

# Outlook on Renewable Energy in Asia

Asia Clean Energy Forum 2017,  
Asian Development Bank Headquarters

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June 05, 2017



**Bloomberg**  
**New Energy Finance**

# Analysis to help you understand the future of energy and transport



Solar



Wind



Power and Utilities



Gas



Carbon Markets & Climate



Energy Smart Technologies



Storage



Electric Vehicles



Mobility and Autonomous Driving



Frontier Power



Emerging Technologies



Americas

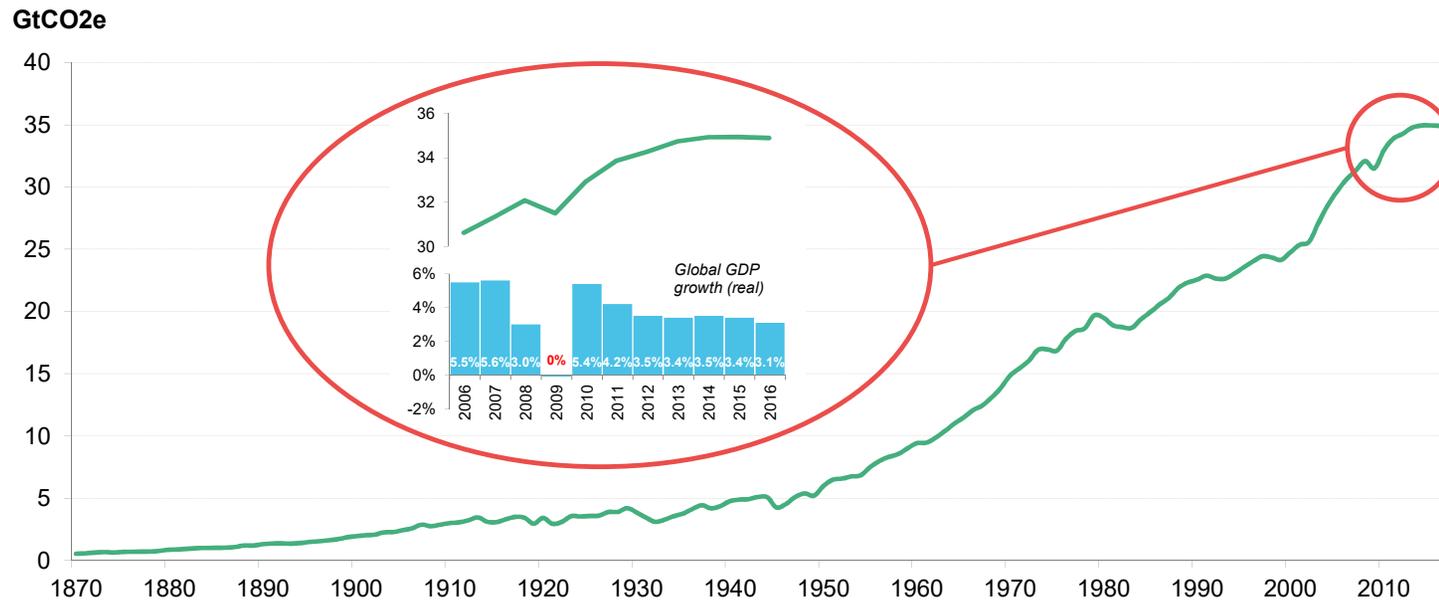


Europe, Middle East & Africa



Asia Pacific

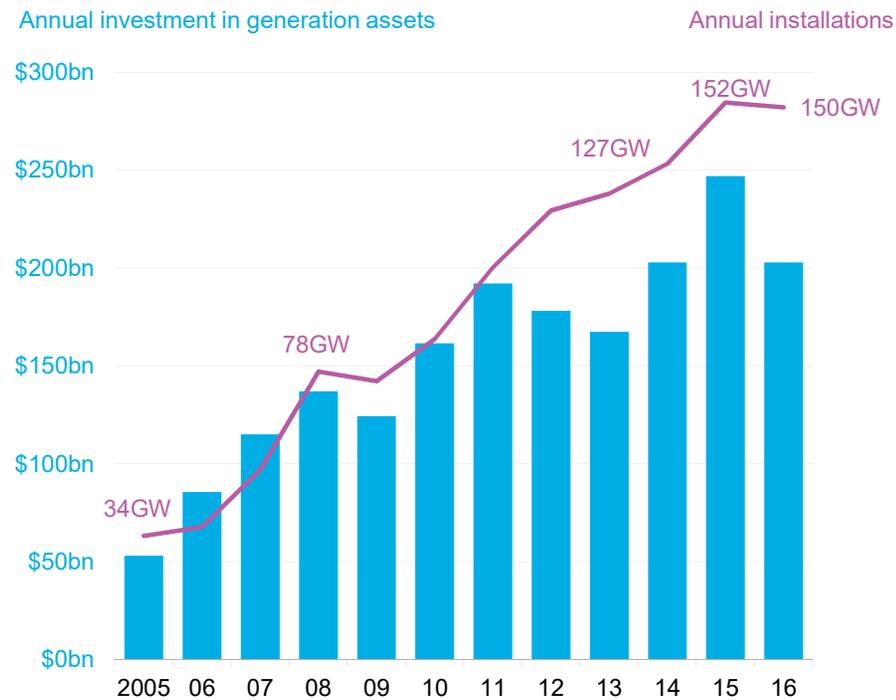
# Global carbon emissions from fossil fuels



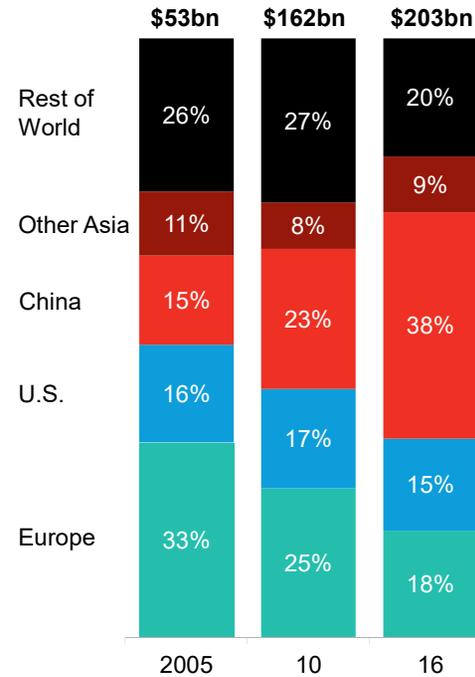
Source: IEA; CDIAC; BP; Bloomberg New Energy Finance

# Clean energy finance and installations have quadrupled

Clean energy annual asset finance and installations



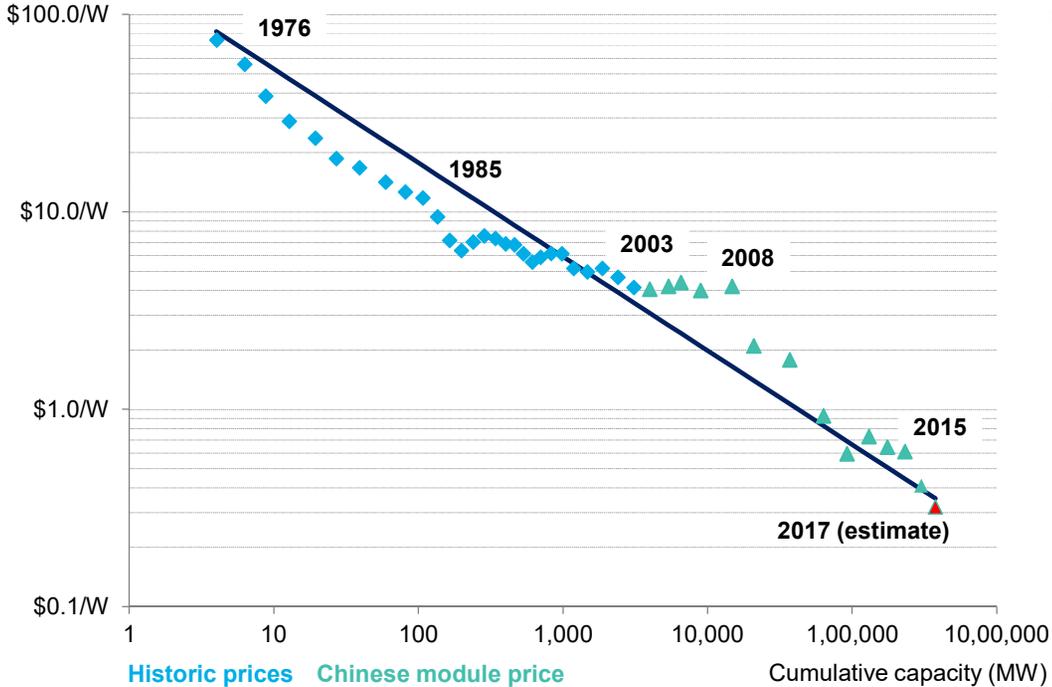
Asset finance by country/region



Source: Bloomberg New Energy Finance

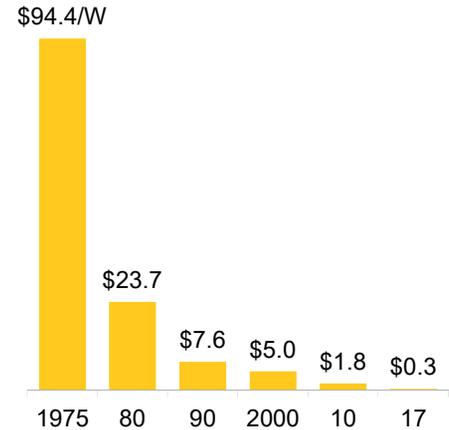
# Technology is fundamentally changing the energy landscape

Crystalline silicon solar PV experience curve



Since 1975:

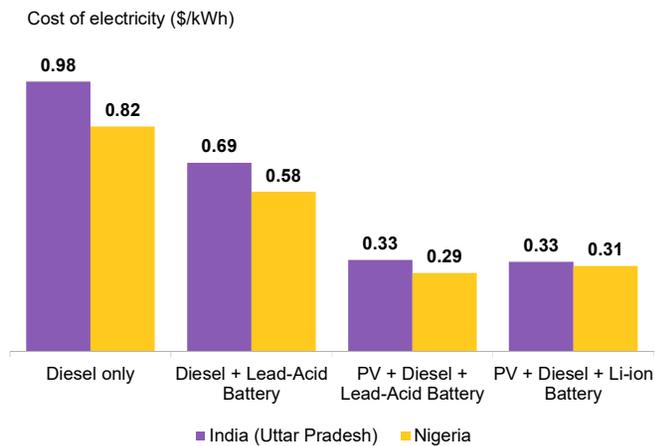
- 28% decrease in price for every doubling of production
- 99% decrease in unit cost
- 115,000x increase in cumulative installations



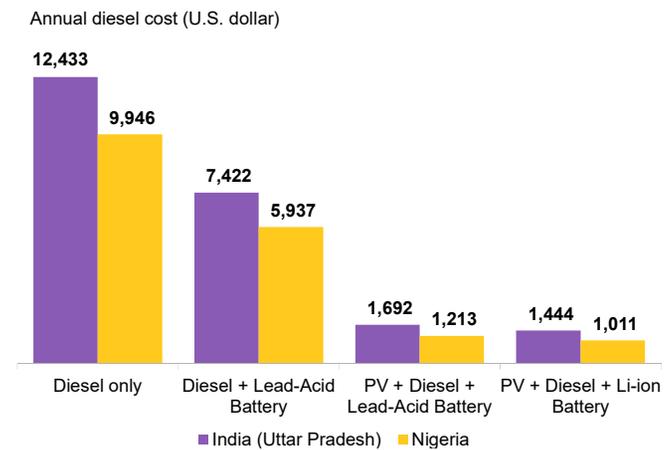
Source: Bloomberg New Energy Finance, Paul Maycock

# Using solar to cut telecom tower costs

Cost of electricity for off-grid cell tower sites



Annual diesel cost for off-grid cell tower sites



Source: HOMER, Bloomberg New Energy Finance

Note: Diesel pilferage was taken into account as cost - 20% of diesel price assumed.

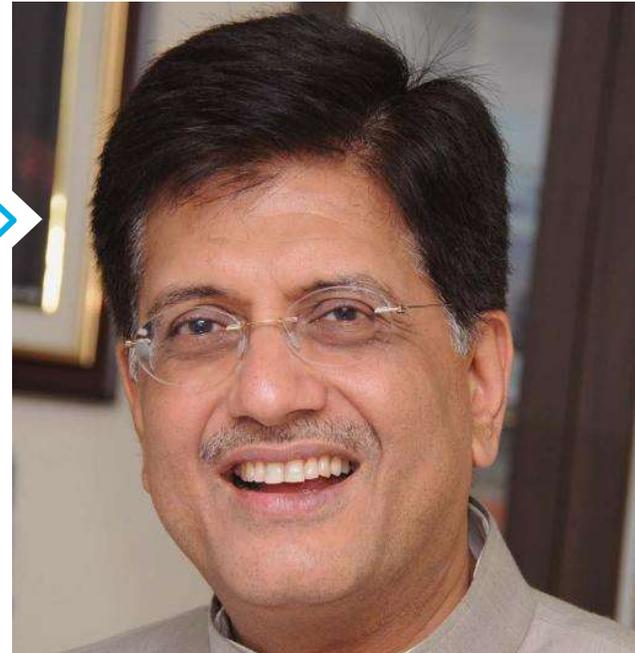
# Price of renewable energy in India

“

The cost of solar power is now cheaper than coal in this country.

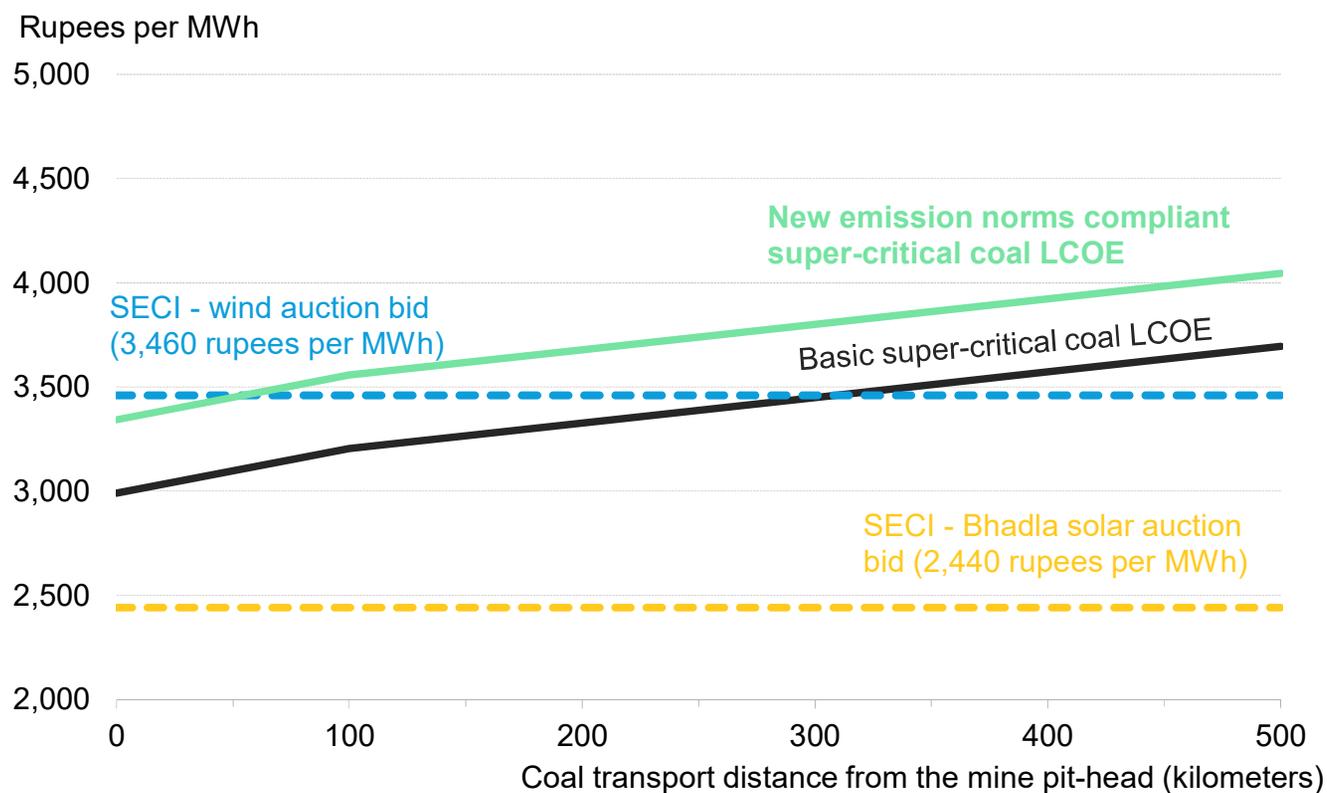
”

*Piyush Goyal  
Minister of State for Power, Coal, New &  
Renewable Energy and Mines, India*



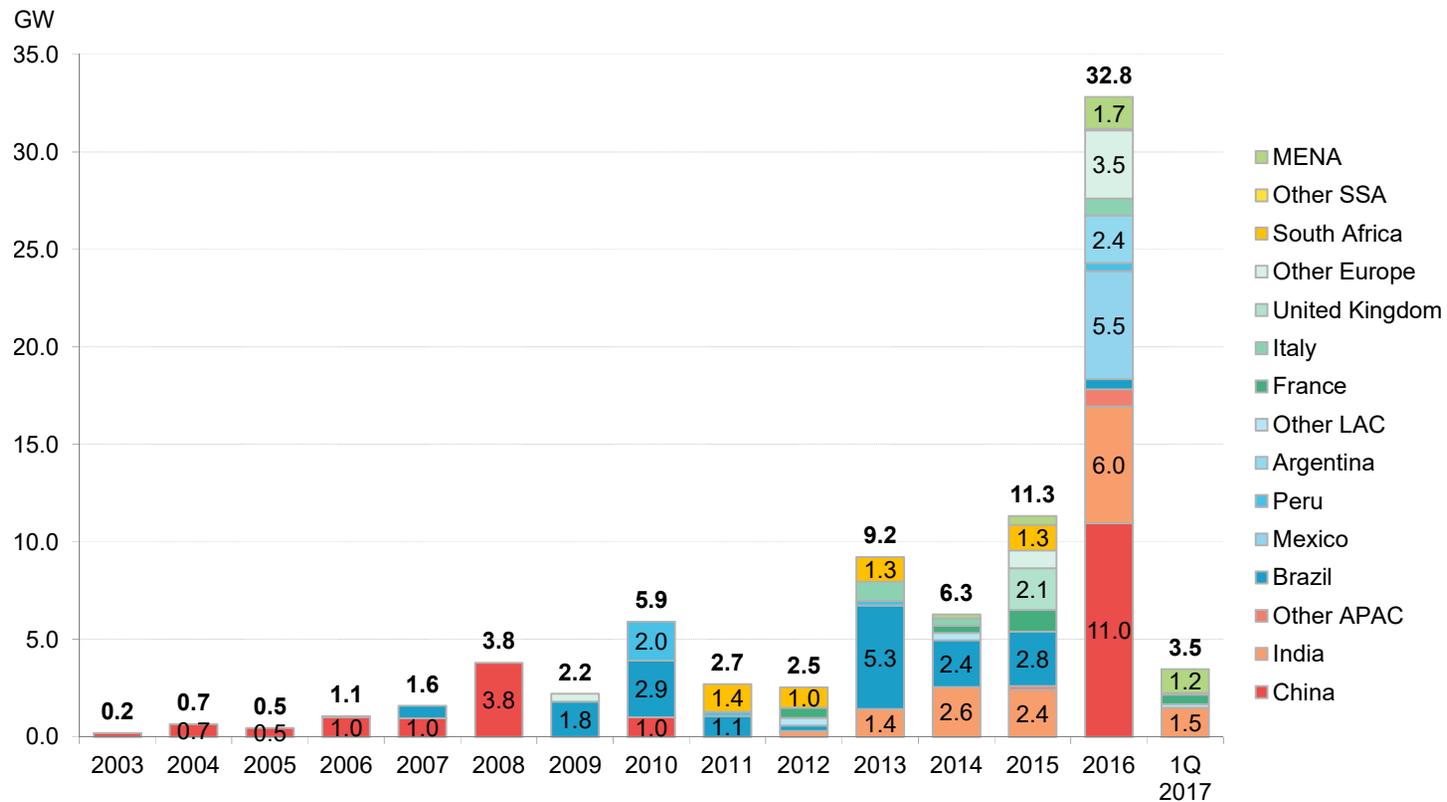
*Image: Twitter*

## Levelised cost of electricity of super-critical coal power generation by coal transport distance in India



Source: Bloomberg New Energy Finance. Note: SECI is the Solar Energy Corporation of India

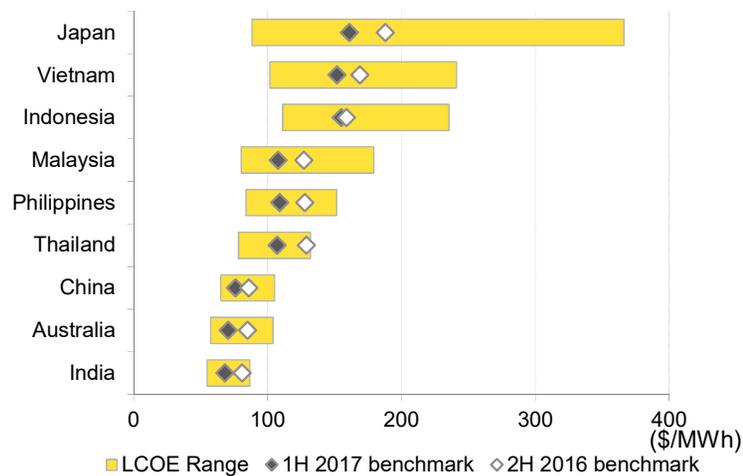
# Global auctioned and tendered renewables capacity



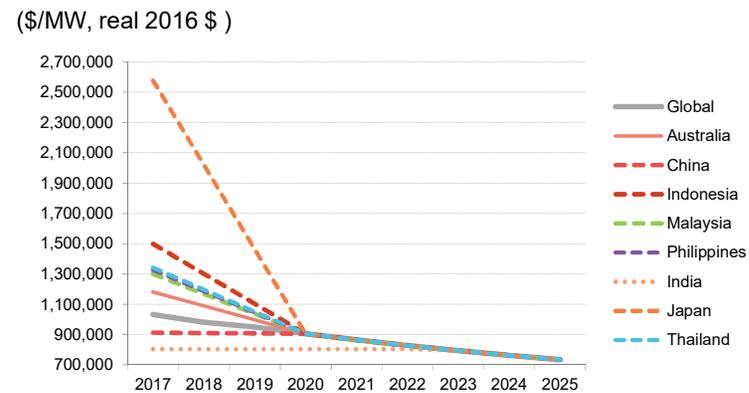
Source: Bloomberg New Energy Finance. Note: The chart excludes Chile where contracts are awarded for generation. The country has procured around 46 TWh of electricity generated by renewables since 2006.

# Impact of policy on renewable costs: solar example

Current levelised cost of electricity from utility-scale PV – no tracking



BNEF expectations on solar capex convergence as a result of subsidy / barrier phase outs

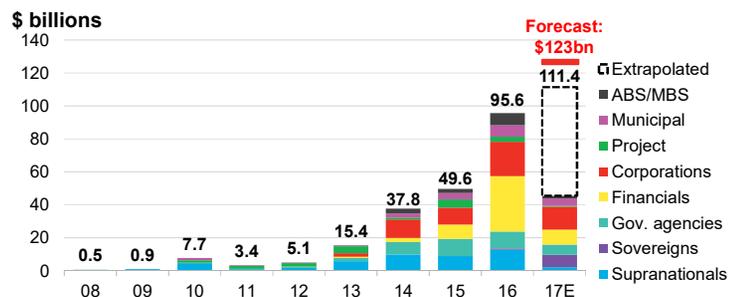


Source: Bloomberg New Energy Finance. Note: Data represents first half of 2017.

Source: Bloomberg New Energy Finance.

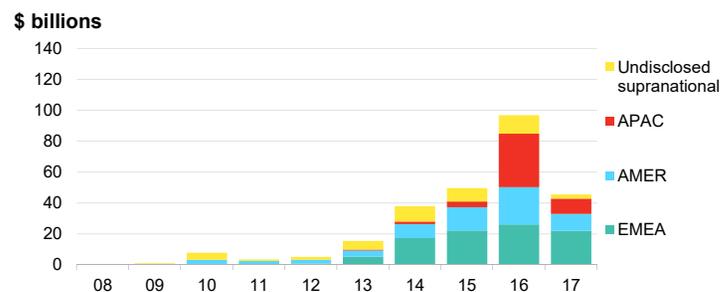
# Annual green bond issuance

## Annual green bond issuance by issuer type



Category	Subcategory	2012	2013	2014	2015	2016	2017
SSA	Supranationals	1.77	5.69	9.89	8.86	12.72	2.09
SSA	Sovereigns	0.00	0.00	0.00	0.00	0.78	7.49
SSA	Government agencies	0.81	2.08	7.49	10.42	10.29	6.31
Corporate	Financials	0.00	0.83	2.60	8.71	33.49	9.06
Corporate	Corporates	0.00	2.10	11.11	10.20	20.95	13.84
Project	Project	2.09	4.14	1.15	5.08	3.16	0.69
Municipal	Municipal	0.37	0.36	2.54	3.84	6.78	4.45
ABS/MBS	ABS/MBS	0.06	0.23	2.97	2.49	7.48	1.55
<b>Total</b>	<b>Total</b>	<b>5.09</b>	<b>15.43</b>	<b>37.75</b>	<b>49.59</b>	<b>95.65</b>	<b>111.39</b>

## Annual green bond issuance by region

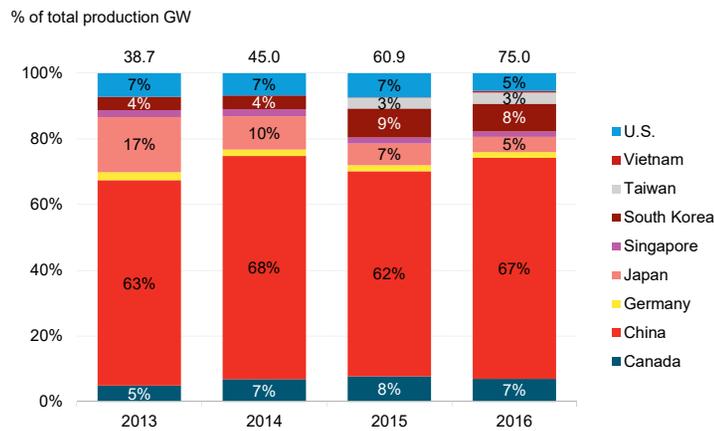


	2012	2013	2014	2015	2016	2017
EMEA	0.87	5.19	17.11	22.29	27.30	21.95
AMER	2.45	4.03	9.14	15.49	24.36	10.92
APAC	0.00	0.52	1.61	3.86	34.74	9.98
SNAT	1.77	5.69	9.89	8.00	10.22	2.63

Source: Bloomberg New Energy Finance. Note: 2017 forecast is based on compound annual growth rate between 2013 and 2016 inclusively. 2017 extrapolation is based on rate of issuance in 2017 year to date. SSA stands for supranational, sovereign and agency bonds. US muni are US municipal bonds. 2017 is year to date. SNAT is supranational. Undisclosed supranational numbers do not match supranational numbers on the left, because it is based on geographic disclosures.

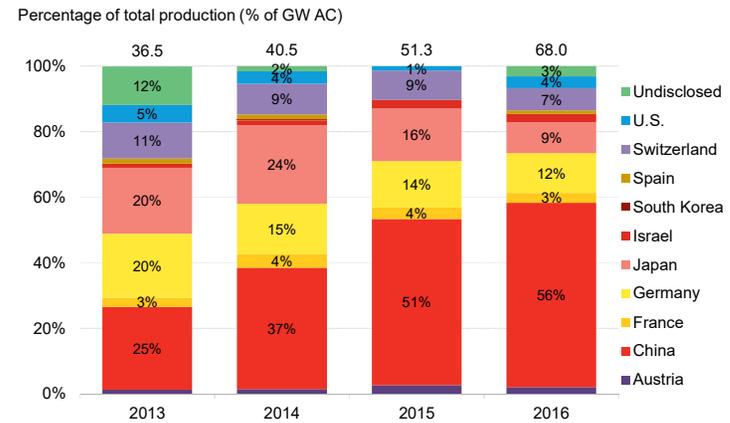
# Who supplies the world's solar market?

Annual module production by company HQ location



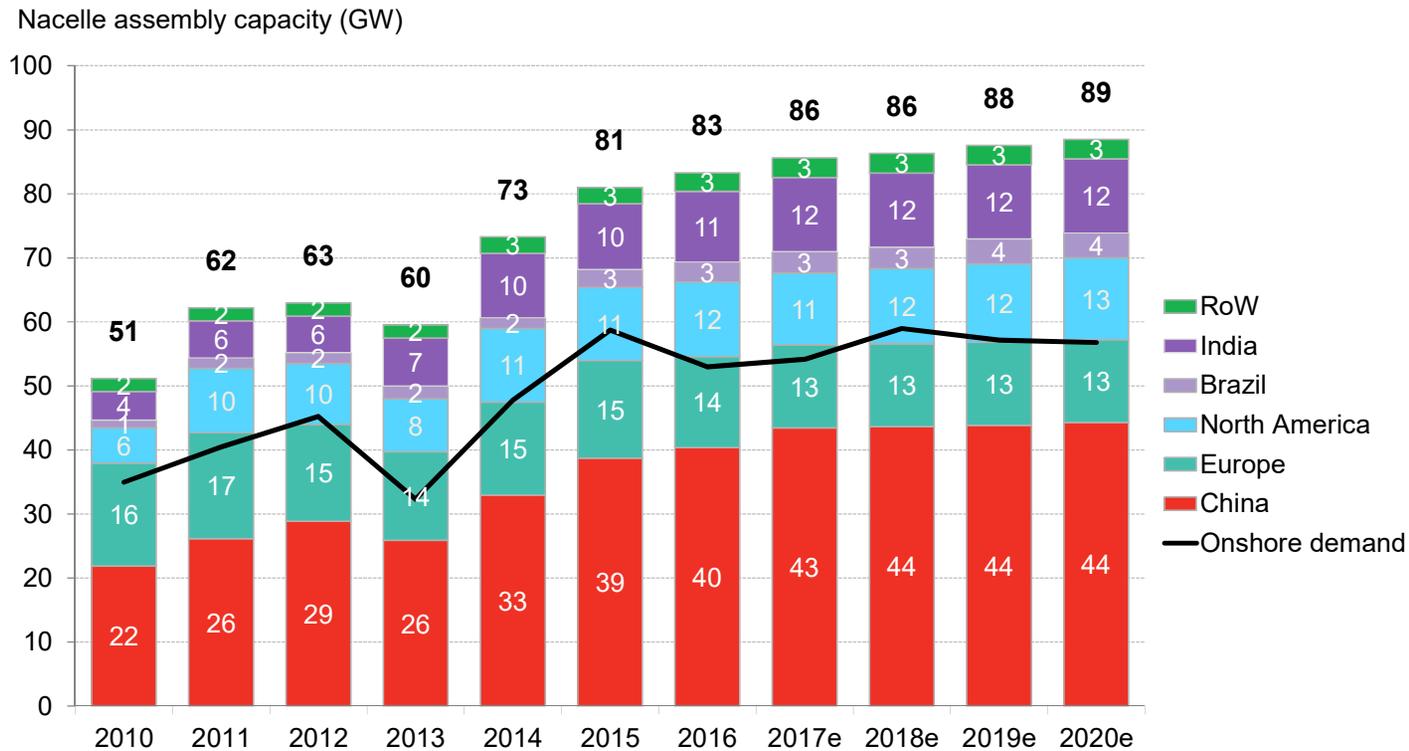
Source: Bloomberg New Energy Finance

Annual inverter production by company HQ location



Source: Bloomberg New Energy Finance

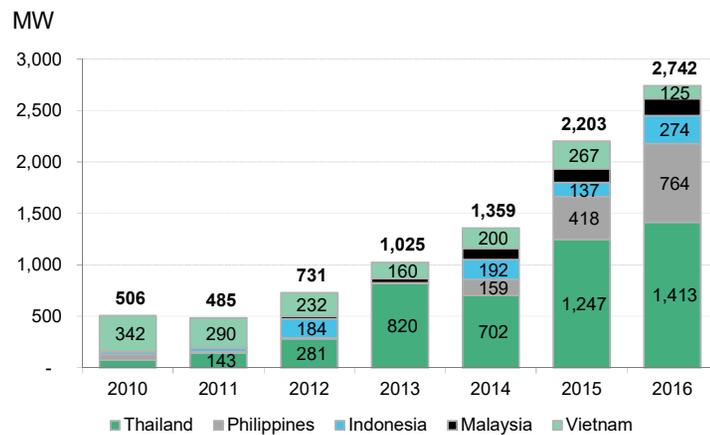
# Who supplies the world's wind market?



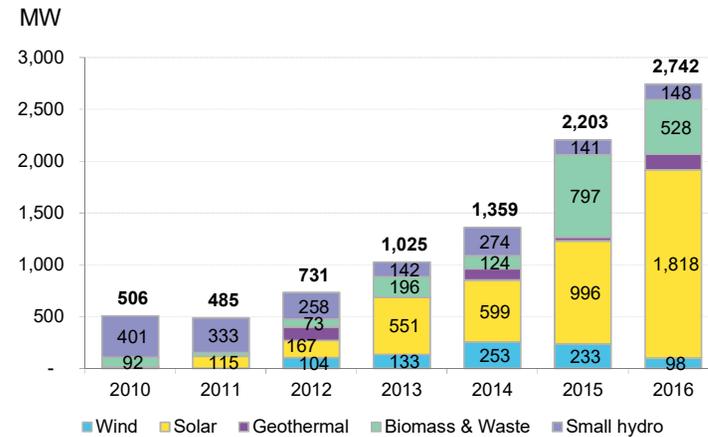
Source: Bloomberg New Energy Finance

# Renewable energy deployment in Southeast Asia

Renewable capacity commissioned by country



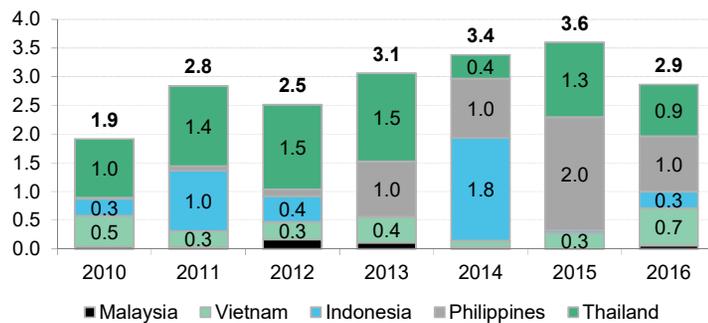
Renewable capacity commissioned by sector



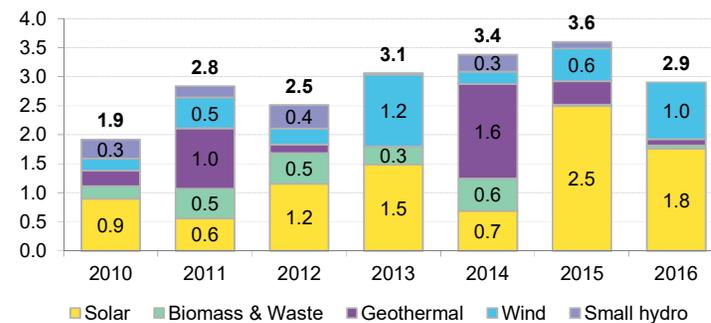
Source: Bloomberg New Energy Finance

# Renewable energy asset finance in Southeast Asia

Asset finance for 'new-build' by country, \$bn



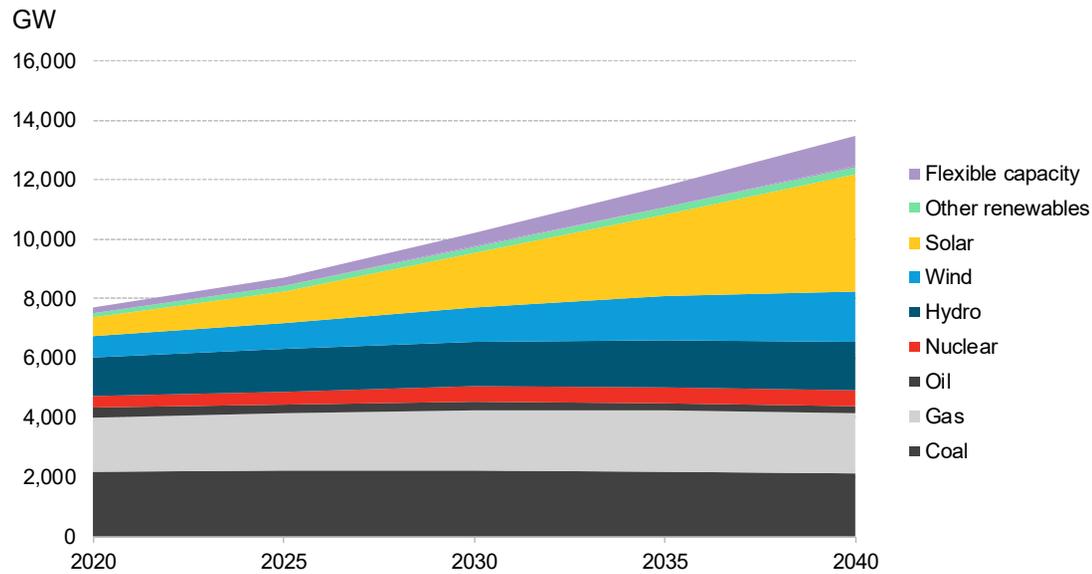
Asset finance for 'new-build' by sector, \$bn



Source: Bloomberg New Energy Finance

# BNEF NEO2016 and International Energy Agency capacity forecasts

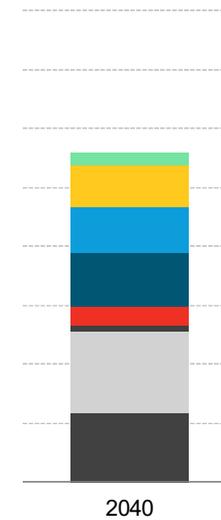
**BNEF New Energy Outlook 2016**



**2040 capacity forecasts**

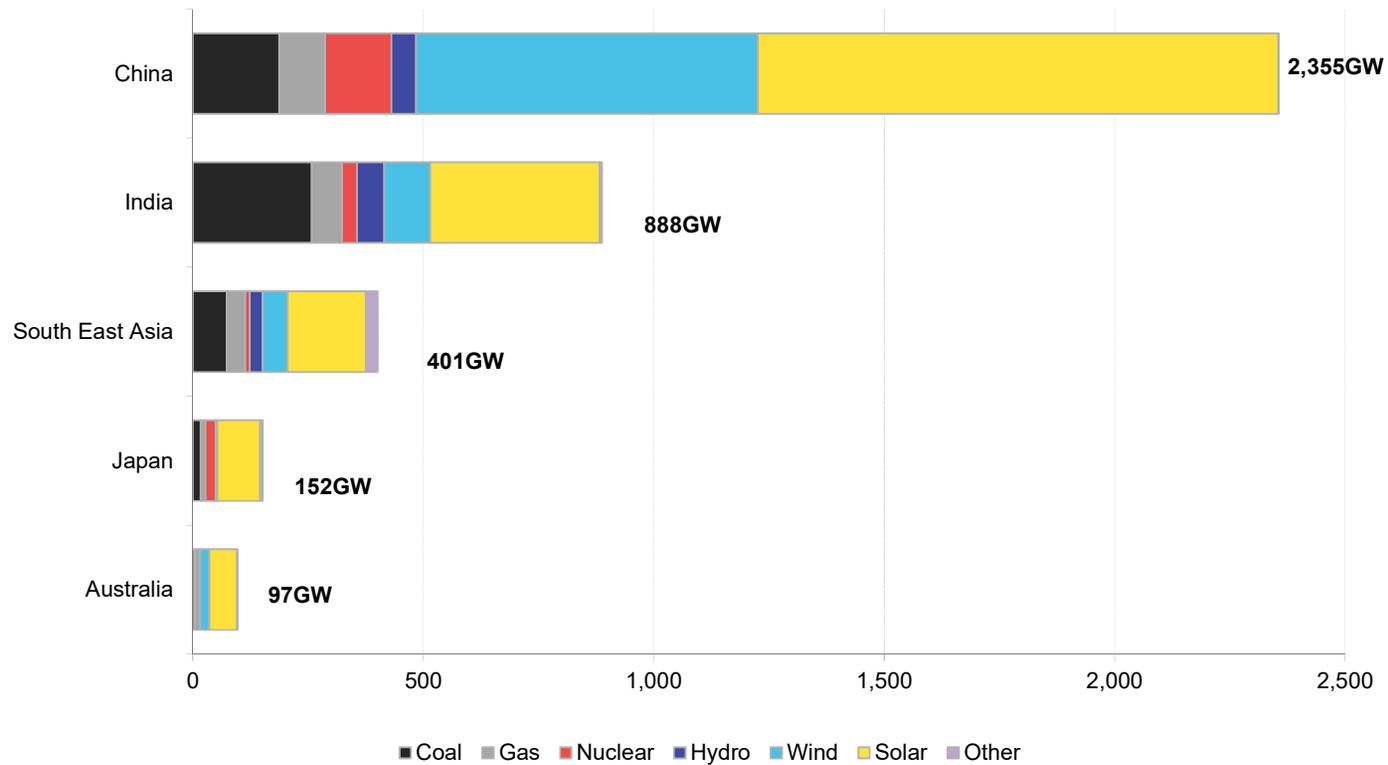
Utility-scale PV:	2,400GW	19x growth
Small-scale PV:	1,500GW	12x growth
Onshore wind:	1,600GW	4x growth
Offshore wind:	131GW	11x growth
Flexible capacity:	1,000GW	8x growth

**IEA World Energy Outlook 2016 "New Policies"**



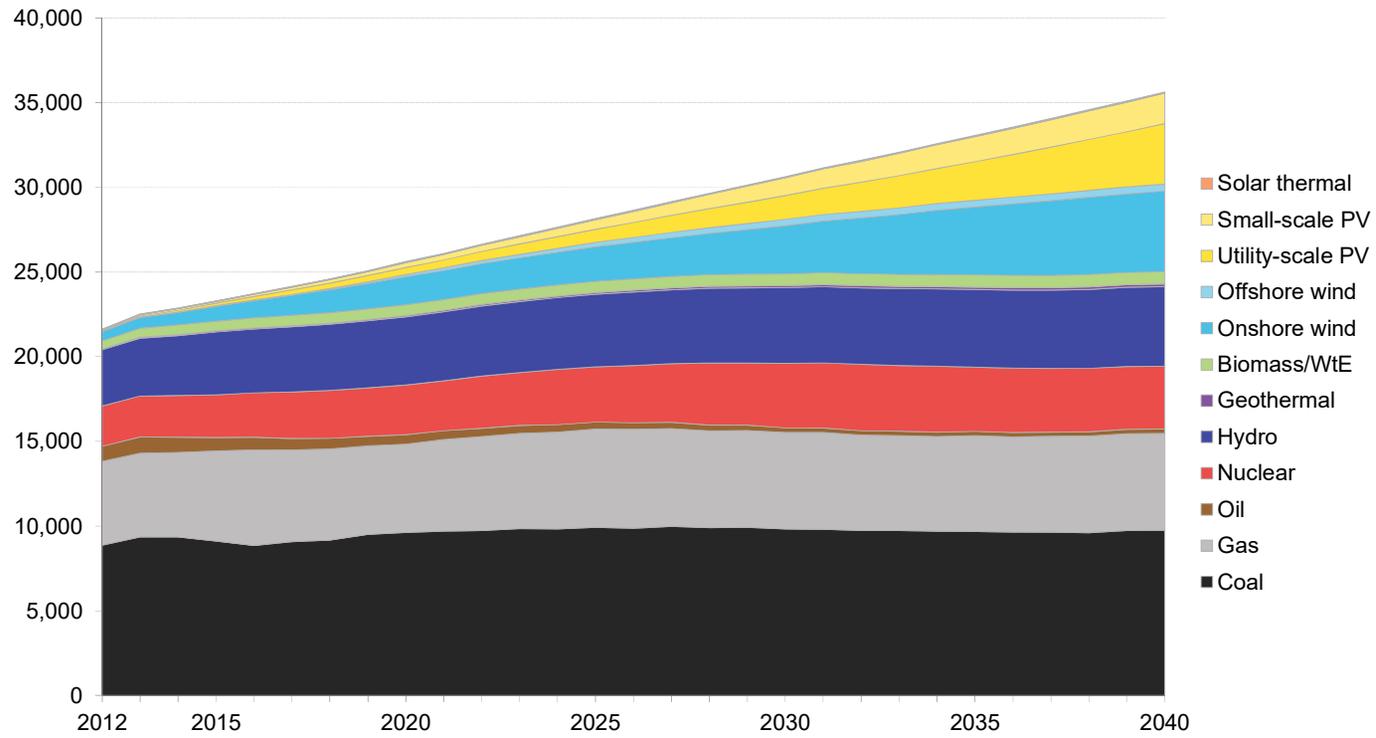
Source: Bloomberg New Energy Finance, IEA

# Power generation capacity additions in APAC, 2015 - 2040



Source: Bloomberg New Energy Finance

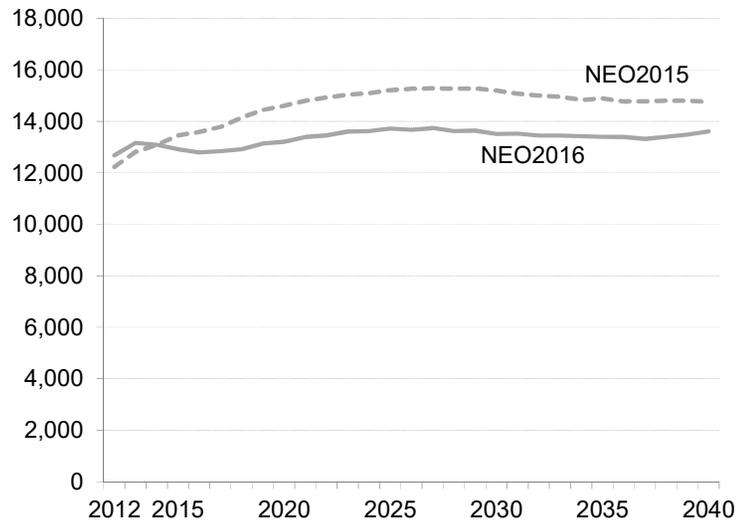
# Global generation by technology (TWh)



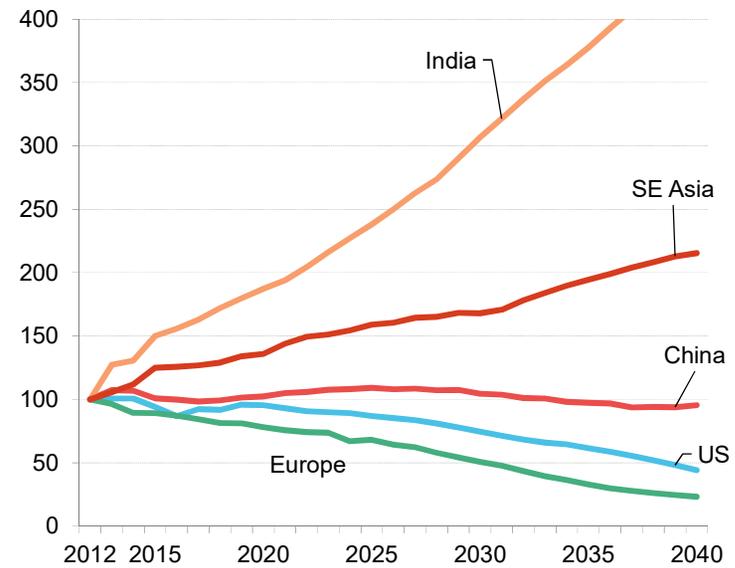
Source: Bloomberg New Energy Finance

# Power sector CO<sub>2</sub> emissions

Emissions (MtCO<sub>2</sub>)



Normalised to 2012

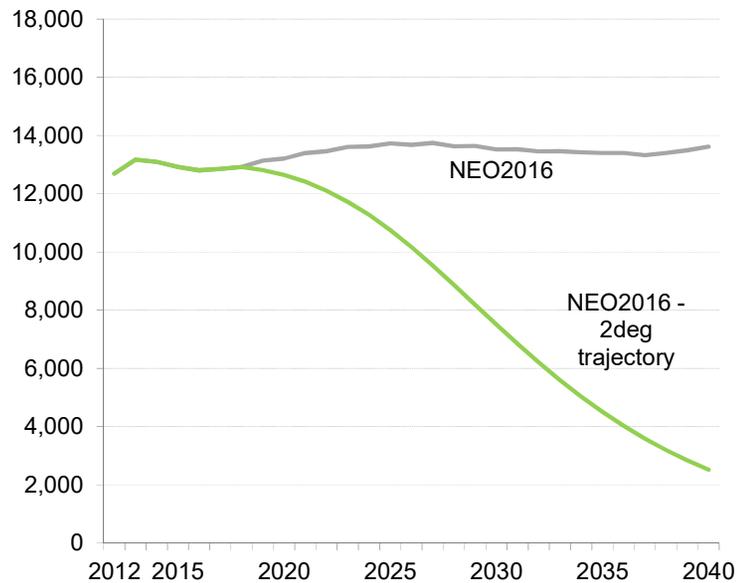


Source: Bloomberg New Energy Finance

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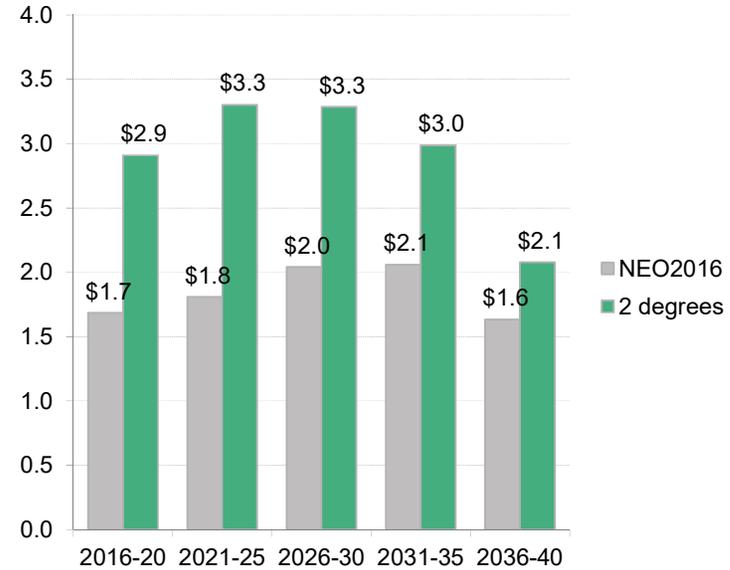
# Power sector CO<sub>2</sub> emissions – 2 degrees scenario (MtCO<sub>2</sub>)

Emissions (MtCO<sub>2</sub>)



Source: Bloomberg New Energy Finance

Total investment in zero-carbon technologies (trillion dollars)



Source: Bloomberg New Energy Finance

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