International Energy Agency

Renewables Market Report

Market analysis and forecasts to 2024

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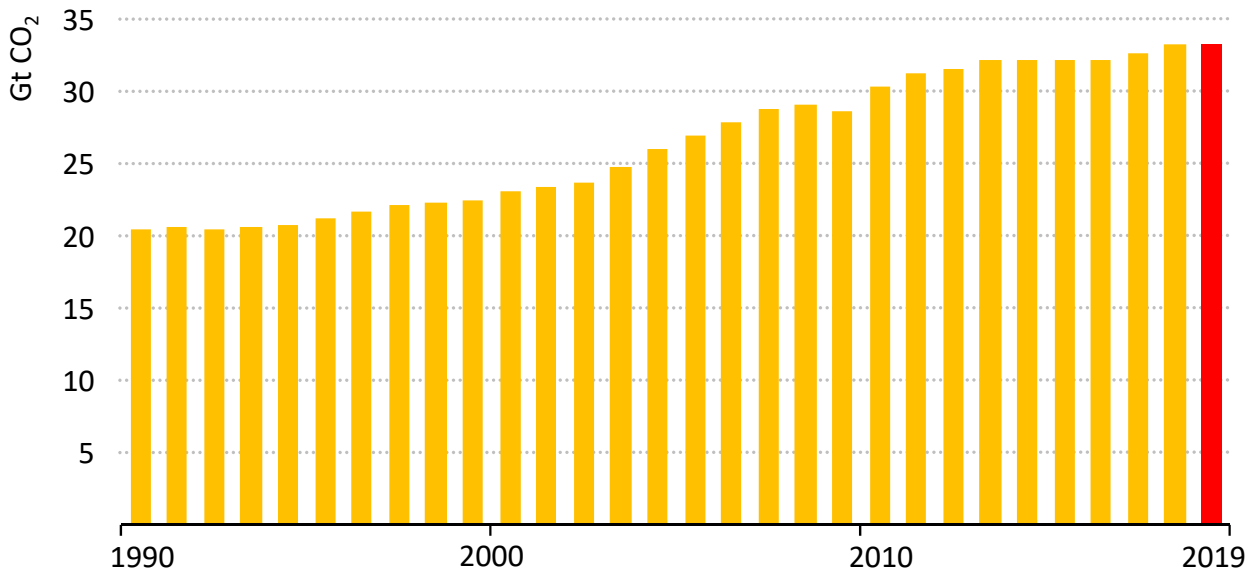
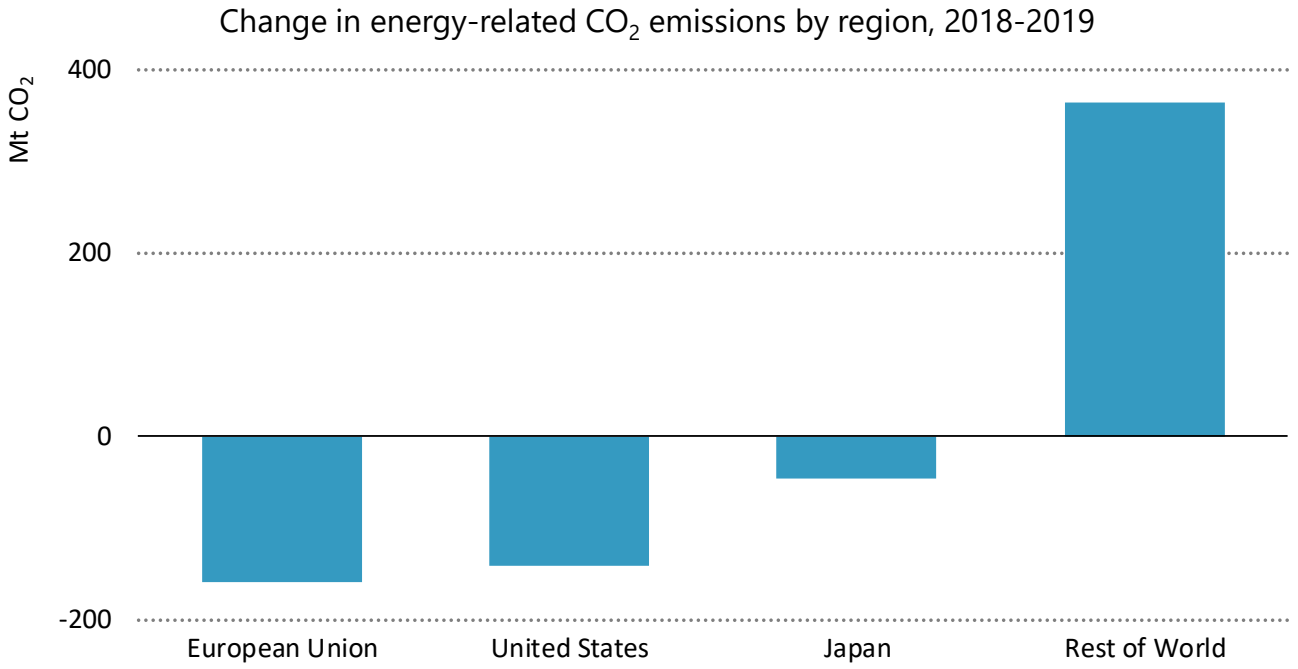
CO_2 emissions flatlined in 2019

Global energy-related CO_2 emissions, 1990-2019



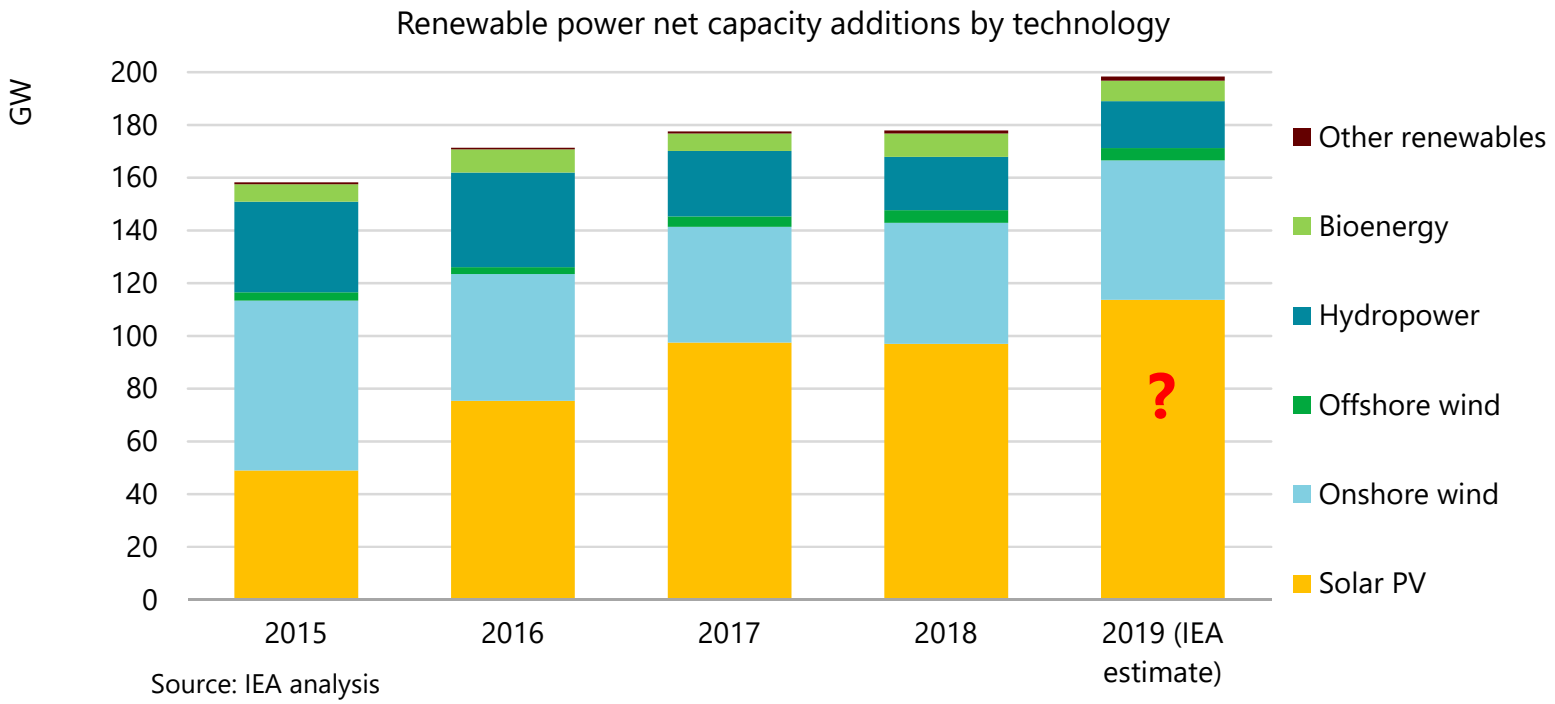
Global CO_2 emissions flattened in 2019 at around 33 Gt, after two years of increases. Lower coal-fired generation in advanced economies and rising output from lower-carbon sources underpinned the decline.

CO_2 emissions in advanced economies declined sharply



Increasing renewables, coal-to-gas fuel switching, lower demand and higher output from nuclear all contributed to a decline of 370 Mt CO_2 in advanced economies, offsetting continued growth elsewhere.

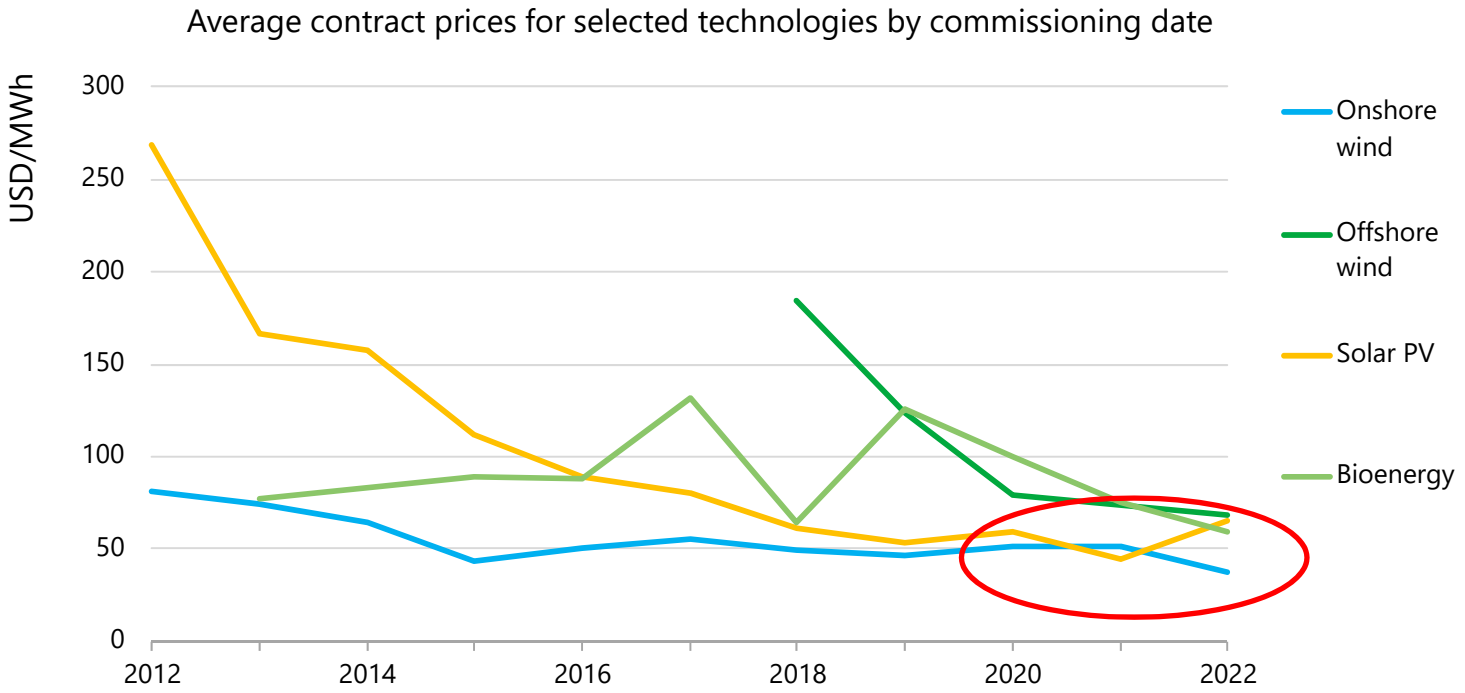
After stalling in 2018, renewable additions to see double-digit growth in 2019



Source: IEA analysis

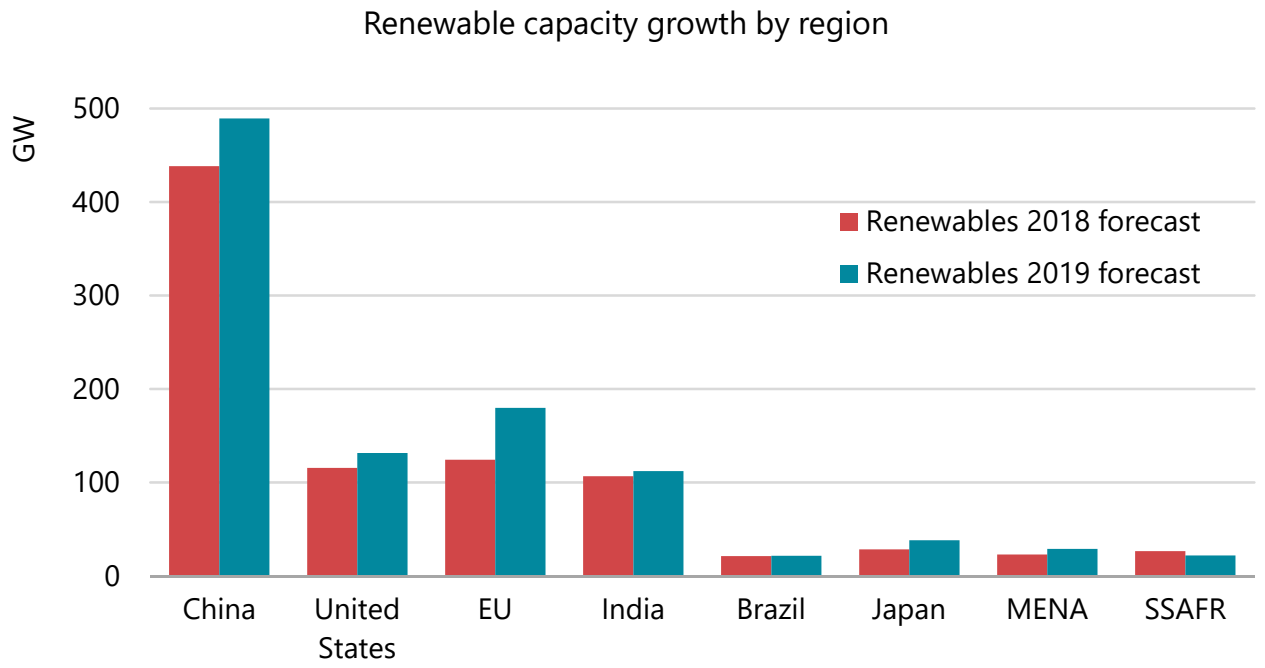
Renewable capacity additions to grow by almost 12% this year, the fastest pace since 2015, driven by PV and wind

Competition is driving wind and solar prices down rapidly



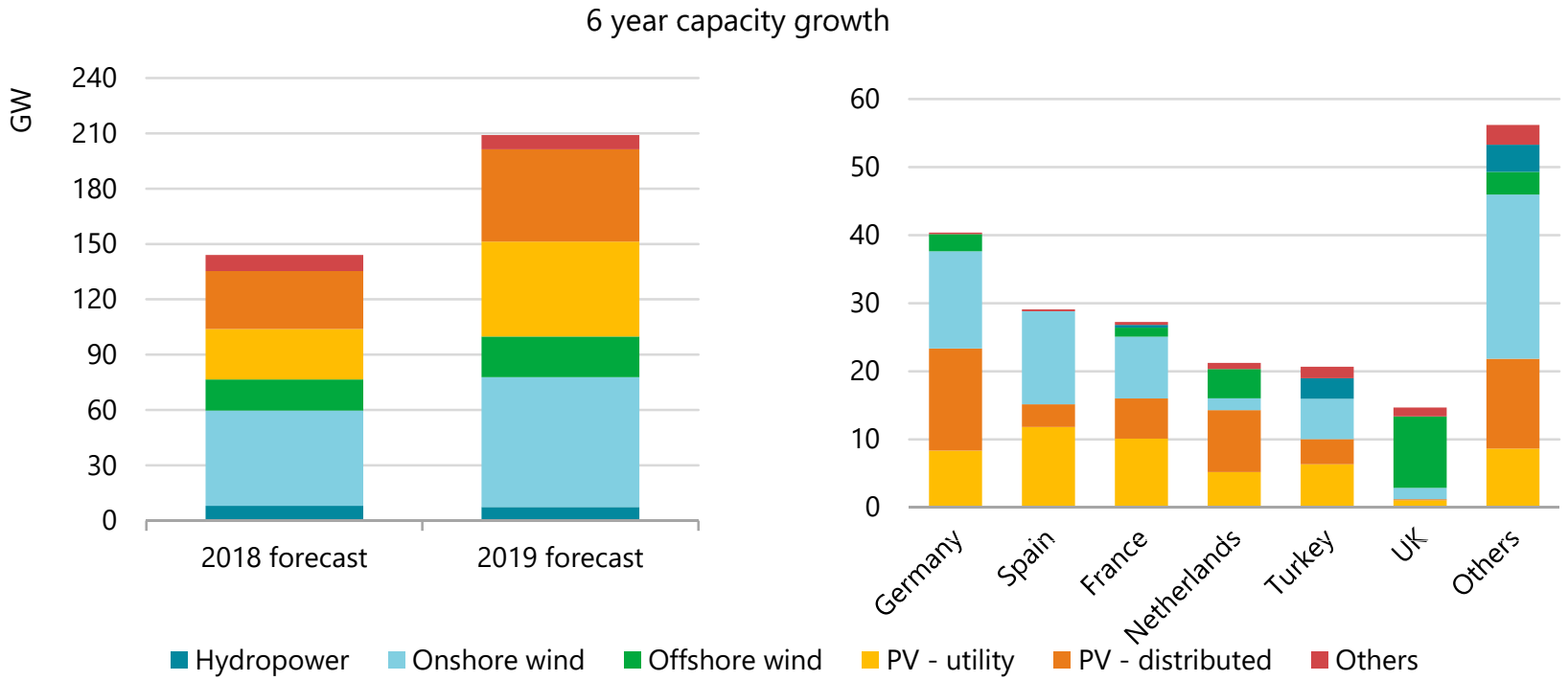
Competitive auctions are expected drive two-thirds of all renewable capacity growth in the next five years with average wind and solar PV contract prices ranging from USD 20/MWh to USD 60/MWh

EU and China drive a more optimistic forecast



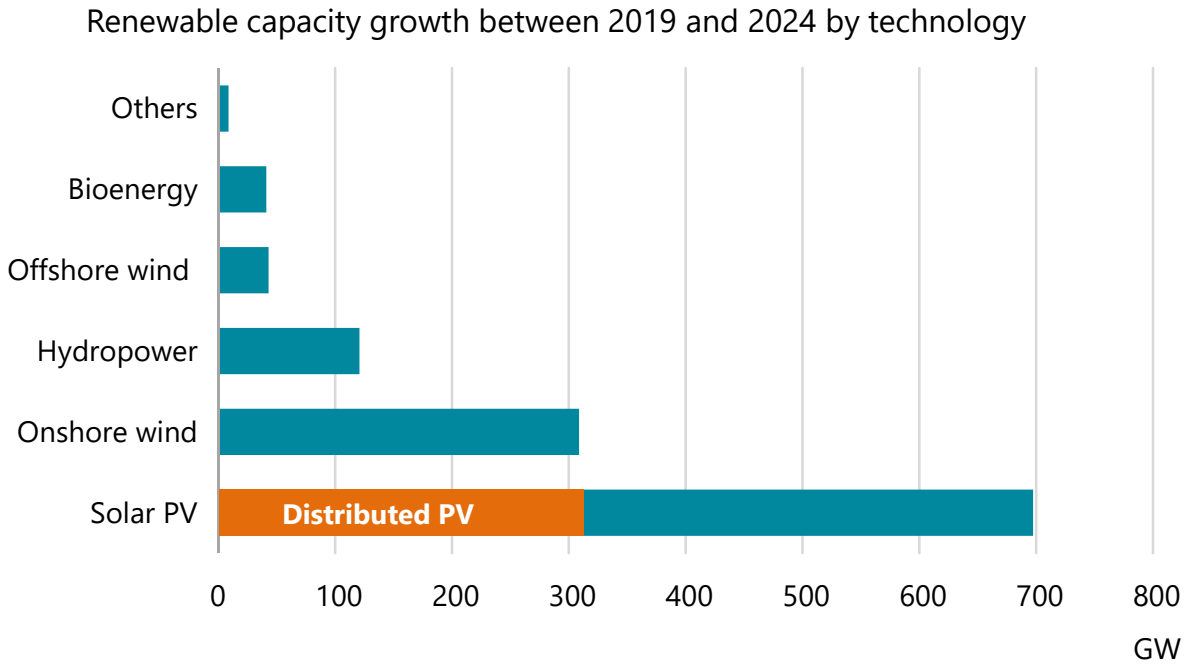
The forecast is revised up by 14% in all regions except Sub-Saharan Africa where high financing risk, administrative and policy uncertainties, and grid availability remain challenging

Higher European forecast boosted by new policies



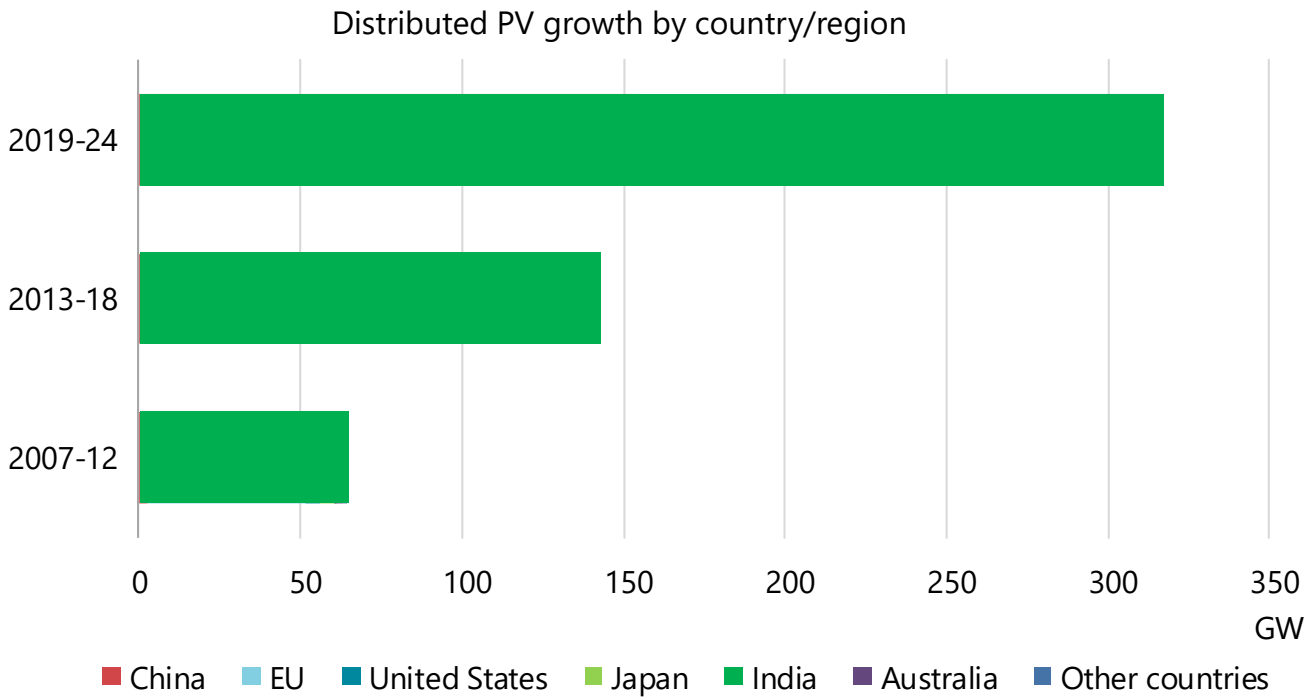
Improved visibility over future plans for utility PV and wind and attractive economics for distributed PV provide a more optimistic outlook in Europe; more than 70% of the growth occurs in top six markets.

Solar PV drives strong rebound in renewable capacity expansion



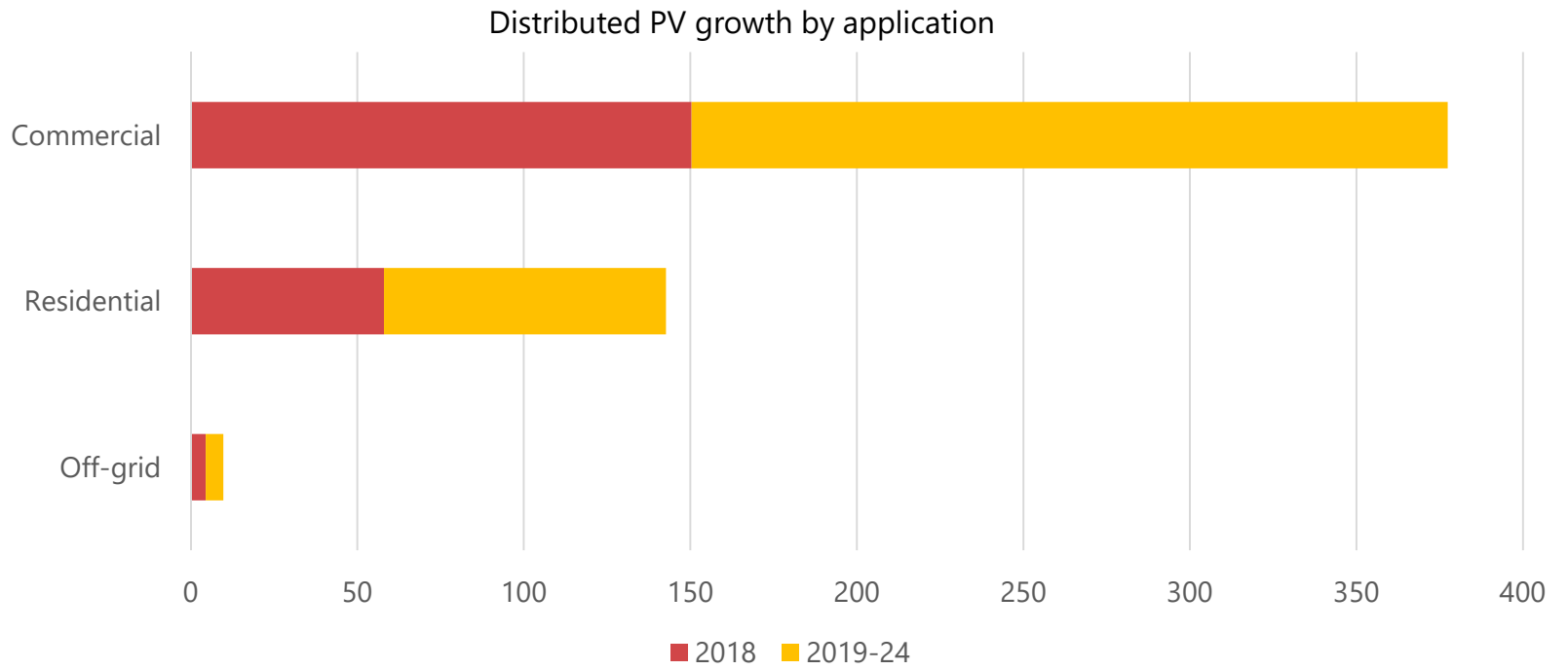
Renewables expand by 50% through 2024, with distributed PV alone growing as much as onshore wind

Distributed PV expansion more than doubles



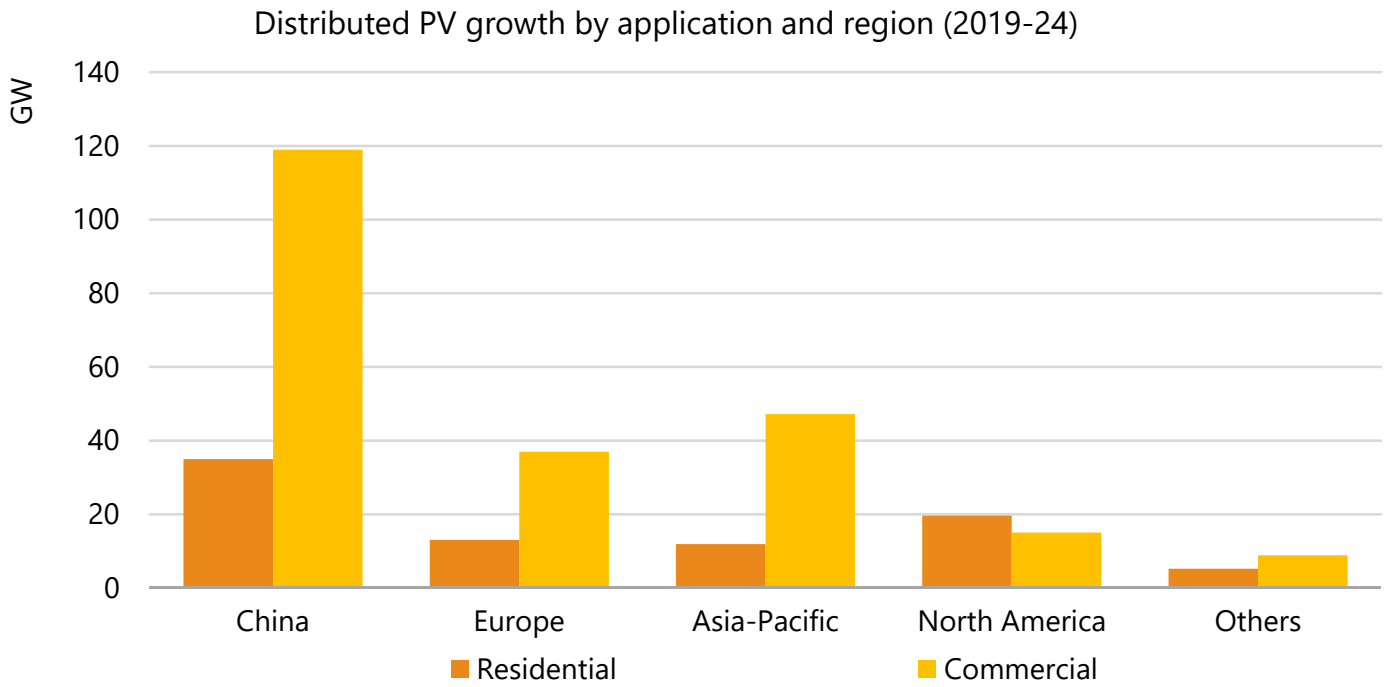
Over the next five years, China's distributed PV capacity becomes the world's biggest, growth in the EU resumes, and other countries such as India emerge as new markets

Commercial buildings and industry lead distributed PV growth



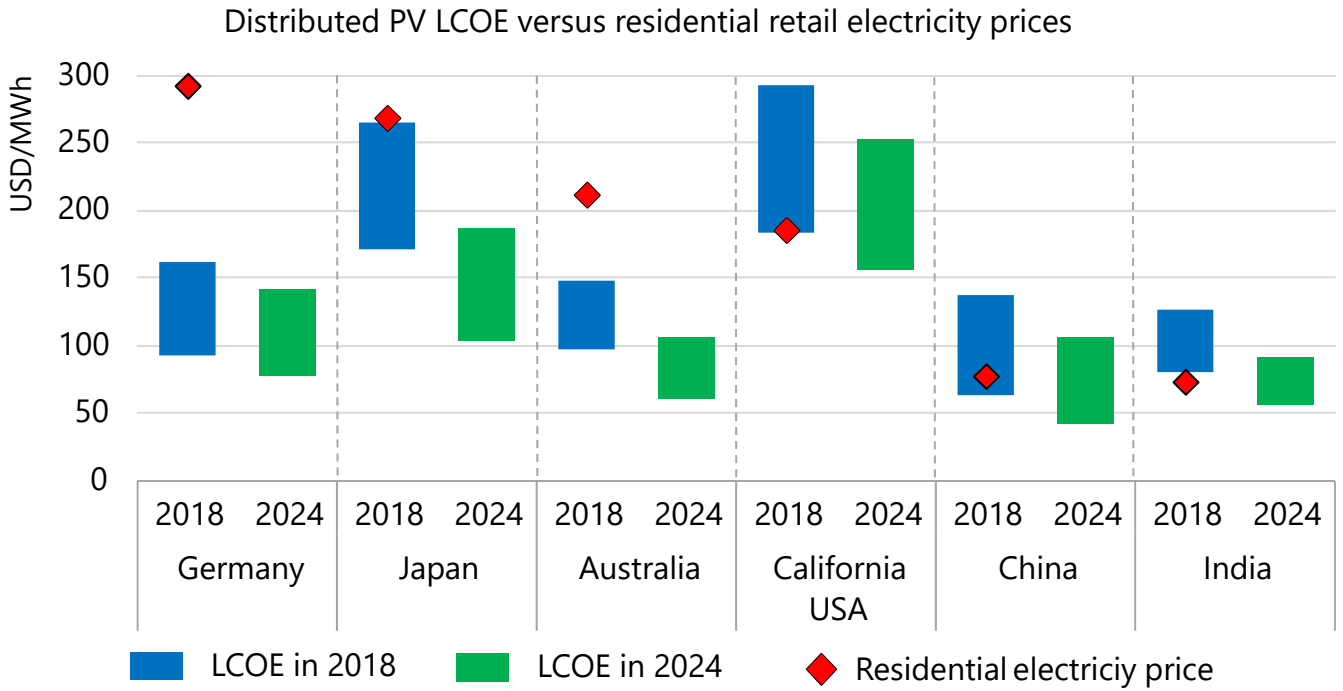
Economies of scale + better match between PV output and electricity demand in commercial/industrial applications enable higher self-consumption, saving more on electricity bills than in case of residential

But residential sector leads growth in the United States



By 2024, China surpasses Europe to have the most distributed PV capacity installed, due to commercial boom

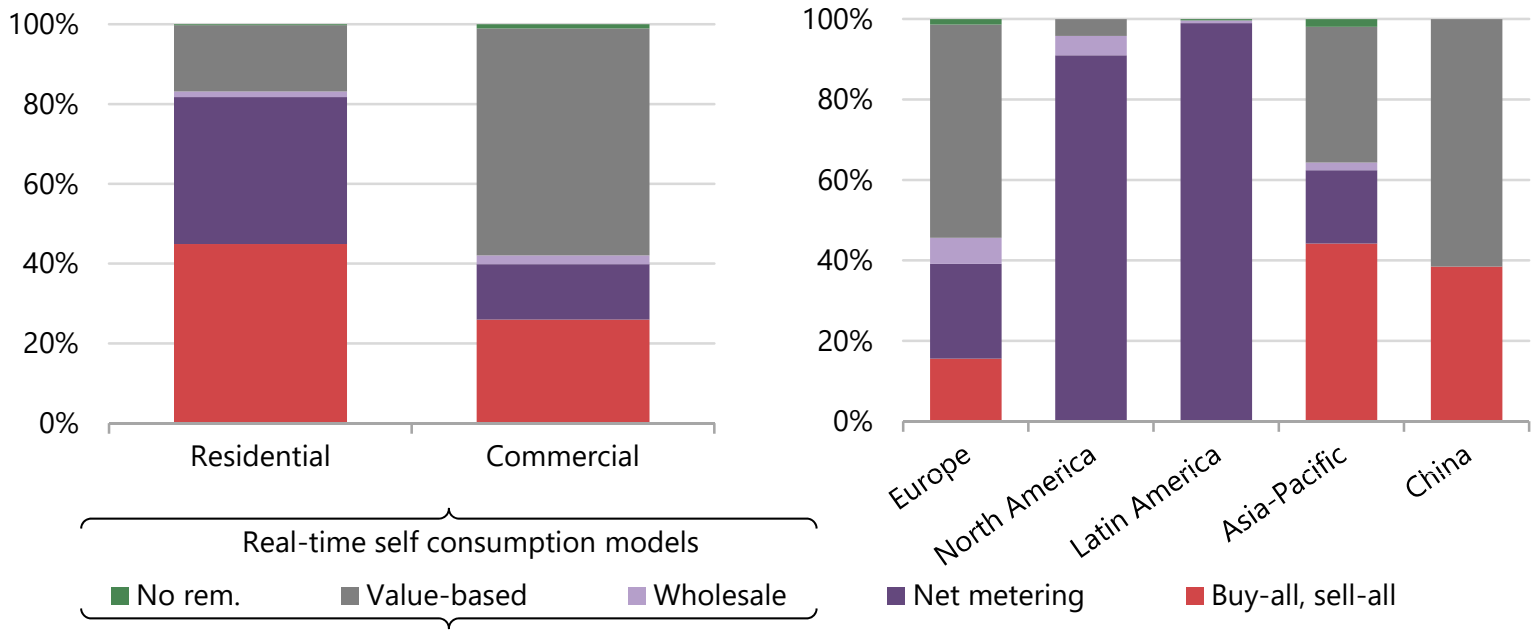
Distributed PV increasingly cheaper than retail electricity prices



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

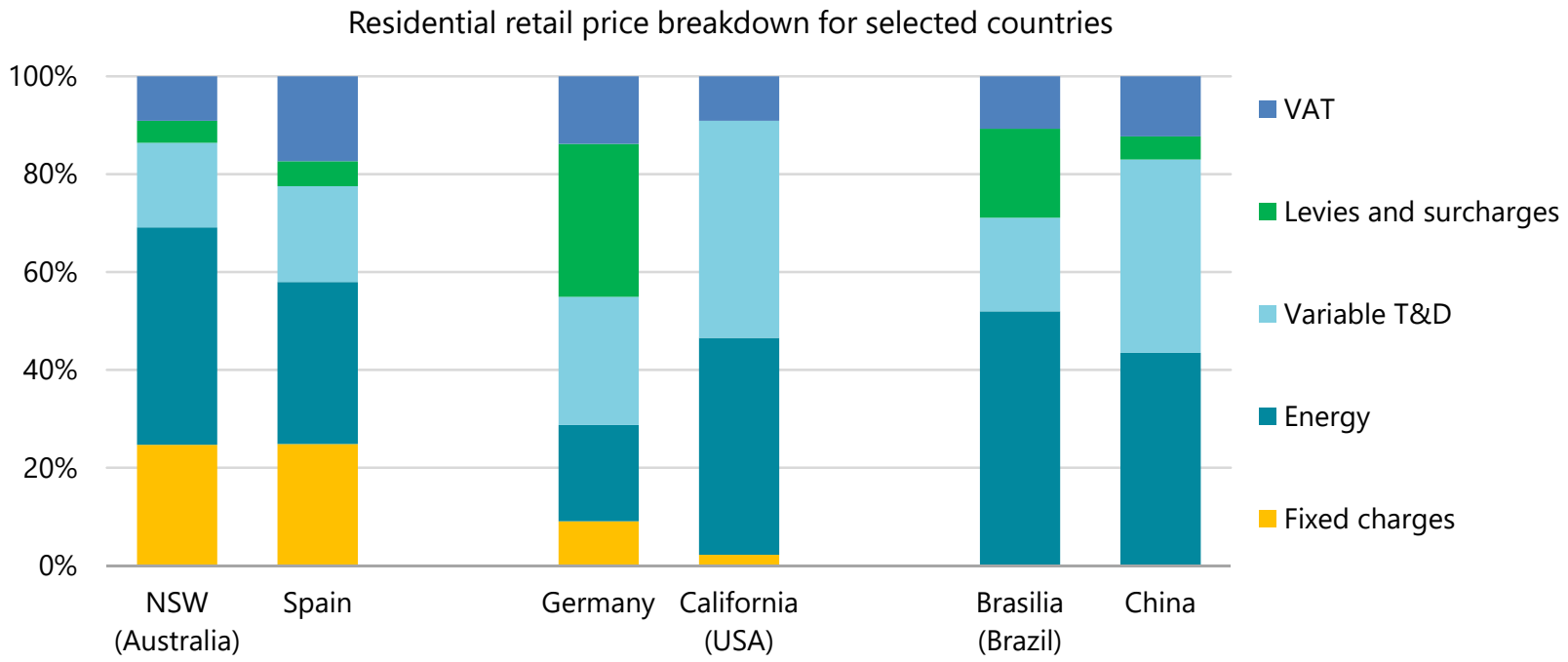
Distributed PV policies vary by application and country

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



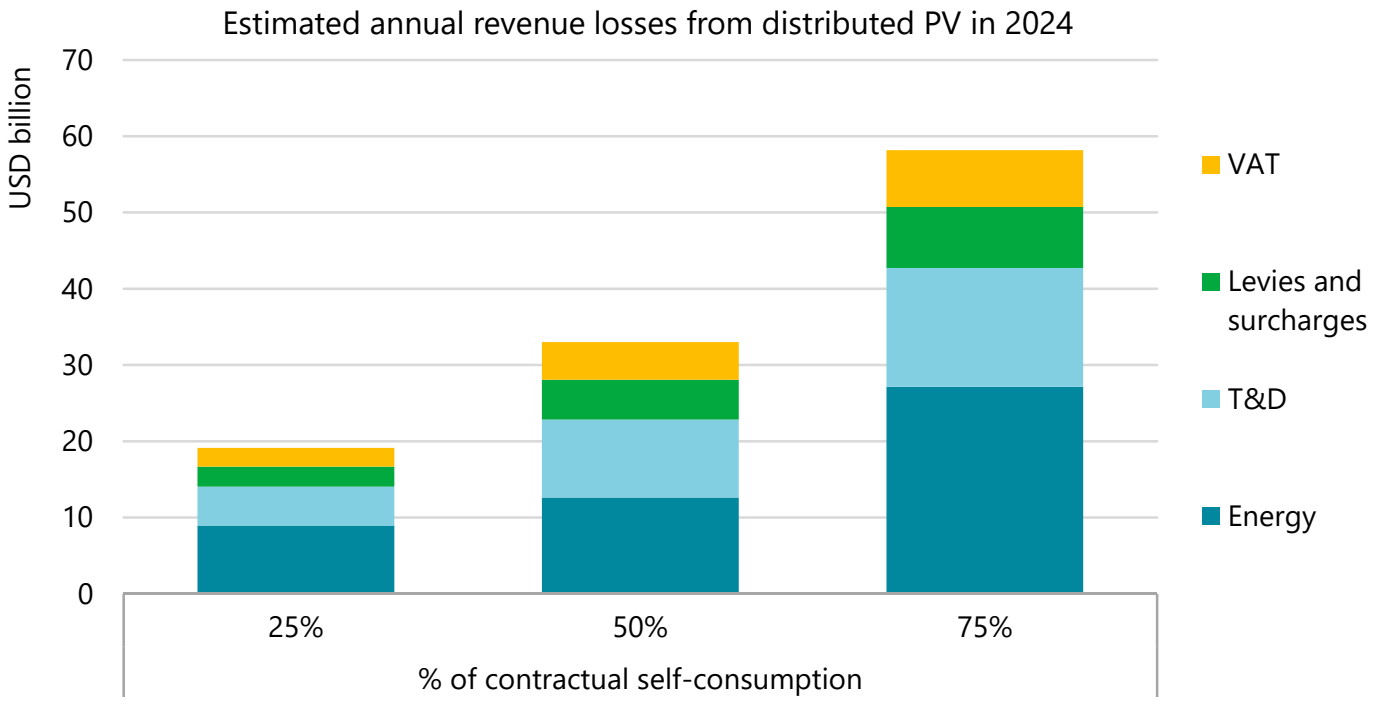
Buy-all, sell-all and net metering models are expected to drive growth in the residential sector while real-time self-consumption models with value-based remuneration to dominate commercial applications

Retail price design matters for all stakeholders



Transmission and distributed charges are mostly collected per kWh basis with a handful of countries including them under the fixed component

Distributed PV's rapid growth must be managed



New policies and market reforms are needed to find a balance between the opposing interests of distributed PV owners, energy & distribution companies, and electricity consumers in general

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.

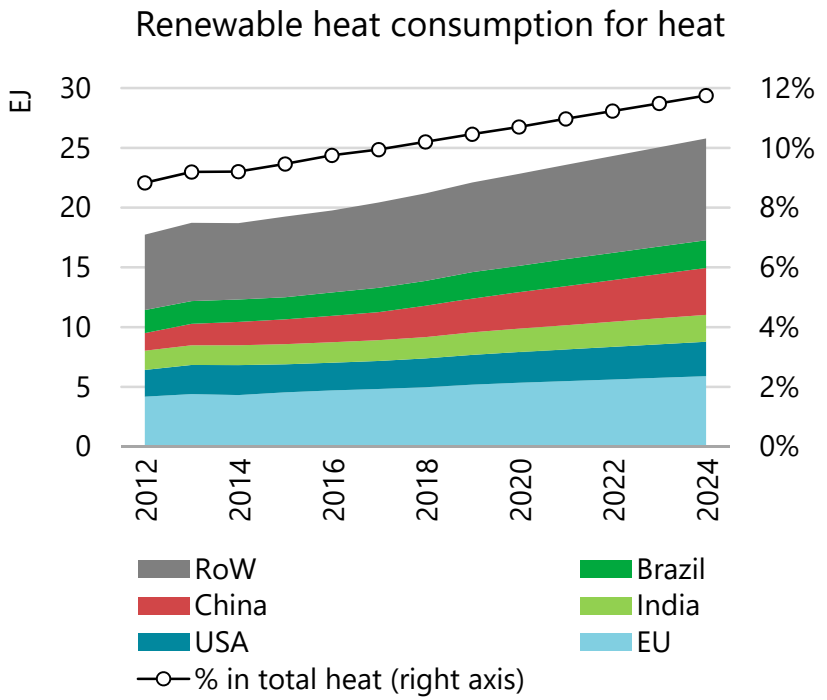
- Distributed PV growth is led by commercial applications but its expansion requires policies that find the best compromise between attracting investment, securing enough revenues for grids and ensuring a fair allocation of grid costs for all consumers.

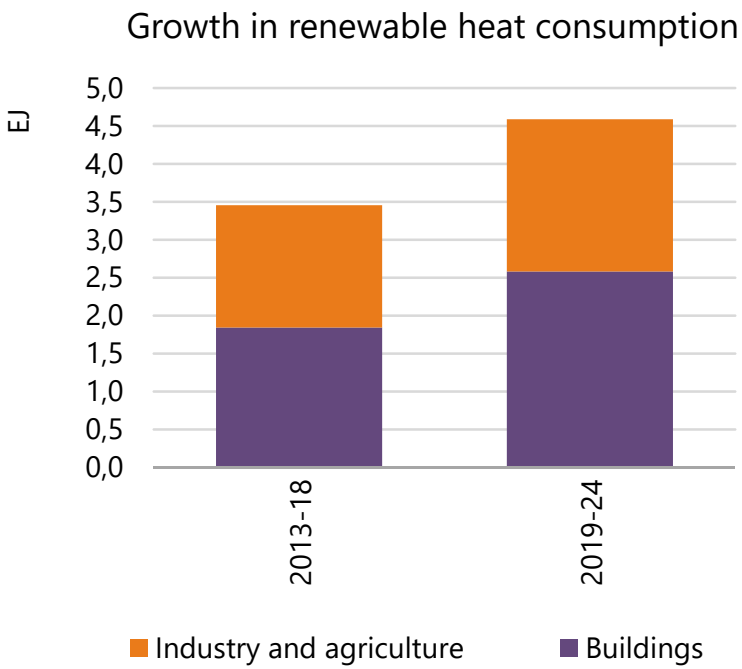
- Biofuel production set for ongoing expansion, as Asia leads growth from policies to enhance security of supply. HVO output increases but innovation is needed to commercialise new biofuel technologies.

- 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

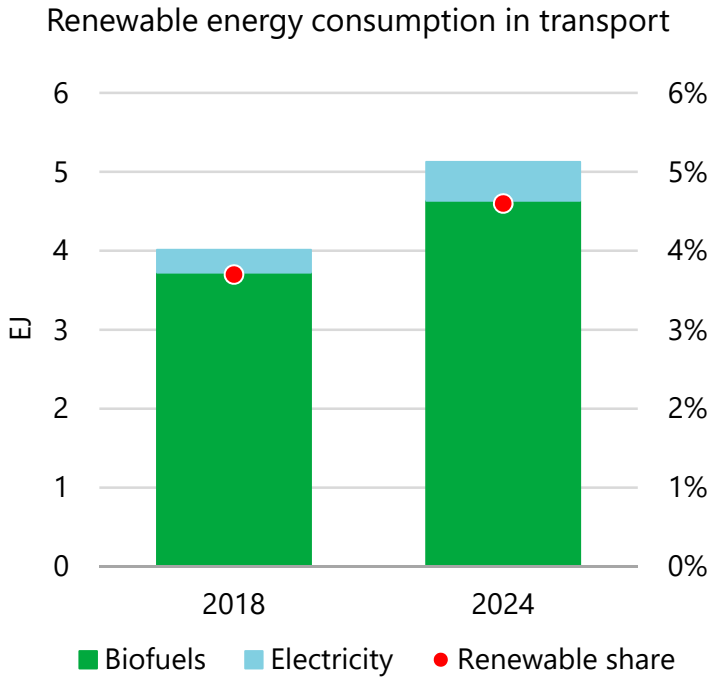
Renewable heat expands almost a quarter in the next five years

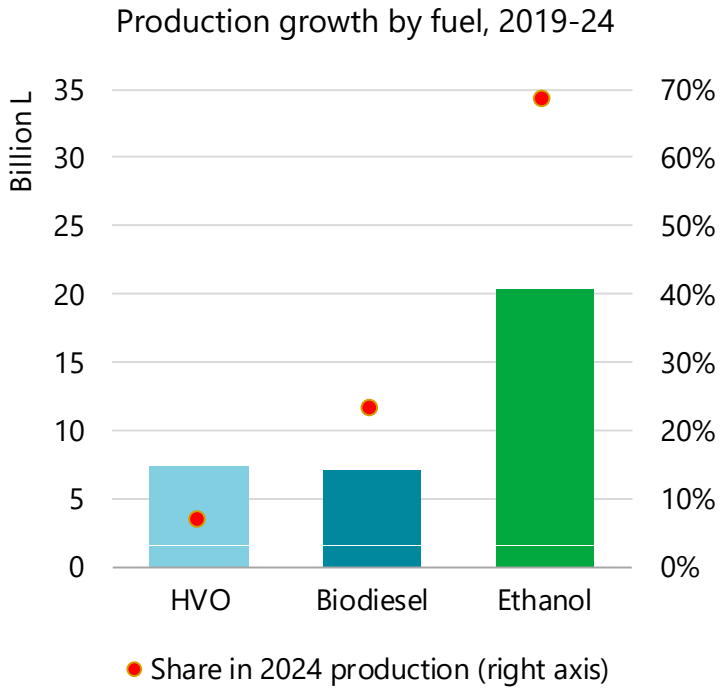




China, EU, India and the US account for two-thirds of renewable heat growth globally, with slightly stronger increase in buildings than in industry. Renewables meet only 12% of global heat demand by 2024

Transport lags behind other sectors in harnessing renewable energy

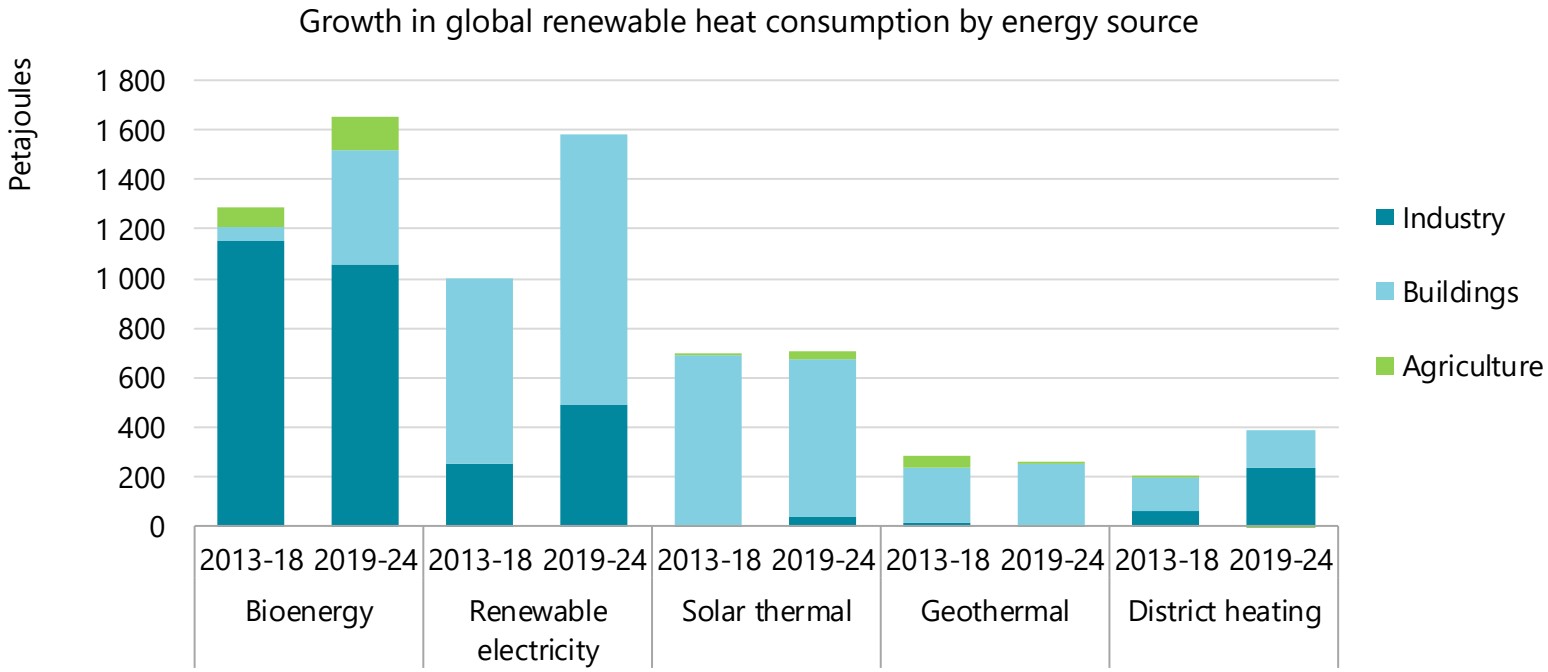




By 2024 renewable energy in transport remains below 5%, compared to 30% in the electricity sector.

1 EJ = 23.9 Mtoe

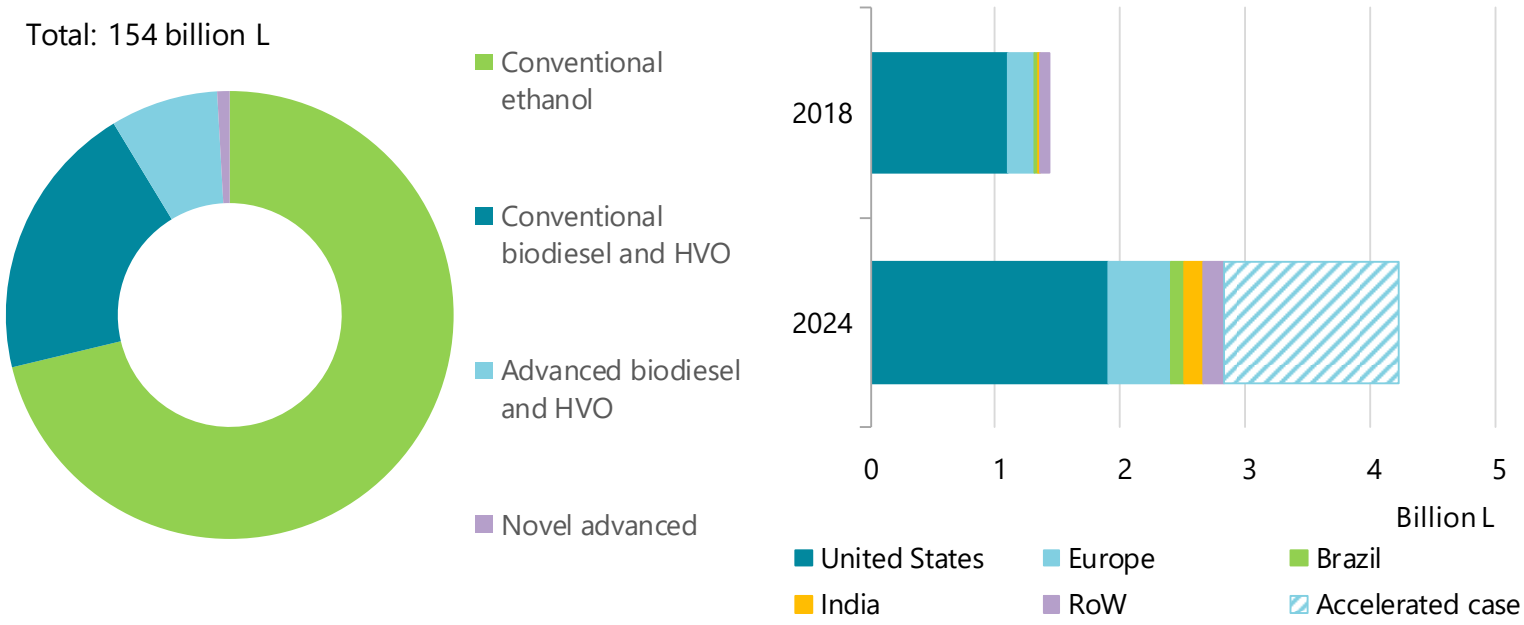
Renewable heat expands almost a quarter in the next five years



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

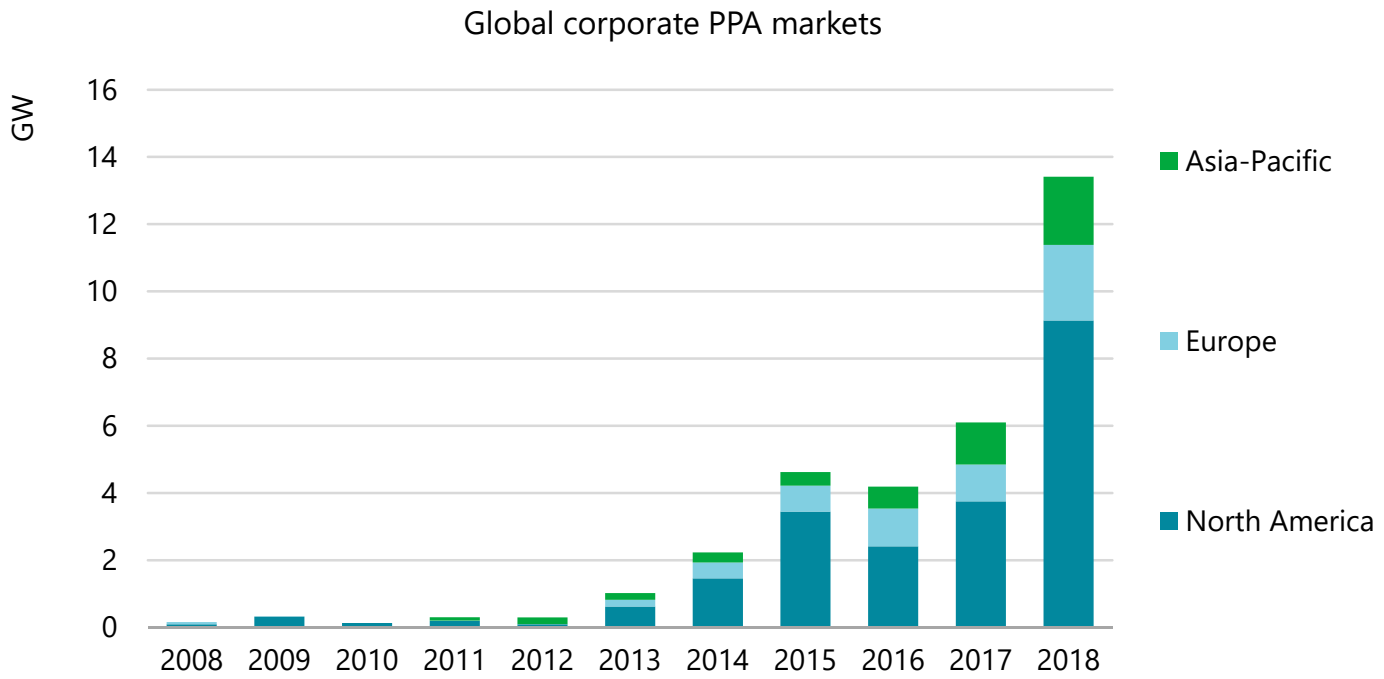
A stronger push of biofuel technology innovation needed

Biofuel production overview, 2018 (left), novel advanced biofuel production by country / region (right)



USA leads new biofuel technology development, but by 2024 these fuels only provide <2% of biofuel production as the high investment risk of moving from demo- to commercial-scale hampers growth.

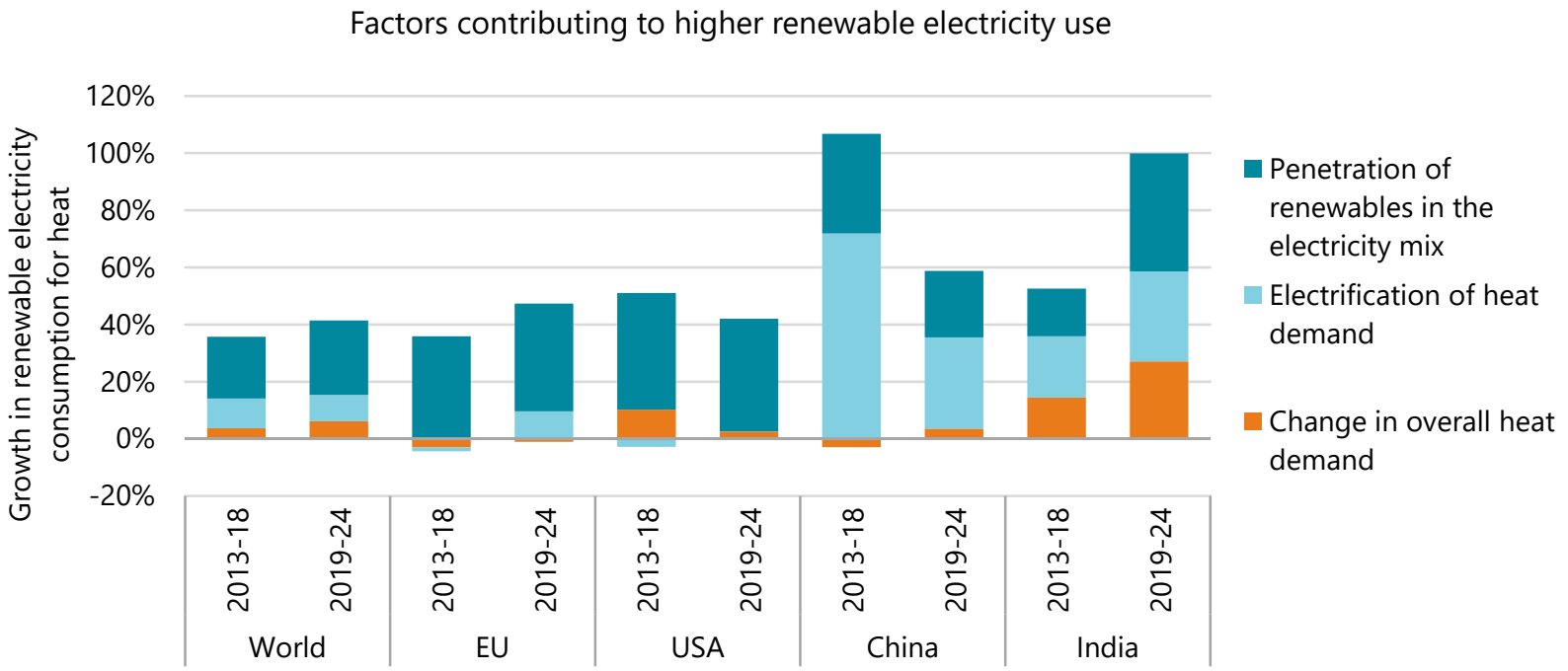
Corporate PPAs to emerge as a new source of revenue



Source: BNEF

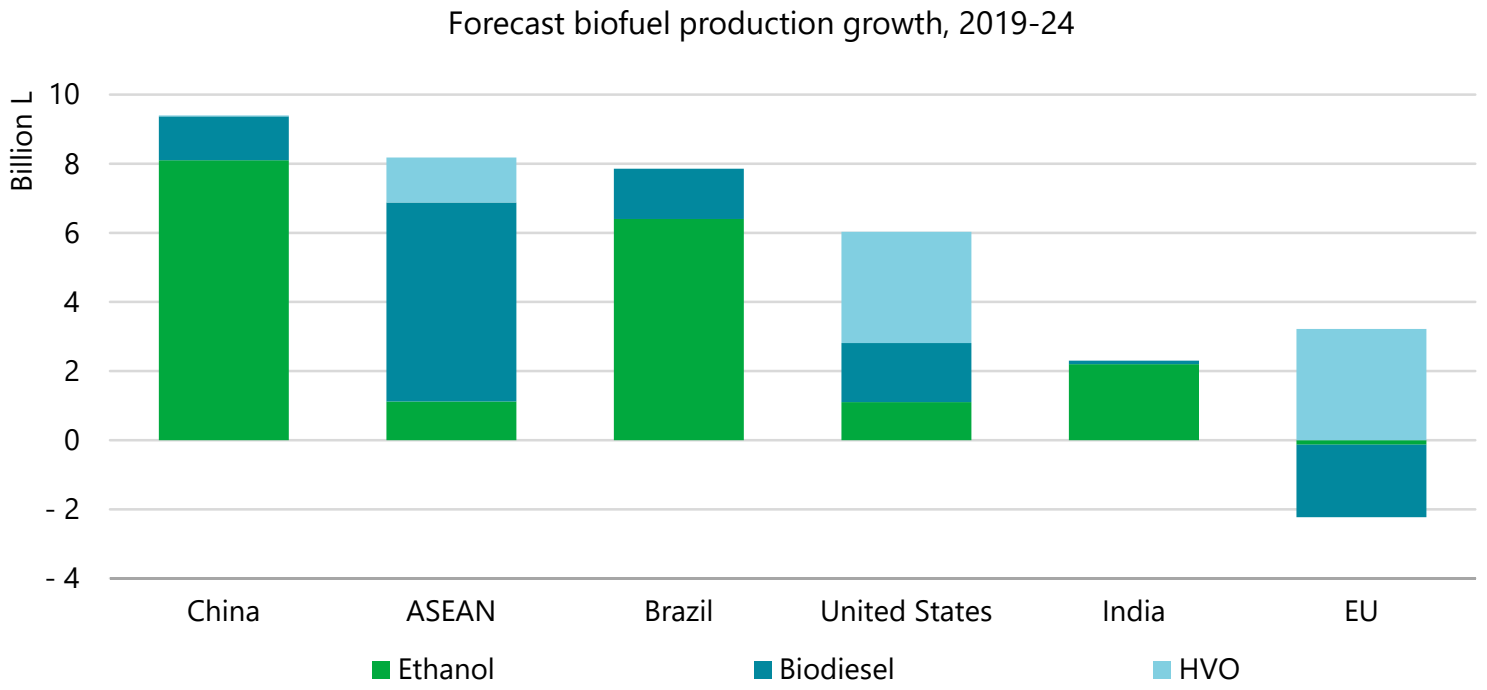
Multiple revenue streams from corporate PPAs, auction contracts and spot market revenues increase risk exposure of renewables leading to more complex business models but also higher project risk

Renewable electricity uptake benefits the heat sector



Electrification of heat and adoption of heat pumps play a significant role in China and India.
Penetration of renewables in the electricity mix is the key reason for growth in the EU and the USA.

China leads forecast biofuel production growth for the first time



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