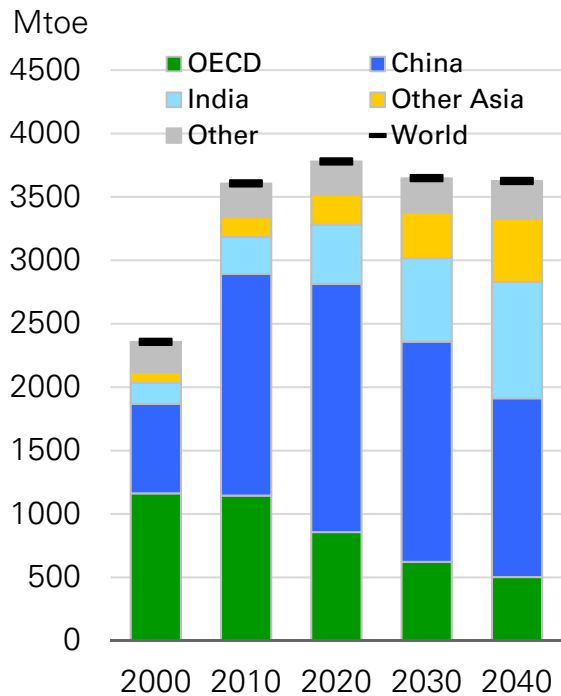
Storage and removal of carbon

- CCUS
- Negative emission technologies, eg land carbon, bioenergy with CCS (BECCS)

Global coal demand flatlines, with falls in China and OECD...



Coal demand by region



Change in coal demand by region

