

BP Energy Outlook
2019 edition

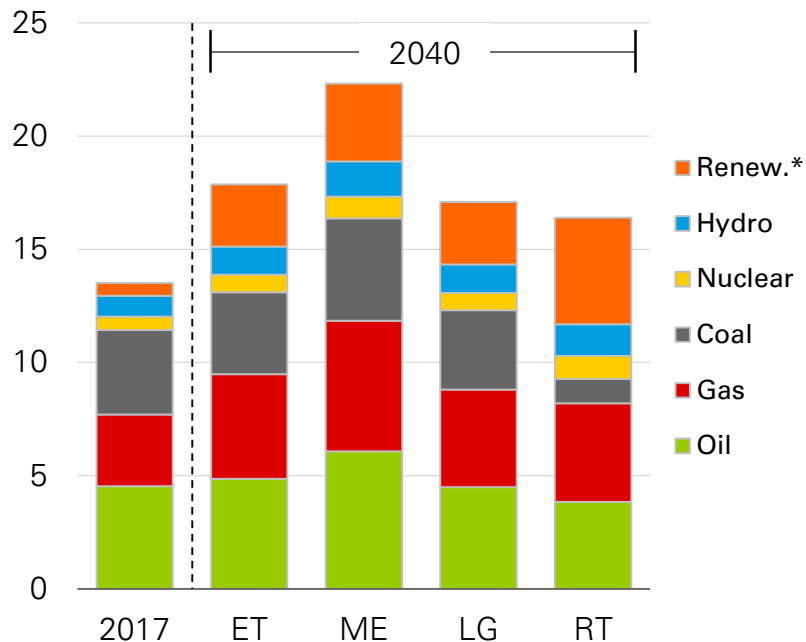
Spencer Dale
Group chief economist



Energy Outlook scenarios

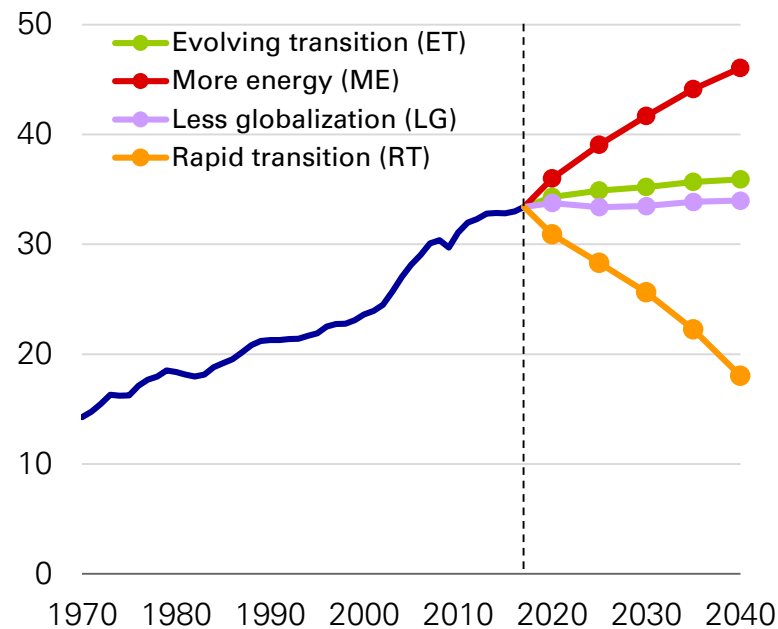
Primary energy consumption by fuel

Billion toe



CO₂ emissions

Gt of CO₂



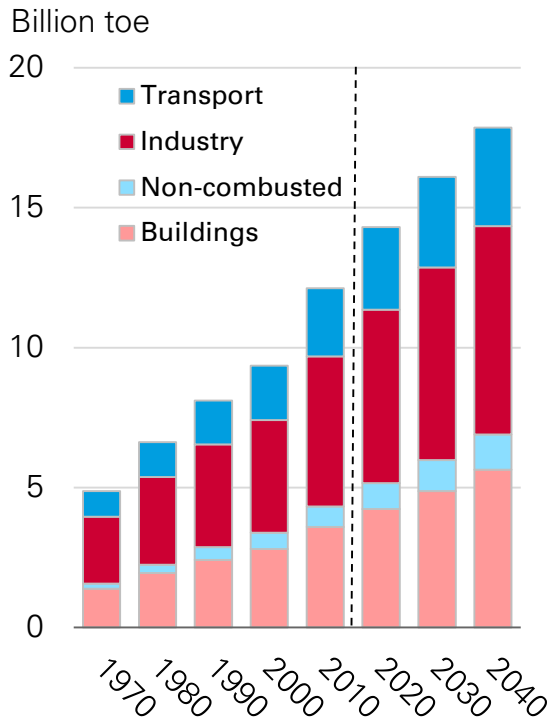
*Renewables includes wind, solar, geothermal, biomass and biofuels



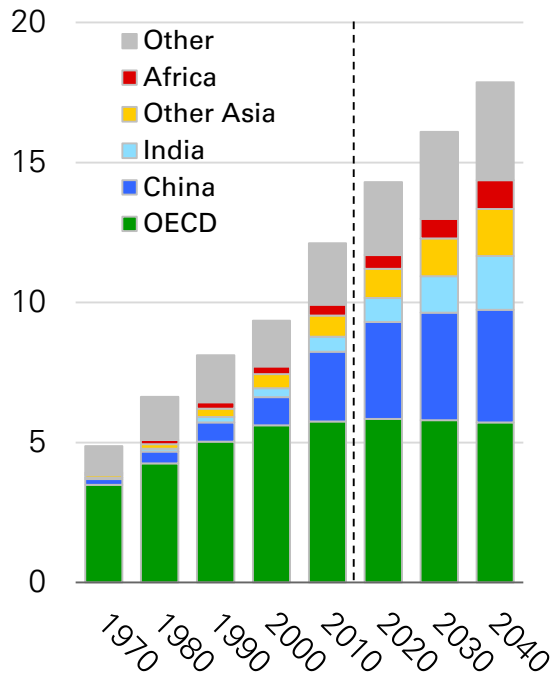
Three windows on the energy transition

Primary energy demand

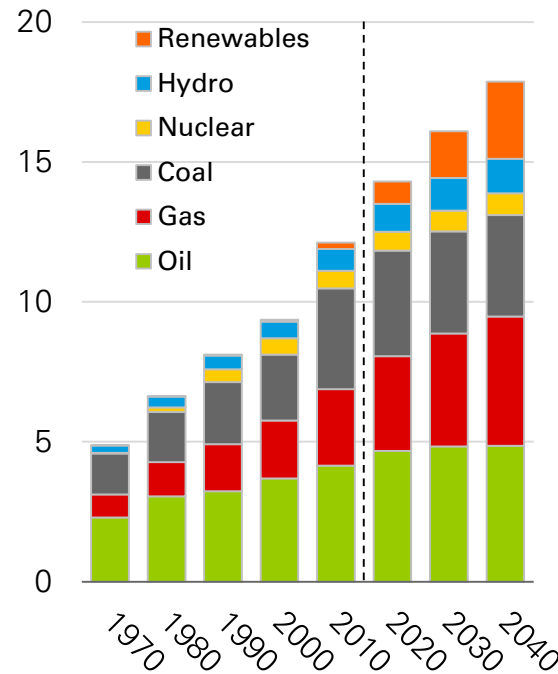
End-use sector



Region



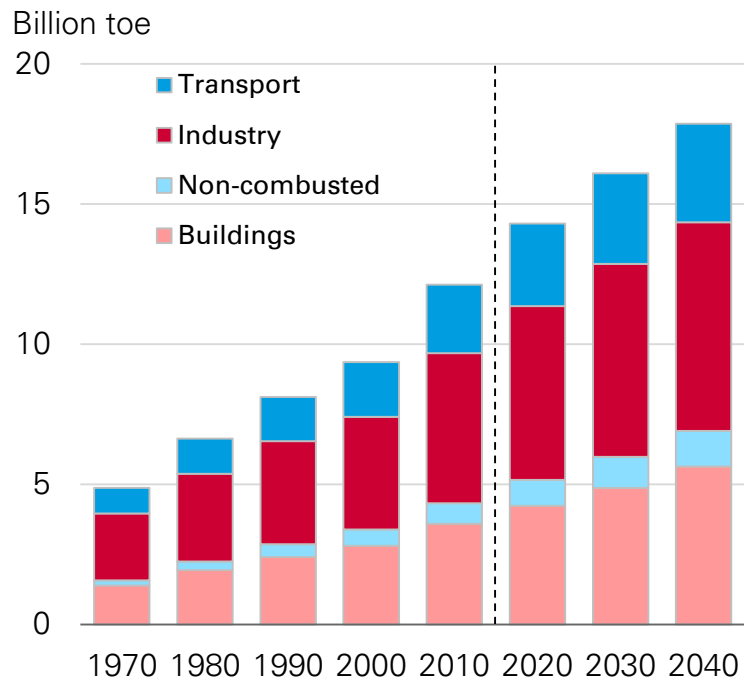
Fuel



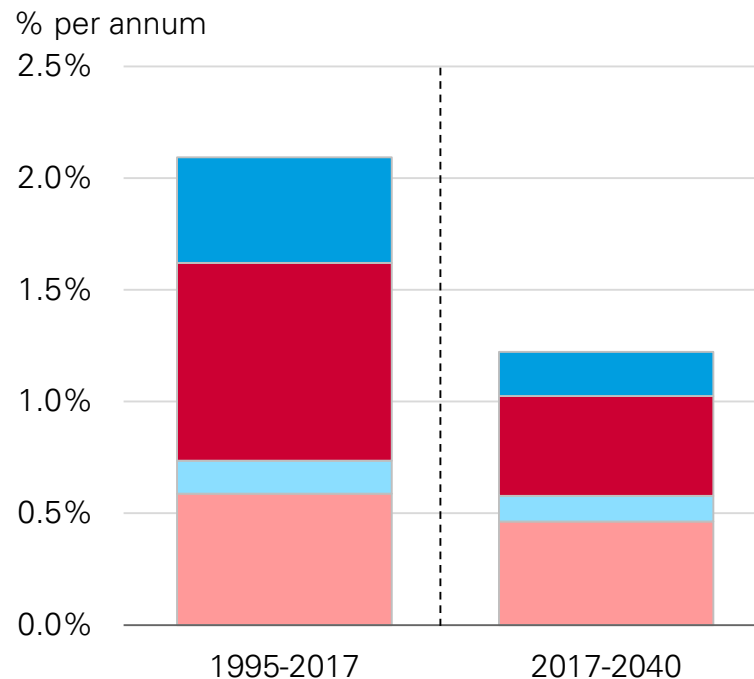


Energy demand by sector

Primary energy consumption by end-use sector



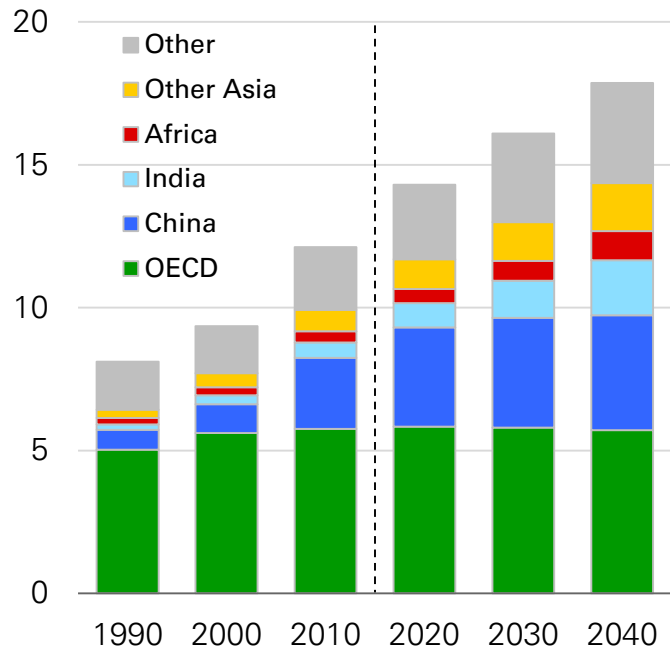
Annual demand growth and sector contributions



Regional energy demand

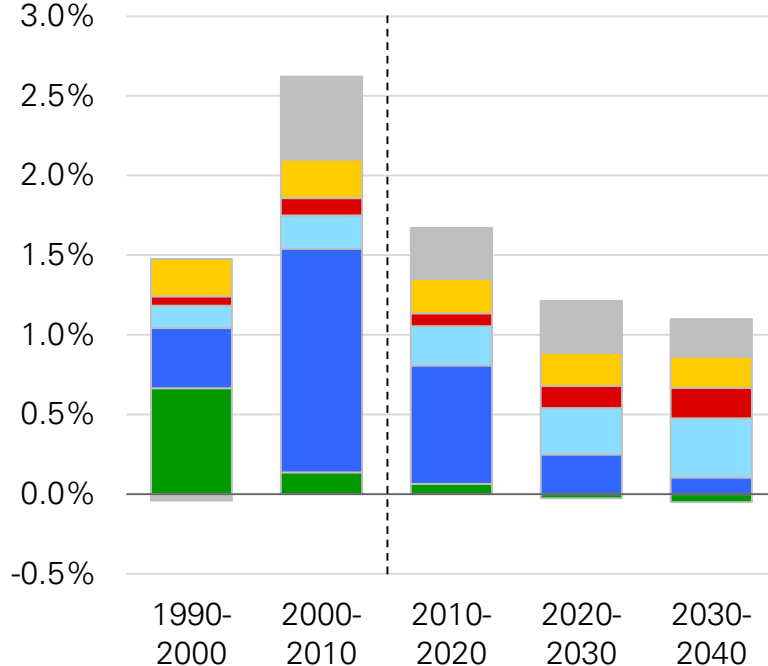
Primary energy consumption by region

Billion toe



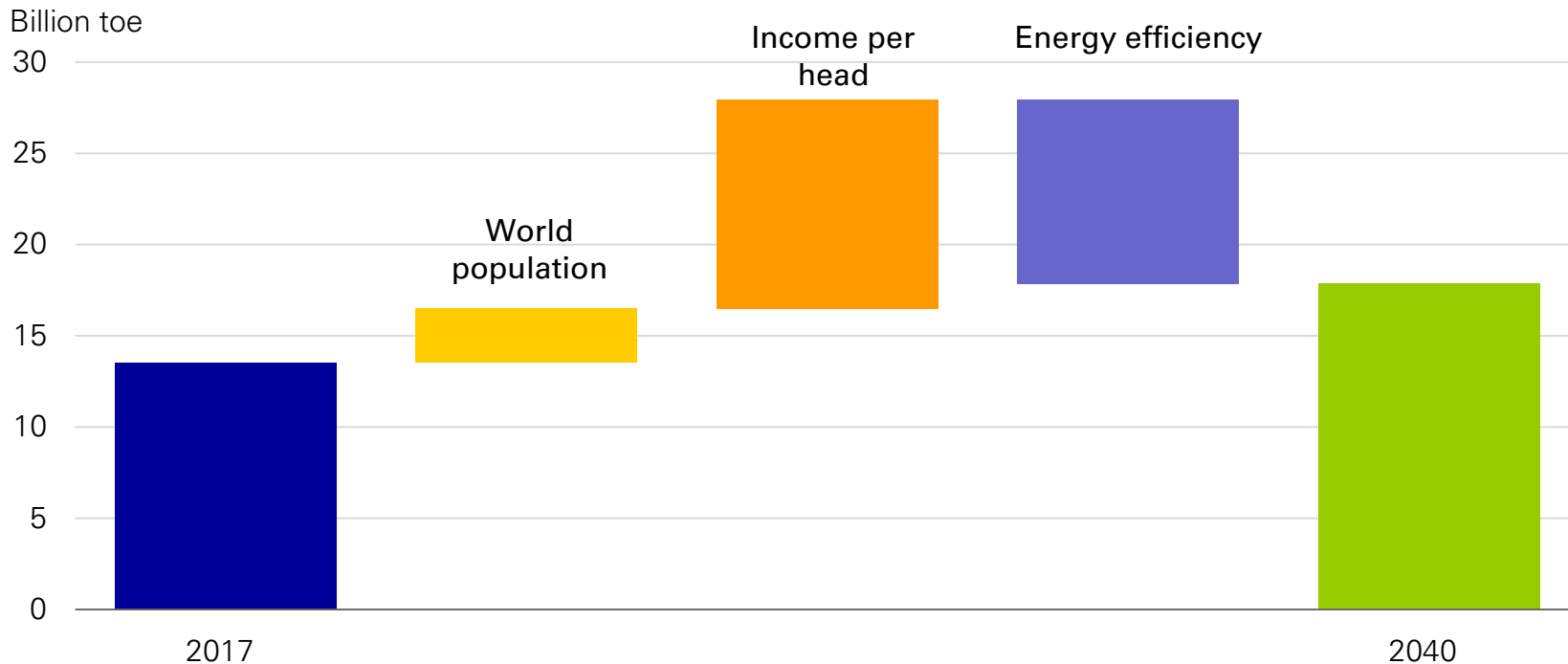
Primary energy growth and regional contributions

% per annum



Increase in primary energy demand

Increase in primary energy demand, 2017-2040

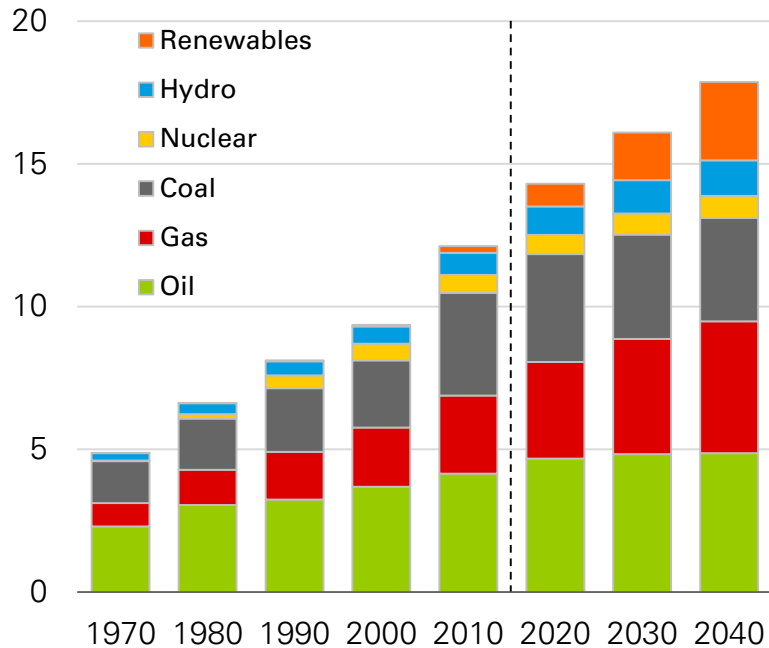




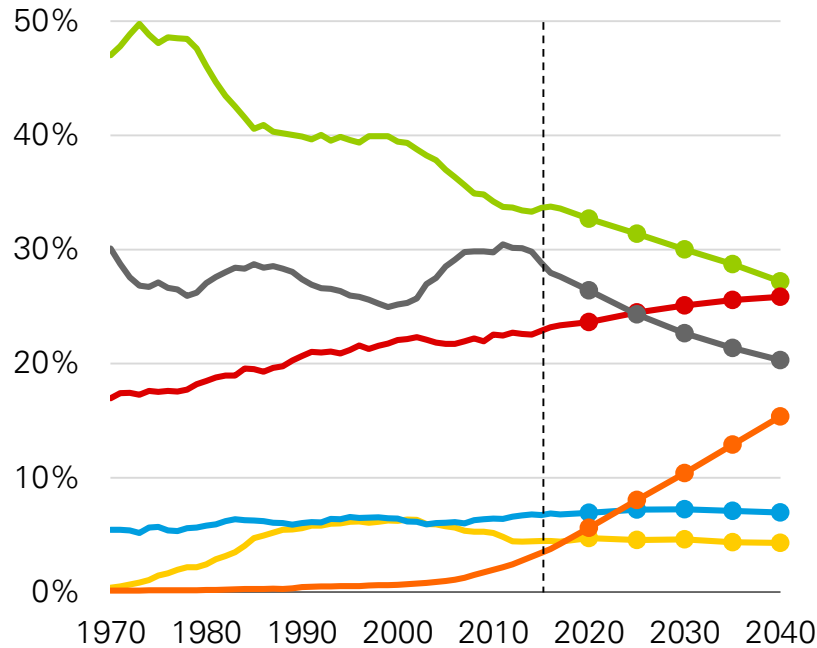
Global energy by fuel type

Primary energy consumption by fuel

Billion toe



Shares of primary energy

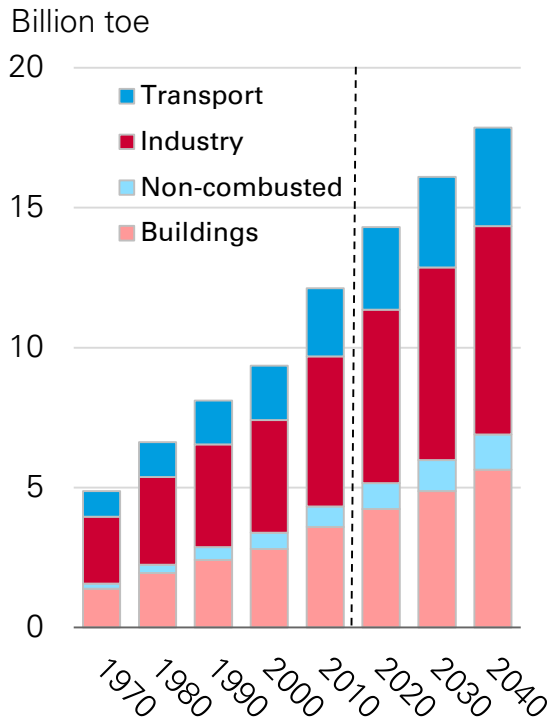




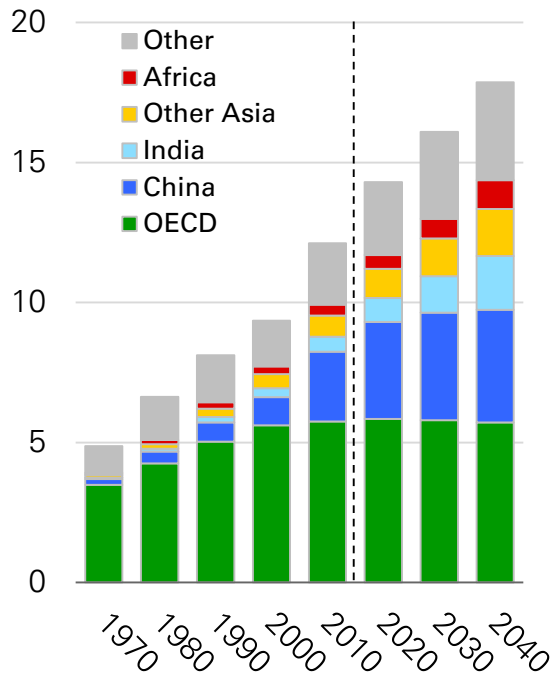
Three windows on the energy transition

Primary energy demand

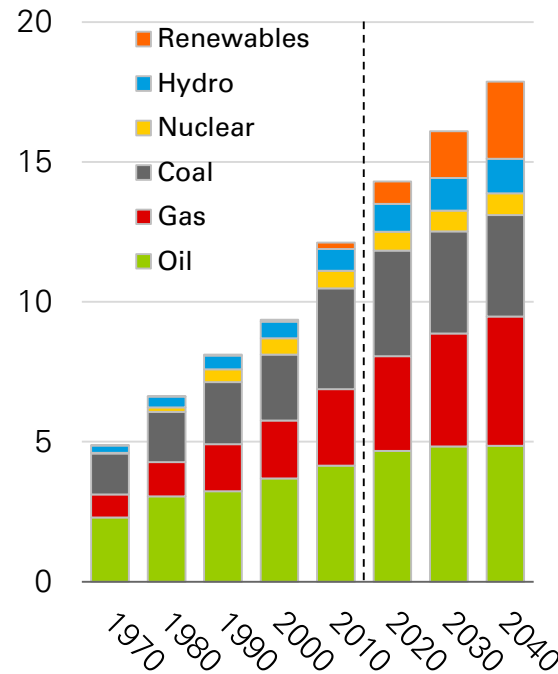
End-use sector



Region



Fuel





Five key questions and uncertainties

- ▶ How much 'more energy' does the world need?
- ▶ How important are plastics for the future of oil demand?
- ▶ What might happen if the trade disputes escalate?
- ▶ How quickly could renewables grow?
- ▶ A low-carbon energy system: what more needs to be done?



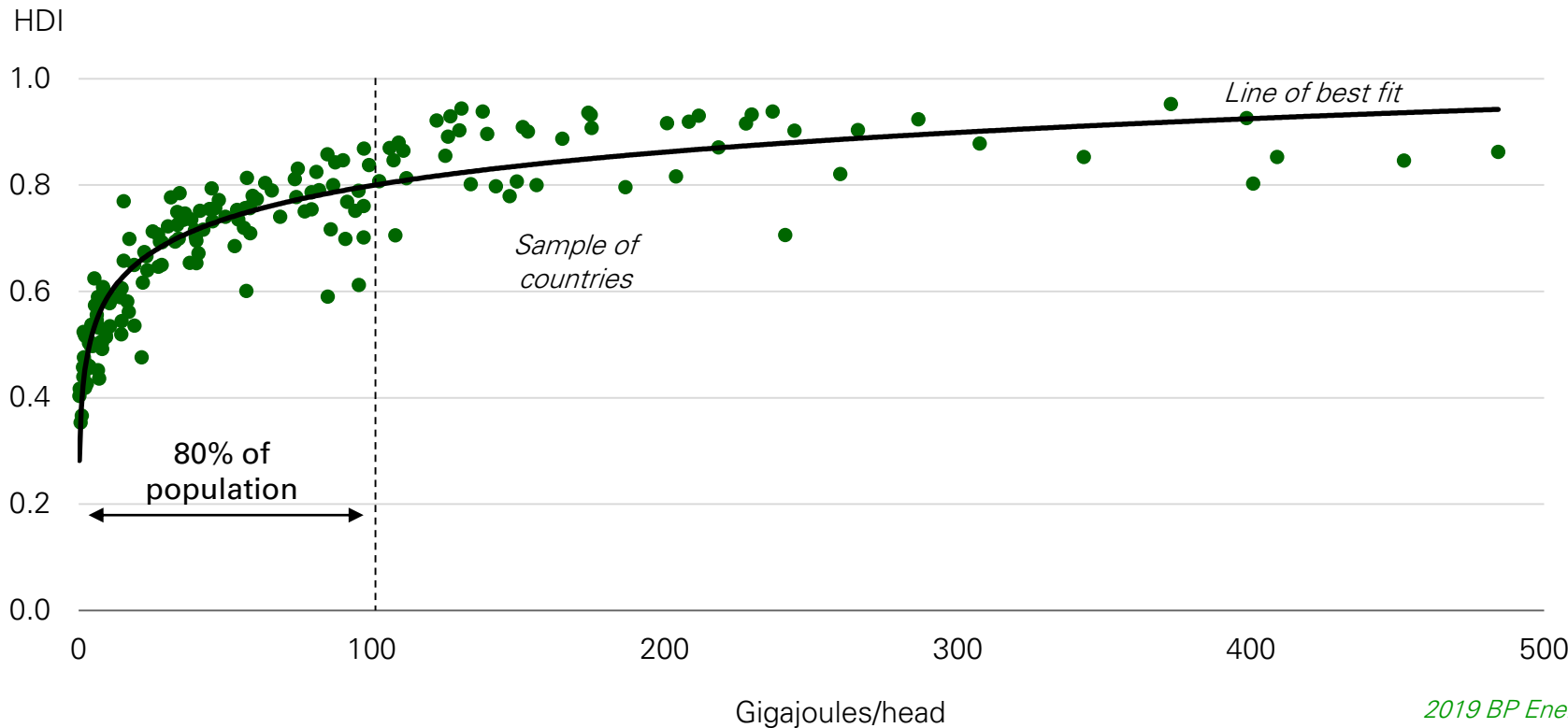
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Human development and energy consumption

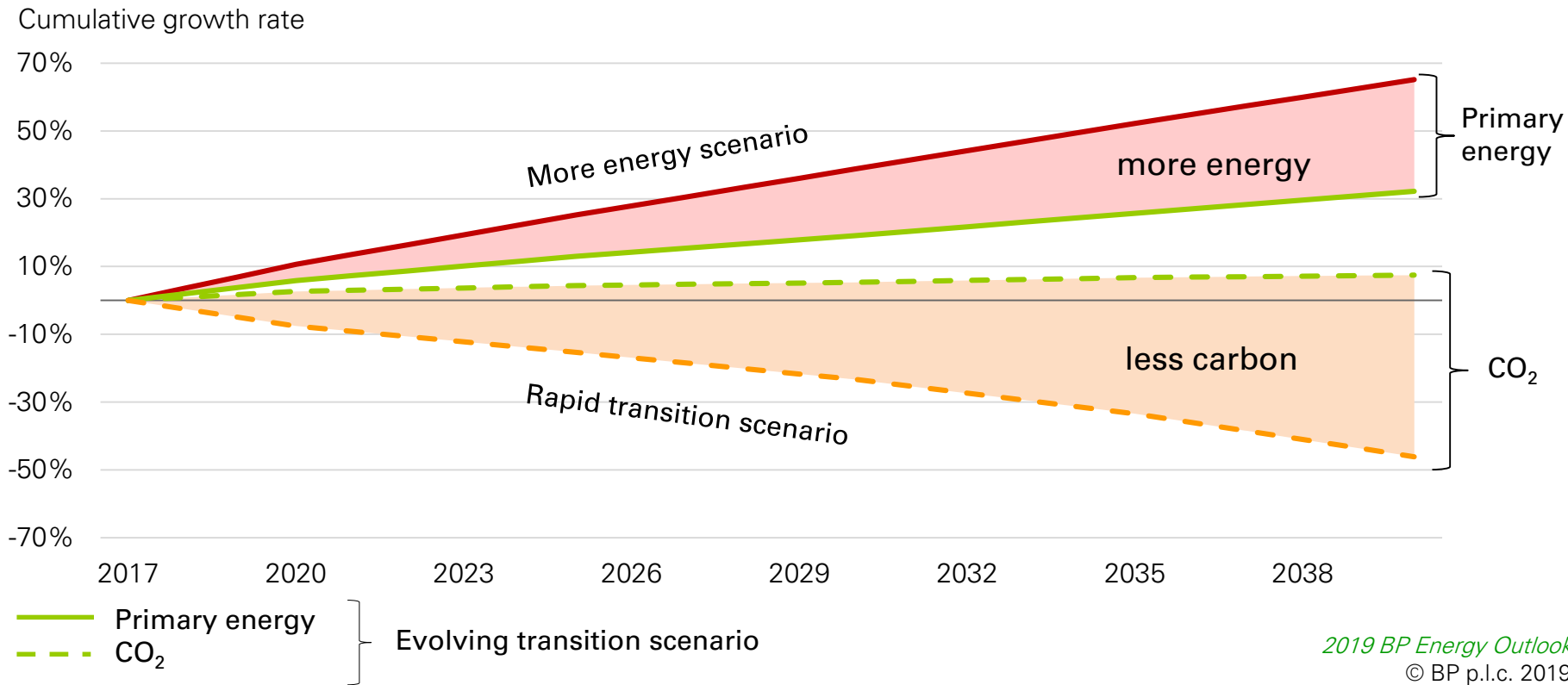
UN Human Development Index and energy consumption, 2017





Dual challenge: more energy, less carbon

Primary energy demand and carbon emissions



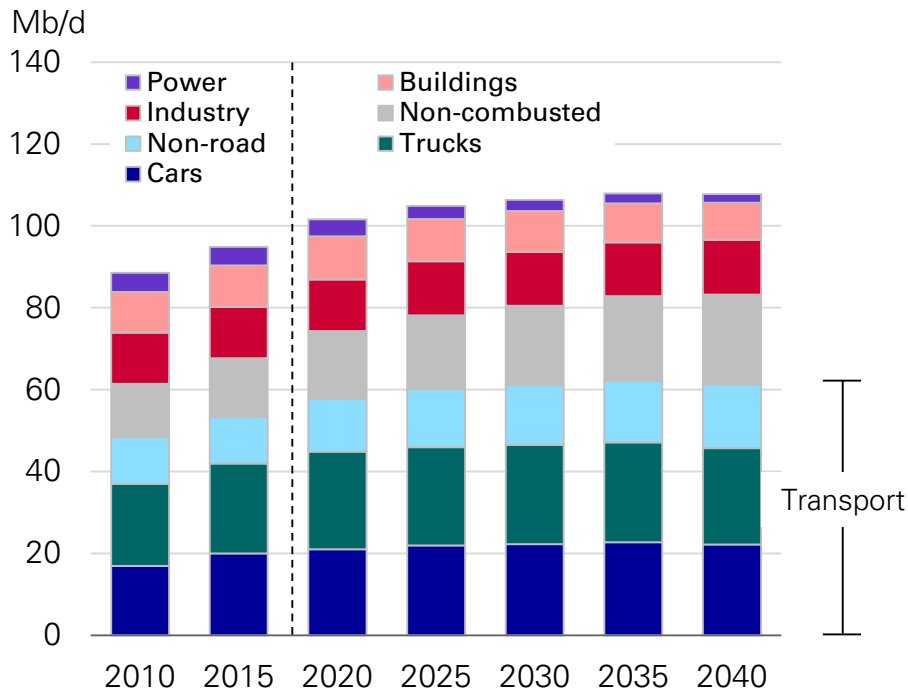
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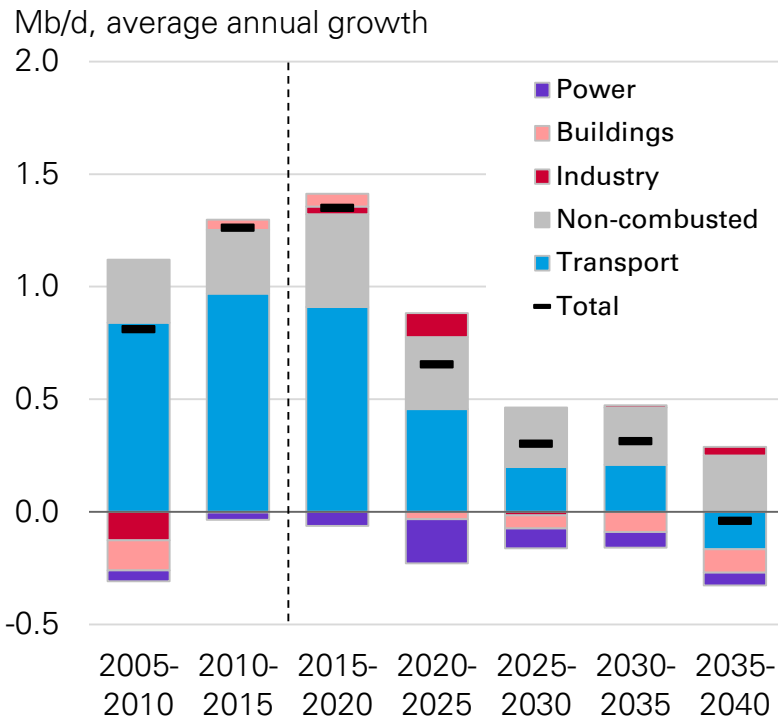


Demand for oil and other liquid fuels

Liquids demand

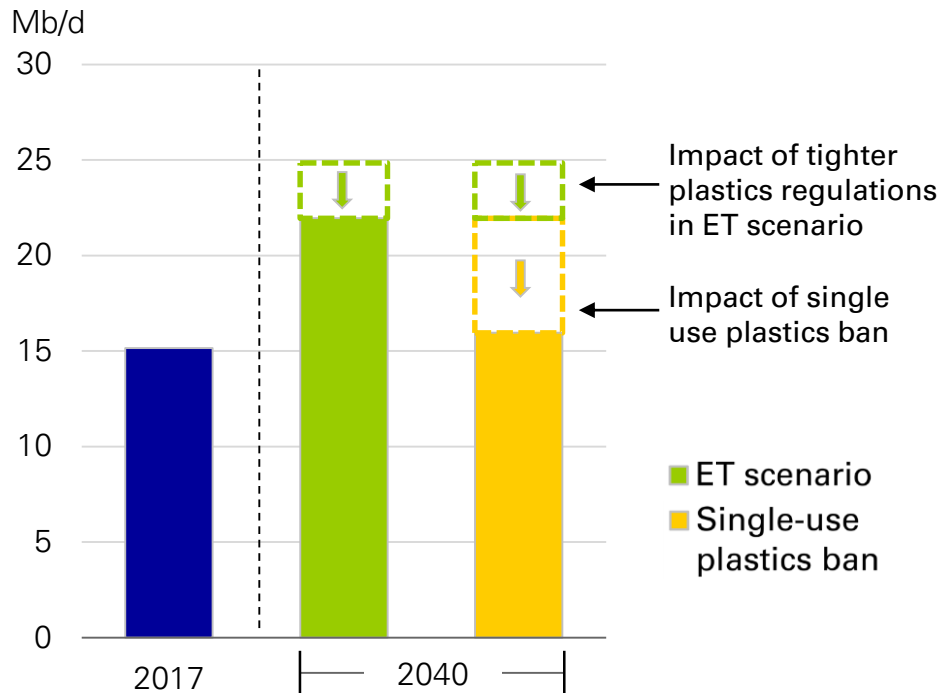


Liquids demand growth

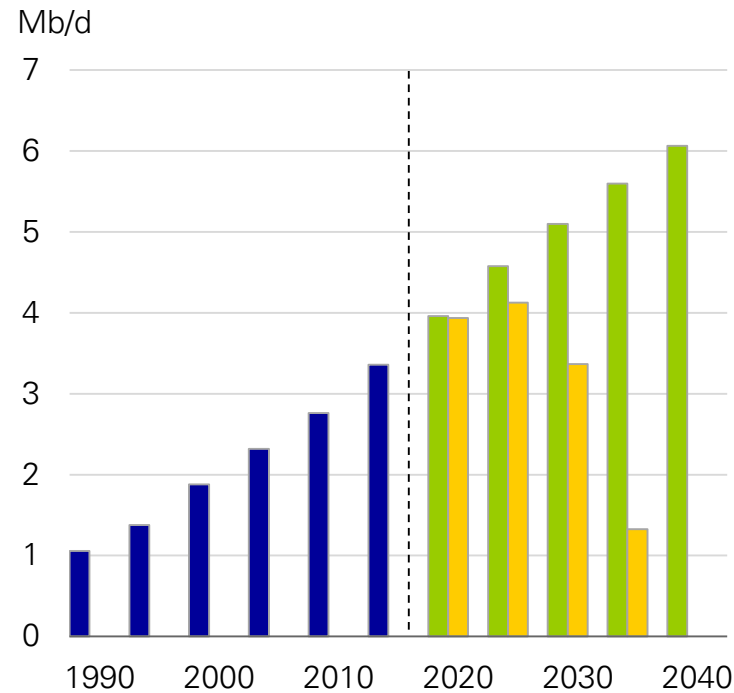


Demand for liquid fuels and plastics

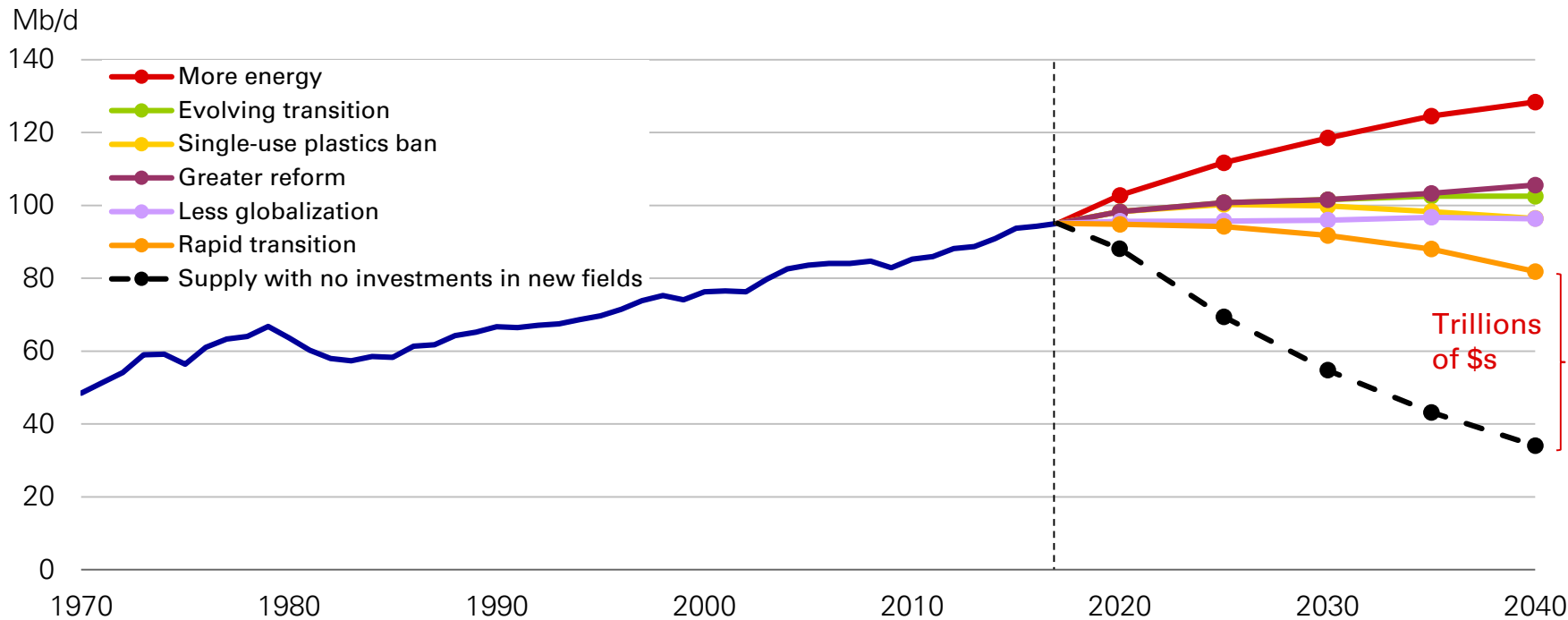
Demand for non-combusted liquid fuels



Liquid feedstocks for single-use plastics



Demand and supply of oil





Five key questions and uncertainties

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- ▶ **What might happen if the trade disputes escalate?**
- ▶ How quickly could renewables grow?
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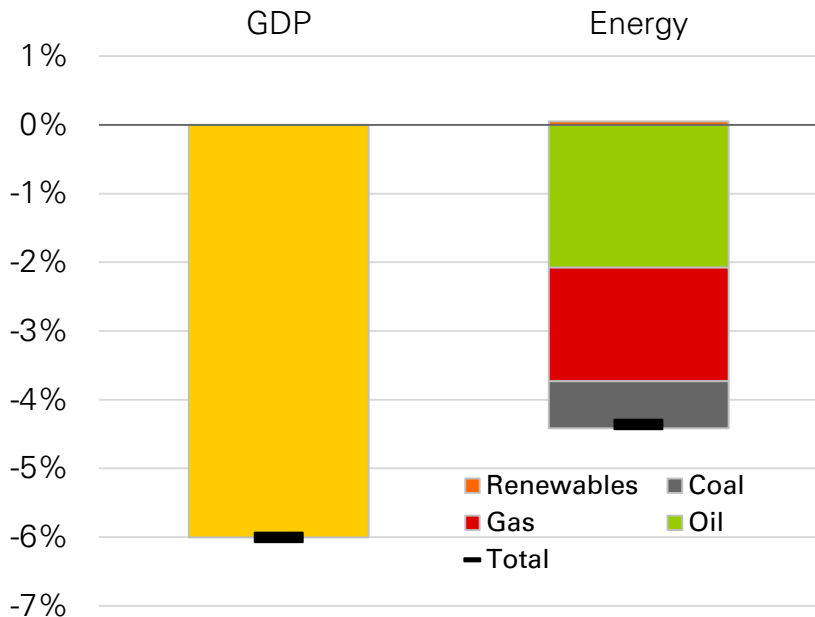


Less globalization scenario

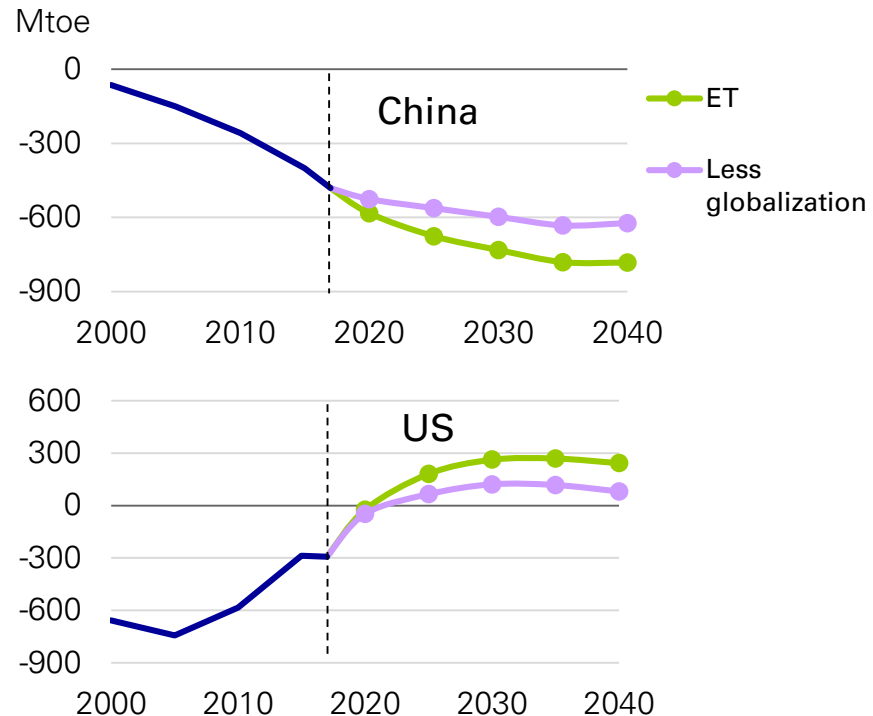
- ▶ Reduced openness and trade leads to slight reduction in trend global GDP growth
- ▶ Concerns about energy security adds a small risk premium (10%) to imported energy

Alternative scenario: Less globalization

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



Net exports (oil & gas)





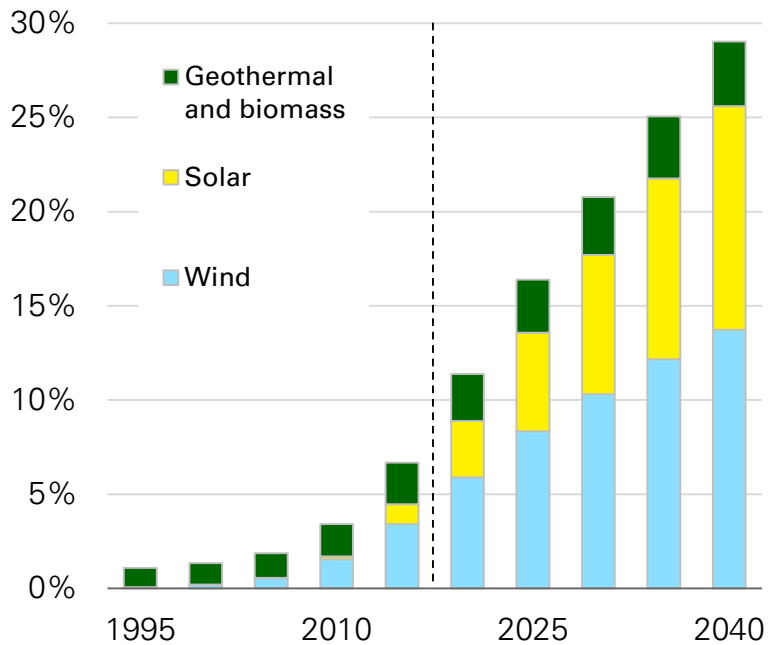
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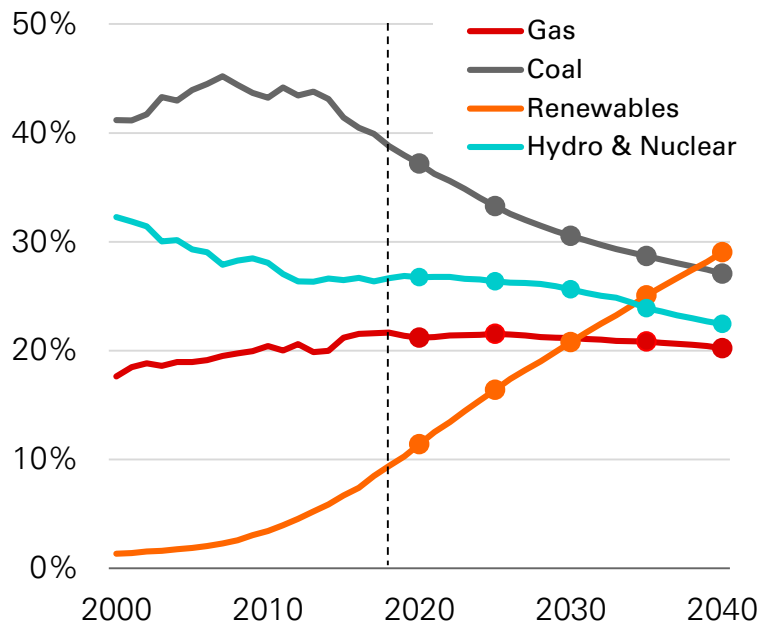
Renewable energy



Renewables share of power generation



Fuel shares in power

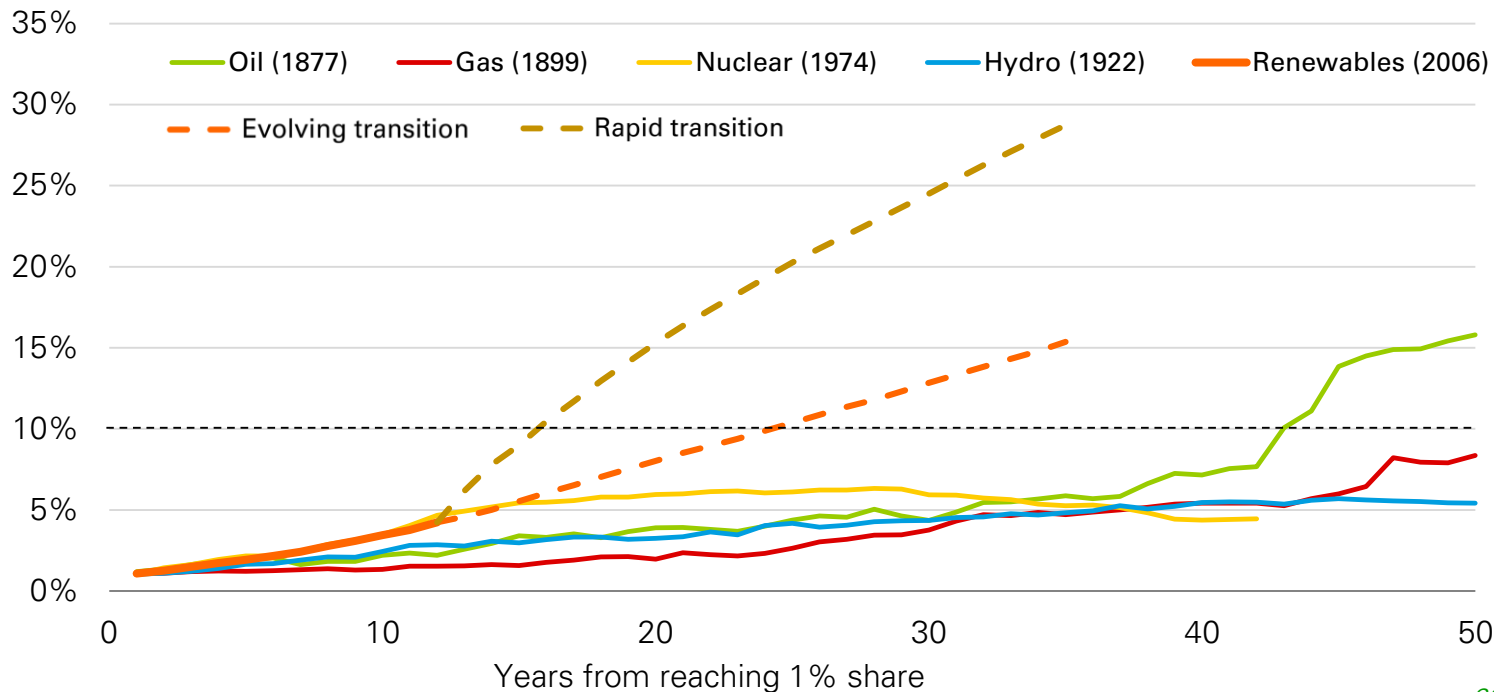


Speed of energy transition



Speed of penetration of new fuels in global energy system

Share of world energy





Five key questions and uncertainties

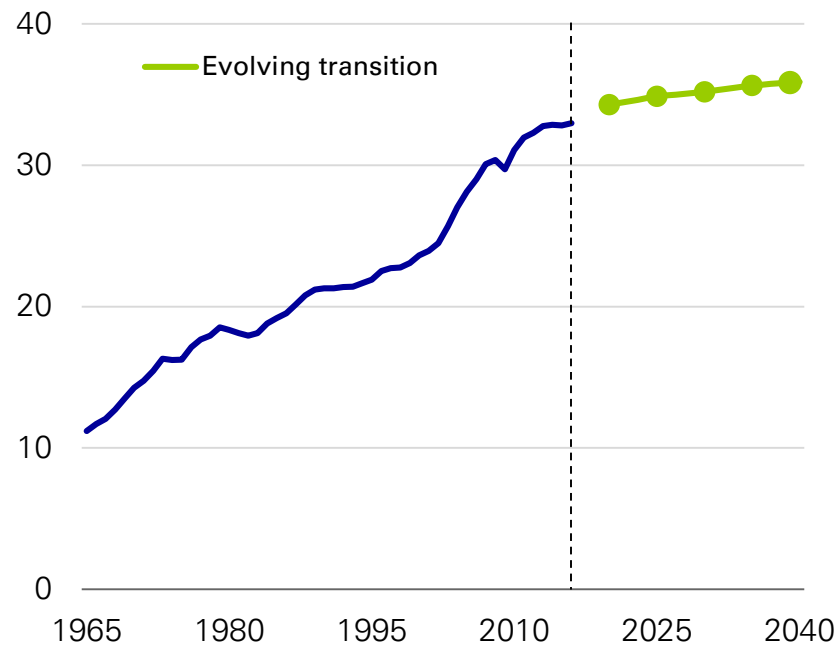
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- ▶ **A low-carbon energy system: what more needs to be done?**



CO₂ emissions in ET scenario

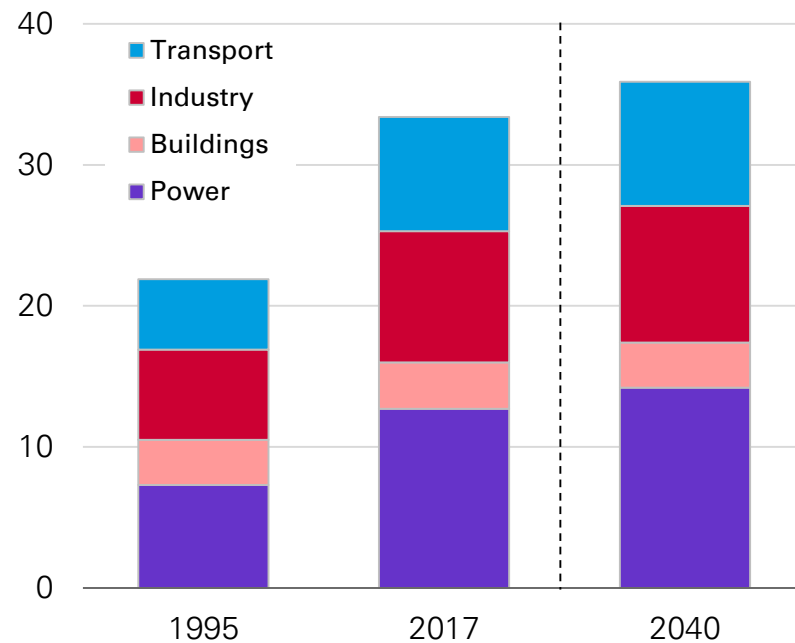
CO₂ emissions

Gt of CO₂



CO₂ emissions by sector

Gt of CO₂



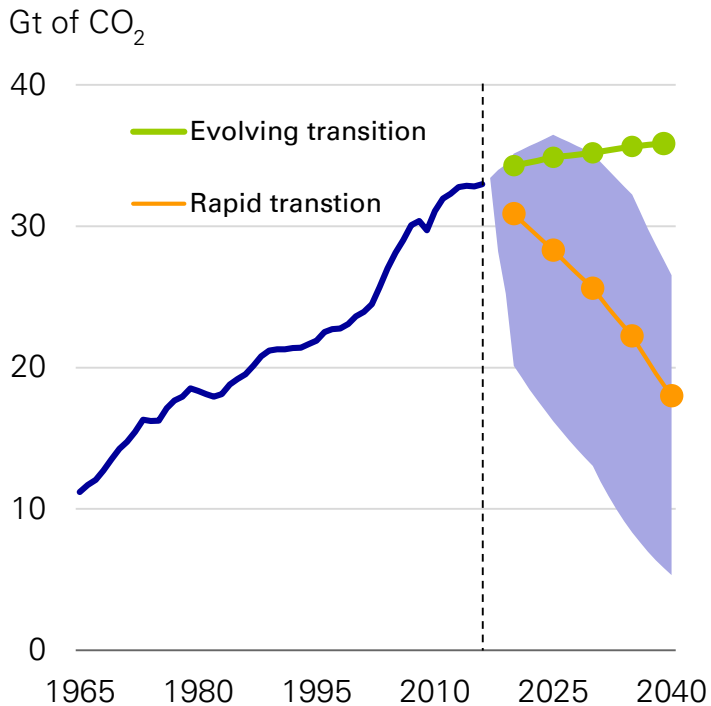


Rapid transition scenario: policy measures

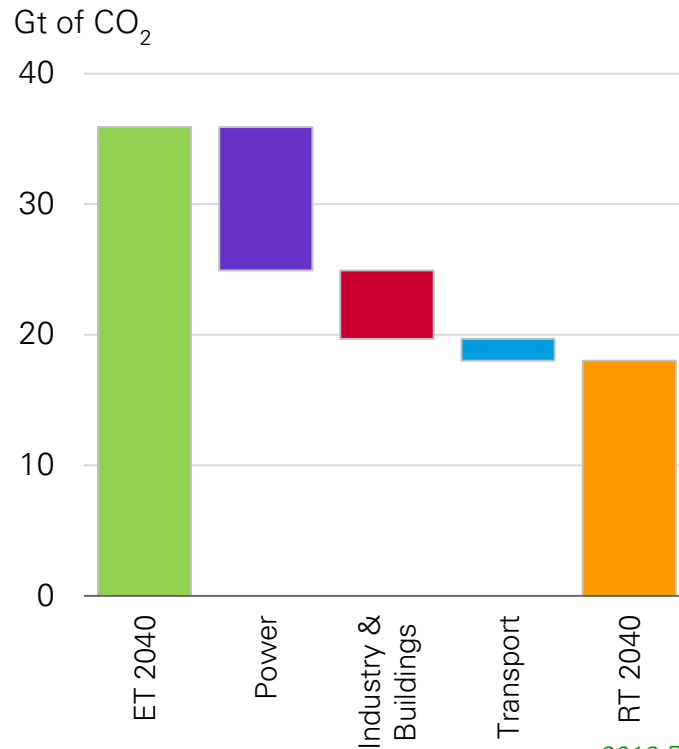
- ▶ Wide range of policy measures: broadly equivalent in terms of their implied costs and effort
- ▶ No silver bullet: a comprehensive set of policy measures is needed
- ▶ Carbon prices are key, especially in the power and industrial sectors
- ▶ Role for targeted regulatory measures, especially until carbon prices reach material levels

CO₂ emissions

CO₂ emissions



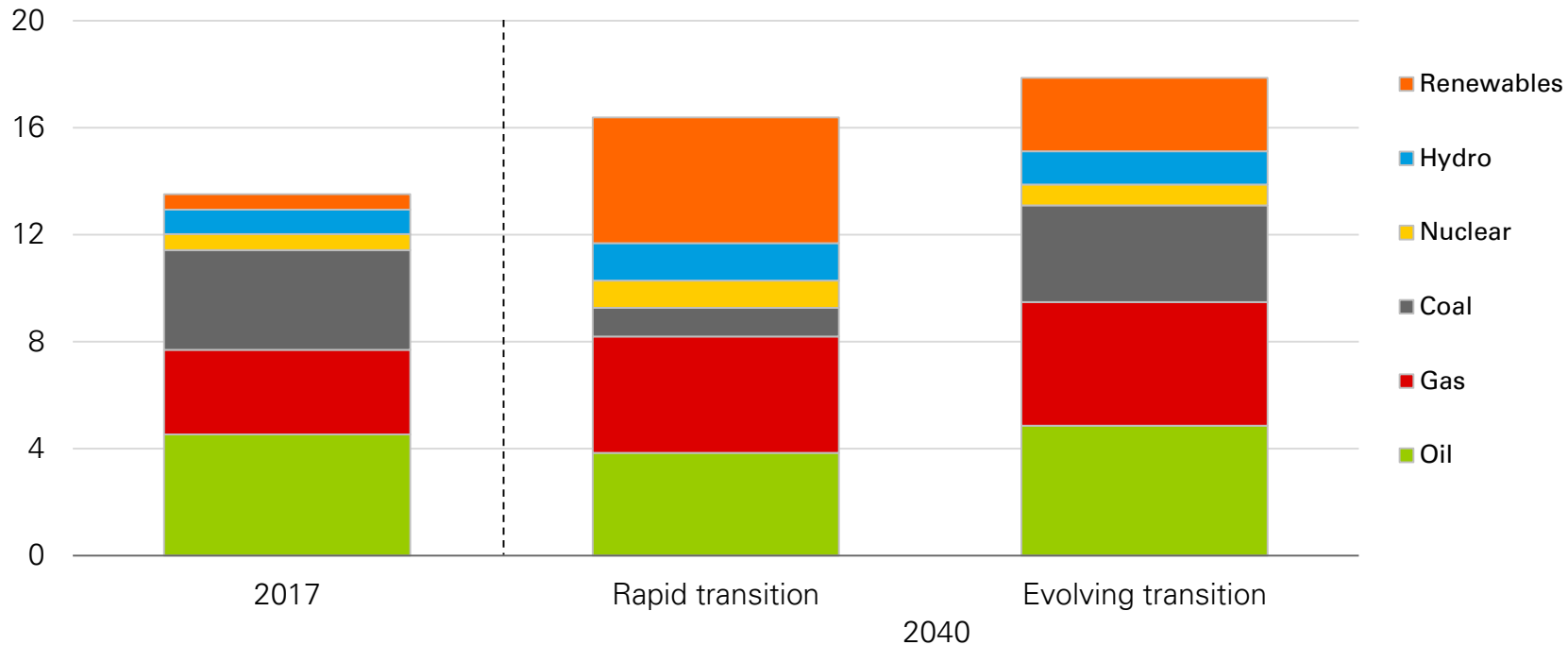
CO₂ in 2040: ET vs RT scenario



Global energy demand and fuel mix

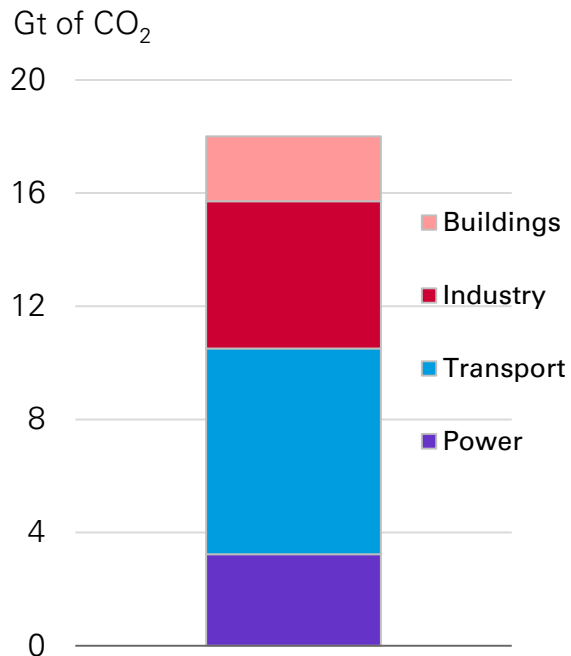
Primary energy consumption by fuel

Billion toe



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

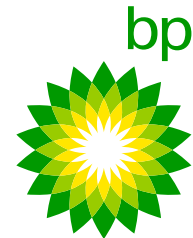
- Hydrogen
- Bioenergy

Efficiency

- Circular economy
- Process efficiency

Storage and removal of carbon

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



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