

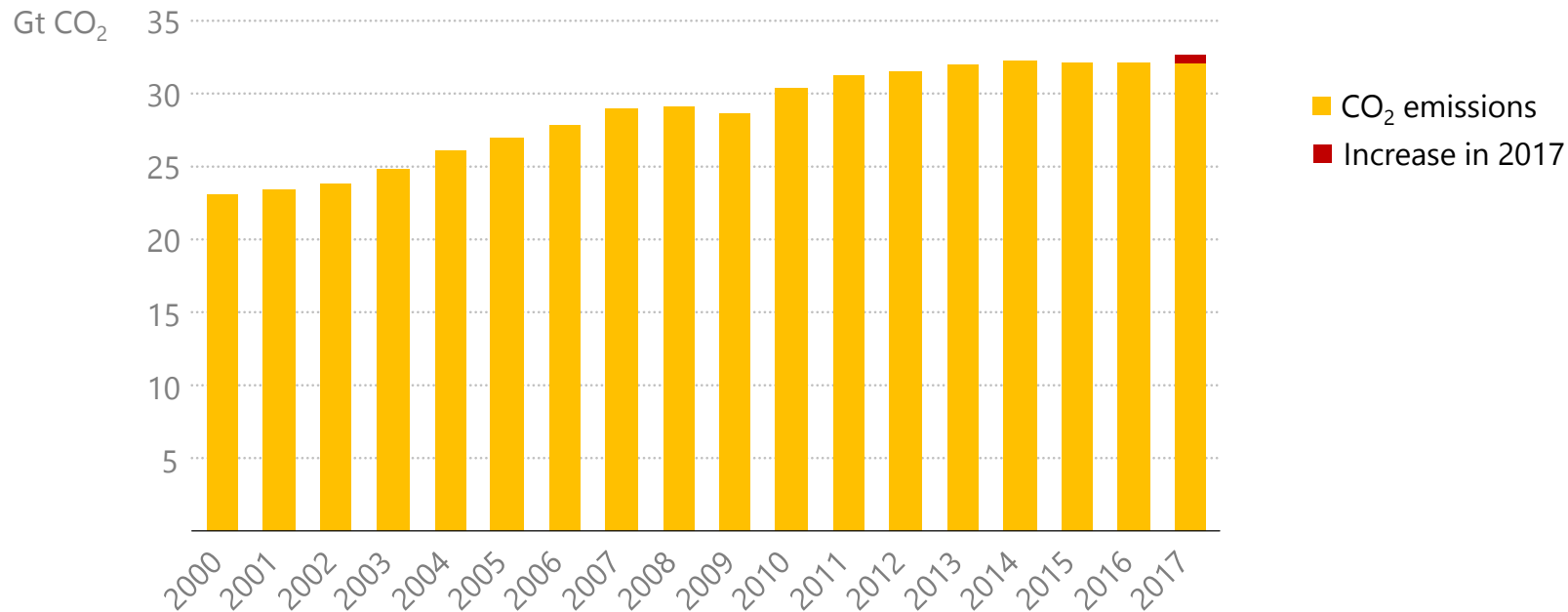


Oil & Gas in the Clean Energy Transition

Keisuke SADAMORI, Director, Energy Markets and Security, IEA
European Energy Forum, 8 June 2018

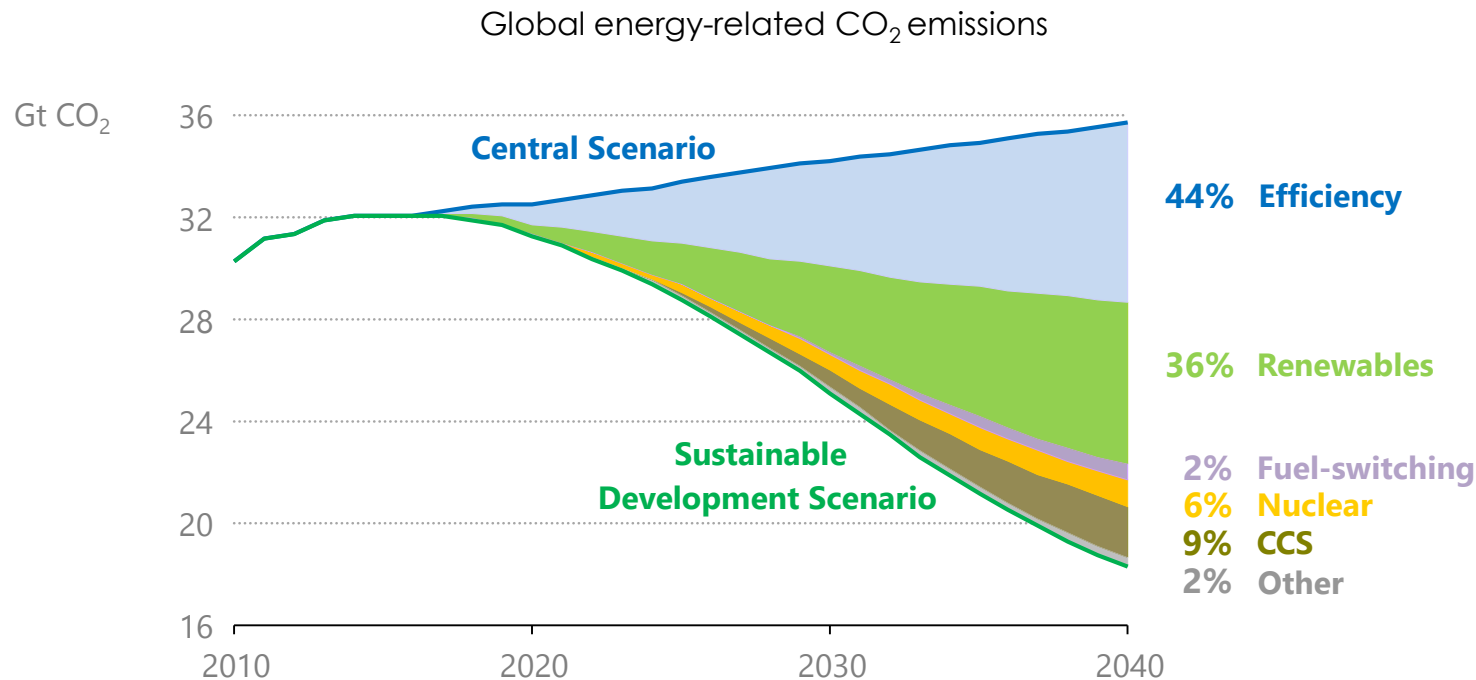


Global energy-related CO₂ emissions



After remaining flat for 3 years, global CO₂ emissions rose again in 2017, to an all-time high

What could the future look like?



A wide variety of technologies are necessary to meet sustainability goals, notably energy efficiency, renewables, CCUS and nuclear

How are clean energy technologies progressing?

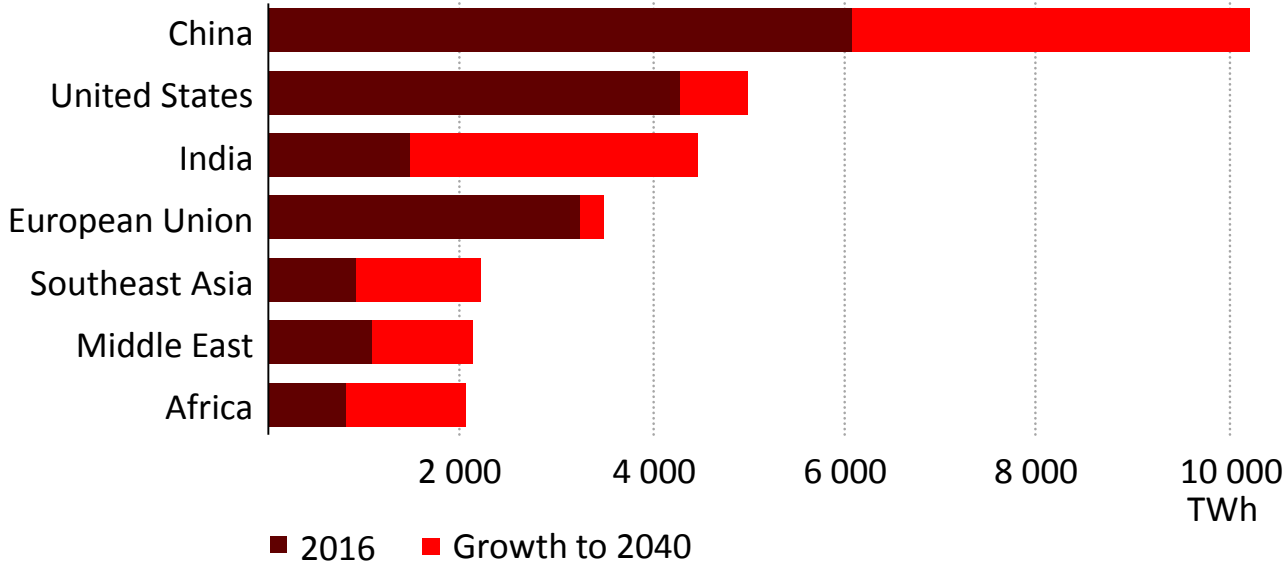


Power

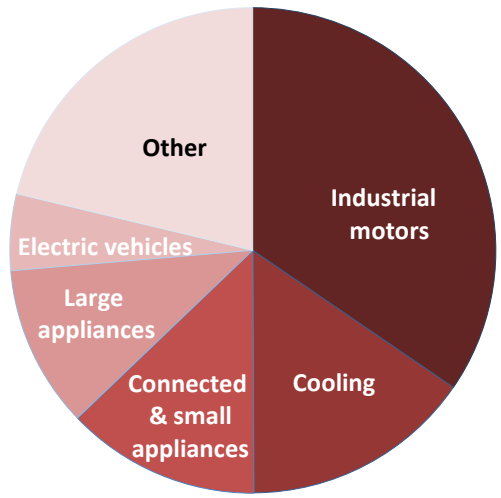
- **Renewable power**
 - **Solar PV**
 - **Onshore wind**
 - **Offshore wind**
 - **Hydropower**
 - **Bioenergy**
 - **Geothermal**
 - **Concentrating solar power**
 - **Ocean**
- **Nuclear power**
- **Natural gas-fired power**
- **Coal-fired power**
- **CCS in power**

The future is electrifying

Electricity generation by selected region

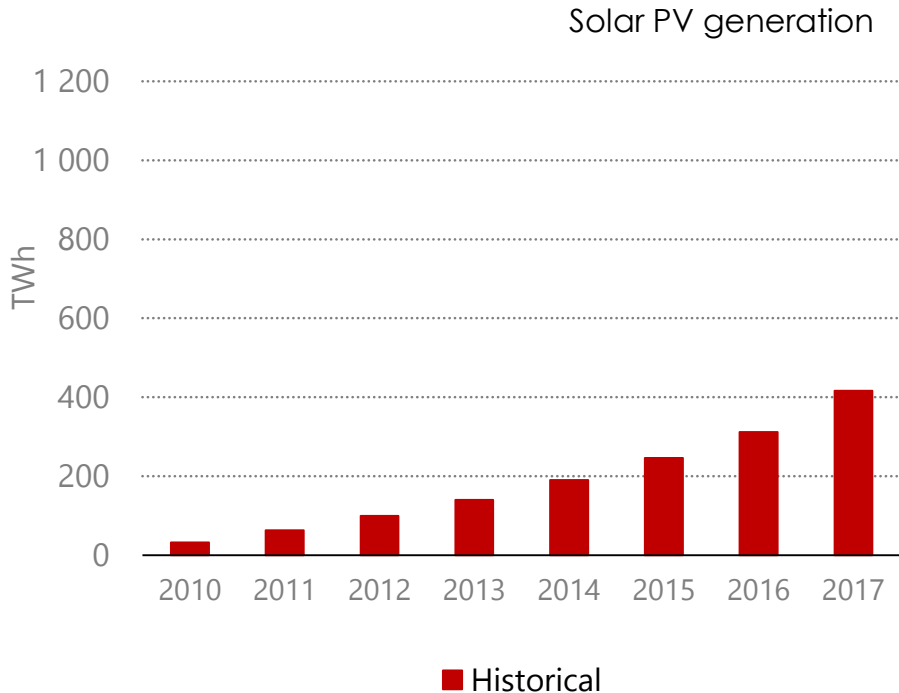


Sources of global electricity demand growth



India adds the equivalent of today's European Union to its electricity generation by 2040, while China adds the equivalent of today's United States

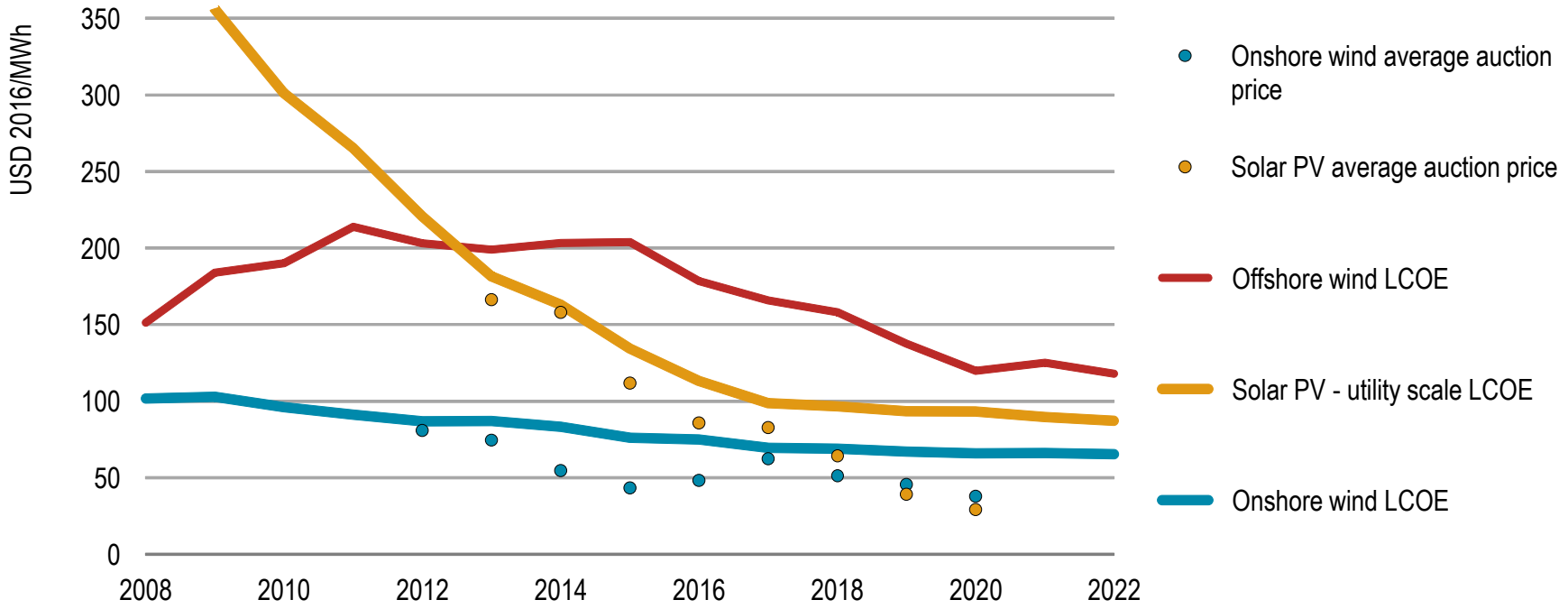
Solar PV is the only renewable technology that is on track



Following another record year in 2017, solar PV continues to lead the expansion in renewable power, driven by strong growth in China, the US and India

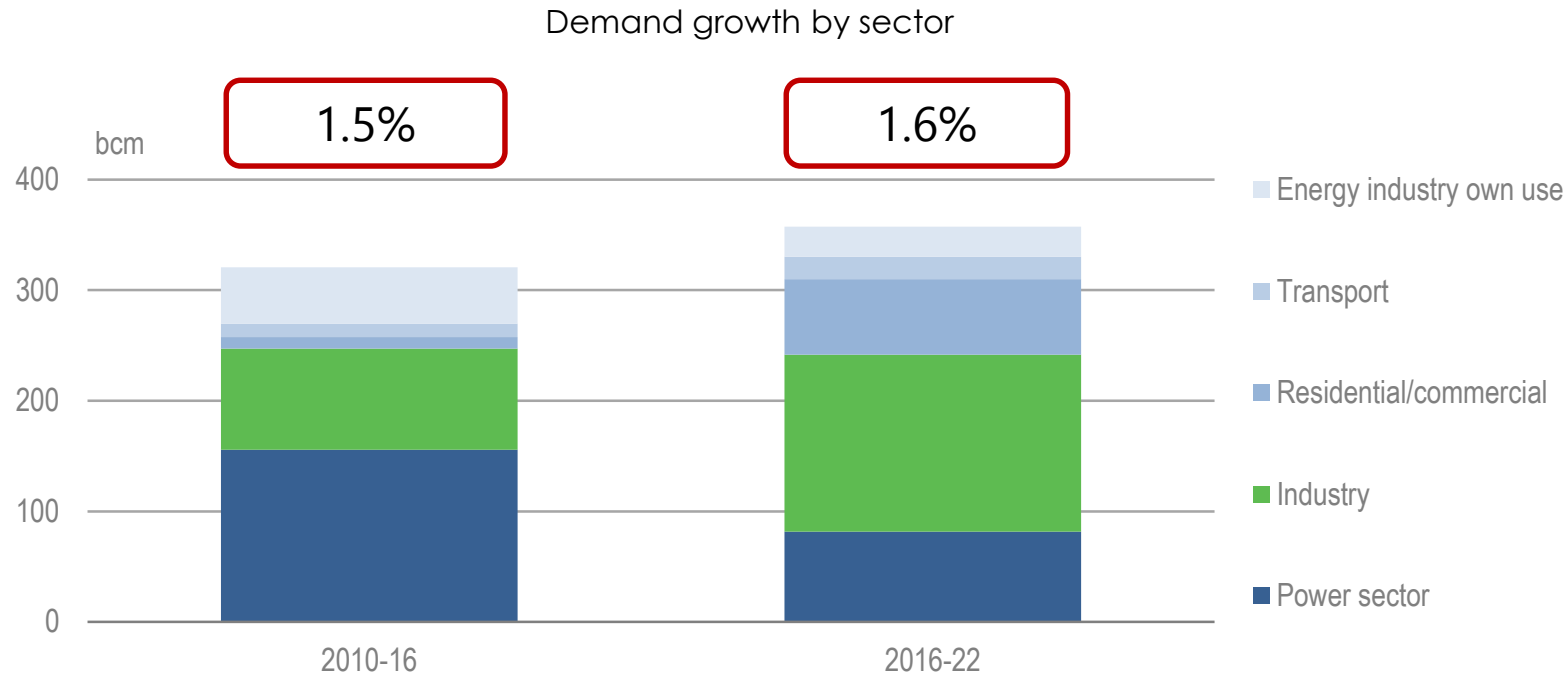
Wind and solar PV costs being driven down by competition

Wind and solar PV average LCOEs and auction results by commissioning date



The cost of wind and solar PV have fallen sharply, with further reductions expected; Cost-optimal integration requires interconnections, flexible generation, storage & demand response

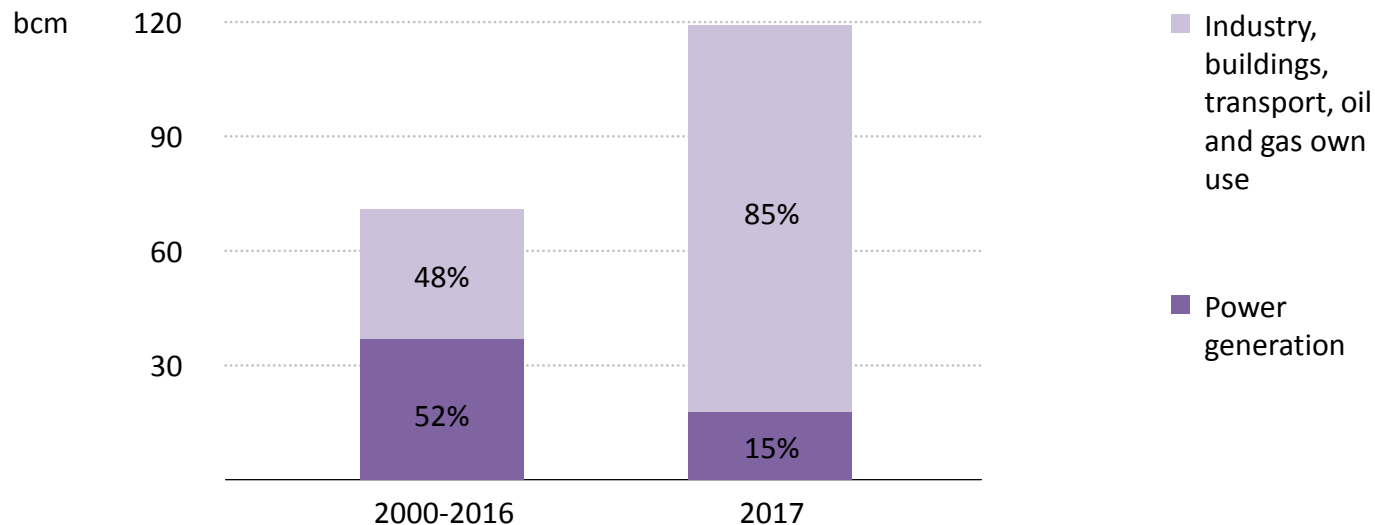
Gas demand growth moves from power generation to industry



China, US and India account for half of the growth in industry sector, driven by chemicals and fertilisers

Abundant & relatively low-cost supplies are boosting gas use

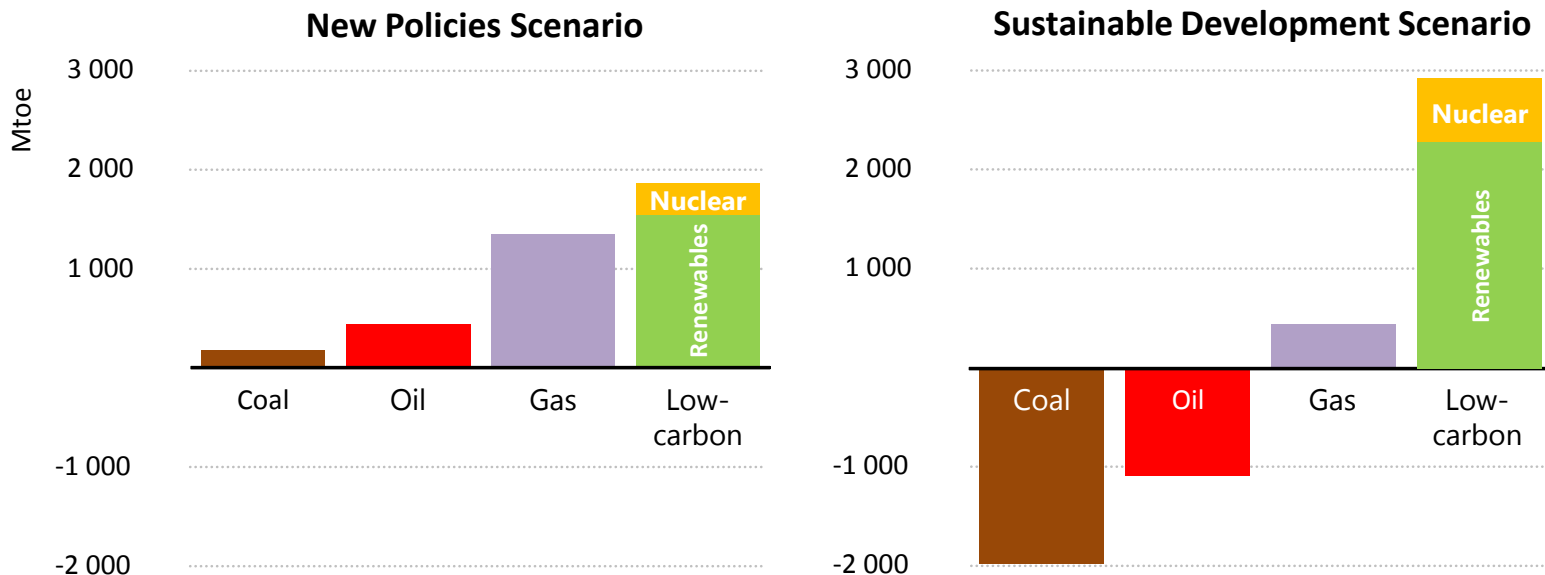
Growth in global gas demand



The drive to “make China’s skies blue again” meant that China accounted for nearly 30% of the increase in global gas demand in 2017; the power sector is no longer the main source of worldwide growth

Gas is resilient in a changing energy world

Change in global primary energy demand by scenario 2016-2040



Gas is the only fossil fuel that ends up higher in 2040 than today in the Sustainable Development Scenario, although its contribution varies widely across regions, between sectors and over time

WEO engagement: methane emissions

■ Analysis of methane emissions was part of focus on natural gas in WEO-2017

- Changing gas market dynamics & the rising role of LNG
- Competitive positioning of gas in price-sensitive Asian import markets
- The role of natural gas in the energy transition

■ Impact:

- 22 November: eight major companies signed “Guiding Principles on Reducing Methane Emissions across the Natural Gas Value Chain”
- Three more have since joined, including Qatar Petroleum, Gazprom
- Principles “address priority areas for action highlighted in the World Energy Outlook 2017”



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- Coal-fired power
- CCS in power

Industry

- **Cement**
- **Chemicals**
- **Steel**
- **Aluminum**
- **Pulp and paper**
- **CCS in industry**

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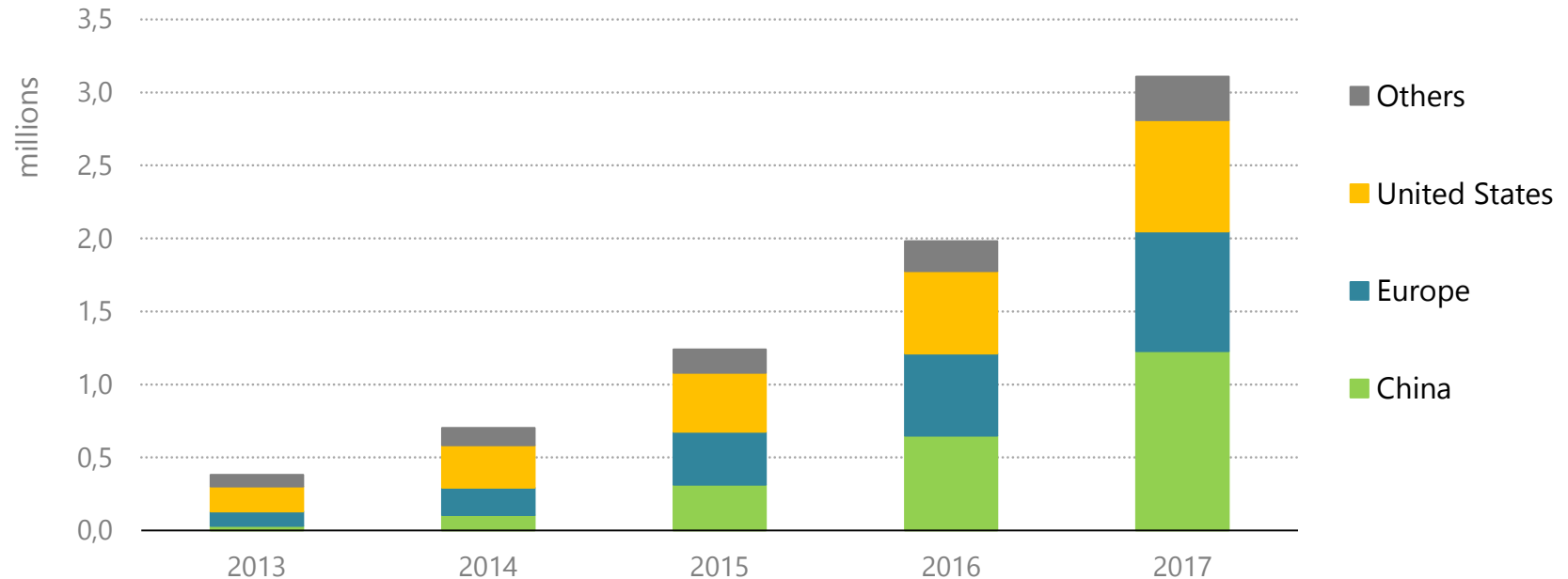
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Transport

- **Electric vehicles**
- **International shipping**
- **Fuel economy**
- **Trucks**
- **Transport biofuels**
- **Aviation**
- **Rail**

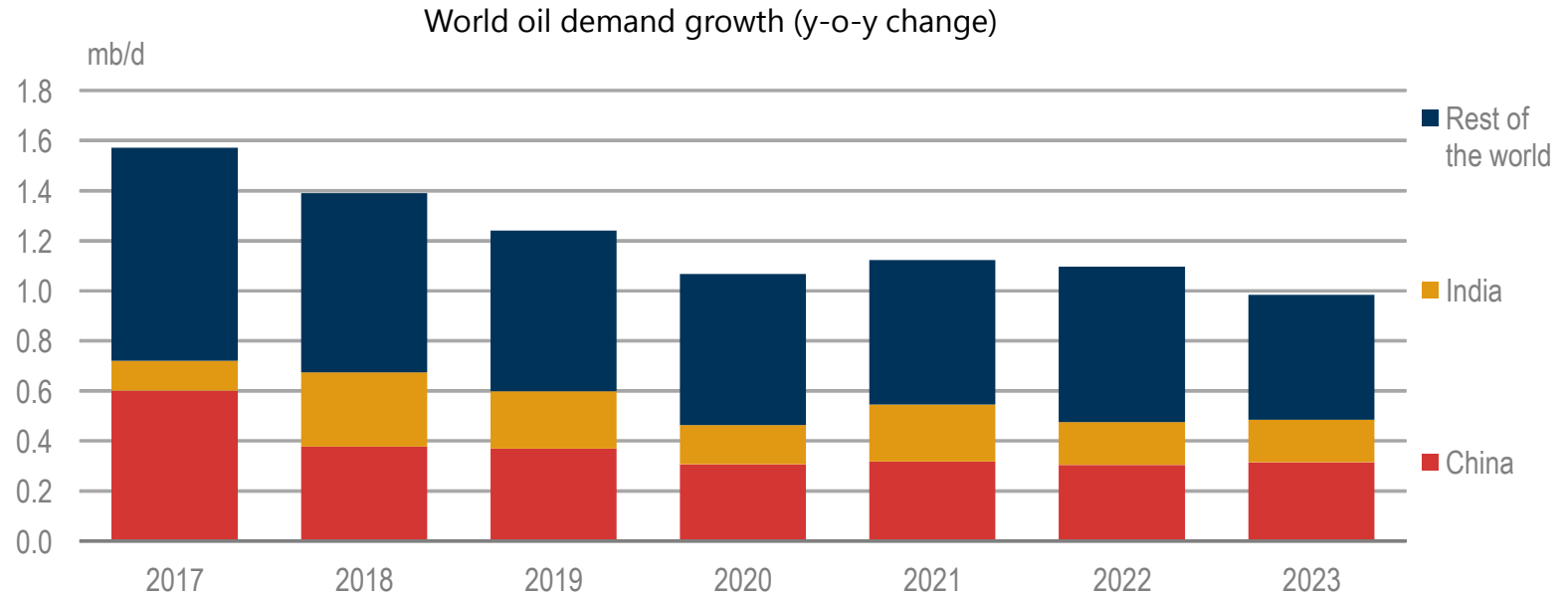
Electric car sales continue to break records

Global electric car stock



The number of passenger electric cars on the road passed 3 million in 2017, although they still represent just 1% of the global car sales

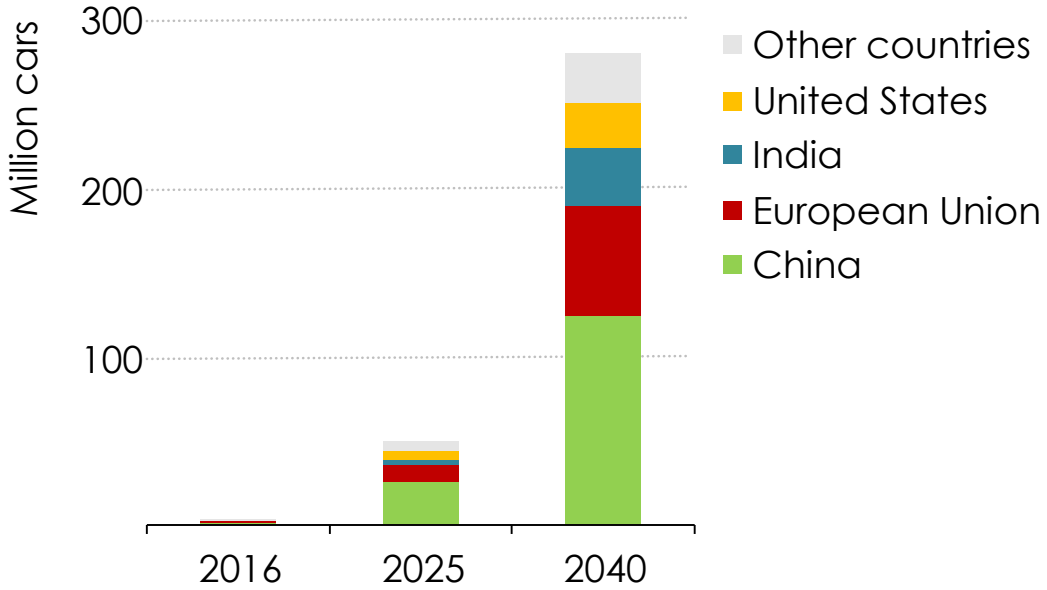
Robust global oil demand growth to 2023



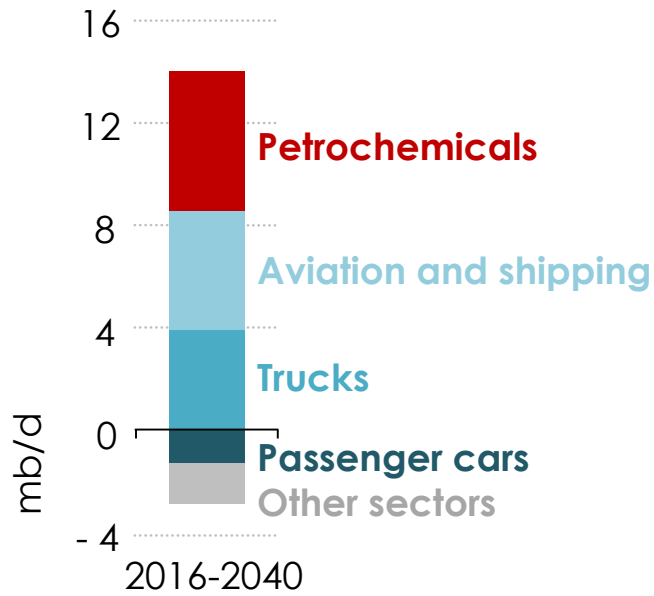
China and India account for almost half of world oil demand growth

EVs are on the way, but oil demand still keeps rising

Electric car fleet



Change in global oil demand



Electric cars are helping to transform energy use for passenger cars, slowing the pace of growth in global oil demand: however, trucks, aviation, shipping & petrochemicals keep oil on a rising trend

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- International shipping
- Fuel economy
- Trucks
- Transport biofuels
- Aviation
- Rail

Buildings

- **Building codes**
- **Heating**
- **Cooling**
- **Lighting**
- **Appliances & equipment**
- **Data centres and networks**

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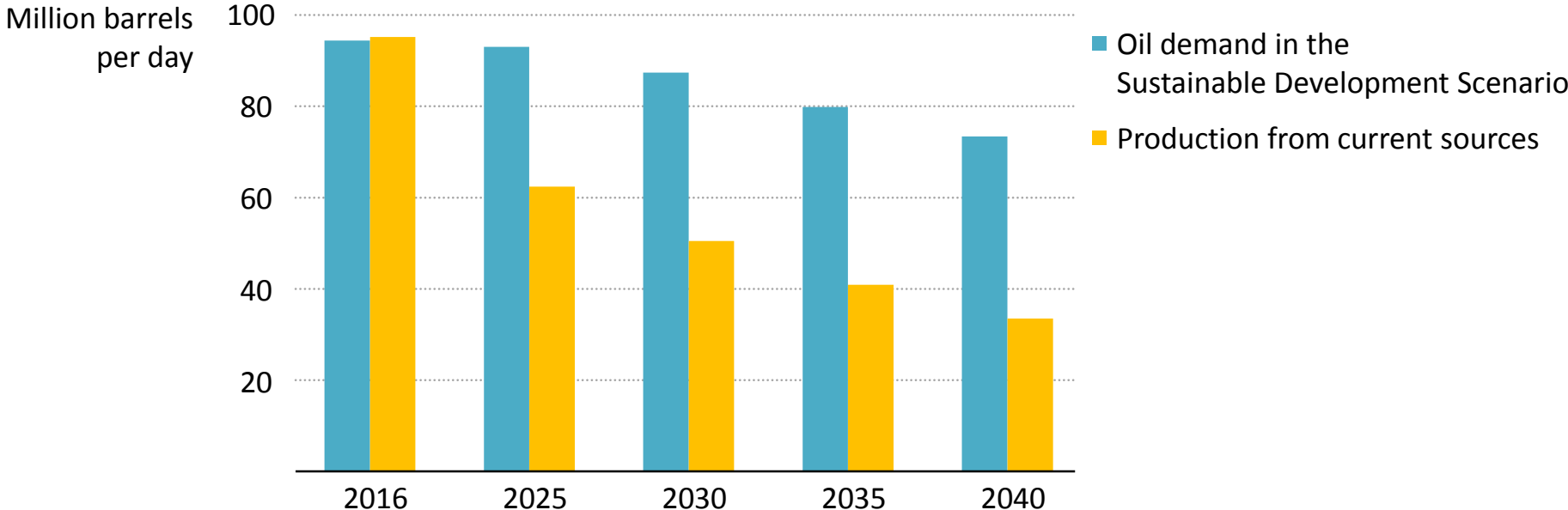
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Energy Integration

- Energy storage
- Smart grids
- Demand response
- Digitalization
- Hydrogen
- Renewable heat

Continued investment needed into fossil fuel supply

Oil demand trajectory and supply outlook from currently producing and new fields



Current production declines much faster than the decline in demand, creating a gap that must be filled with new investments

- Faster technological innovation can spur economic growth, while also improving energy security & sustainability
- Of 38 clean-energy technologies **4 are on track**, **23 need improvement** & **11 are off track**
- Need to focus on all technologies; lack of progress on some puts even more pressure on others
- Government policy & market design will be instrumental in spurring innovation, deployment and private investment
- Oil and Gas will continue to play a major role in the clean energy transition
- Upstream investments will be needed in decades to come even in the low-carbon sustainable development path



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