Renewables 2017

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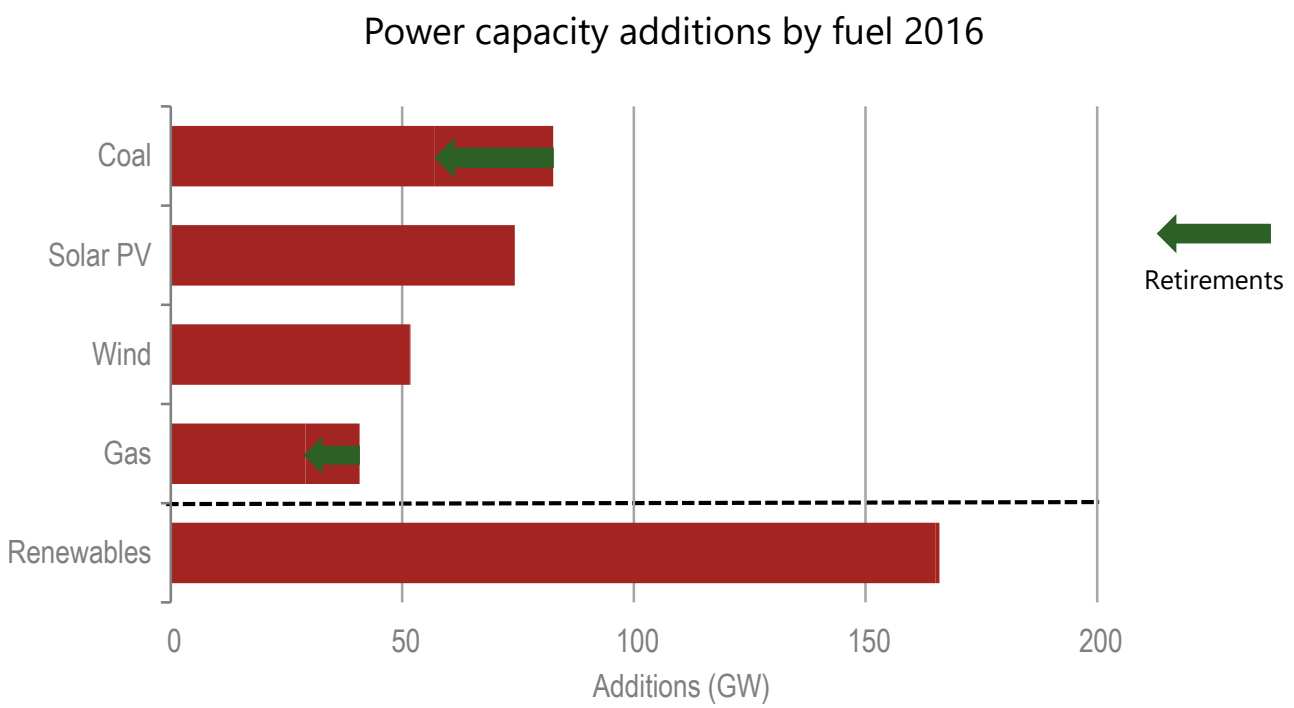
IEEJ, Tokyo – 31 October 2017

Context

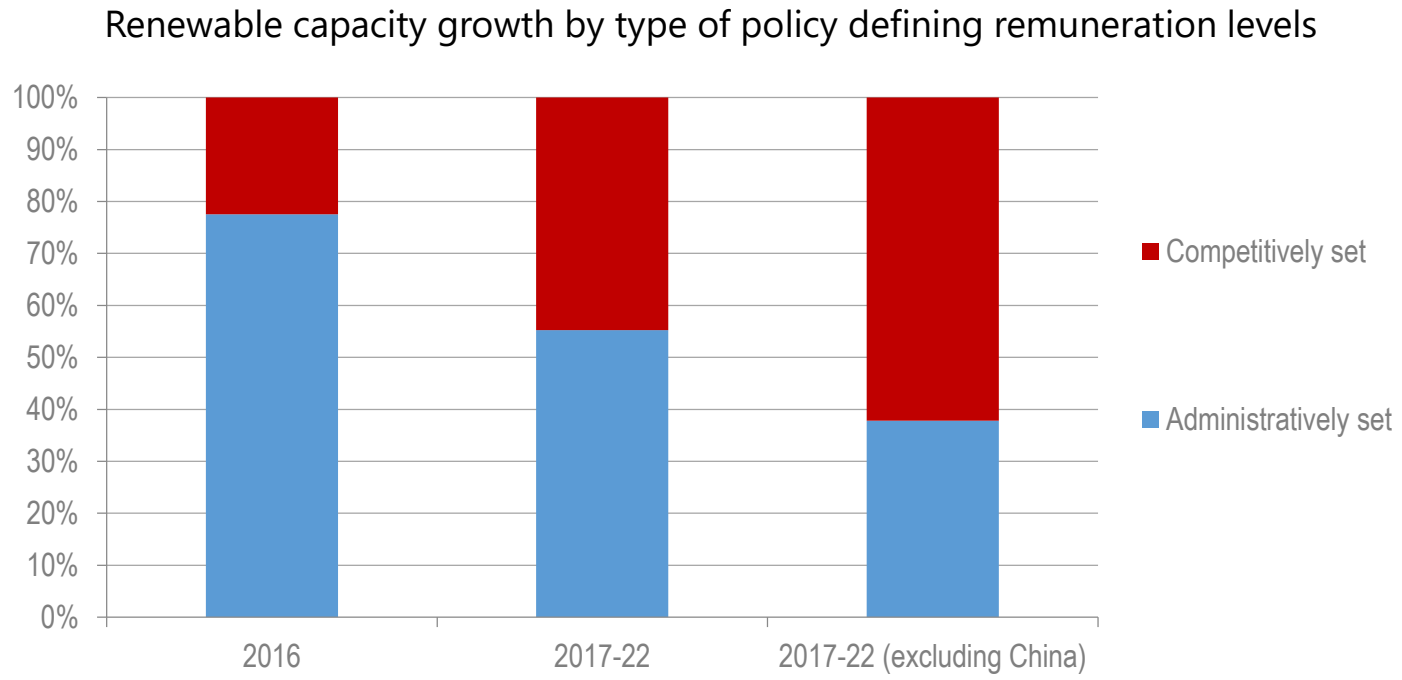
- Three numbers and three core global energy challenges:
  - *6.5 million premature deaths each year can be attributed to air pollution*
  - *2.7 degrees is the temperature increase under current climate pledges*
  - *1.2 billion people don't have access to electricity and universal access to modern energy remains a distant goal*
- Renewables contribute to meeting all these challenges

2016 – Renewables hitting new records driven by solar PV



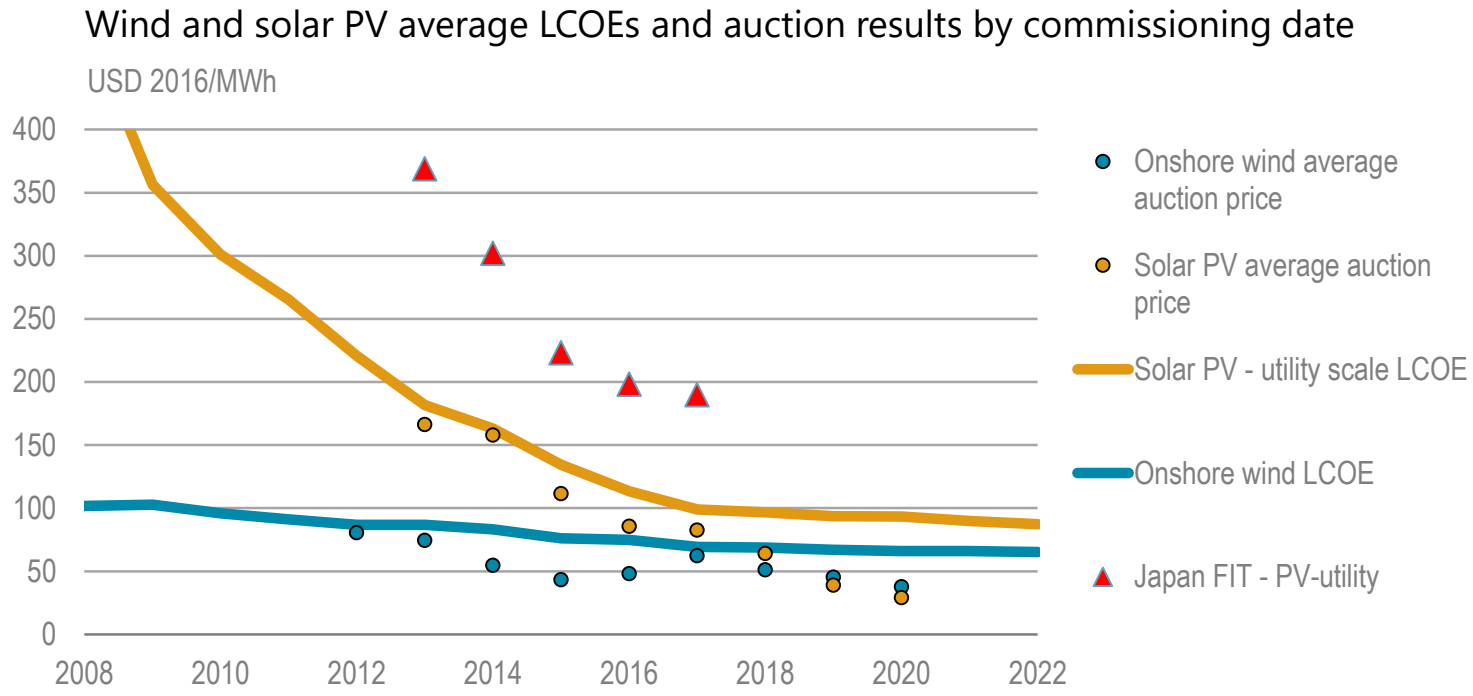
Renewables breaking an all-time record accounting for two thirds of global net capacity additions; For the first time solar PV becoming the global leader in net capacity growth

Renewable policies spurring more competition



Competitive tenders with long-term contracts will drive almost half of new capacity growth globally; the timing of policy transition in China may accelerate further this trend

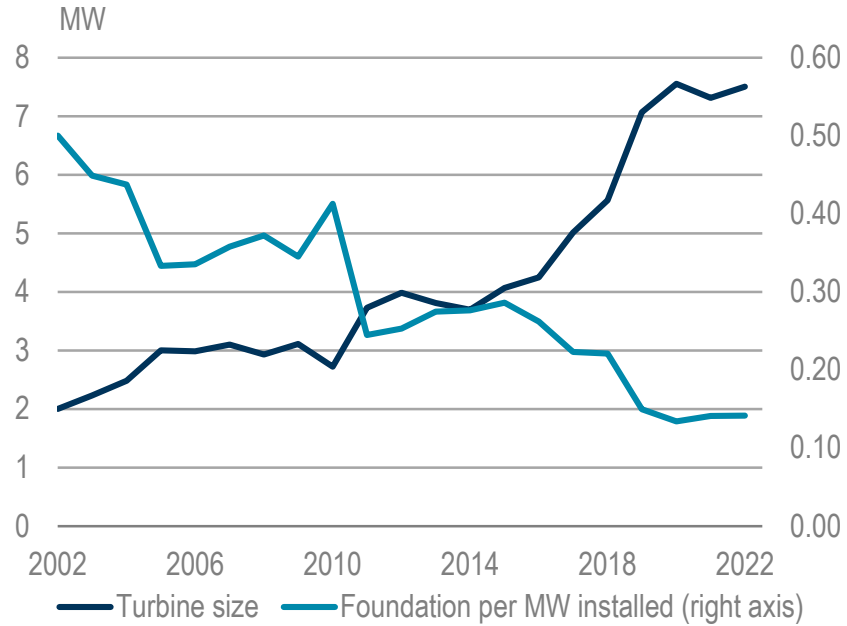
Competition driving costs down



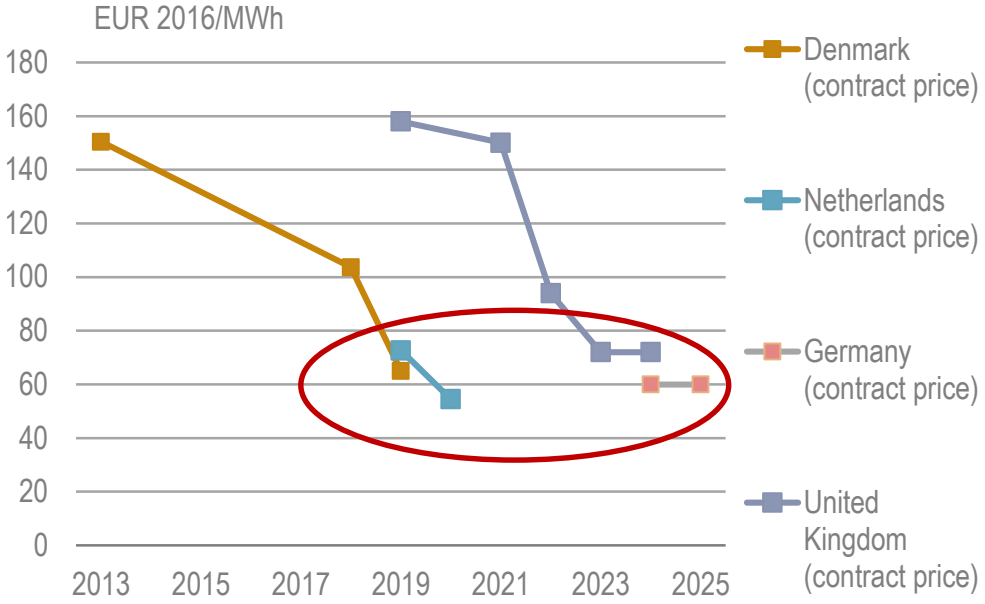
Price discovery through competitive auctions effectively reduces costs along the entire value chain

Offshore wind: bigger turbines, fewer foundations = lower generation costs

Offshore wind average turbine size and foundation per MW installed

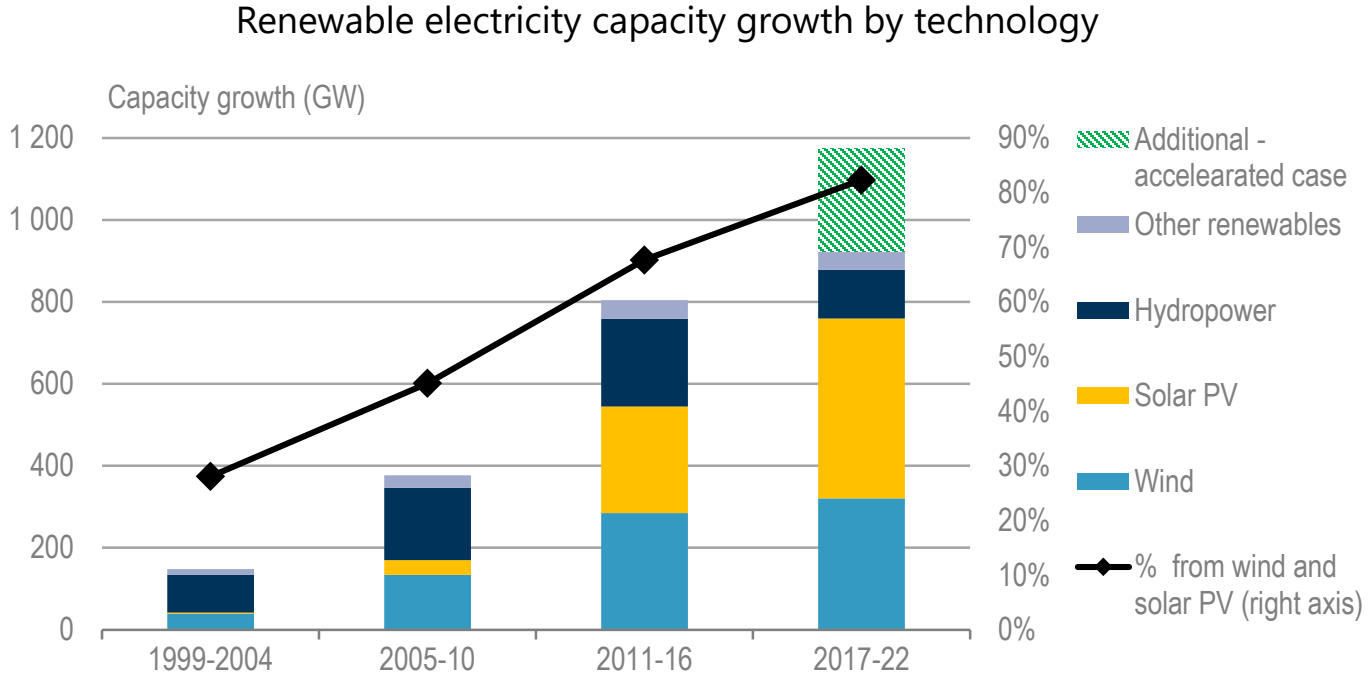


Offshore wind auction results



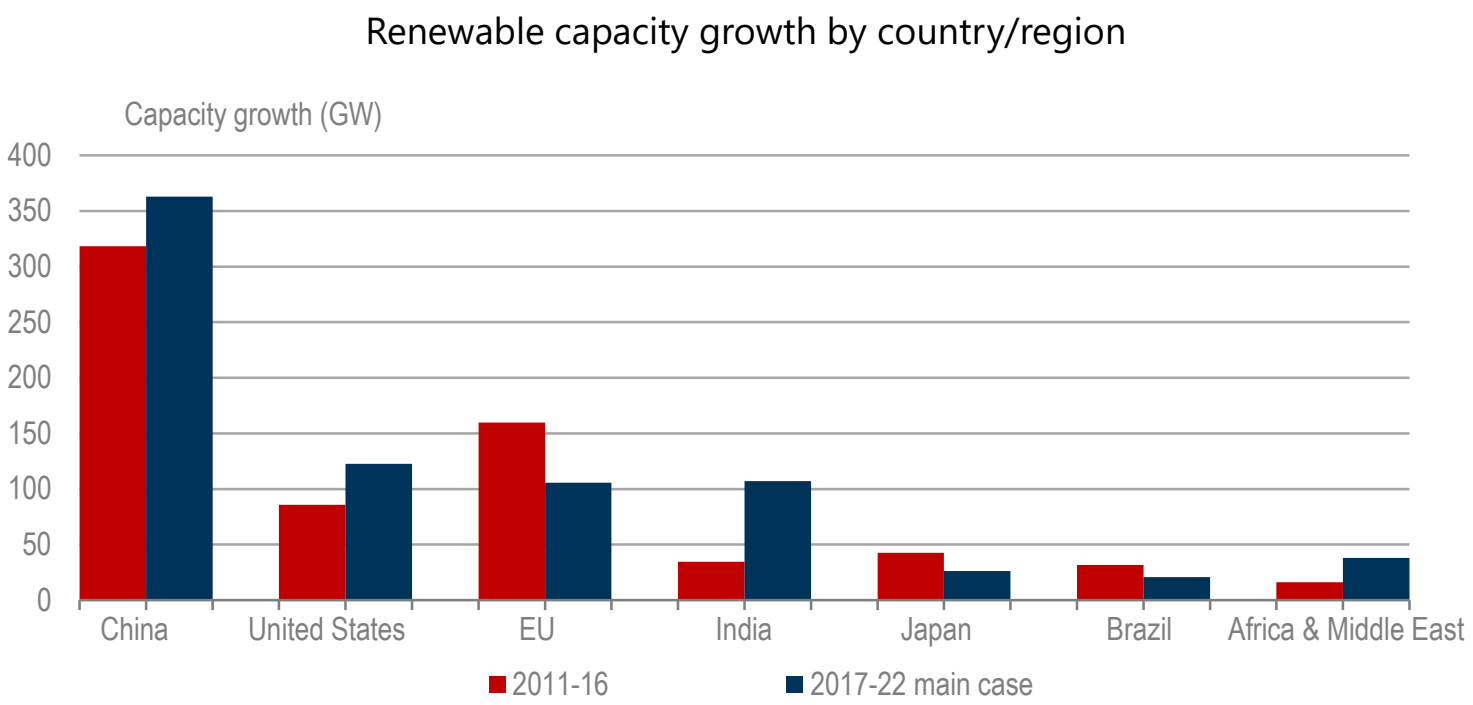
Offshore wind generation costs to decline by a third on average in just five years

Renewables growth more and more dependent on wind and solar



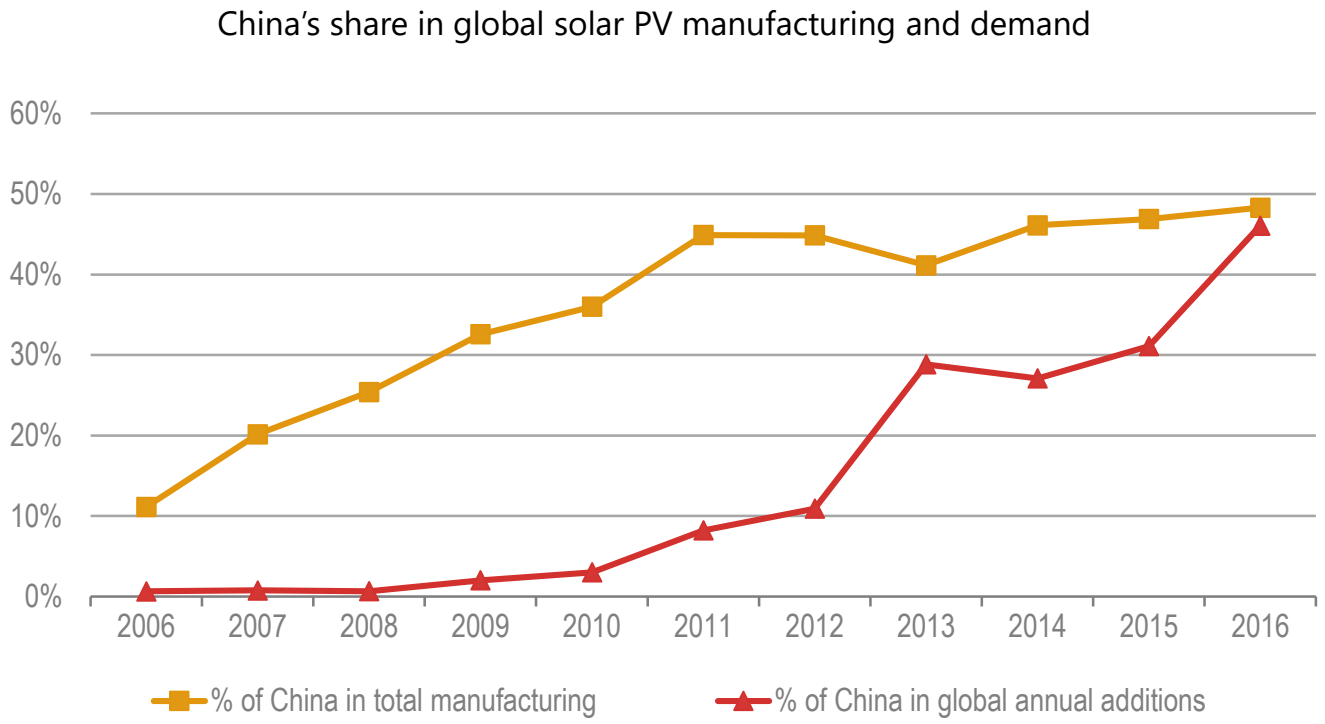
PV enters a new era, becoming the undisputed leader in renewable power capacity growth; growth could be 27% higher led by PV (60%) with enhanced policies addressing regulatory uncertainties and grid integration

China continues to lead growth while India overtakes the EU



The forecast is 12% more optimistic vs. last year mainly due to solar PV revisions in China and India

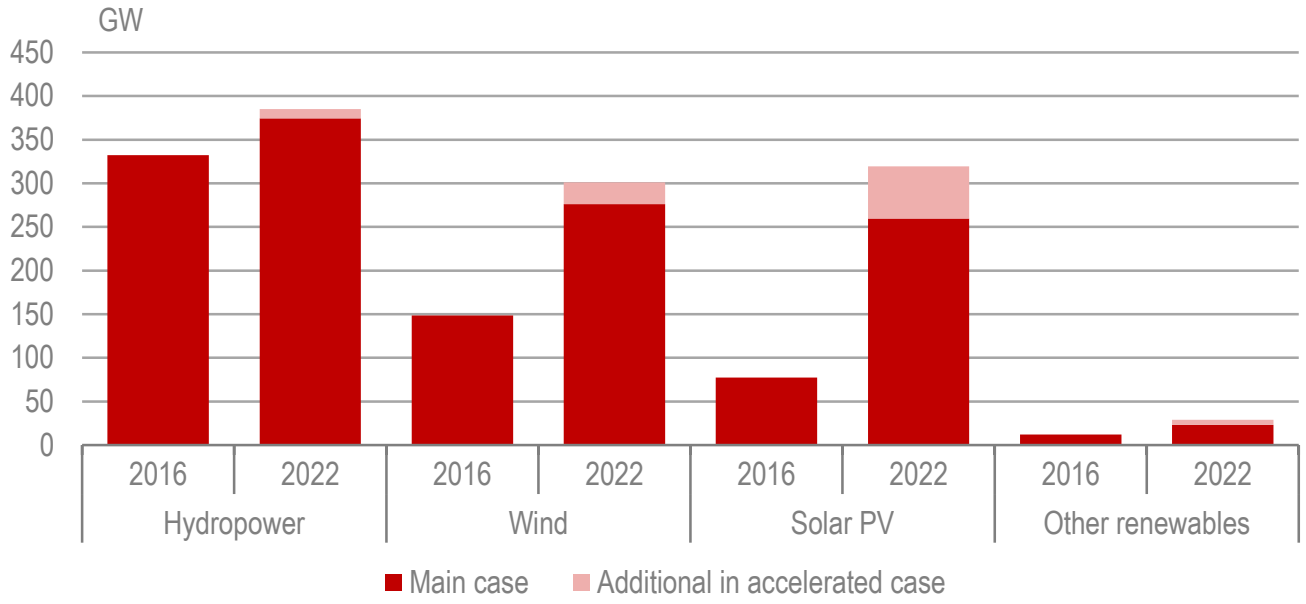
China holds the key to the new solar PV era



China influences the global market volumes and prices of solar PV

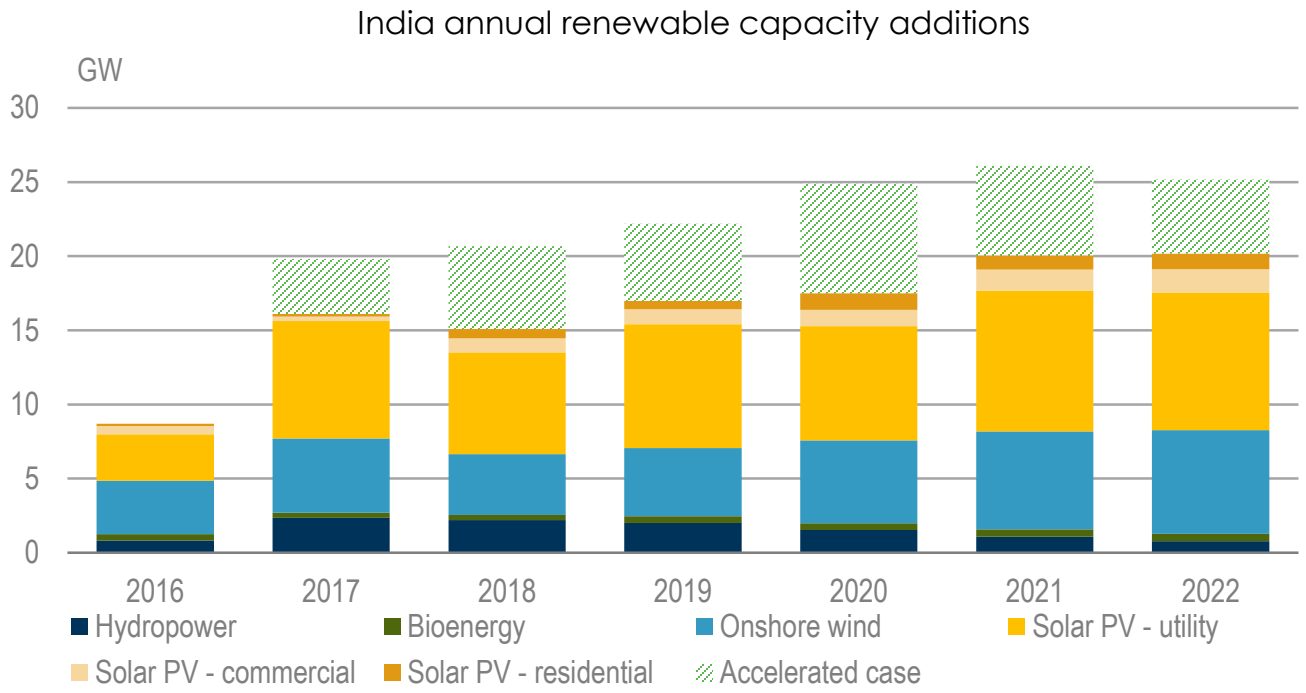
Solar PV to lead China's renewable expansion

China cumulative renewable capacity by technology in 2016 and 2022



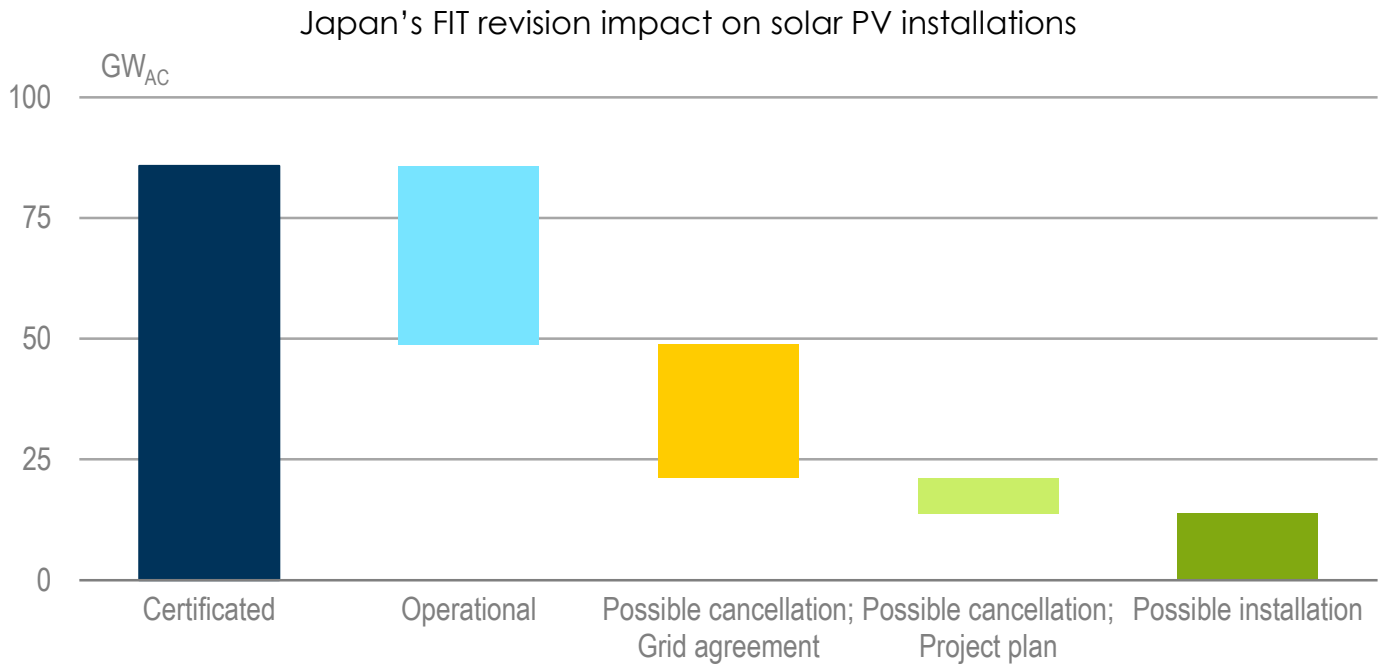
Hydropower growth slows due to social and environmental concerns; wind expansion is stable despite integration challenges while solar PV growth slowly shifts to distributed generation

India: Policy improvements drive more optimistic outlook



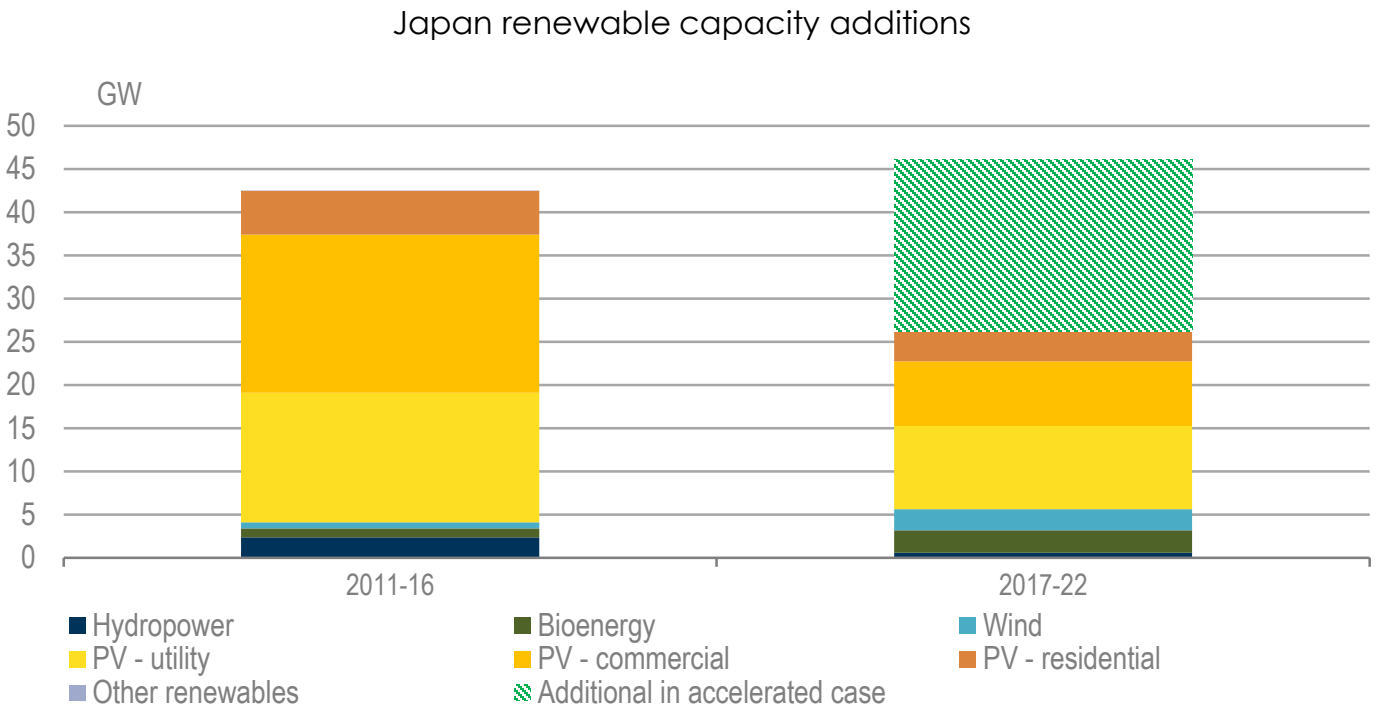
UDAY scheme improving financial health of distribution companies and auctions lead to competitive prices; grid integration, further implementation of RPOs and distributed generation remain challenges

Japan's FIT revision: an important forecast uncertainty for PV



More than half of all previously approved but non-operational PV projects to be cancelled after METI's review while the pace of new approvals remain a forecast uncertainty

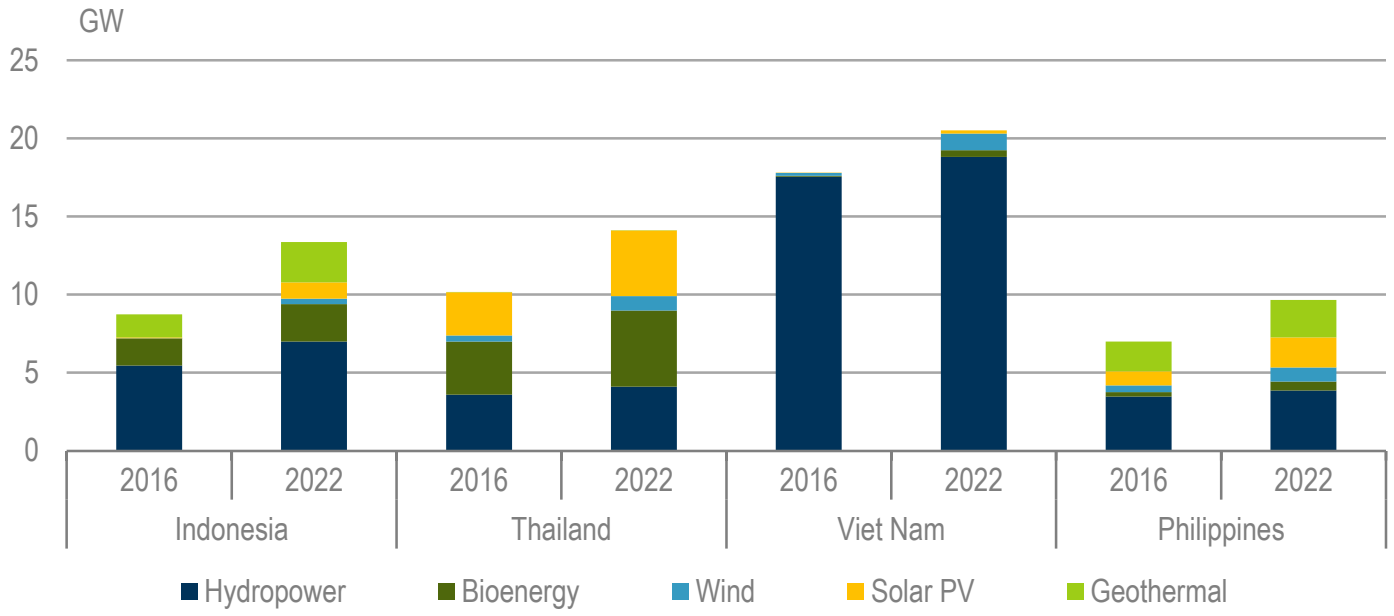
Solar PV and bioenergy lead Japan's new renewable additions



PV accounts for 80% of renewable growth with 21 GW expected in the next five years to reach 63 GW by 2022 but if FIT cancellations remain minimal PV capacity could be 16 GW higher

ASEAN's non-hydro renewable capacity to double by 2022

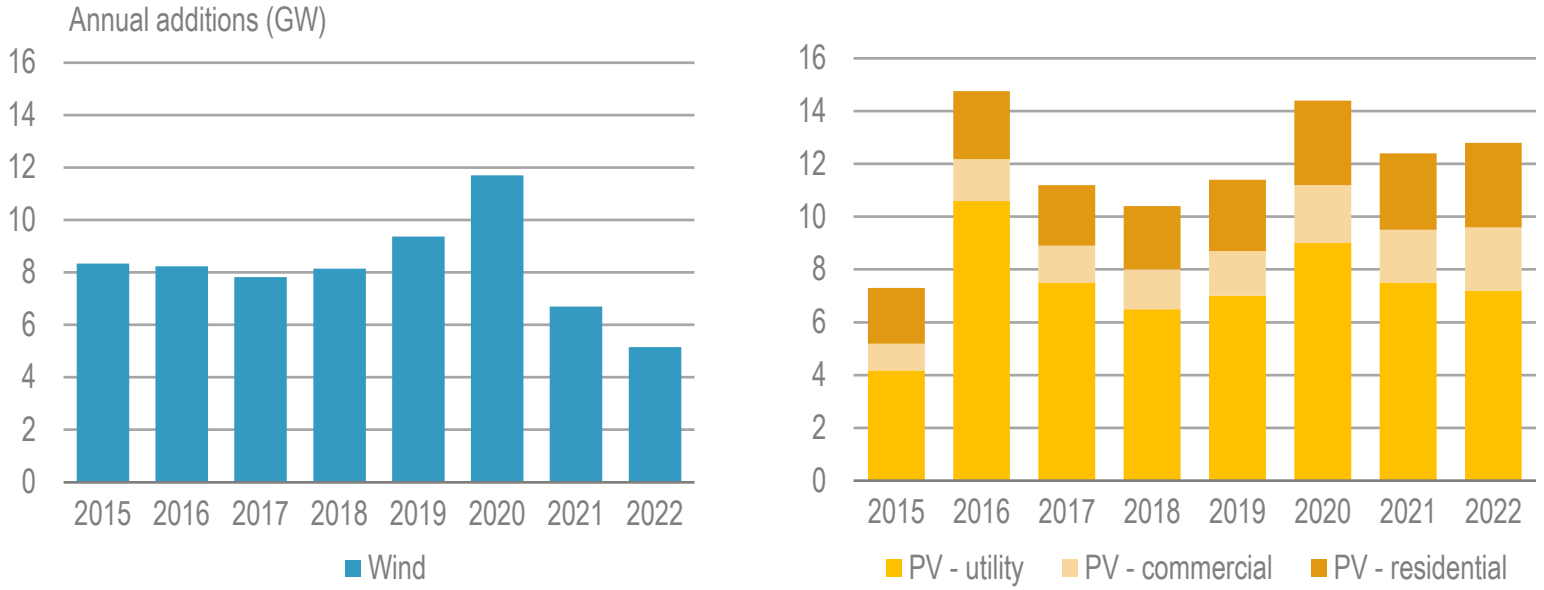
Cumulative renewable capacity in selected countries in ASEAN in 2016 and 2022



Energy diversification needs and growing power demand drive renewable capacity growth in ASEAN but grid integration, policy and regulatory uncertainties remain important challenges

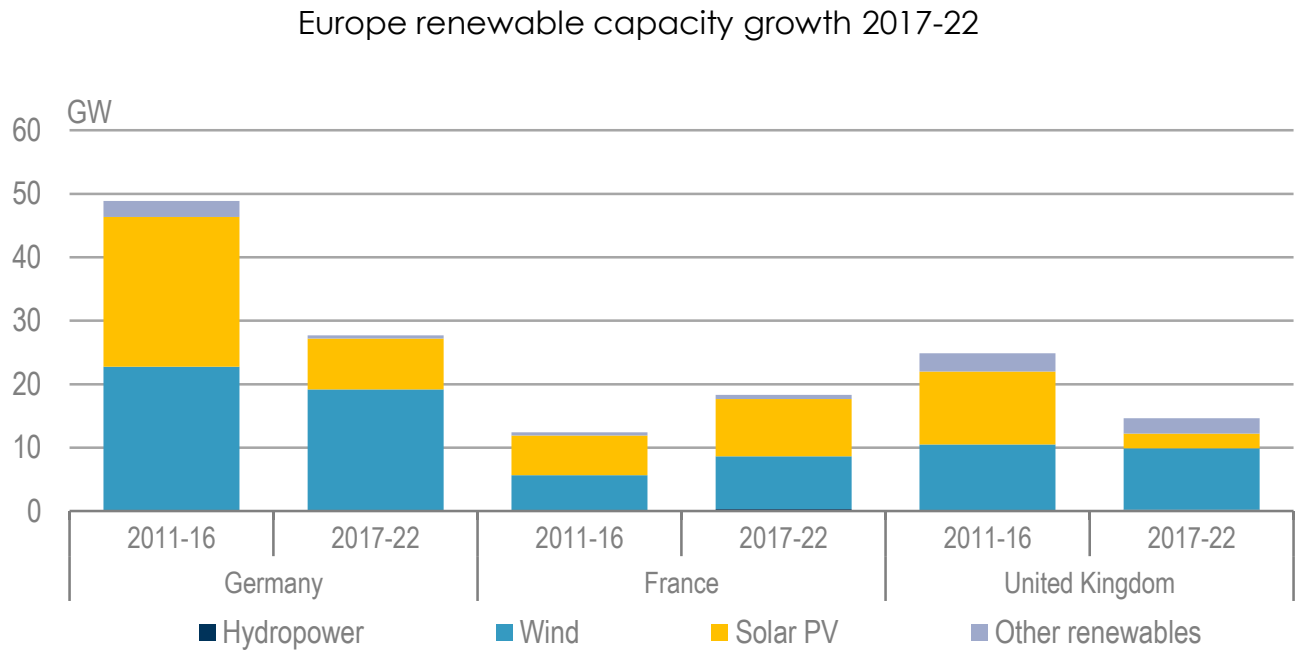
US tax incentives, RPSs and other state-level incentives remain strong drivers

United States annual capacity additions for solar and wind by technology



Annual additions trend for solar and wind affected by tax phase-out schedules but announced policies on trade and tax reform remain important forecast uncertainties.

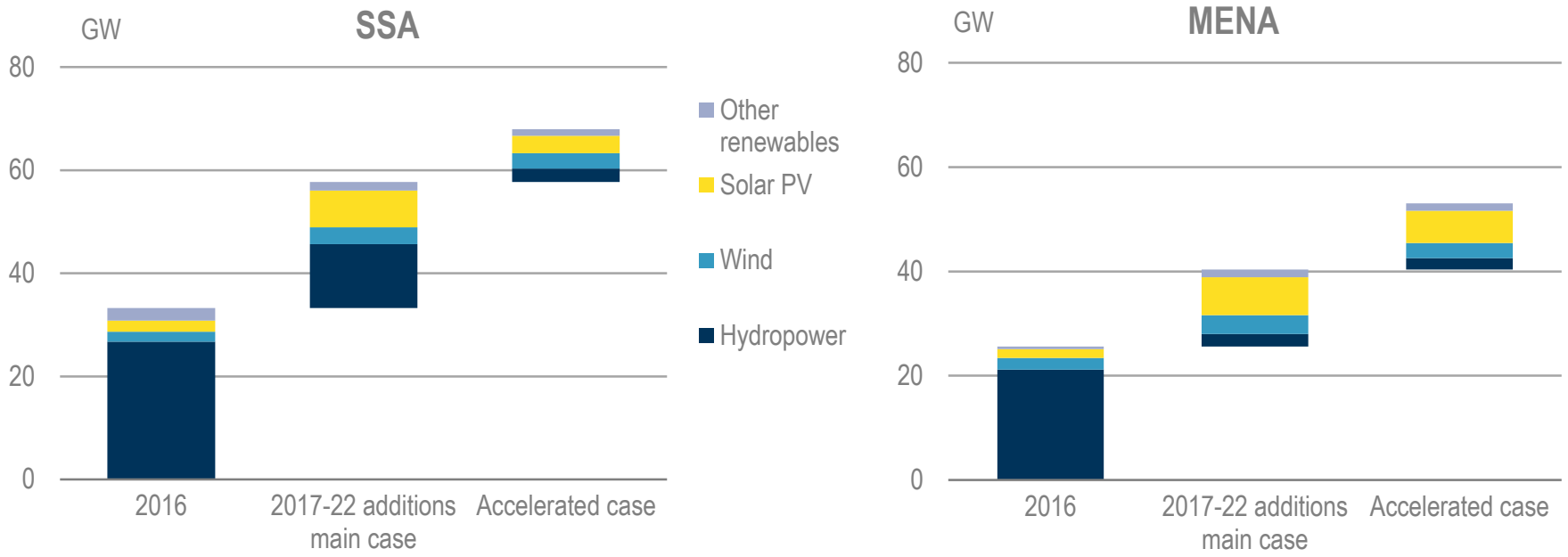
Europe's deployment reflects policy transition



Europe's renewable capacity is forecast to increase by over one-fifth in 2022, led by Germany, France and the UK, with the pace of growth gradually dictated by auction schedules with fixed volumes.

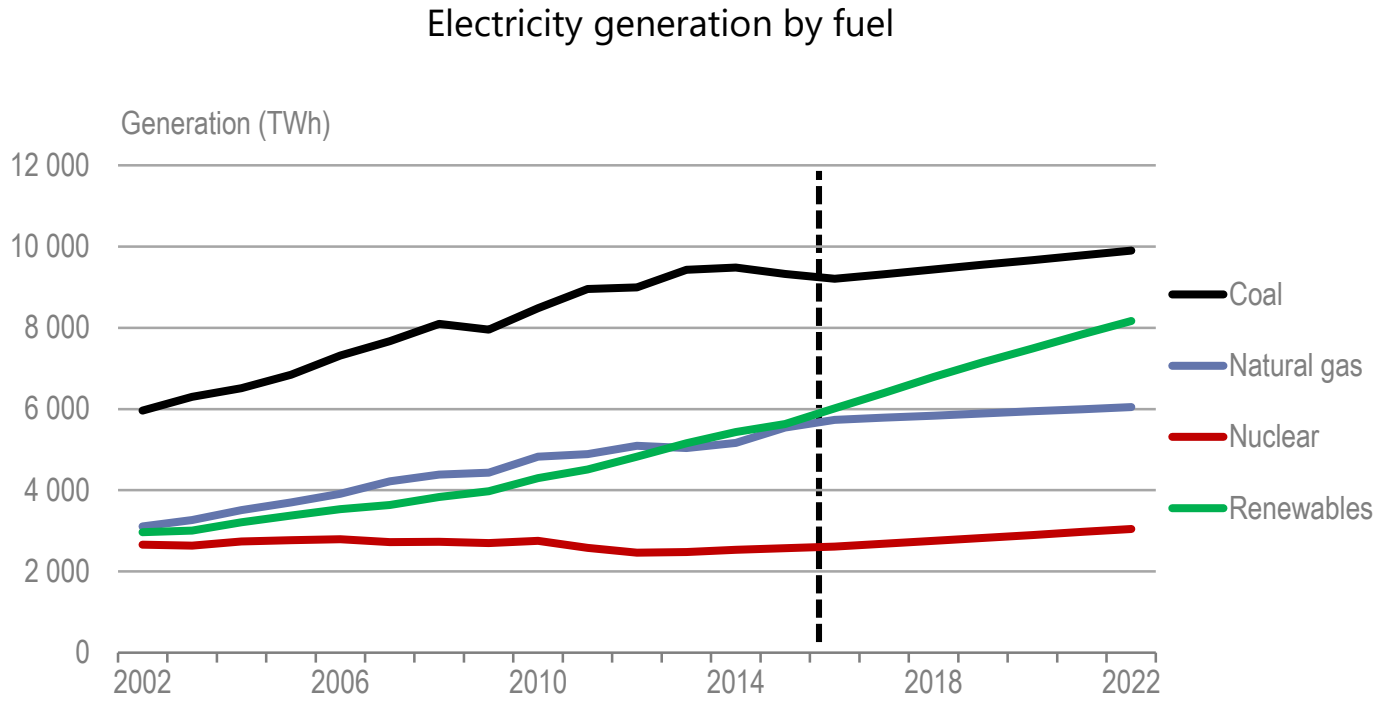
SSA and MENA to benefit from wind and PV cost reductions

SSA and MENA renewable energy capacity



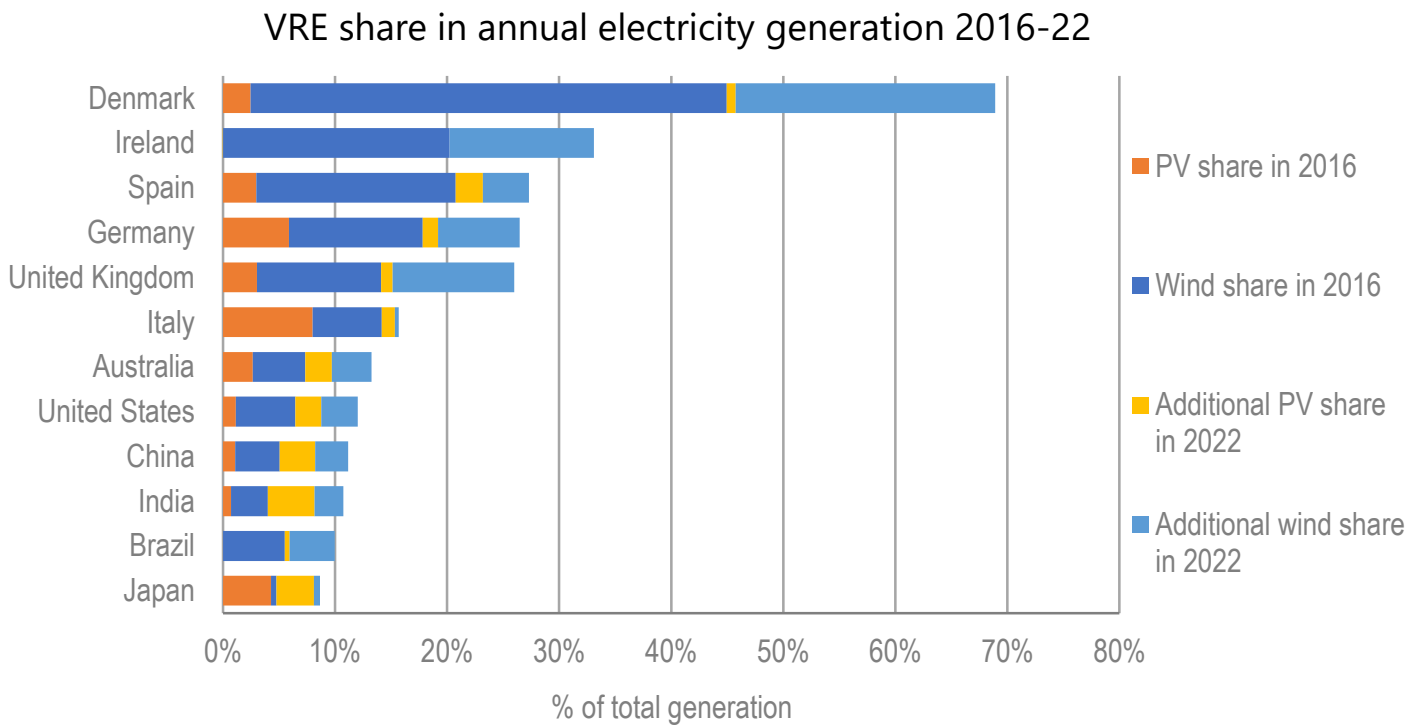
Demand and diversification drive renewable growth in MENA and sub-Saharan Africa; expansion could be faster with policy and regulatory clarifications, access to low-cost financing and faster grid upgrades

Renewables closing the gap with coal



Renewable generation to expand by over a third with its share increasing from 24% in 2016 to 30% in 2022, rapidly closing the gap with coal

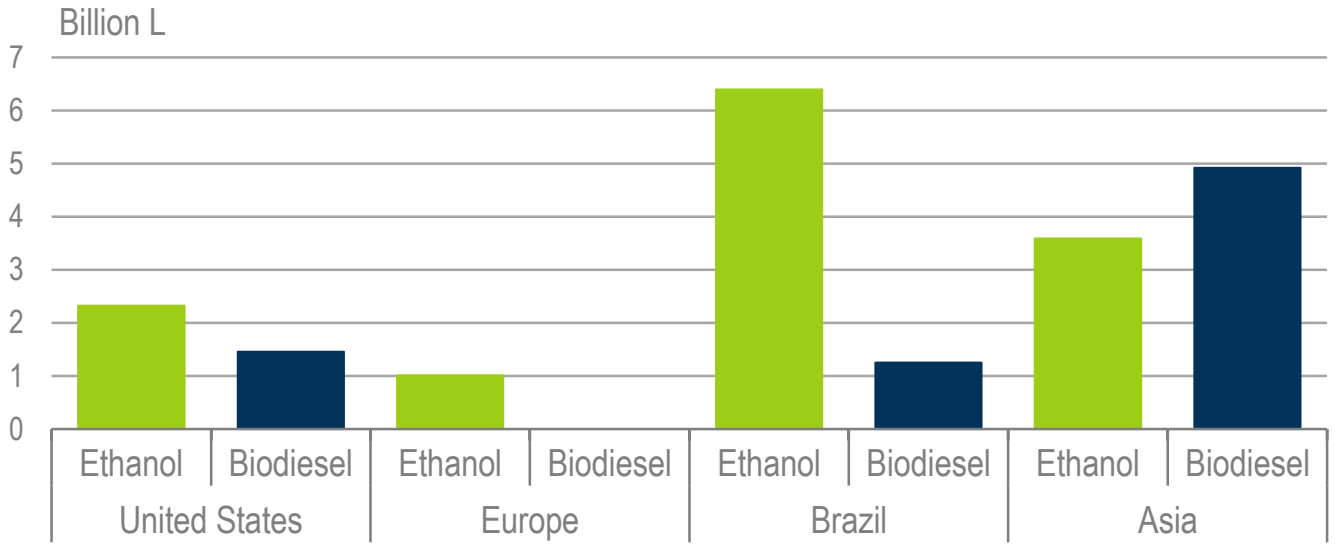
Wind and solar transforming power sector - system integration becomes key



More flexible power systems, adapted market design and policies will have to play a key role in integrating larger shares of wind and solar in a secure and cost-effective way

Asia and Brazil drive biofuels production growth

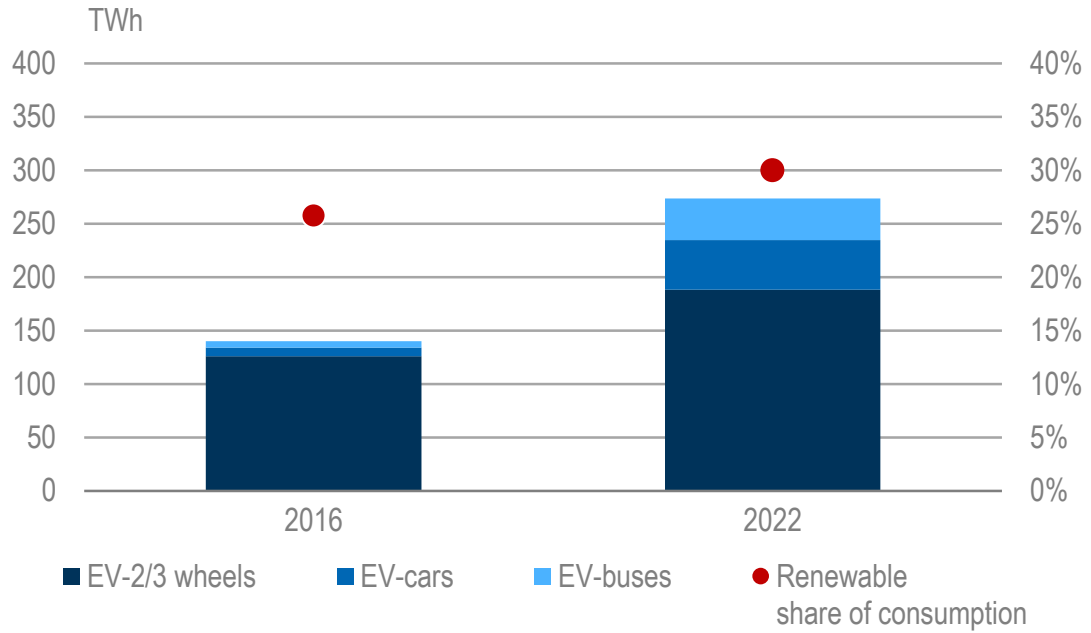
Forecast conventional biofuel production growth 2017-22 in key countries and regions



Global conventional biofuel production is forecast to grow for 136 billion L to 159 billion L by 2022; advanced biofuels output to increase sevenfold but represent only 1% of total biofuel production

Renewables to supply almost a third of EV demand in 2022

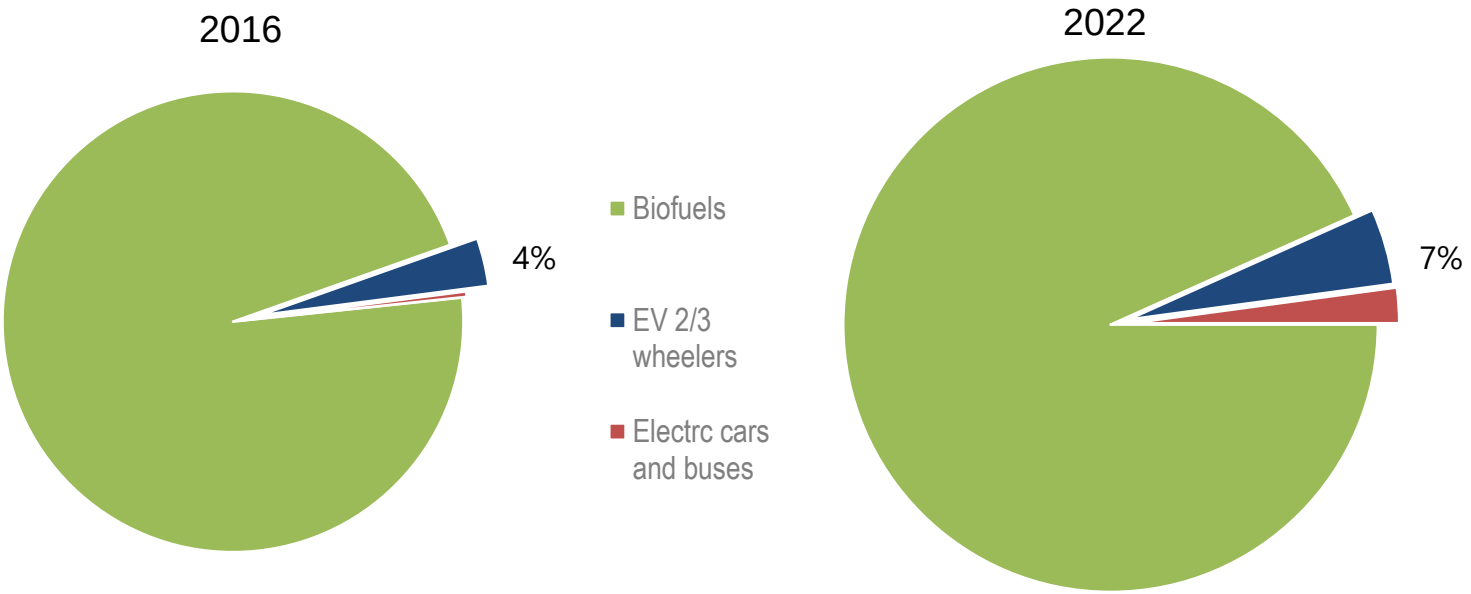
Global electricity consumption by EVs and share of renewable consumption in 2016 and forecast for 2022



China accounts for almost 90% of global EV electricity consumption in 2022, mostly from 2/3 wheelers, and remains the largest electric car market, followed by Europe and the United States.

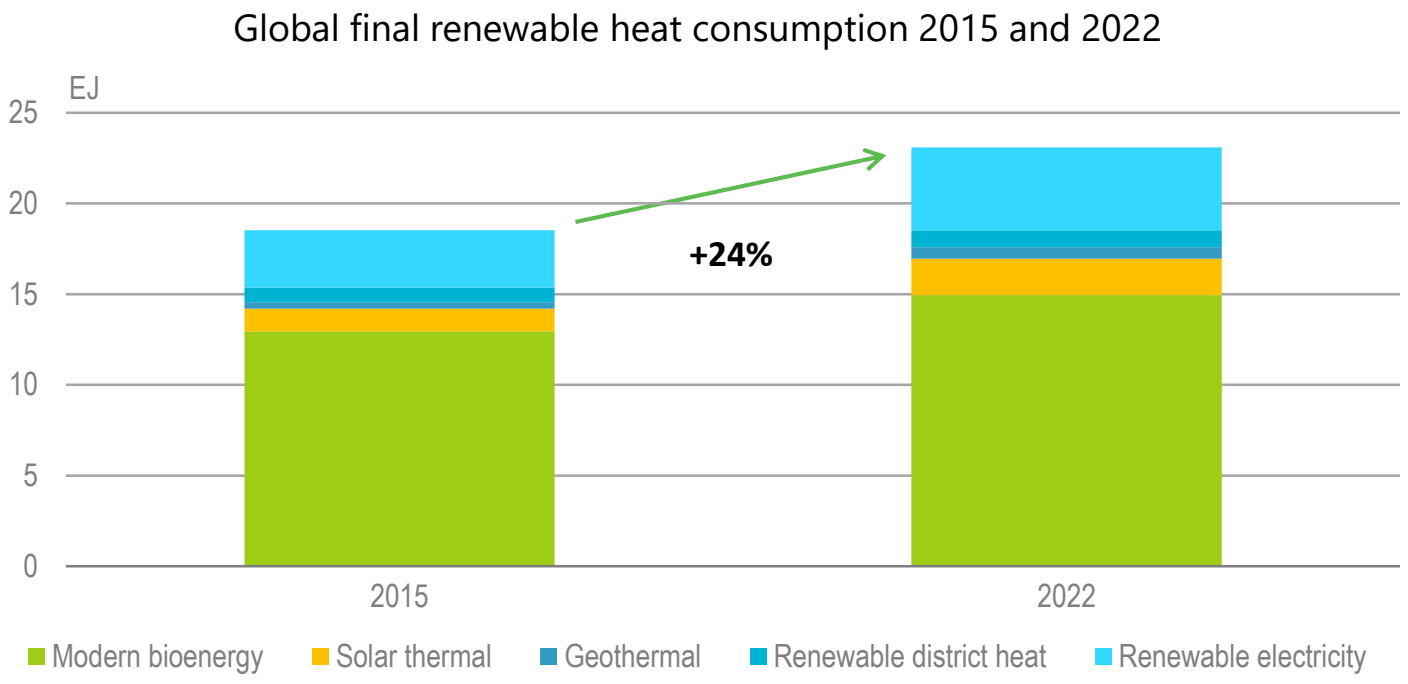
Surging EVs to complement biofuels in renewable transport

Biofuels and electric vehicles contribution to renewable energy consumption in road transport



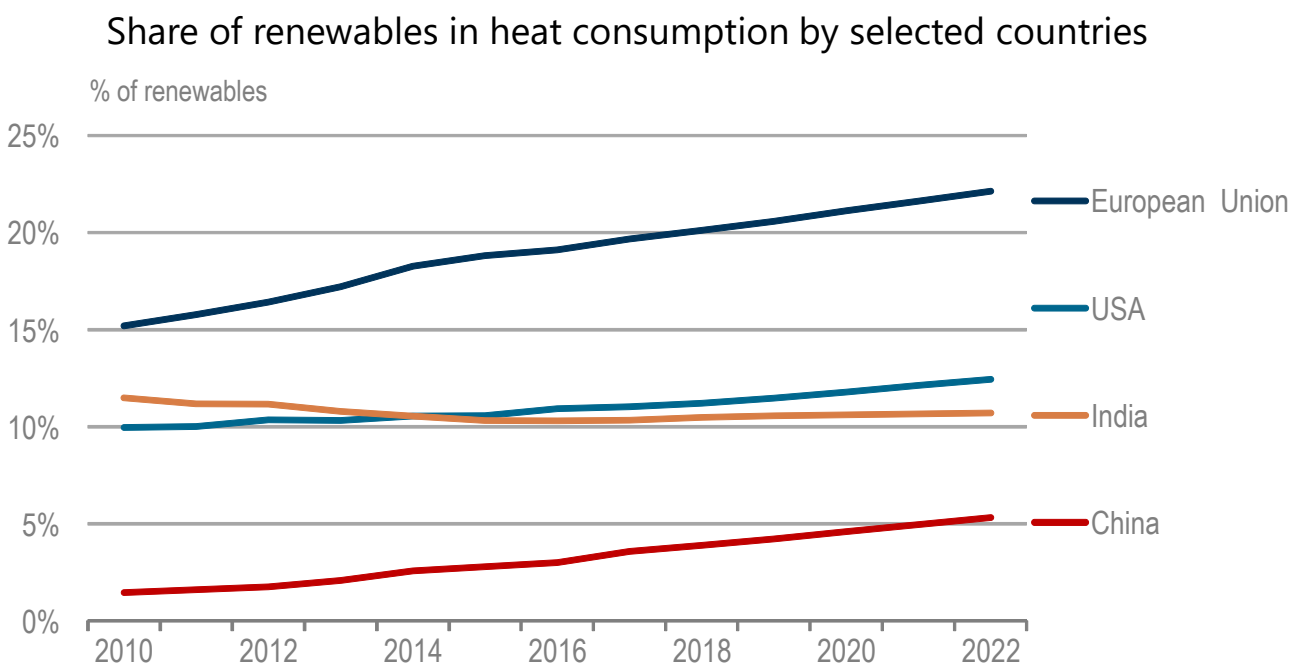
Share of renewables in road transport increases from 4% in 2016 to almost 5% in 2022, with biofuels representing 80% of the growth led by Asia & Brazil; EV electricity consumption doubles by 2022, with renewables providing 30% of demand

Renewable heat – slower but steady growth



Bioenergy will dominate growth in absolute terms; electricity accounts for 6% of heat consumption and renewable electricity used for heat is expected to almost double.

Progress in renewable heat depends on strong policies



Renewables share in heat consumption rises from 9% in 2016 to 11% in 2022. China leads absolute growth with new targets; EU remains the largest renewable heat consumer while total heat demand outpaces renewables growth in India

Concluding remarks

- Renewables rise by 1,000 GW to 2022, equal to half of current total coal capacity
- Renewables generation exceeds 8,000 TWh by 2022, equal to total electricity consumption of China, India & Germany combined
- Solar PV enters a new era leading the growth in renewables, driven by a rapid expansion in deployment & manufacturing capacity in China
- Despite rapid growth in EVs, decarbonisation of transport is a long way off
  - *Only 30% of electricity used by EVs is sourced from renewables*
  - *Advanced biofuels require specific incentives to bolster deployment*
- Policymakers have to turn their focus to system integration & expanding the use of renewables for heating & cooling

Thank you

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