International Energy Agency

World Energy Outlook 2019

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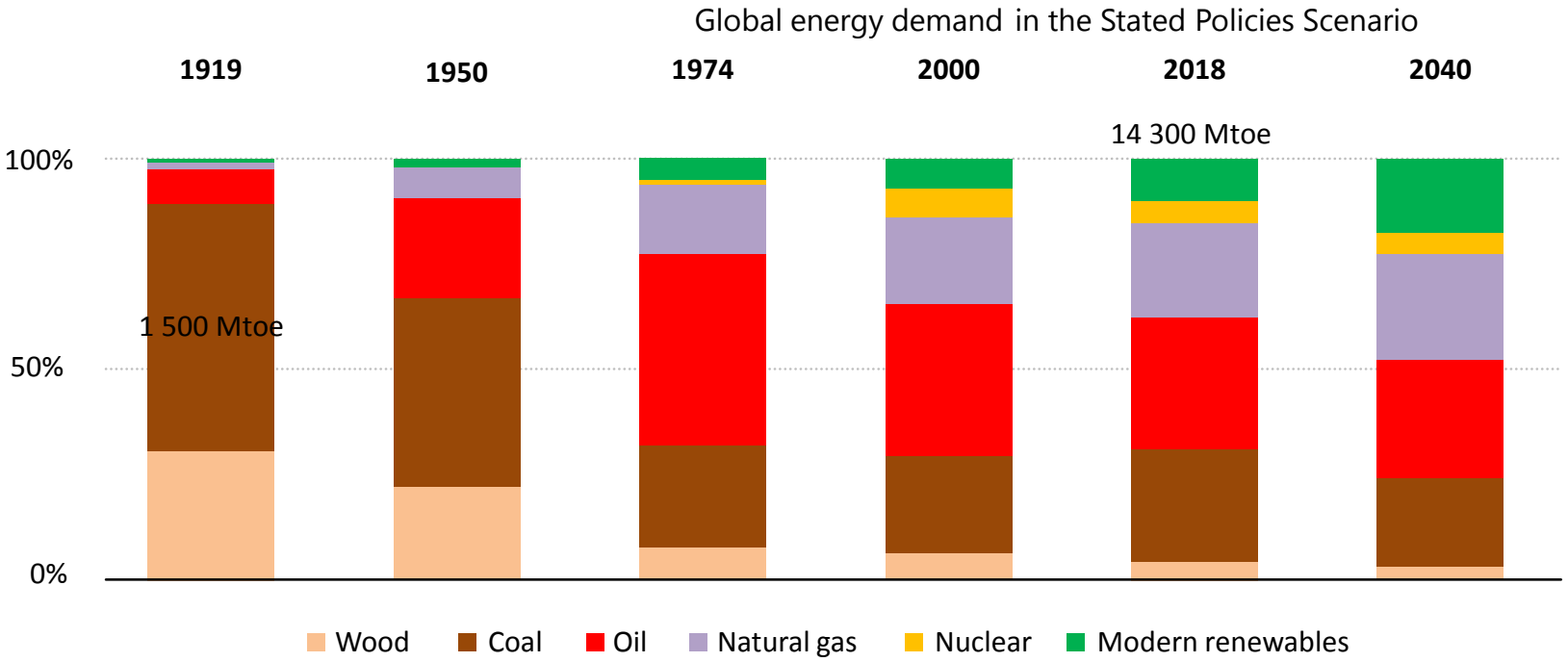
Context

- The energy world is marked by a series of deep disparities, between:
  - The calm in well-supplied oil markets versus deep geopolitical tensions and uncertainties
  - The need for rapid cuts in emissions, while these emissions reach historic highs
  - The promise of energy for all, while 850 million people remain without access to electricity
- Cost reductions & digitalisation are boosting new technologies, but they still need a helping hand from policy
- More than ever, energy decision makers need to take a hard, evidence-based look at the choices ahead
- The *World Energy Outlook* does not forecast what will happen; it explores different possible futures:
  - What if the world continues on its current path, with no additional changes?
  - What if we reflect today's policy intentions and targets? This is the Stated Policies Scenario (STEPS)
  - What if we meet sustainable energy goals in full? This is the Sustainable Development Scenario (SDS)

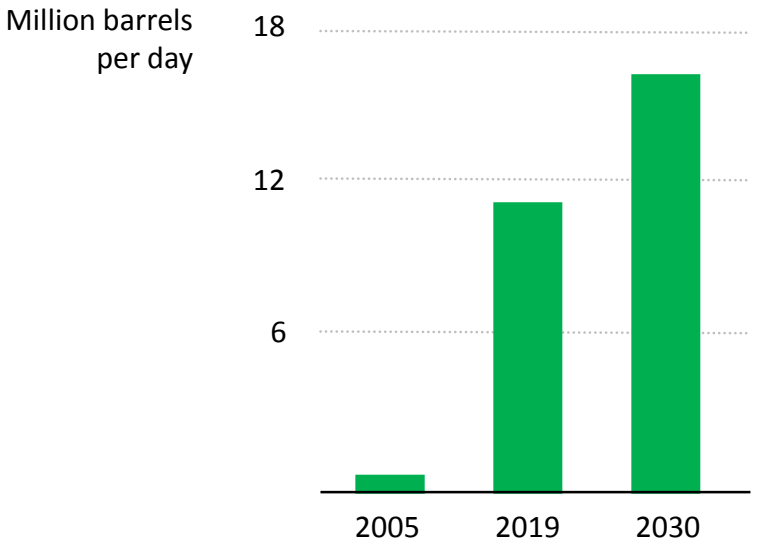
Perspectives from energy history



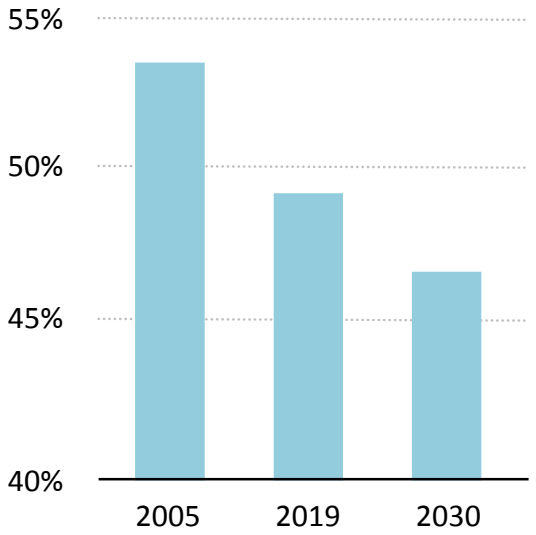
The last century has witnessed multiple transitions to and from different fuels and technologies
The challenge today is one of scale: global energy use is ten times higher than in 1919…. and growing

Shale can stay higher for longer

US shale oil production in the Stated Policies Scenario



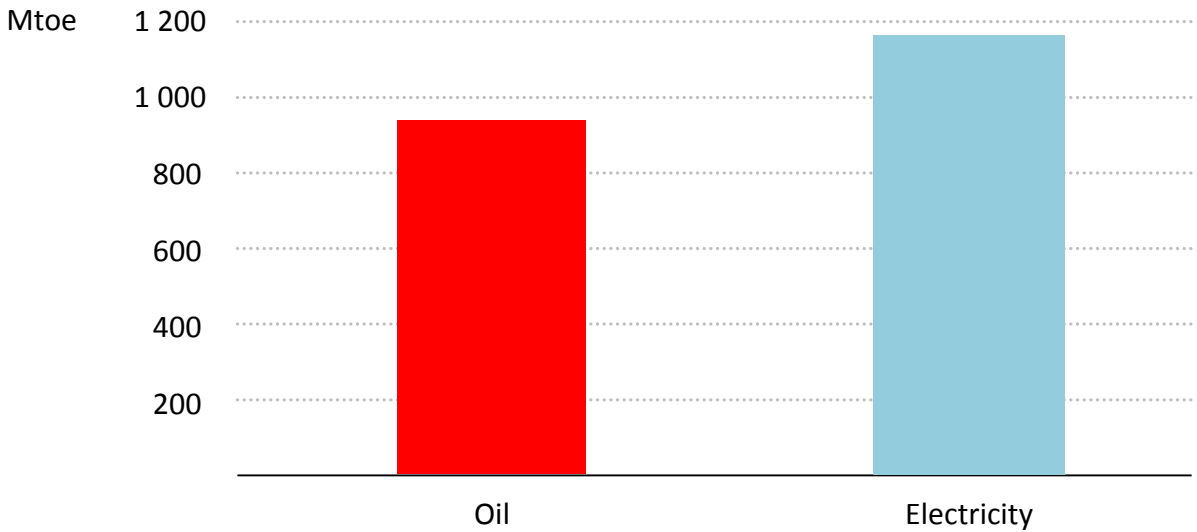
Share of "OPEC plus Russia" in global oil production



The dramatic growth of recent years in US shale is set to slow, but the resources are there to maintain high output for many years to come. This provides a strong counterweight to efforts to "manage oil markets"

The 20-year switch

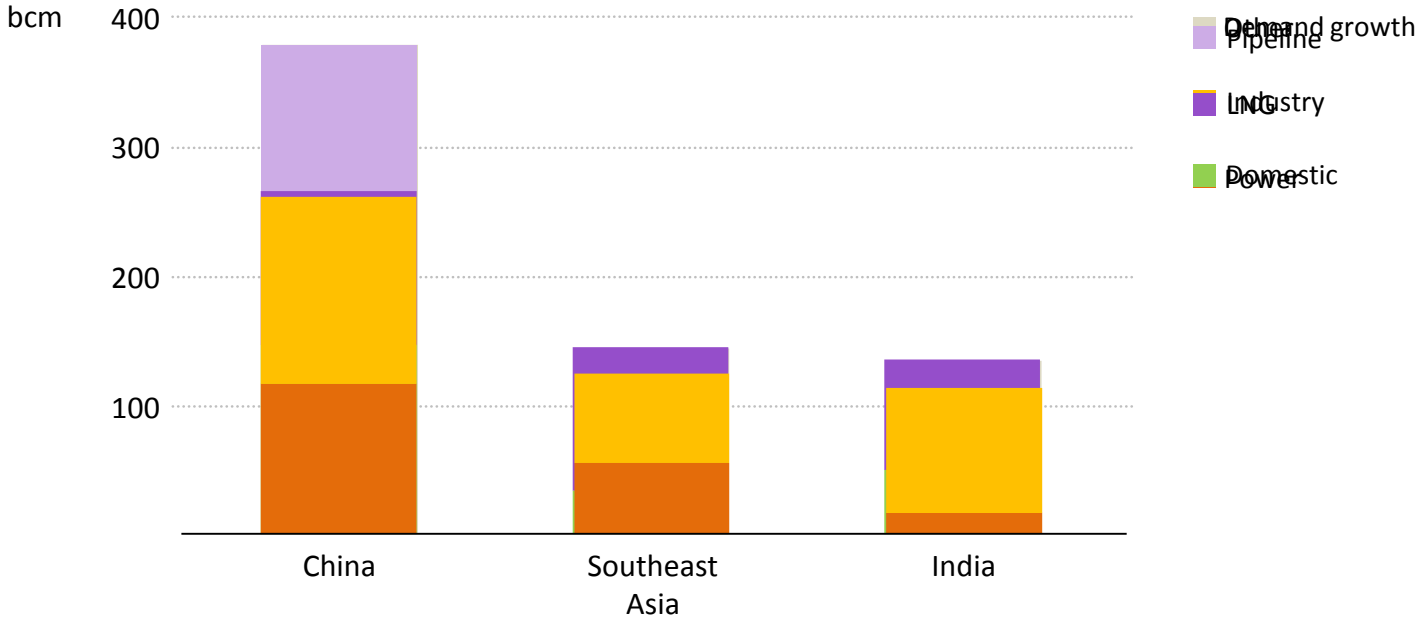
Change in global oil and electricity consumption, 2000 - 2018
Change in global oil and electricity consumption in the Stated Policies Scenario, 2018 - 2040



When consumers needed more energy in the past, they traditionally turned to oil
In the future, they turn first to electricity – even more so in the Sustainable Development Scenario

Natural gas turns to Asia

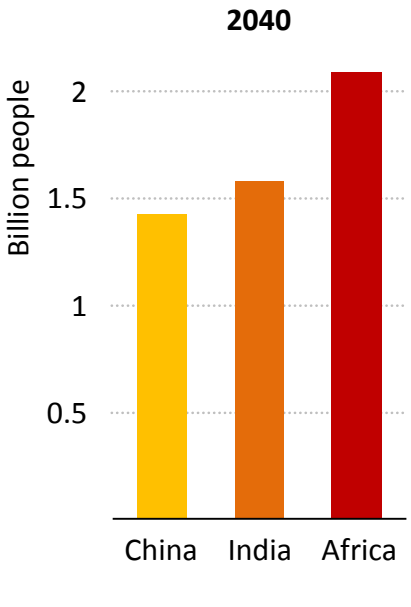
Growth in gas demand and supply in selected Asian markets in the Stated Policies Scenario, 2018-2040



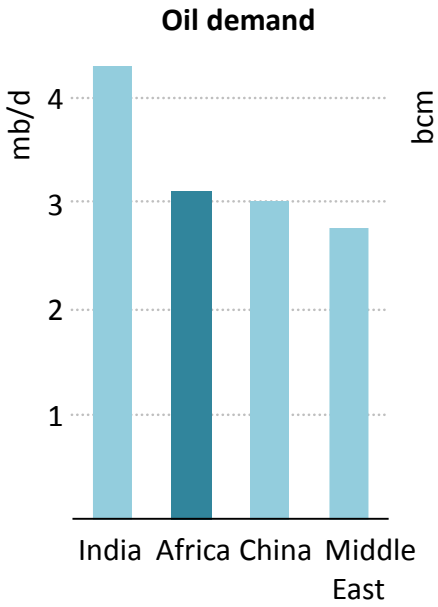
Developing economies in Asia account for half of global growth in gas demand, with industrial consumers taking the largest share, and this provides the spur for almost all the growth in gas trade, led by LNG

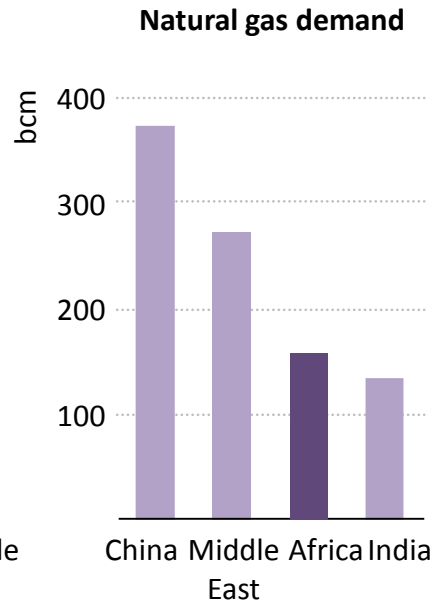
Africa emerges as a key driver for global energy markets

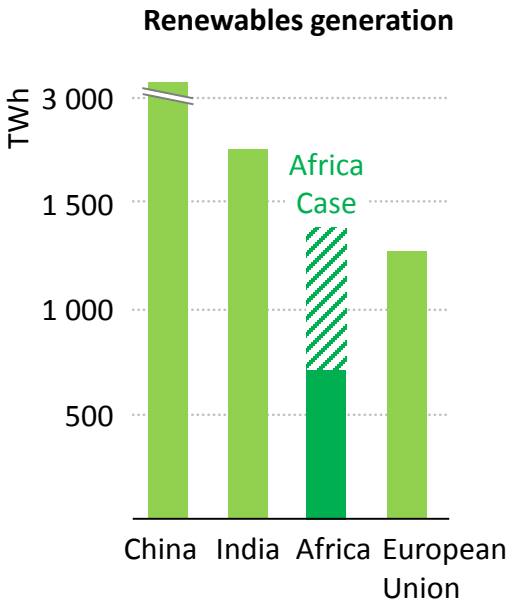
Total population by region



Africa's role in global energy growth, 2018-40

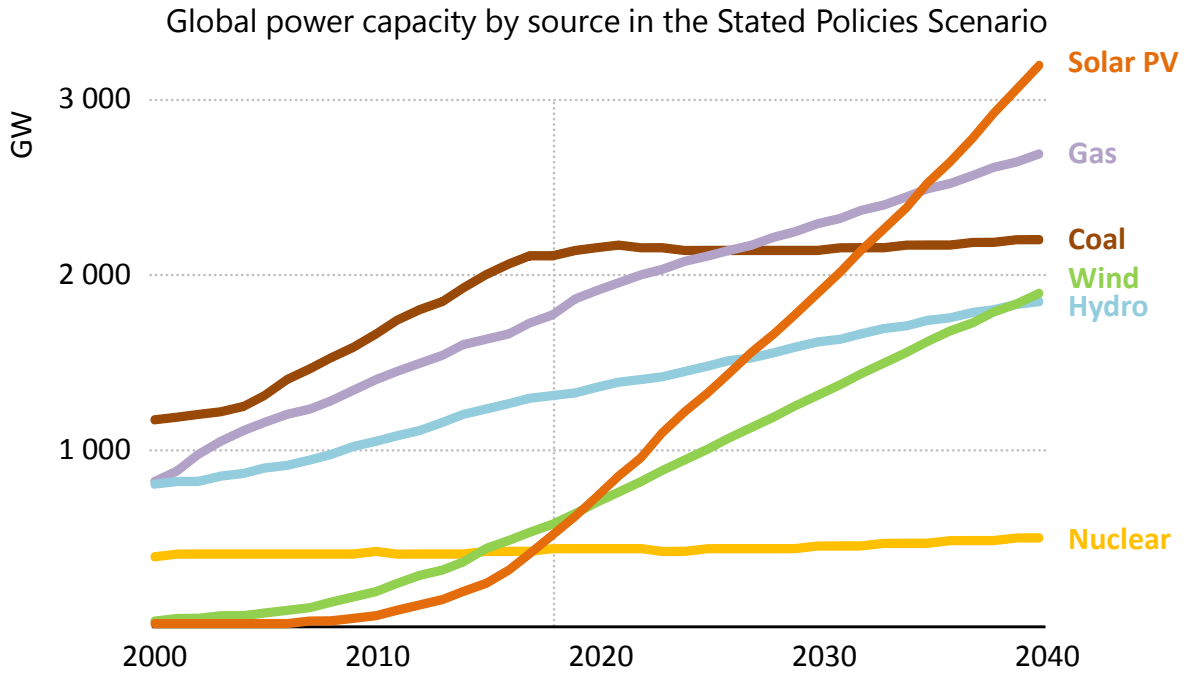






With rapidly rising population and a major switch away from the traditional use of biomass, Africa emerges as a major source of global growth for oil, natural gas and renewables

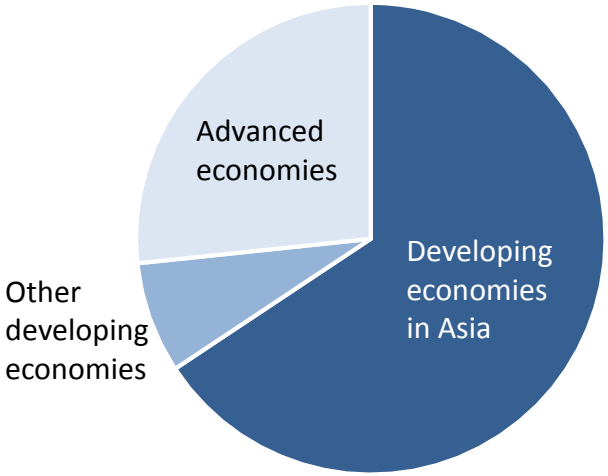
New solar PV projects are taking off



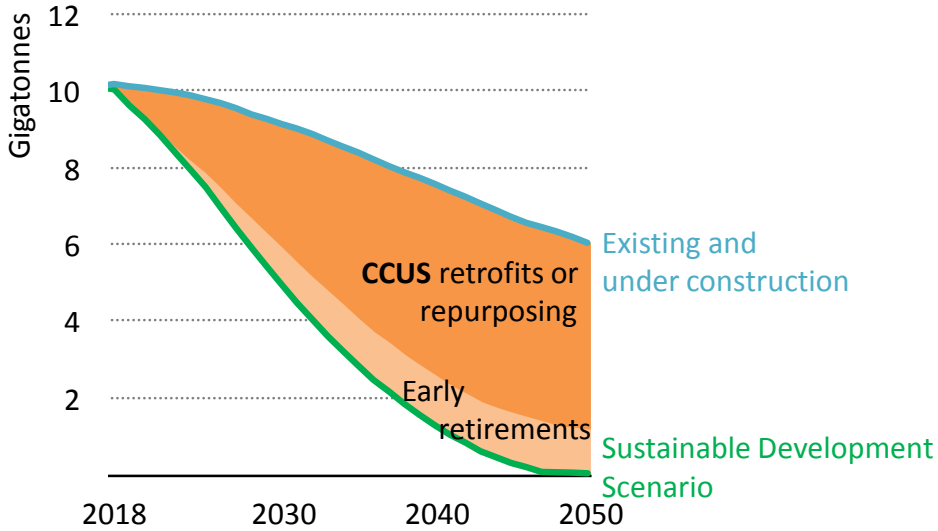
The power mix is being re-shaped by the rise of renewables and natural gas. In 2040, renewables account for nearly half of total electricity generation.

Today's coal plants leave a legacy that technology can address

Coal-fired capacity, existing and under construction:
2 250 GW



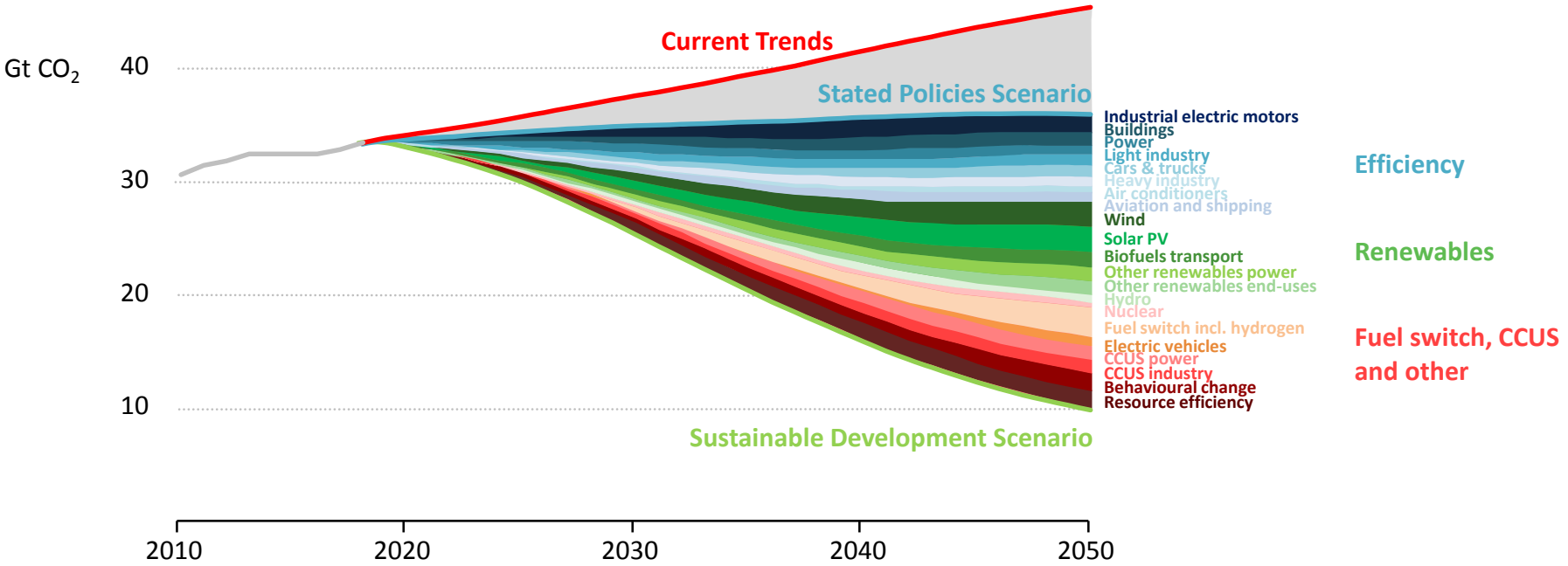
Annual CO_2 emissions from coal-fired power plants



Investment in CCUS will be critical to ensure that the young coal fleet is compatible with climate targets, while repurposing them to provide flexibility can reduce CO_2 and pollutant emissions, and help integrate renewables

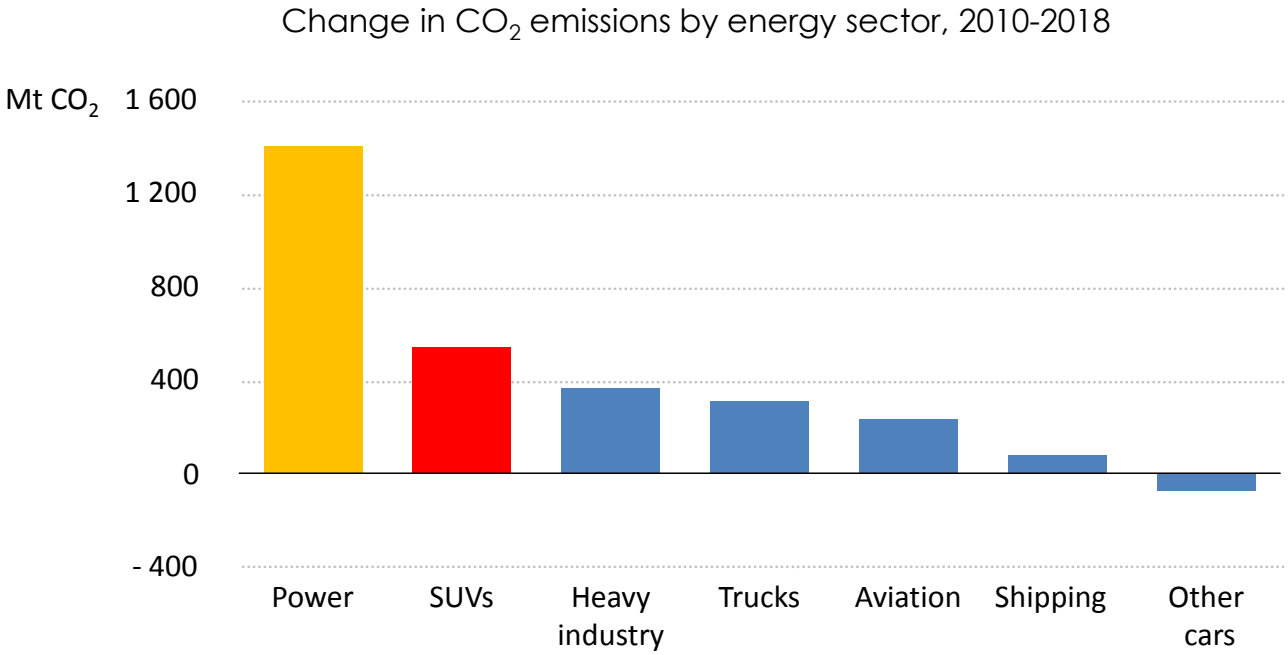
No single or simple solutions to reach sustainable energy goals

Energy-related CO_2 emissions and reductions in the Sustainable Development Scenario by source



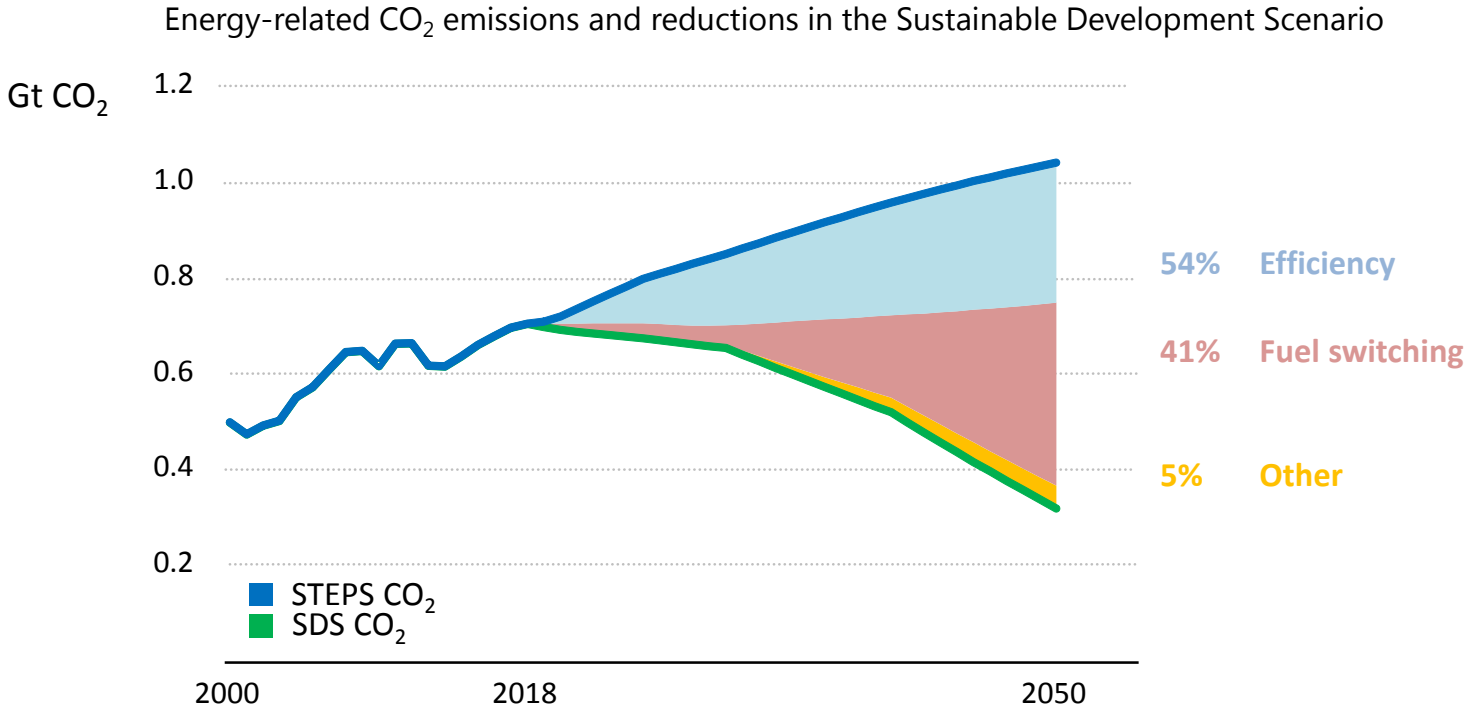
A host of policies and technologies will be needed across every sector to keep climate targets within reach, and further technology innovation will be essential to aid the pursuit of a 1.5°C stabilisation

Power and SUVs have been the main forces driving emissions higher



The global fleet of SUVs increased from 35 million in 2010 to over 200 million in 2018, becoming a major force in rising oil demand and the second-largest reason for CO_2 emissions growth since 2010

Pathways for decarbonising international shipping



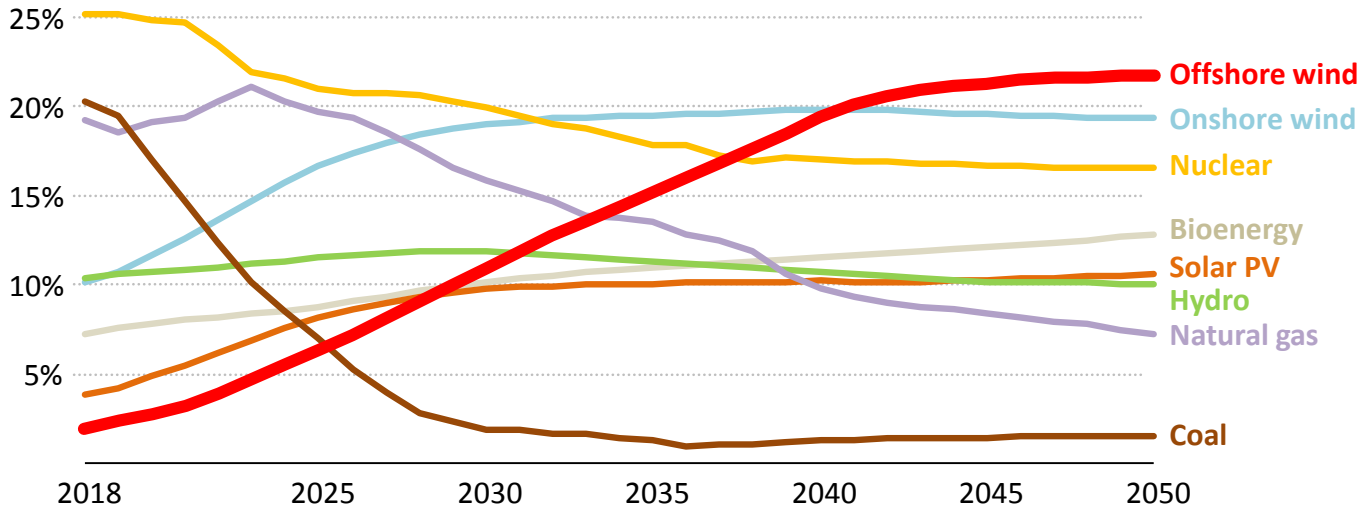
Besides efficiency, biofuels and hydrogen contribute to more than 40% for reaching IMO GHG emissions target

Conclusions

- Energy policies are adjusting to new pressures and imperatives, but the overall response is still far from adequate to meet the energy security and environmental threats the world now faces
- The oil & gas landscape is being profoundly reshaped by shale, ushering in a period of intense competition among suppliers & adding impetus to the rethink of company business models & strategies
- Solar, wind, storage & digital technologies are transforming the electricity sector, but an inclusive and deep transition also means tackling legacy issues from existing infrastructure
- Energy is vital for Africa's development, and Africa's energy future is increasingly influential for global trends as it undergoes the largest urbanisation the world has ever seen
- All have a part to play, but governments must take the lead in writing the next chapter in energy history and steering us onto a more secure and sustainable course

A carbon neutral Europe puts offshore wind in front

Shares of electricity generation by technology in the European Union, Sustainable Development Scenario



Offshore wind is set to become the largest source of electricity in the European Union by 2040, complementing other renewables towards a fully decarbonised power system