



What is going on in the Energy Market?

Thursday, 8 June 2017



ClimateWorks
AUSTRALIA

THE FUTURE OF THE ENERGY MARKET

FRONTIER ADVISORS CONFERENCE

Rob Kelly - Research Projects Manager

8 June 2017

The Paris Agreement is still driving business and government action



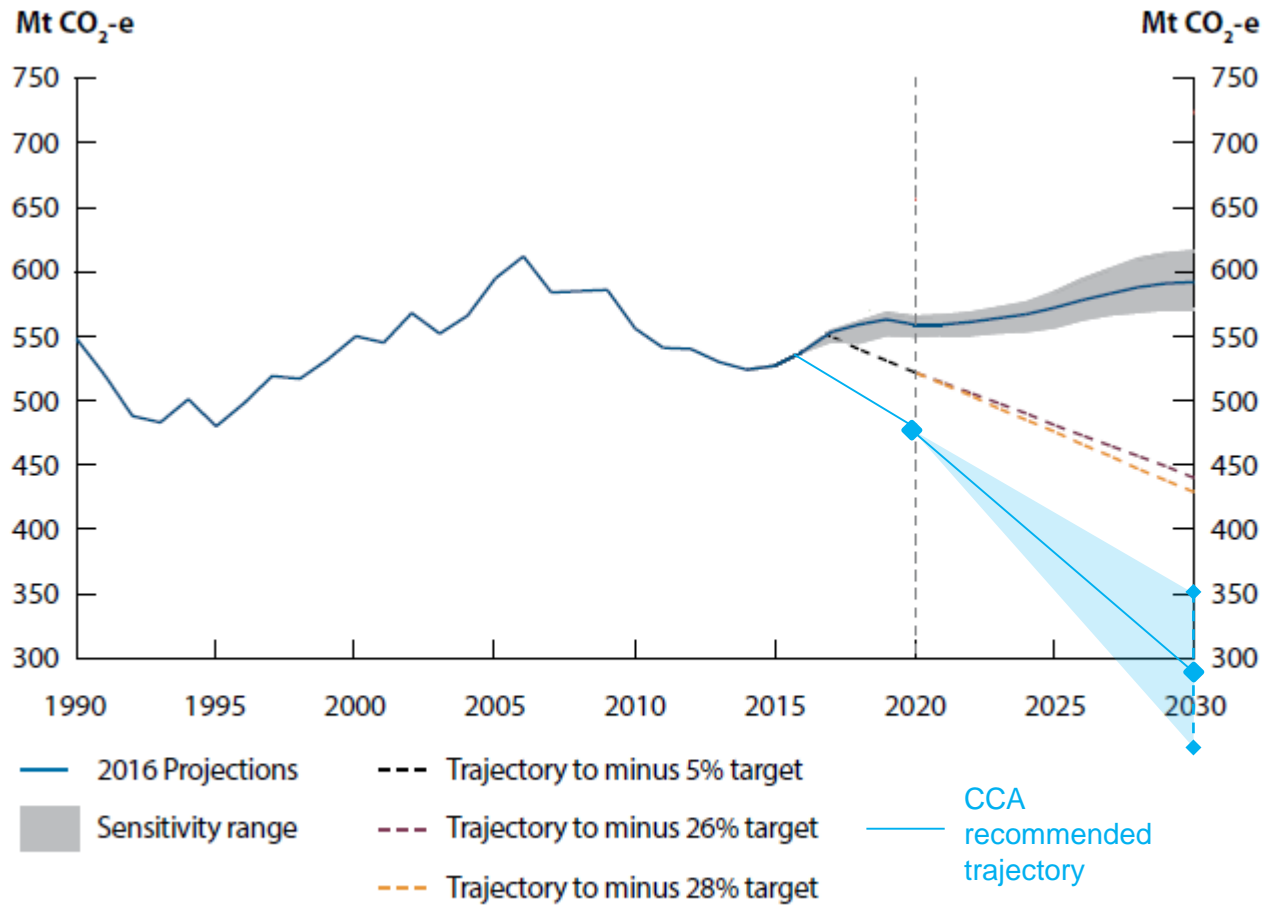
What the 'Paris Agreement' does

- Commits countries to $< 2^{\circ}\text{C}$, aiming for 1.5°C
- Requires all countries to upgrade pledges every 5 years
- Embeds 2018 global stock take of actions and progress by UN

The United States has announced that it will be withdrawing from the agreement with the earliest withdrawal date being November 2020



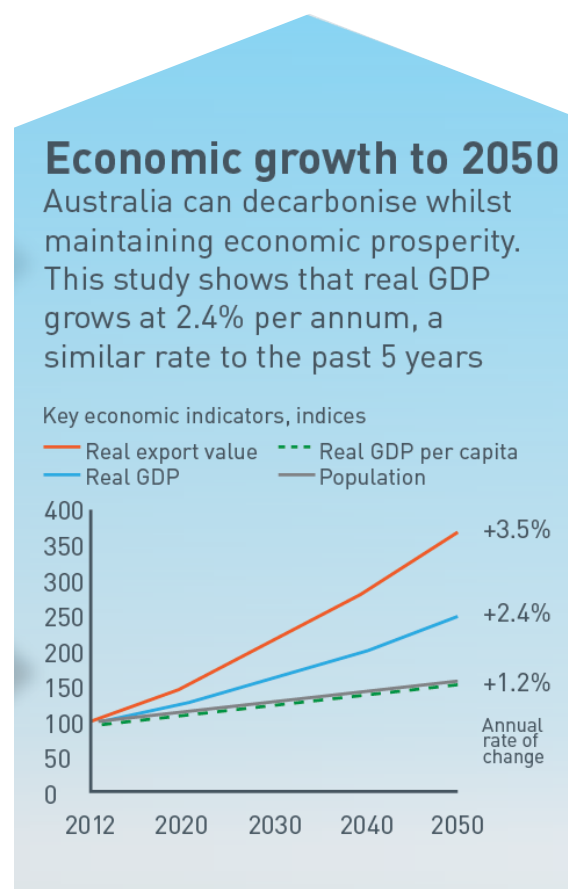
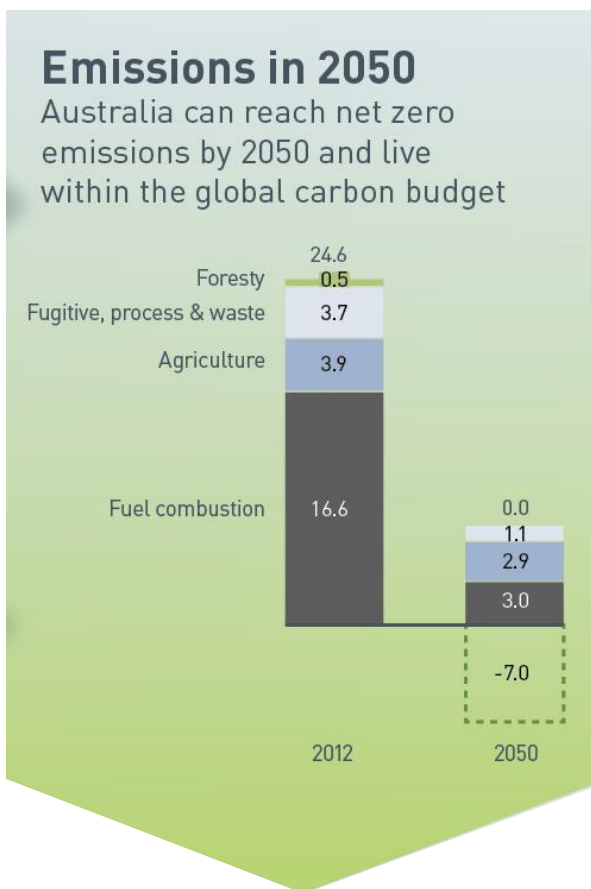
Emissions will need to reach net zero to meet a 2 degree target



Cumulative emissions for 2013-2030
=
10.1 GtCO₂e
=
Carbon budget recommended by CCA for 2013-2050

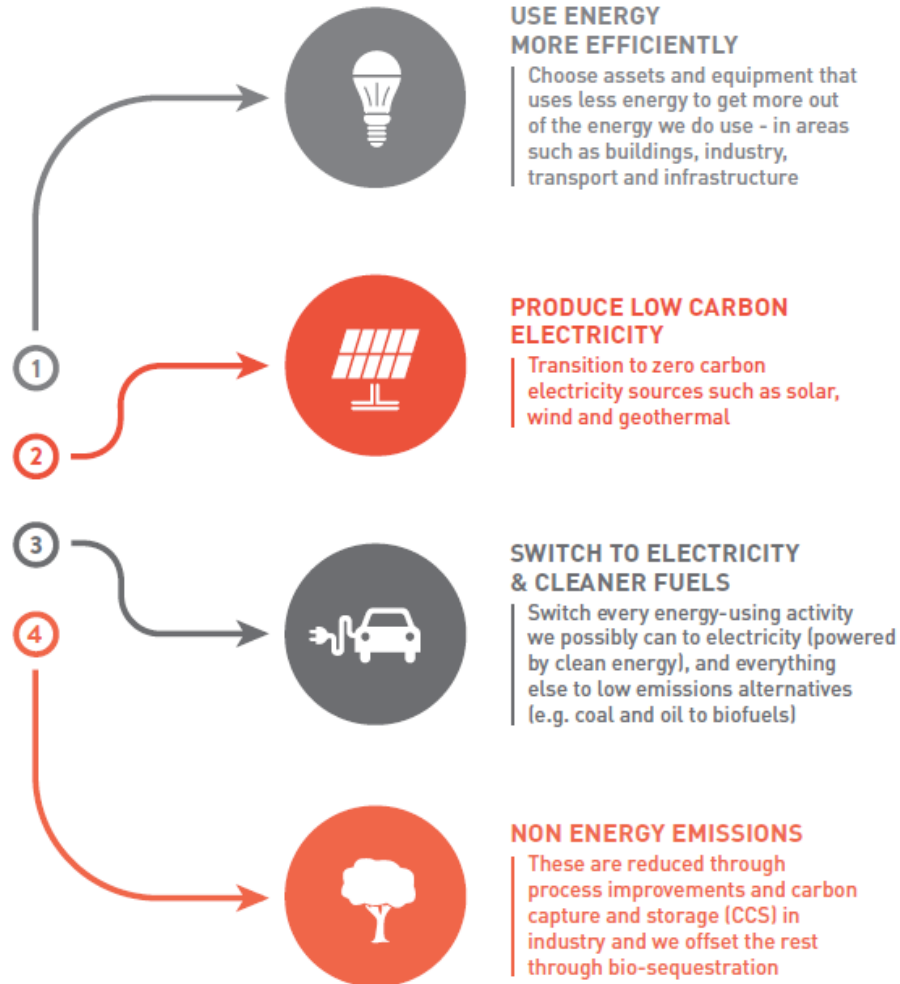


Our modelling shows that Australia can reach zero net emissions by 2050, while our economy continues to grow in line with recent trends



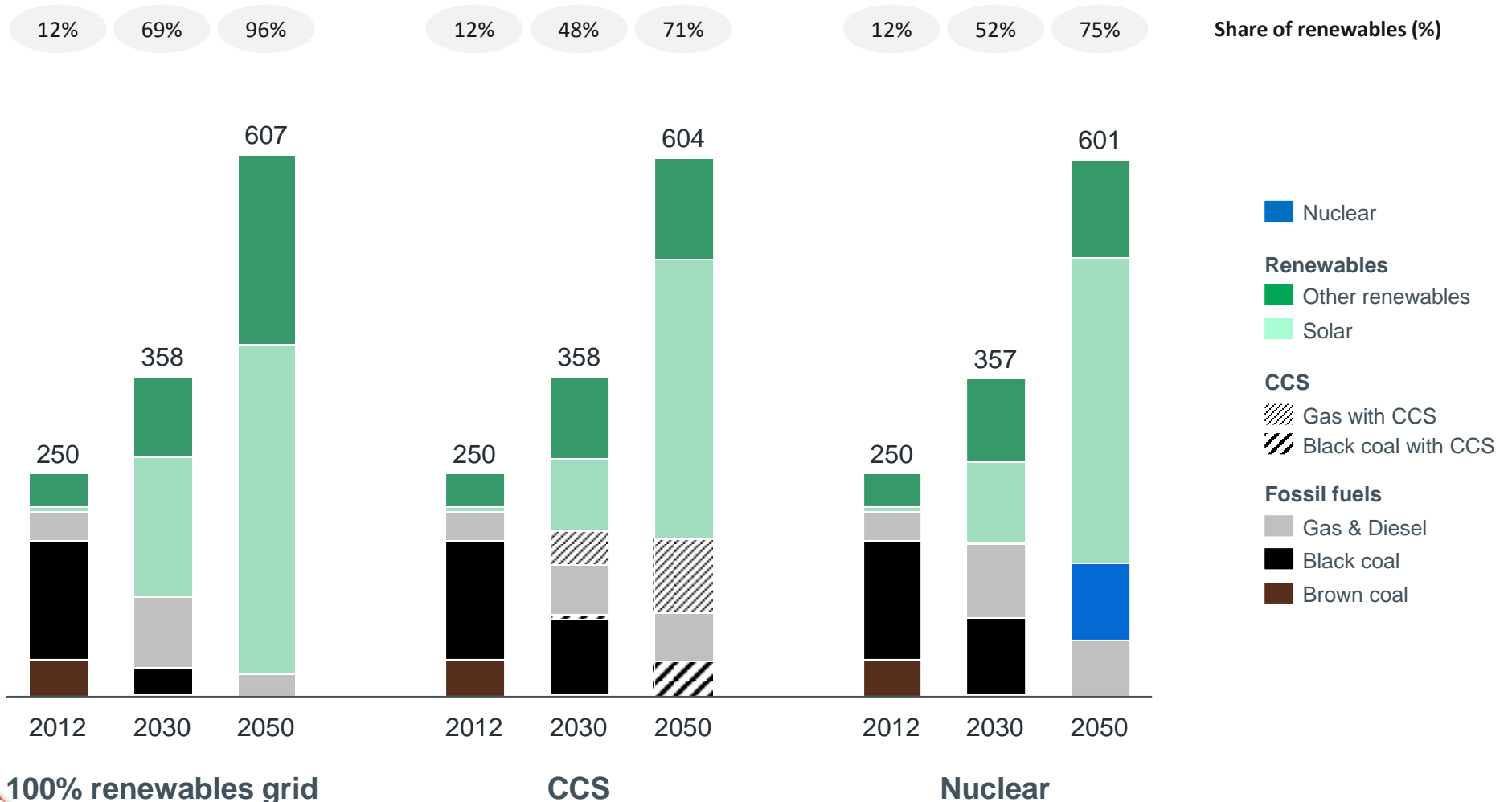
Deep decarbonisation can be achieved through four 'pillars' of transformation

Figure 3. The four pillars of decarbonisation



Australia's electricity grid can be almost completely decarbonised, with renewables expected to contribute the largest share of generation by 2050

Generation for three electricity scenarios, TWh



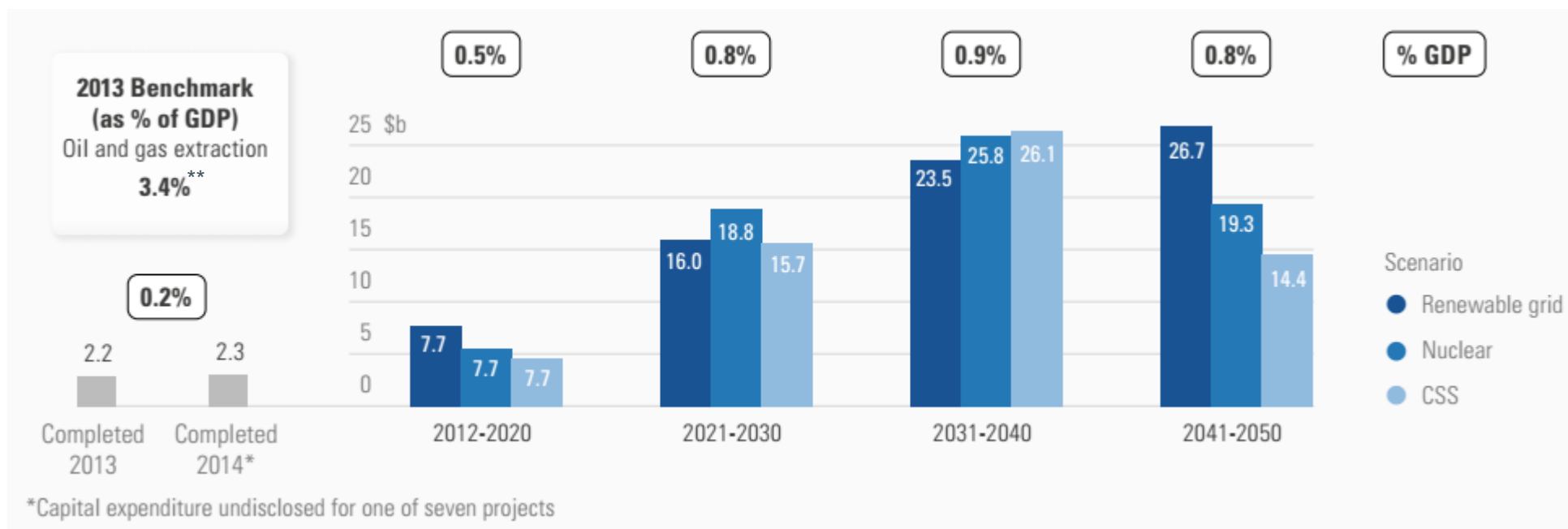
100% renewables grid

CCS

Nuclear

While the increase in investment in electricity generation is sizeable, it is small compared to what has been achieved in recent years

Average annual capital investment modelled in DDPP scenarios compared to current value of completed generation projects, \$b



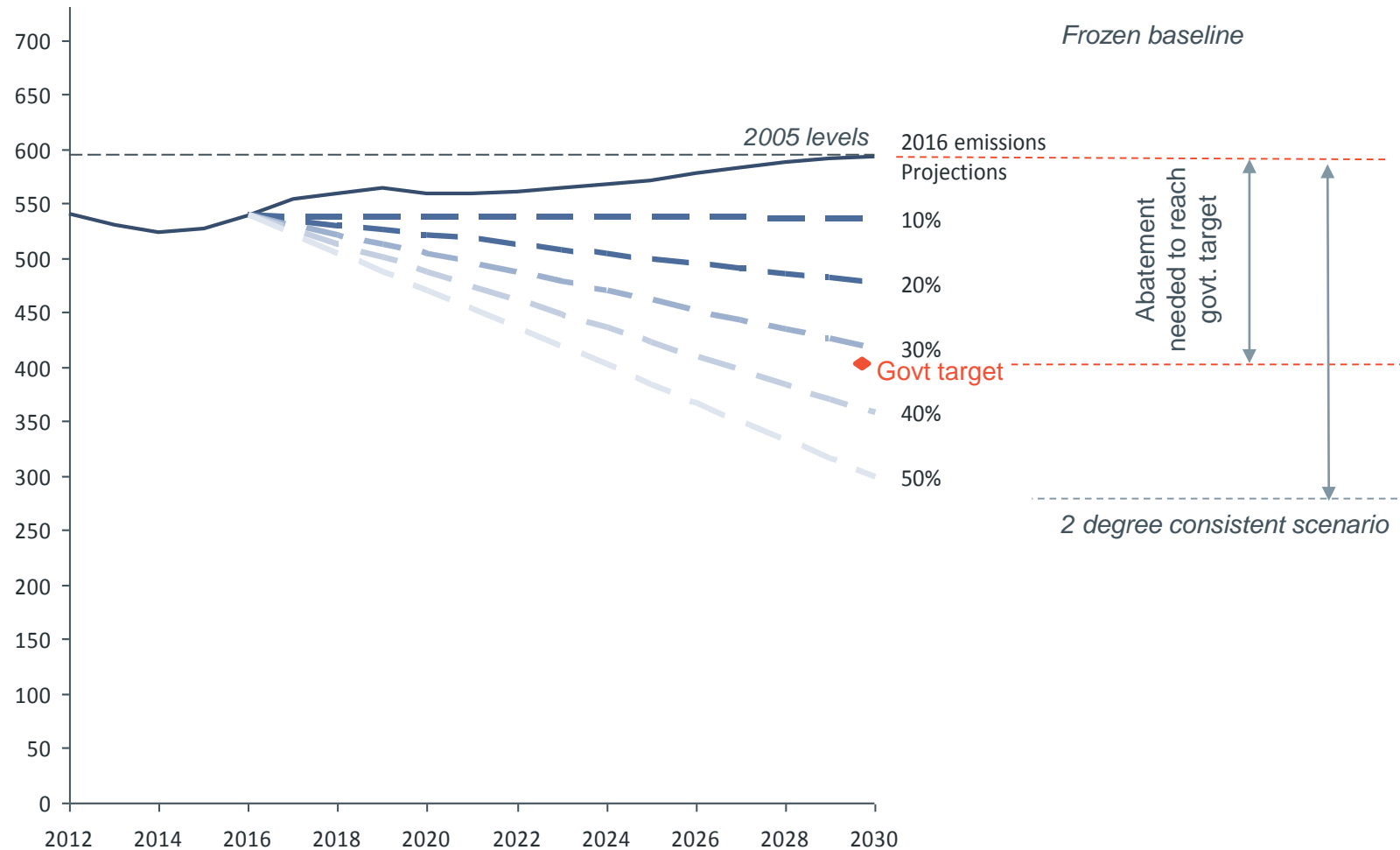
** from 0.5% in 2009, driven by LNG growth

Source: ClimateWorks Australia & ANU, Pathways to Deep Decarbonisation in 2050 (additional analysis); Bureau of Resource and Energy Economics 2014 Major Electricity Generation Projects; ABS capital investment data



A significant acceleration is needed to meet government targets

Australia's emissions projections to 2030 and potential emissions reduction targets below 2005 levels, MtCO₂e per annum



Source: data extracted from *Pathways to Deep Decarbonisation in 2050: How Australia can prosper in a low carbon world*, ClimateWorks & ANU, 2014

Renewable energy targets have been set or proposed at state and federal levels



Federal target: 23.5% (exp.) by 2020



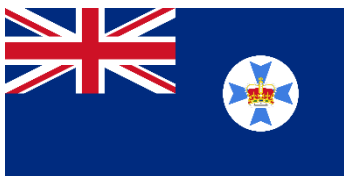
South Australia - 50% by 2025



Victoria - 40% by 2025



ACT: 100% by 2020

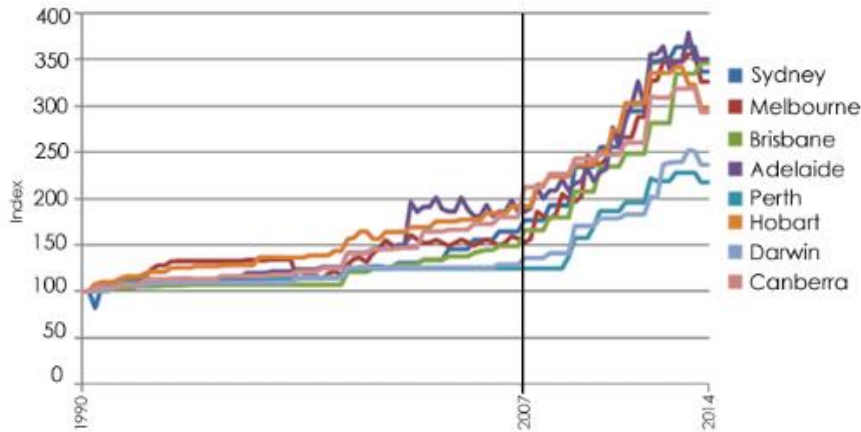


Queensland (proposed) - 50% by 2030



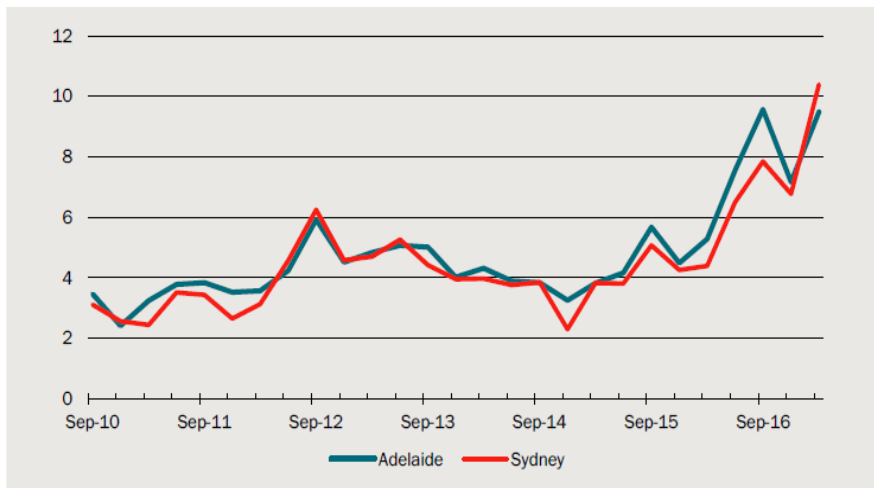
Energy price volatility and policy uncertainty are driving electricity costs up

Electricity Price Index (\$ per GJ)



Source: ABS

Gas Prices (\$ per GJ)



Data source: AER

- Current wholesale prices are between 30% and 100% above the long-run wholesale price
- Rising gas prices directly impact on electricity costs
- Policy uncertainty leads to higher costs of new capacity

CIE Review of economic modelling exercises & assessment of the impact of uncertainty

Investment is needed to ensure Australia's energy can be affordable, reliable and sustainable

Affordability

Energy Average household bills to rise by almost 11 per cent

ACT's electricity shock

Katie Burgess
Energy reporter

Electricity bills for the average Canberra household are set to rise by about 10.7 per cent from July under a draft determination by the ACT Independent Competition and Regulatory Commission (ICRC).

Shane Rattenbury said Canberra would still pay on average \$800 less than Queensland residents despite the proposed increase.

“Despite the proposed increase, the ACT will remain one of the lowest electricity prices in the country,” Mr Rattenbury said. Comparisons carried out by the ICRC showed Canberra electricity bills were on average about \$600 lower than Sydney’s, about \$600 less than Brisbane, \$100 cheaper than Adelaide, about \$200 less than Melbourne and around \$700 cheaper than Hobart. No data was available for Perth.

But the ICRC said if the wholesale price of electricity remained high, it was likely to result in a higher percentage price increase.

The commission noted the biggest driver of the estimated price increase was the wholesale electricity price, which has more than doubled from around \$2 per MWh to \$10 per MWh since June.

“We don’t regulate the wholesale market, that’s outside of our control but it seems to be the uncertainty we’re seeing in the market, as we’re seeing the price of fuel supply the gas go up, as the market restructures, we’re seeing all these uncertainties which have really driven the price up over the last 18 months,” Mr Rattenbury said.

“The ACT is still going to be the cheapest, to be fair part of that is because our network costs are a bit lower than the others and we do have regulated retail prices and we do try and keep the retail component of those prices as regulated as possible.”

“The bulk of today’s proposed increase is outside the control of the ACT, and similar price rises will be felt by most other Australian states.”

The draft ruling from the ICRC coincided with Energy Prime Minister Barnaby Joyce lambasting the ACT’s 10 per cent renewable

“Investment in new energy projects has a dual industry benefit: a clear plan for the future of energy in Australia, particularly on setting a price on carbon emissions.”

Mr Rattenbury said.

“The bulk of today’s proposed increase is outside the control of the ACT, and similar price rises will be felt by most other Australian states.”

The draft ruling from the ICRC coincided with Energy Prime Minister Barnaby Joyce lambasting the ACT’s 10 per cent renewable

Continued Page 2

STATE POLITICS

Power price surge is killing jobs, says Business SA

MEREDITH BOOTH

The Australian | 12:00AM May 20, 2017

NSW

Electricity price shock: Small business bills have doubled in the past decade

EXCLUSIVE Sharri Markson, The Daily Telegraph

February 27, 2017 12:00am

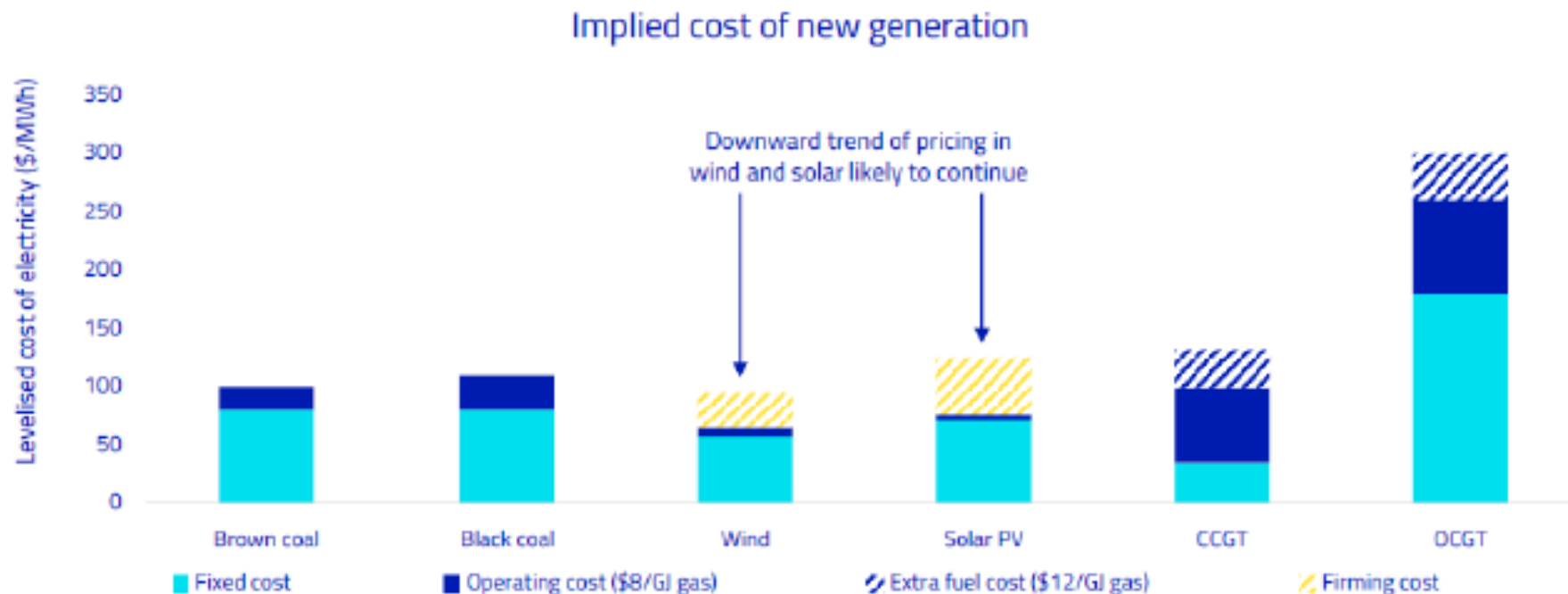
Reliability



Sustainability



Renewables are already cost competitive with conventional power

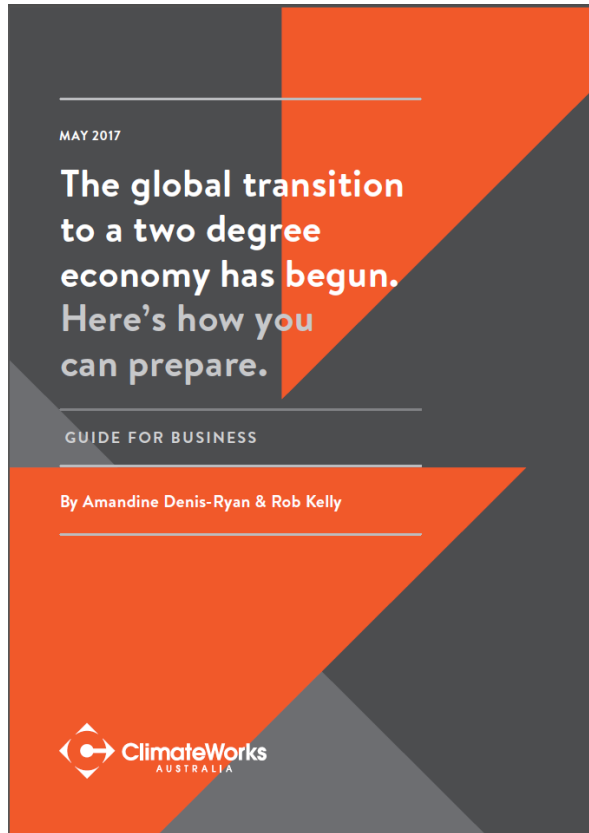


Source: AGL estimates; assumes capacity factors of 40% for wind, 25% for solar, 75% for CCGT and 10% for OCGT; heat rates of 8 for CCGT and 10 for OCGT.

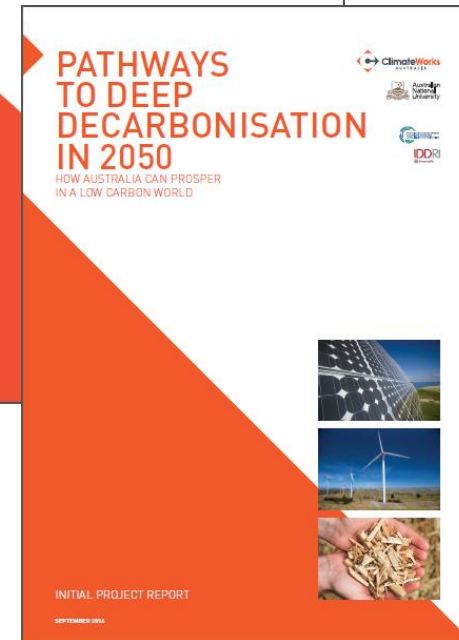
Source: AGL



Our guide and supporting analysis can be downloaded from our website



<http://www.climateworksaustralia.org/publication/report/global-transition-two-degree-economy-has-begun-heres-how-you-can-prepare>



<http://climateworks.com.au/project/national-projects/pathways-deep-decarbonisation-2050-how-australia-can-prosper-low-carbon>





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New Financial Trends in Electricity

“APRA wants to be explicit some climate risks are distinctly financial in nature. Many of these risks are foreseeable, material and actionable now.”

Geoff Summerhayes, APRA - February 2017

Tim Buckley, Director of Energy Finance Studies, Australasia
(tbuckley@ieefa.org)

Frontier Advisors - Melbourne



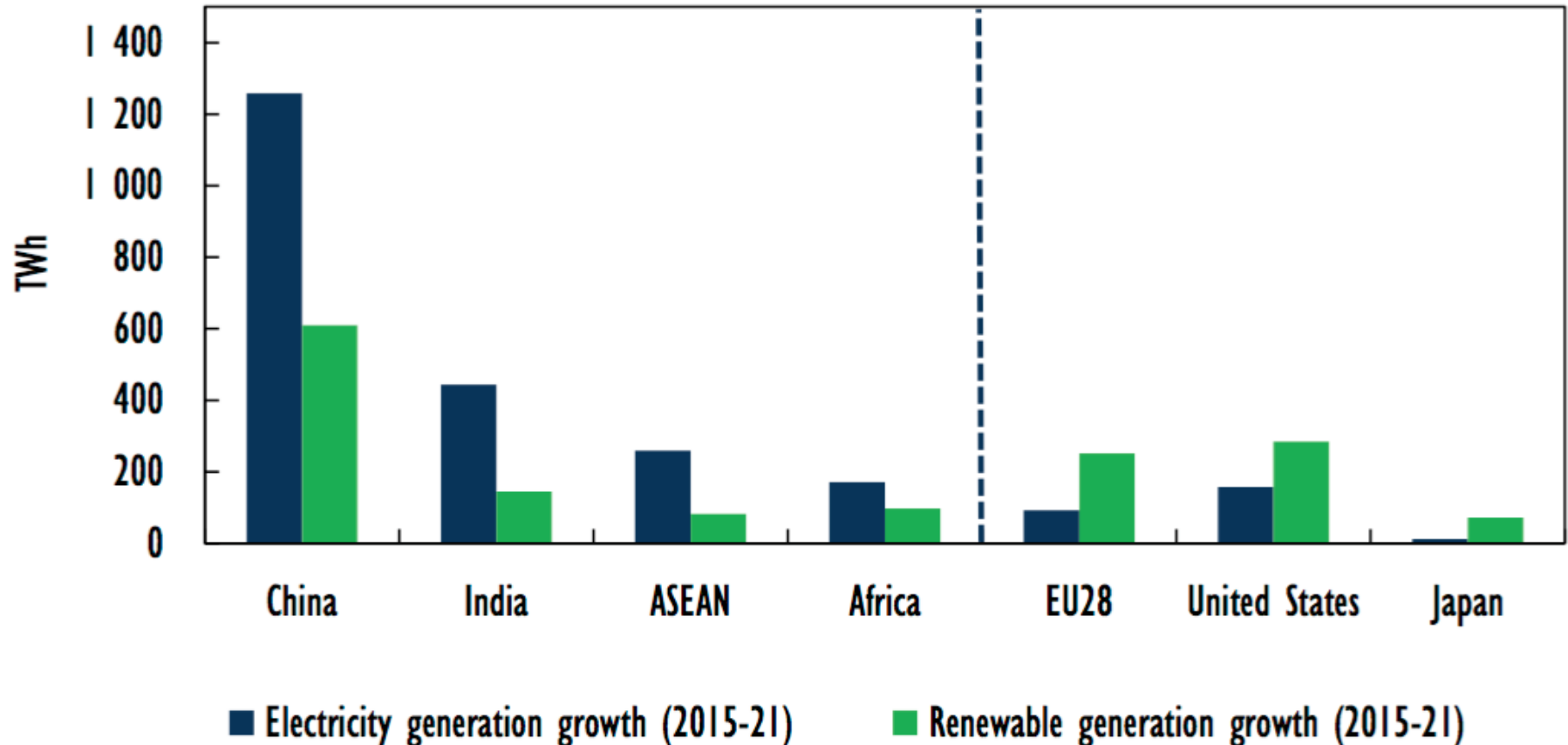
AGENDA

The Global Electricity Market Transformation

1. **Setting the Scene – Global Policy: Momentum is building, not fast enough**
2. **Electricity Markets are Transforming – different pressures, same outcome**
 - China
 - India
 - America
 - Germany
 - Mexico
3. **Thermal Coal Price – structural decline of seaborne market?**
 1. **Renewables are deflationary**
 - Technology gains and economies of scale
 - Batteries will transform distributed solar on rooftops from 2018.
5. **Financial Markets Are Moving**

1.1 IEA

Electricity and renewable generation growth by country/region

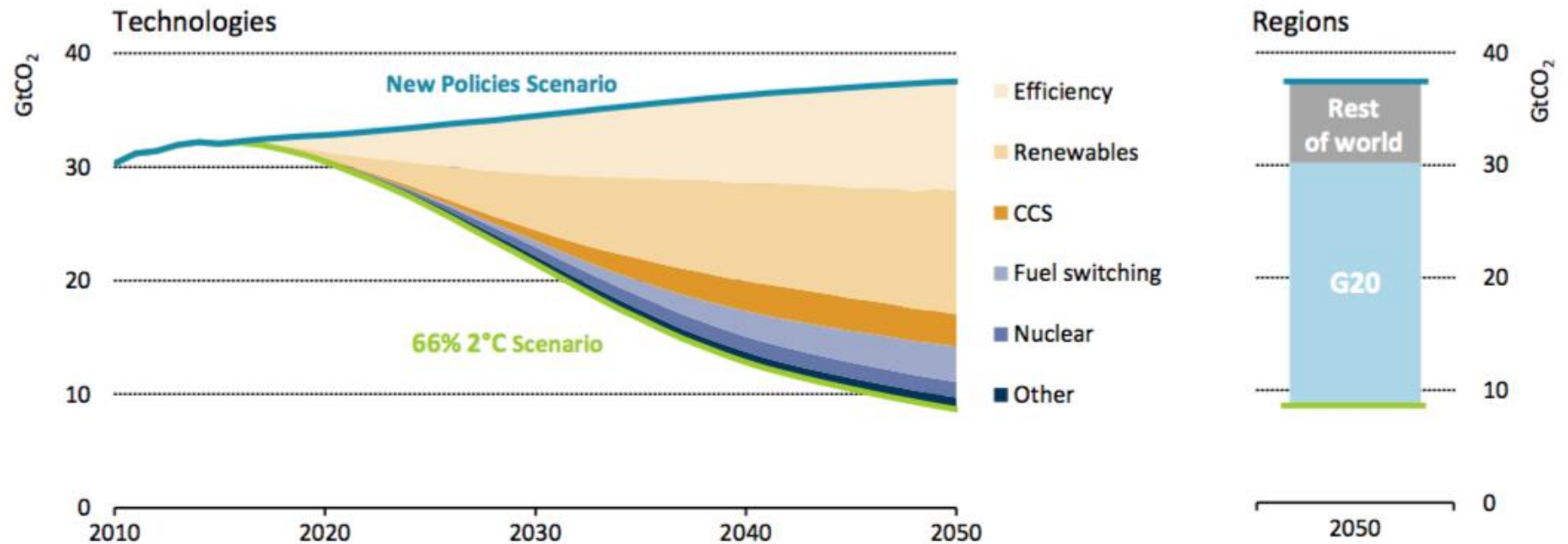


Source: Total electricity generation from World Energy Outlook 2016, forthcoming.

IEA figures released in Nov 2016 – upgrading world wind electricity forecast by 50% to 5,394TWh by 2040.

1.1 IEA

Figure ES.1 • Global emissions abatement by technology and region in the 66% 2°C Scenario relative to the New Policies Scenario



Note: The New Policies Scenario reflects the implications for the energy sector of the NDCs of the Paris Agreement.

The Paris Climate Agreement is well short of a 2 degree C scenario

2. Electricity Markets are Transforming

China State Grid's Chairman in February 2016 stated:

The only hurdle to overcome is "mindset," Liu said. "There's no technical challenge at all."

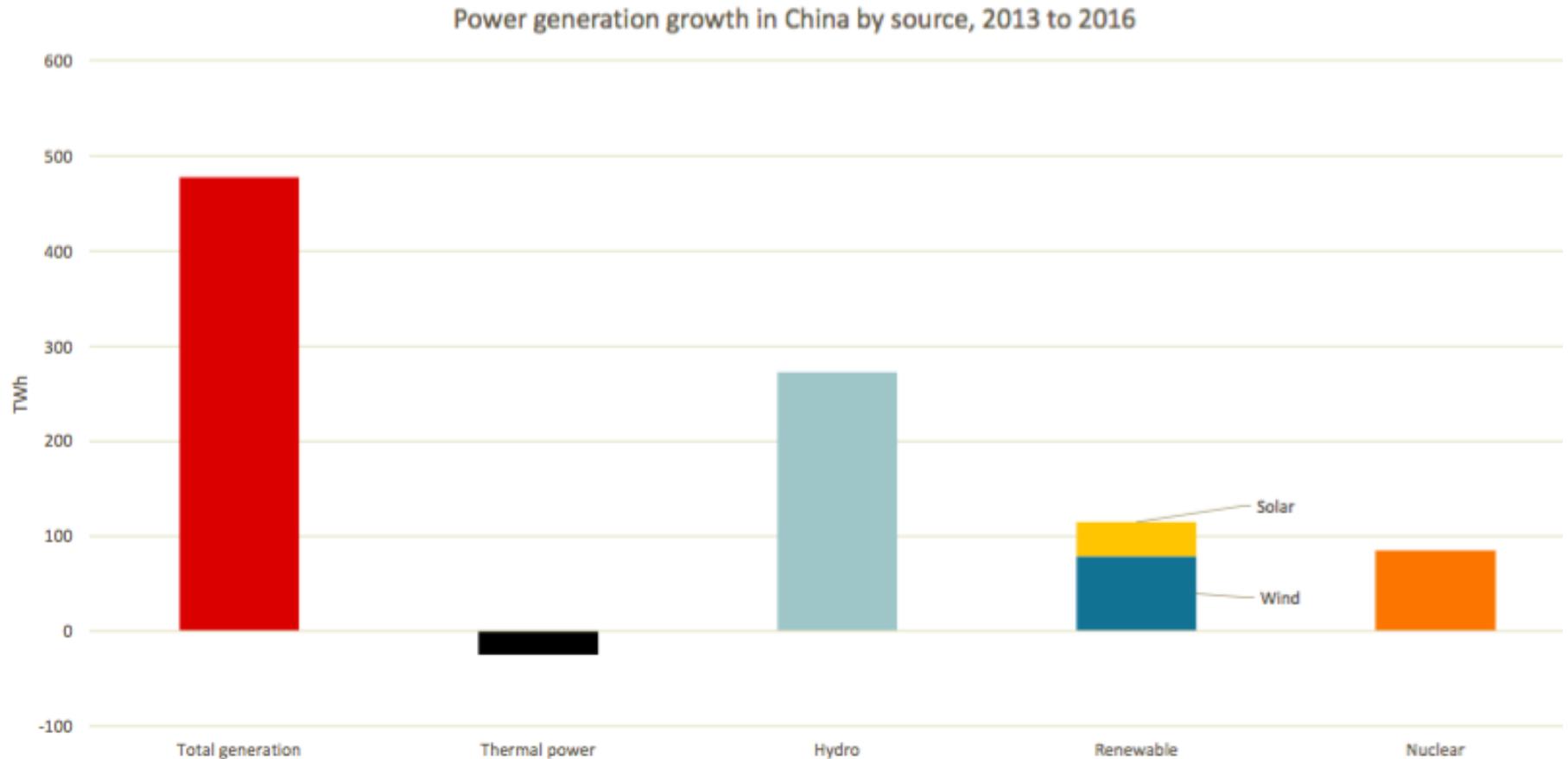
2.1 IEA Energy Productivity - China

Energy Productivity	2003-2013	2014	2015	2016
GDP Growth	10.0%	7.3%	6.9%	6.7%
Energy Intensity	-2.2%	-4.8%	-5.6%	-5.2%
TPES *	7.6%	1.6%	0.9%	1.1%

* TPES - Total Primary Energy Supply

Something fundamentally shifted post 2013

2.1 China's Thermal power peaked 2013

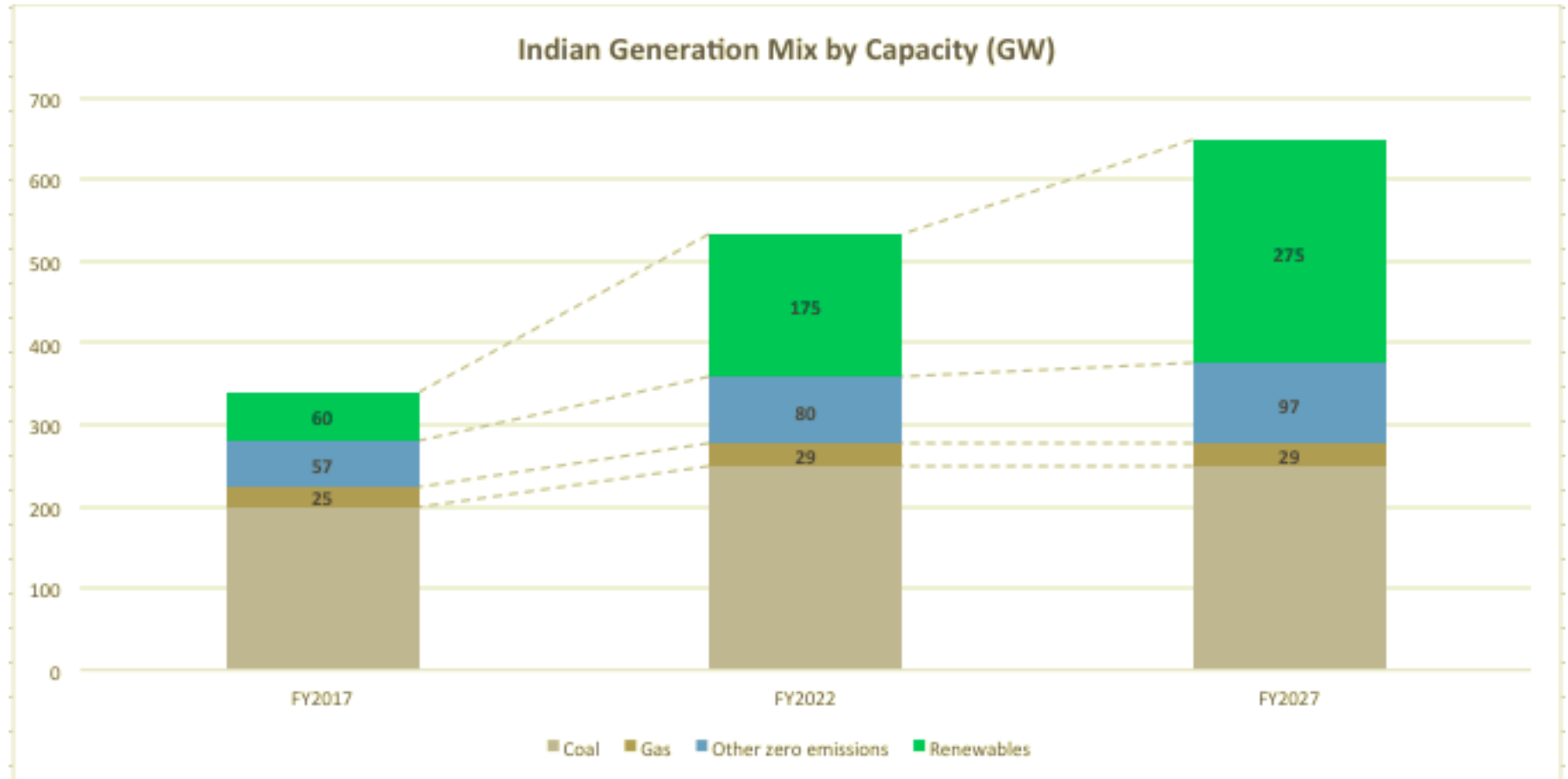


2.2 India

India's Energy Minister Goyal stated December 2016:

- 1. A plan to transformation the entire Indian electricity system with 275GW of renewable energy installs by FY2027 vs 43GW in FY2016. This involves a doubling of wind installs to 6GW pa and trebling solar installs to >10GW pa.*
- 2. Thermal power of 265GW in FY2027 would represent just 43% of total system capacity, down from 69% in FY2016. The CEA concluded no new coal fired capacity was needed this coming decade.*
- 1. Plans to more than double India's domestic coal production to 1.5Bn tpa by 2021, requiring a massive investment in rail infrastructure, CH&PP plus major new domestic mine development.*

2.2 India



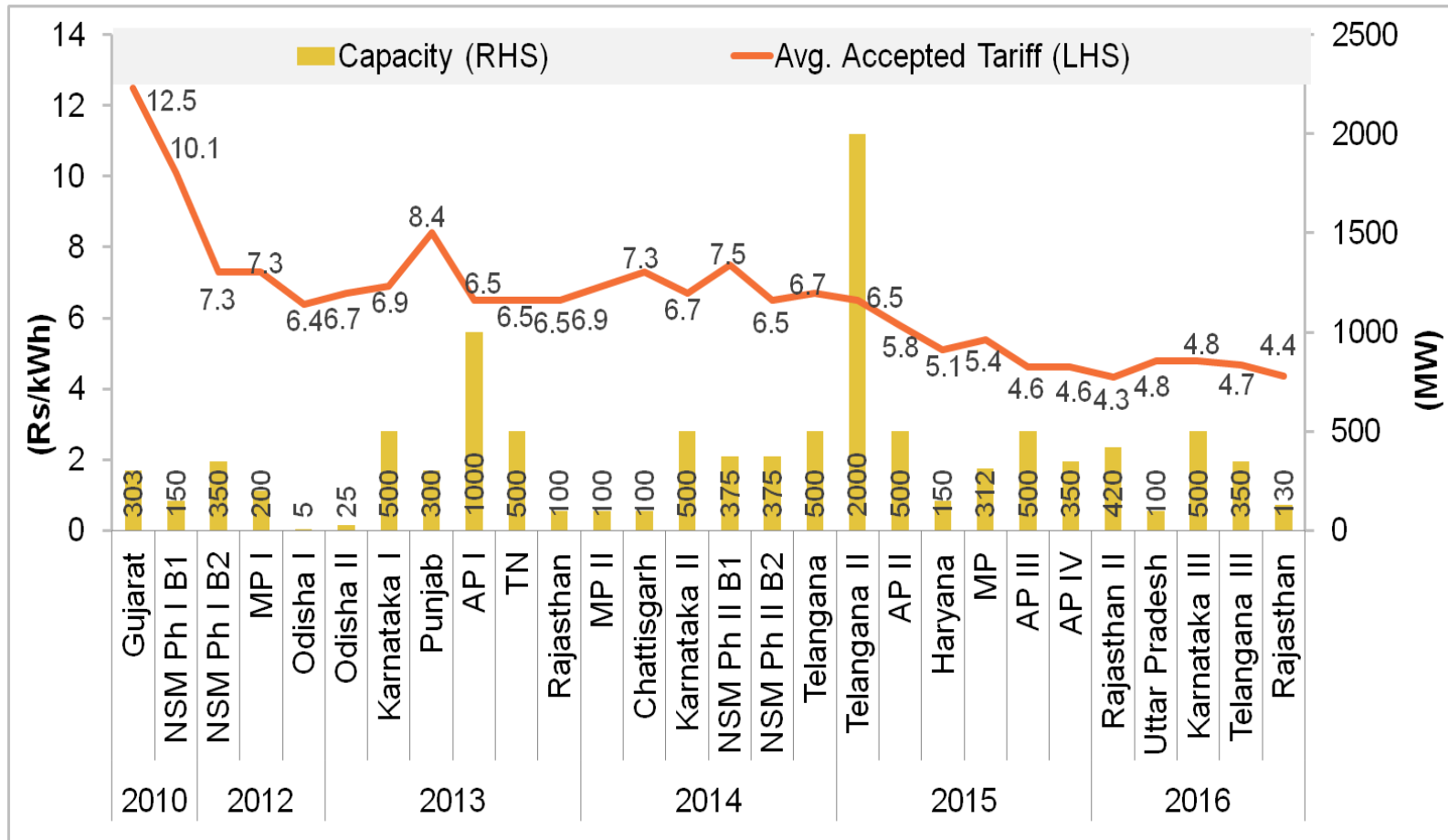
2.2 India

Coal imports peaked in 2014/16. After the 6% yoy decline 2015/16 and an expected further 10% fall in 2016/17 for coal imports, Energy Minister Piyush Goyal stated rather categorically:

“Indian companies used to import a lot of thermal coal. We want to completely stop its import over the next 2-3 years. We have already reduced imports by Rs280bn. We will save Rs400bn.”

2.2 India – Solar Tariffs Are Falling Rapidly

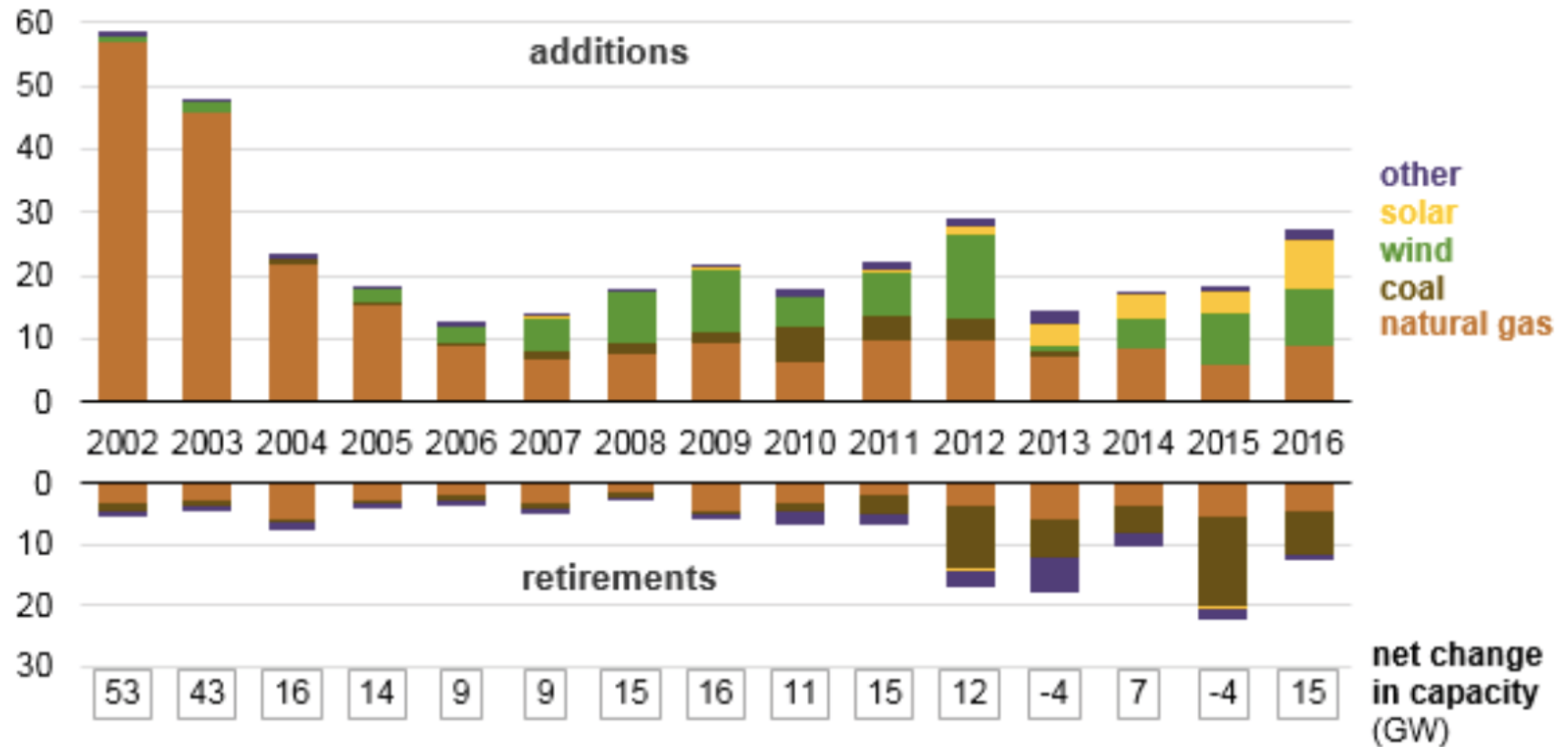
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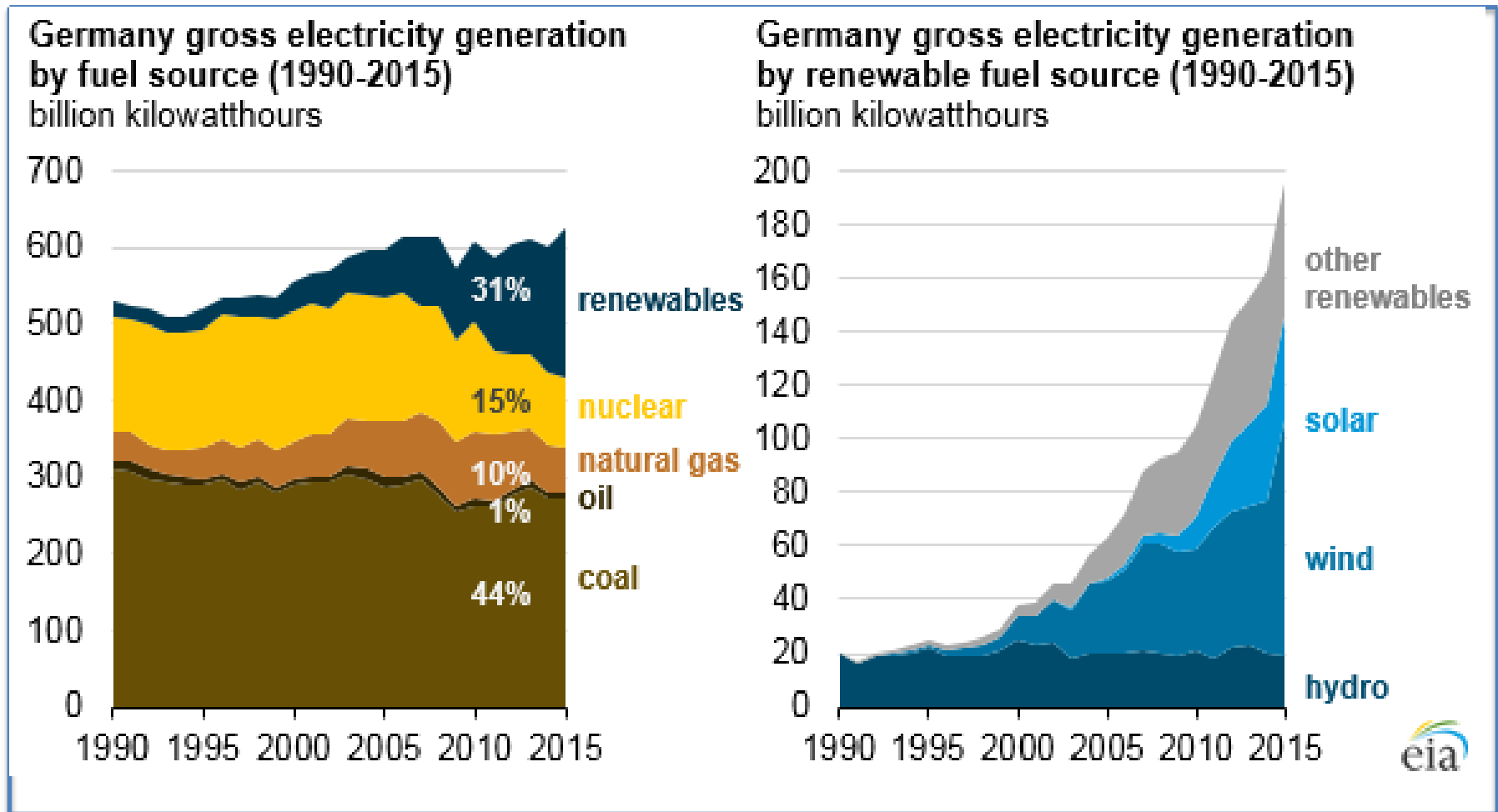
April 2017: A new low utility solar of Rs2.44/kWh (US\$38/MWh) was set: 30% lower than two months earlier. This is down from Rs12/kWh in 2010.

2.3 US Electricity Transformation

U.S. utility-scale electric capacity additions and retirements (2002-16)
gigawatts

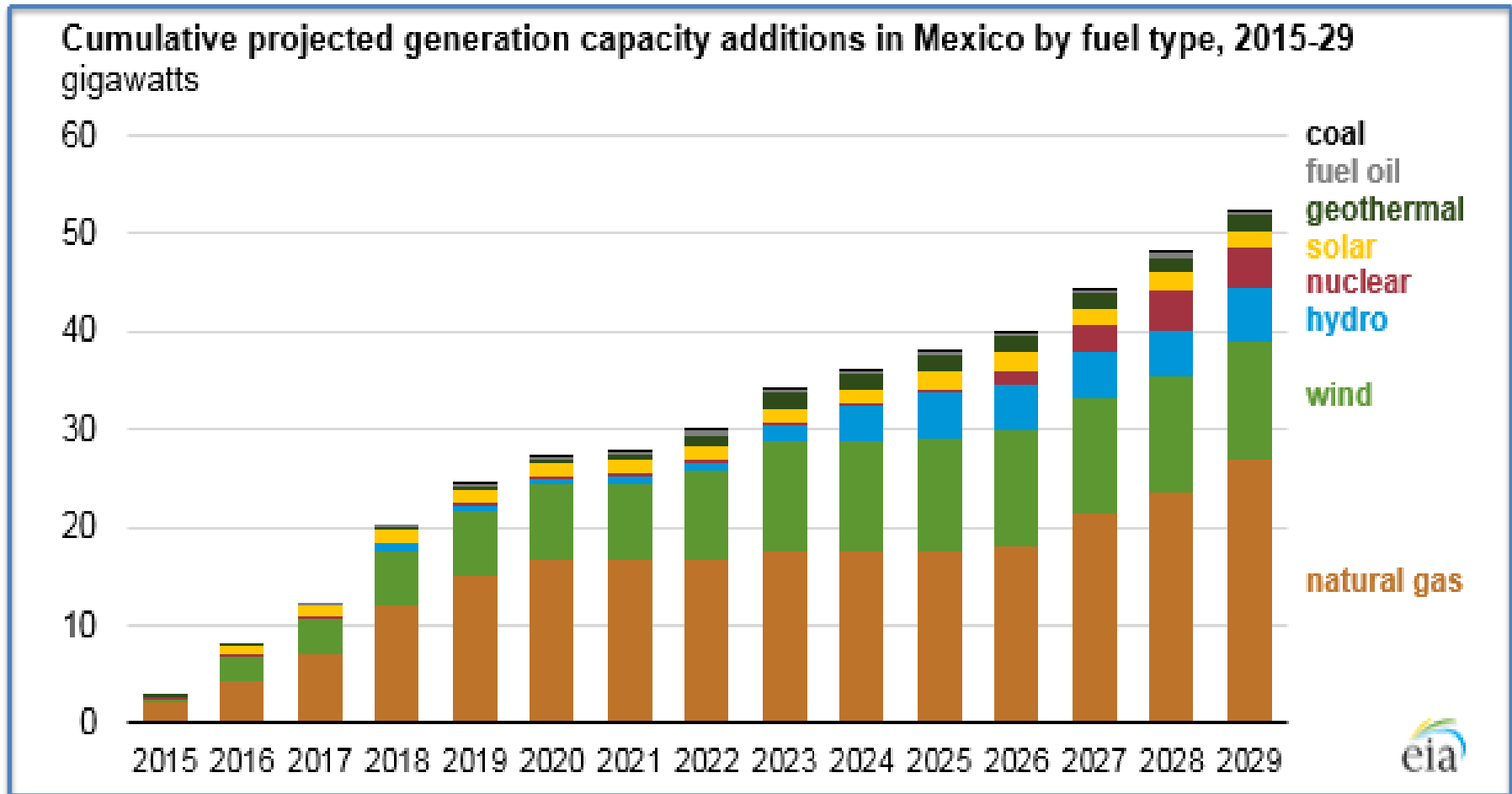


2.4 German Electricity Transformation



Energiewende: renewable sources hit 40.9% share in March 2017; to increase to 40-45% by 2025 and to >80% by 2050

2.5 Mexican Electricity Transformation



Mexico plans a 53GW capacity expansion by 2029, 25GW of which is renewables. The large gas expansion using imported US gas is threatened by Trump's Mexican plans. Meanwhile, domestic solar and wind at US\$35-40/MWh.

3 Thermal Coal Export Price Volatility

Coal, Australian thermal coal Monthly Price - US Dollars per Metric Ton

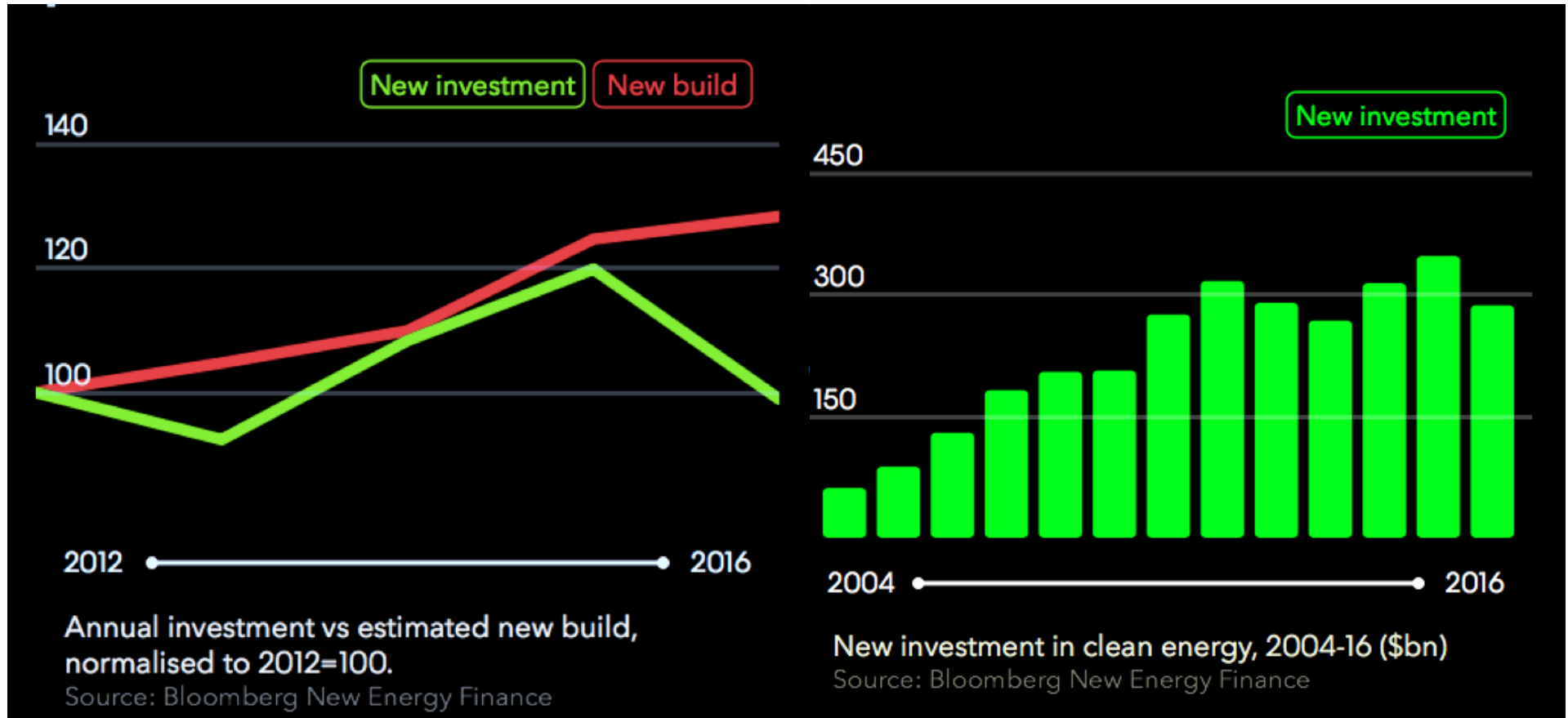
Range

May 2007 - Apr 2017: 30.690 (51.15 %)



Description: Coal, Australian thermal coal, 12000- btu/pound, less than 1% sulfur, 14% ash, FOB Newcastle/Port Kembla, US Dollars per Metric Ton

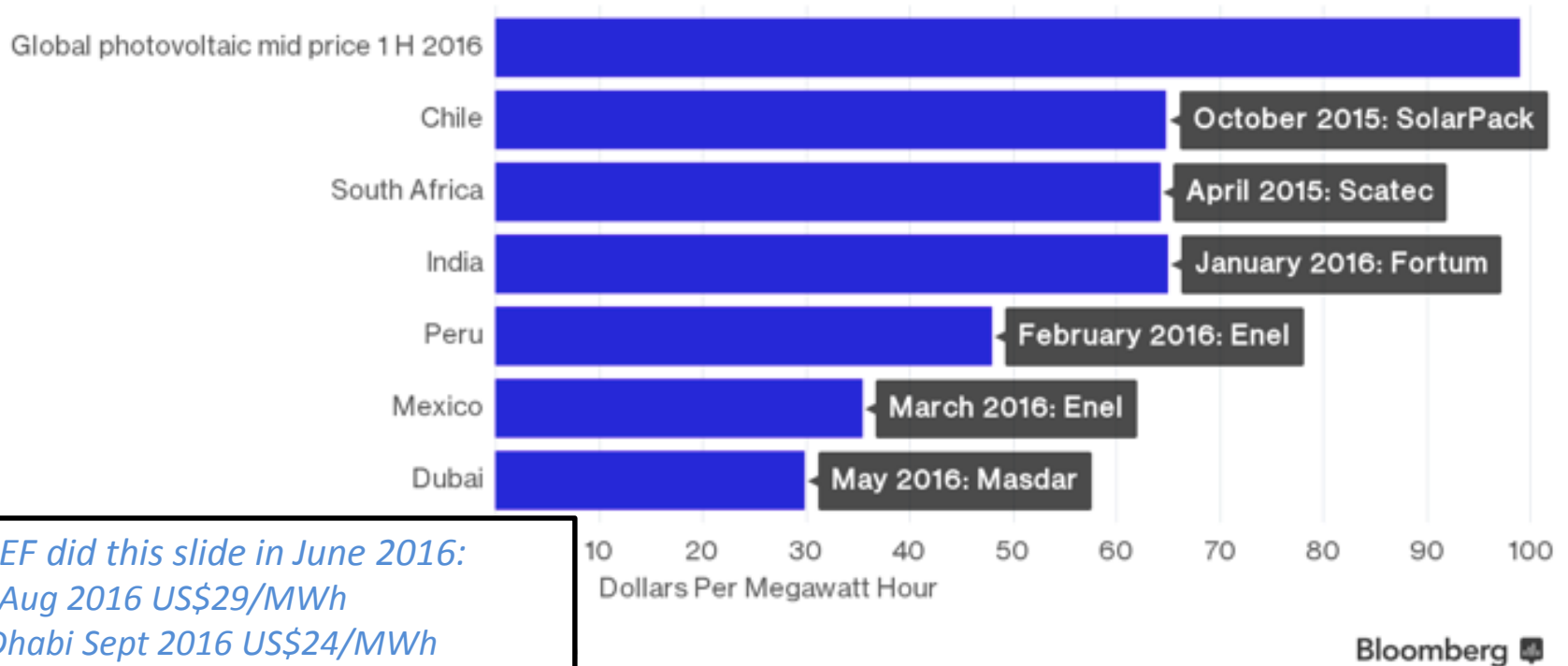
4 Renewable Energy



4.1 Solar cost reductions

Auctions Driving Down Solar Farm Prices

Companies are winning auctions with record low bids around the world

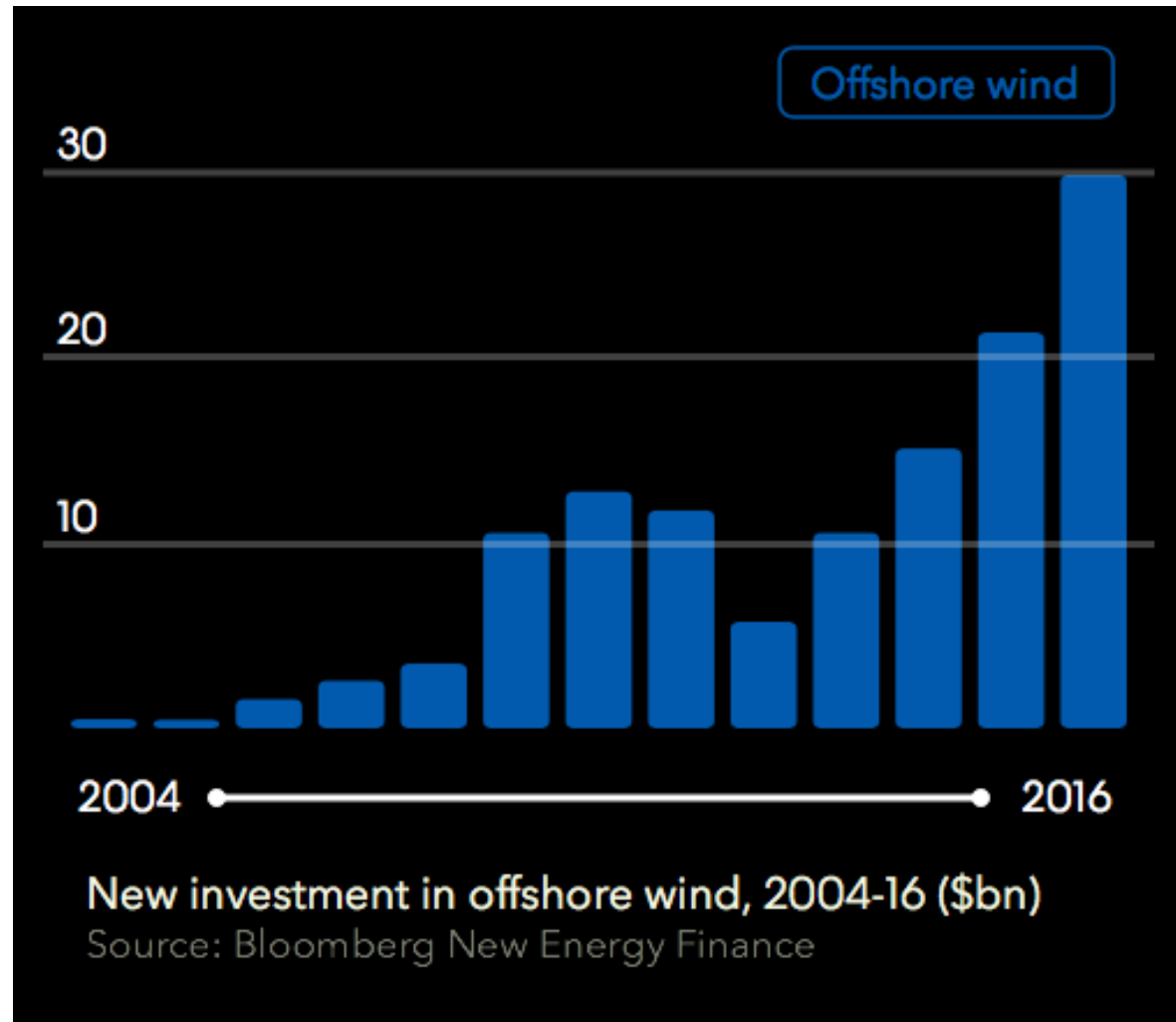


Since BNEF did this slide in June 2016:

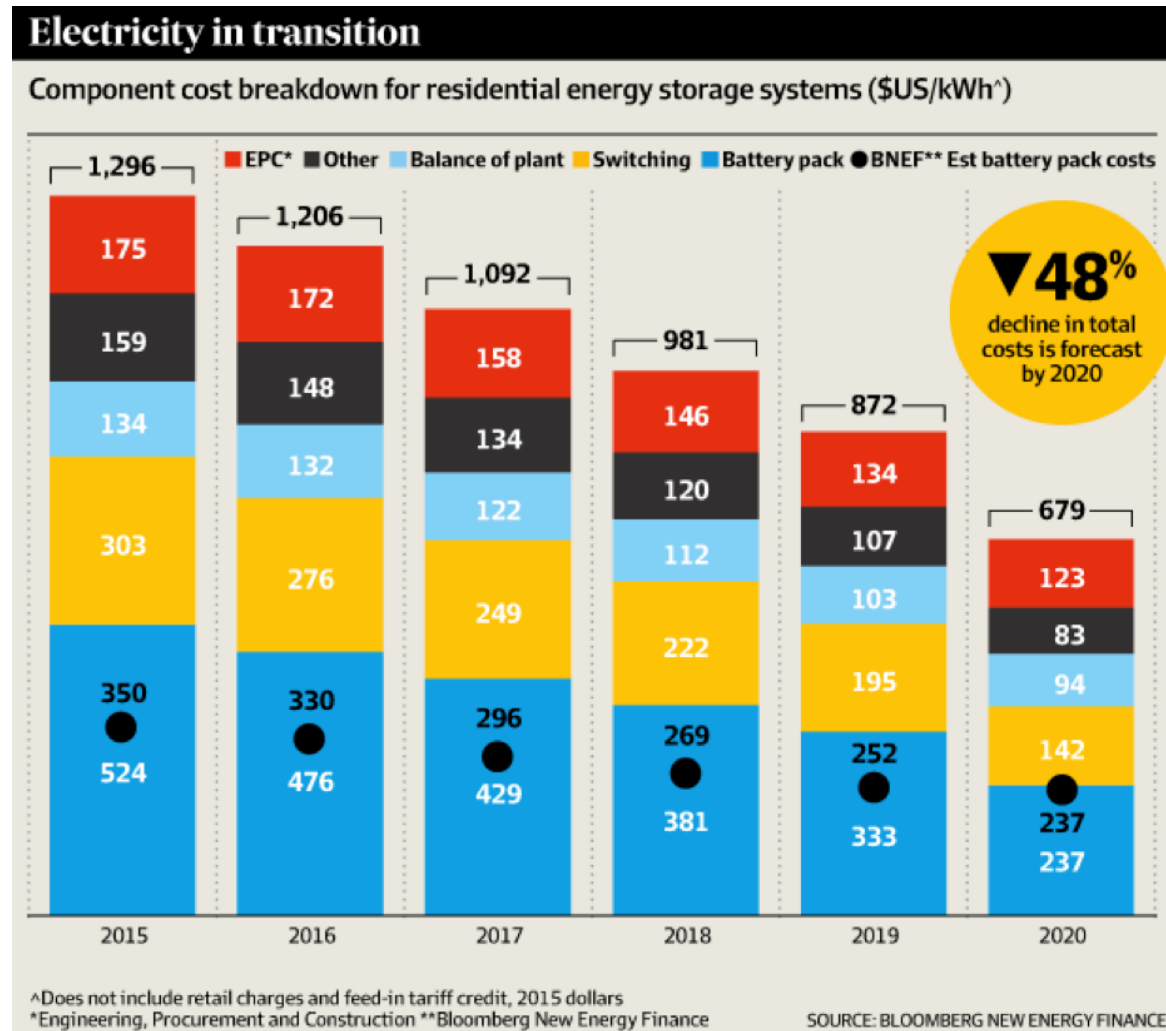
- Chile Aug 2016 US\$29/MWh
- Abu Dhabi Sept 2016 US\$24/MWh
- Australia Dec 2016 US\$64/MWh
- Germany Feb 2017 US\$54/MWh
- Abu Dhabi March 2017 US\$24/MWh
- India April 2017 US\$38/MWh

4.3 Offshore Wind – Just Starting

Nov 2016: Vattenfall tendered a record low €50/MWh (US\$53) for offshore wind in Denmark. This is half the rate forecast by IRENA for 2025.



4.4 Storage is coming, rapidly



5 Financial Markets Are Moving

1. **Norwegian Sovereign Wealth Fund – US\$1 Trillion FUM - 2015**
2. **Bank of England – Governor Mark Carney – 2015
“Tragedy of the Horizons”**
3. **AXA of France (€717Bn FUM)/Allianz of Germany (€2 trillion)**
1. **National Australia Bank: Wont invest in Carmichael Coal - 2015**
2. **Blackrock - \$5.3 Trillion FUM – 2016: call for global carbon price**
3. **Deutsche Bank – 2017 – No new finance of thermal coal mines / plants**
4. **APRA – Feb 2017 – Financial institutions must analyse climate risk**
5. **Westpac – May 2017 - No new finance of thermal coal mines / plants**

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