

Global Wind Power Installations & Financing Outlook

Vietnam Wind Power Conference, 2019

Ashish Sethia

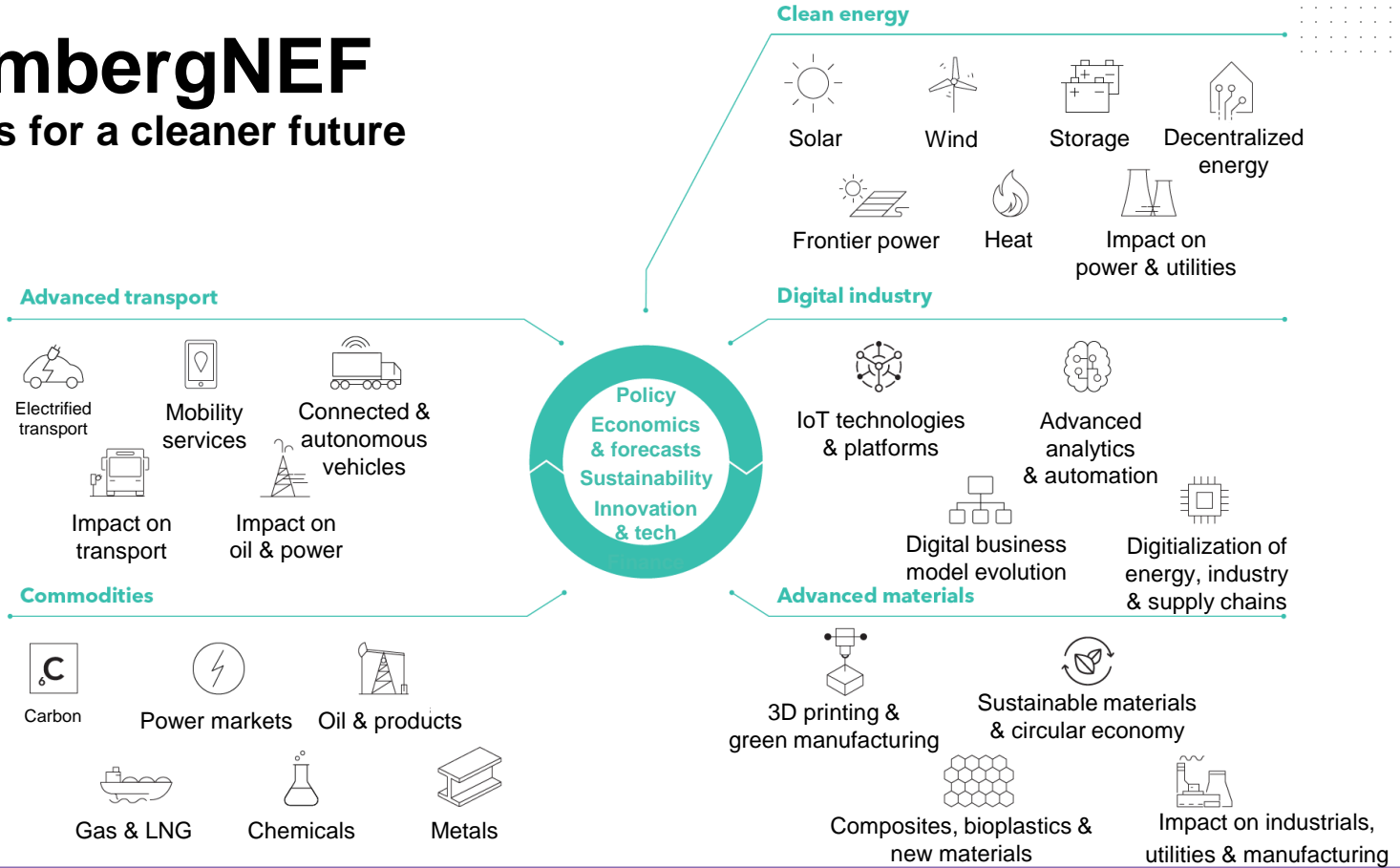


@BloombergNEF @asethia

June 11, 2019

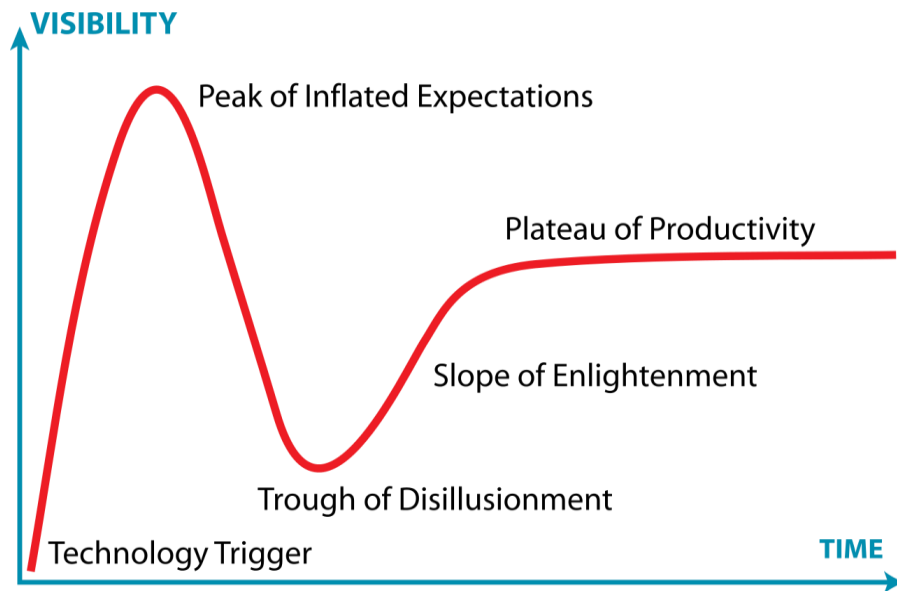
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Strategies for a cleaner future



Amara's Law & Hype Cycles

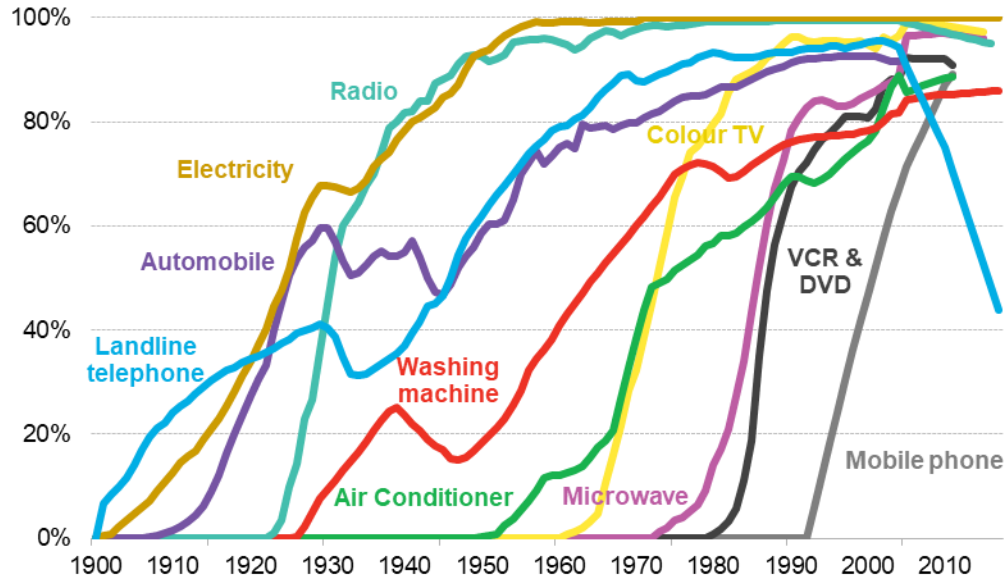
“We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run”, Roy Amara



Source: *The Institute of Future, Gartner*

Technology led transitions of the past

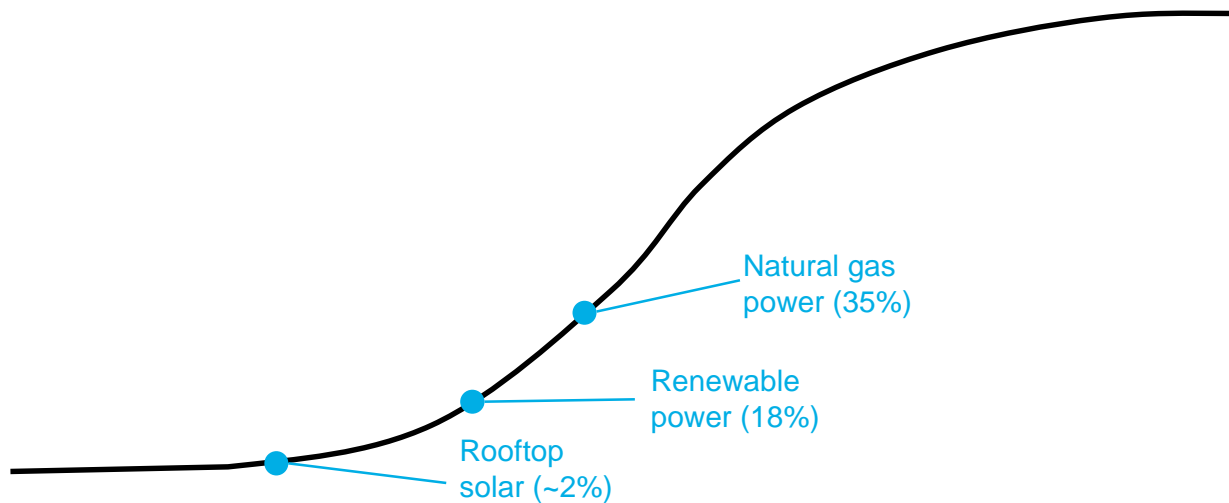
Selected technologies' penetration of U.S. households



Source: Michael Felton, NY Times, <https://www.census.gov/history/pdf/sipp-data-appliances.pdf>

How far are we in the energy transition?

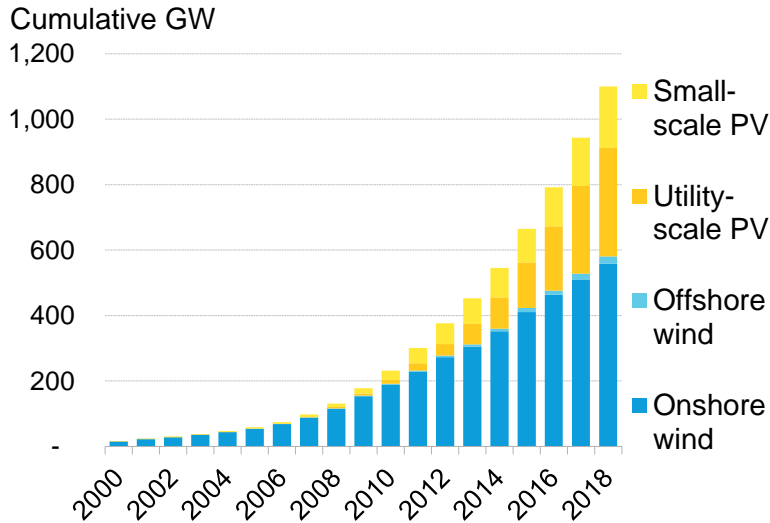
Current penetration of selected technologies in power generation, U.S.



Source: BloombergNEF

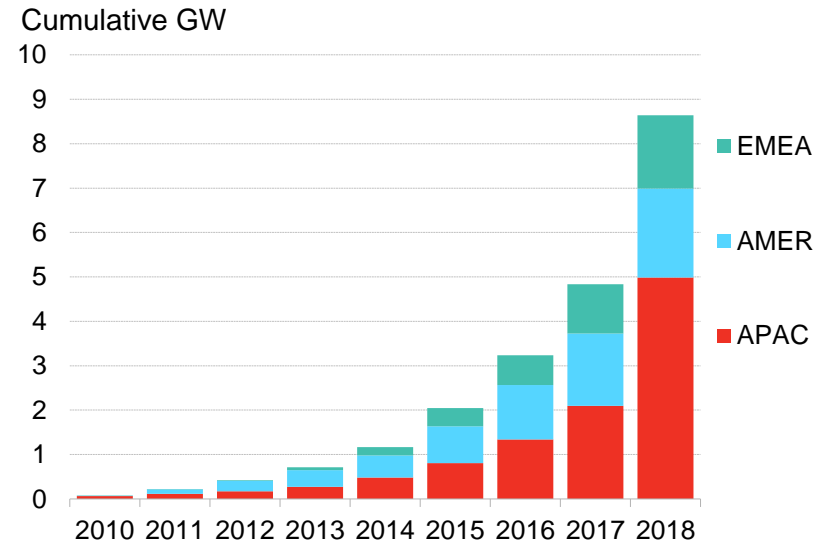
Wind and solar are at terawatt scale, storage is accelerating

Global wind and solar installations



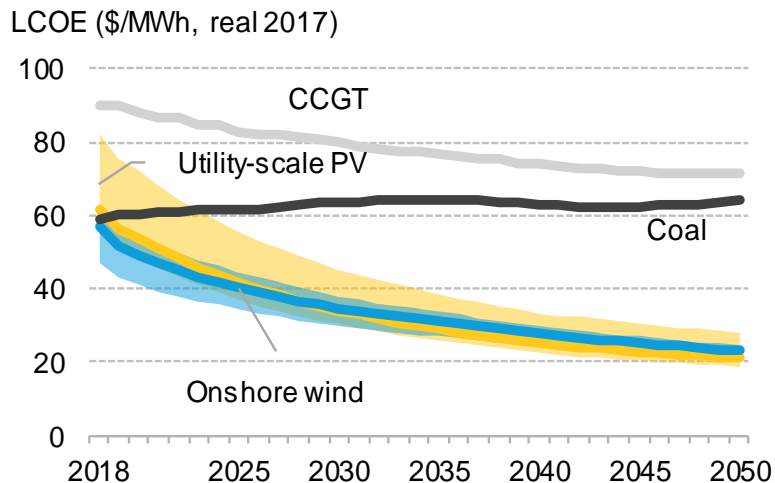
Source: Bloomberg NEF.

Global stationary energy storage installations



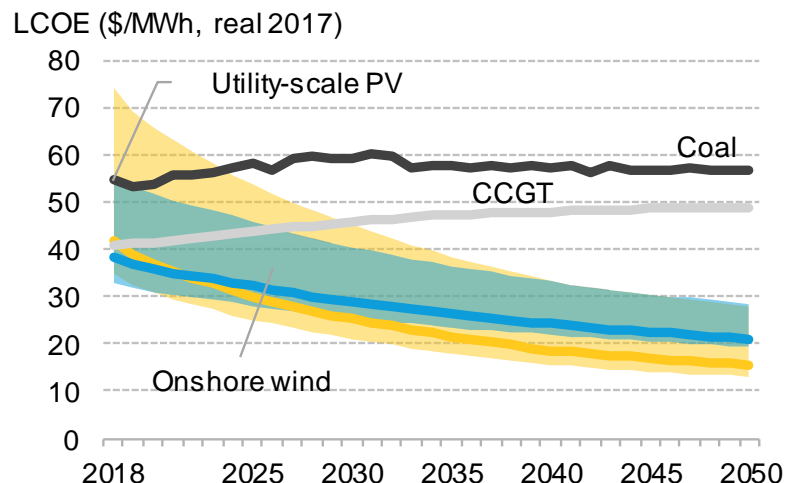
Tipping point 1: new renewables vs new fossils

China



Source: BloombergNEF Note: PV capacity factors in China: 12%-18% in 2018, onshore wind 23%-32%. Coal and gas plants LCOEs include a carbon price.

U.S.

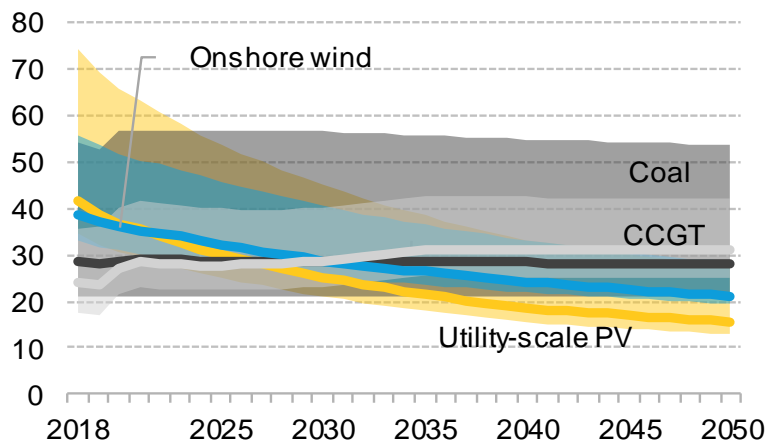


Source: BloombergNEF Note: the PV LCOE is for a tracking PV system. PV tracking capacity factors in the US: 14%-30% in 2018 and onshore wind: 29%-49% in 2018

Tipping point 2: new renewables vs existing fossils

U.S.

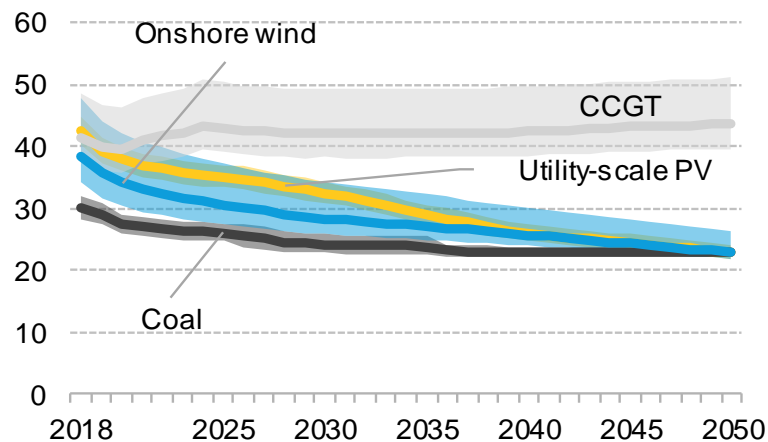
LCOE vs running costs (\$/MWh, 2017 real)



Source: BloombergNEF Note: the PV LCOE is for a tracking PV system. PV tracking capacity factors in the US: 14%-30% in 2018 and onshore wind: 29%-49% in 2018

India

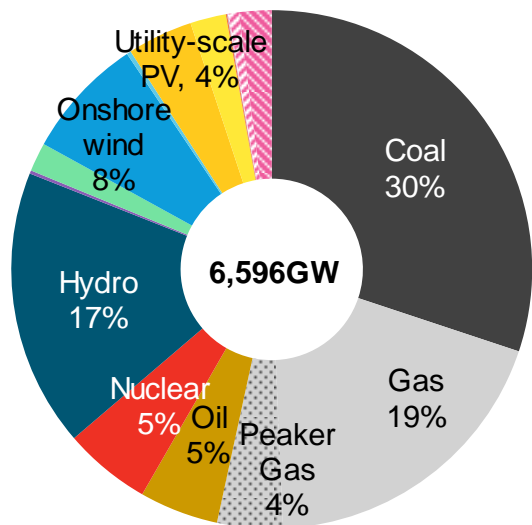
LCOE vs running costs (\$/MWh, 2017 real)



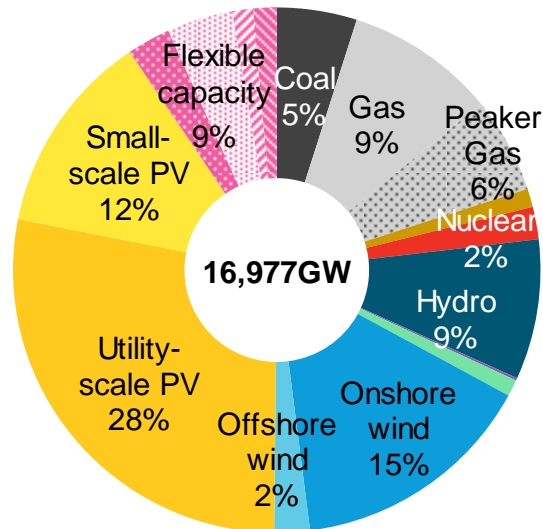
Source: BloombergNEF. Note: PV capacity factors in India: 18%-20% in 2018, onshore wind 25%-35%.

79% of new power generating capacity will be renewable

Total installed capacity, 2017 (GW)



Total installed capacity, 2050 (GW)

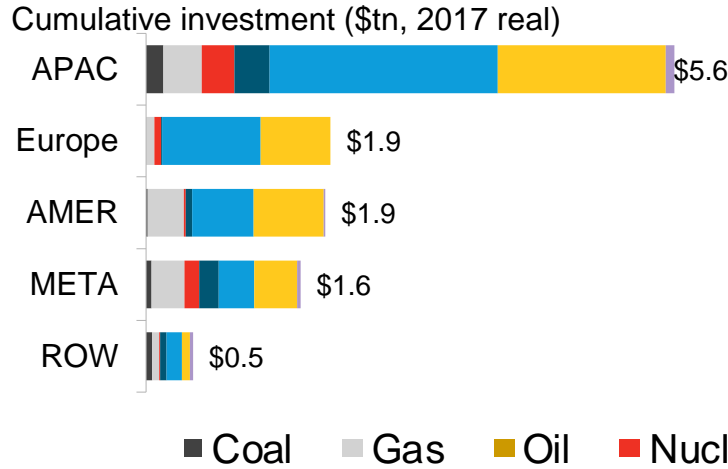


Half a decade for the next wind and solar TW

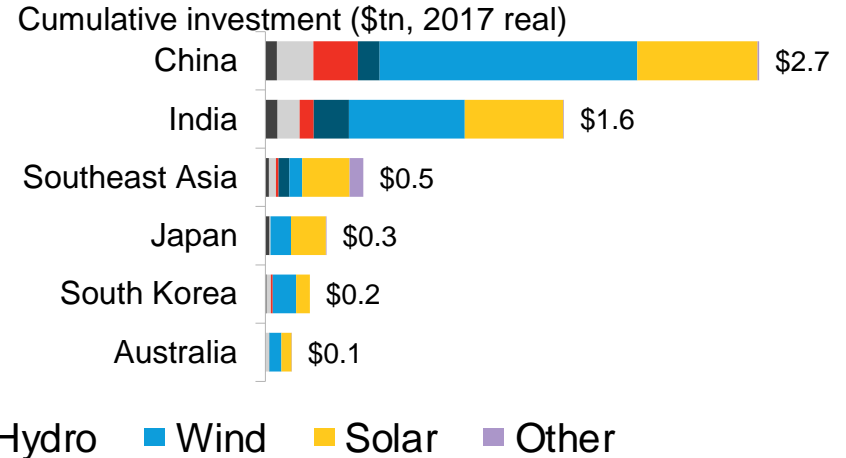
Source: BloombergNEF

Asia needs ~1/2 of global power generation investment

Global investment in power generation by region, 2018-2050

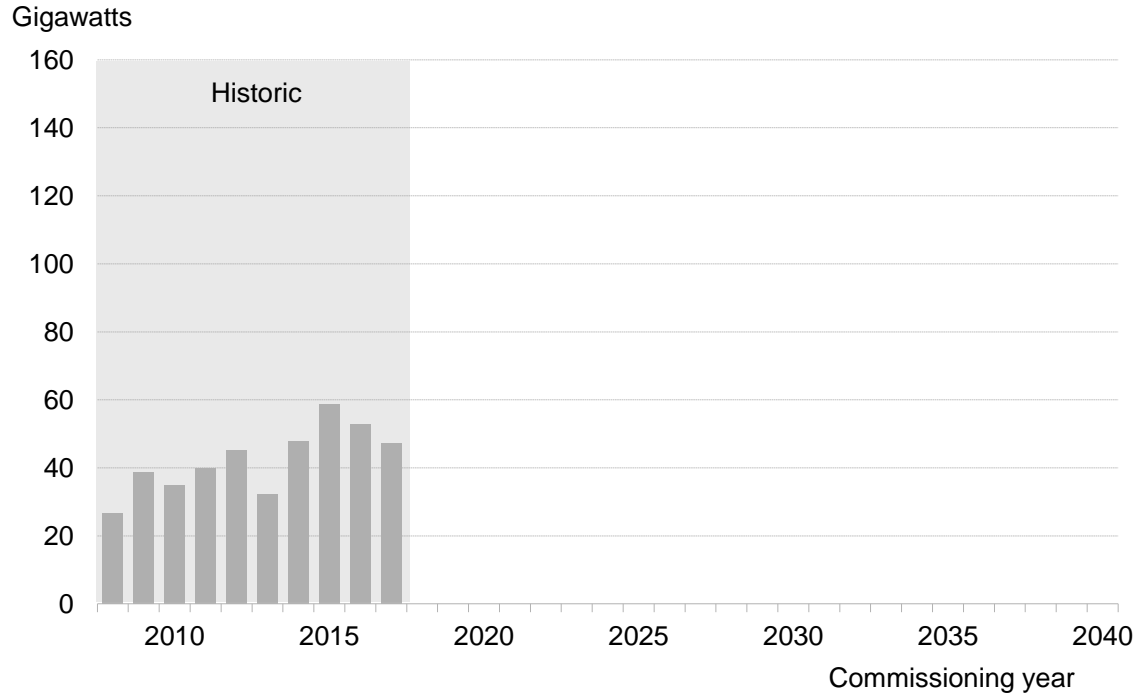


Asia Pacific investment in power generation by region, 2018-2050



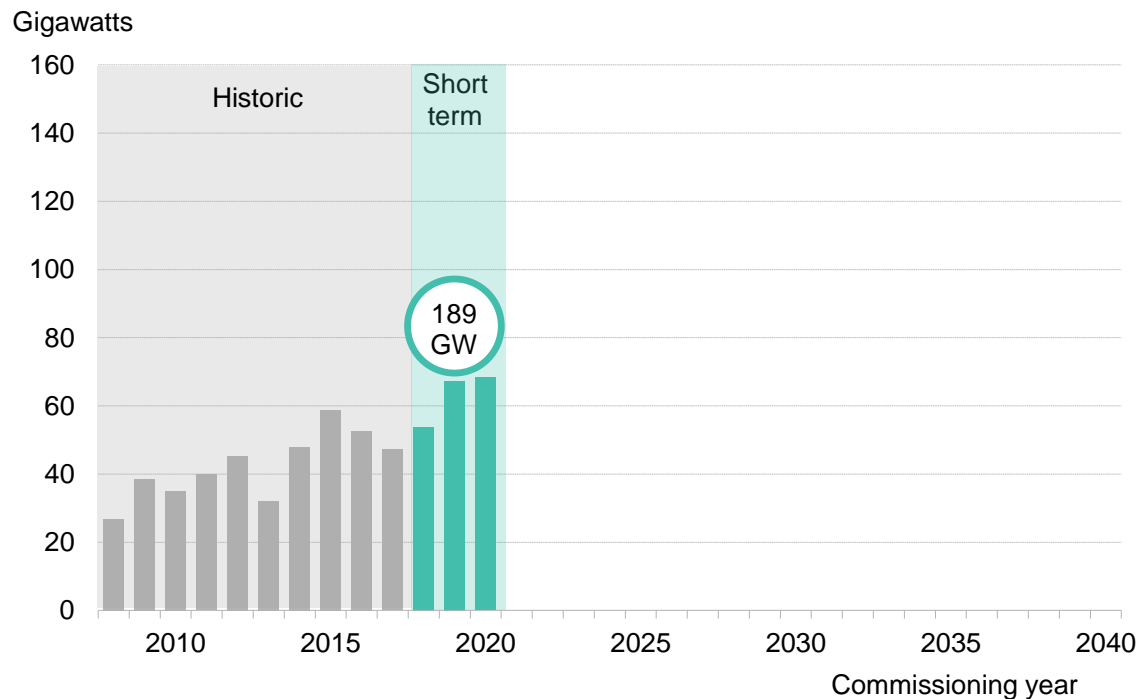
Source: BloombergNEF

Global onshore wind forecast



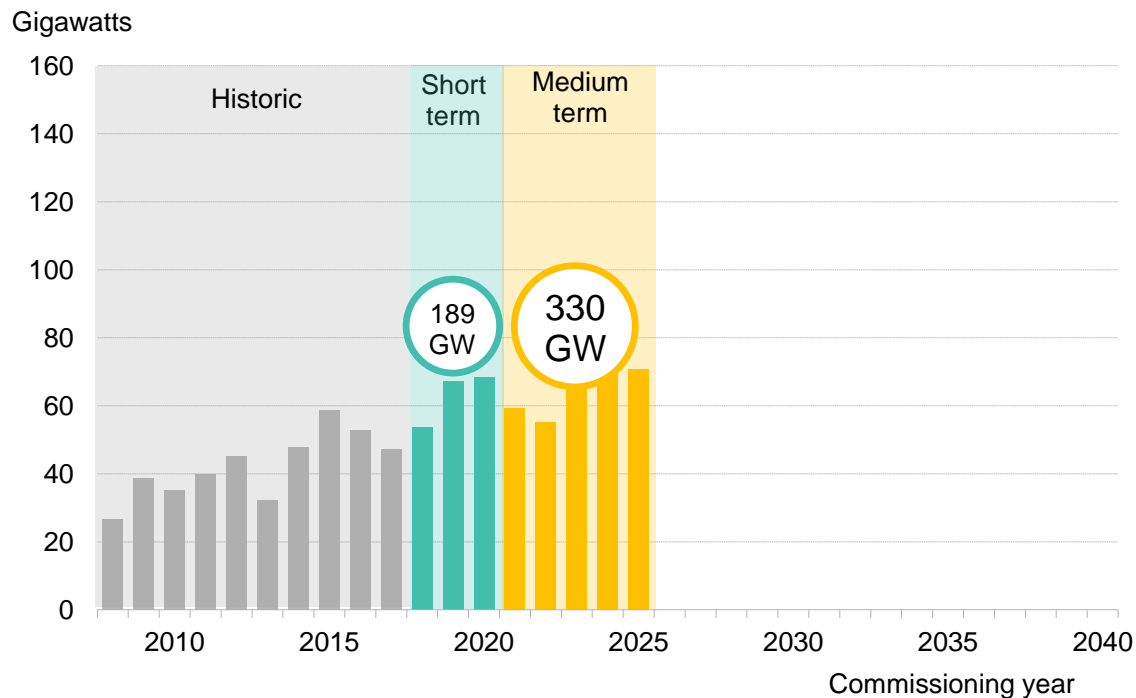
Source: Bloomberg NEF. Notes: Data for 2008-22 from 3Q 2018 Global Wind Market Outlook; 2023-40 data from New Energy Outlook 2018.

Global onshore wind forecast



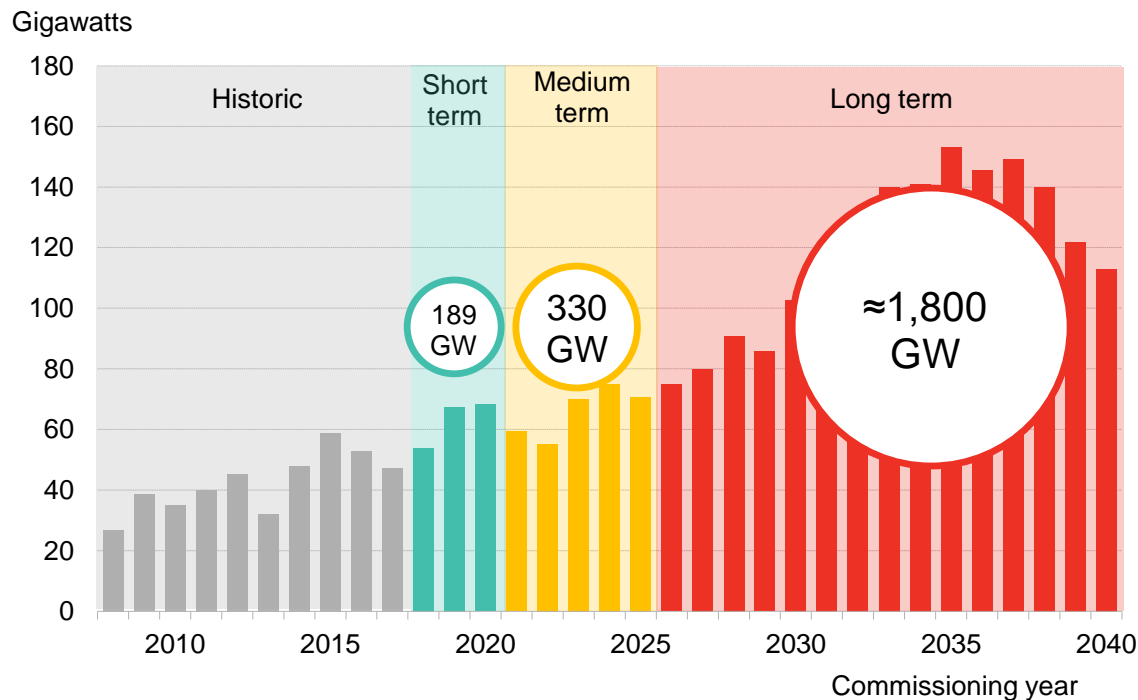
Source: Bloomberg NEF. Notes: Data for 2008-22 from 3Q 2018 Global Wind Market Outlook; 2023-40 data from New Energy Outlook 2018.

Global onshore wind forecast



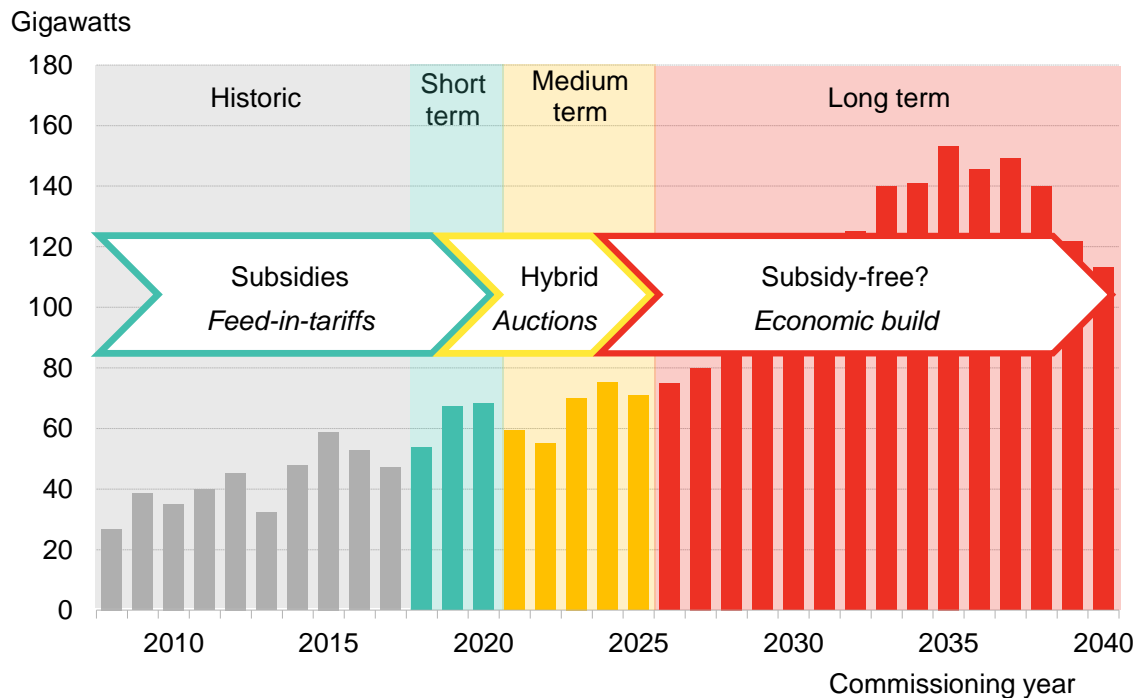
Source: Bloomberg NEF. Notes: Data for 2008-22 from 3Q 2018 Global Wind Market Outlook; 2023-40 data from New Energy Outlook 2018.

Global onshore wind forecast



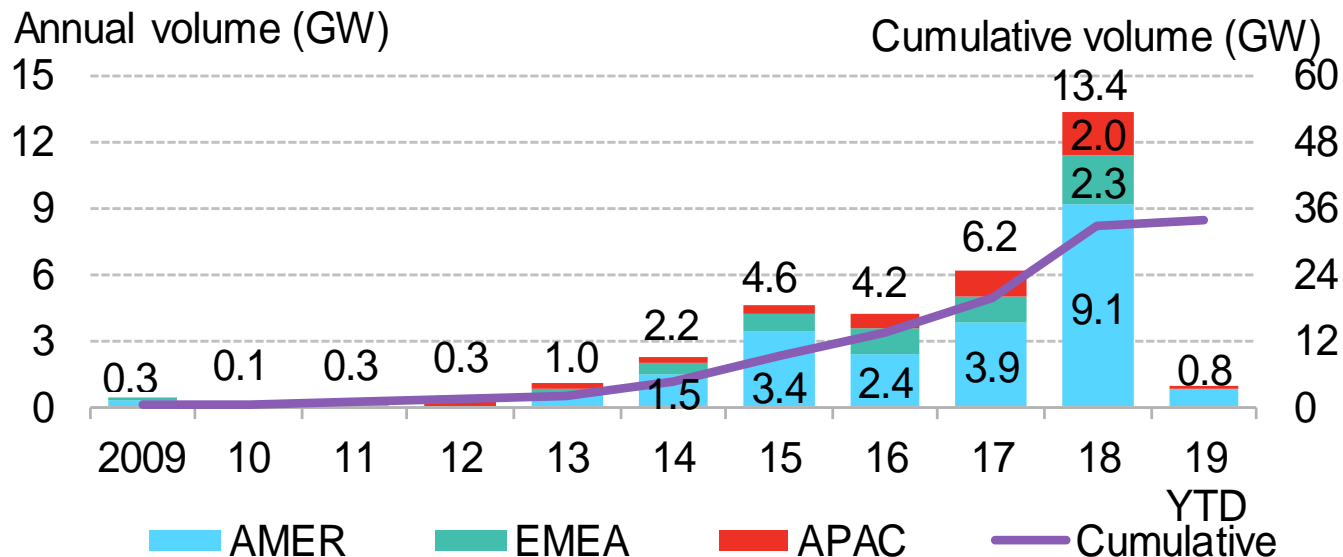
Source: Bloomberg NEF. Notes: Data for 2008-22 from 3Q 2018 Global Wind Market Outlook; 2023-40 data from New Energy Outlook 2018.

Wind project revenue drivers



Source: Bloomberg NEF. Notes: Data for 2008-22 from 3Q 2018 Global Wind Market Outlook; 2023-40 data from New Energy Outlook 2018.

Corporate PPAs create new routes to market



Source: BloombergNEF. Note: Chart is for offsite PPAs only. APAC capacity is estimated. Figures are subject to change and may be updated as more information is made available.

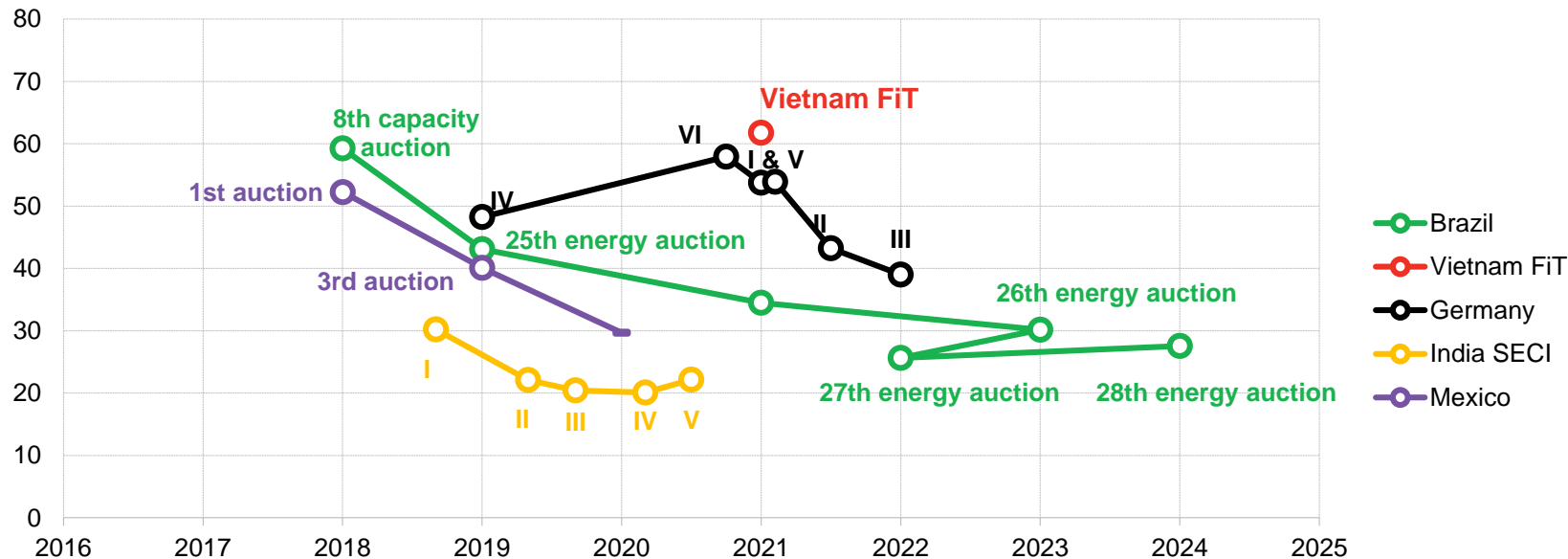
All project inputs have combined to drag down prices...



Source: BloombergNEF

Competitive auctions have resulted in cost drops

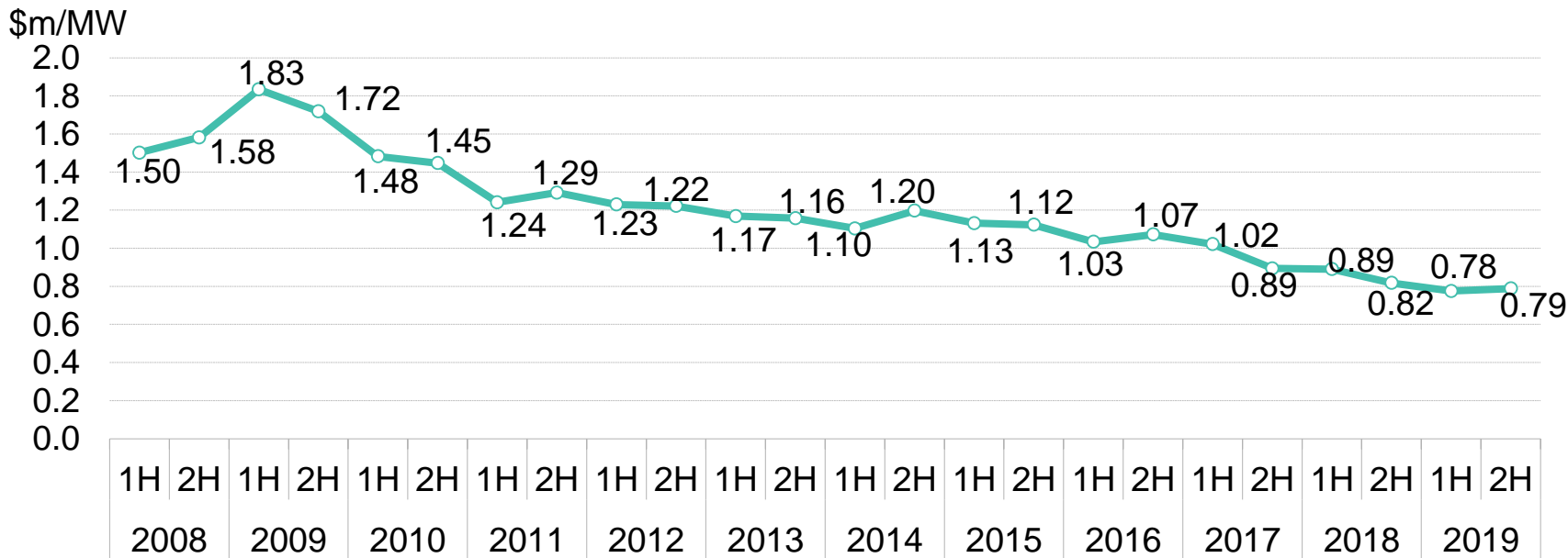
\$2017/MWh



Source: BloombergNEF Note: Data shows levelized average winning date by commissioning date. Bids have been levelized to account for indexation, exchange rate, tariff duration and expected merchant tail.

Wind turbine prices have declined

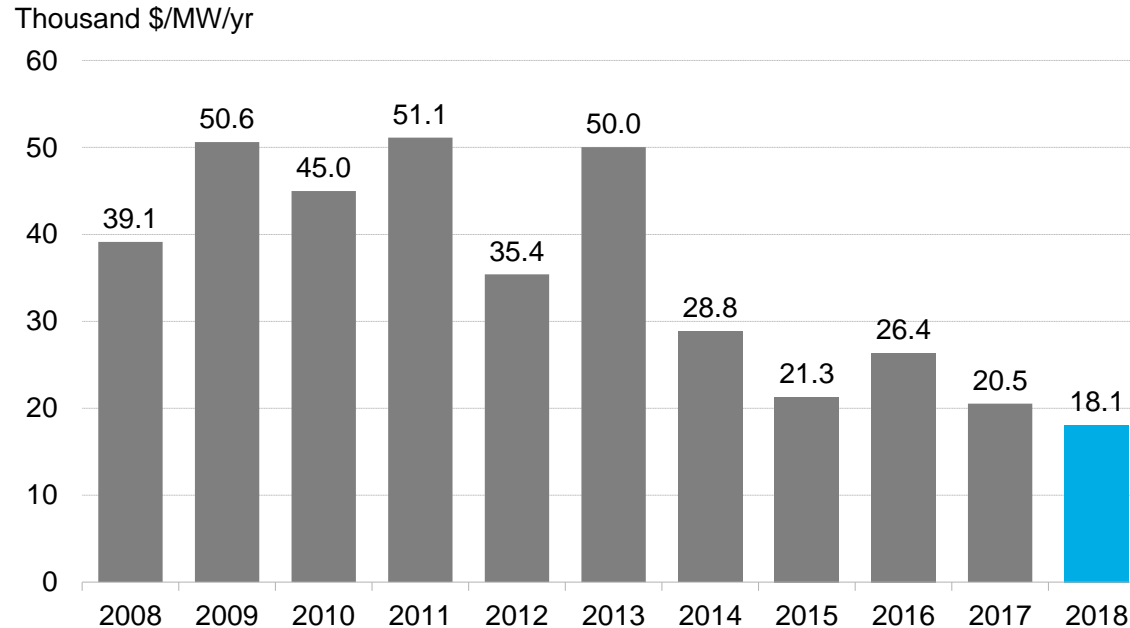
Global turbine price index by delivery date, 2H 2018



Source: BloombergNEF

O&M prices are falling too

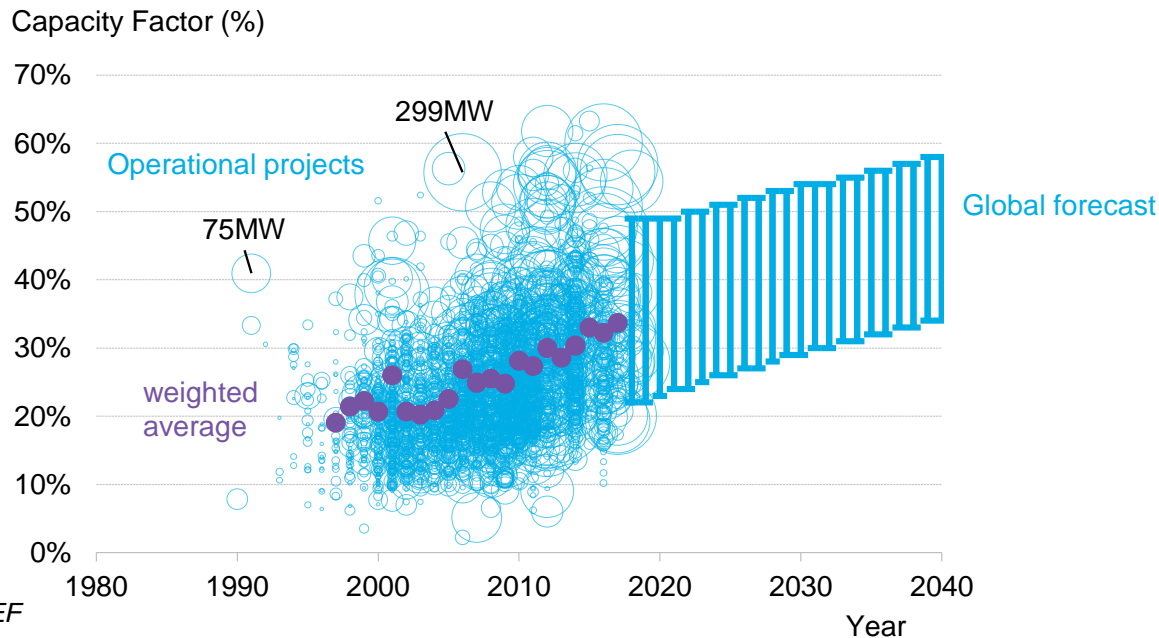
Full-service initial O&M contract pricing



Source: BloombergNEF Note: Pricing for full-service initial agreements only. This includes routine and unscheduled maintenance, minor and major component parts and labor.

Onshore wind capacity factors are rising 1% point year-on-year

Historic and forecast onshore wind gross capacity factors

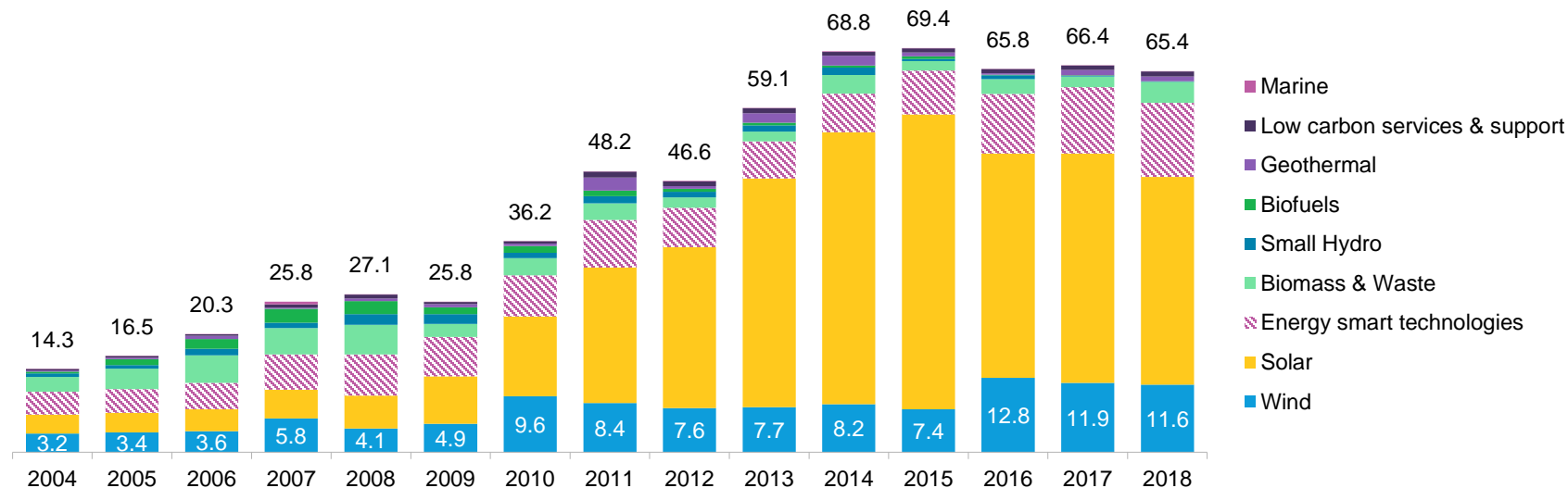


Source: BloombergNEF

Investor interest in renewables in APAC holding steady

Clean energy investment in APAC (ex-China)

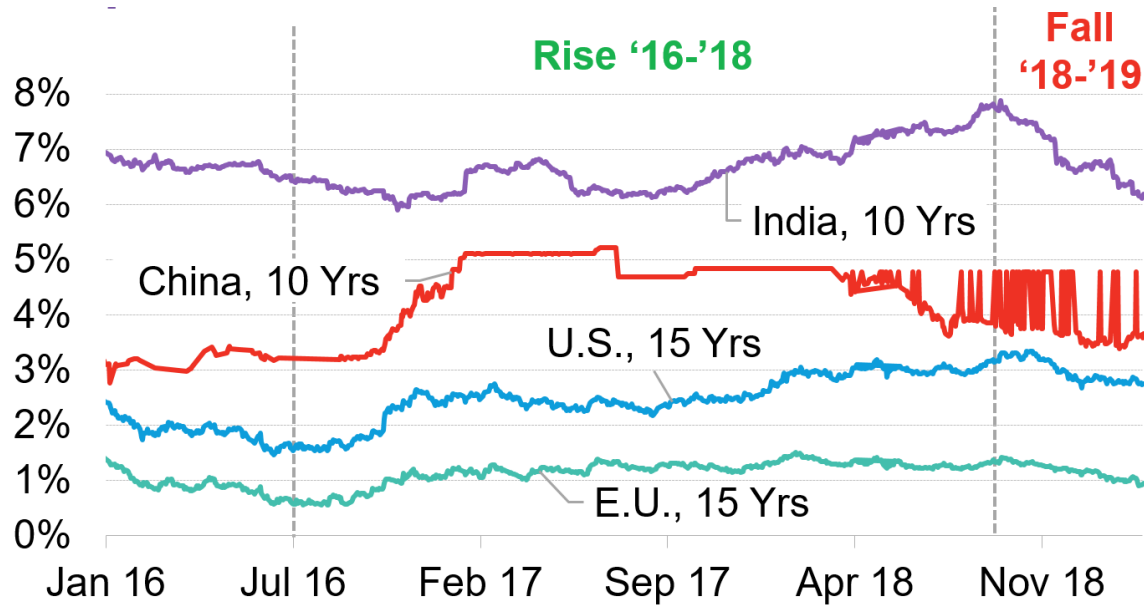
\$ billion



Source: BloombergNEF Note: Includes small-scale distributed solar capacity

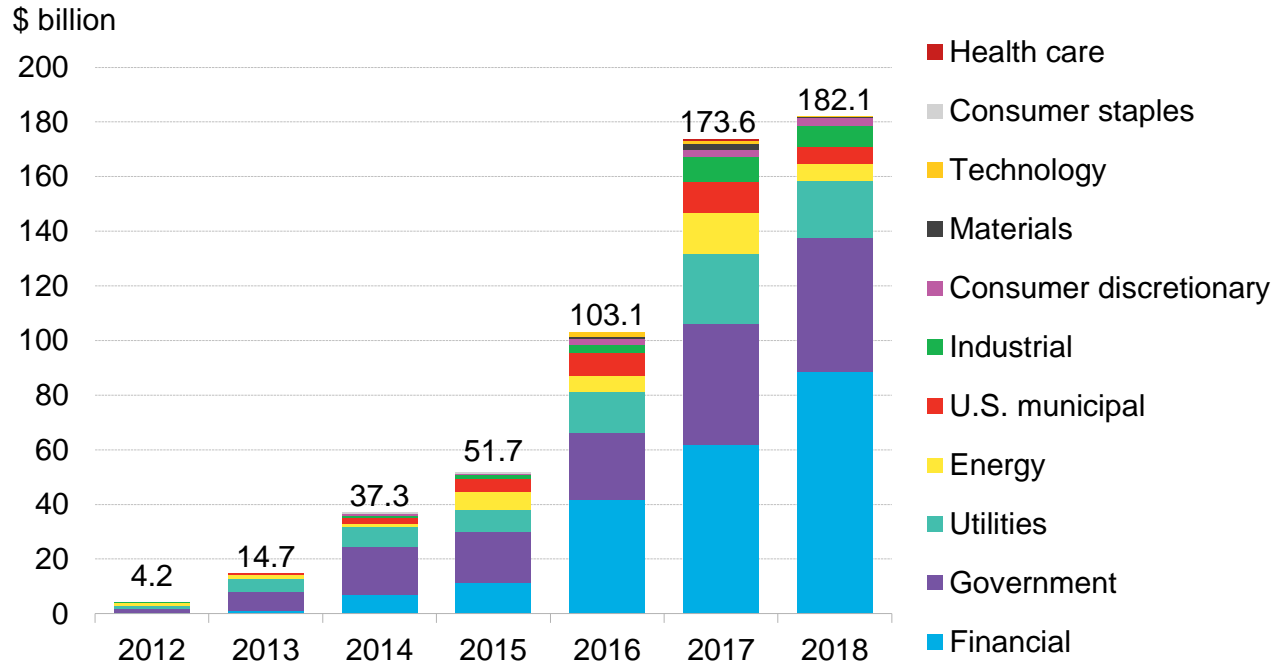
Cheap debt is helping

Swap rates for select tenors and countries



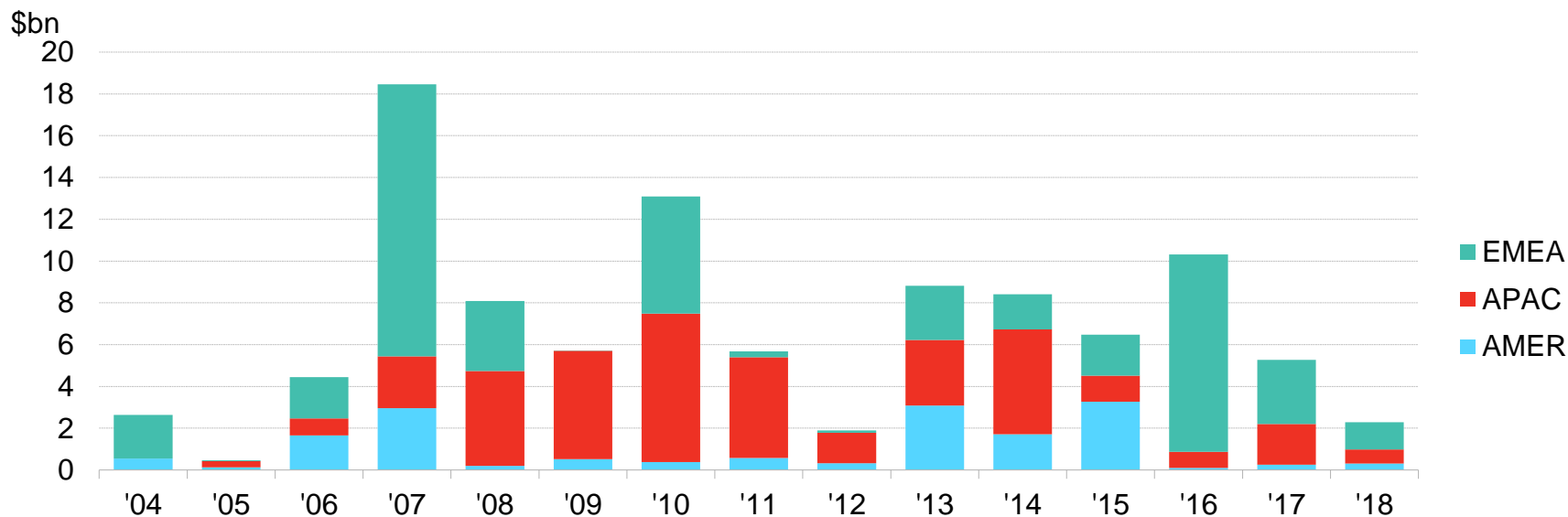
Source: Bloomberg Note: Reflective of fixed-for-floating swap rates.

Green bond issuance growing



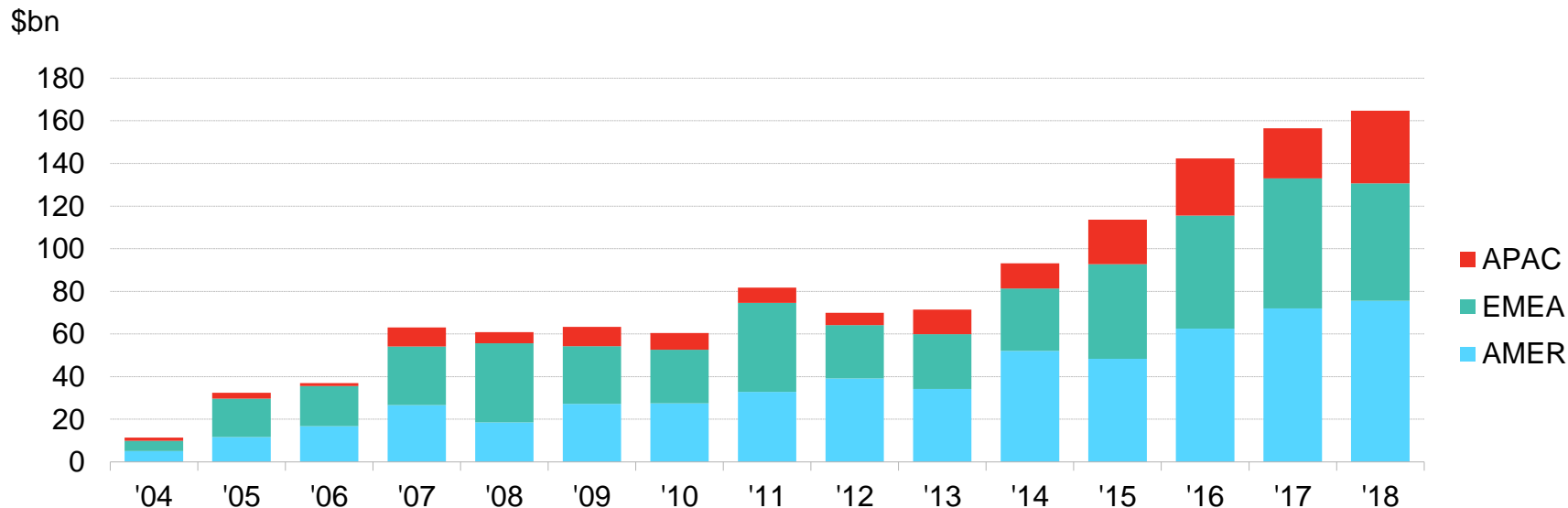
Source: *BloombergNEF Green Bonds Tool*

Clean energy IPOs still too far and few



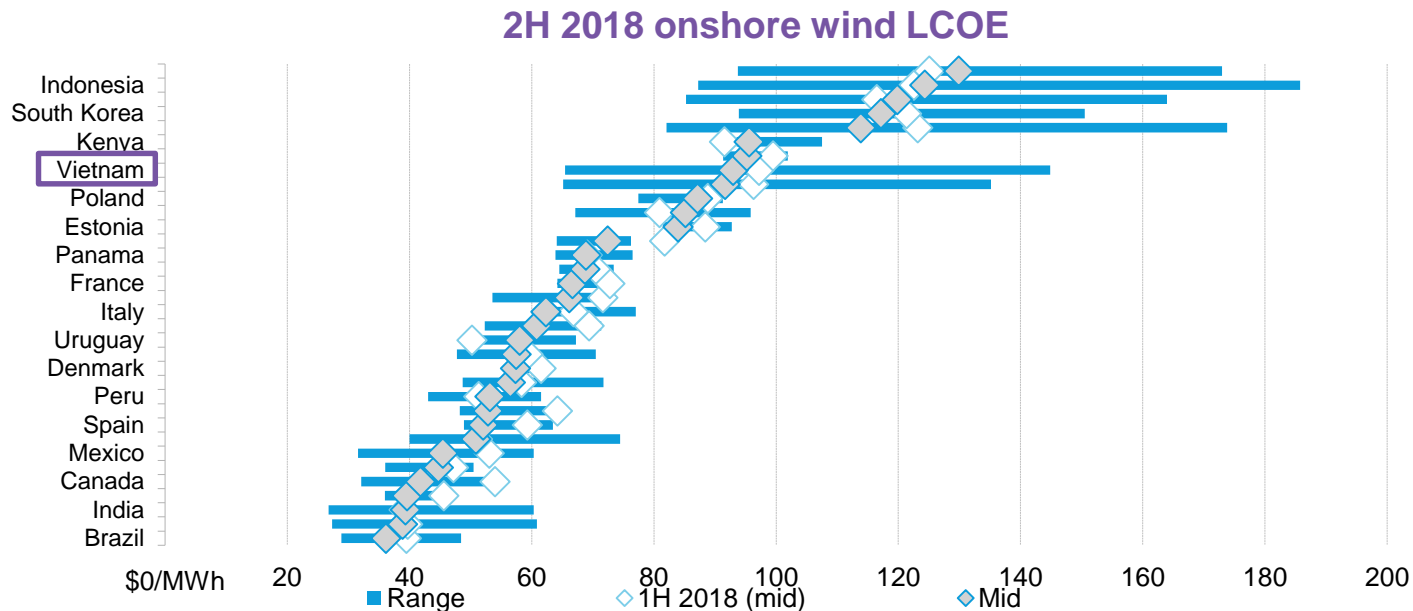
Source: BloombergNEF Note: includes renewable energy and energy efficiency

But clean energy M&A rising steadily



Source: BloombergNEF Note: includes renewable energy and energy efficiency










LCOEs in leading markets at \$40-50/MWh



Source: BloombergNEF. Note: LCOE for a project starting construction in 2H 2018.

Risks remain even in high-deployment markets

Perception of risk in Indian renewables projects

Financiers	Risks	IPPs
Financiers that ranked the parameter among the top two risks		IPPs that ranked the parameter among the top two risks
71% 	Curtailement - grid or offtake	 86%
43% 	Regulatory risks	 71%
57% 	Payment delays	 14%
14% 	Resource estimation errors	0%
14% 	Land acquisition risks	 29%
0%	Forex risks	0%
0%	Plant downtime	0%

Source: BloombergNEF Note: Survey done in 2018.

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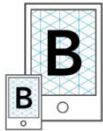
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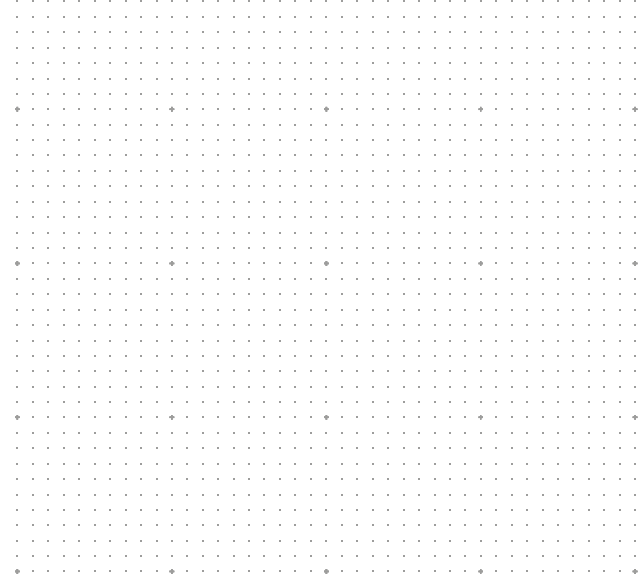
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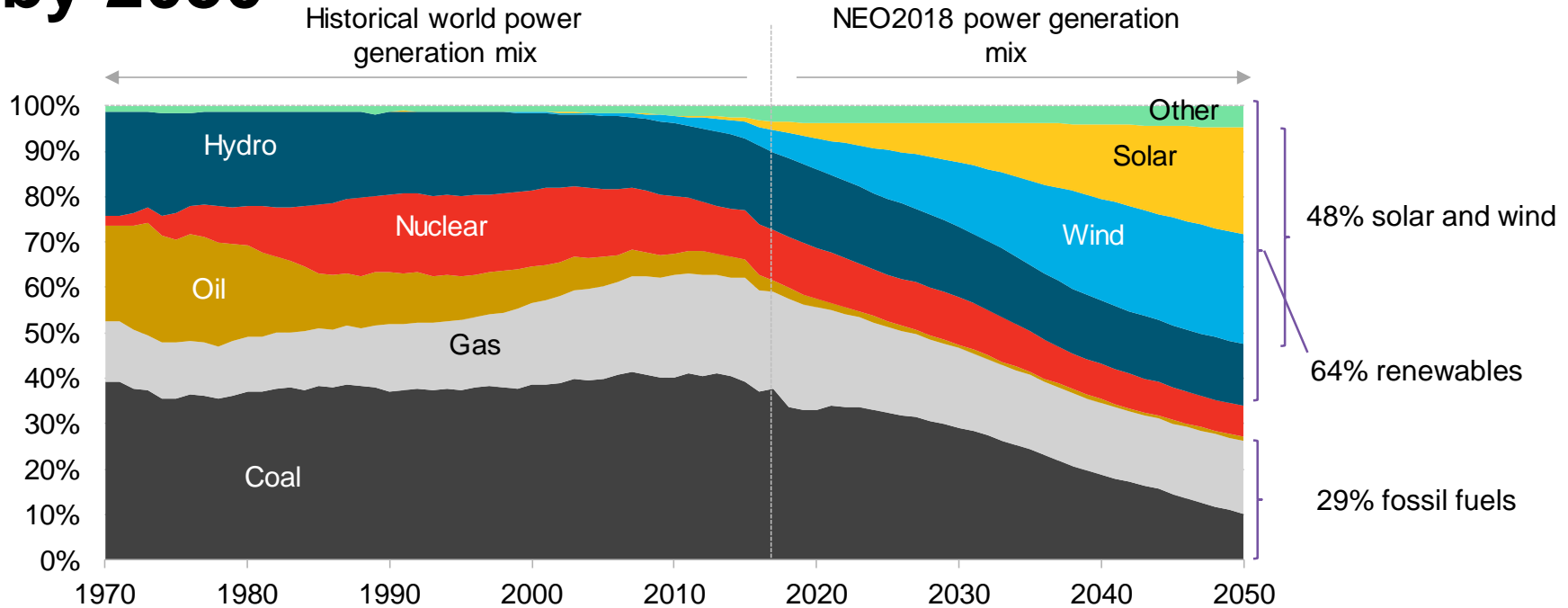
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Appendix



50% wind and solar generation by 2050

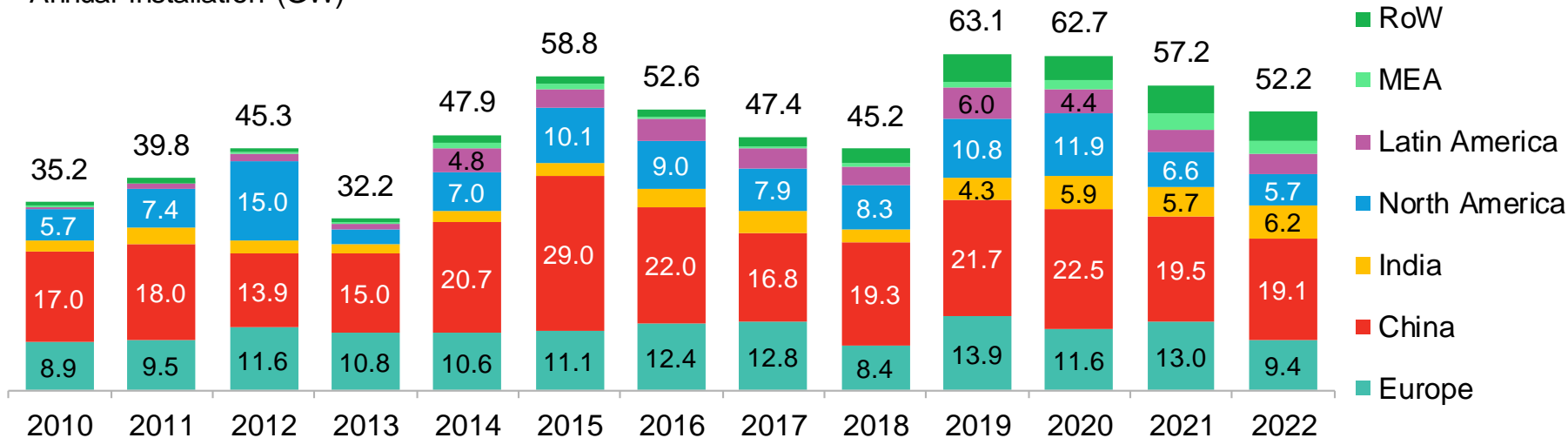


Source: BloombergNEF

Global onshore wind installation forecast – set to hit new heights

Medium-term global onshore wind forecast

Annual installation (GW)

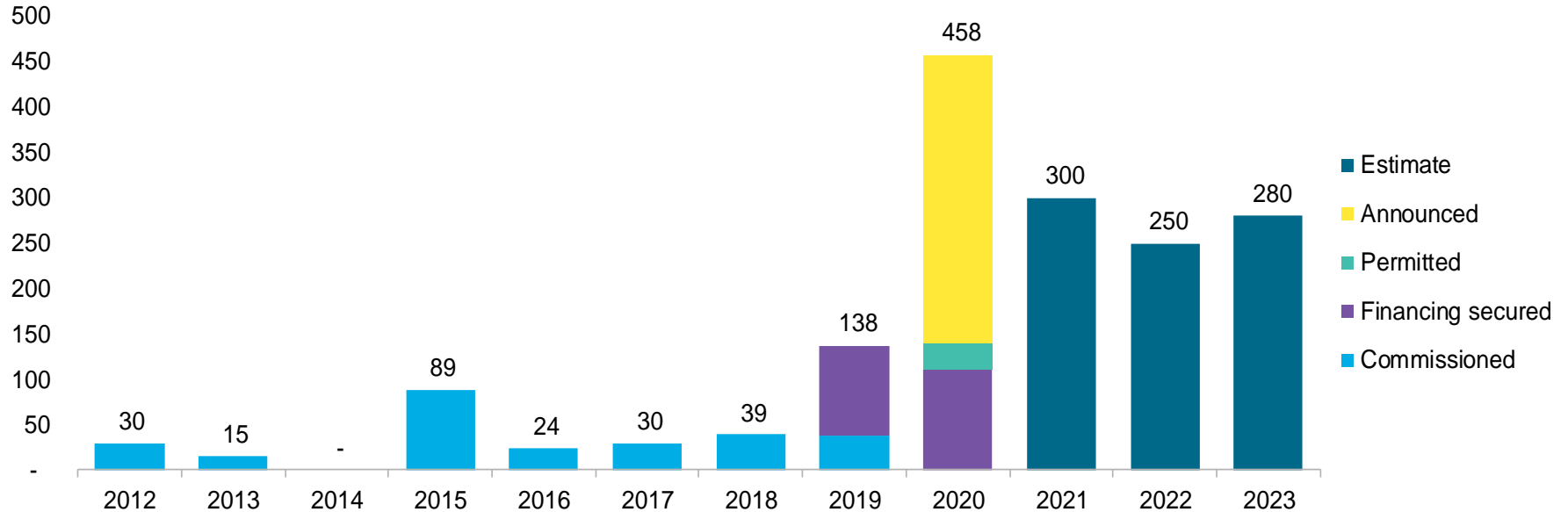


Source: BloombergNEF. Note: We treat as commissioned installed but not grid-connected capacity for China and grid-connected capacity for all other markets. Some historical installation data have been revised.

Vietnam forecast

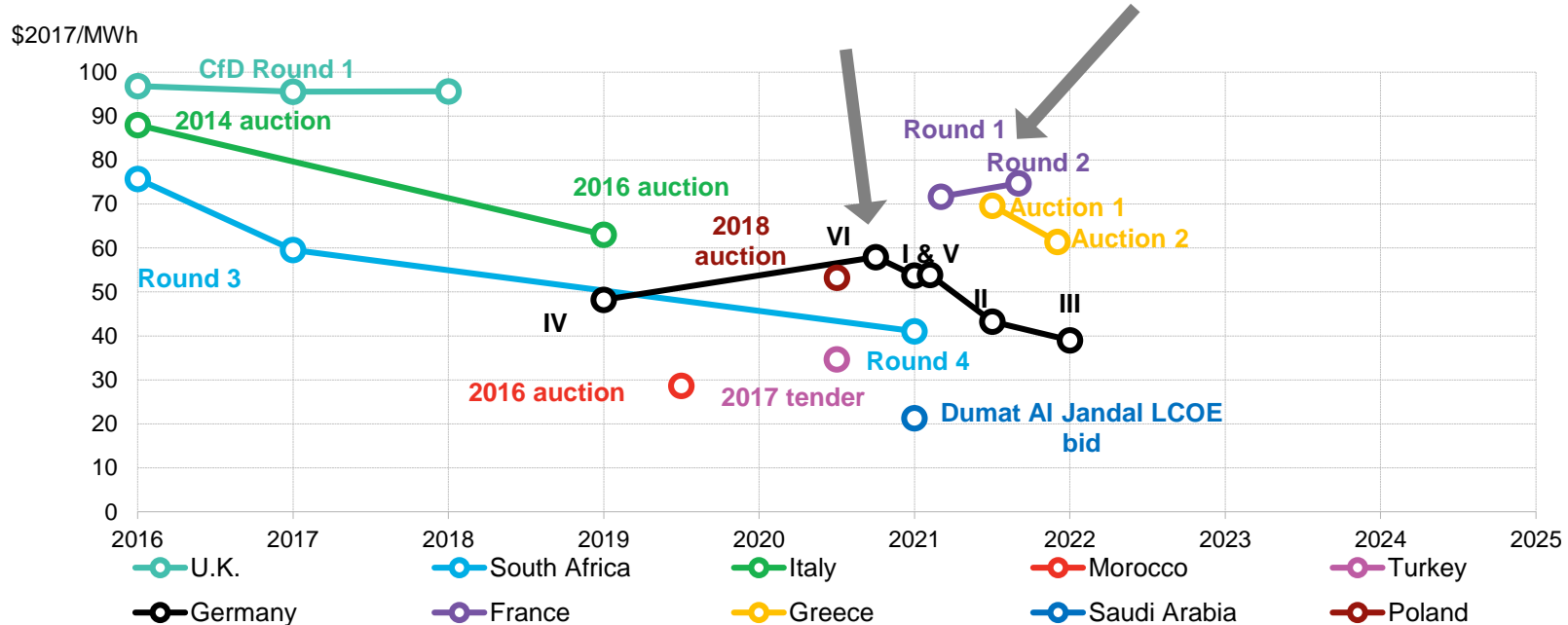
Vietnam installation forecast

Annual installation (MW)



Source: BloombergNEF

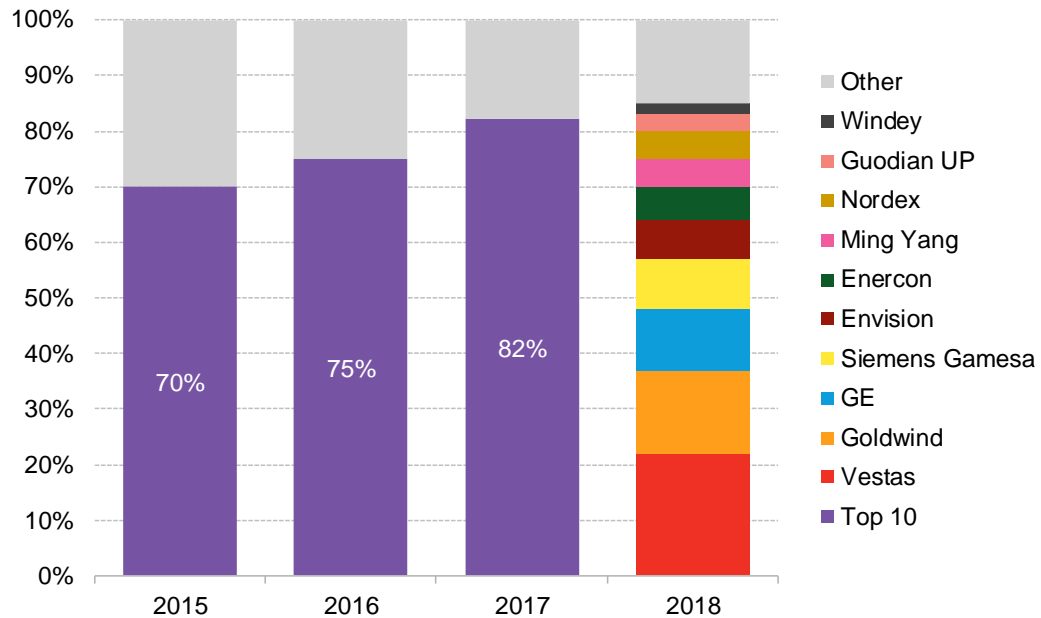
Getting the admin process right is key (and hard!)



Source: BloombergNEF

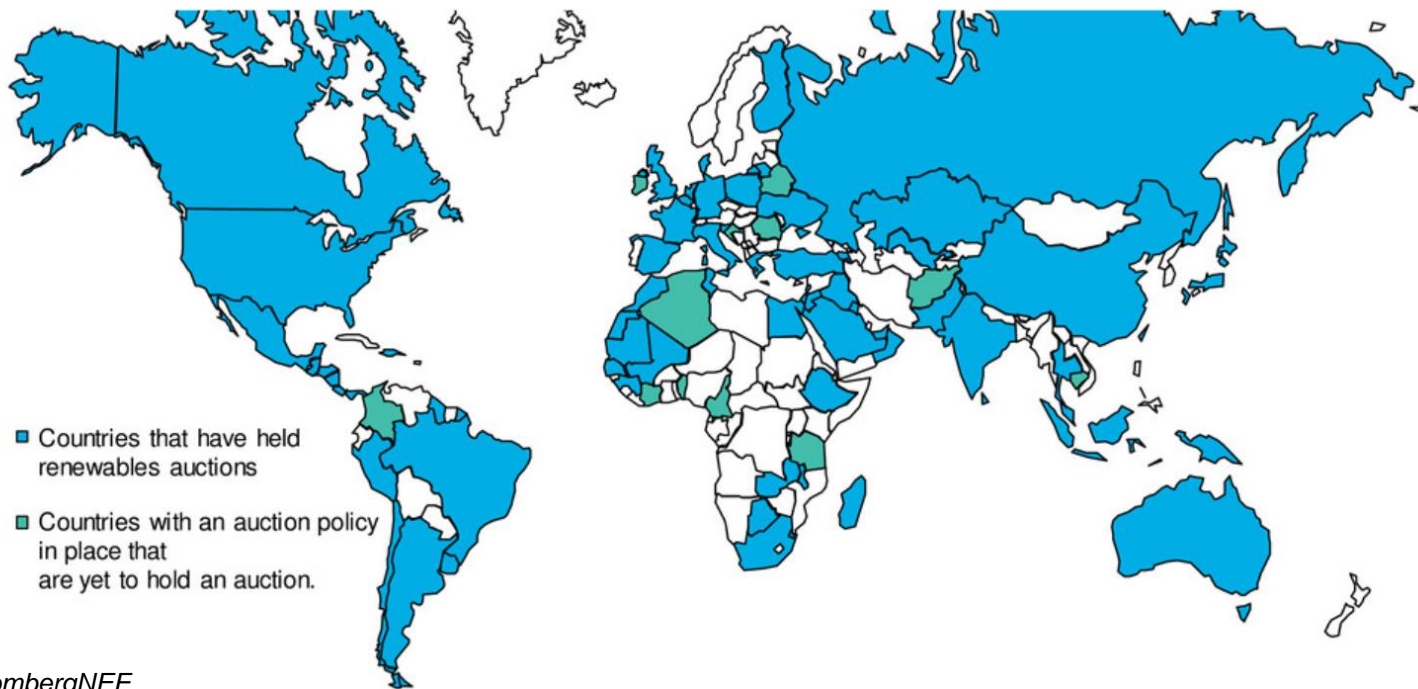
Consolidation has made the turbine market more global

Global onshore turbine manufacturers market share



Source: BloombergNEF. Note: Only includes onshore wind capacity.

Smart auctions design can help markets respond



Source: BloombergNEF.