2019 Korean Wind Industry Symposium Presentation

Global wind power: A look at market hotspots and emerging trends

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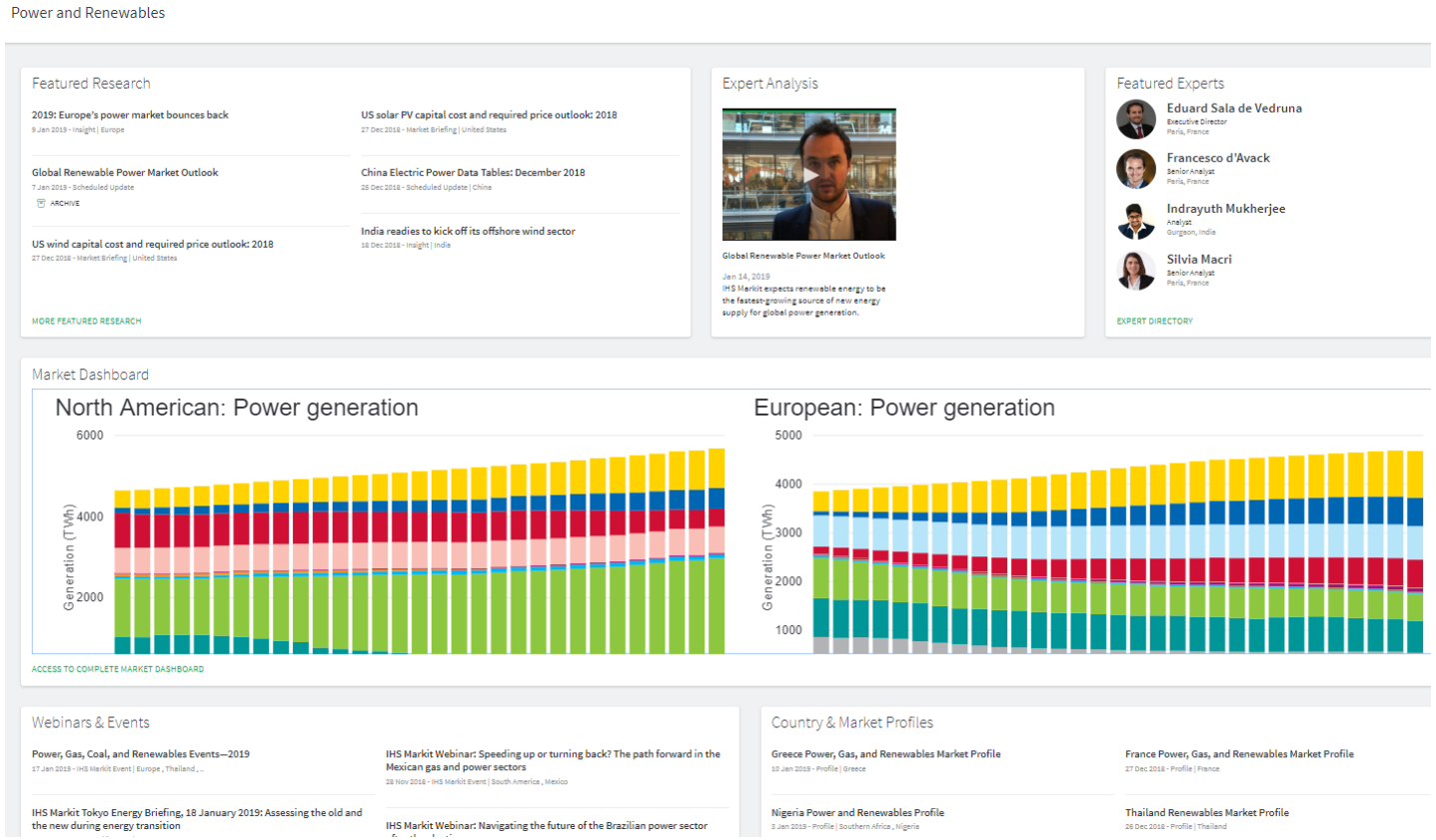

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Global wind market overview

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Key takeaways

- While conventional fuels dominate total installed capacity in all regions today, renewables will capture the bulk of new capacity additions between now and 2050 everywhere except India.
- IHS Markit expects nearly 5.2 TW of new renewable energy capacity to be added globally between 2018 and 50, of which 28% and 8% will come from onshore and offshore wind respectively.
- This growth in renewables installations is expected to generate investments totaling US$7.5 trillion driven by the Asia Pacific region and Europe. Onshore and offshore wind will account for 34% and 13% of the total renewable energy investment respectively.
- Renewable costs have been decreasing, improving competitiveness and resulting in LCOE ranges for onshore wind, offshore wind, and solar PV converging globally.
- Rapidly falling wind costs have triggered supply side consolidation for the industry. In 2018, nearly two thirds of the total wind installations was accounted for by the five largest vendors.
- Vendor portfolios are being constantly upgraded with newer and larger turbines. New models promise higher annual energy production (AEP), lowering costs. Larger sizes also unlock opportunities in low-wind sites.

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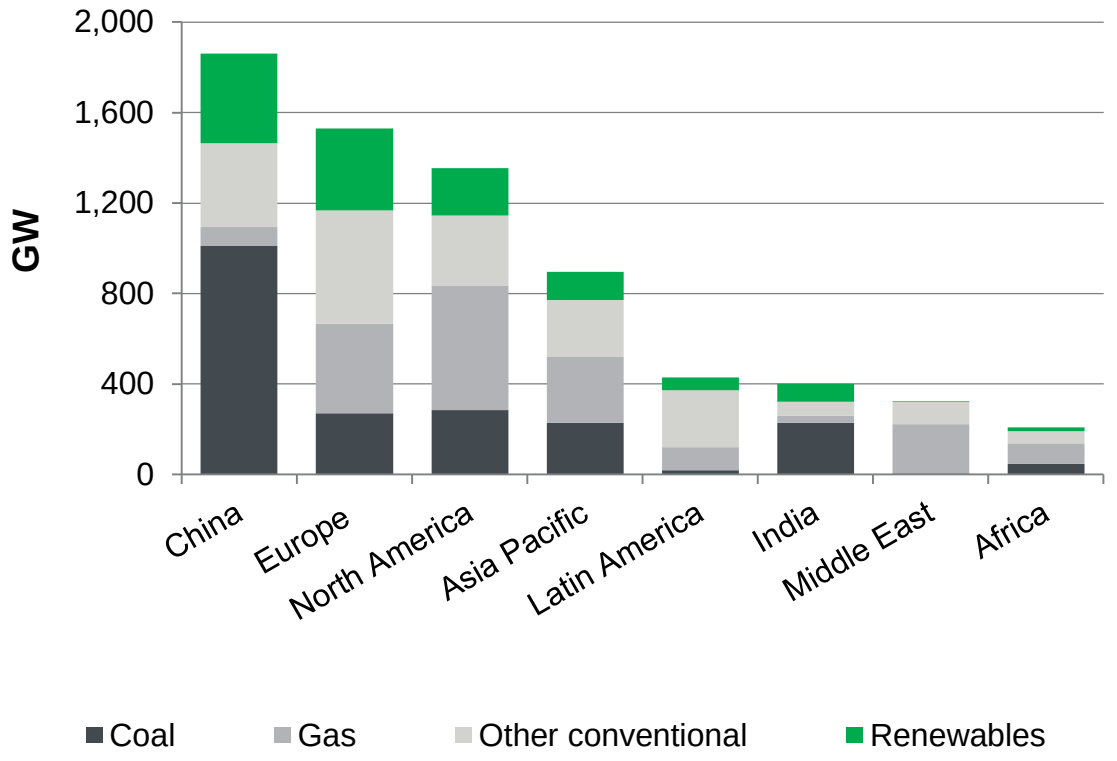
Renewables will become the dominant source of new capacity additions globally except in India

Operating capacity, by source, 2017



Note: Rivalry scenario. Other conventional includes large hydro, nuclear, and oil. China excluding Hong Kong, Macao, and Taiwan.
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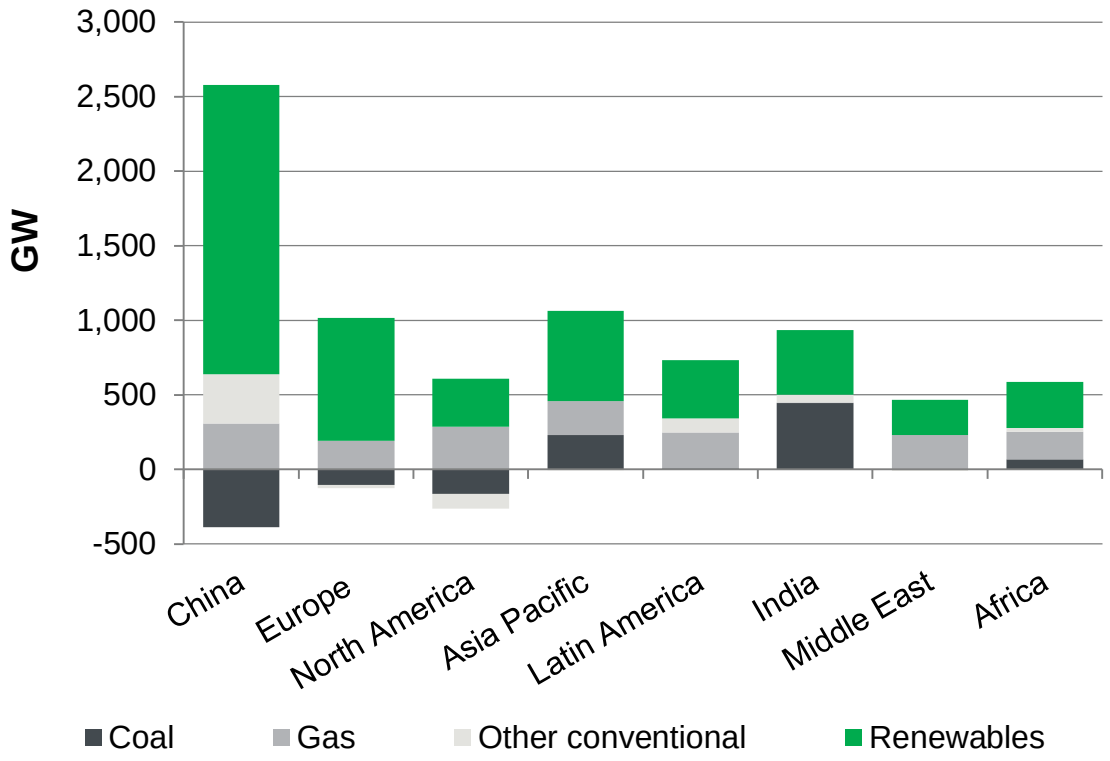
Net capacity additions, 2018–50



Note: Rivalry scenario. Other conventional includes large hydro, nuclear, and oil. China excluding Hong Kong, Macao, and Taiwan.
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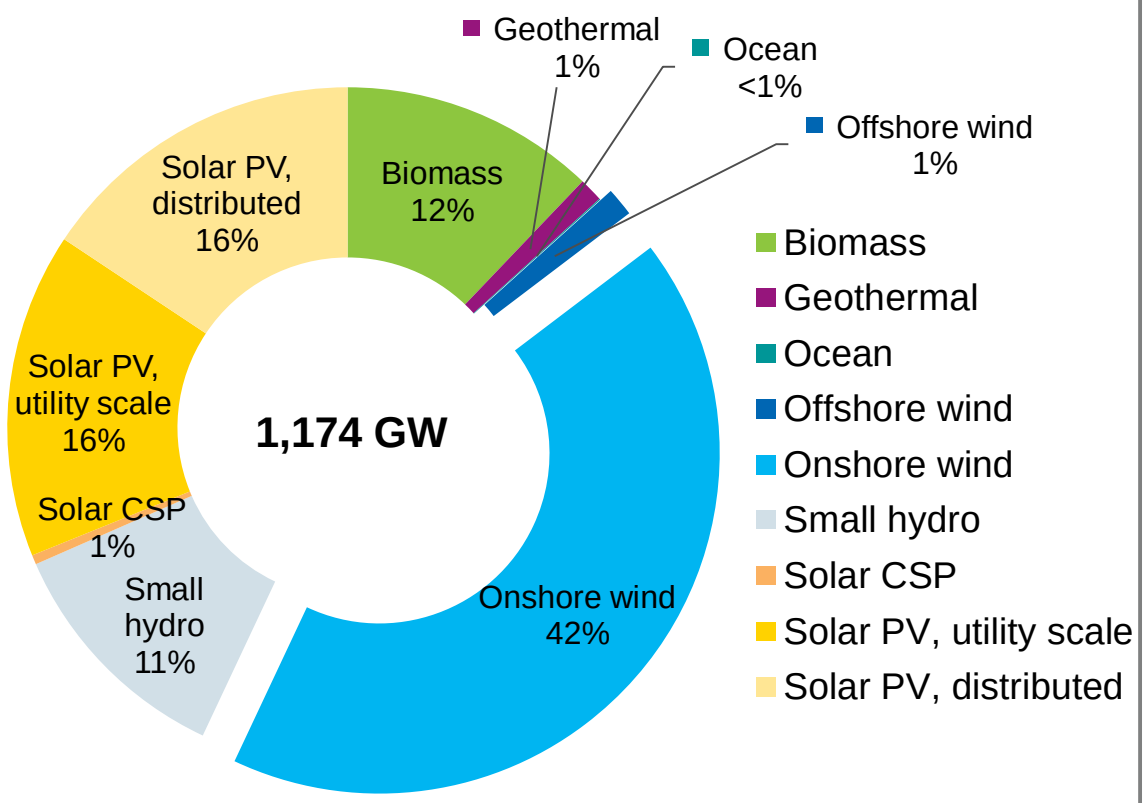
Wind will account for 36% of the new renewable capacity added globally during the 2018–50 period

Installed renewable capacity by technology, 2017



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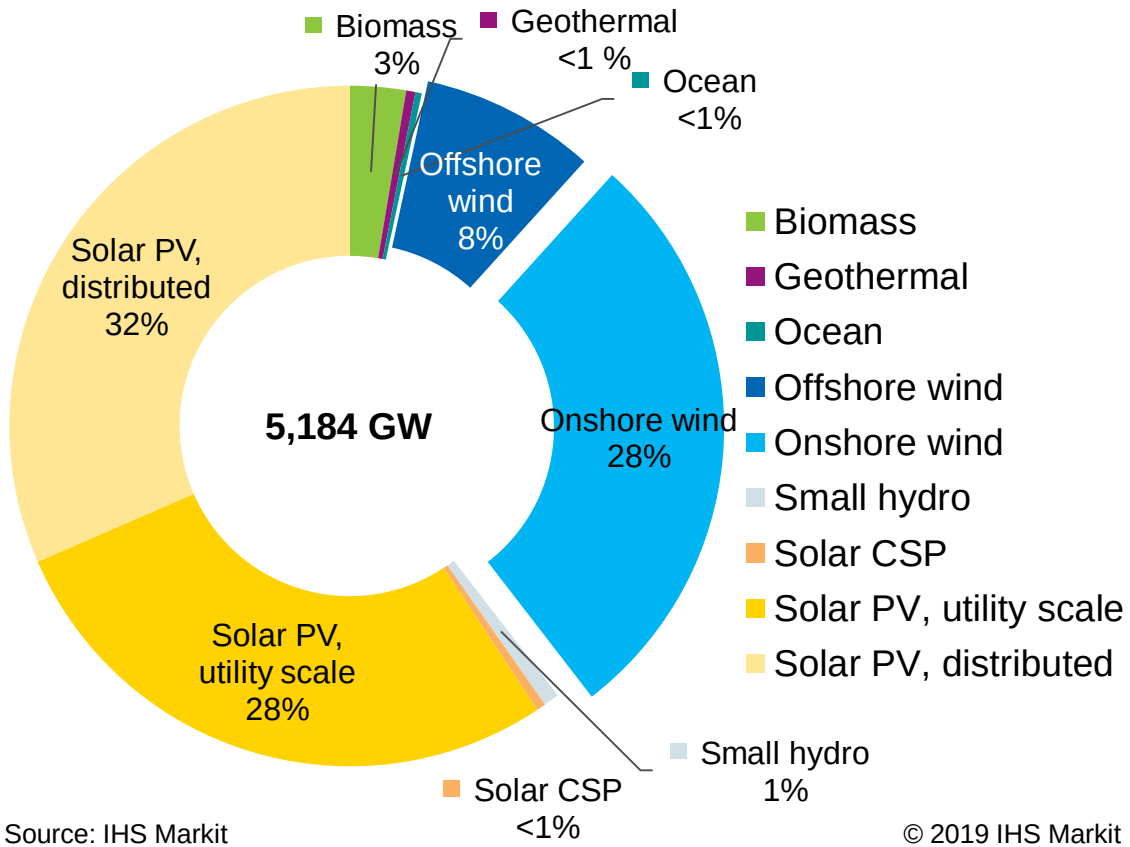
Net renewable capacity additions by technology, 2018–50



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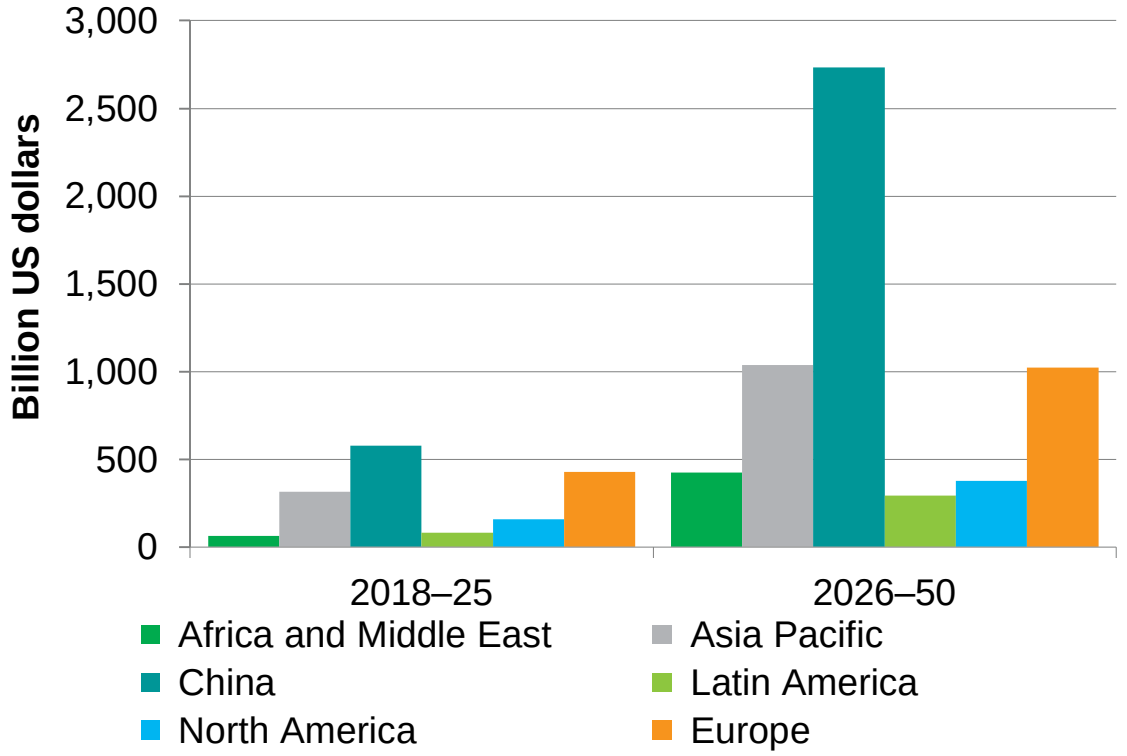
Drive by the highly capital intensive offshore sector, wind will account for nearly half of the total investment in renewables

Investment in renewable capacity by region (2018–50)



Note: Rivalry scenario cost assumptions and capacity additions. China excluding Hong Kong, Macao, and Taiwan.
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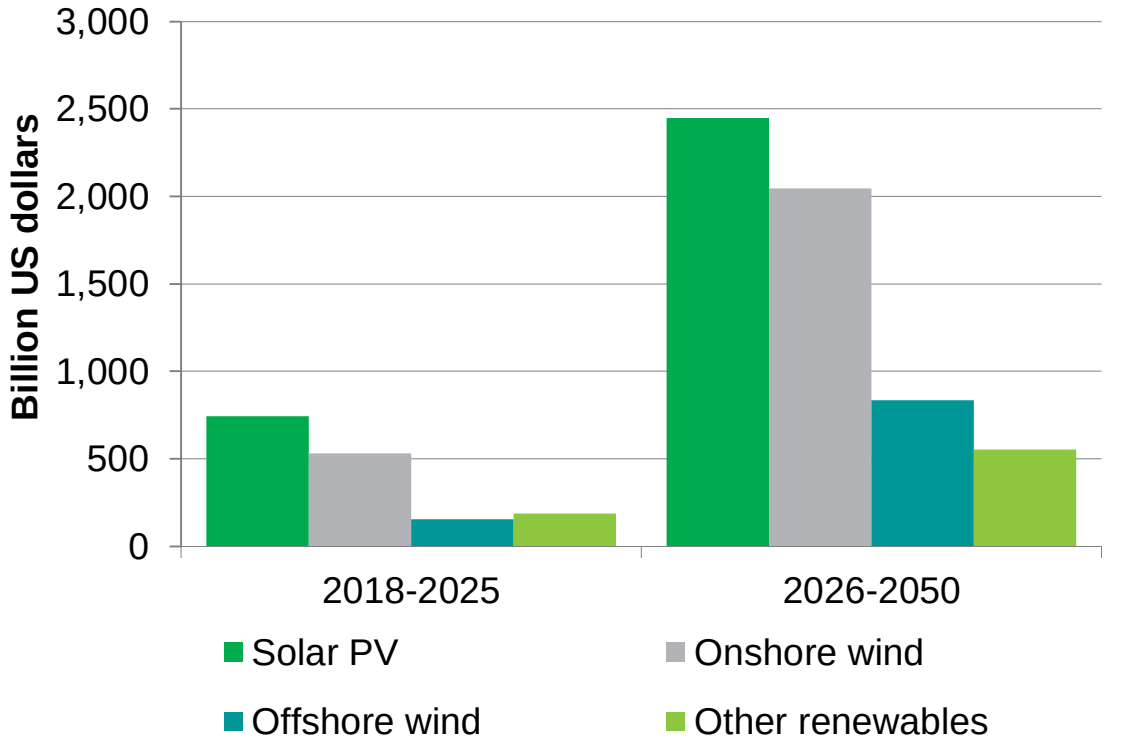
Investment in renewable capacity by technology (2018–50)



Note: Rivalry scenario cost assumptions and capacity additions. Does not include batteries.
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Growth drivers and inhibitors: Onshore and offshore wind

Onshore wind

Drivers

- Targeted policies
- Good resource
- Proven technology
- Improving technology
- Repowering potential

Inhibitors

- NIMBYism
- Saturation in some mature markets
- Expected cost declines lower than alternatives

Source: IHS Markit

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Offshore wind

Drivers

- Targeted policies
- Better wind resource
- Global cost expectations
- Industry momentum

Inhibitors

- Higher cost than alternatives
- Development and policy risk
- Project execution complexity

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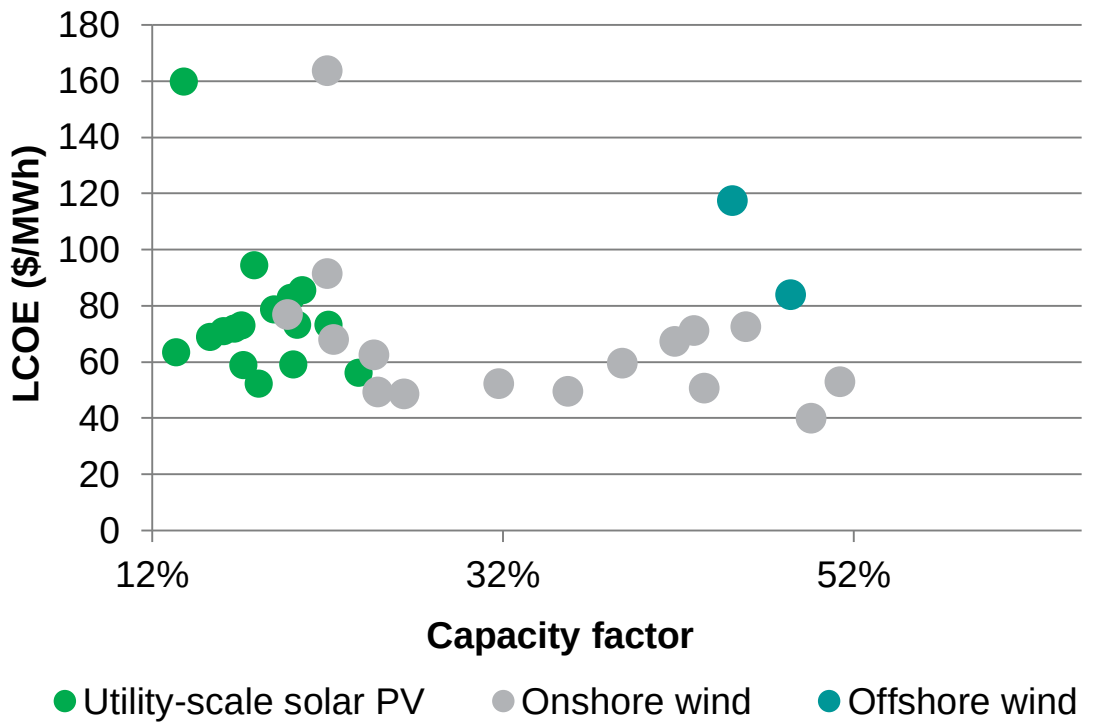
As access to technology and local project development experience improves, LCOE ranges are expected to converge

Renewable LCOEs by country/region, 2015



Note: Real 2017 values. Dots represent country/region averages for a typical project and can be much lower given above-average resource, financing conditions, or very large projects (economies of scale). LCOE = levelized cost of electricity. China excluding Hong Kong, Macao, and Taiwan.

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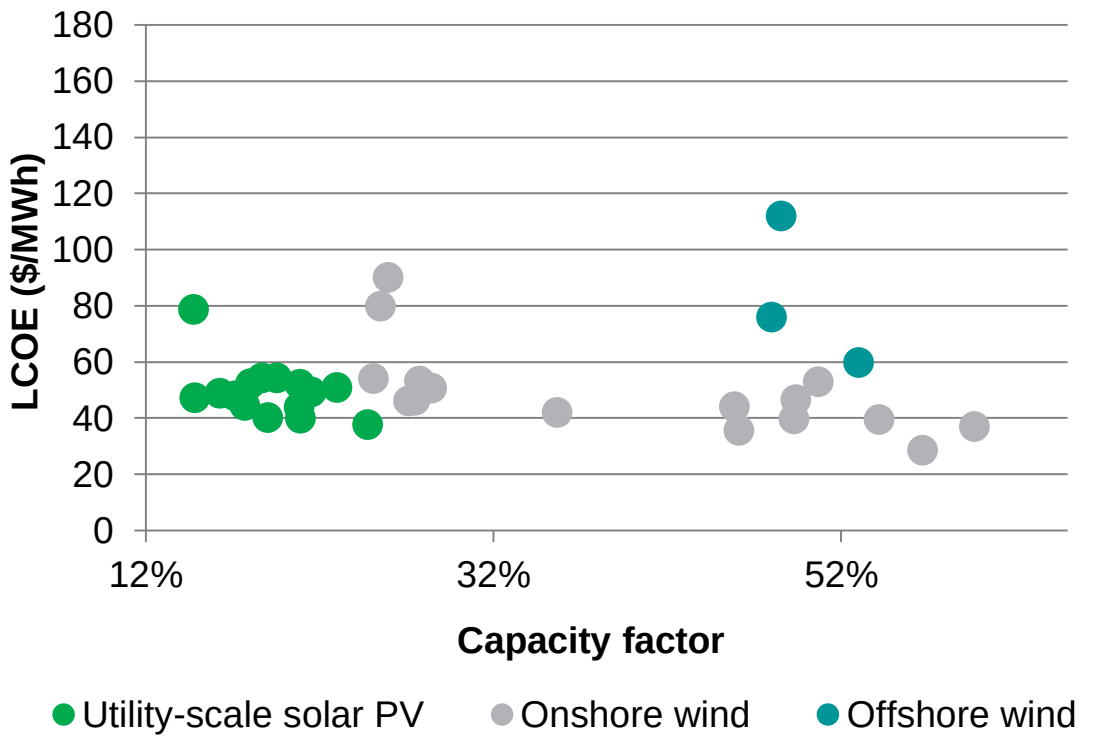
Renewable LCOEs by country/region, 2030



Note: Real 2017 values. Dots represent country/region averages for a typical project and can be much lower given above-average resource, financing conditions, or very large projects (economies of scale). China excluding Hong Kong, Macao, and Taiwan.

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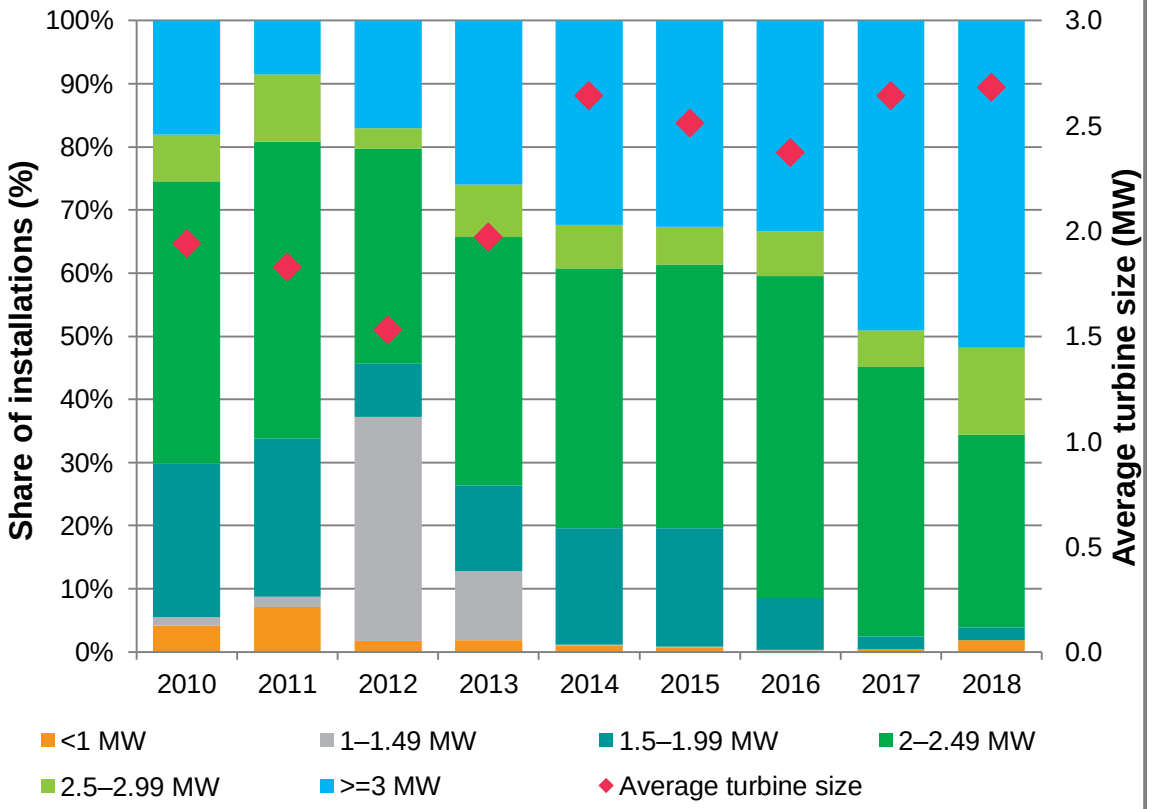
Wind turbine sizes have grown with average ratings and rotor diameters increasing by nearly 40% since 2010

Split of global wind turbine installations by turbine rating, 2010–18



Notes: Excludes installations data for China. Excludes installations for which turbine size data was not known

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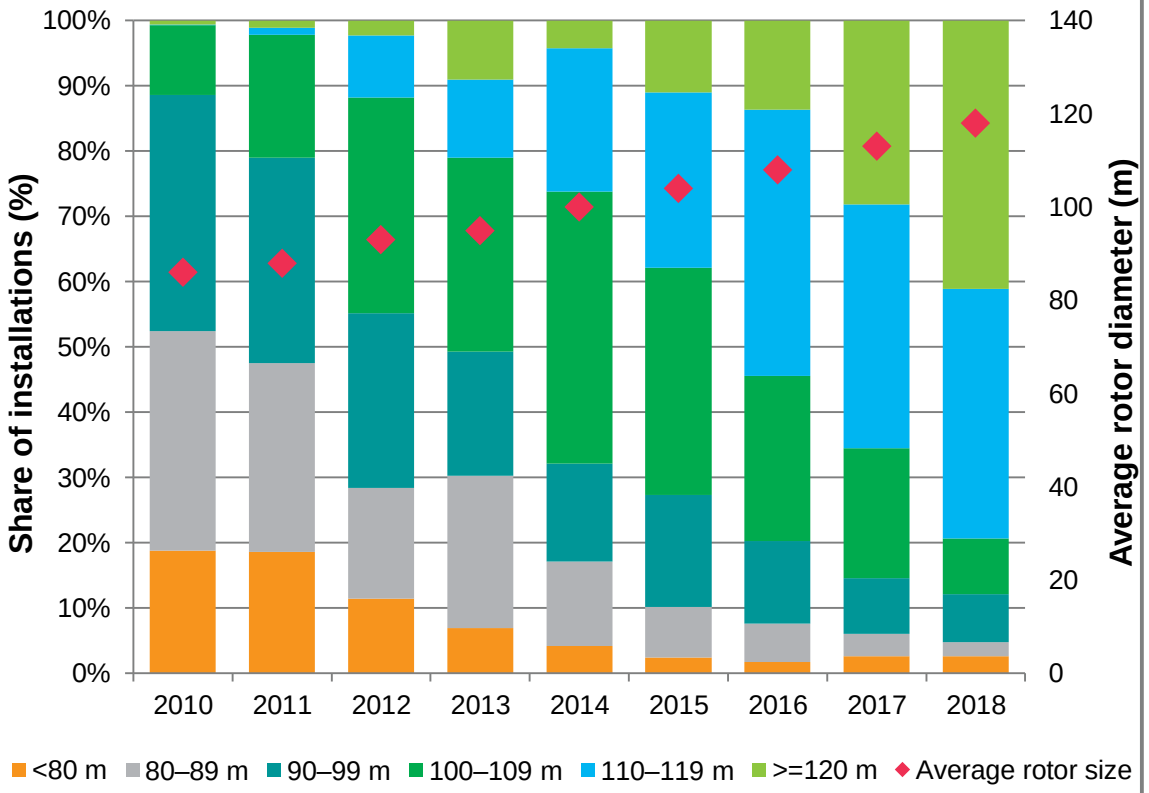
Split of global wind turbine installations by rotor diameter, 2010–18



Notes: Excludes installations data for China. Excludes installations for which rotor diameter data was not known.

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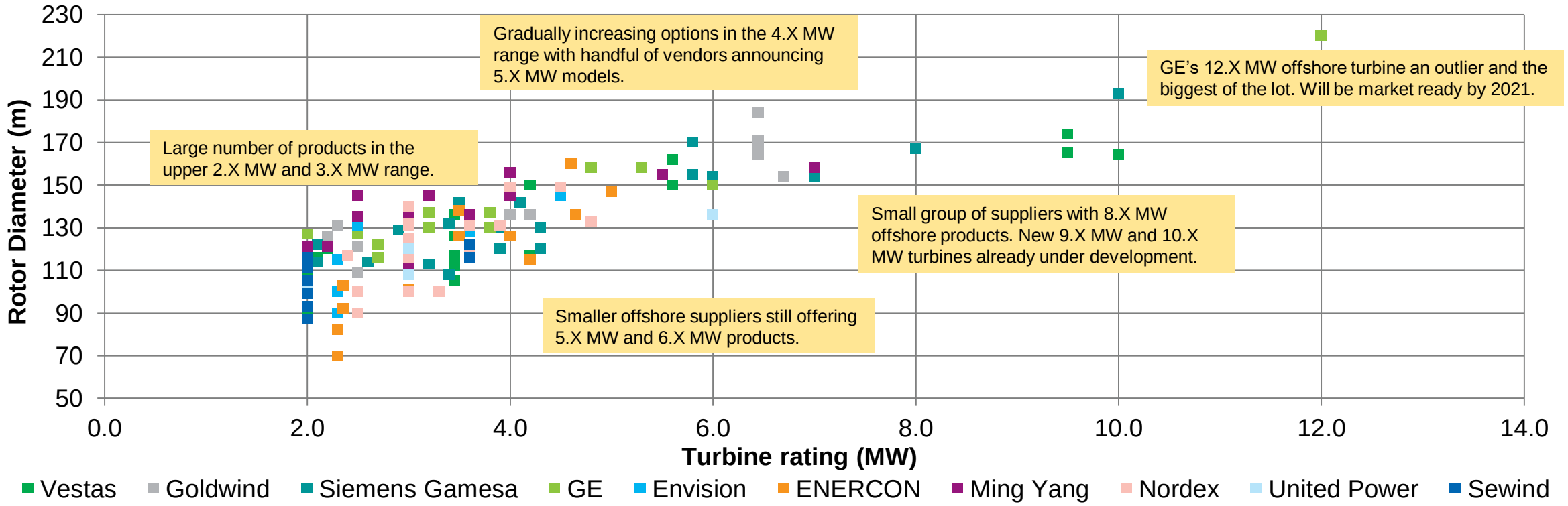
Continuous product upgradation and broad portfolios have enabled major vendors to supply site specific turbine configurations globally

Turbine models offered by the top 10 largest wind turbine vendors in 2018



Notes: The exhibit does not represent an exhaustive list of turbine configurations offered by suppliers, which vary depending upon the modularity of the turbine platform. Turbine models listed directly on respective vendor websites or otherwise disclosed on public sources have been shown. Also includes newly announced turbine models by vendors which are not commercially available yet. Turbine models information for Chinese vendor's subject to data availability. Vendor's ranked on the basis of turbine shipments in 2018. MHI Vestas Offshore Wind turbines shown under Vestas.

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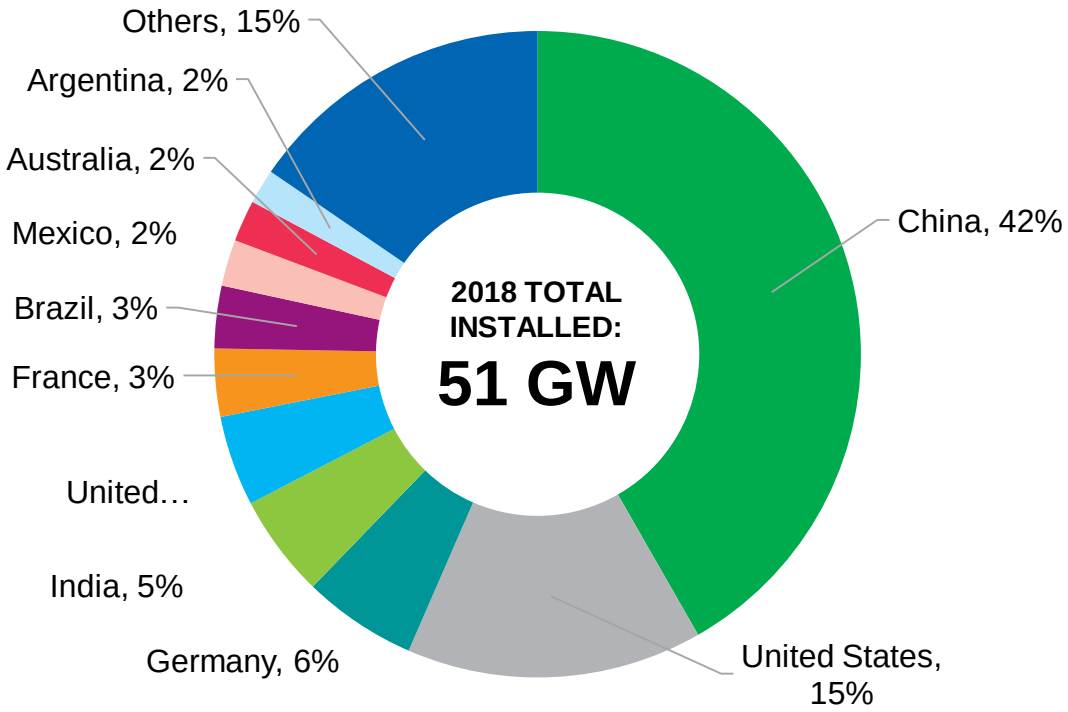
Major western OEMs have solidified market share through geographic expansion while Chinese vendors continue focusing on their home market

Global wind turbine installations in 2018, by top 10 markets



Notes: Total installations exclude 965 MW of partially repowered projects by GE in the U.S. in 2018
Source: IHS Markit

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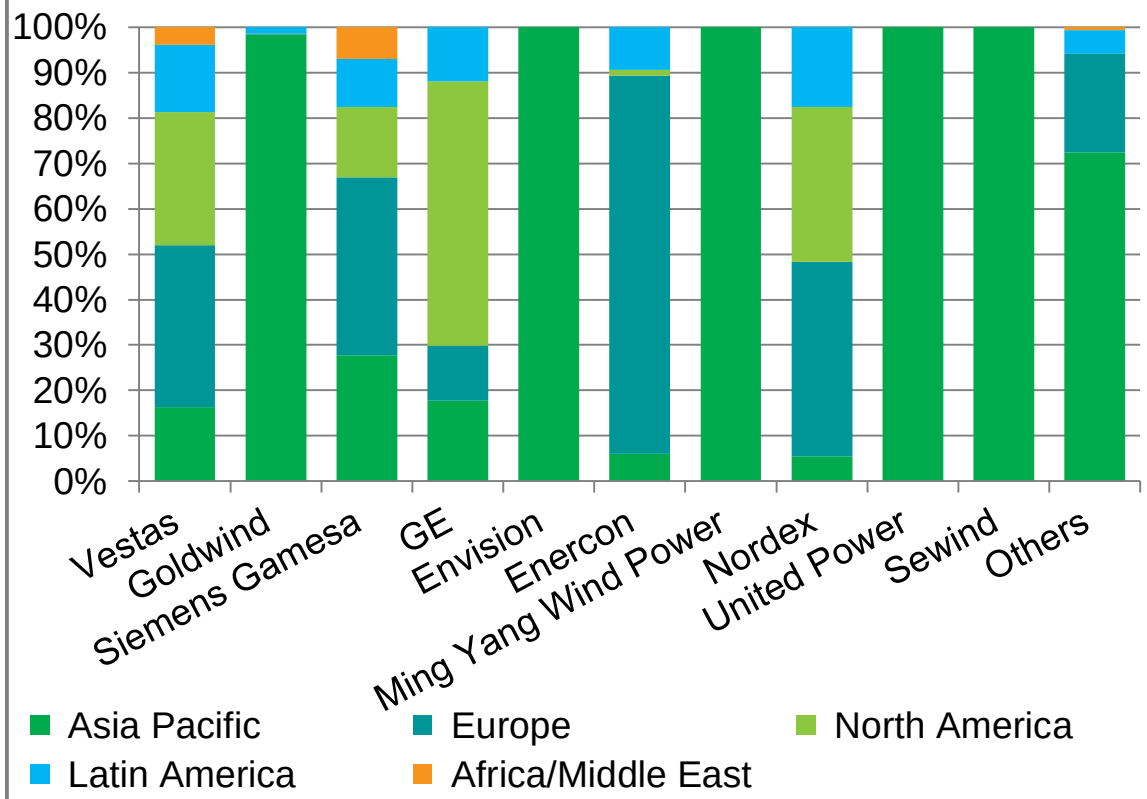
Regional exposure of top 10 turbine vendors in 2018



Notes: Total installations exclude 965 MW of partially repowered projects by GE in the U.S. in 2018
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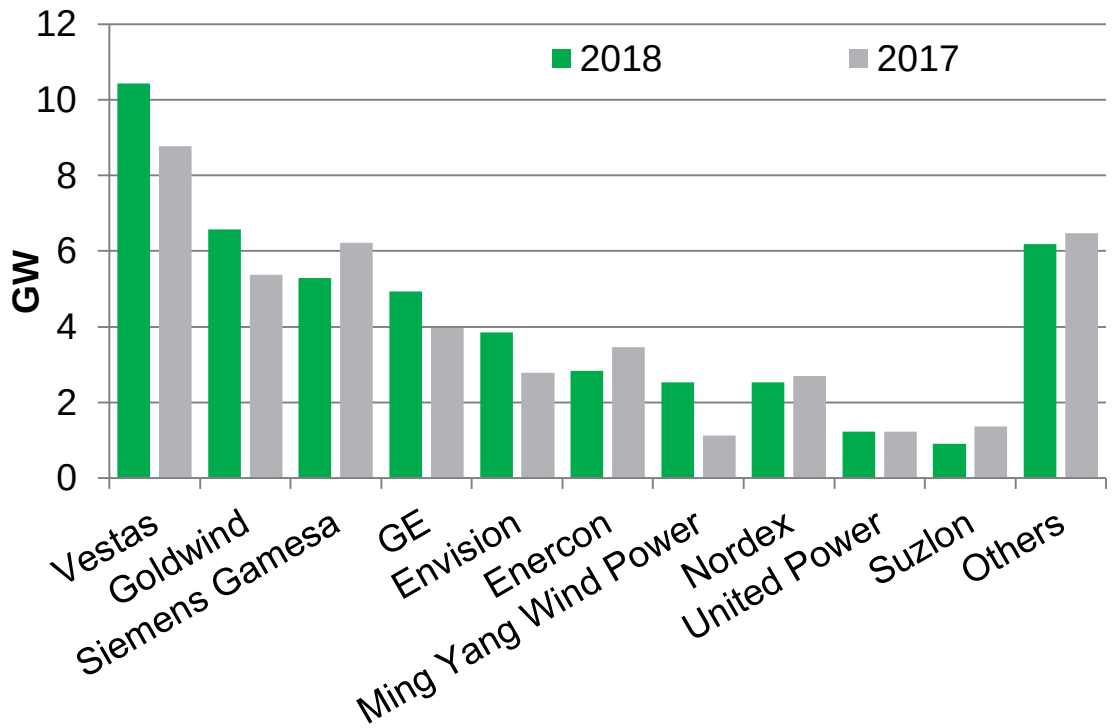
Despite its high entry barriers, several major vendors are targeting the high growth offshore sector

Top 10 vendors by 2018 onshore installations



Notes: Others include Senvion, Windey, CSIC Haizhuang, XEMC Windpower, Sewind, Dongfang Electric, WEG, CRRC Wind Power, Nanjing Wind Power, Sany Electric, Huayi (HEAG), Energine, Huachuang, Inox Wind, Xuji Wind Power, Nanjing Zhongren, Sinovel, Taiyuan Heavy Industries, ReGen Powertech, Leitwind, NuPower, Vensys, and Hitachi

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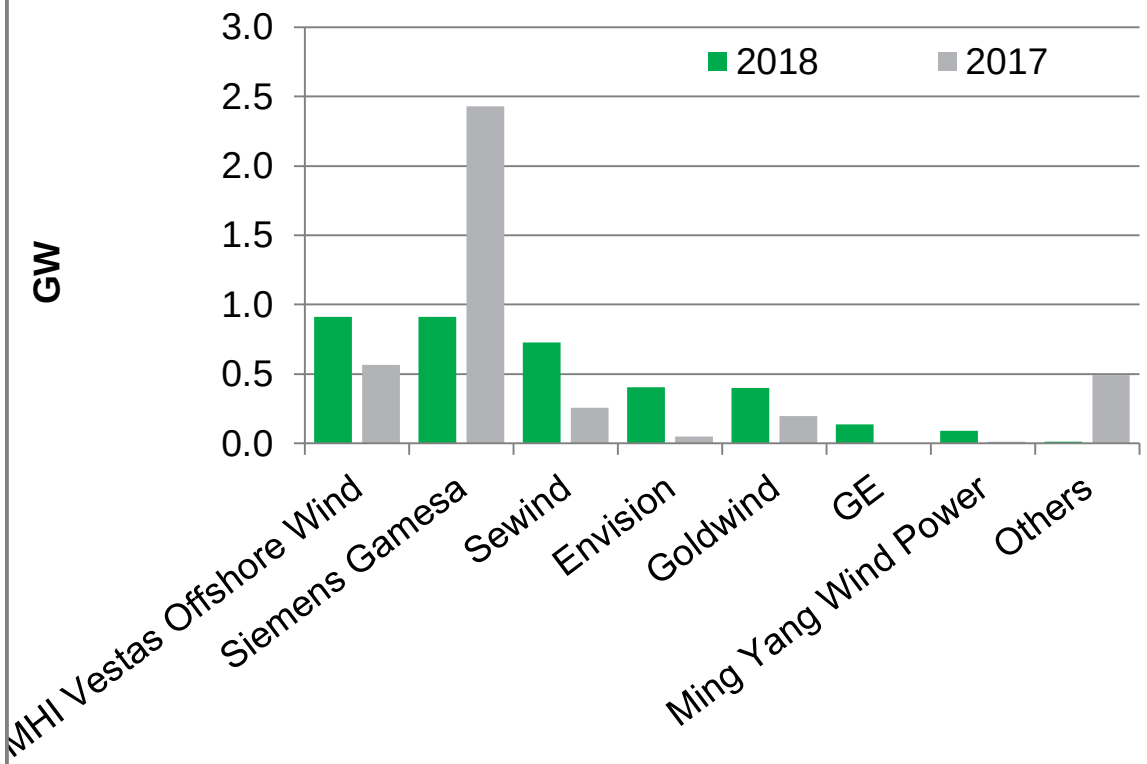
Top vendors by 2018 offshore installations



Notes: Others include United Power, Doosan, Taiyuan Heavy Industries, Senvion, Dongfang Electric, and CSIC Haizhuang. Installations for MHI Vestas Offshore Wind have been counted on the basis of project commissioning due to lack of data availability.

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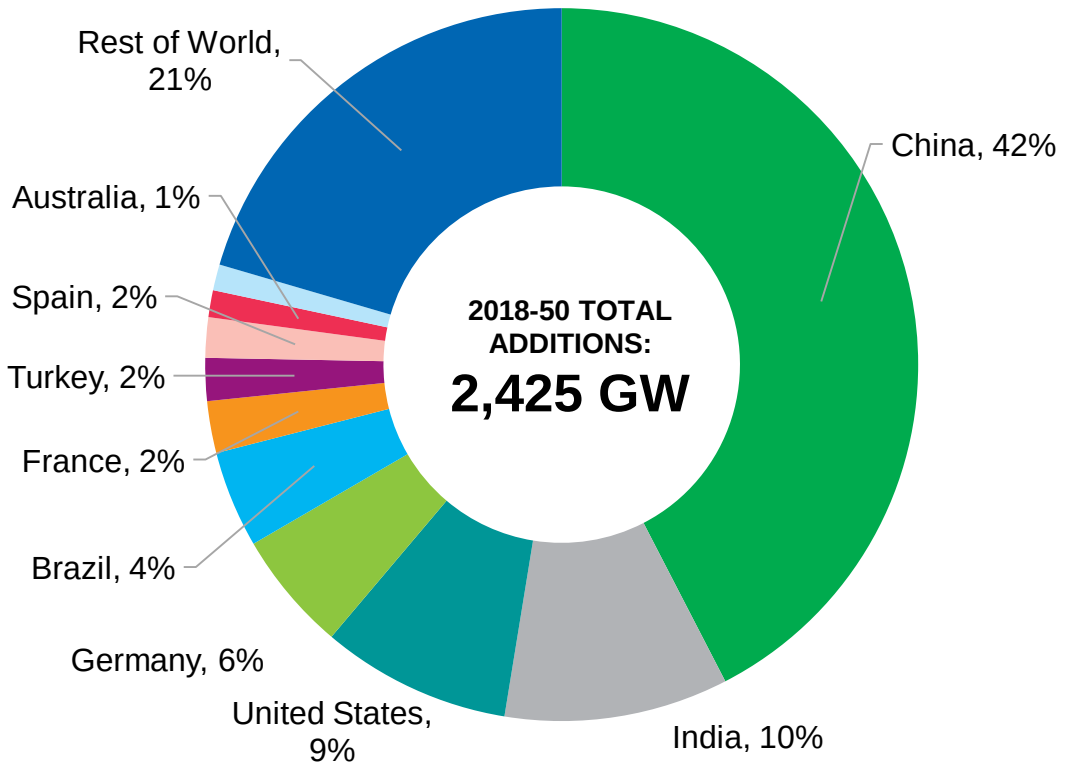
Offshore wind is a concentrated opportunity as the top 5 markets will account for 80% of the additions, 70% of which will be in China

Onshore wind additions in top 10 markets: 2018–50



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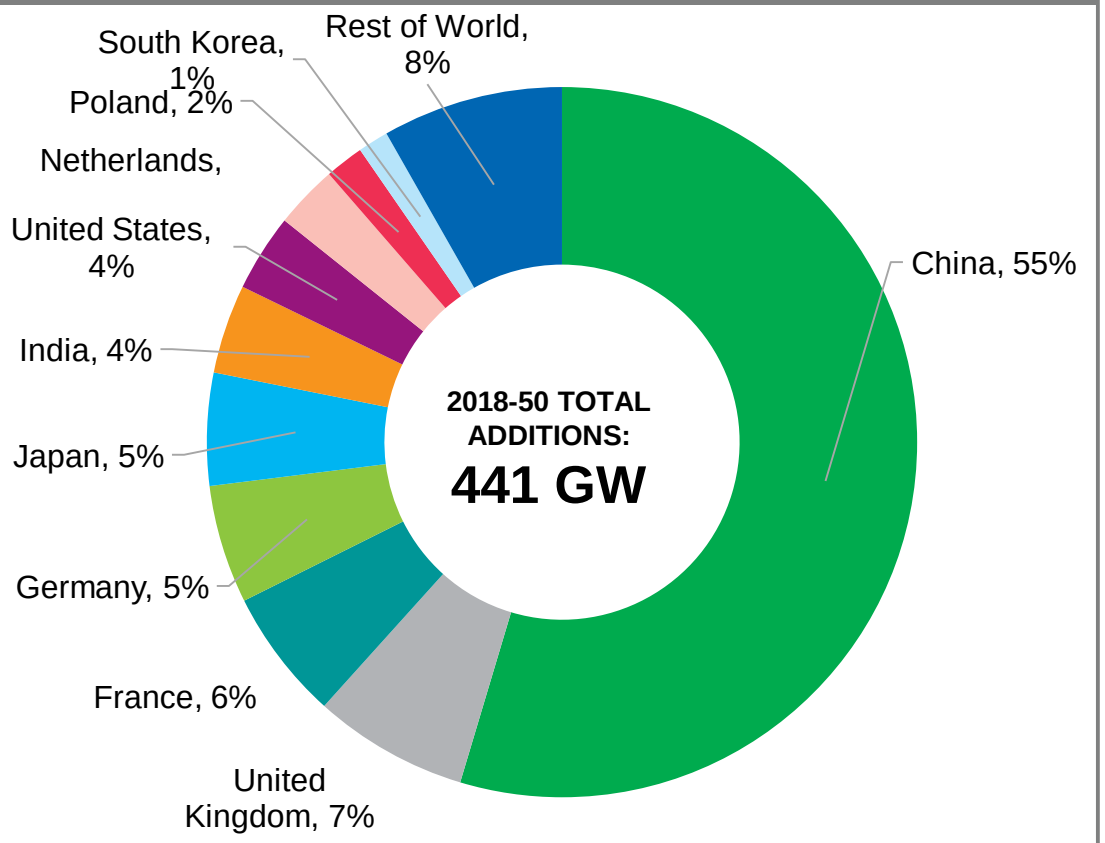
Offshore wind additions in top 10 markets: 2018–50



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Snapshot of major Southeast Asian wind markets

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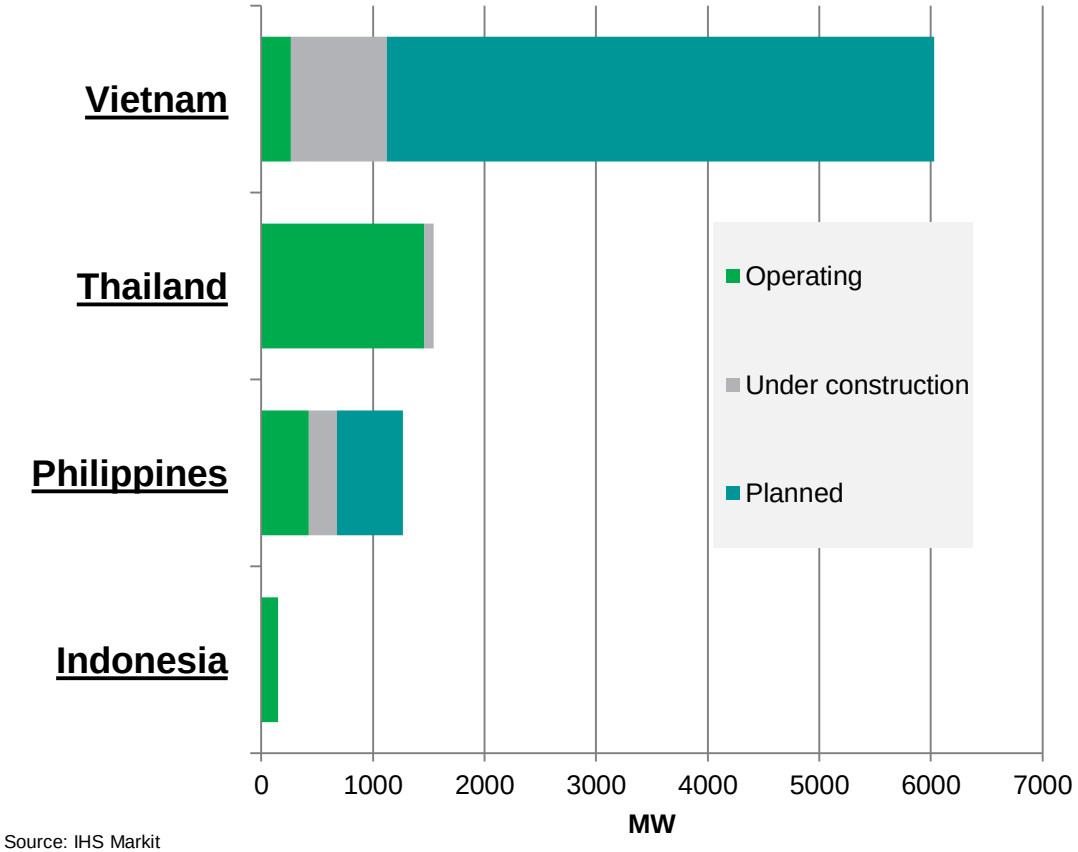
Aggressive targets and feed-in-tariffs for wind energy make Vietnam the most attractive market in Southeast Asia

Snapshot of operating capacity, project pipelines, support policies, and targets for wind energy in major Southeast Asian markets (Q2-2019)



Support schemes	Support schemes
6,000 MW by 2030	Feed-in-tariff: $85/MWh for onshore wind Feed-in-tariff: $98/MWh for offshore wind
3,000 MW by 2036	After lucrative FIT adder of $109/MWh for projects >10 MW, and feed-in-tariff of $190/MWh for projects <10 MW, the government wants to lower the cost of renewables to the level of conventional fuels.
2,378 MW by 2030	RPS will boost the demand for all renewables when it comes into force after the establishment of a renewable trading market.
855 MW added by 2028	Tariff determined as: Maximum 85% of local generation cost if local cost > national average cost. Negotiated rate if local cost < national average cost

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