



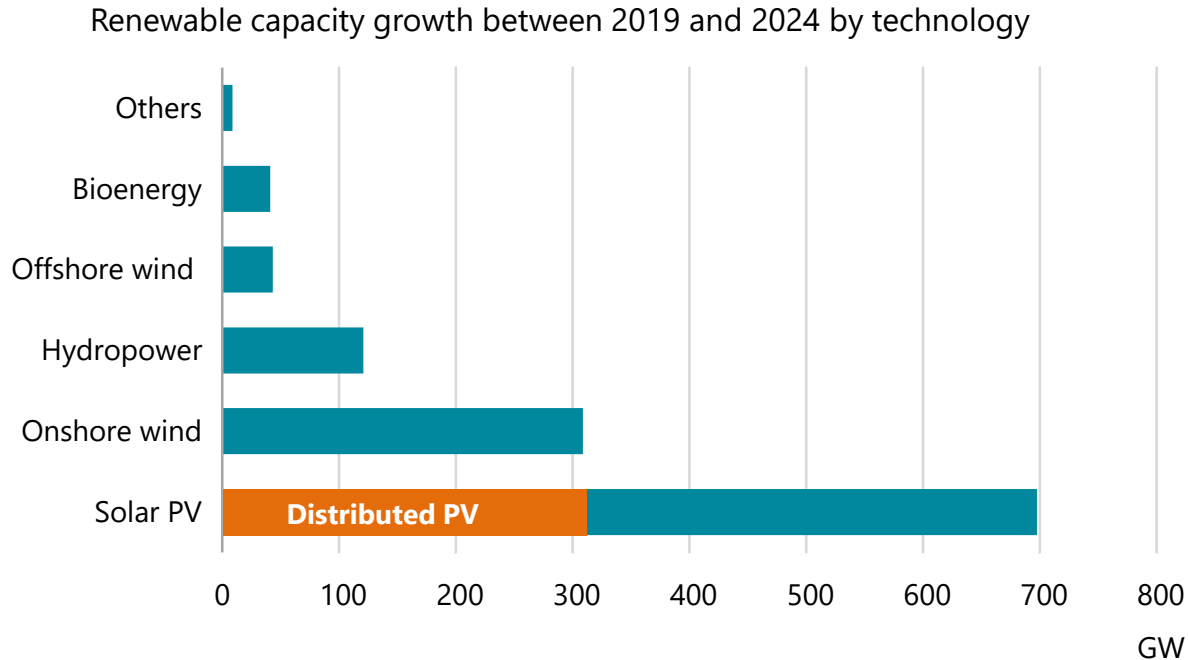
Renewables 2019

Market analysis and forecasts to 2024

Brazil Launch at FGV

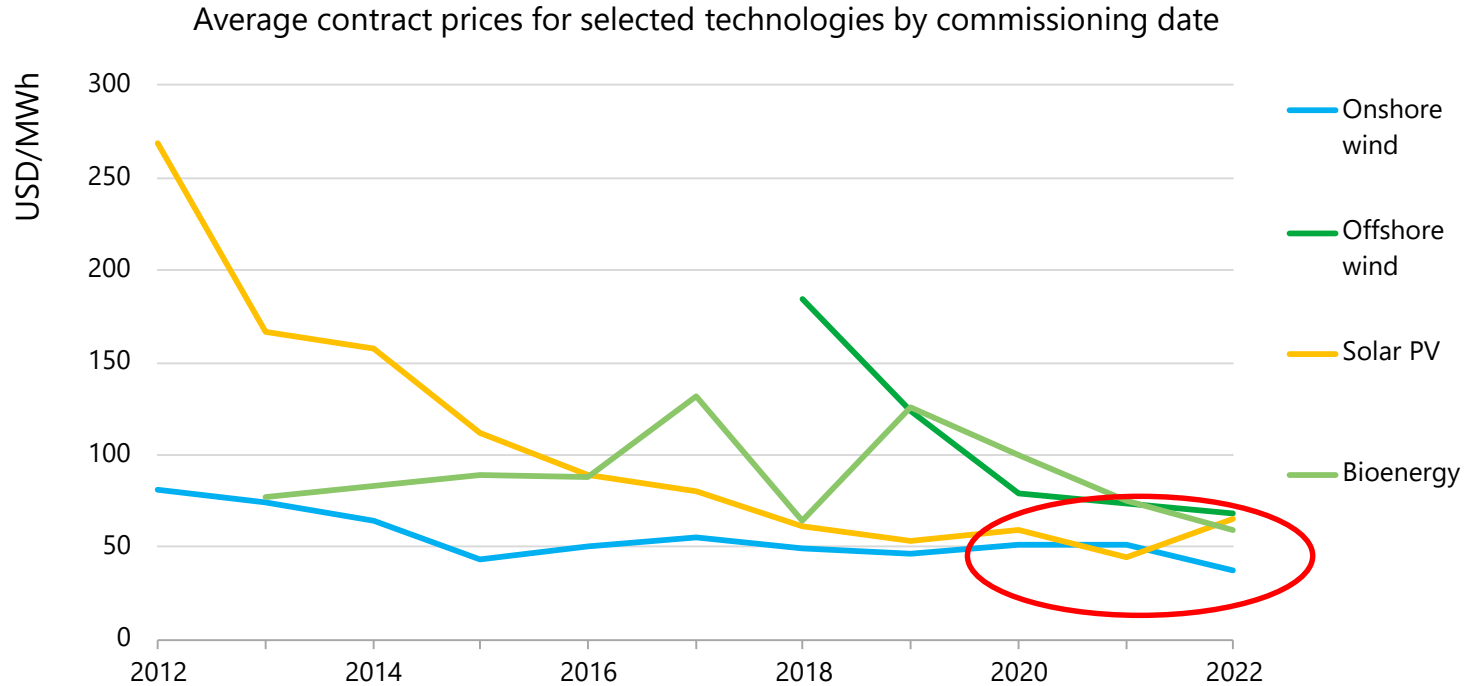
Rio – 25 November 2019

Solar PV drives strong rebound in renewable capacity expansion



Renewables expand by 50% through 2024, with distributed PV alone growing as much as onshore wind. The IEA forecast is 14% higher than last year due to improved policies and increasing competitiveness

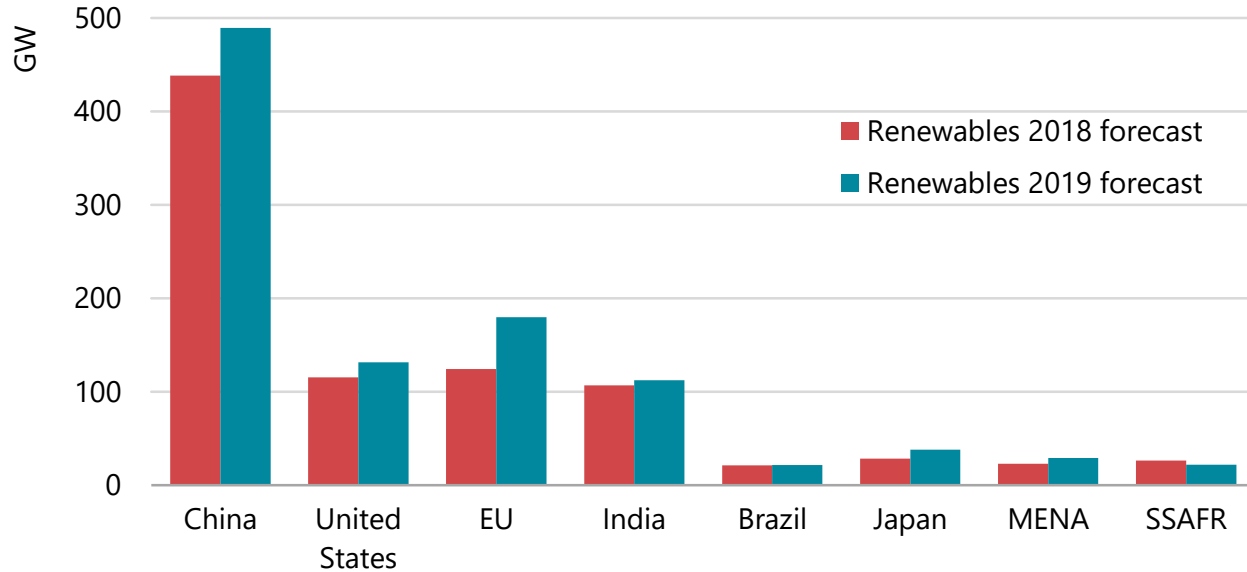
Competition is driving wind and solar prices down rapidly



Competitive auctions are expected drive two-thirds of all renewable capacity growth in the next five years with average wind and solar PV contract prices ranging from USD 20/MWh to USD 60/MWh

EU and China drive a more optimistic forecast

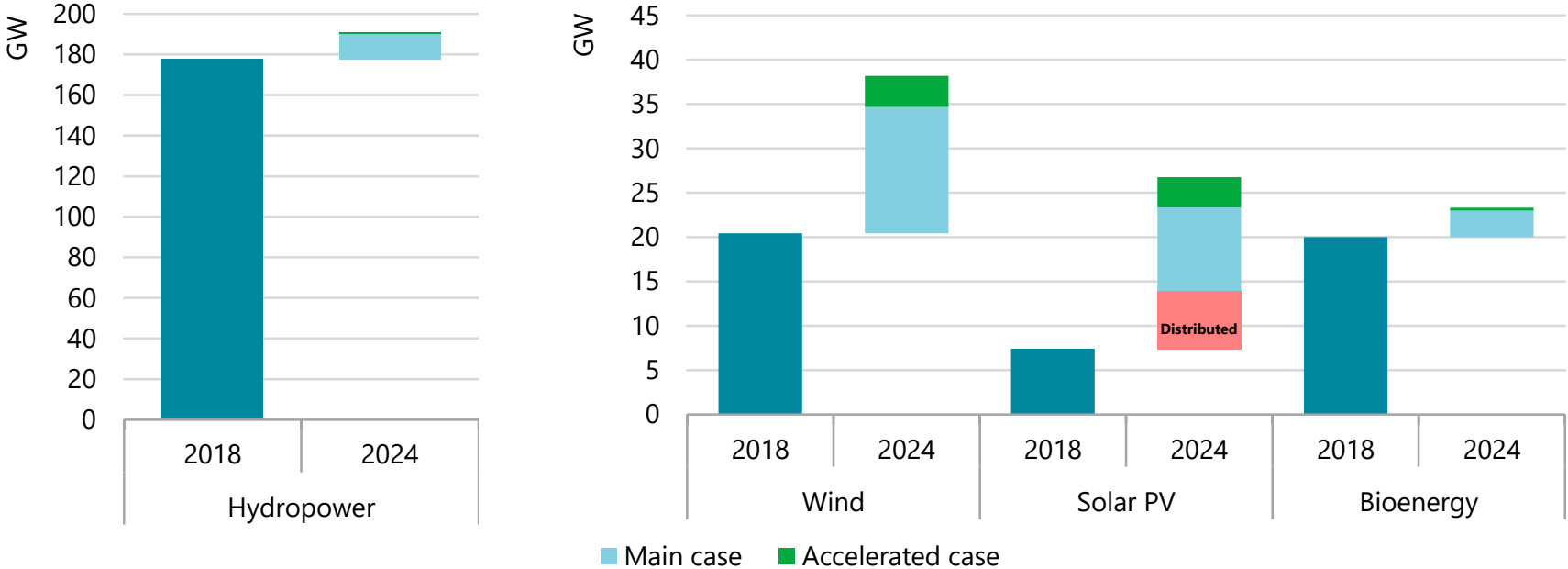
Renewable capacity growth by region



The forecast is revised up by 14% in all regions except Sub-Saharan Africa where high financing risk, administrative and policy uncertainties, and grid availability remain challenging

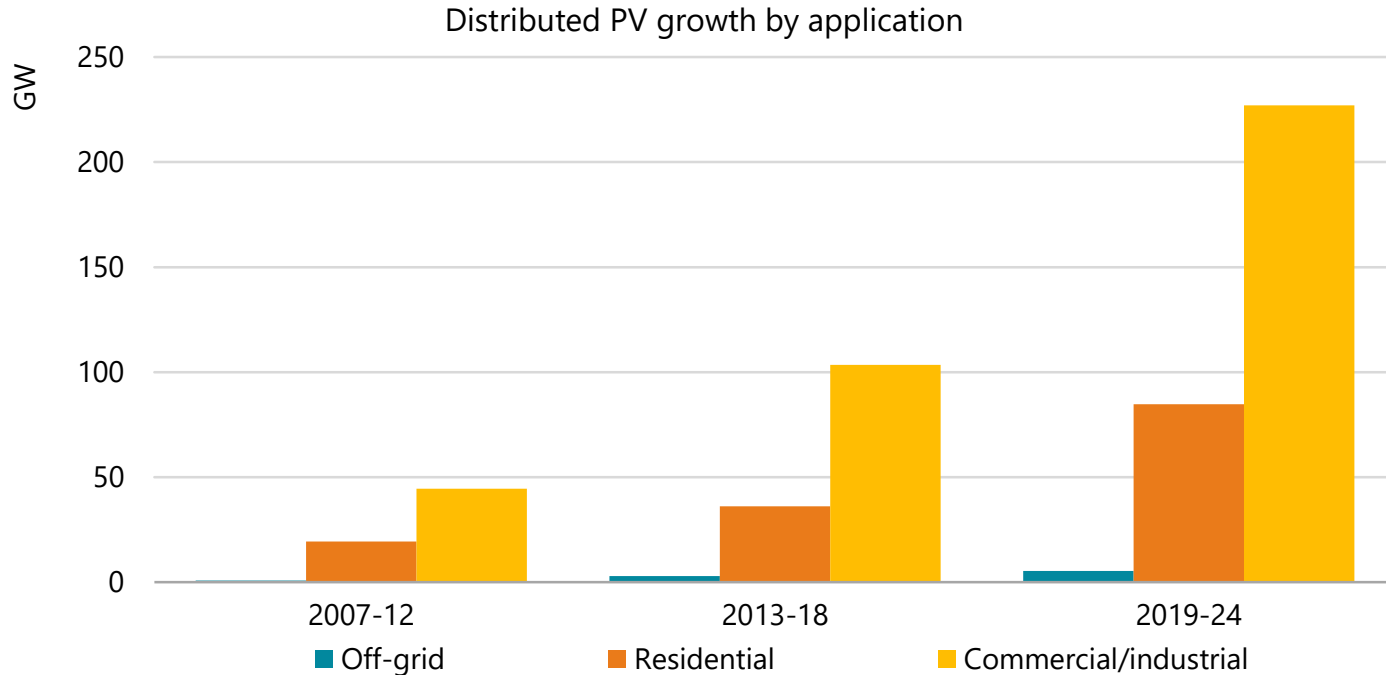
Latin America's renewable expansion dominated by wind and solar

Latin America renewable electricity capacity, historical and forecasts



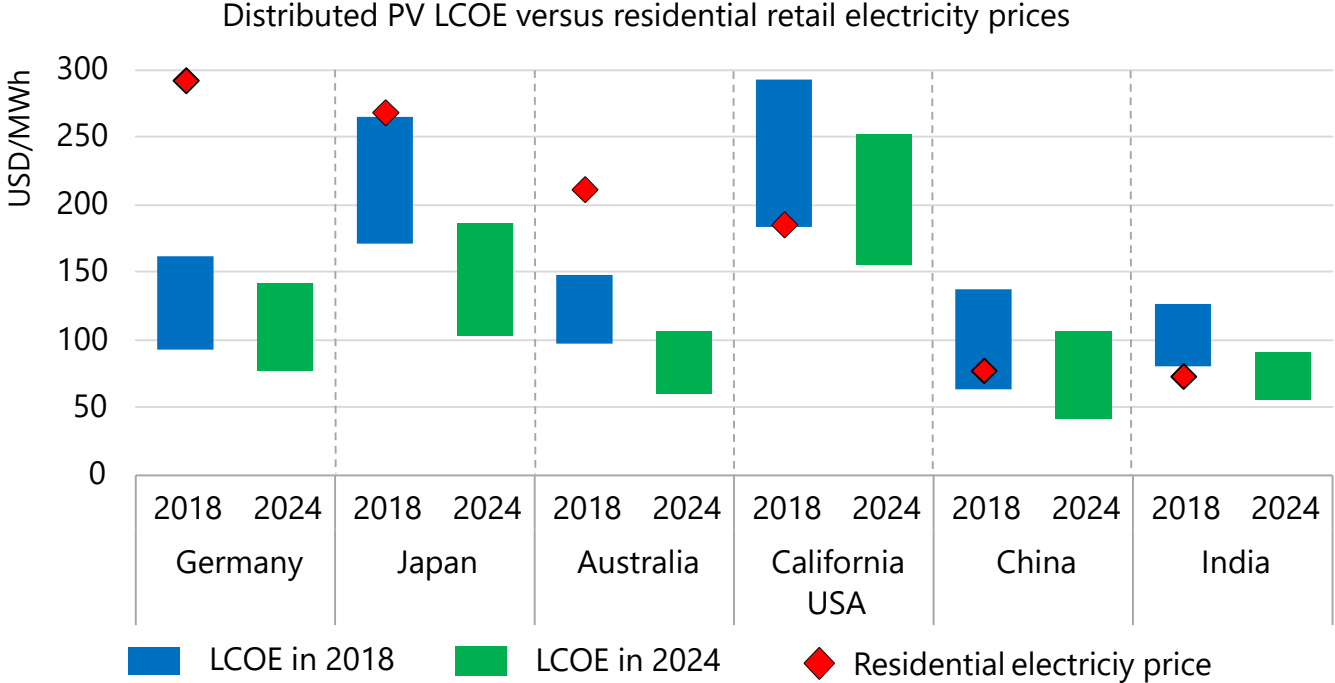
Brazil alone accounts for almost half of all renewable capacity growth in Latin America; distributed systems are responsible for a third of total PV growth in the region driven by policies and improving economics

Commercial buildings and industry lead distributed PV growth



Economies of scale + better match between PV output and electricity demand in commercial/industrial applications enable higher self-consumption, saving more on electricity bills than in case of residential

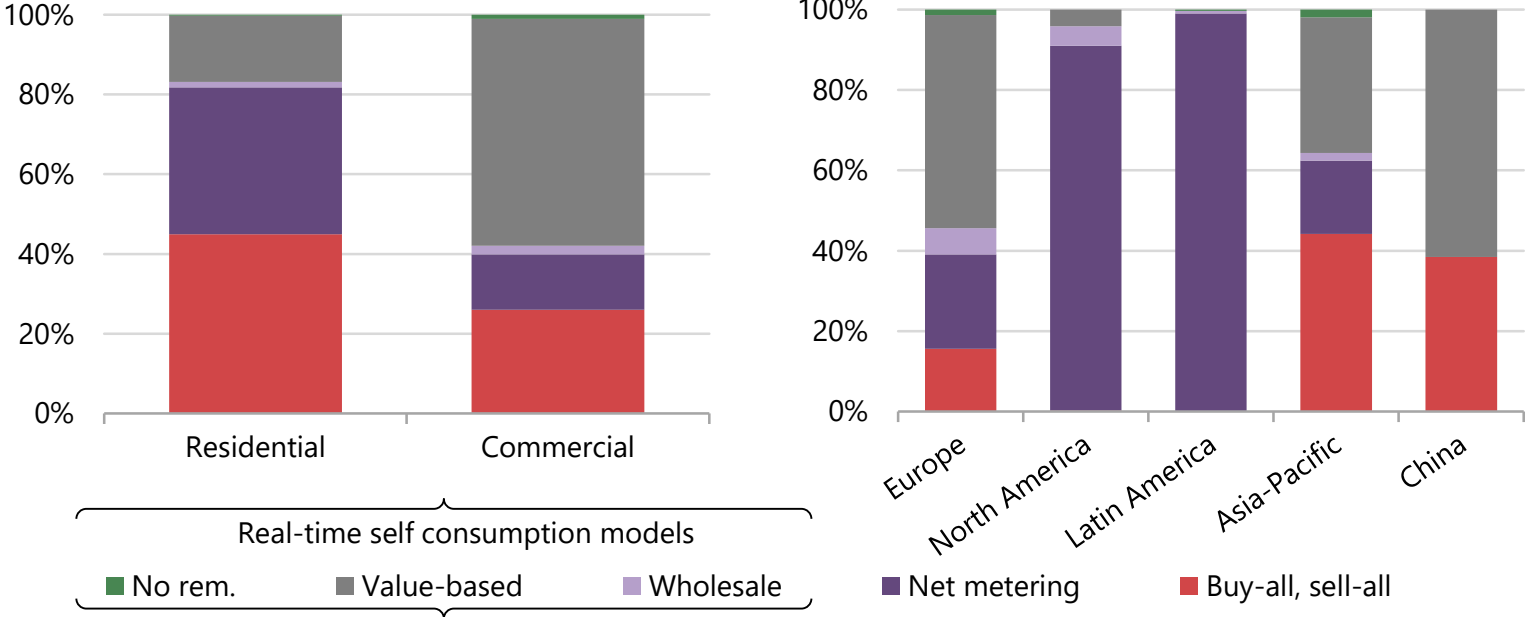
Distributed PV increasingly cheaper than retail electricity prices



Continuing decline of solar PV costs widens the gap with retail electricity prices, increasing distributed PV's economic attractiveness for private investors

Distributed PV policies vary by application and country

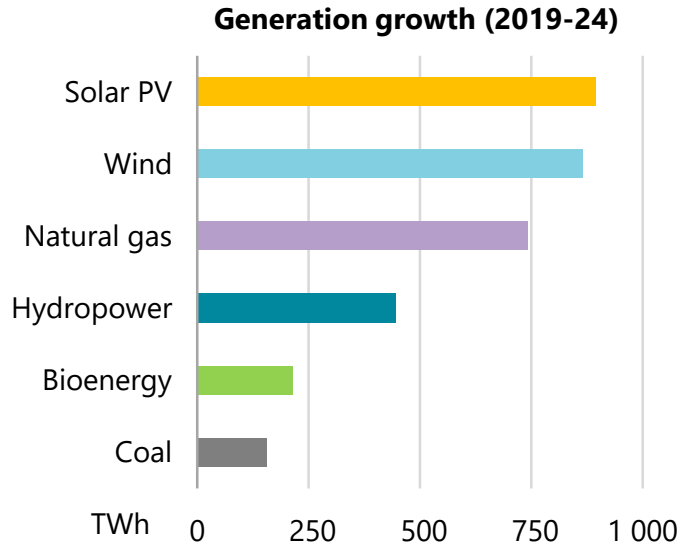
Remuneration policies for distributed solar PV for capacity growth over 2019-24



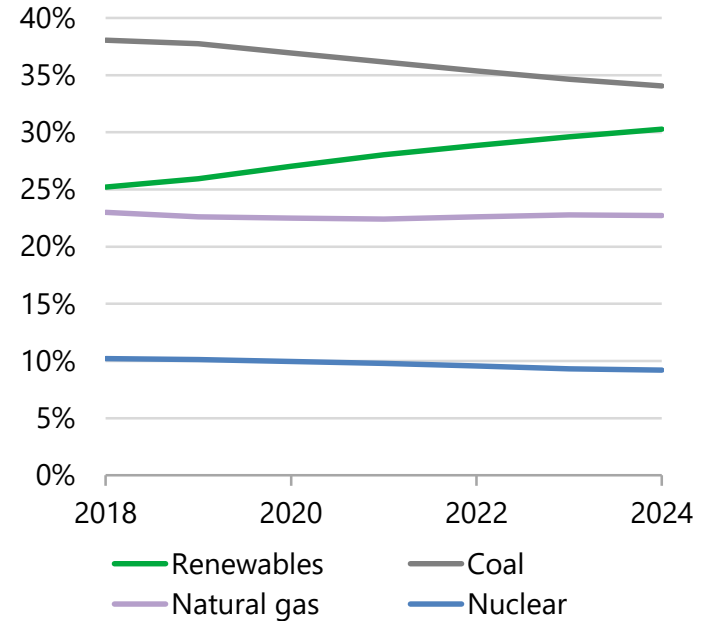
Buy-all, sell-all and net metering models are expected to drive growth in the residential sector while real-time self-consumption models with value-based remuneration to dominate commercial applications

Are we on track to meet global climate targets?

Generation by technology



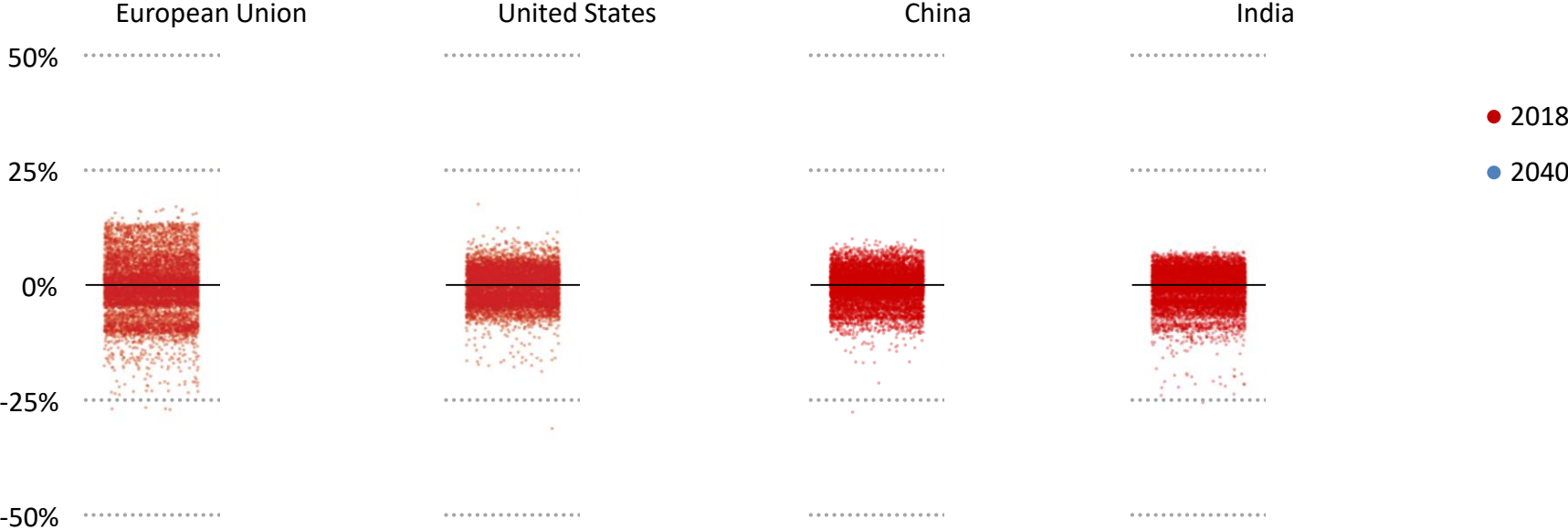
Generation shares



Renewable electricity generation will grow faster than all fuels; however, to be on track with global climate goals, renewables share in generation need to surpass coal before 2024

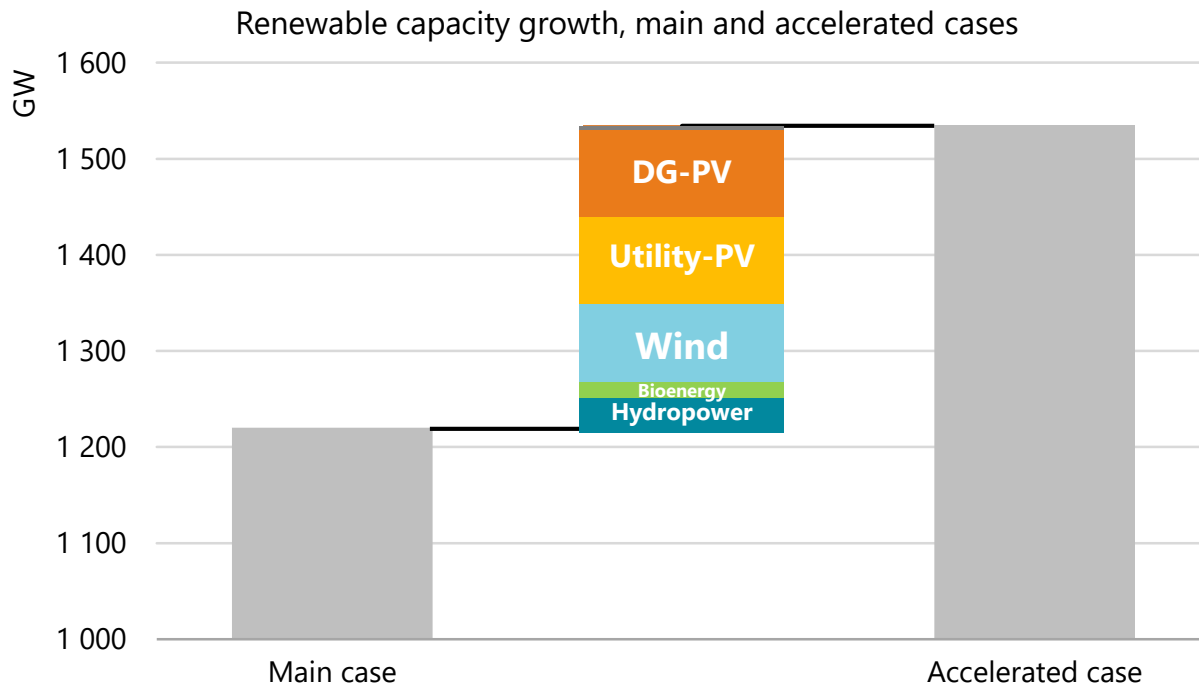
Electricity moves to the heart of modern energy security

Hour-to-hour adjustments required in power systems due to variability in demand, wind and solar



Global needs for flexibility double to 2040, but today's market designs may not bring sufficient investment to deliver it, e.g. in power plants, networks, demand-side response and energy storage, including batteries

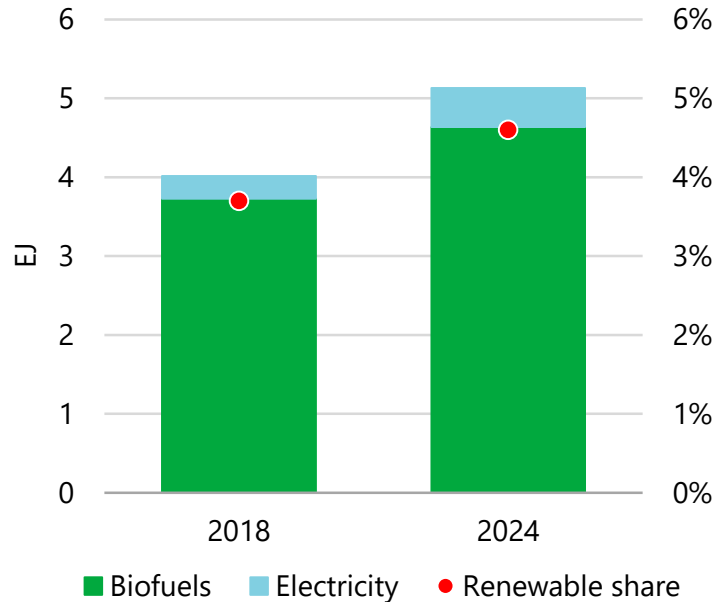
Accelerated renewables growth is possible over the next five years



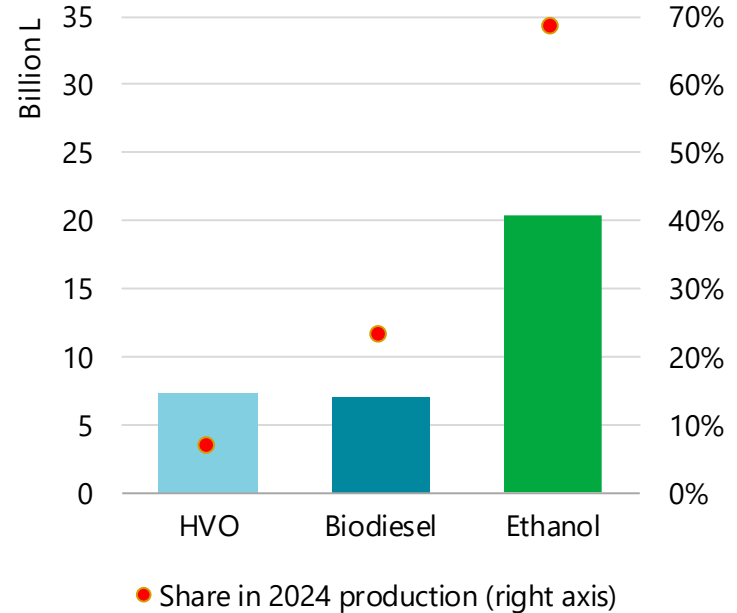
By addressing grid integration, policy uncertainty and financing challenges, governments can accelerate renewables growth by one-quarter, putting renewable electricity on track with sustainable energy goals

Transport lags behind other sectors in harnessing renewable energy

Renewable energy consumption in transport



Production growth by fuel, 2019-24

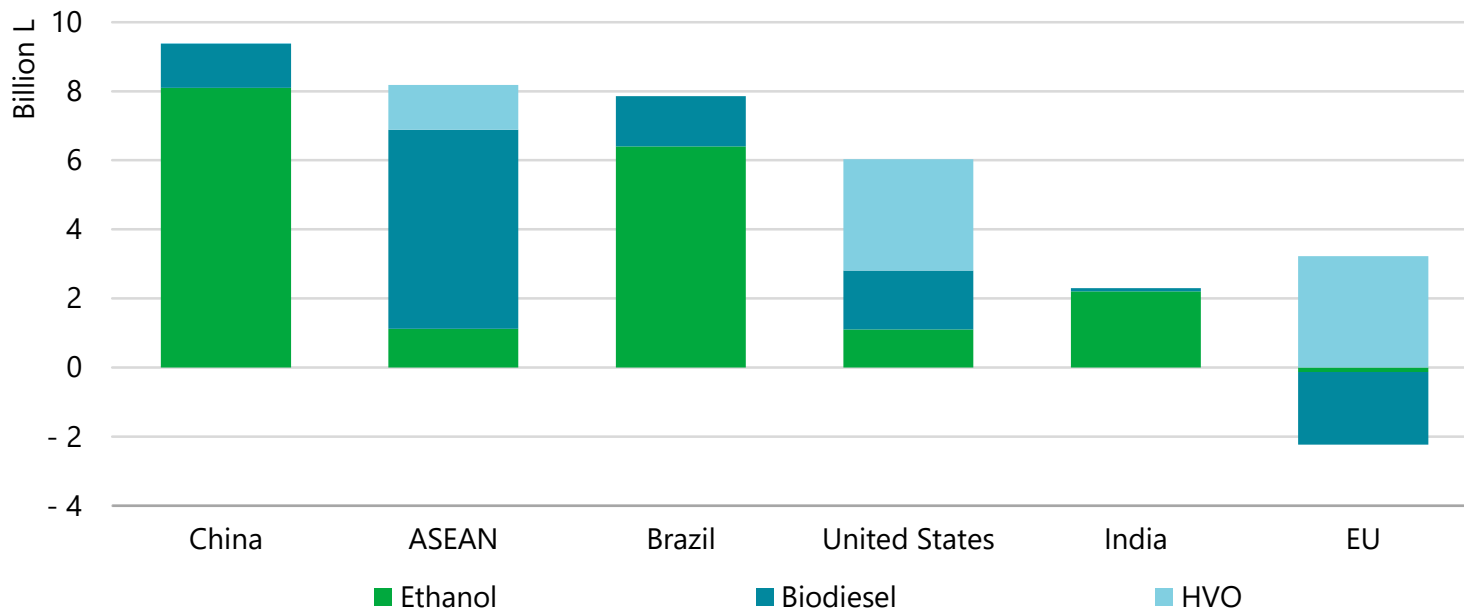


By 2024 renewable energy in transport remains below 5%, compared to 30% in the electricity sector.

1 EJ = 23.9 Mtoe

China leads forecast biofuel production growth for the first time

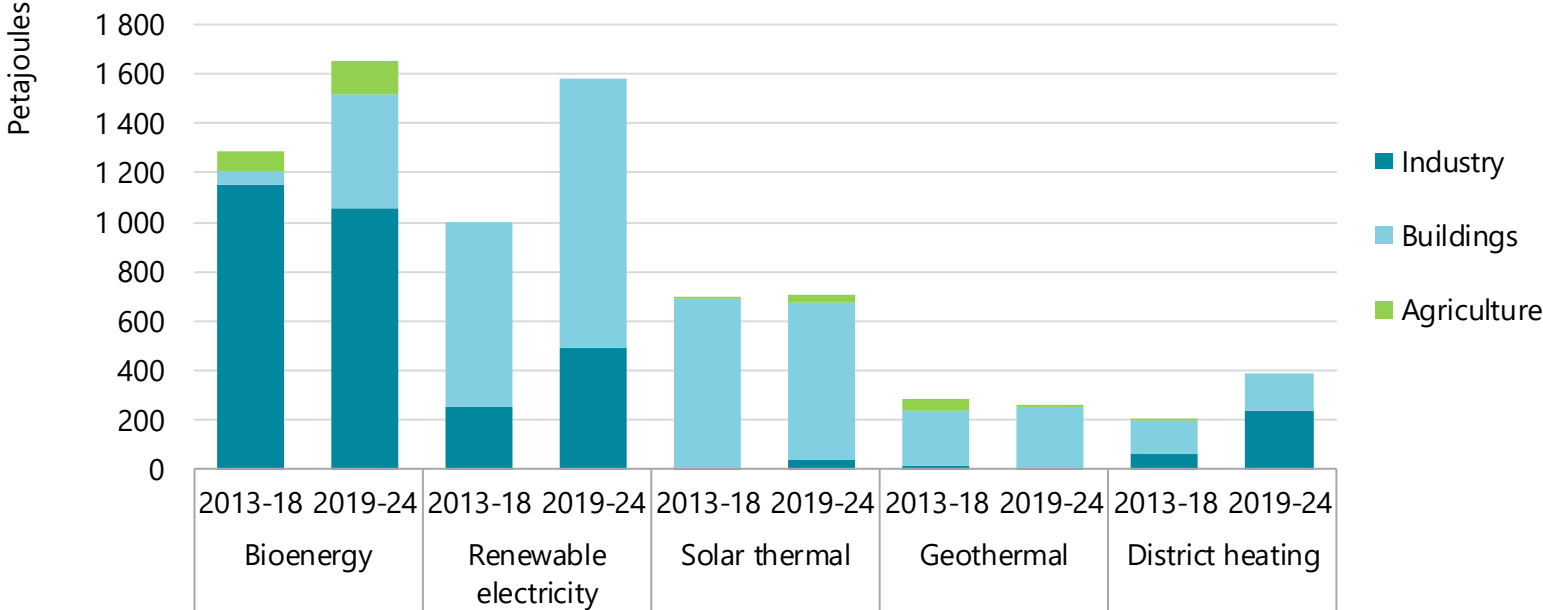
Forecast biofuel production growth, 2019-24



The United States and Brazil remain the largest biofuel producers in 2024, with 2/3 of global output.

Renewable electricity for heat grows as much as bioenergy

Growth in global renewable heat consumption by energy source



Rising shares of renewables in electricity benefits the heat sector while bioenergy expansion continues mostly in industry. China, EU, India and the US account for two-thirds of renewable heat growth globally

Conclusions

- Solar PV and wind account for 70% of global power capacity expansion over the next five years, calling for policies targeting their cost-effective and secure integration in power systems.
- Distributed PV growth is led by commercial applications but its expansion requires policies that find the best compromise between attracting investment, securing enough revenues for grids and ensuring a fair allocation of grid costs for all consumers.
- Biofuel production set for ongoing expansion, as Asia leads growth from policies to enhance security of supply. HVO output increases but innovation is needed to commercialise new biofuel technologies.
- Renewable heat expansion is led by bioenergy and renewable electricity with district heating's decarbonisation potential remaining untapped
- Governments can put renewables on track with climate, air quality & energy access goals through stable policies addressing system integration & investment risk and a greater focus on transport, heat and efficiency