

# Update on the Energy Transition

Korea Energy Transition Conference 2018

Kobad Bhavnagri

October 4, 2018

# Analysis to help you understand the future of energy

## Clean energy



Solar    Wind    Storage    Decentralized energy    Frontier power    Impact on power & utilities

## Commodities



LNG & gas    Oil & products    Power    Carbon

## Advanced transport



Electrified transport    Autonomous driving    Shared mobility    Impact on transport    Impact on oil & power

## Digital industry



Internet of things    Automation & advanced analytics    Advanced materials    Impact on industrials and energy

# Key drivers and challenges in the energy transition

Declining costs

Digitalization

Decentralization

Decarbonization

Maintaining  
reliability

Electrification of  
mobility

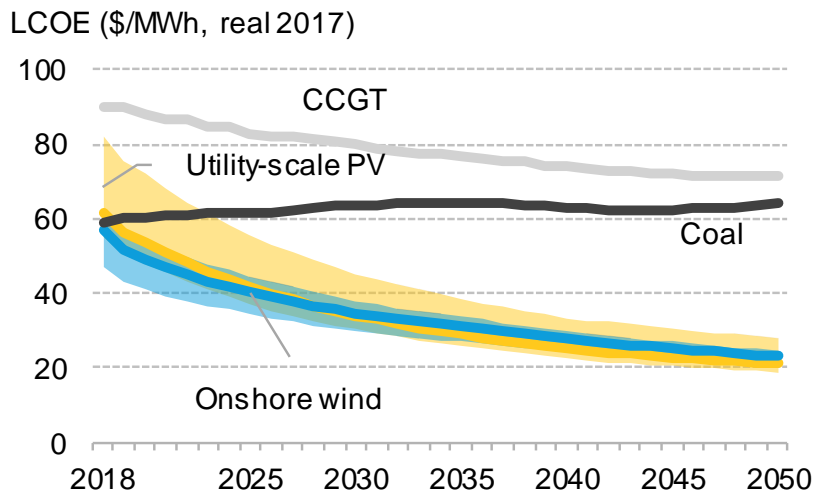
Corporate  
procurement

Investor risk  
management

Source: BloombergNEF

# Declining costs: wind and solar are the cheapest forms of bulk generation

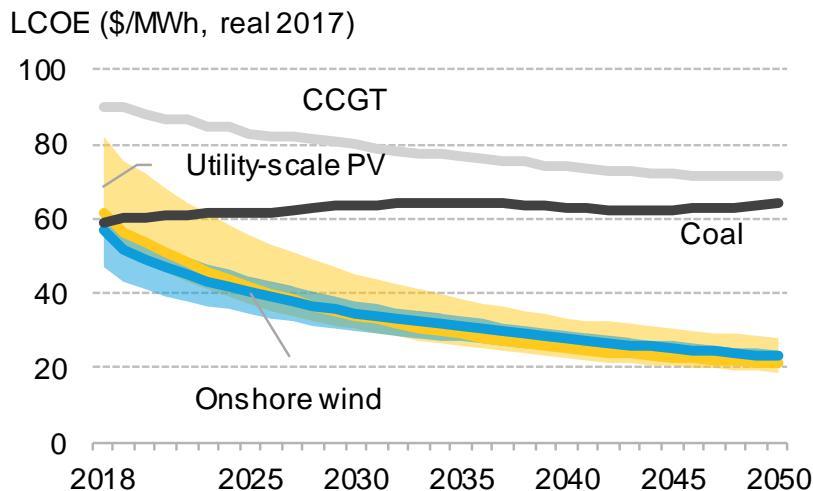
## China



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.

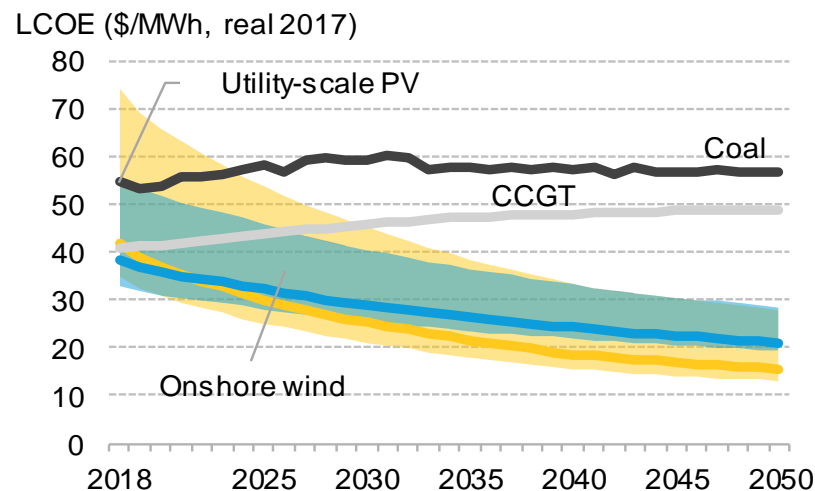
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## U.S.

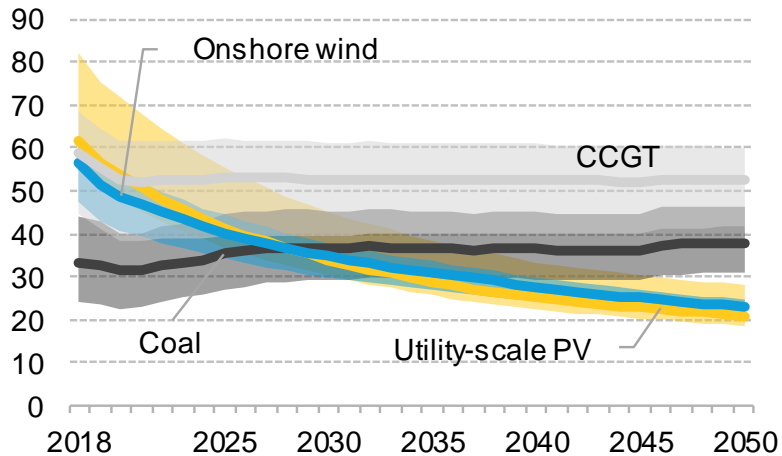


Source: BloombergNEF Note: the PV LCOE is for a tracking PV system. PV tracking capacity factors in the US: 14%-30% in 2018 and onshore wind: 29%-49% in 2018.

# ...and will become cheaper than operating existing coal or gas

## China

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

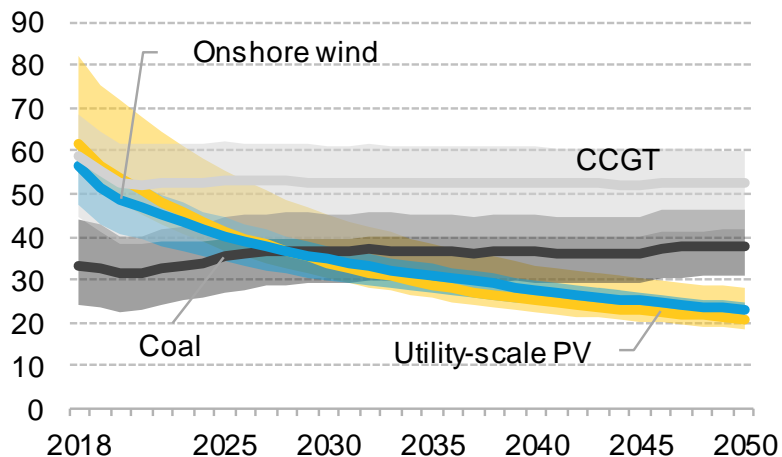


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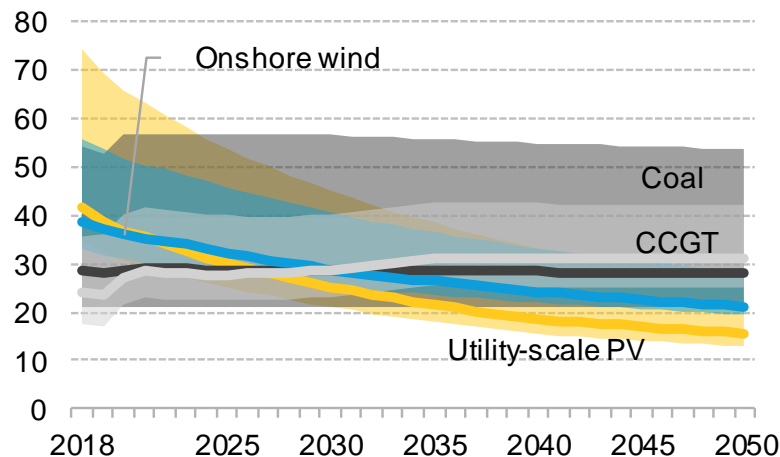
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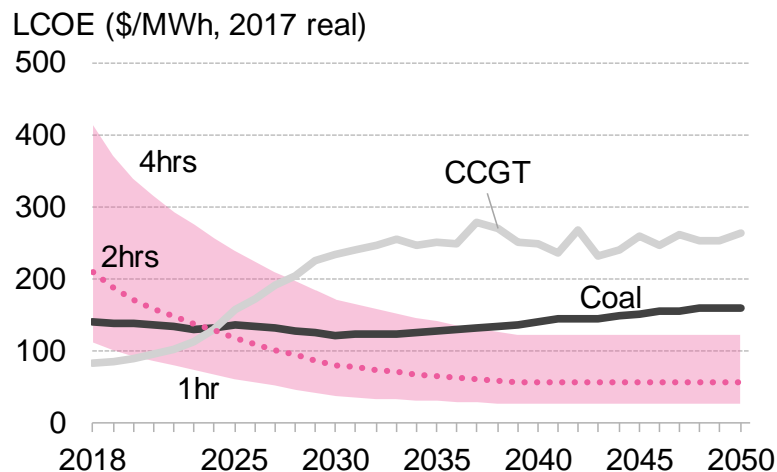
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# Batteries are also becoming the cheapest source of flexibility

Utility-scale battery LCOE charging from existing plants vs new CCGT and coal plants: Australia

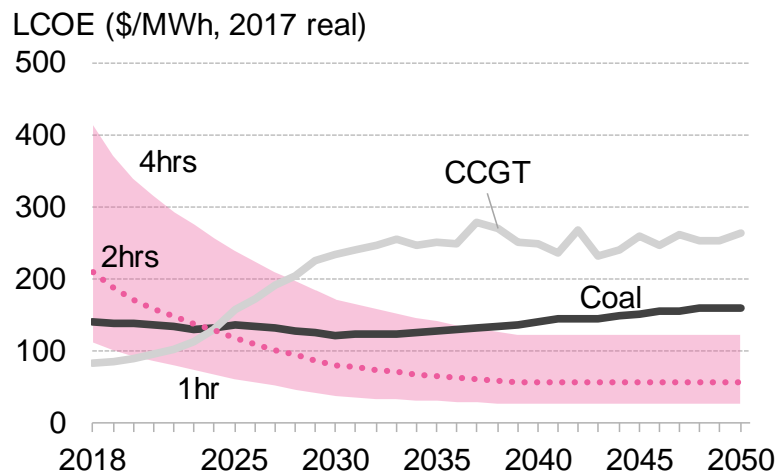


Source: BloombergNEF Note: Charging costs are assuming drop from 60% of the wholesale price today to zero in 2030.



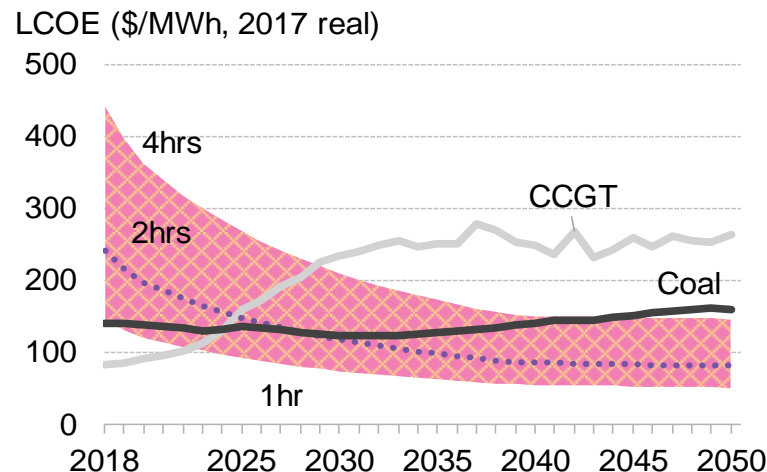
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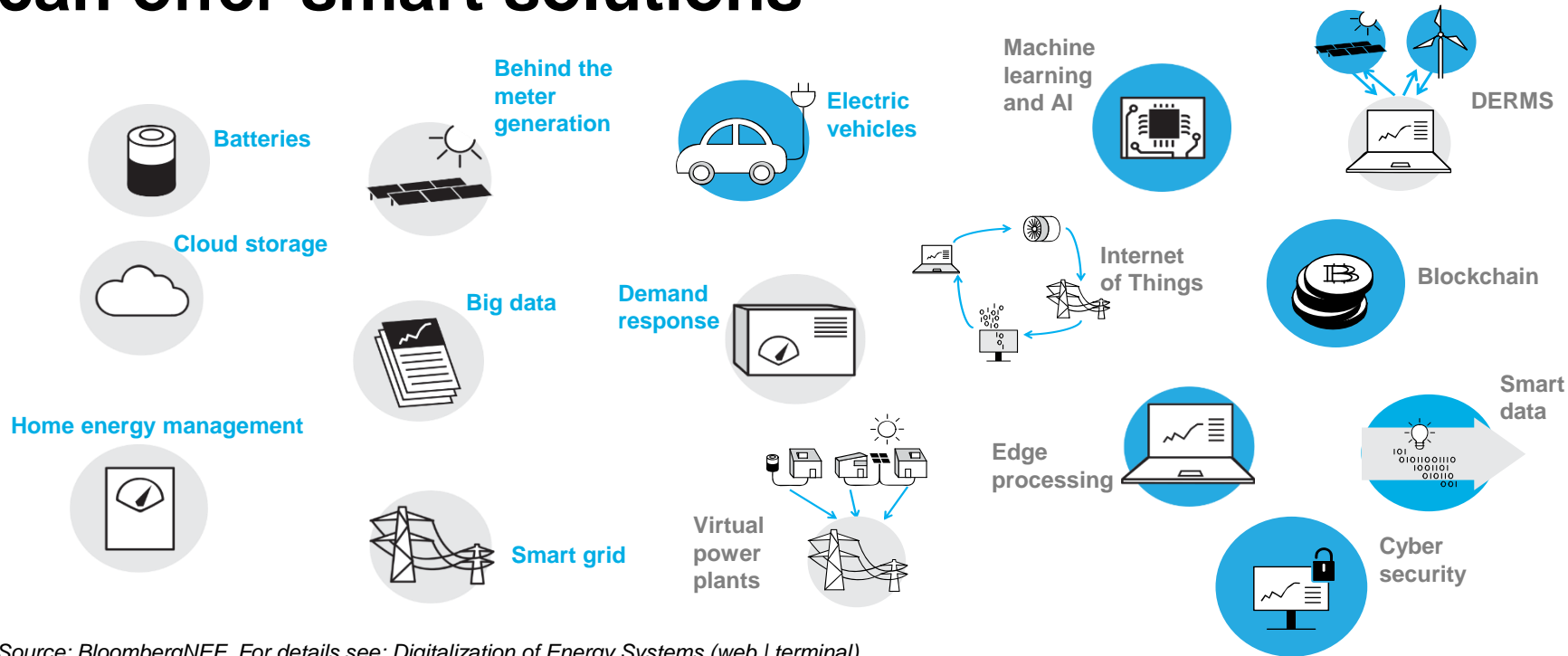
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## Utility-scale battery LCOE charging from a new PV plant vs. new CCGT and coal plants: Australia



Source: BloombergNEF. For details see: [New Energy Outlook 2018 \(web / terminal\)](#).

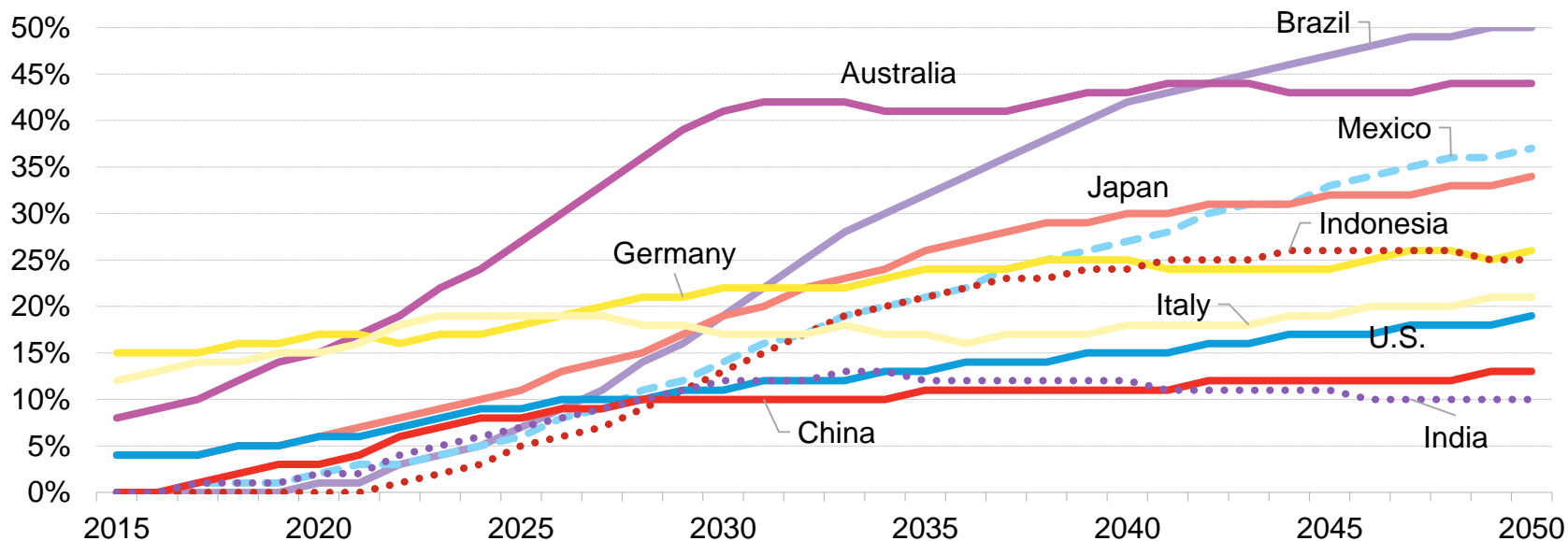
# Digitalization: new technology can offer smart solutions



Source: BloombergNEF. For details see: *Digitalization of Energy Systems* ([web](#) | [terminal](#)).

# Decentralization: PV is coming to a house near you

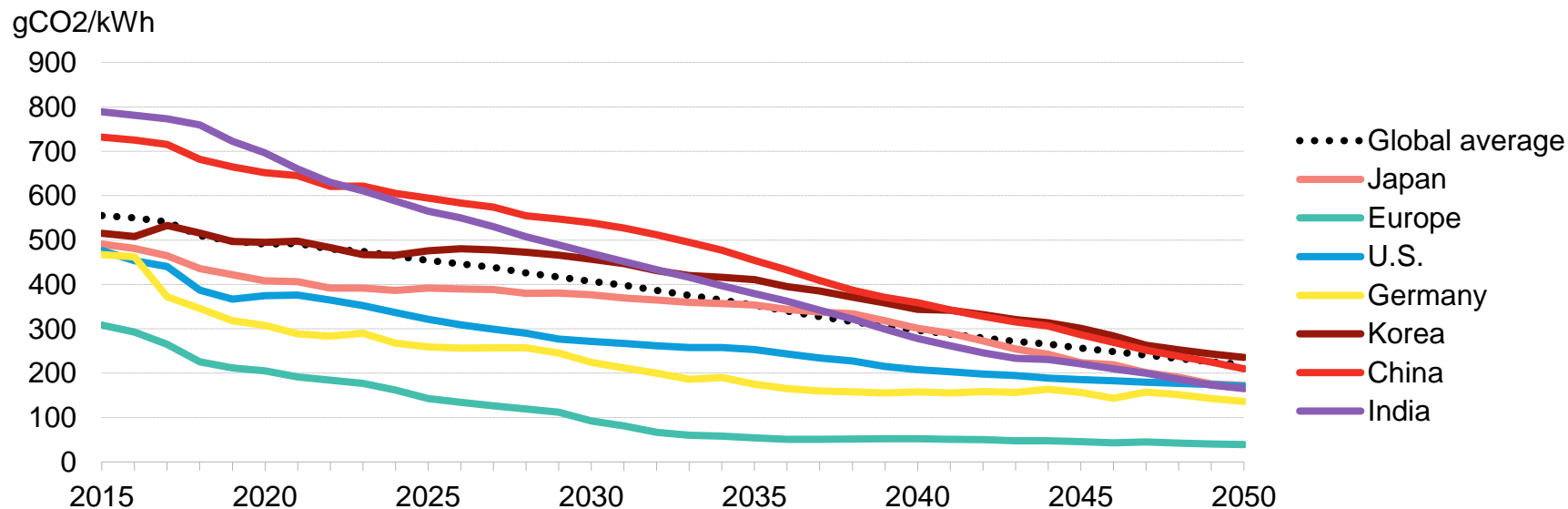
## Decentralization ratio of selected countries



Source: BloombergNEF. For details see: [New Energy Outlook 2018 \(web | terminal\)](#).

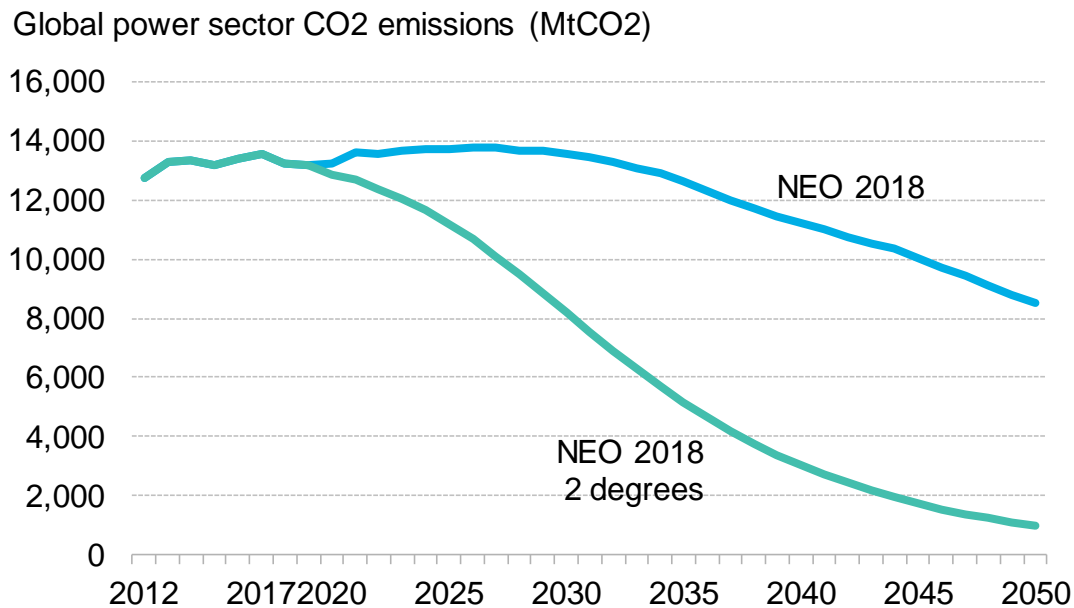
# Decarbonization: is happening slowly but surely

## Emissions intensity of electricity generation, by country



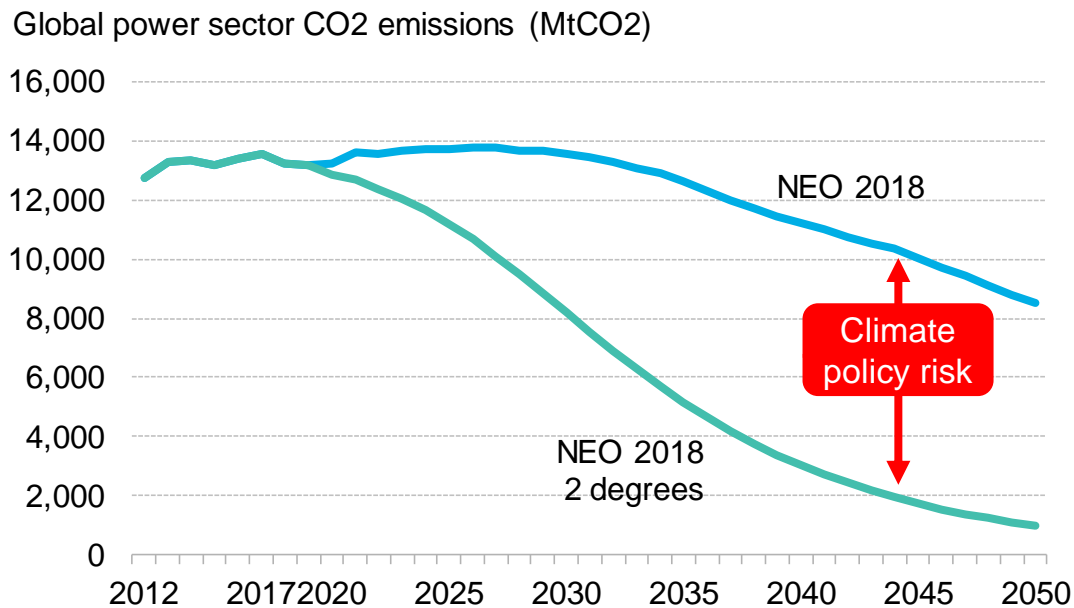
Source: BloombergNEF. For details see: *New Energy Outlook 2018* ([web](#) | [terminal](#)).

# ...but needs to happen faster



Source: BloombergNEF. For details see: *New Energy Outlook 2018* ([web](#) | [terminal](#)).

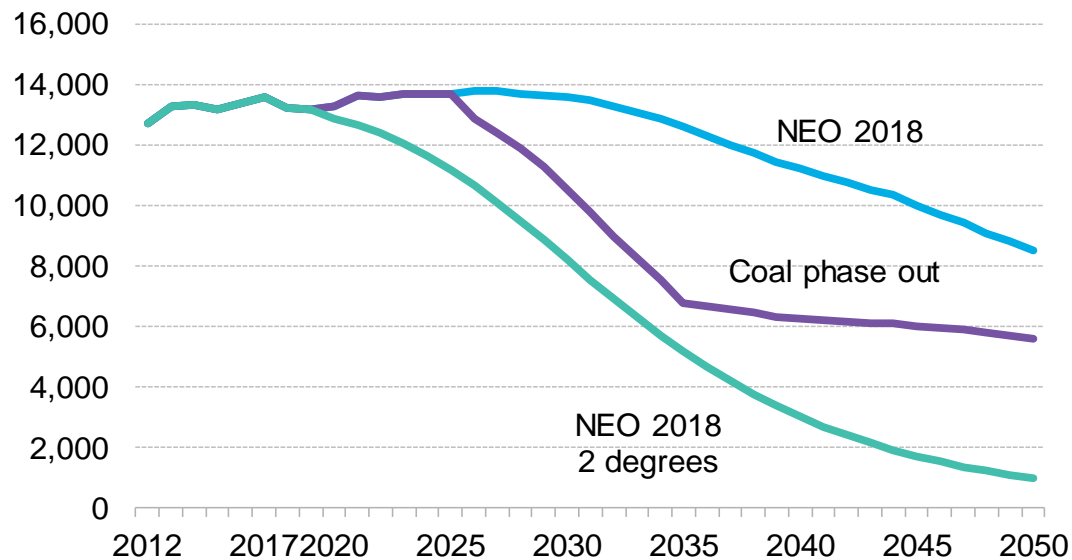
# ...but needs to happen faster



Source: BloombergNEF. For details see: *New Energy Outlook 2018* ([web](#) | [terminal](#)).

# ...phasing out coal alone won't get us there

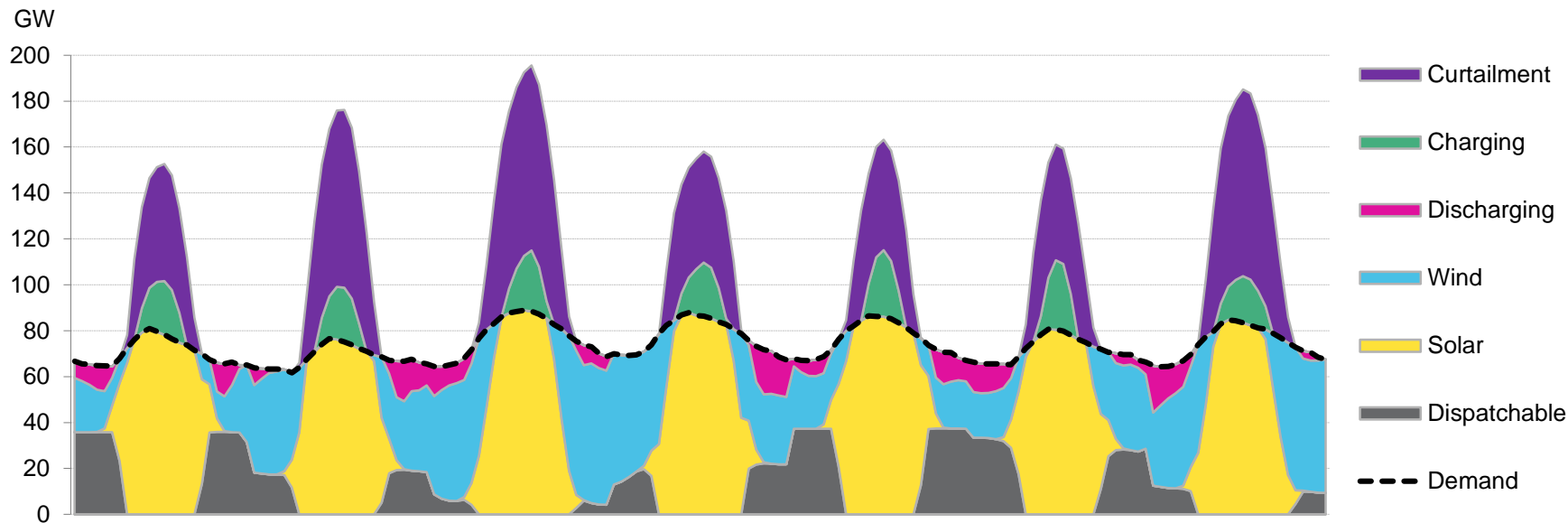
Global power sector CO2 emissions (MtCO2)



Source: BloombergNEF. For details see: *New Energy Outlook 2018* ([web](#) | [terminal](#)).

# Maintaining reliability: is a key global challenge

Germany high renewables week: 2035

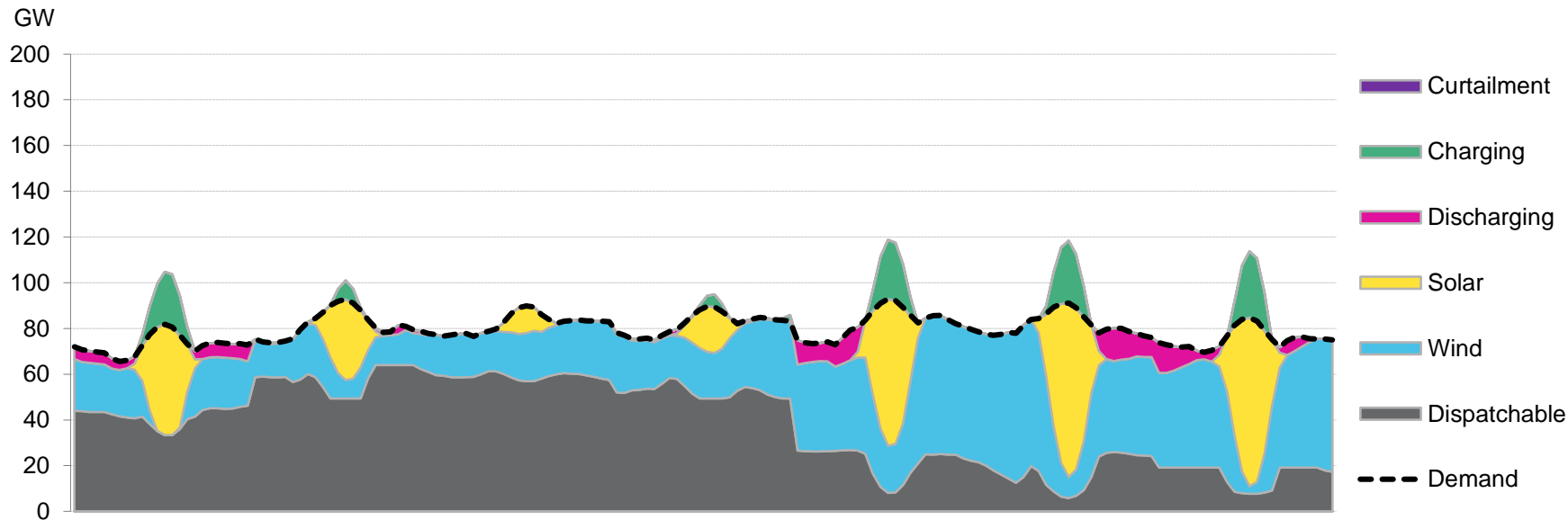


Source: BloombergNEF. For details see: [New Energy Outlook 2018 \(web | terminal\)](#).



# ...which batteries alone cannot solve

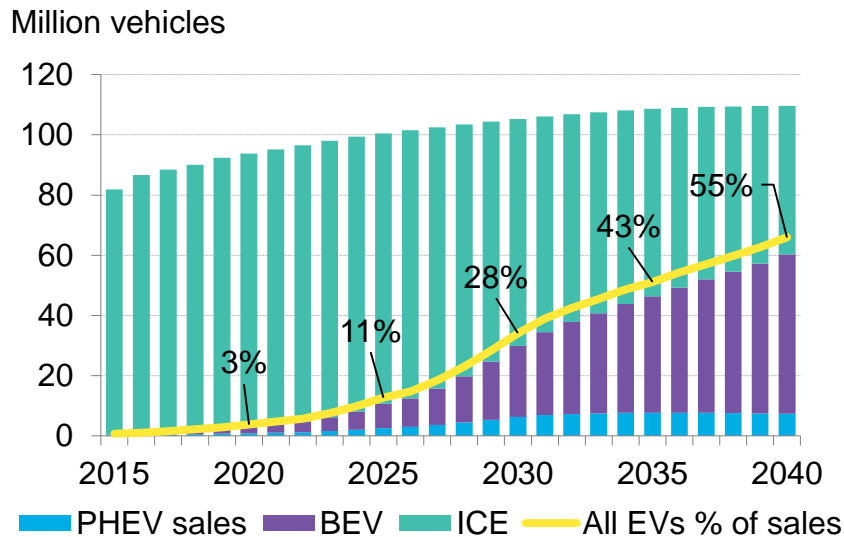
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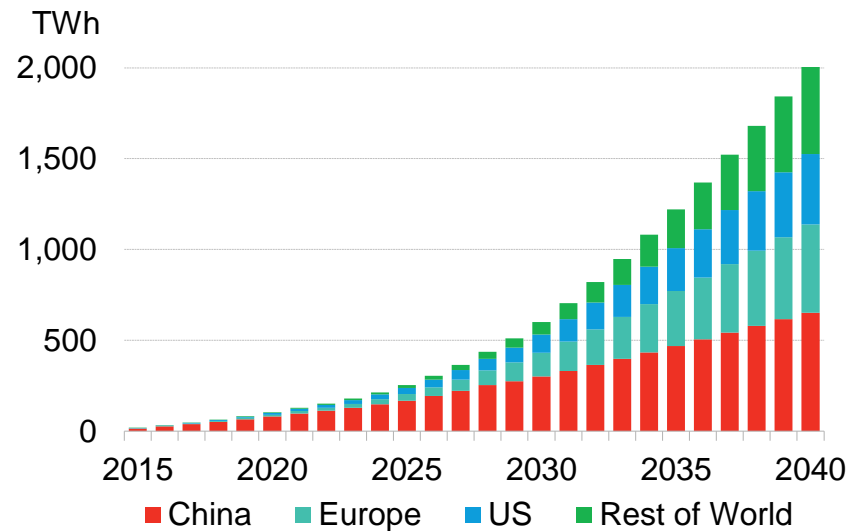
Source: BloombergNEF. For details see: [New Energy Outlook 2018 \(web | terminal\)](#).

# Electrification of mobility: is the clear direction of travel

## Global light duty vehicles sales



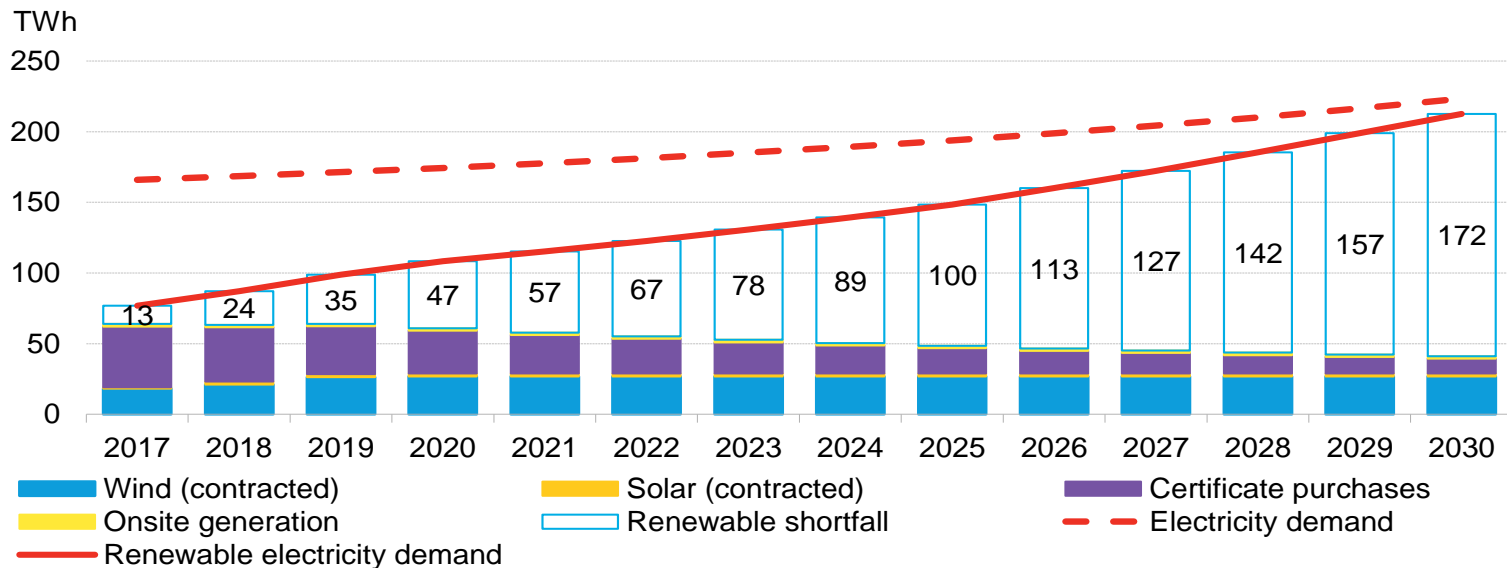
## Electricity consumption from light-duty EVs and e-buses



Source: BloombergNEF. For details see: *Long-Term Electric Vehicle Outlook 2018* ([web](#) | [terminal](#)).

# Corporate procurement: is creating additional demand

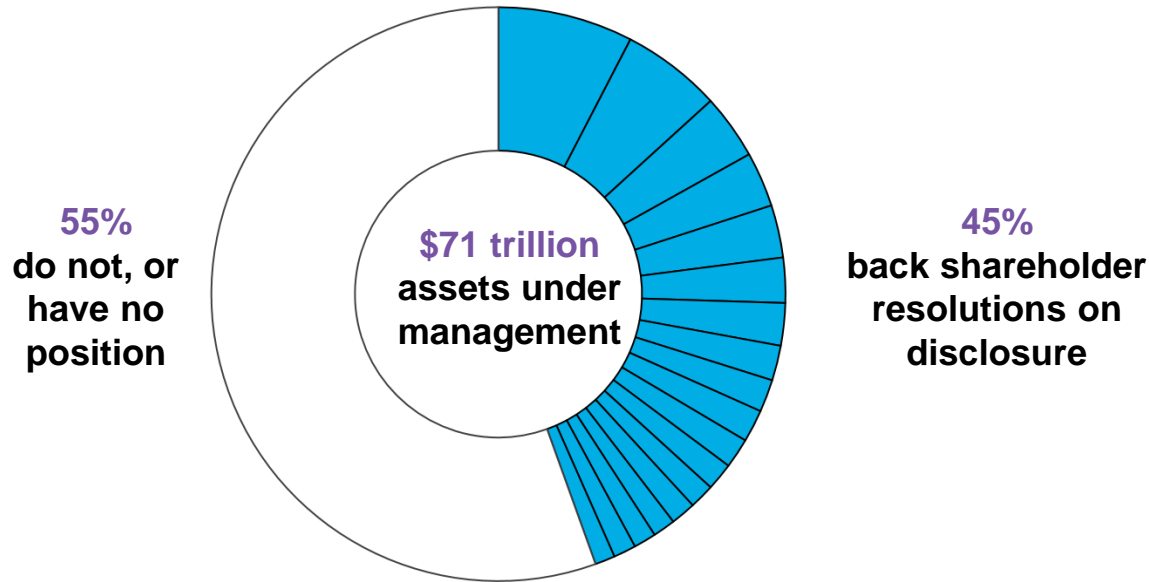
## Projected global renewable electricity shortfall for RE100 member companies



Source: BloombergNEF, Bloomberg Terminal, The Climate Group, company sustainability reports

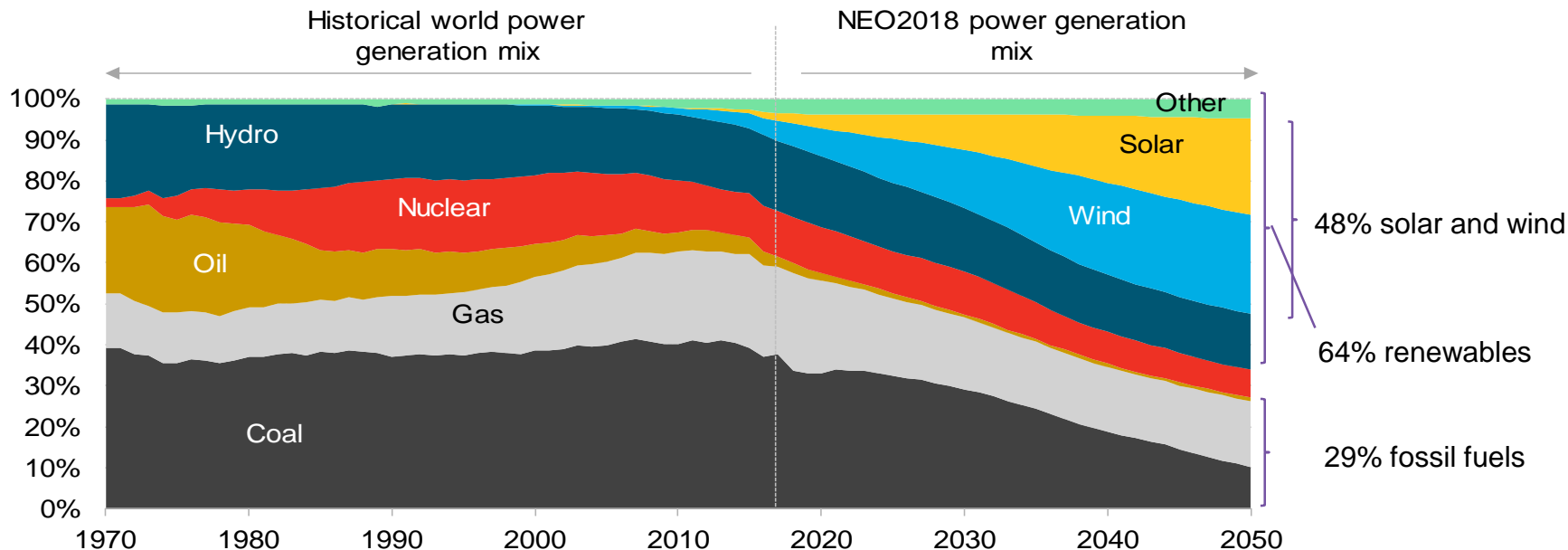
# Investor risk management: pushing capital towards clean

Asset managers as a percentage of all assets under management



Source: Bloomberg Gadfly, as of June 2017

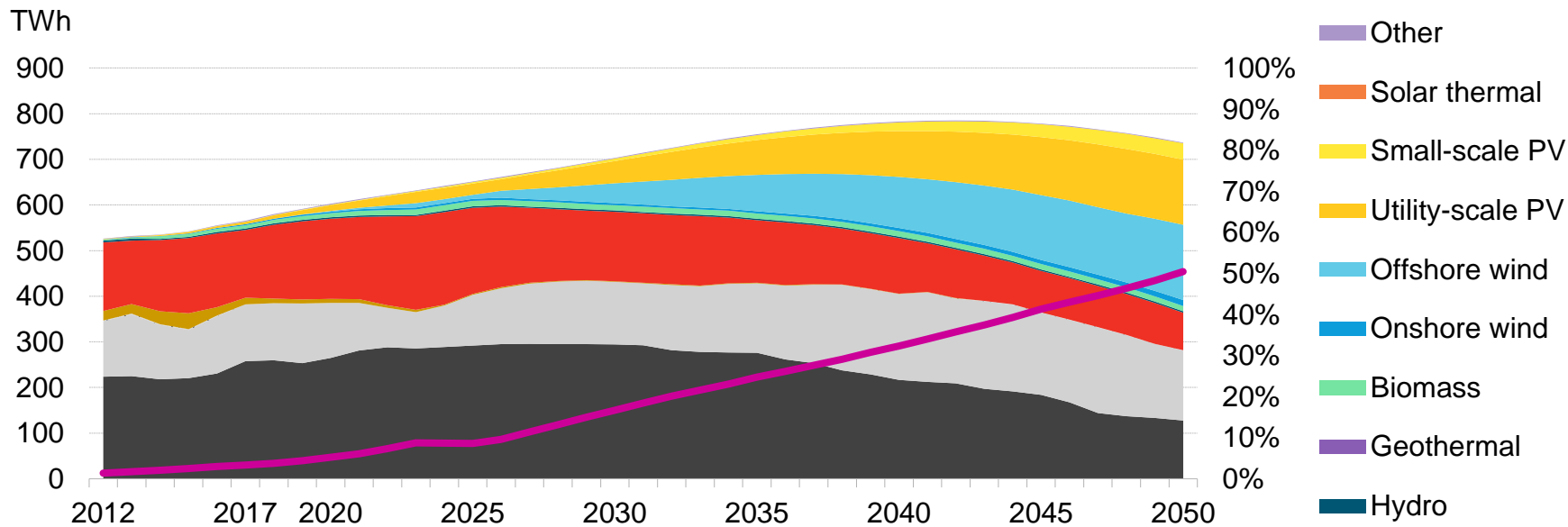
# Outlook: 50% wind and solar generation by 2050



Source: BloombergNEF, IEA. For details see: *New Energy Outlook 2018* ([web](#) | [terminal](#)).

# With an optimized market Korea could achieve 50% renewables without subsidies

## Forecast generation, Korea



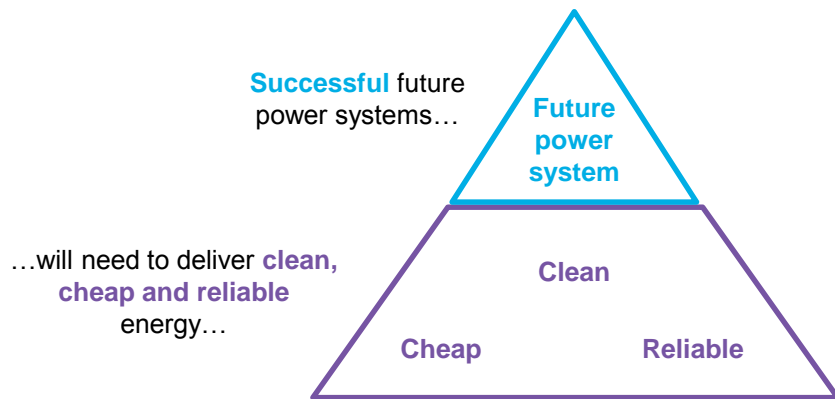
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# Efficient policy and markets are essential to address the trilemma



Source: BloombergNEF. For details see: *Power Market Design Series 6: Australia* ([web](#) | [terminal](#)) and *Power Market Design for a Renewable Future* ([web](#) | [terminal](#)).

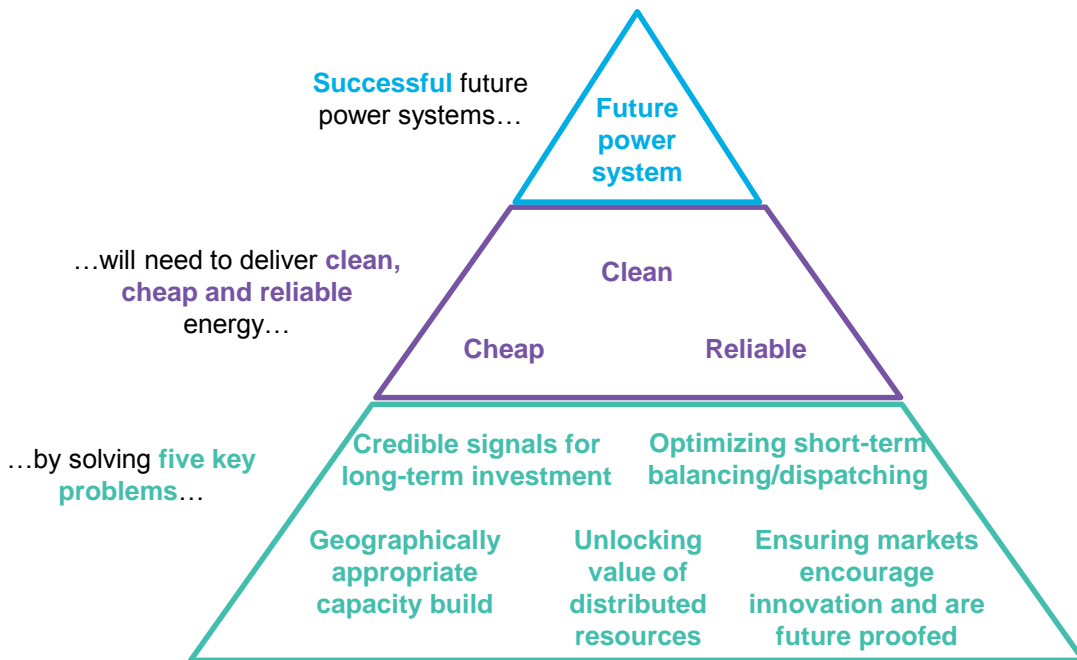
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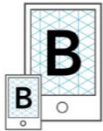
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