

BP Energy Outlook
2019 edition

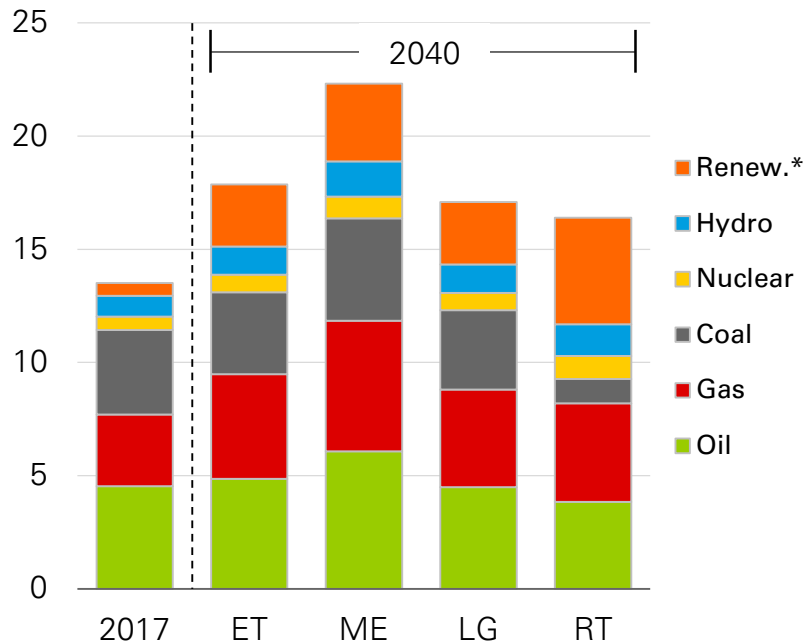
Richard de Caux
Head of refining analysis
Group Economics



Energy Outlook scenarios

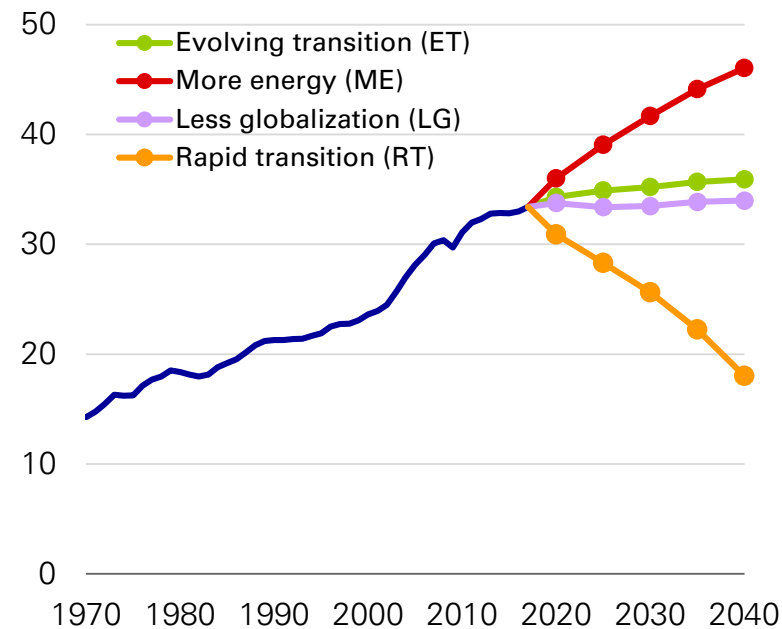
Primary energy consumption by fuel

Billion toe



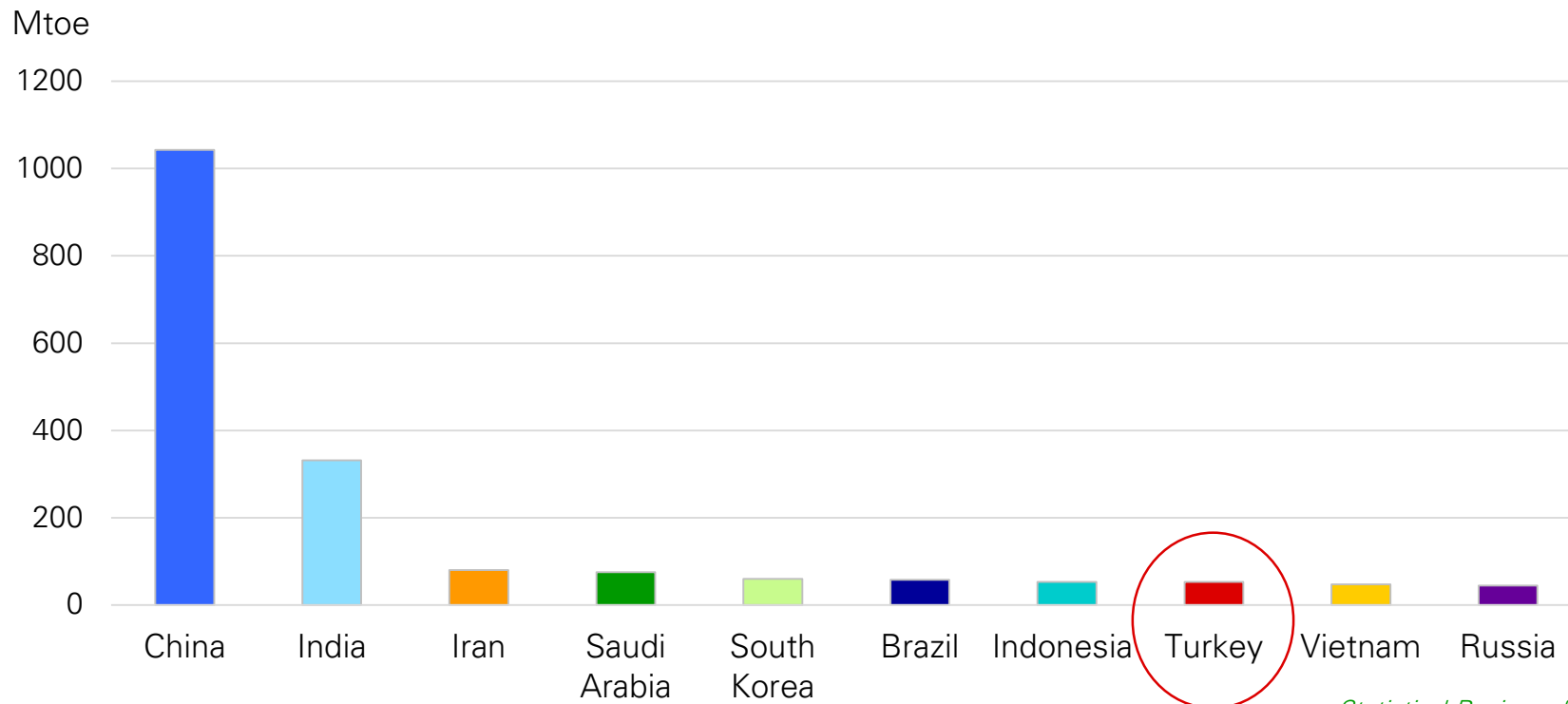
CO₂ emissions

Gt of CO₂

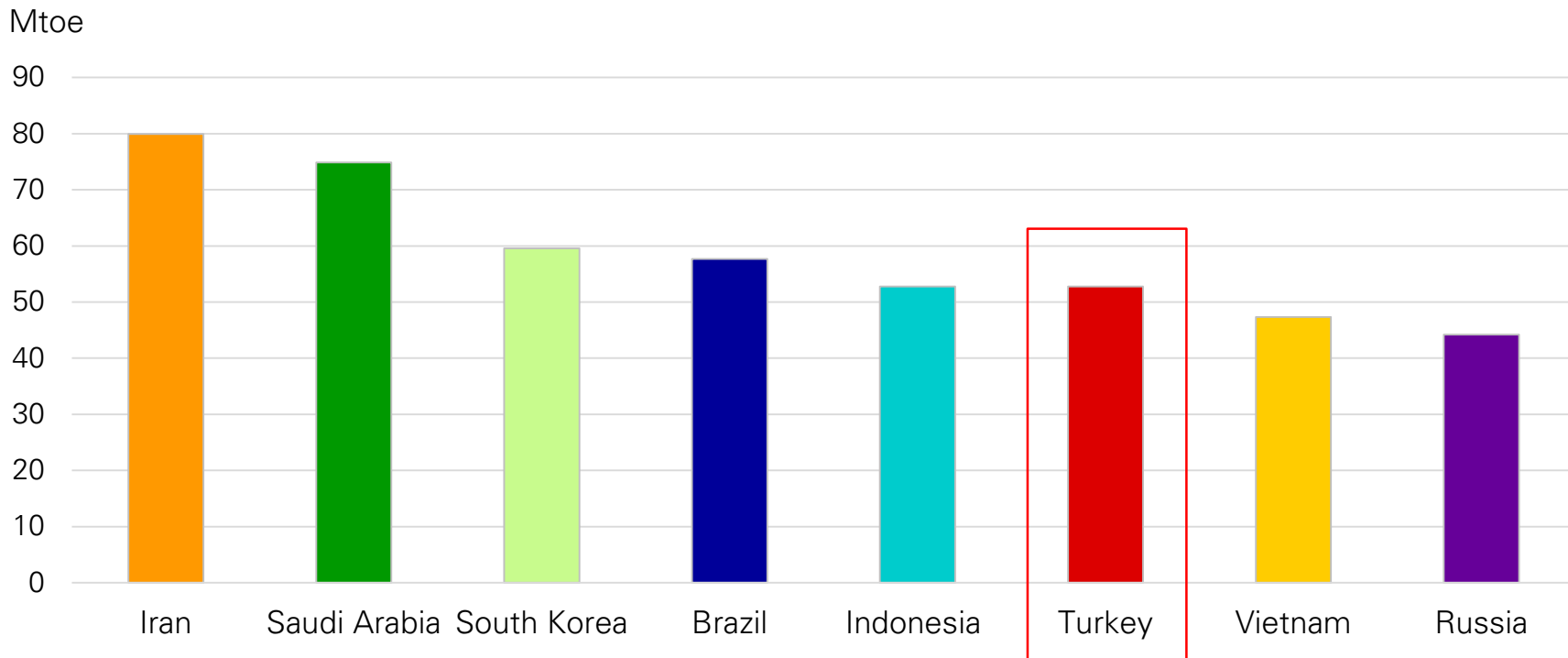


*Renewables includes wind, solar, geothermal, biomass and biofuels

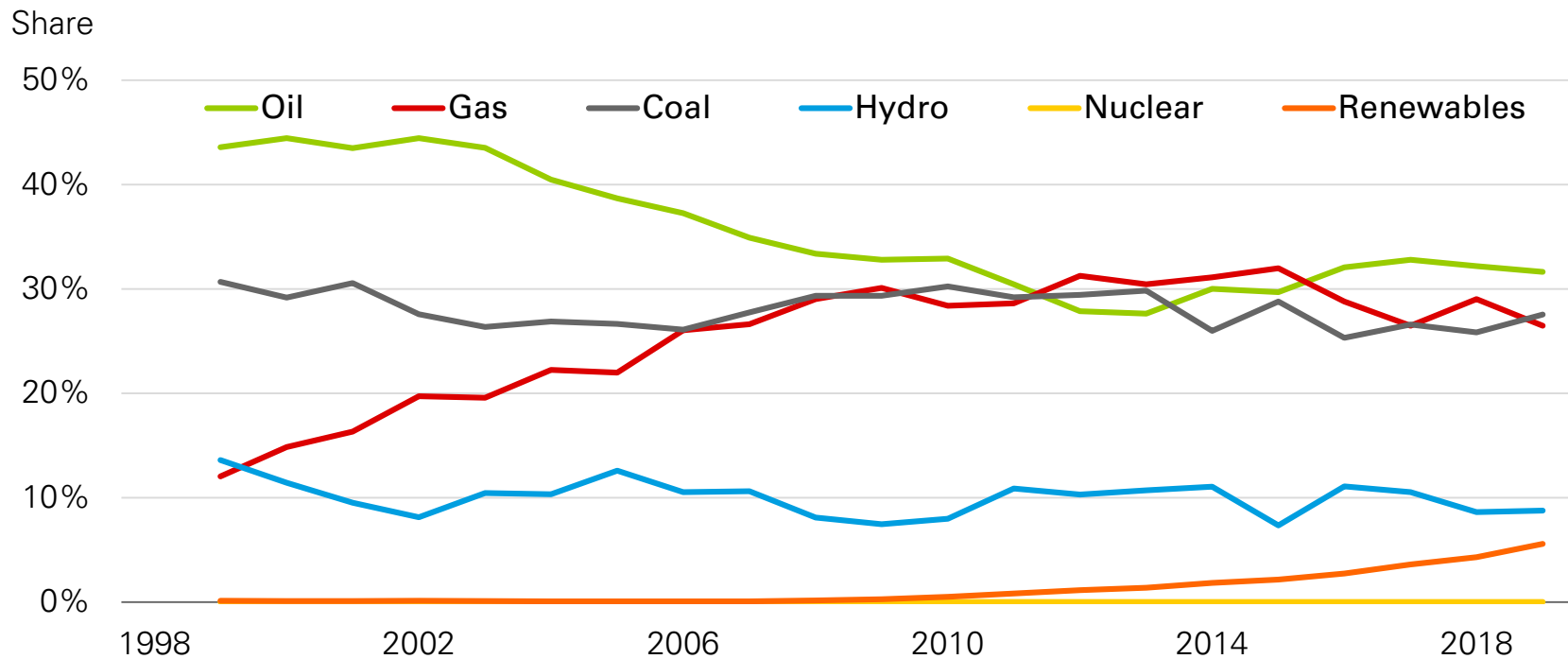
Top 10 energy growth countries over the last 10 years



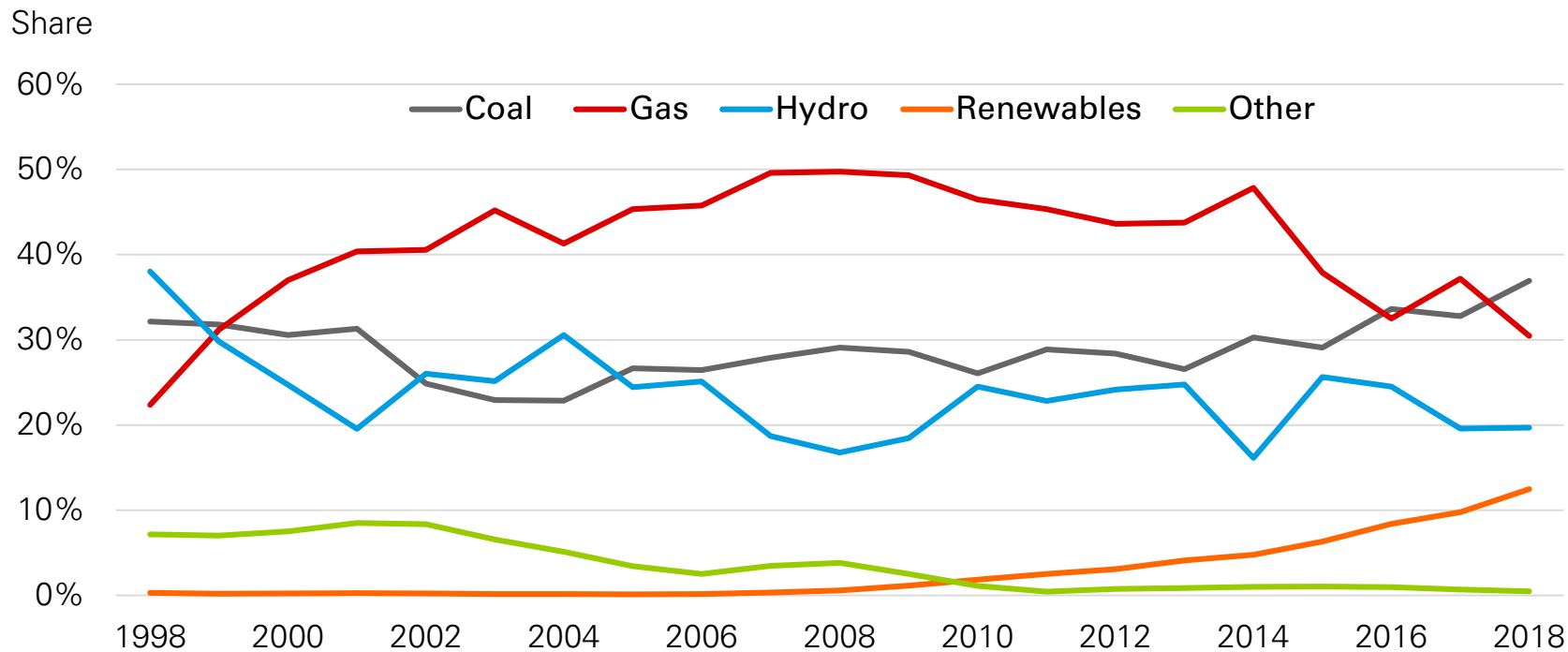
... excluding China and India



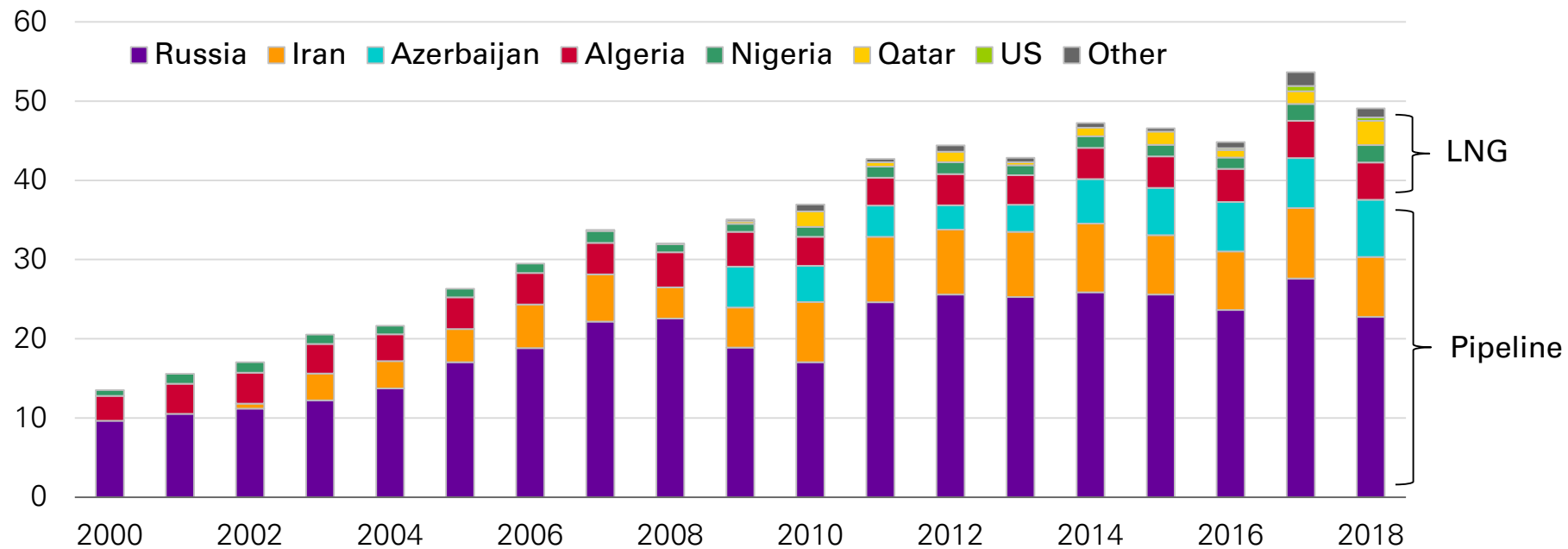
Turkey's energy mix



Fuel shares in power



Turkey's gas imports

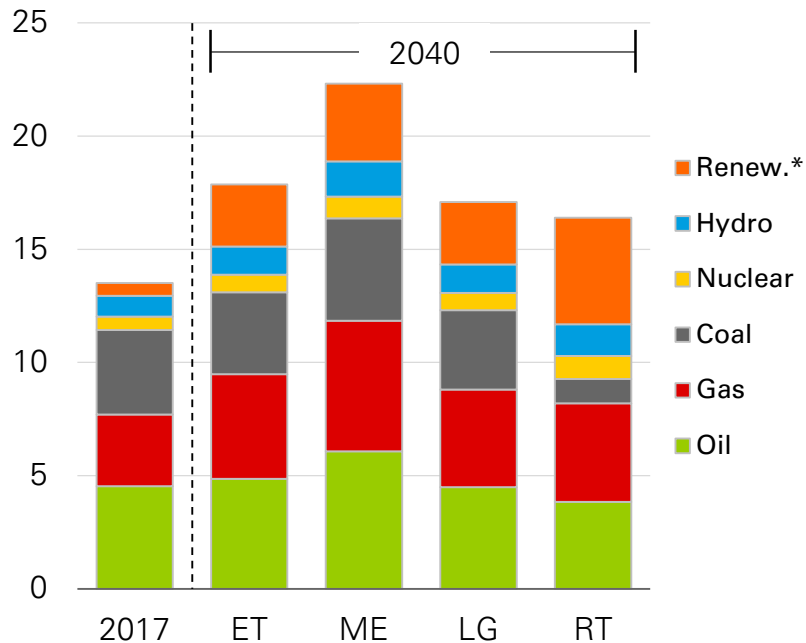




Energy Outlook scenarios

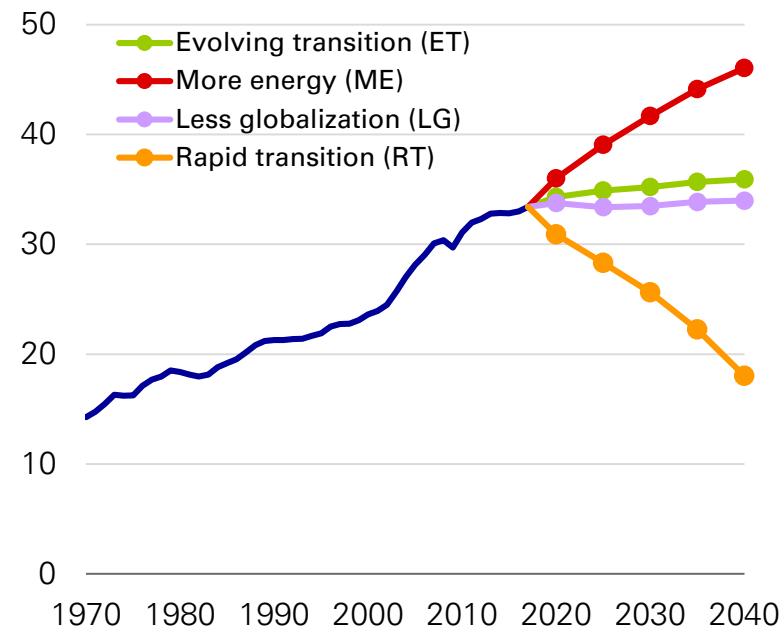
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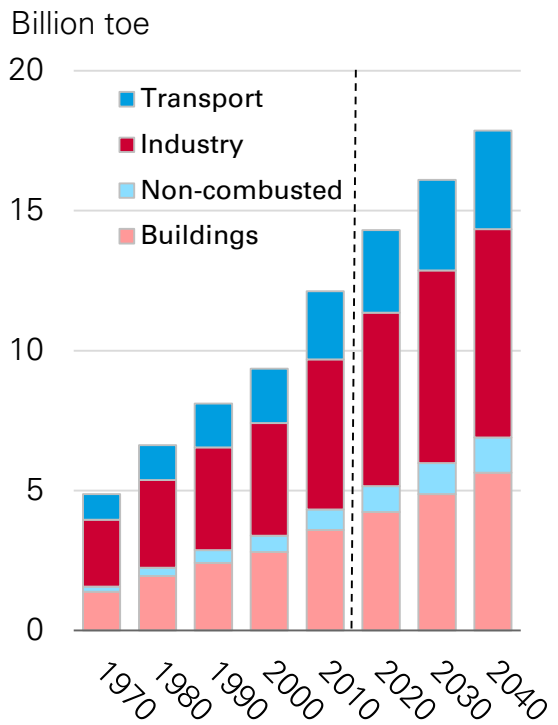
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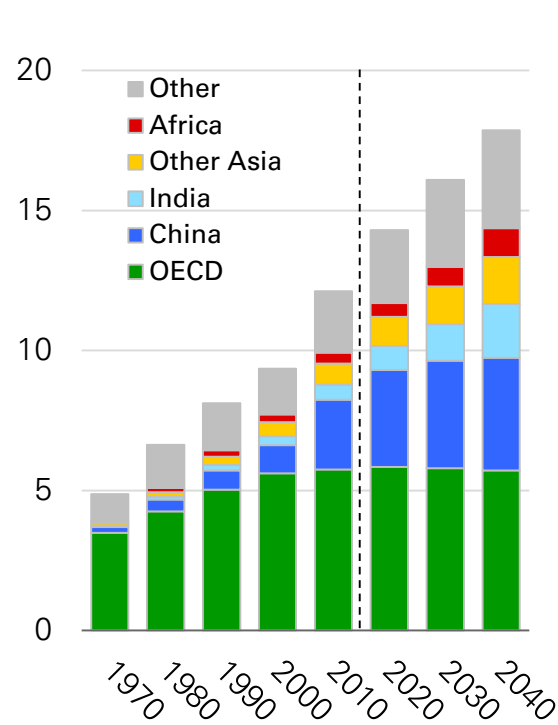
Three windows on the energy transition

Primary energy demand

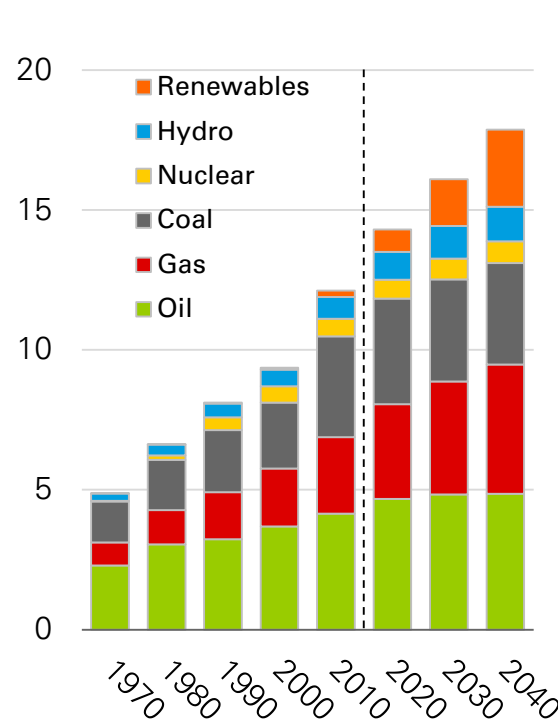
End-use sector



Region



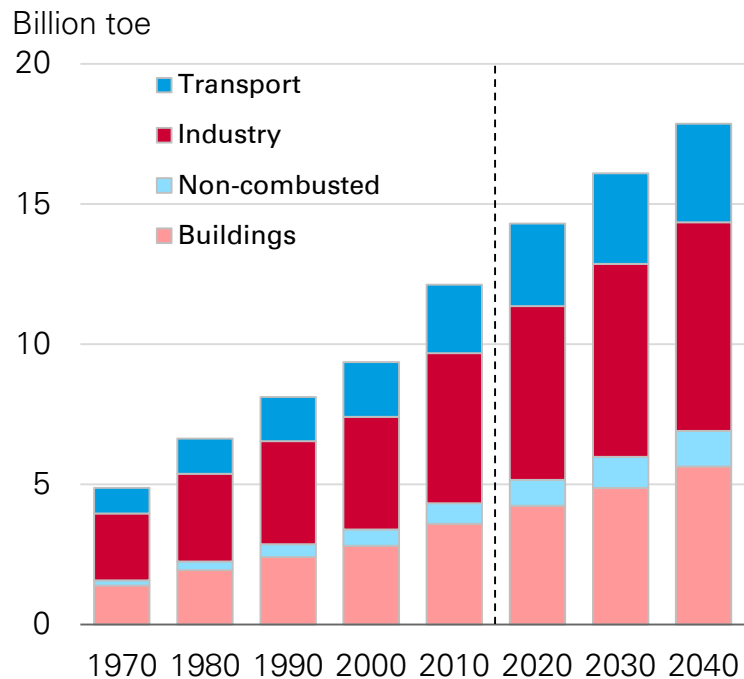
Fuel



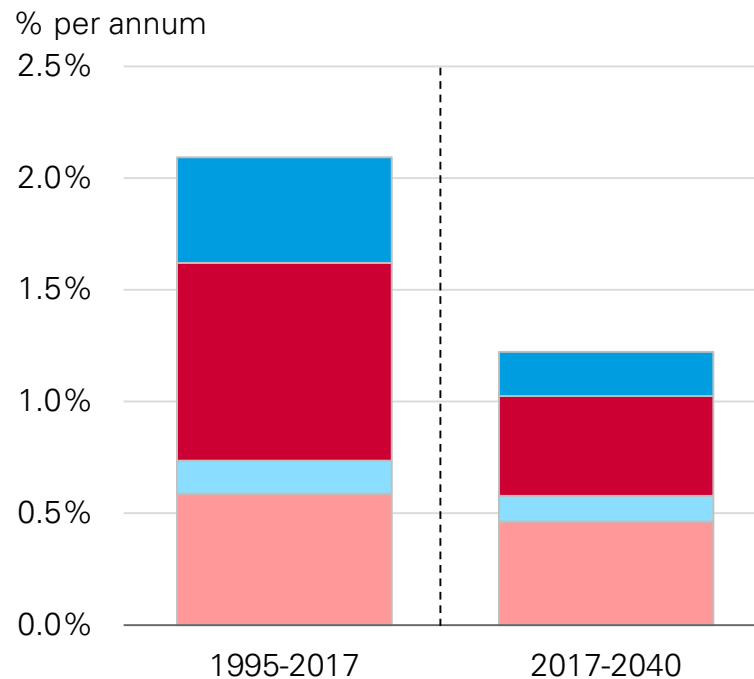


Energy demand by sector

Primary energy consumption by end-use sector



Annual demand growth and sector contributions

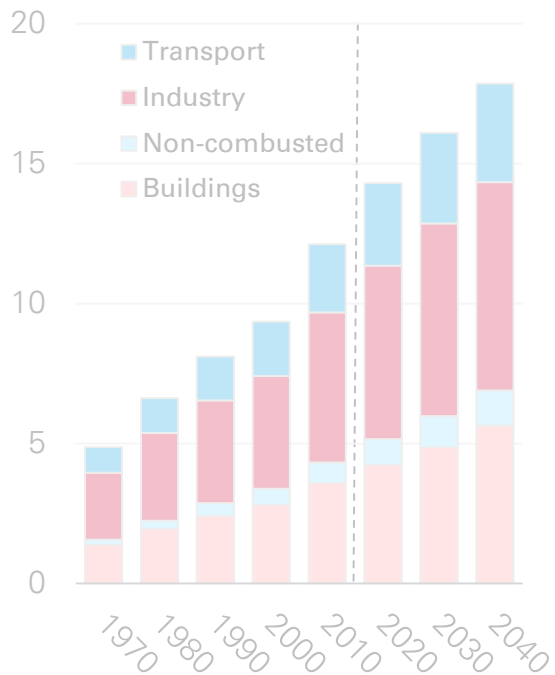




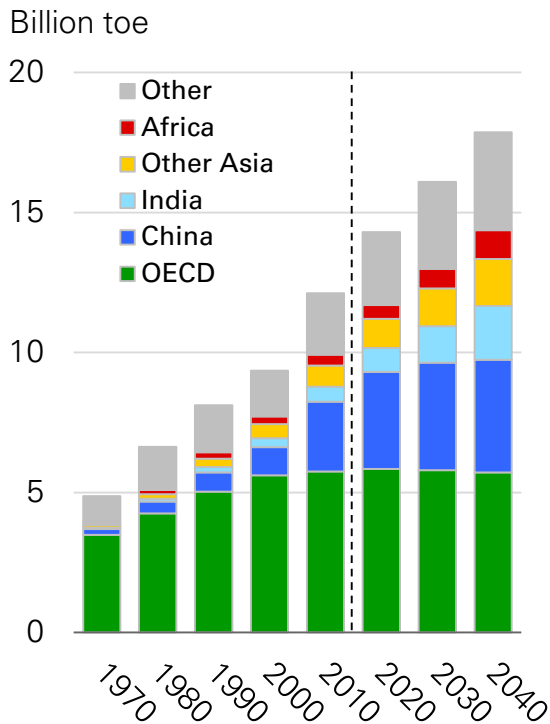
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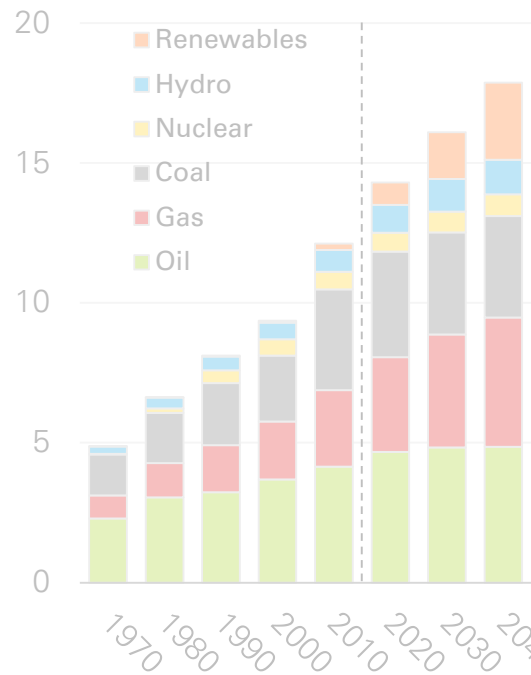
End-use sector



Region



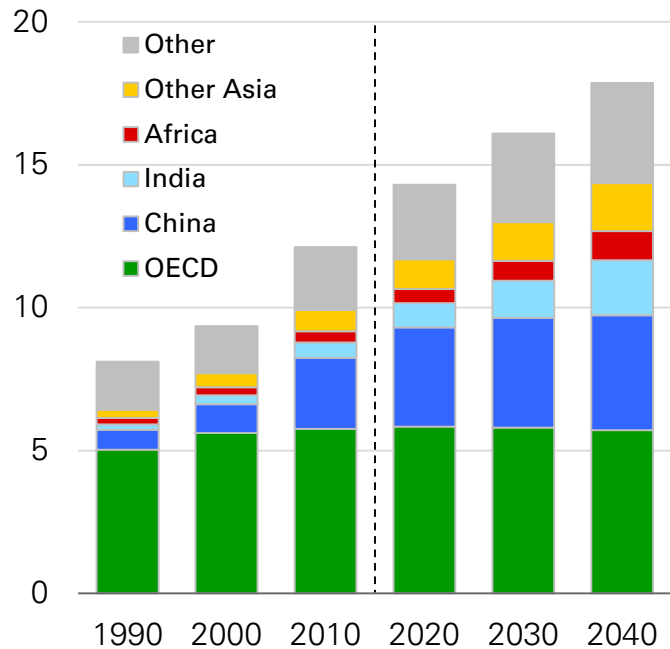
Fuel



Regional energy demand

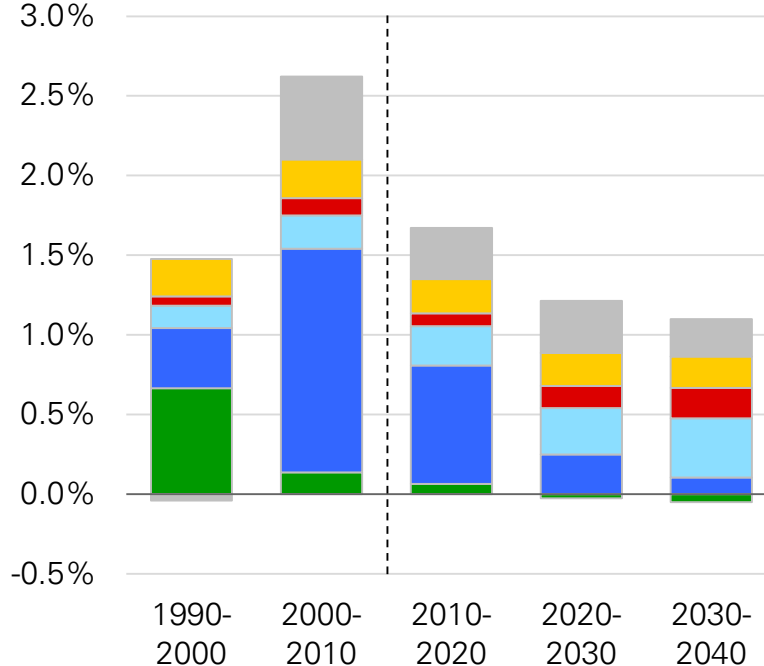
Primary energy consumption by region

Billion toe



Primary energy growth and regional contributions

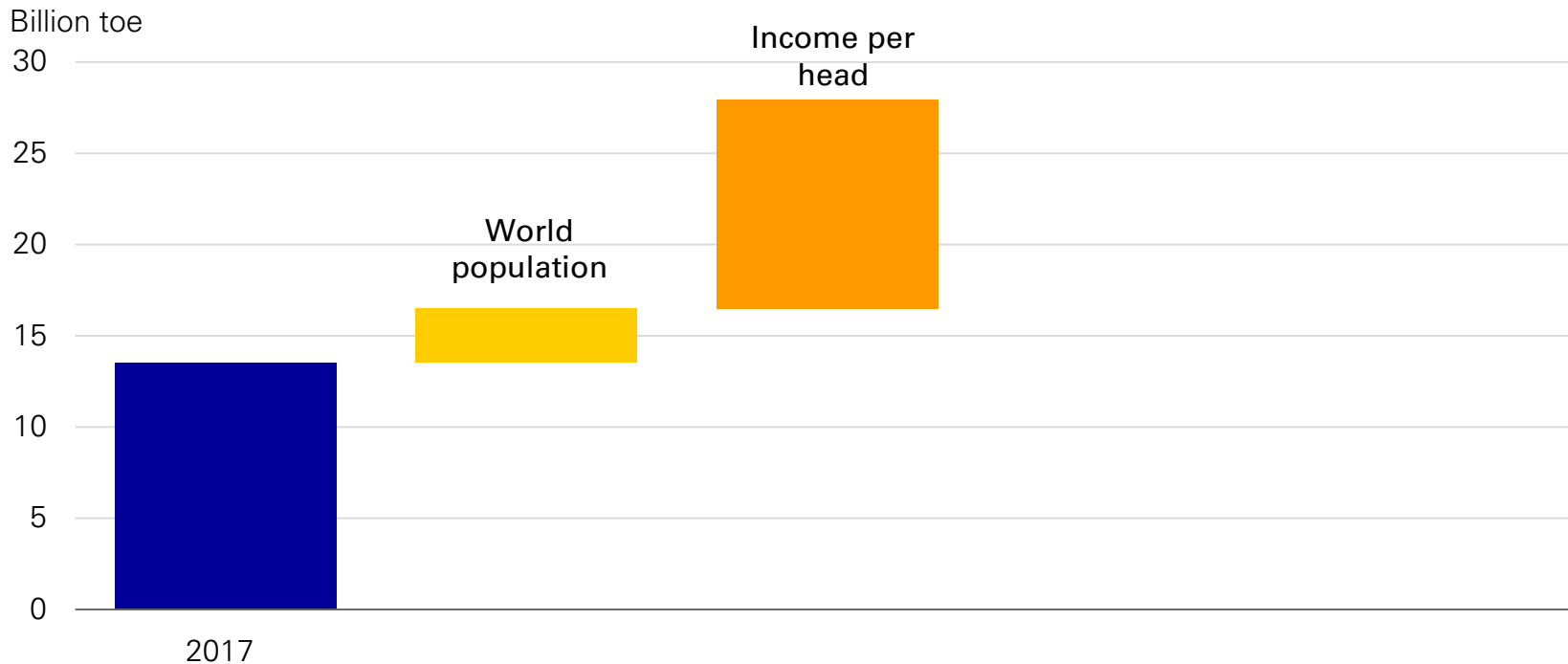
% per annum





Increase in primary energy demand

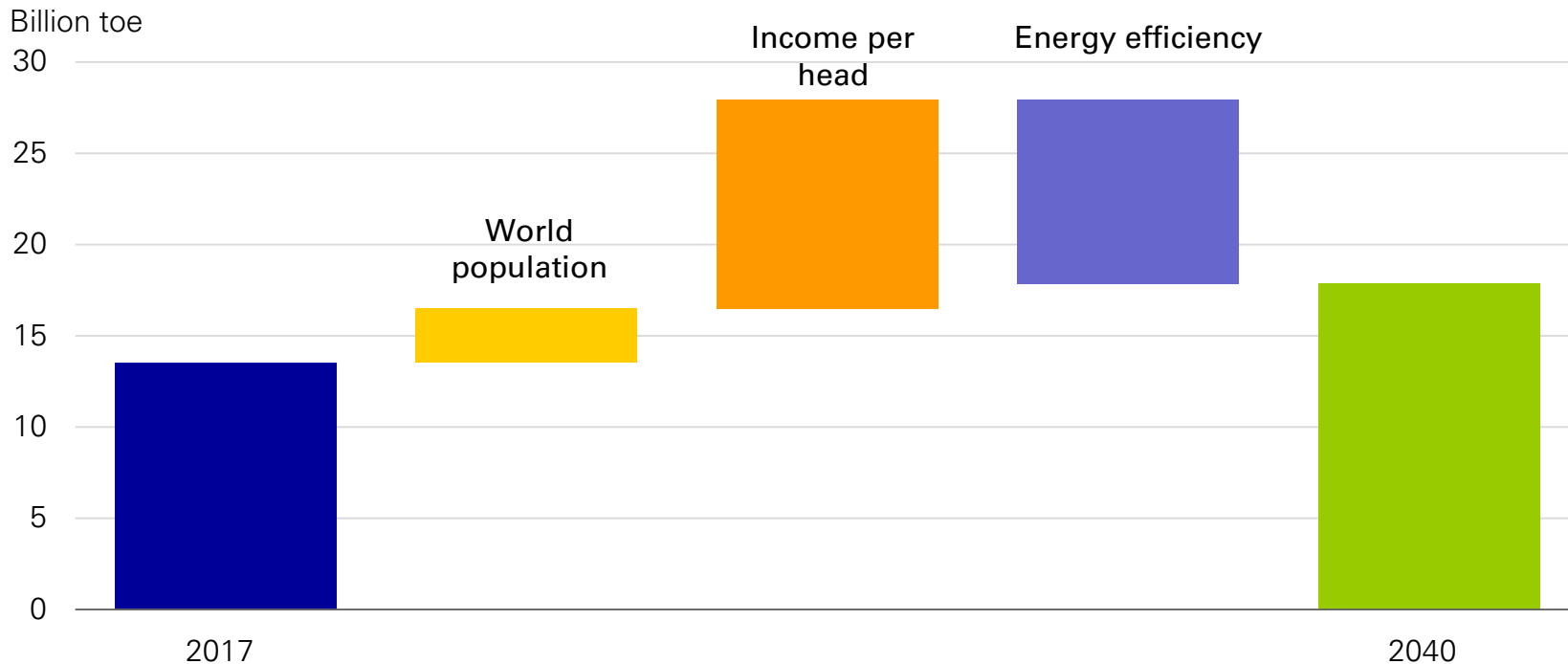
Increase in primary energy demand, 2017-2040





Increase in primary energy demand

Increase in primary energy demand, 2017-2040

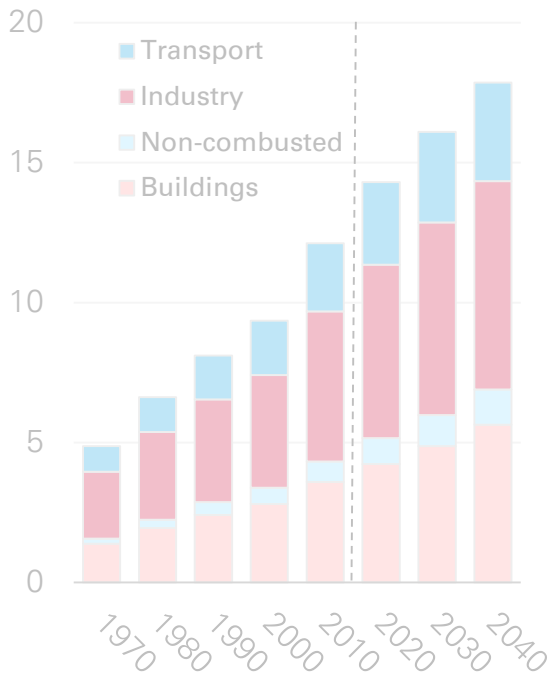




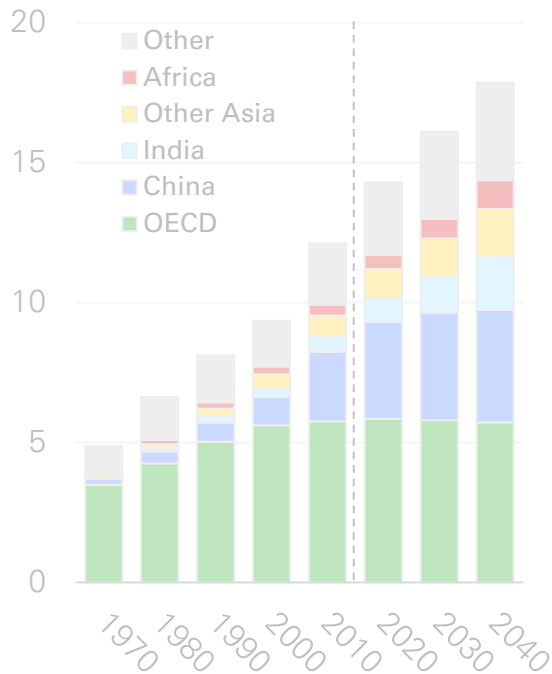
Three windows on the energy transition

Primary energy demand

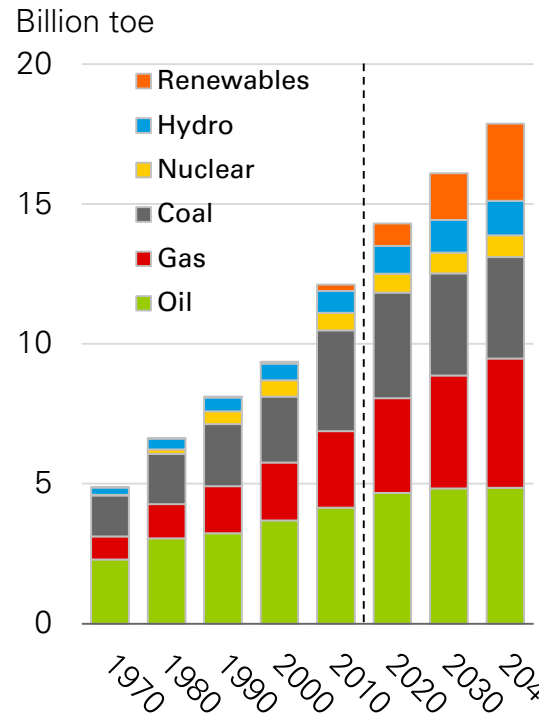
End-use sector



Region



Fuel

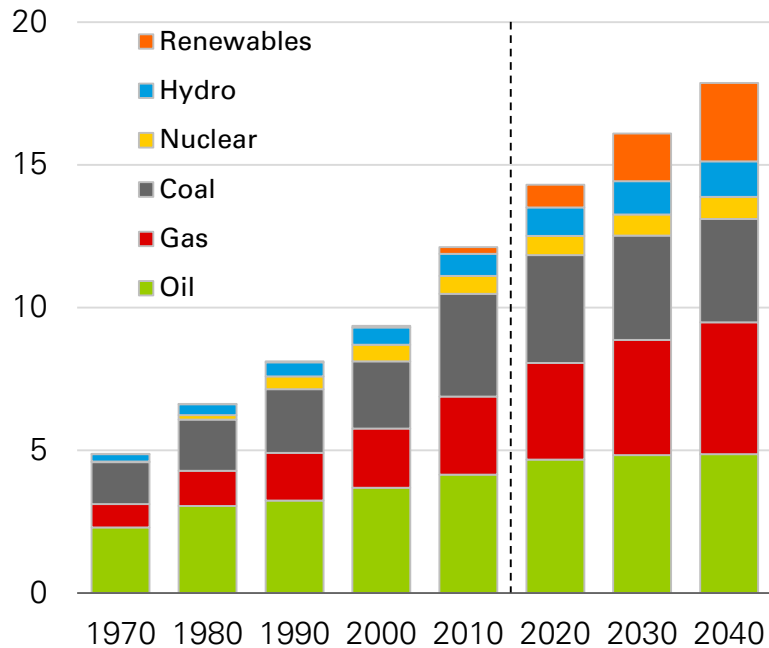




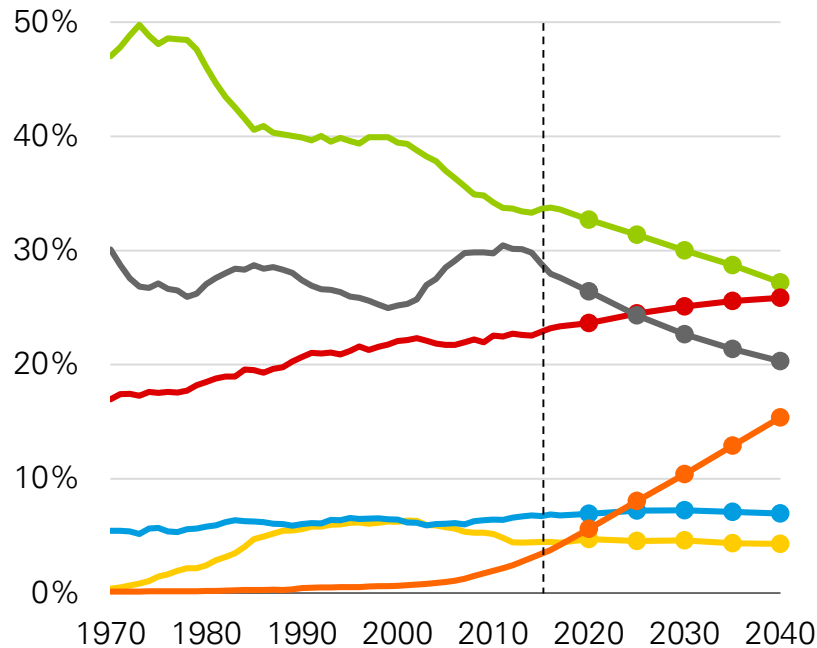
Global energy by fuel type

Primary energy consumption by fuel

Billion toe

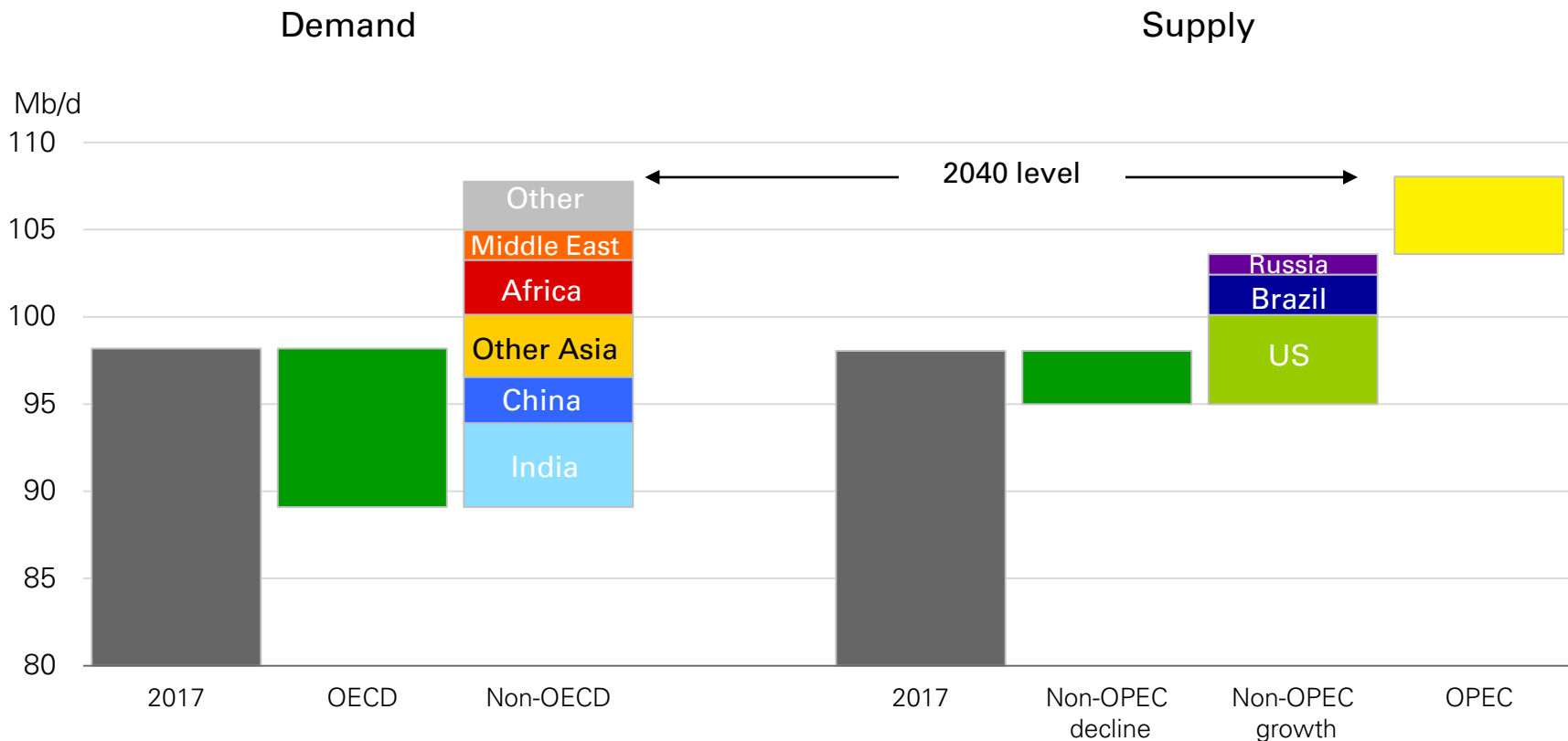


Shares of primary energy





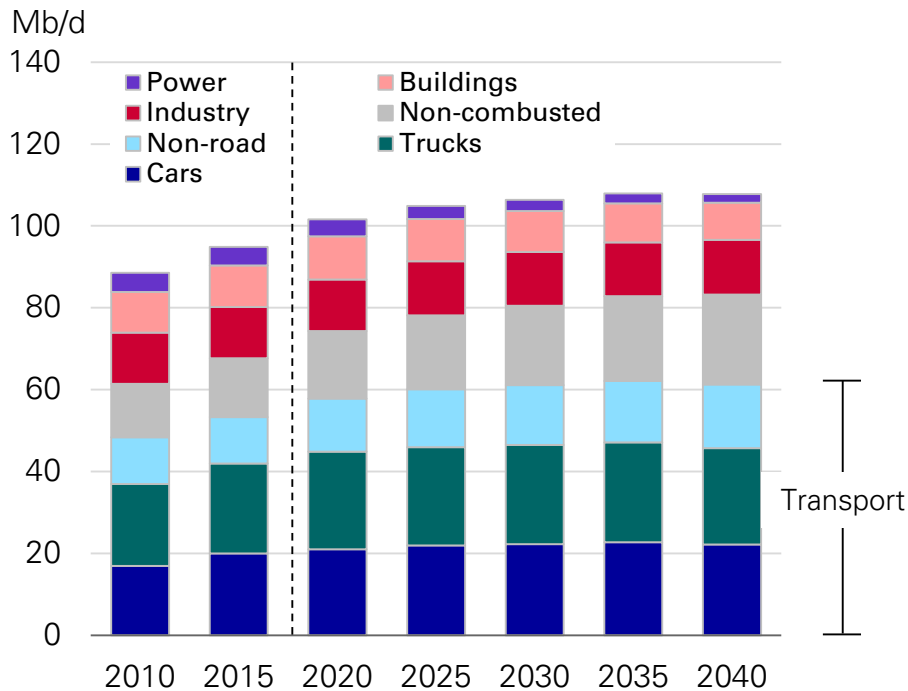
Growing demand for liquid fuels in emerging economies...



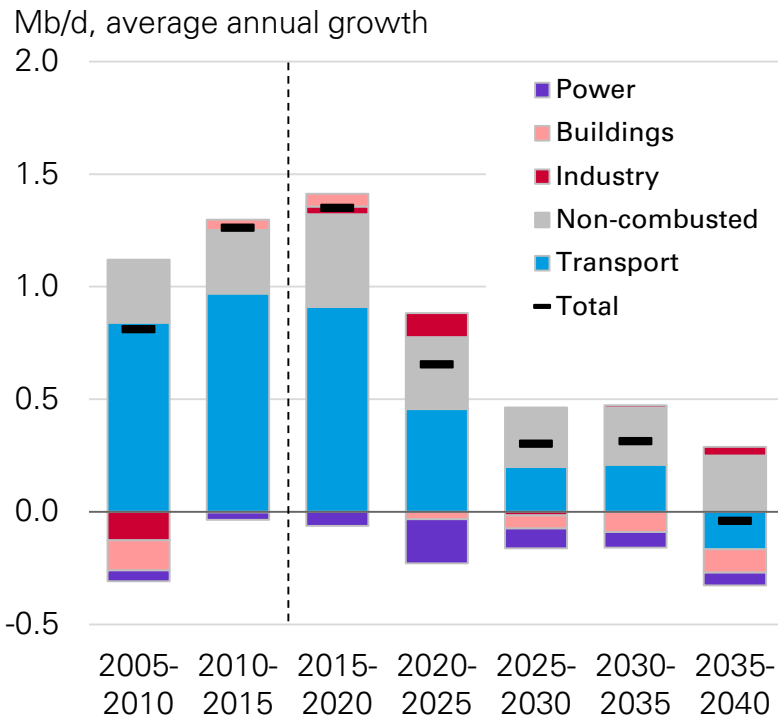


Demand for oil and other liquid fuels

Liquids demand



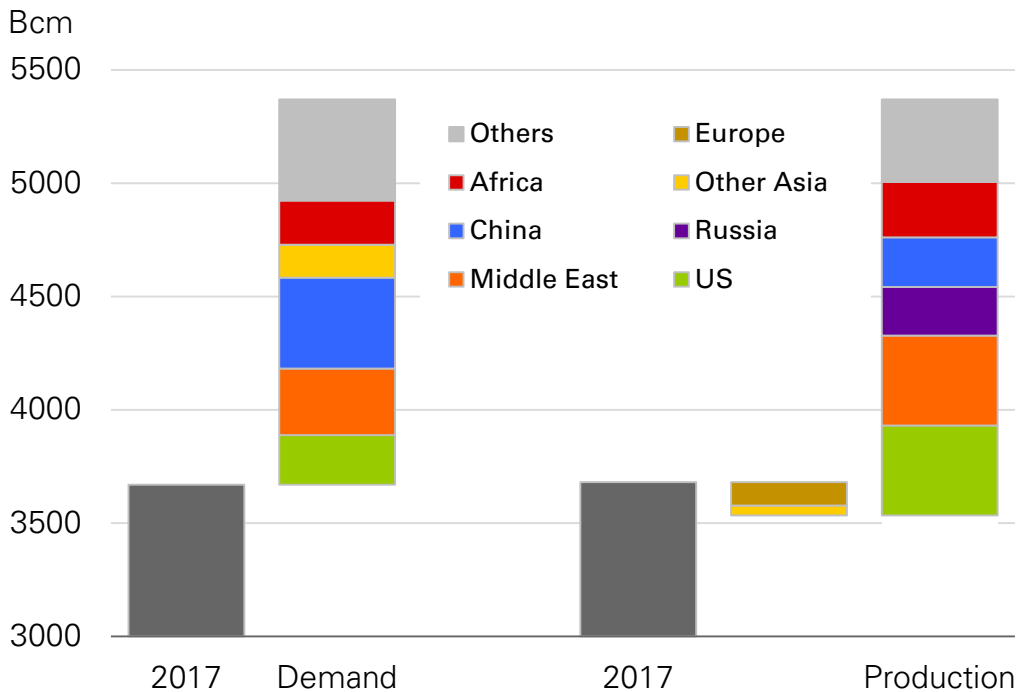
Liquids demand growth



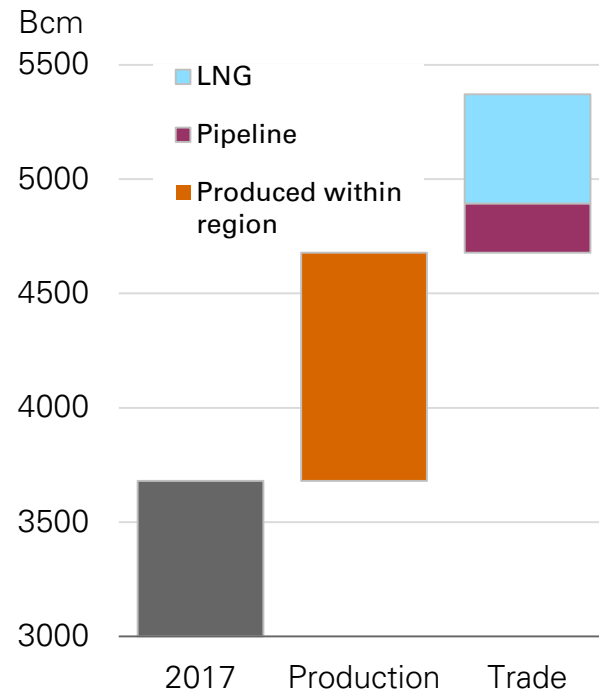


Natural gas grows strongly, with broad-based demand...

Gas demand and production, 2017-40



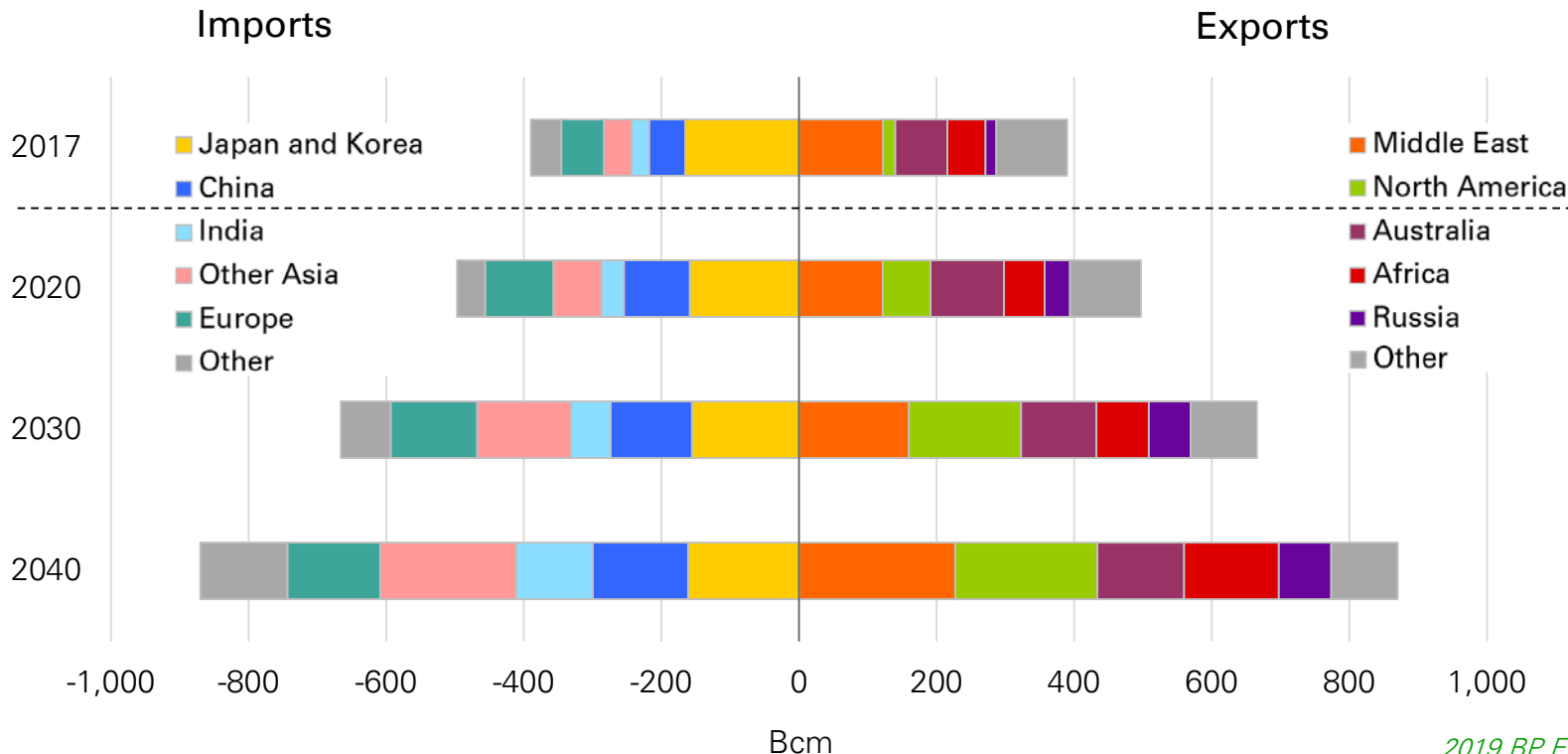
Gas trade, 2017-40



LNG exports increase significantly, led by US and Qatar...



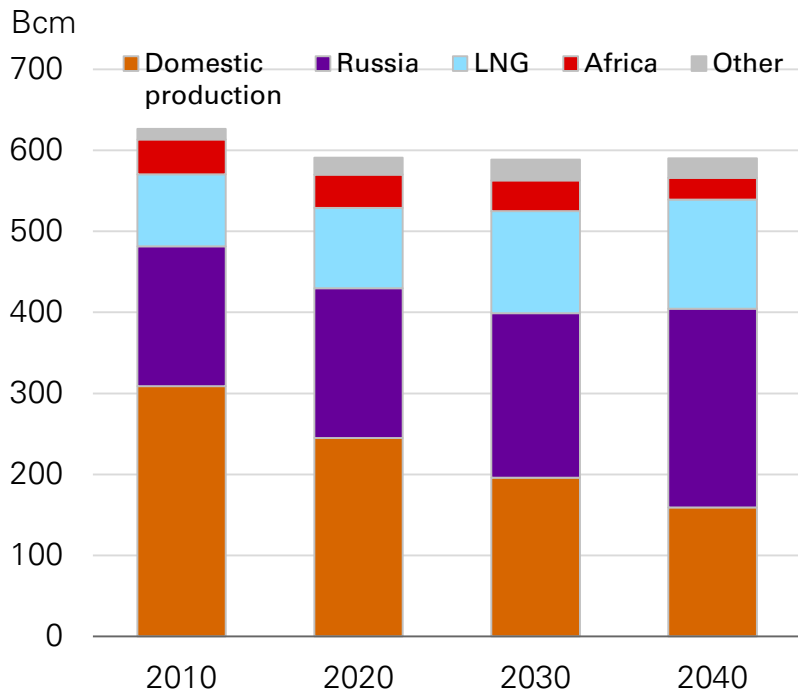
LNG imports and exports



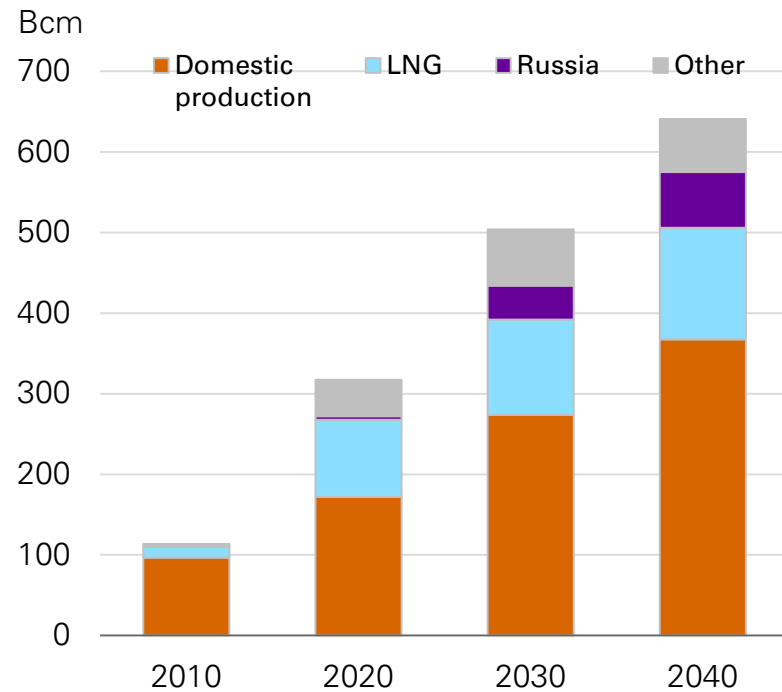


The increasing diversity of gas exports...

Gas supply to Europe

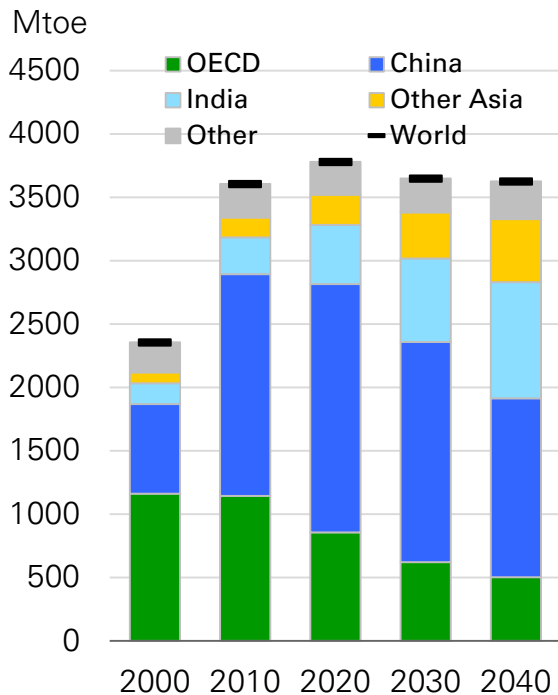


Gas supply to China

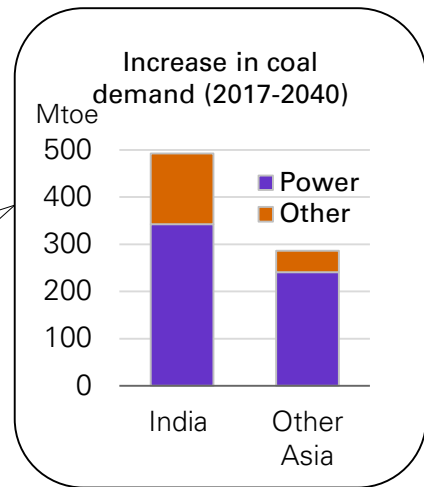
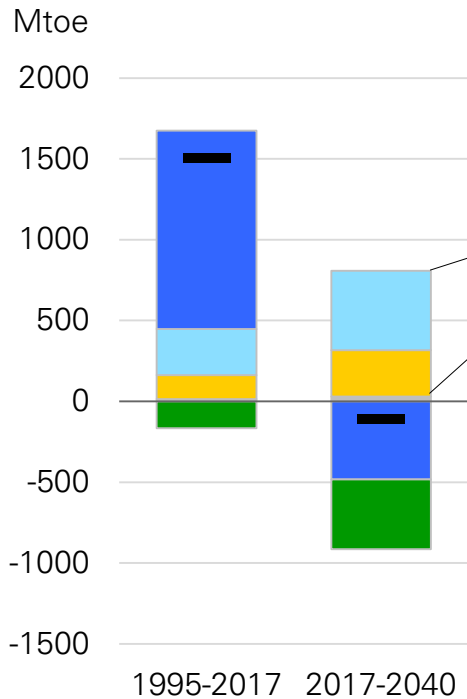


Global coal demand flatlines, with falls in China and OECD...

Coal demand by region



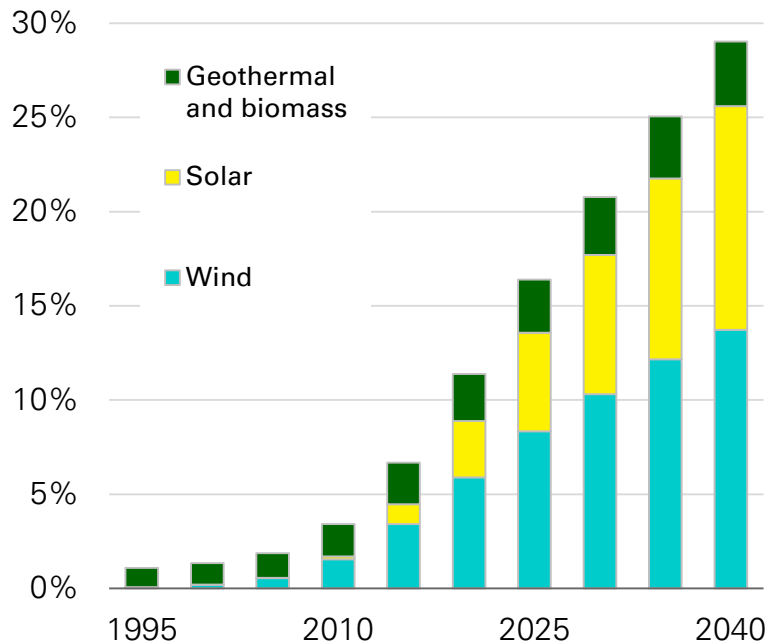
Change in coal demand by region



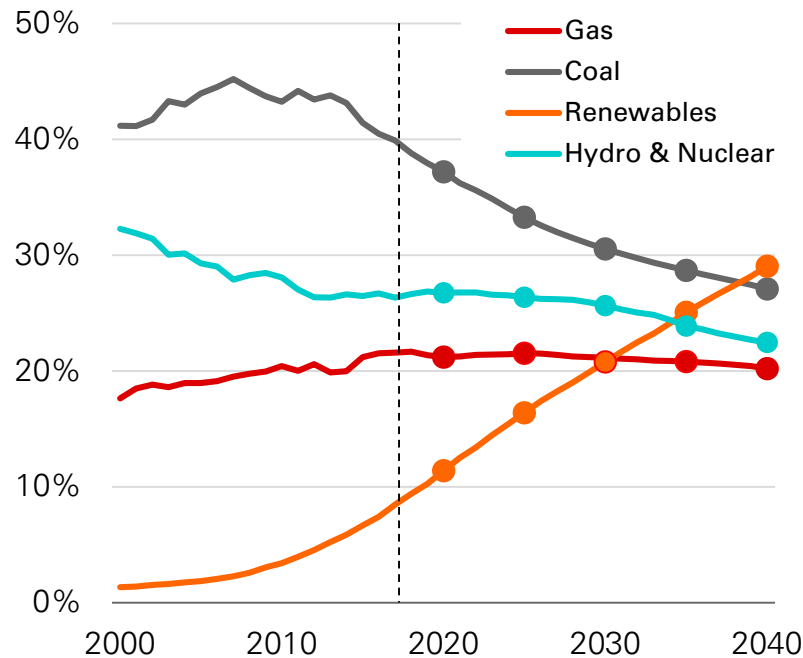


Renewables are the largest source of energy growth...

Renewables share of power generation by source



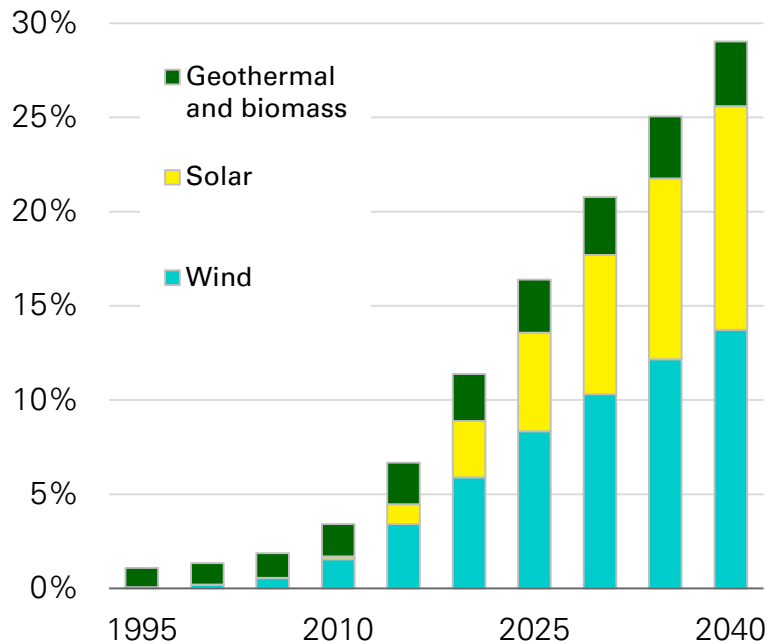
Fuel shares in power



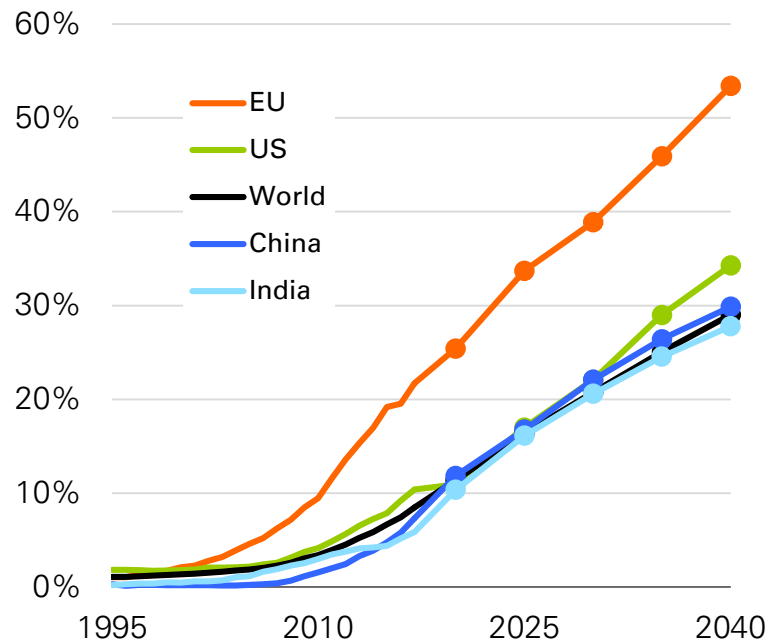


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Renewables share of power generation by source



Renewables share of power generation by region

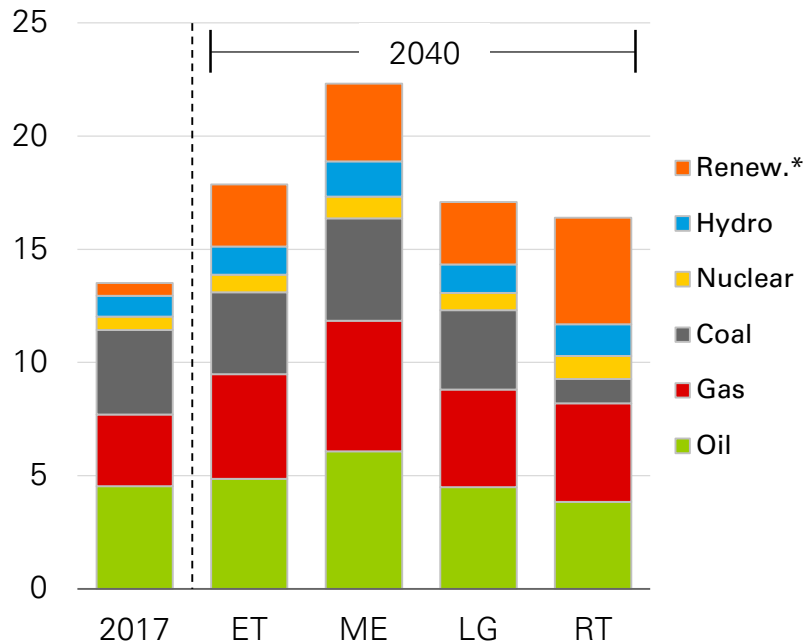




Energy Outlook scenarios

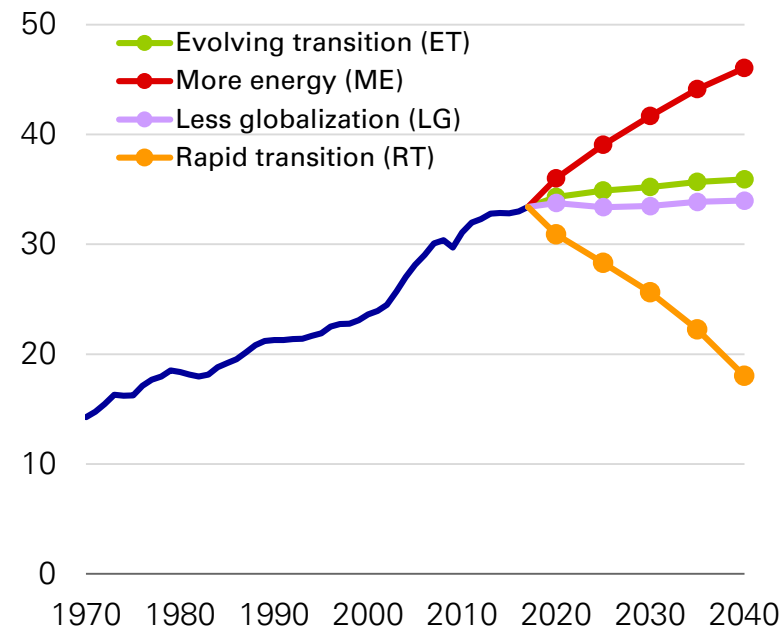
Primary energy consumption by fuel

Billion toe



CO₂ emissions

Gt of CO₂



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



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

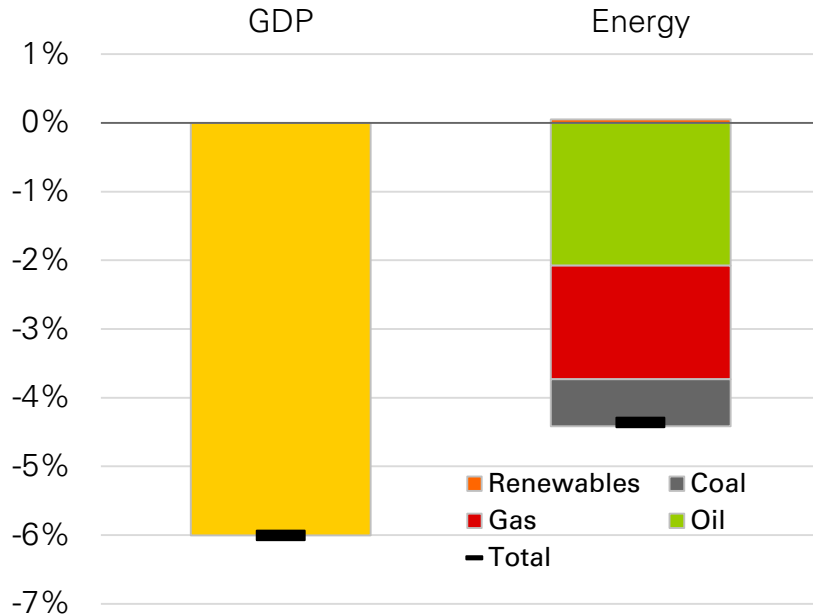


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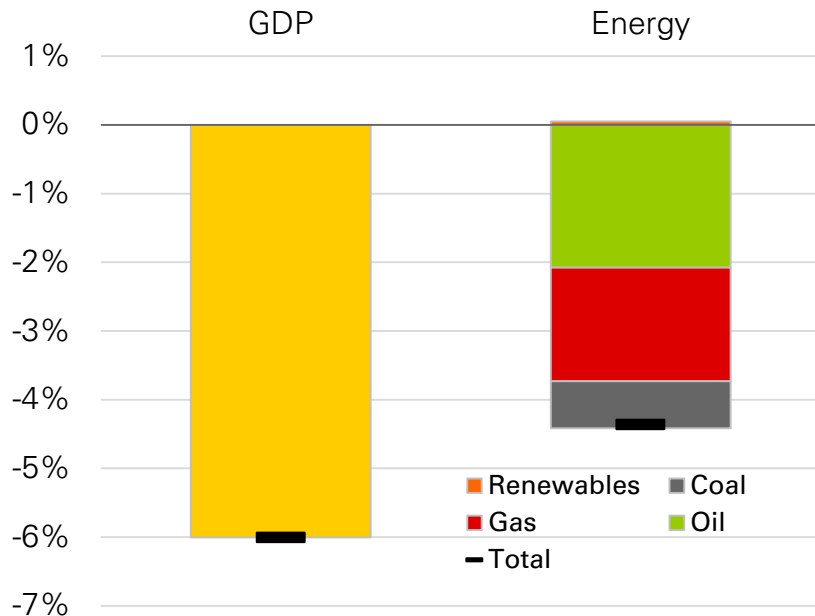
Alternative scenario: Less globalization

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

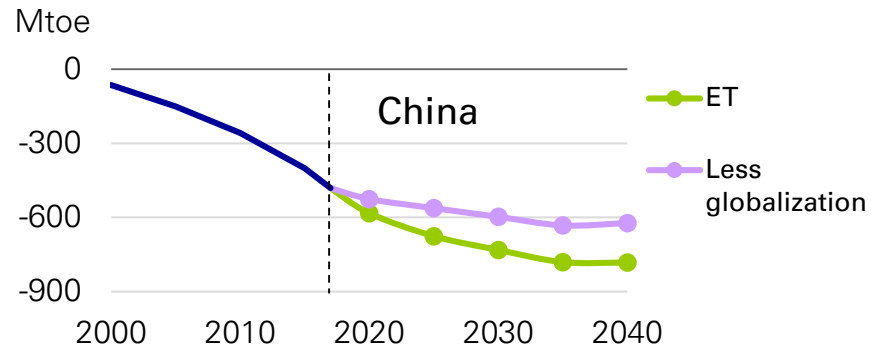


Alternative scenario: Less globalization

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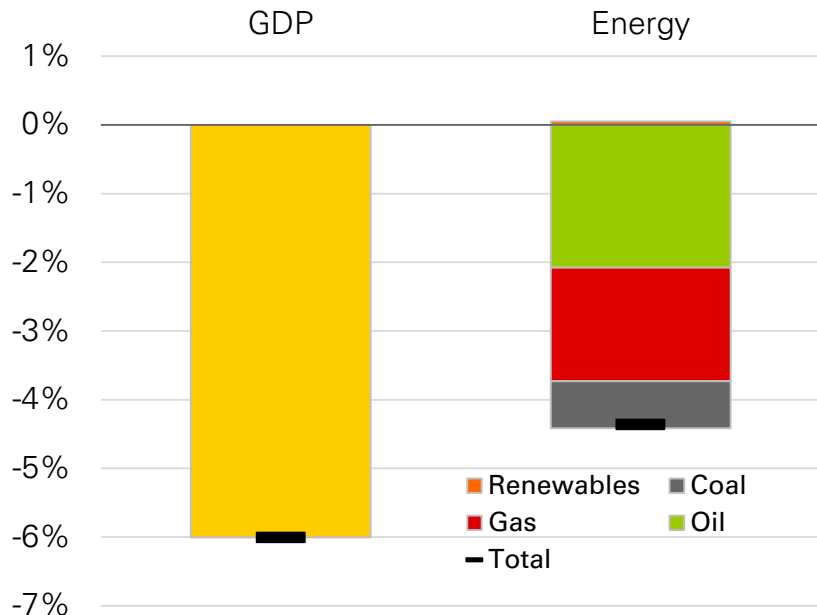


Net exports (oil & gas)

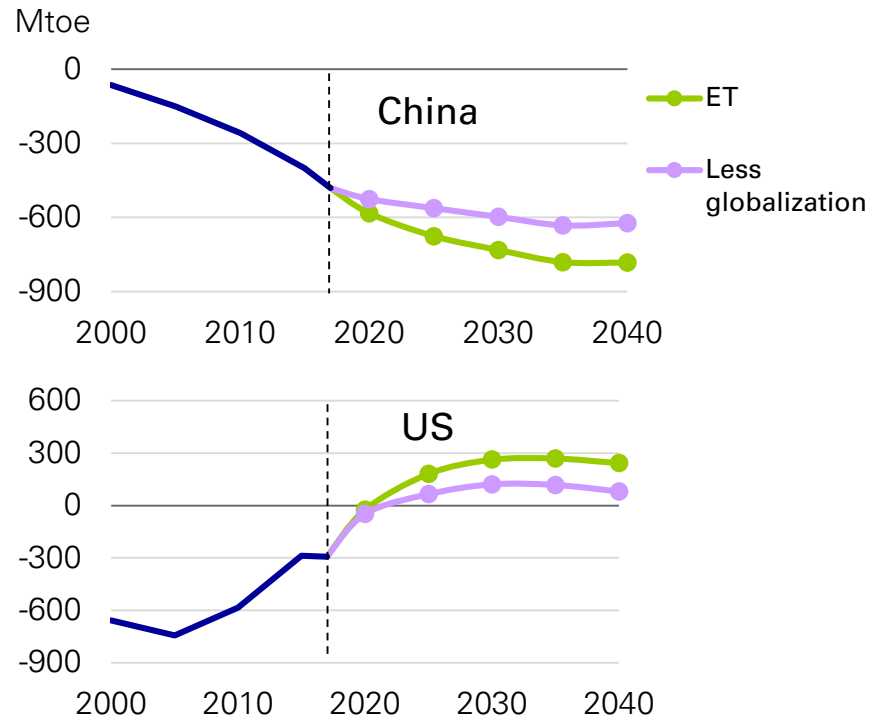


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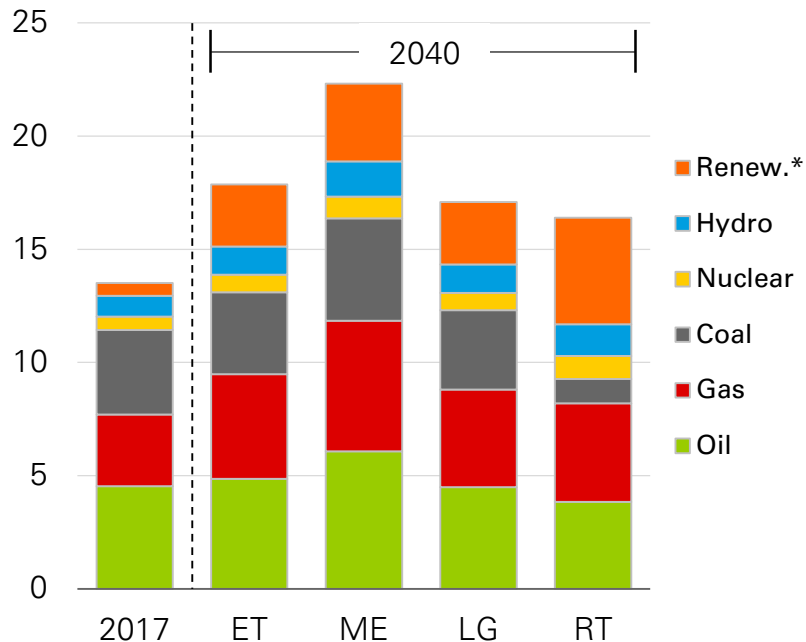




Energy Outlook scenarios

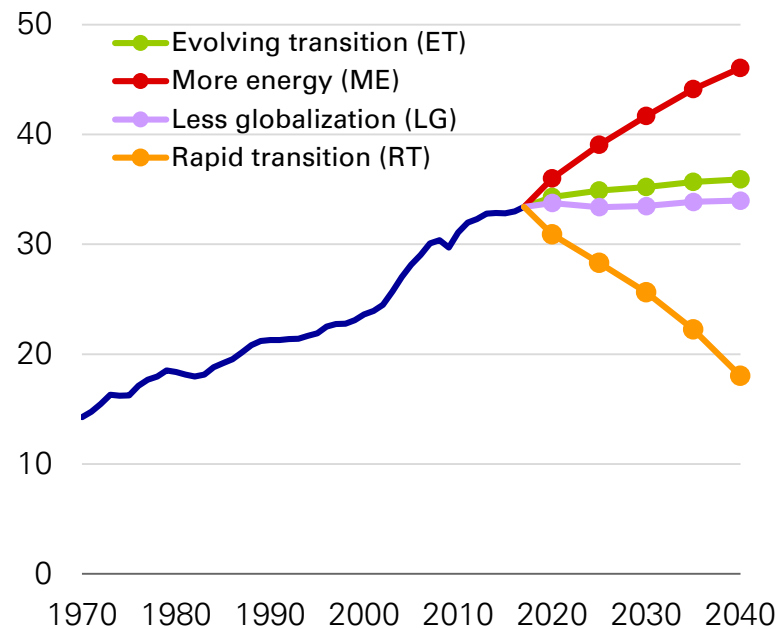
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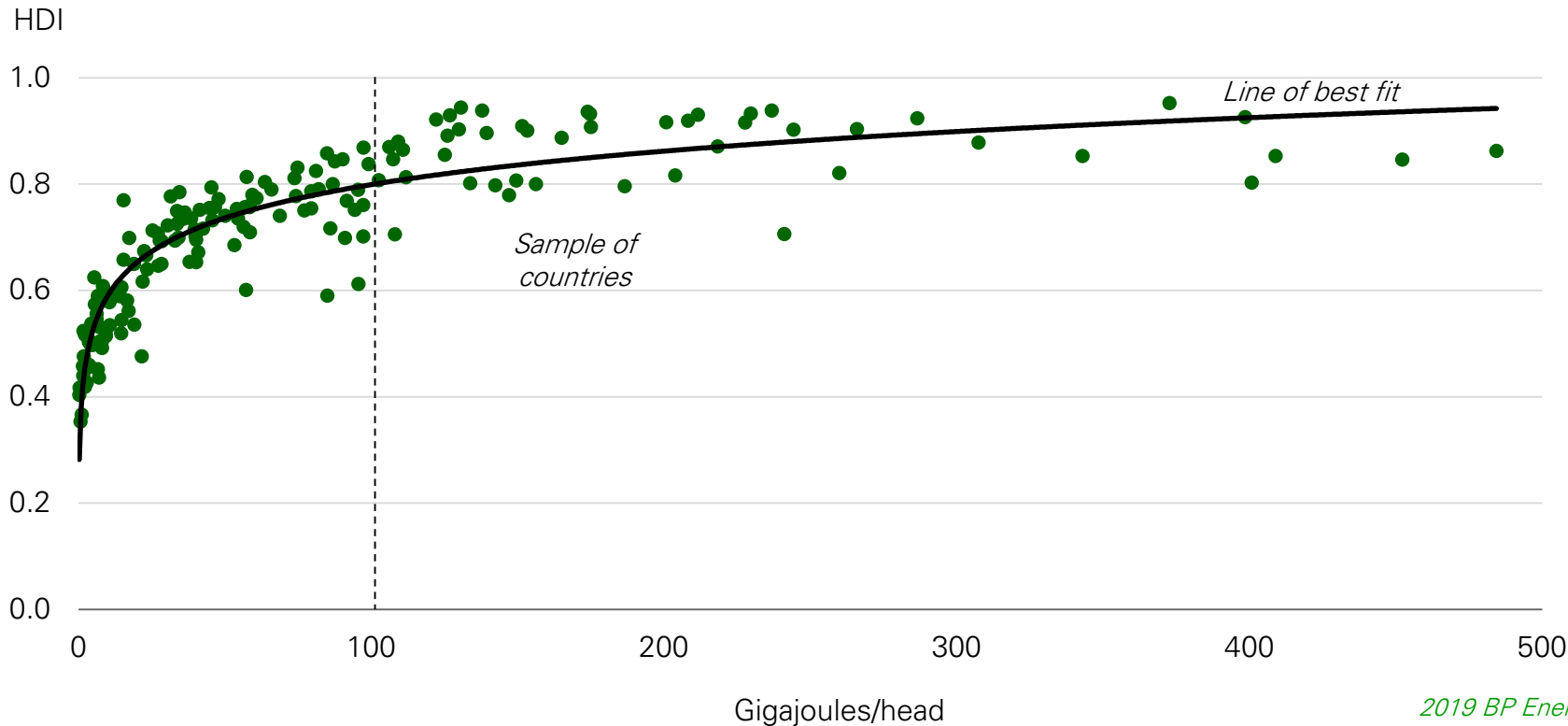


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Human development and energy consumption

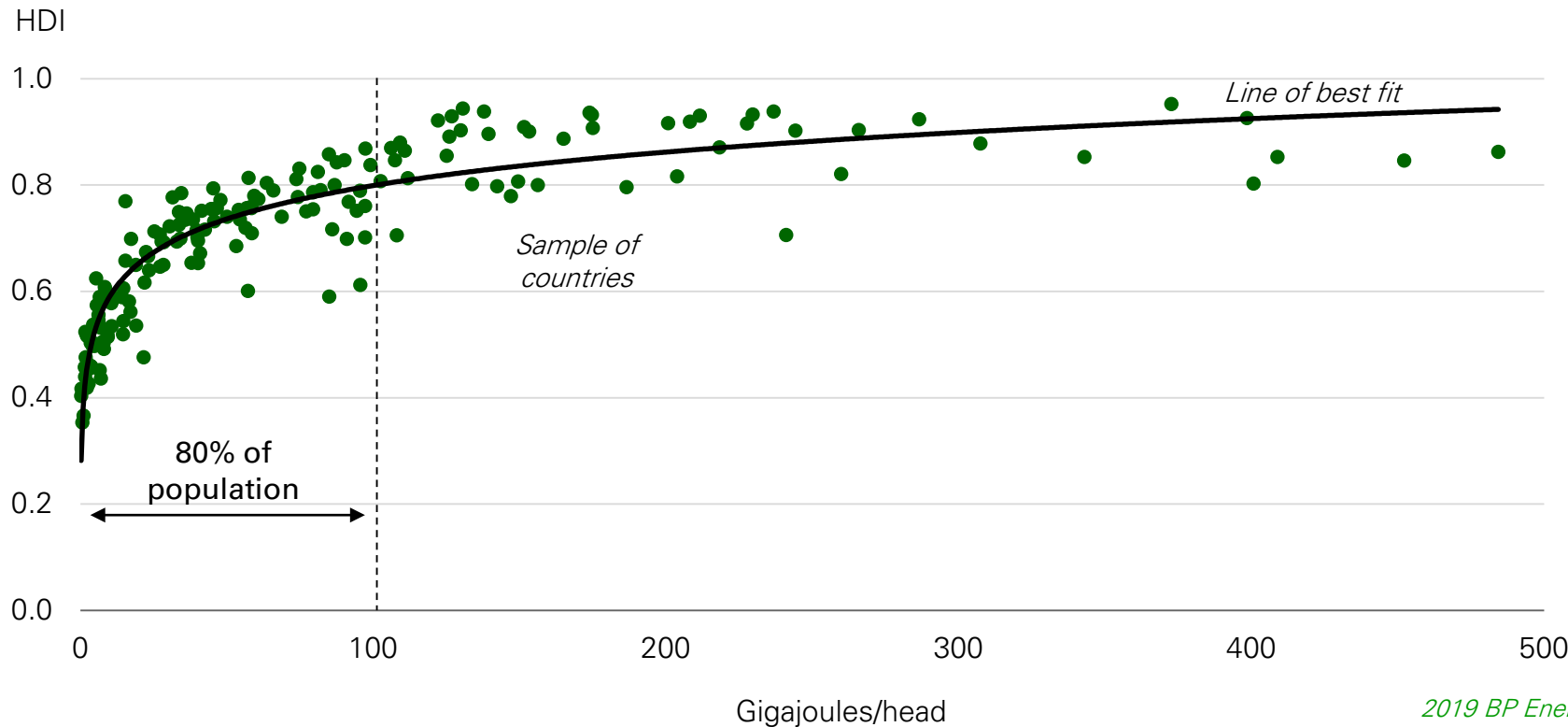
UN Human Development Index and energy consumption, 2017





Human development and energy consumption

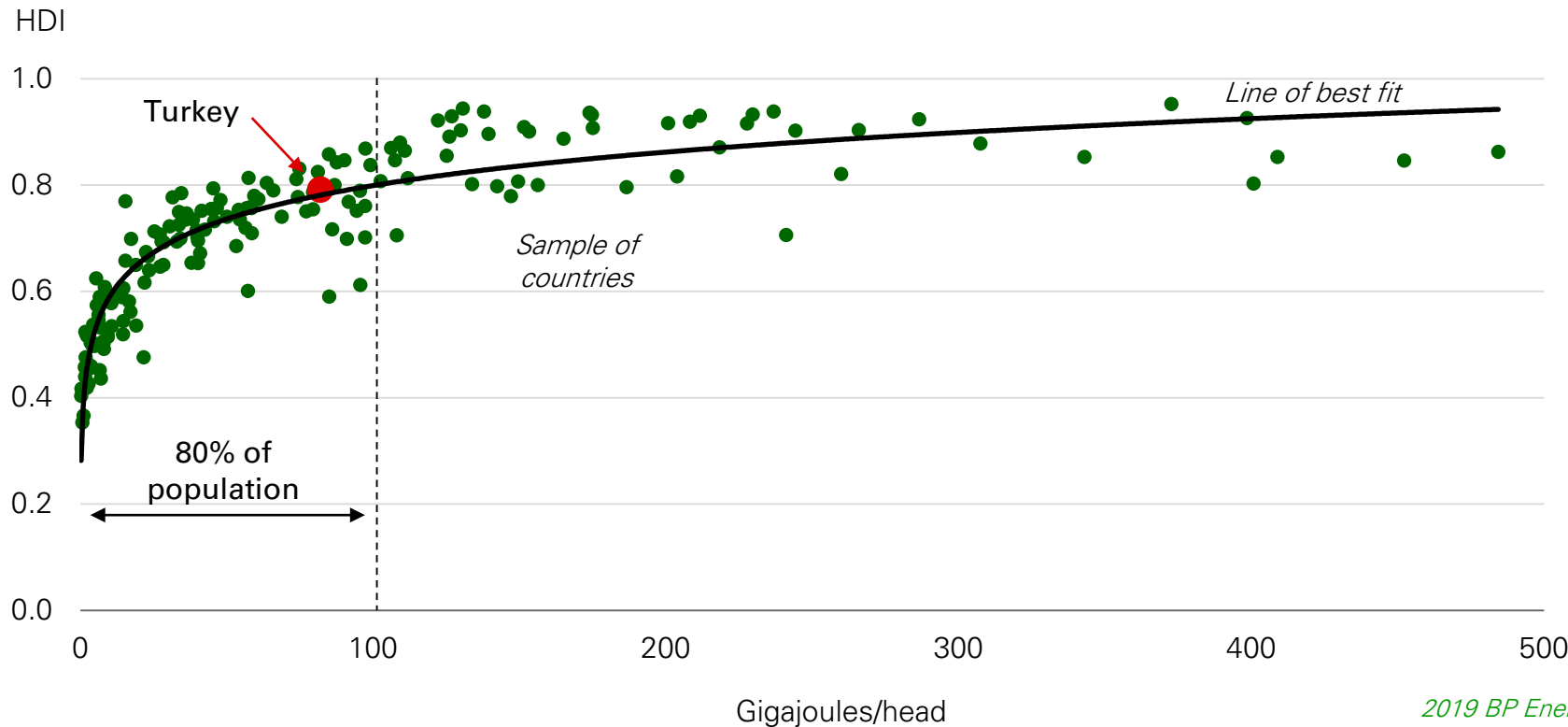
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Human development and energy consumption

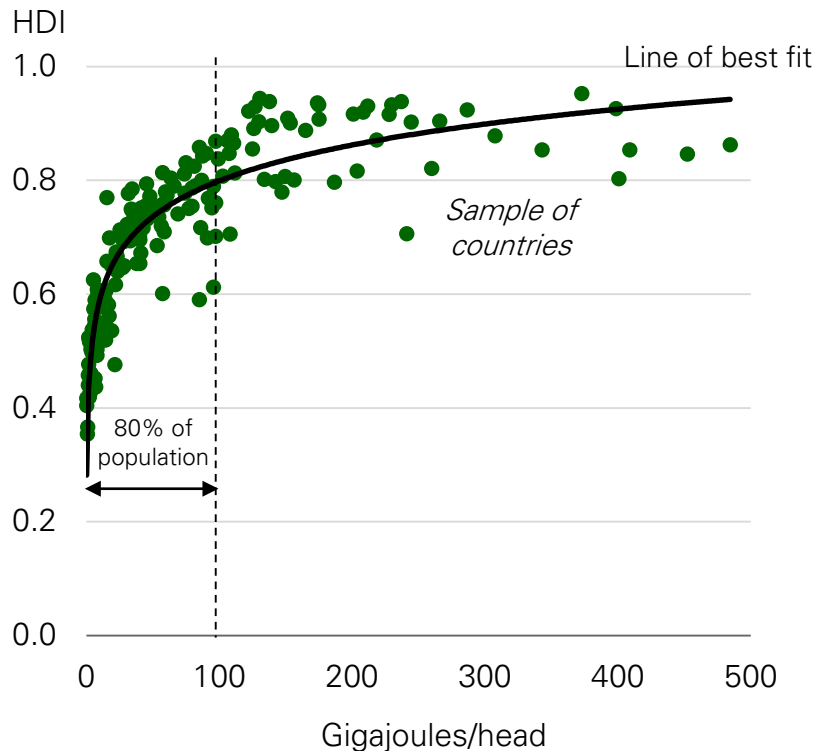
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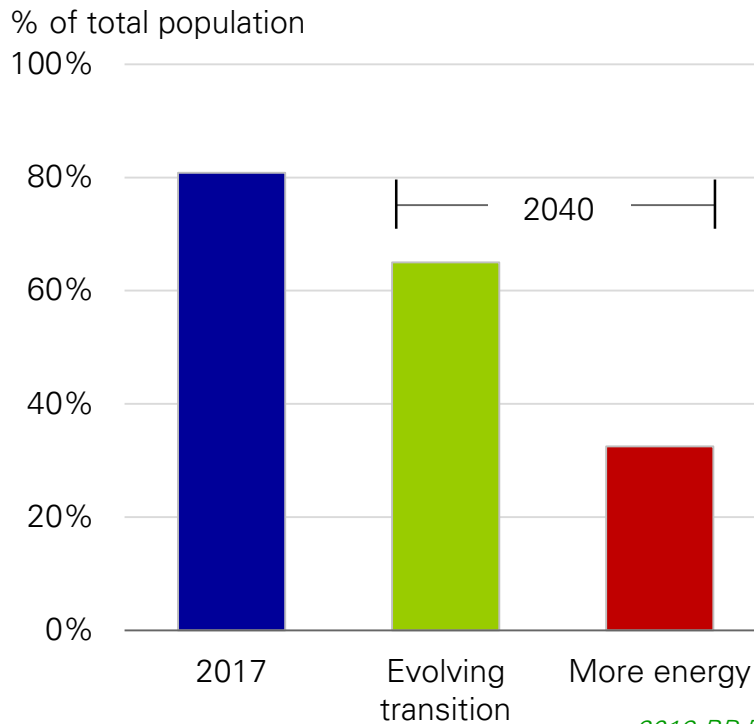


Alternative scenario: the world needs 'more energy' ...

Human development index and energy consumption per head, 2017



Share of world population consuming less than 100 Gigajoules per head

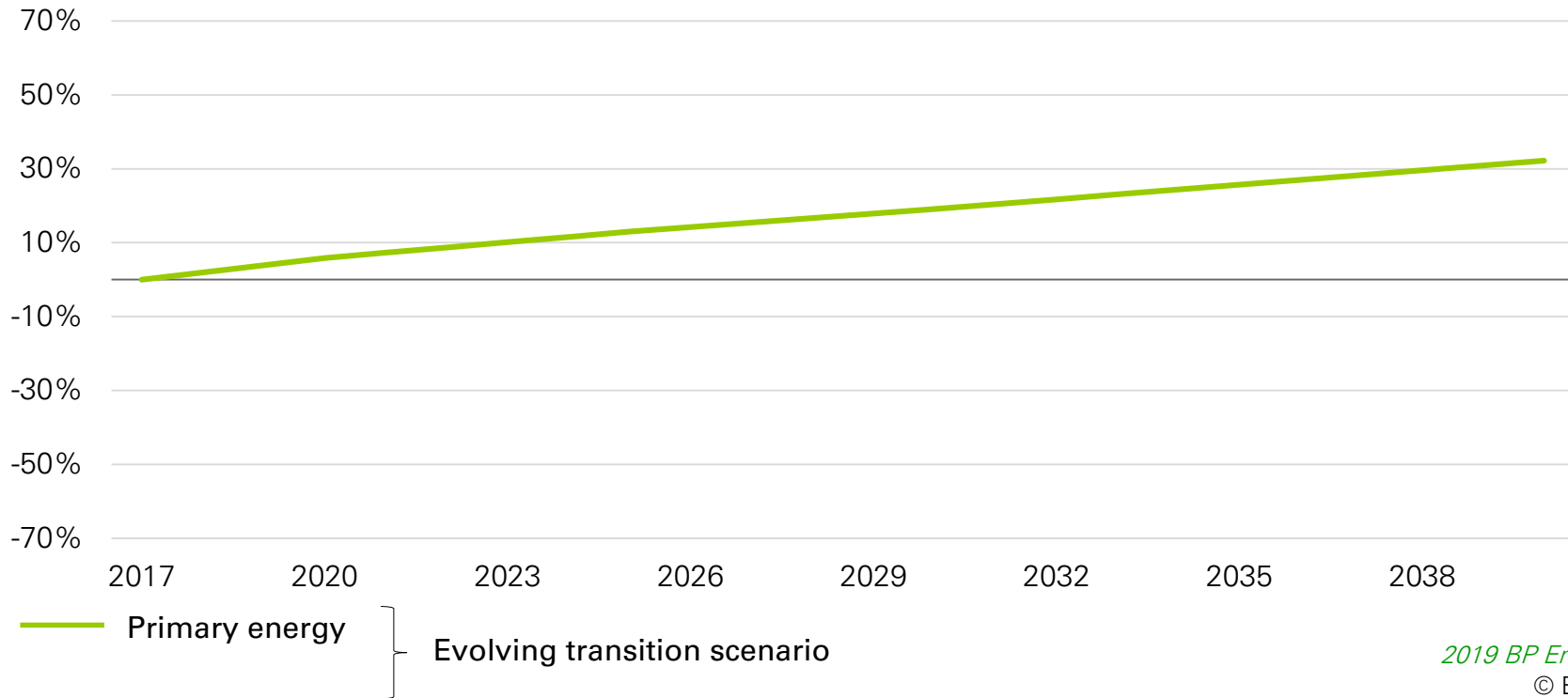




Dual challenge: more energy, less carbon

Primary energy demand and carbon emissions

Cumulative growth rate

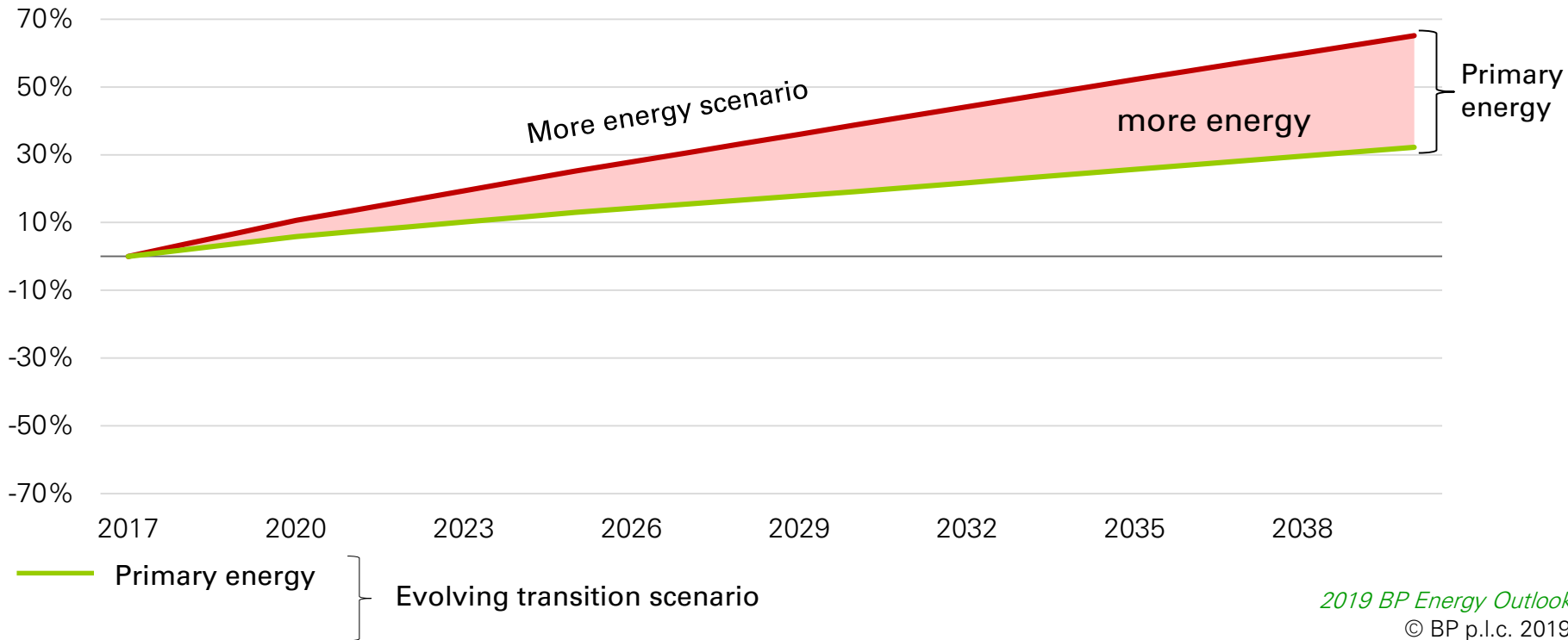




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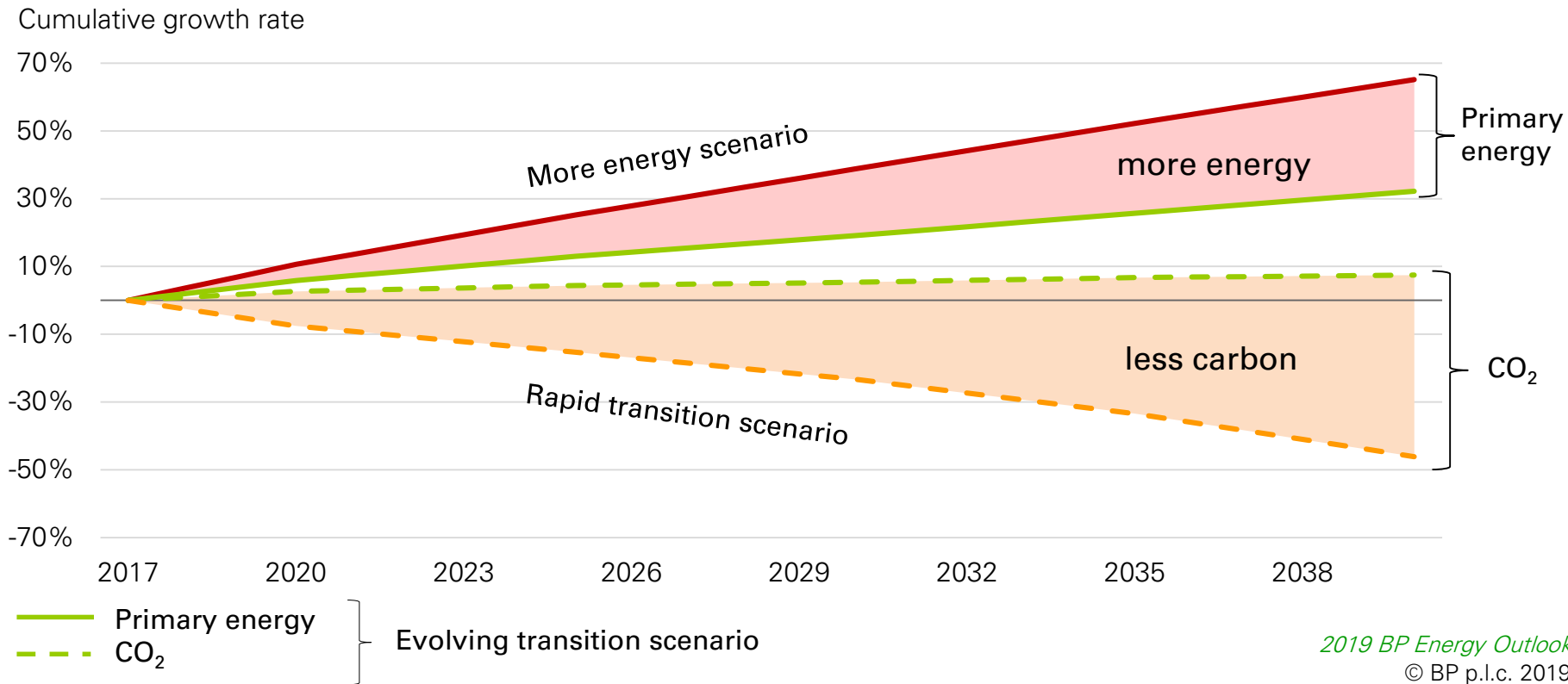
Cumulative growth rate





Dual challenge: more energy, less carbon

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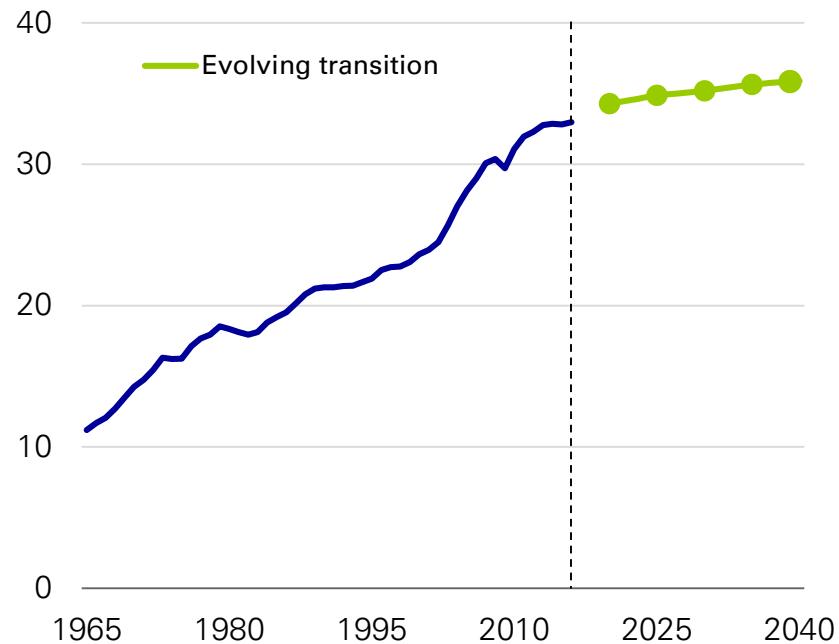




CO₂ emissions in ET scenario

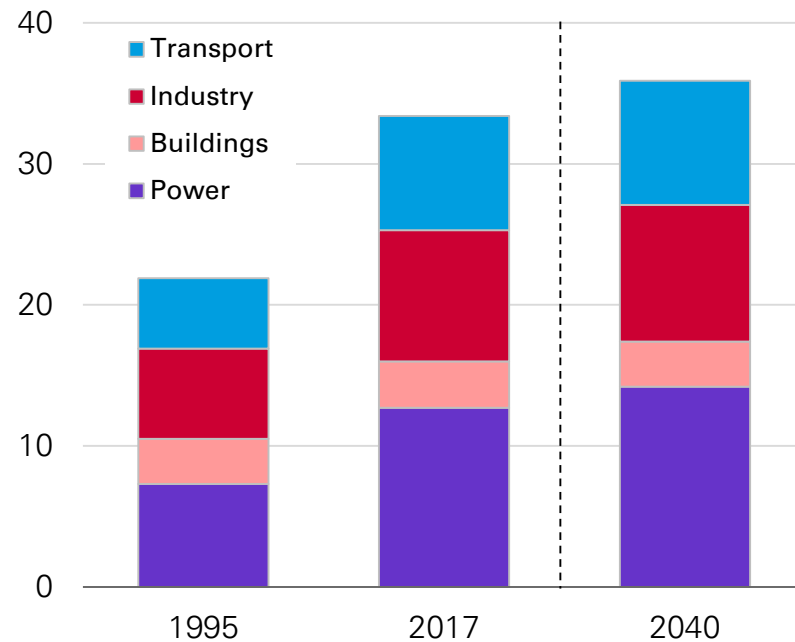
CO₂ emissions

Gt of CO₂



CO₂ emissions by sector

Gt of CO₂





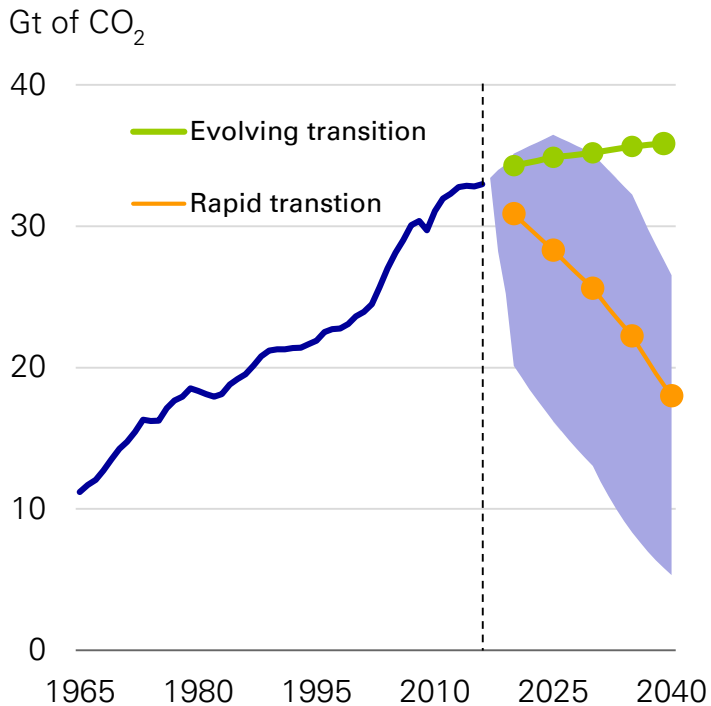
Rapid transition scenario: policy measures

- ▶ 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

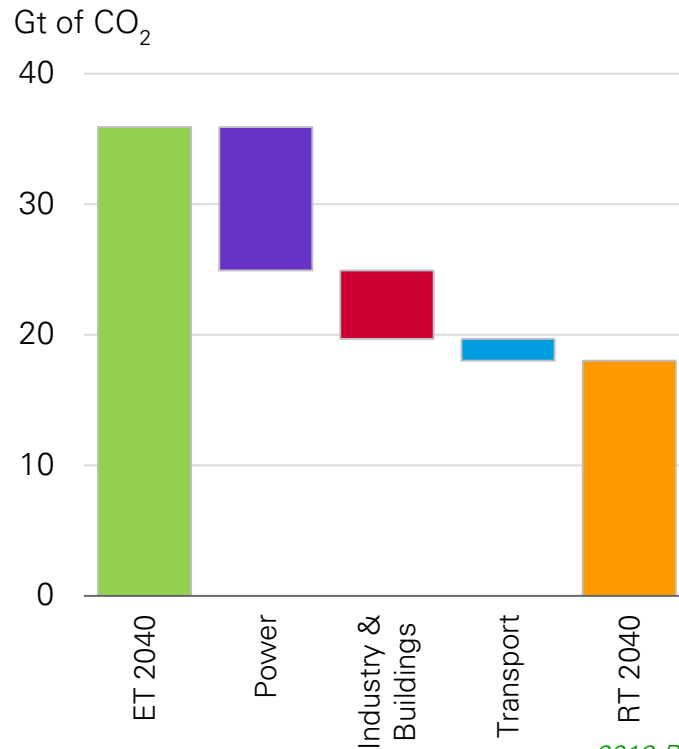


CO₂ emissions

CO₂ emissions



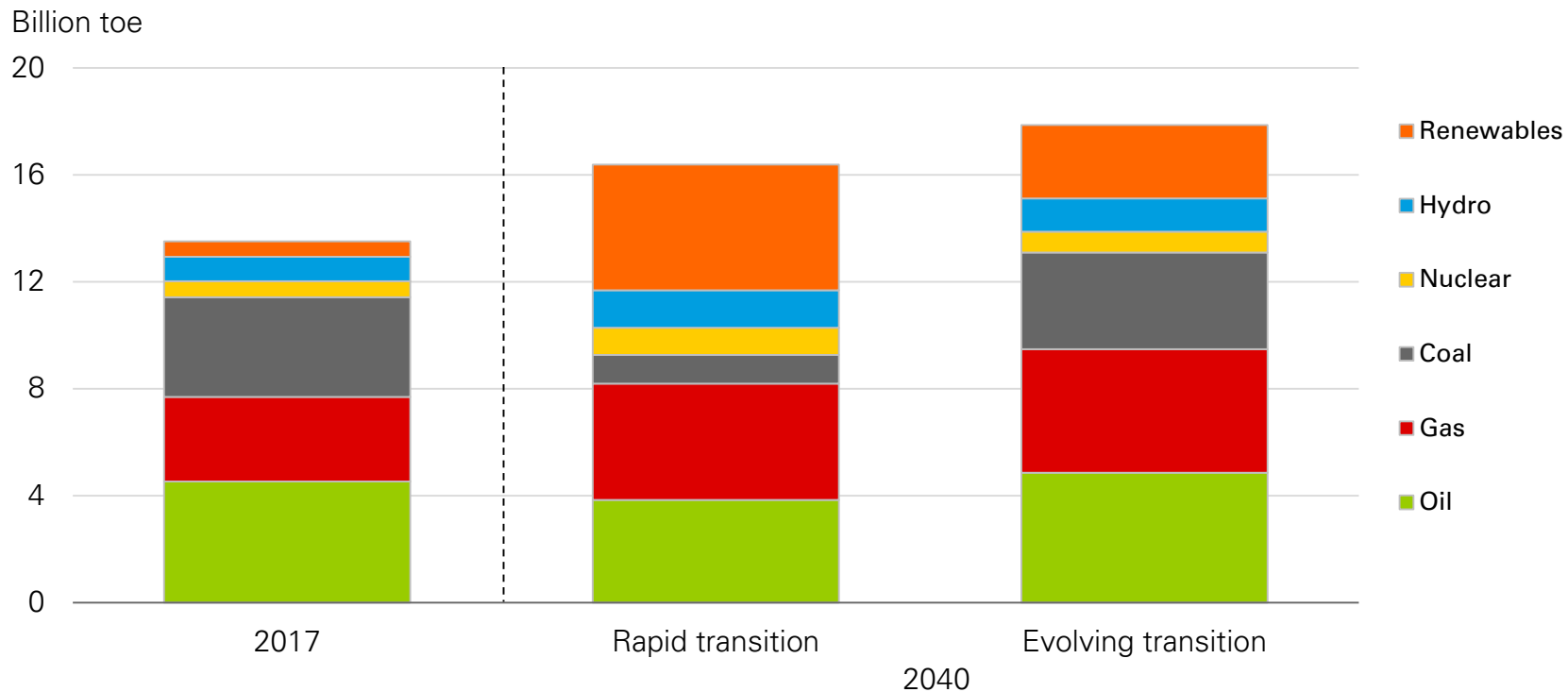
CO₂ in 2040: ET vs RT scenario





Global energy demand and fuel mix

Primary energy consumption by fuel

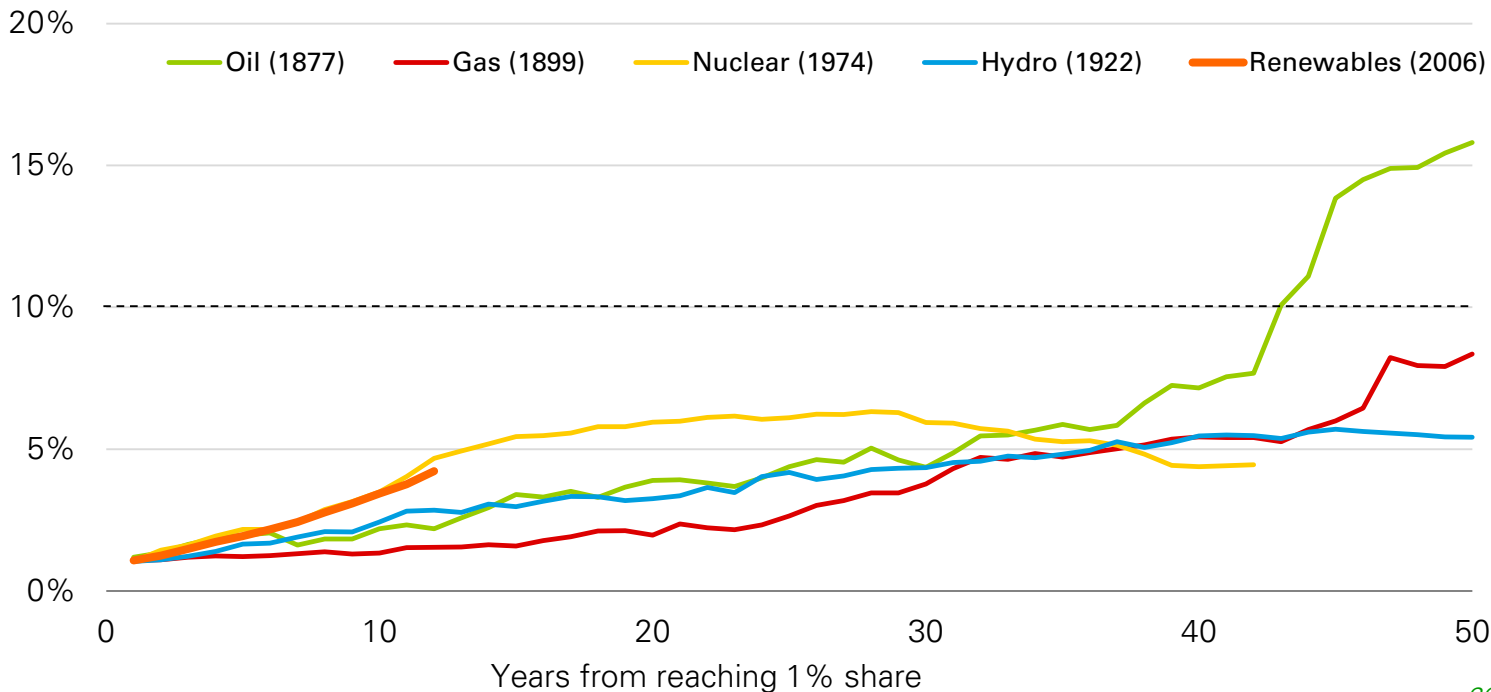




Speed of energy transition

Speed of penetration of new fuels in global energy system

Share of world energy

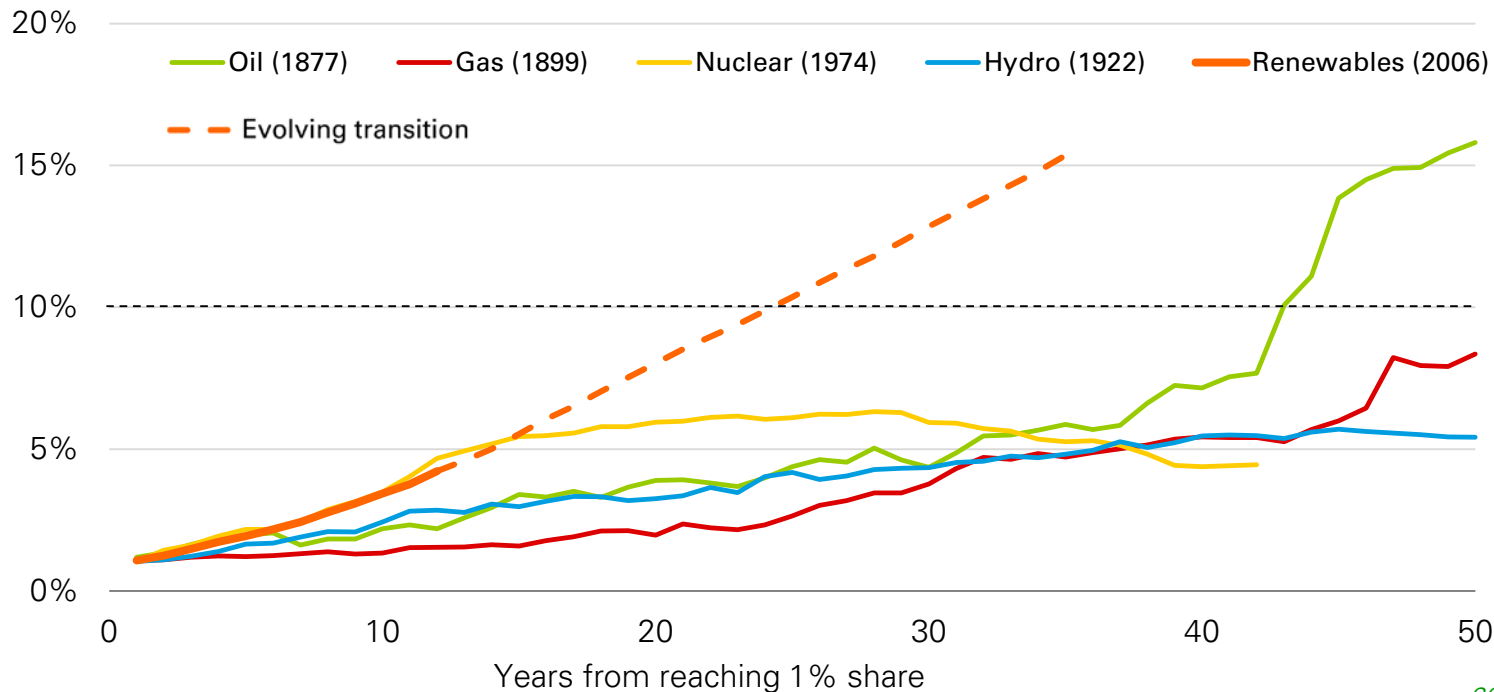


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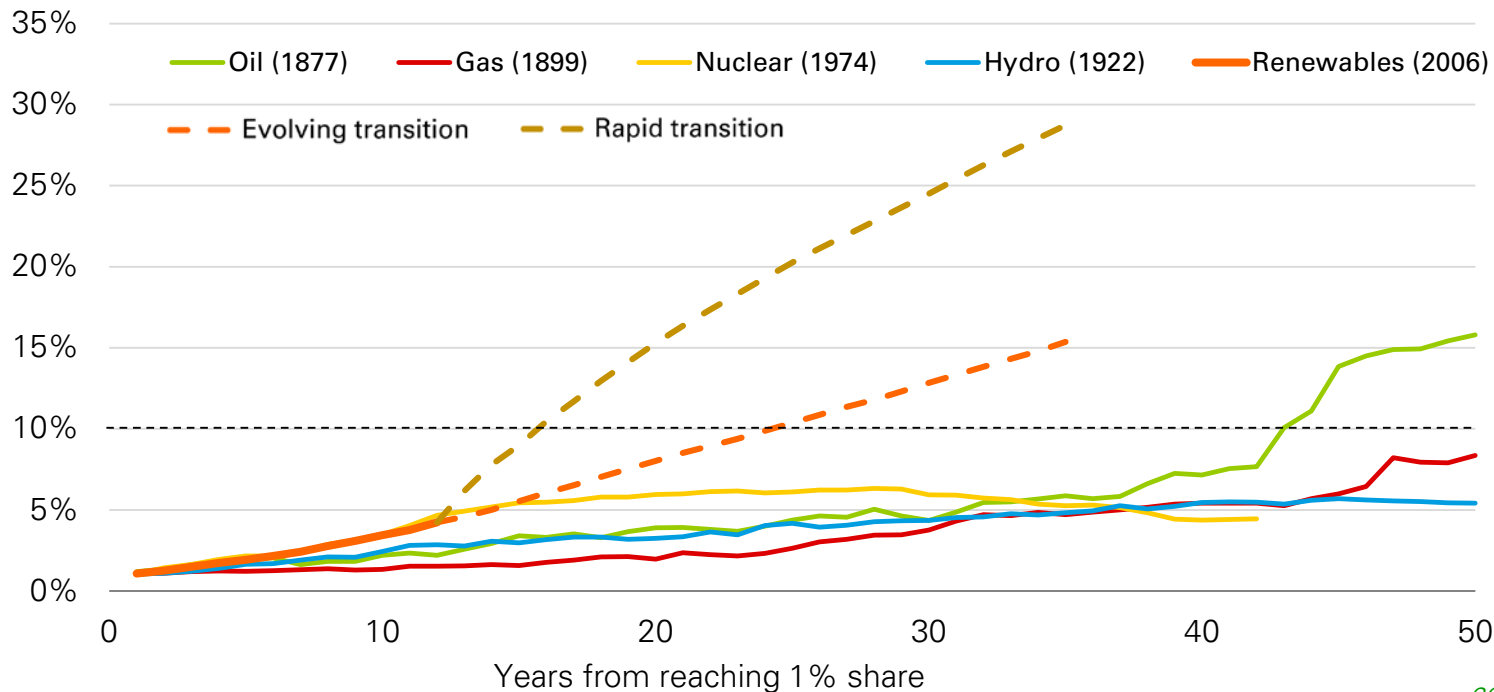


Speed of energy transition



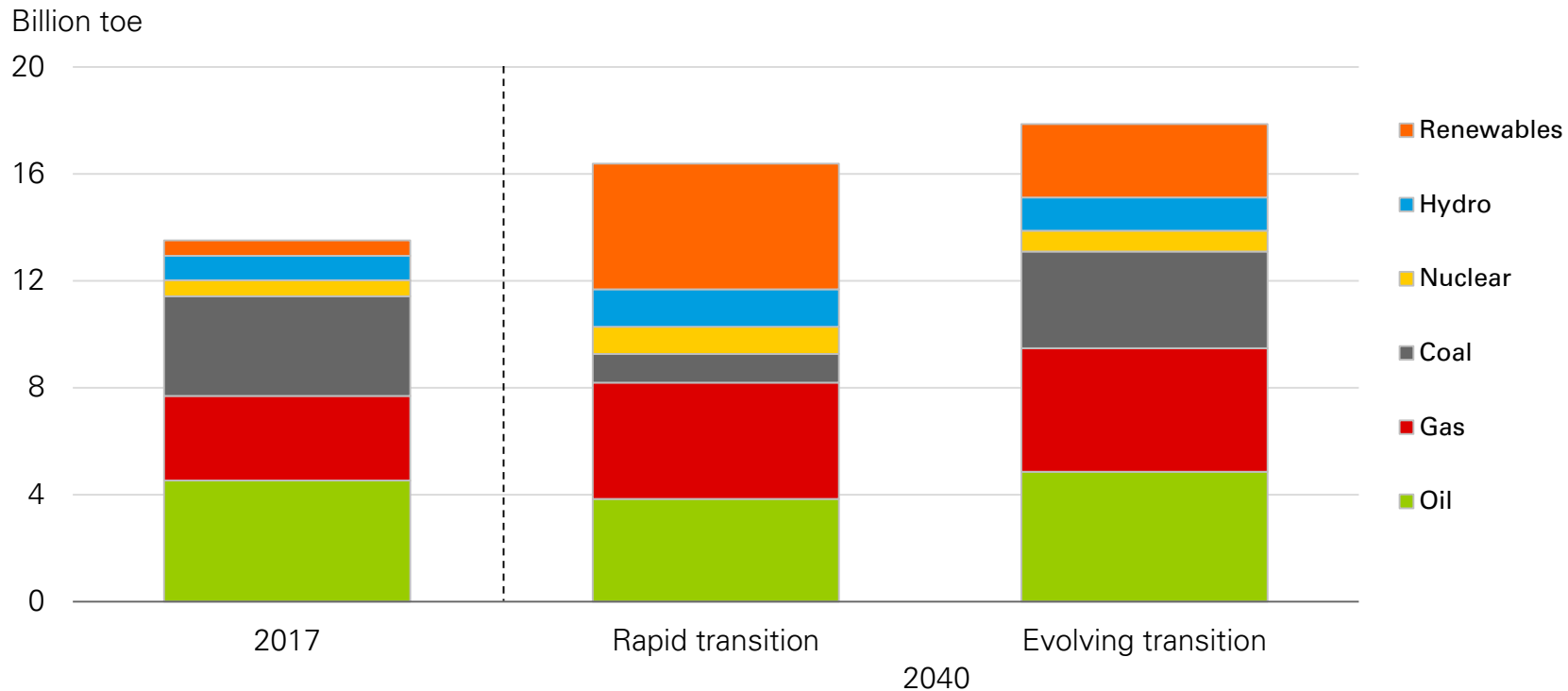
Speed of penetration of new fuels in global energy system

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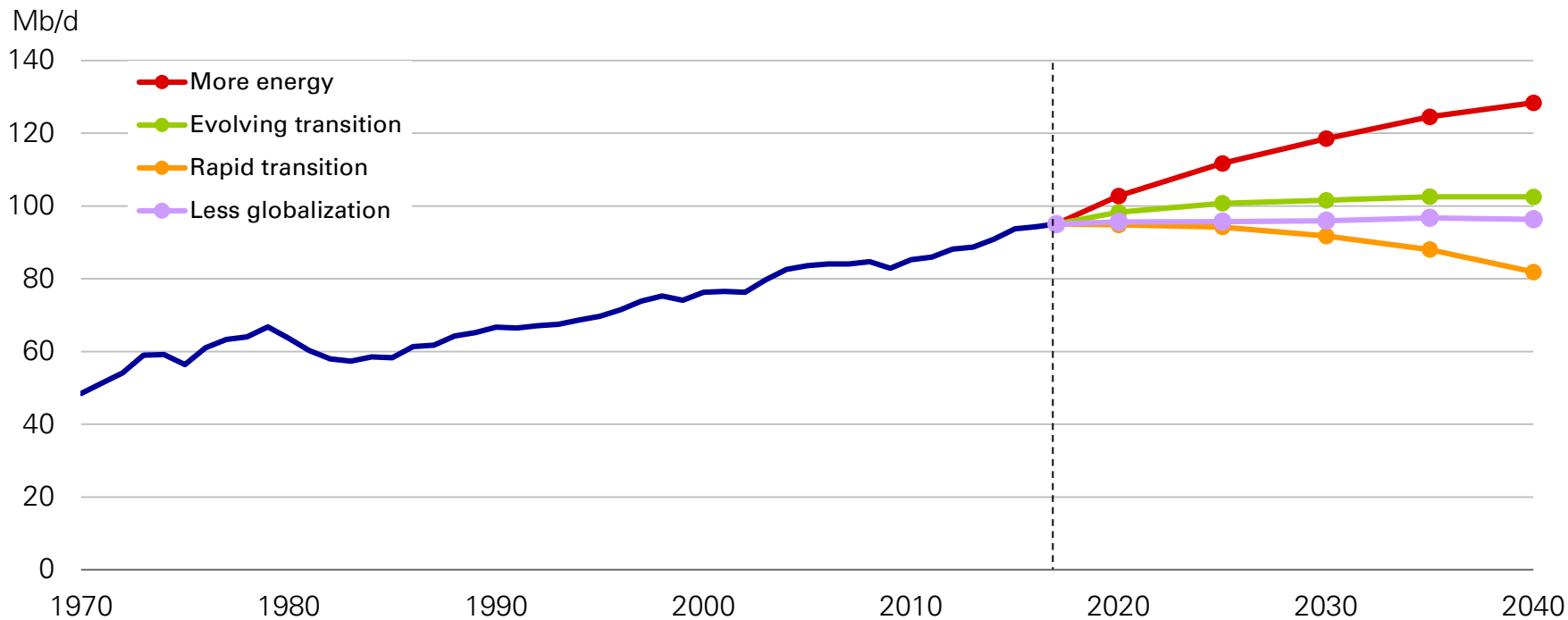


Global energy demand and fuel mix

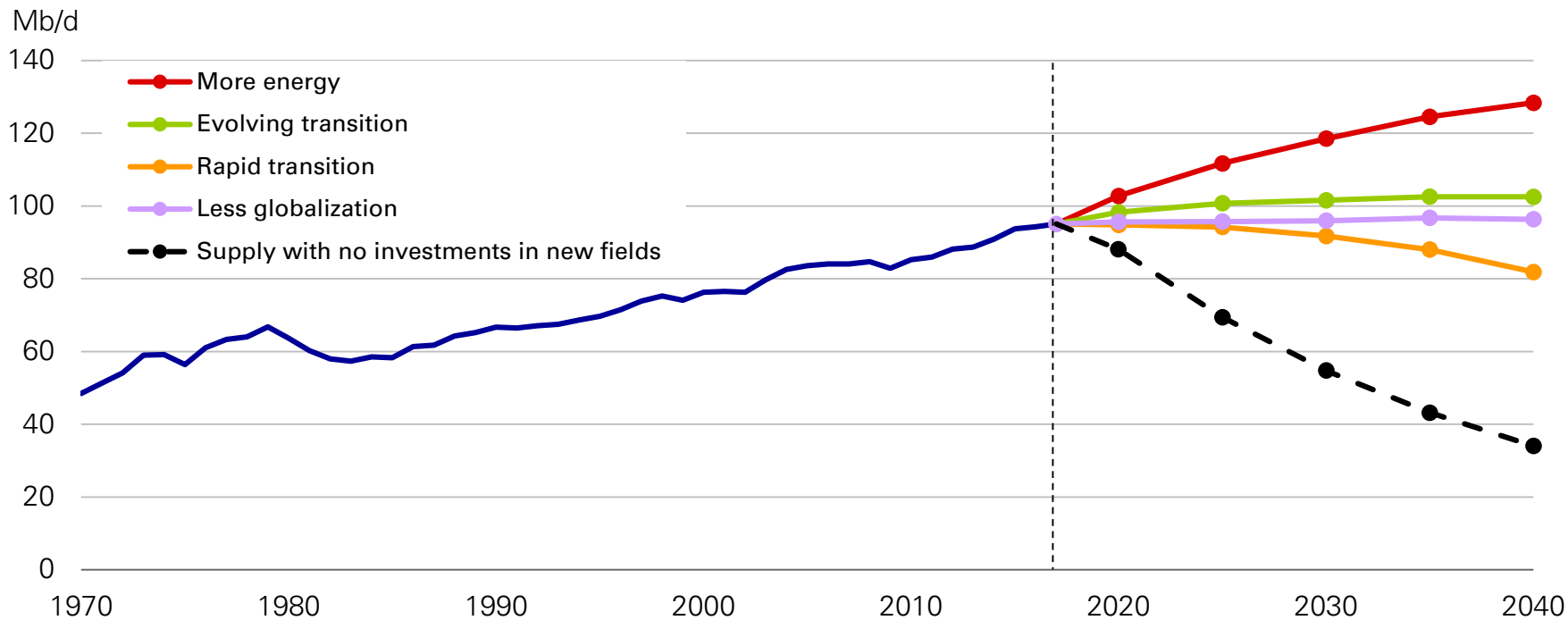
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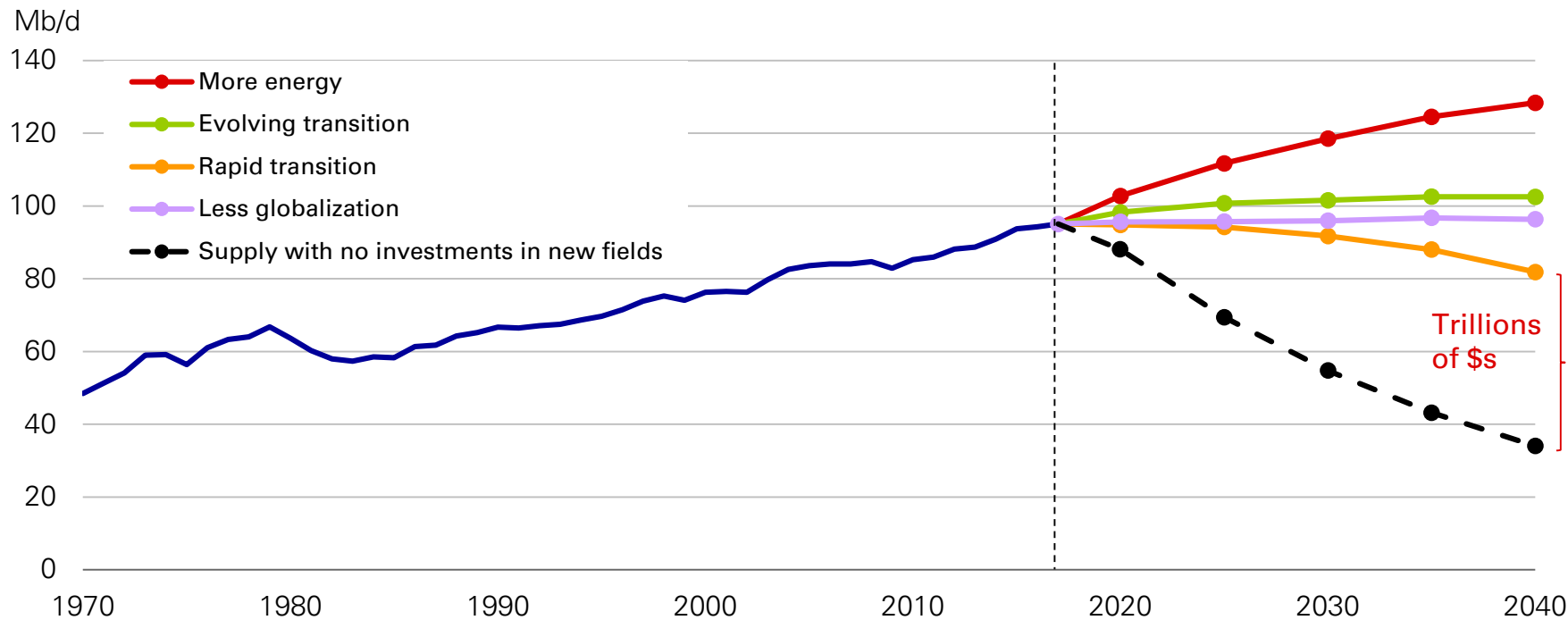
Demand and supply of oil



Demand and supply of oil



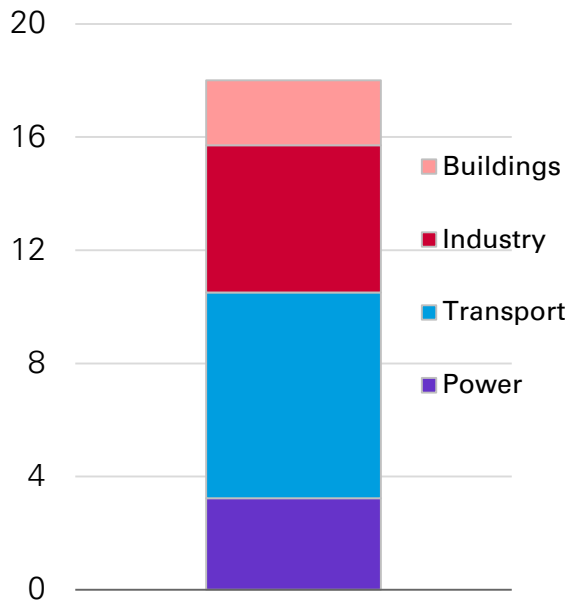
Demand and supply of oil



Hard-to-abate carbon emissions

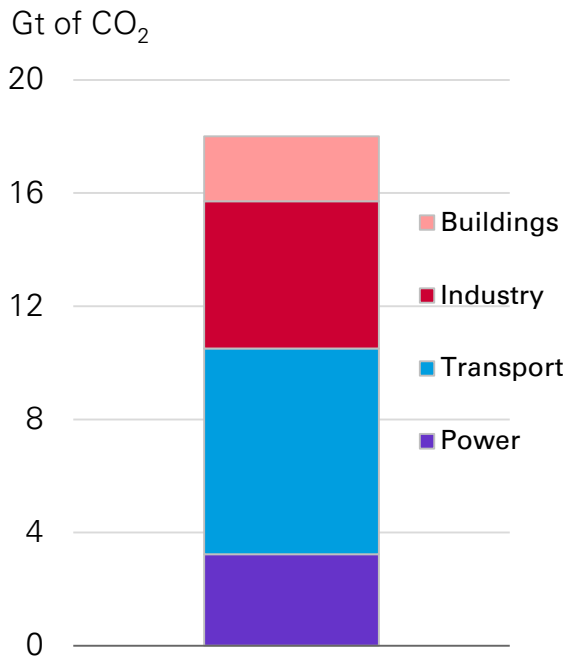
CO₂ emissions in RT scenario in 2040

Gt of CO₂



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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