



Global energy landscape and renewable energy trends

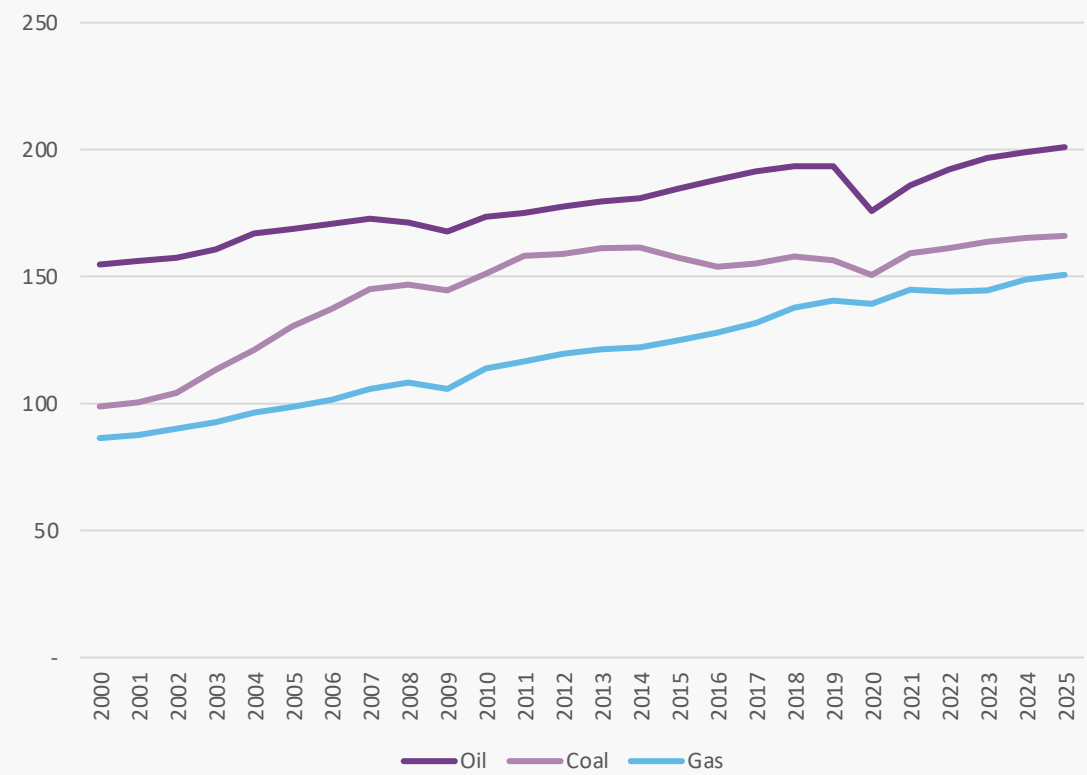
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Global energy trends 2026

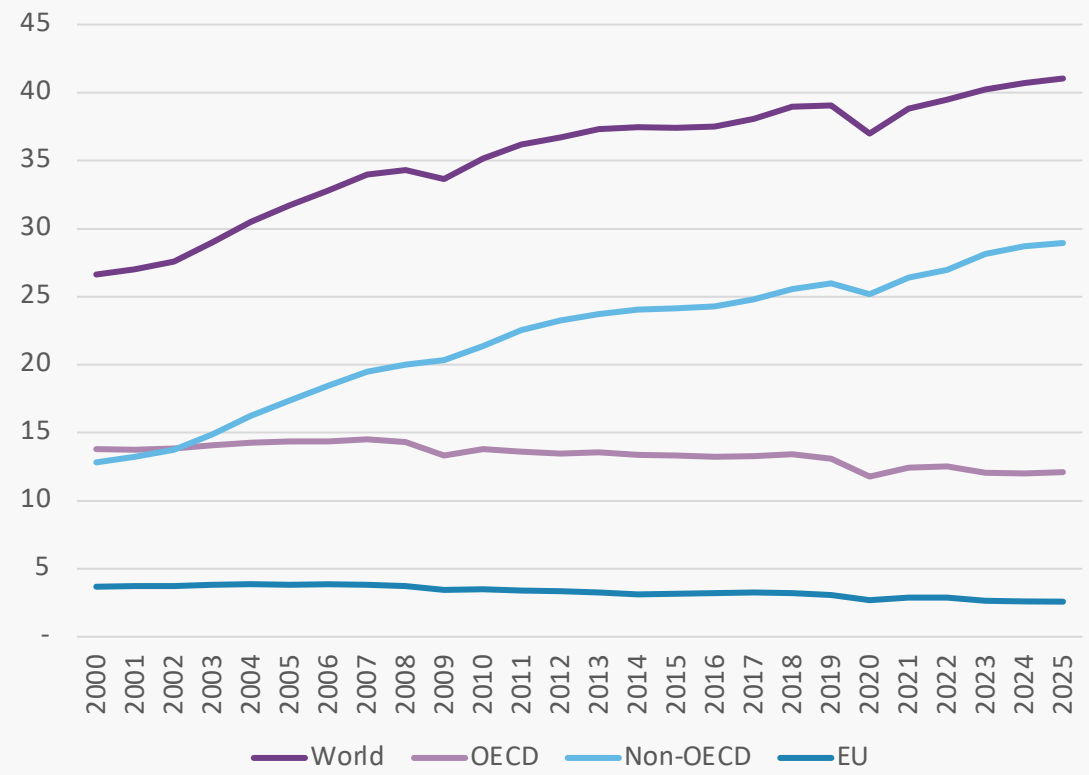
- Global energy consumption is continuing to grow
- Fossil fuels still dominate the global energy mix
- Coal demand may peak in the coming years
- In many countries, coal-fired power plants are shifting from a baseload role towards more flexible operation
- Natural gas was long regarded as a “bridge fuel” in the energy transition, but its role is under question now
- Renewables are expanding rapidly almost everywhere
- Batteries are becoming an integral part of renewable systems
- In many cases, wind and solar PV are cost-competitive with fossil fuels even when coupled with battery storage
- Electricity consumption is growing faster than total energy consumption
- New drivers of electricity demand emerge: electric vehicles, data centers & AI (+ electrolyzers in the future?)
- Electrification is expanding the role of renewables beyond the power sector
- Climate change and extreme temperatures are leading to increased air conditioner use
- Grids are becoming as important as generation
- As the share of variable renewables increases, system flexibility becomes the next big challenge
- Complex modern energy systems need cost optimisation with (open-source) energy models
- Geopolitical conflicts → reducing reliance on fossil fuels is increasingly becoming a matter of energy security

Global fossil fuels consumption is still growing, emissions from energy are continuing to grow too

Global consumption of fossil fuels, exajoules

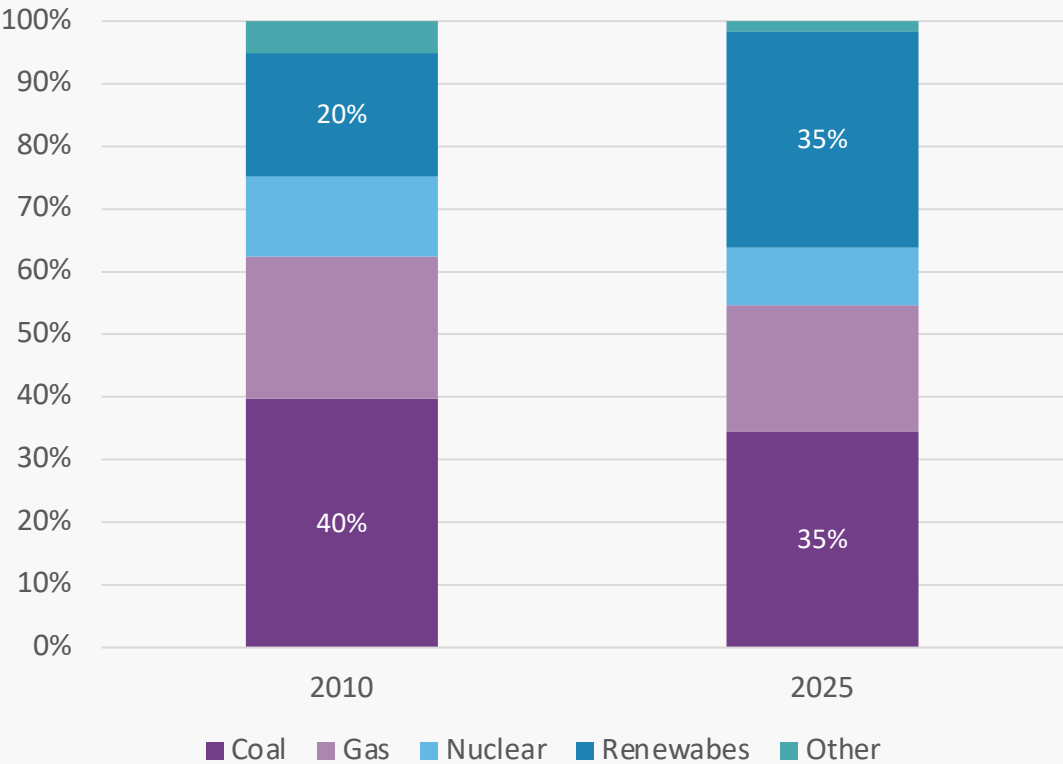


Emissions from energy, process emissions, methane, and flaring, billion tonnes of carbon dioxide equivalent

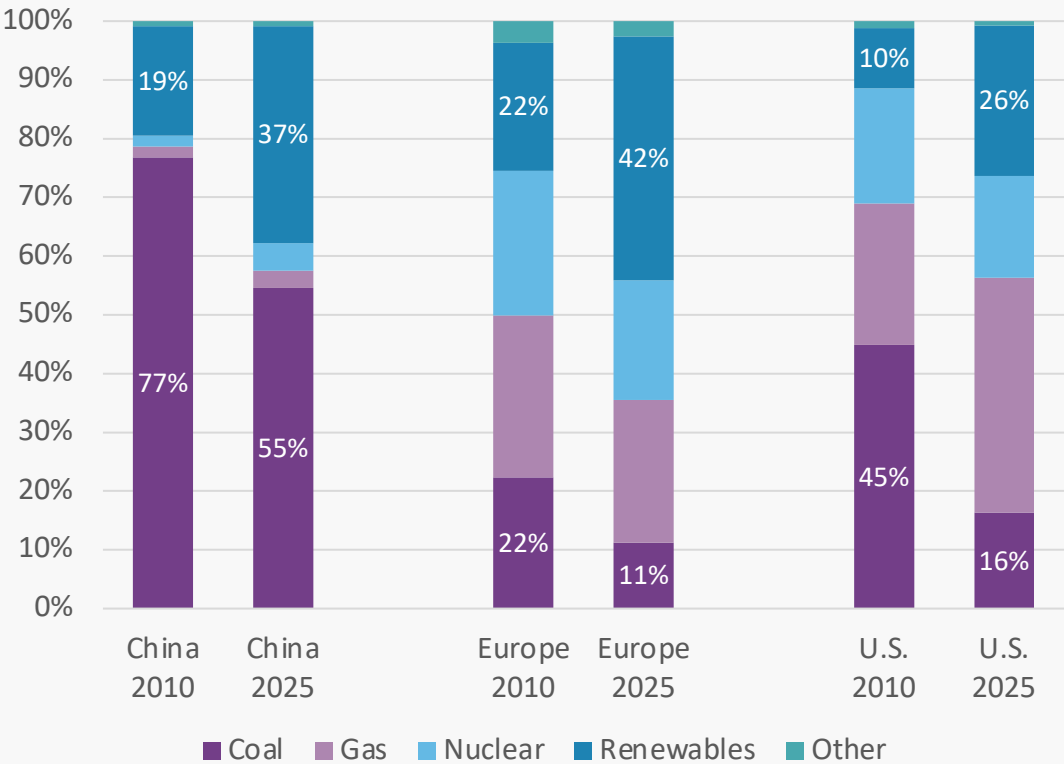


The share of coal in the power generation has been decreasing, while the share of renewables has been growing

Global power mix in 2010 and 2025



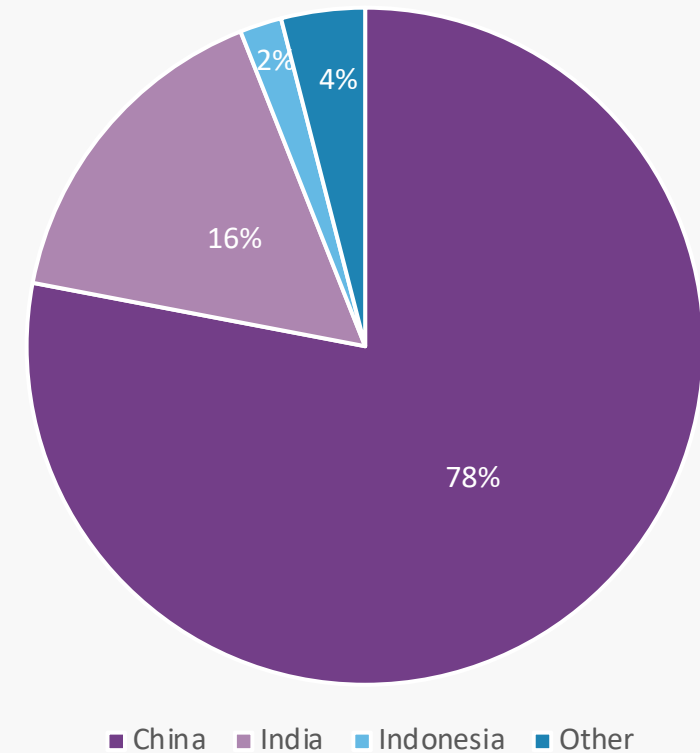
Power mixes of China, Europe and the United States in 2010 and 2025



When will coal generation peak?

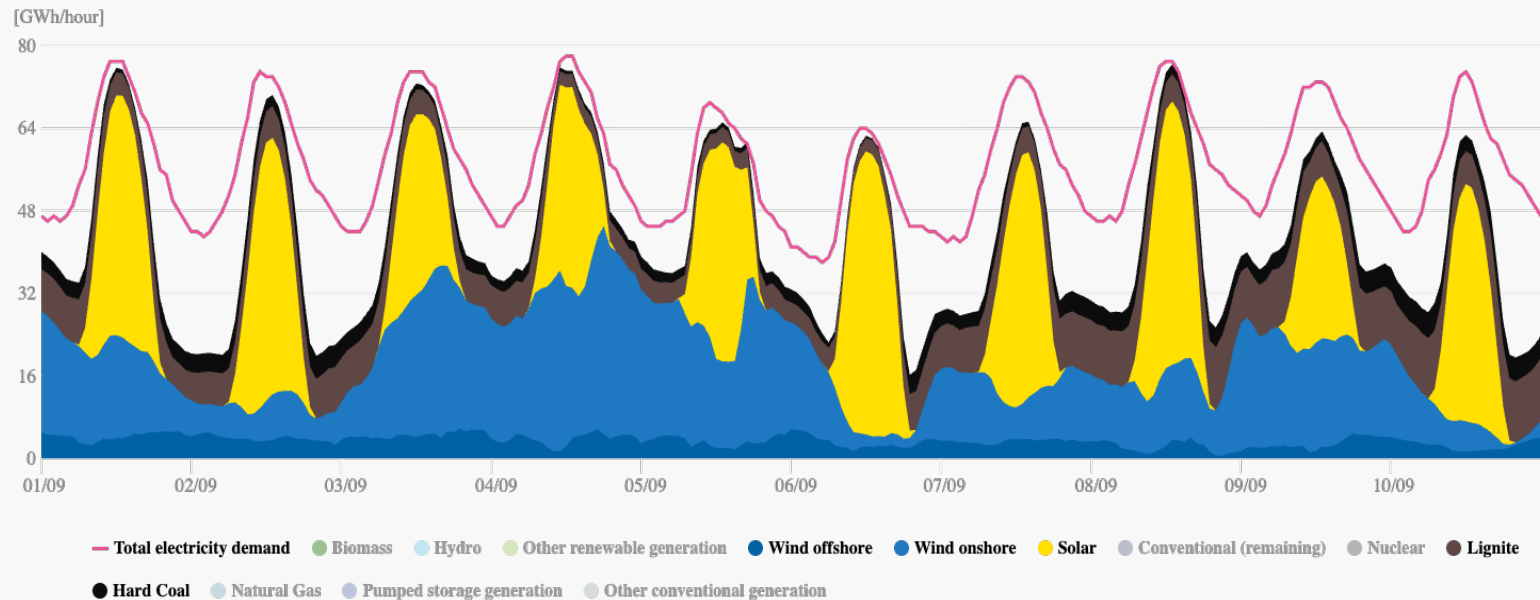
- Global coal-fired electricity generation decreased by 0.6% in 2025
- However, this might be not a new trend yet (U.S.-Israeli War with Iran → gas price shocks)
- Since the 2015 Paris Agreement, 42 countries have abandoned plans to develop new coal-fired power capacity
- All EU countries will be coal-free by 2050, with only 3 countries (Bulgaria, Germany and Poland) phasing out coal after 2033
- Yet, meeting the goals of the Paris Agreement requires the global coal-fired power fleet to be phased out by 2040
- In 2025, only 32 countries planned to build new coal-fired power plants, while construction was underway in just 15 countries

Coal-fired capacity under construction in 2026, by country



Coal is increasingly shifting from a primary source of generation to a backup role in power systems

Power generation and consumption in Germany, 01-10 September 2026



Historically, coal plants were typically operated as baseload generators:

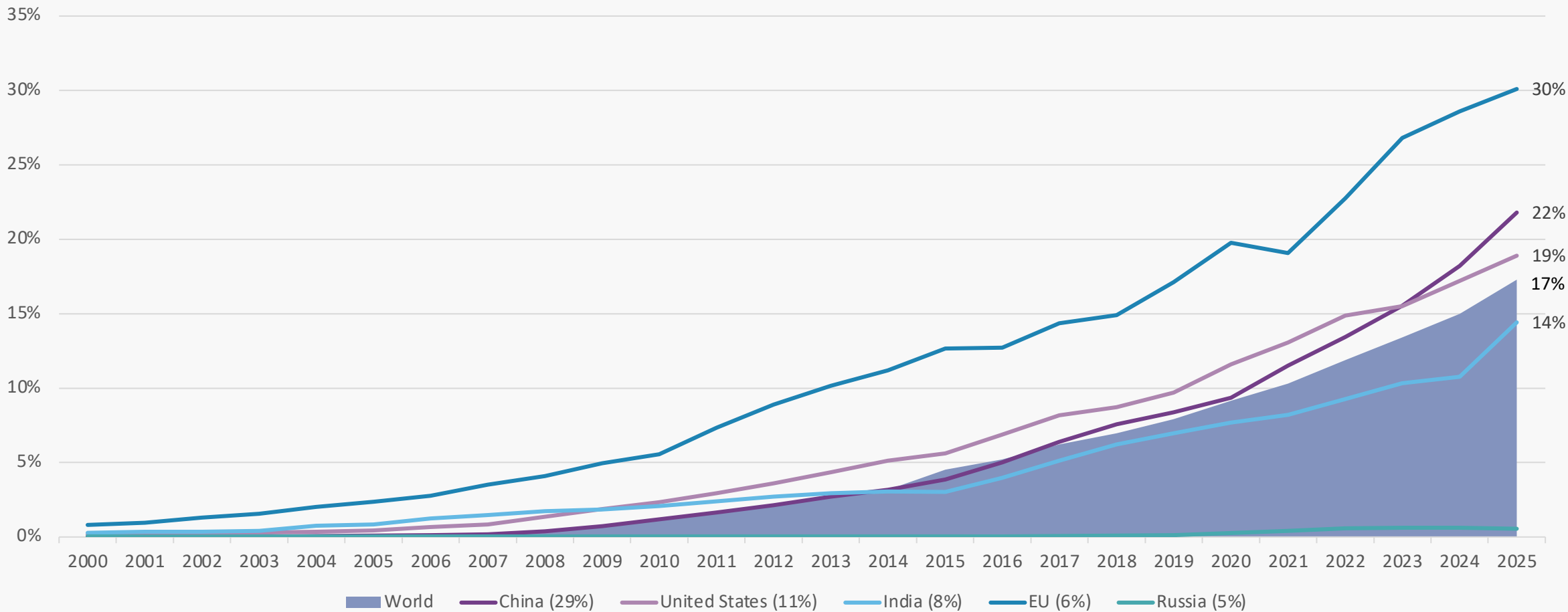
- Coal → high utilisation → relatively constant output

With increasing wind and solar, some coal fleets are instead being used more flexibly:

- Wind/solar available → coal output reduced
- Renewable output falls / demand rises → coal output increased

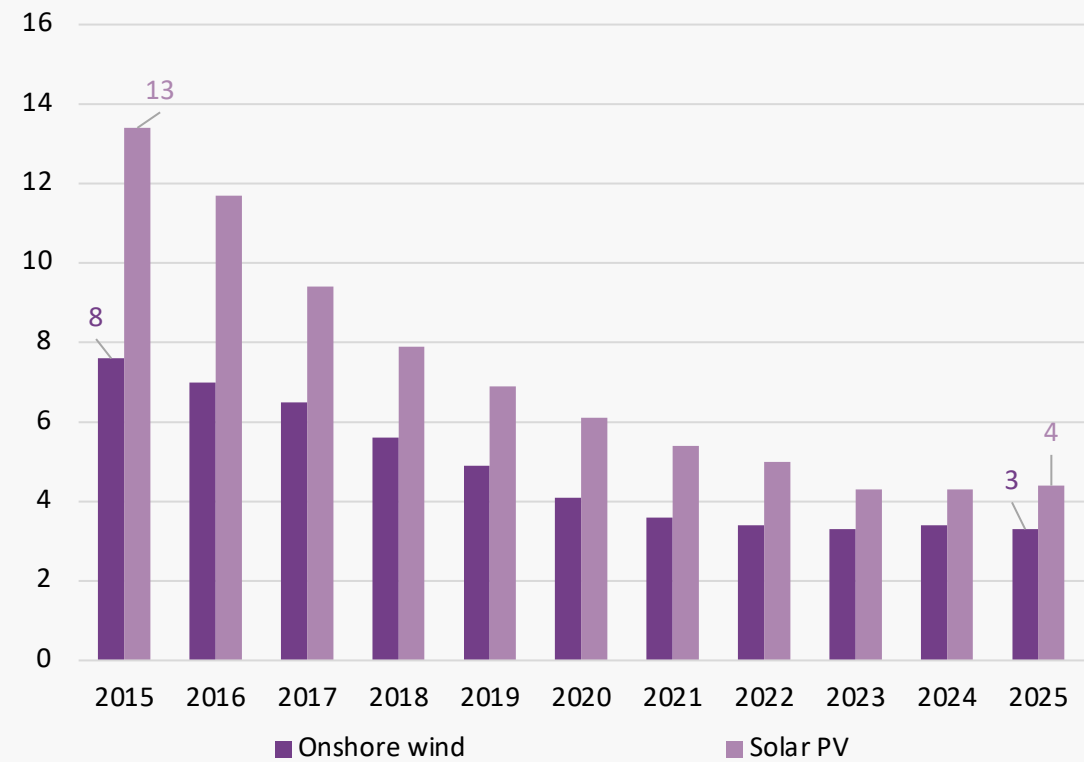
Currently, more than 50% of China's coal-fired power plants are capable of flexible operation

The share of solar PV and wind generation has significantly increased in 4 out of 5 global top GHG emitters

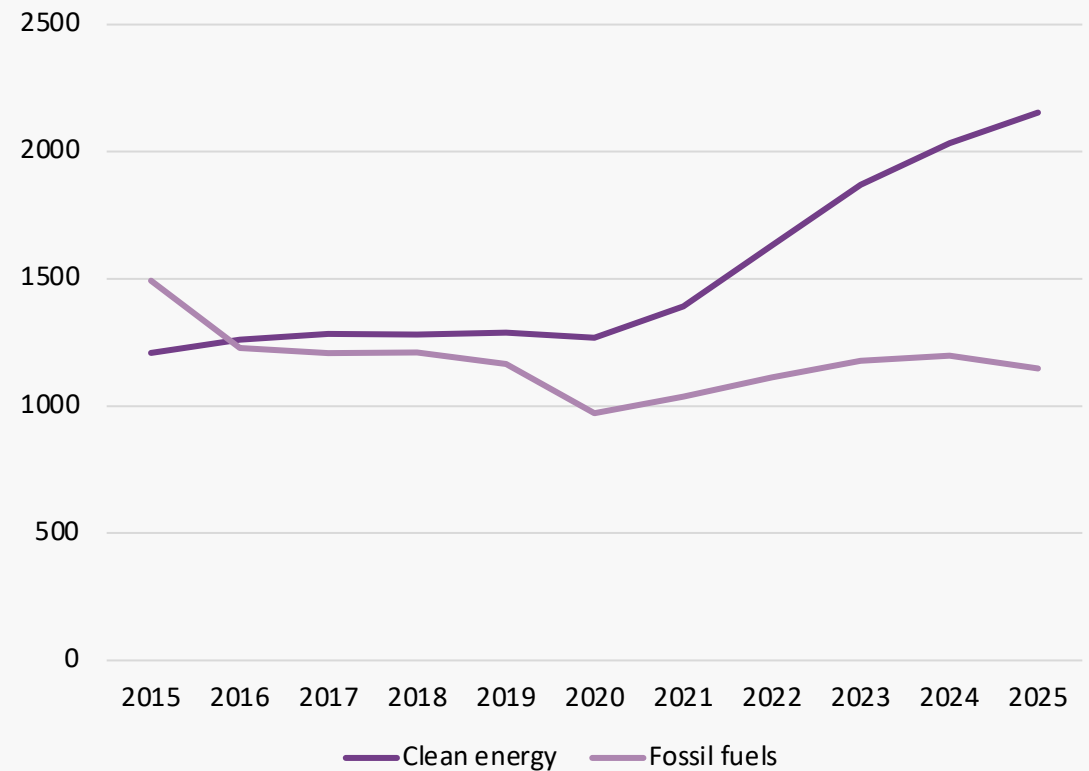


The LCOE of onshore wind and solar PV has fallen by 2–3 times over the past decade, while global investment in clean energy is now nearly twice that in fossil fuels

Levelized cost of energy (LCOE) for onshore wind and solar PV, USD cents / kWh

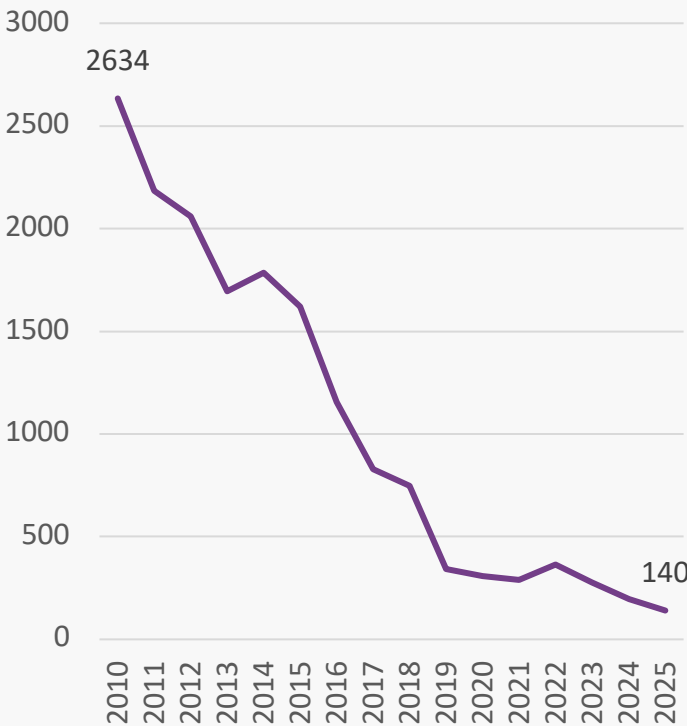


Global investment in clean energy and fossil fuels, billion USD

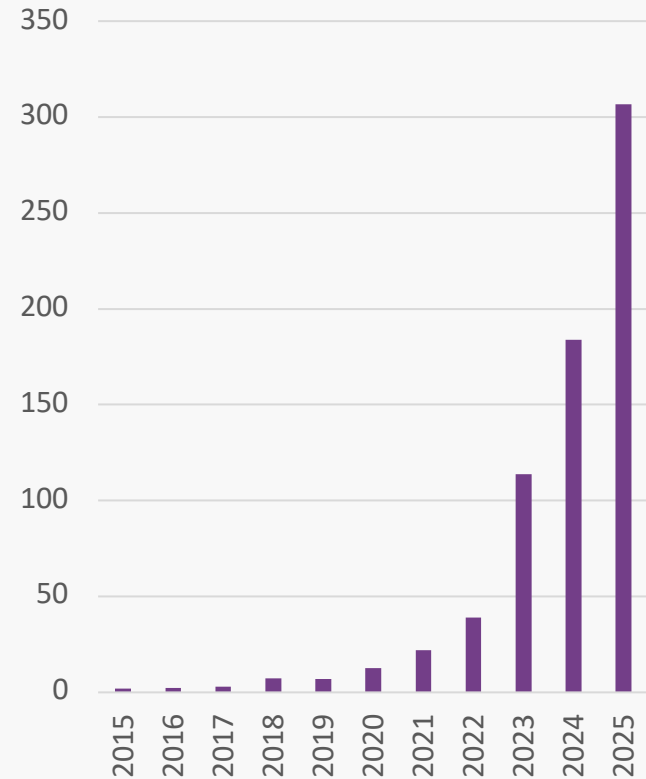


Energy storage has become affordable, and its capacity additions are booming

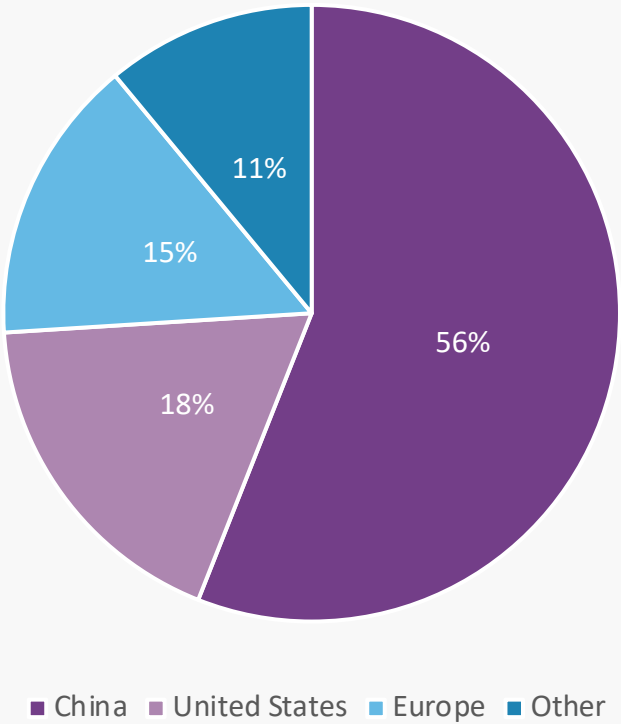
Total installed energy storage project cost, global (2025 USD/kWh usable)



Gross energy storage capacity additions, global (GWh gross)

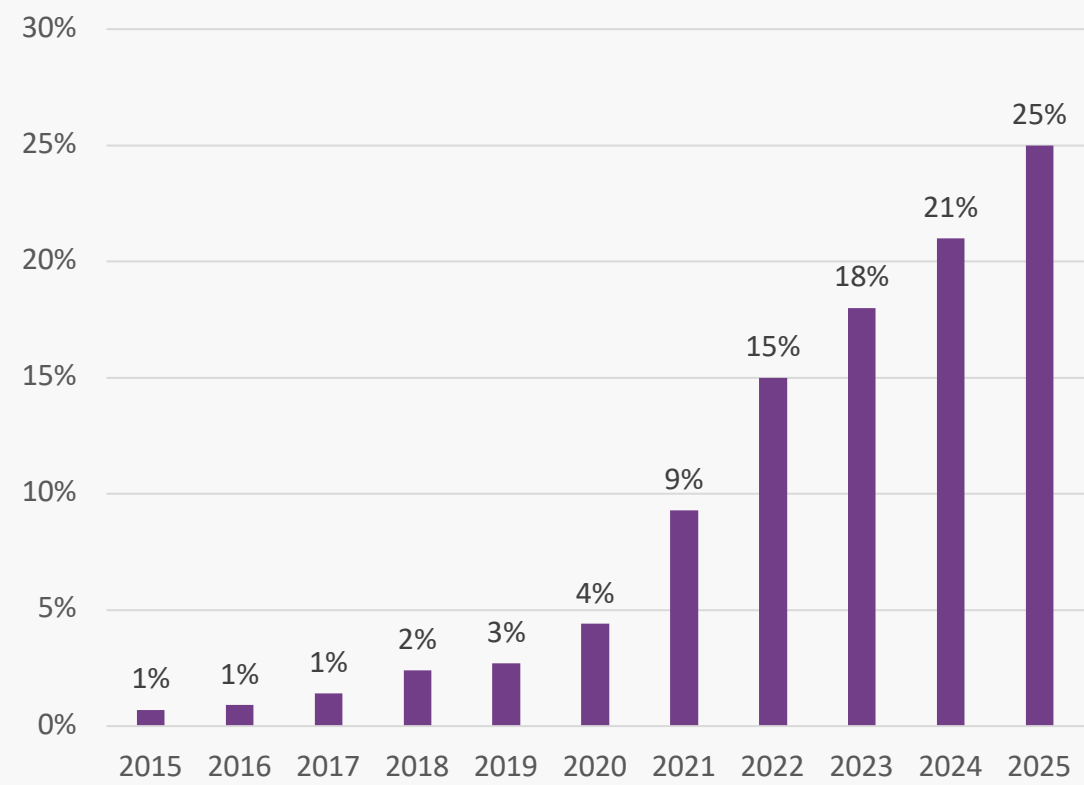


New additions in 2025, by country/region

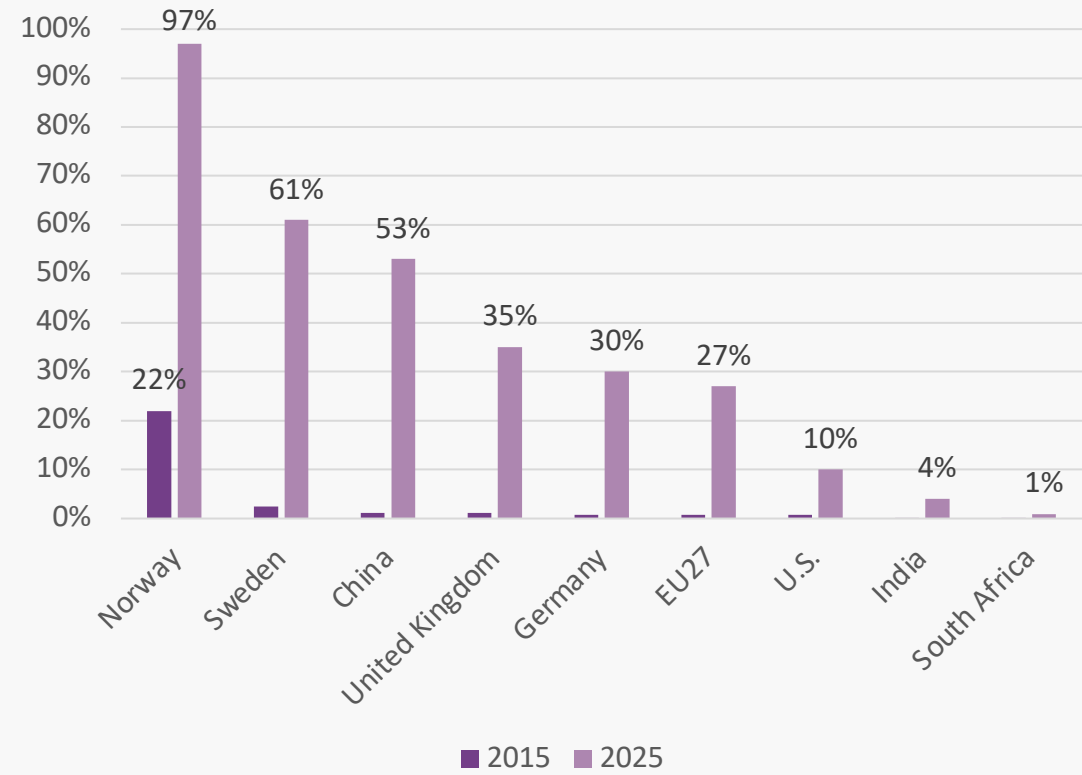


Electric vehicles are increasingly competitive, and their sales are booming

Electric vehicles in global sales of new cars

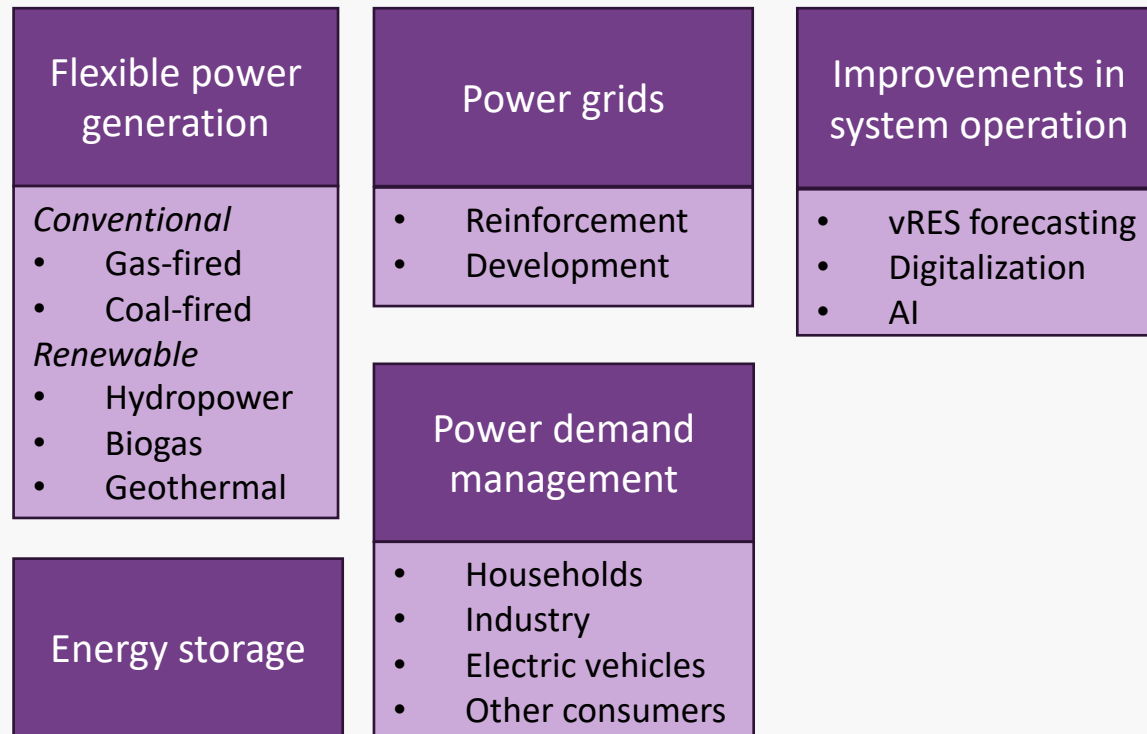


Electric vehicles in global sales of new cars in selected countries



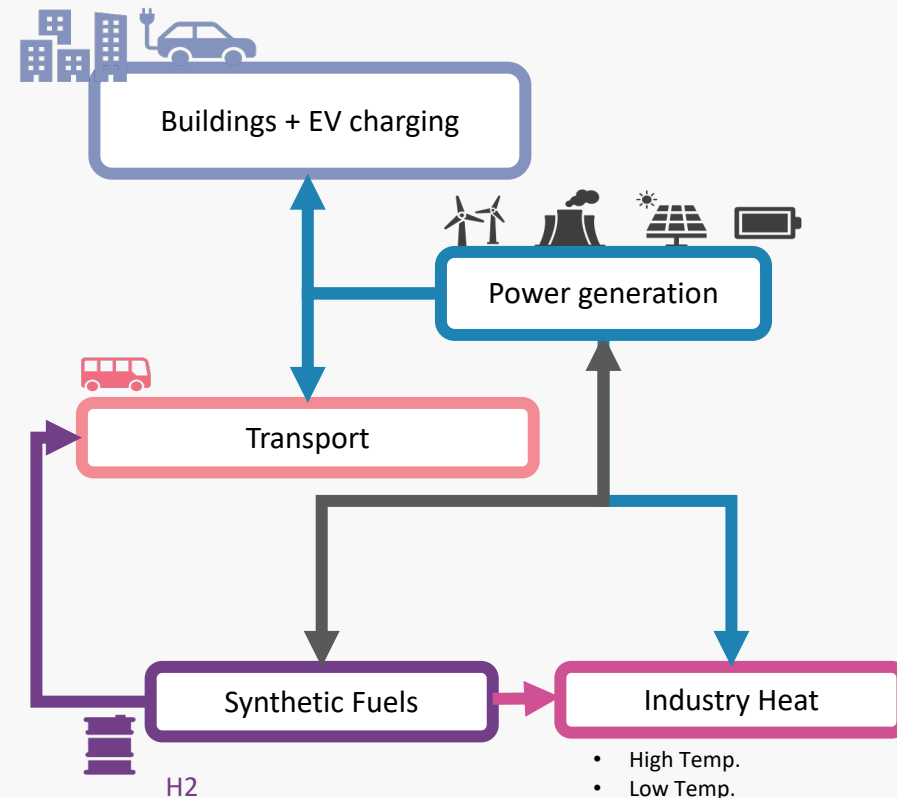
In power systems with high shares of variable renewables, flexibility is becoming a priority; cost optimisation is increasingly available with open-source energy models

Sources of power system flexibility



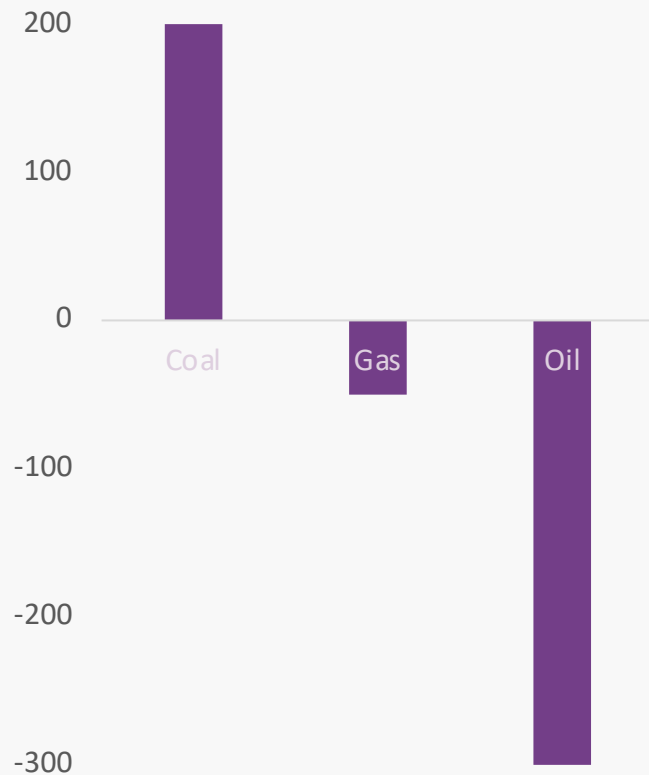
A comprehensive (holistic) approach involves the parallel development of all available tools

Multi-sector cost optimisation (e.g., with PyPSA-SPICE model), both for capacity expansion and generation dispatch, helps to decrease the total system cost



Global emissions from fossil fuels may decrease by 0.5% in 2026 amid the Hormuz crisis, although demand for coal may increase

Projected change in annual global emissions from fossil fuels, MtCO₂



- Trade through the strait of Hormuz was severely disrupted → oil and gas prices spikes; some countries have been trying to substitute gas with coal
- Coal demand may increase by 1.2% in 2026
- However, significant substitution of gas with coal in the short term is impossible
- In the longer term, volatile prices for fossil fuels stimulate more investment in:
 - Renewables, especially wind and solar PV
 - Electric vehicles
- Other factors that increase coal demand in the short term:
 - Strong El Niño that started in 2026 (demand for cooling ↑; hydropower output ↓)
 - Wind and solar PV curtailment in China

Thank you for your attention!

Do you have any questions or comments?

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