



BLOOMBERG NEW ENERGY FINANCE SUMMIT 2015

**NEW YORK
14 APRIL 2015**

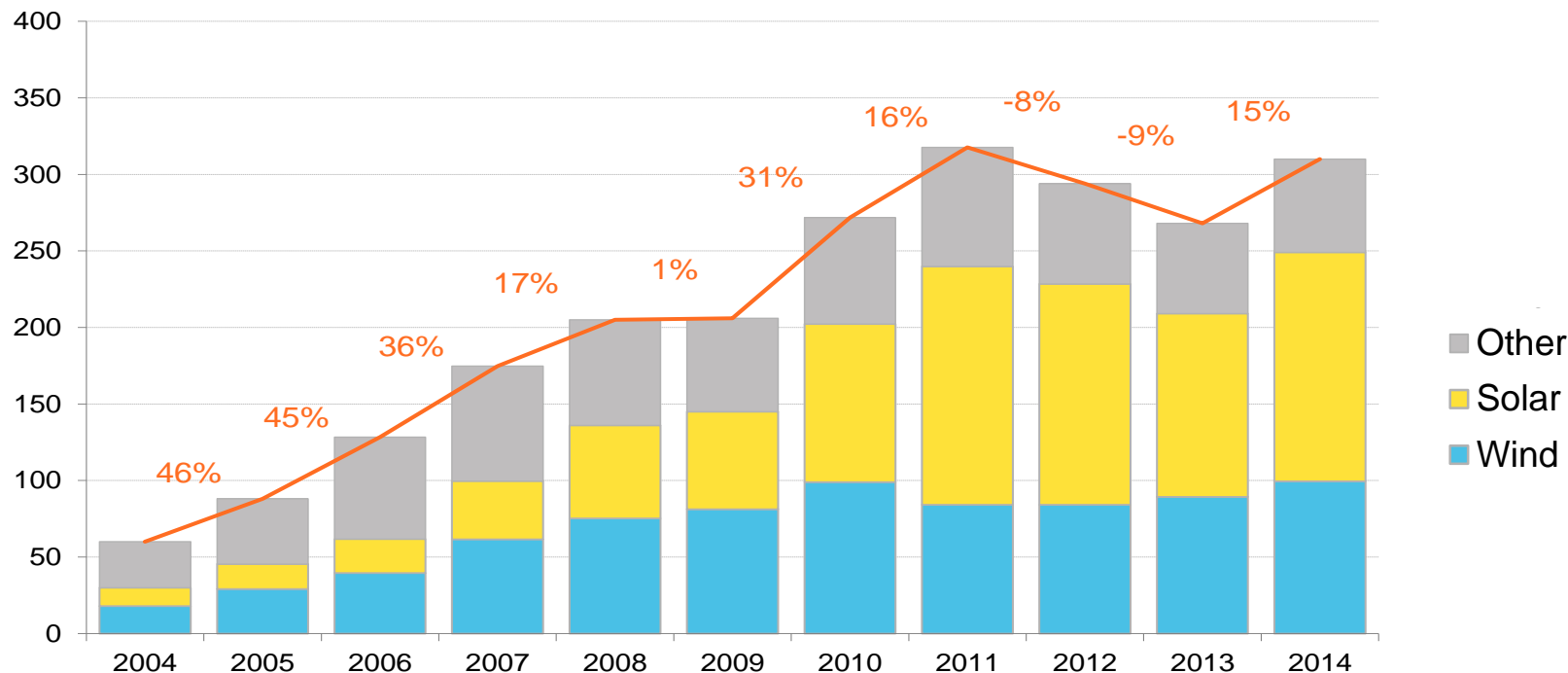
Michael Liebreich, Chairman
of the Advisory Board

Twitter: @mliebreich

Bloomberg
NEW ENERGY FINANCE

NEW INVESTMENT IN CLEAN ENERGY

2004-14 (\$BN)

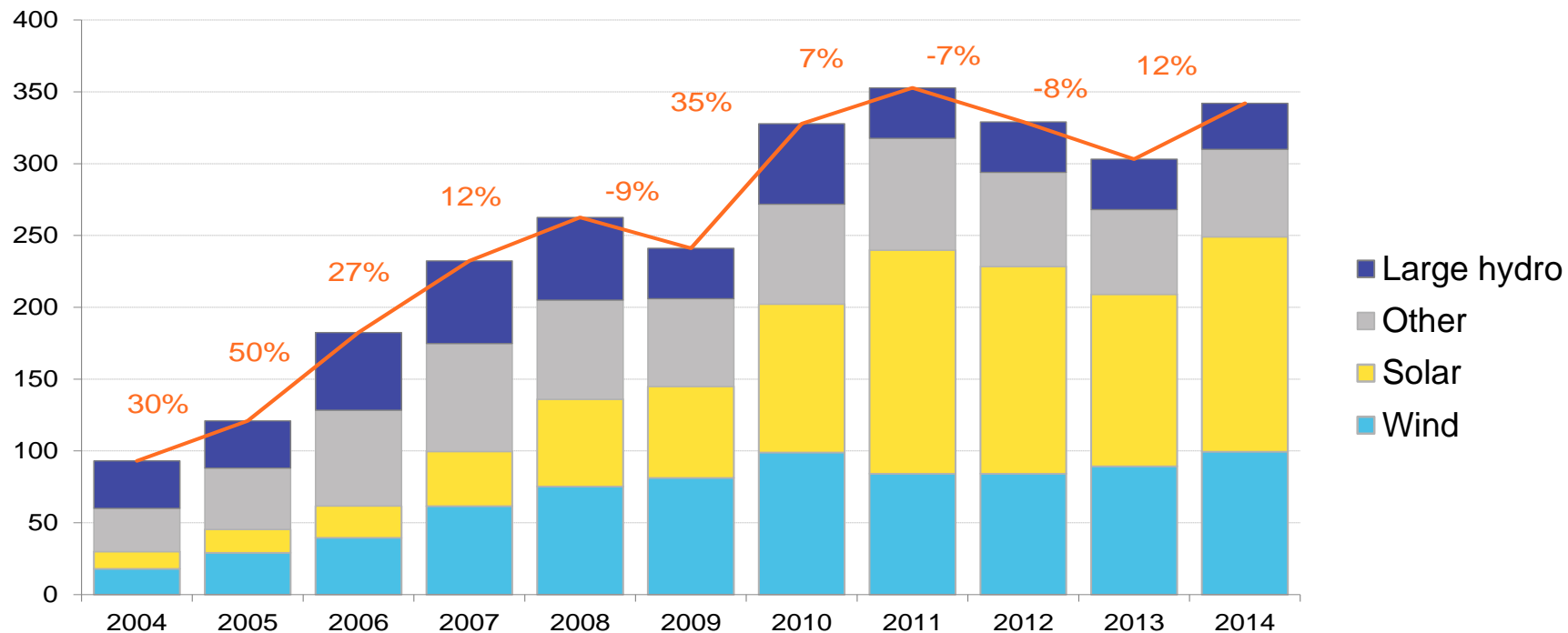


Note: Total values include estimates for undisclosed deals. Includes corporate and government R&D, and spending for digital energy and energy storage projects (not reported in quarterly statistics), as well as a BNEF estimate for large hydro investment.

Source: Bloomberg New Energy Finance

NEW INVESTMENT IN CLEAN ENERGY

2004-14 (\$BN)

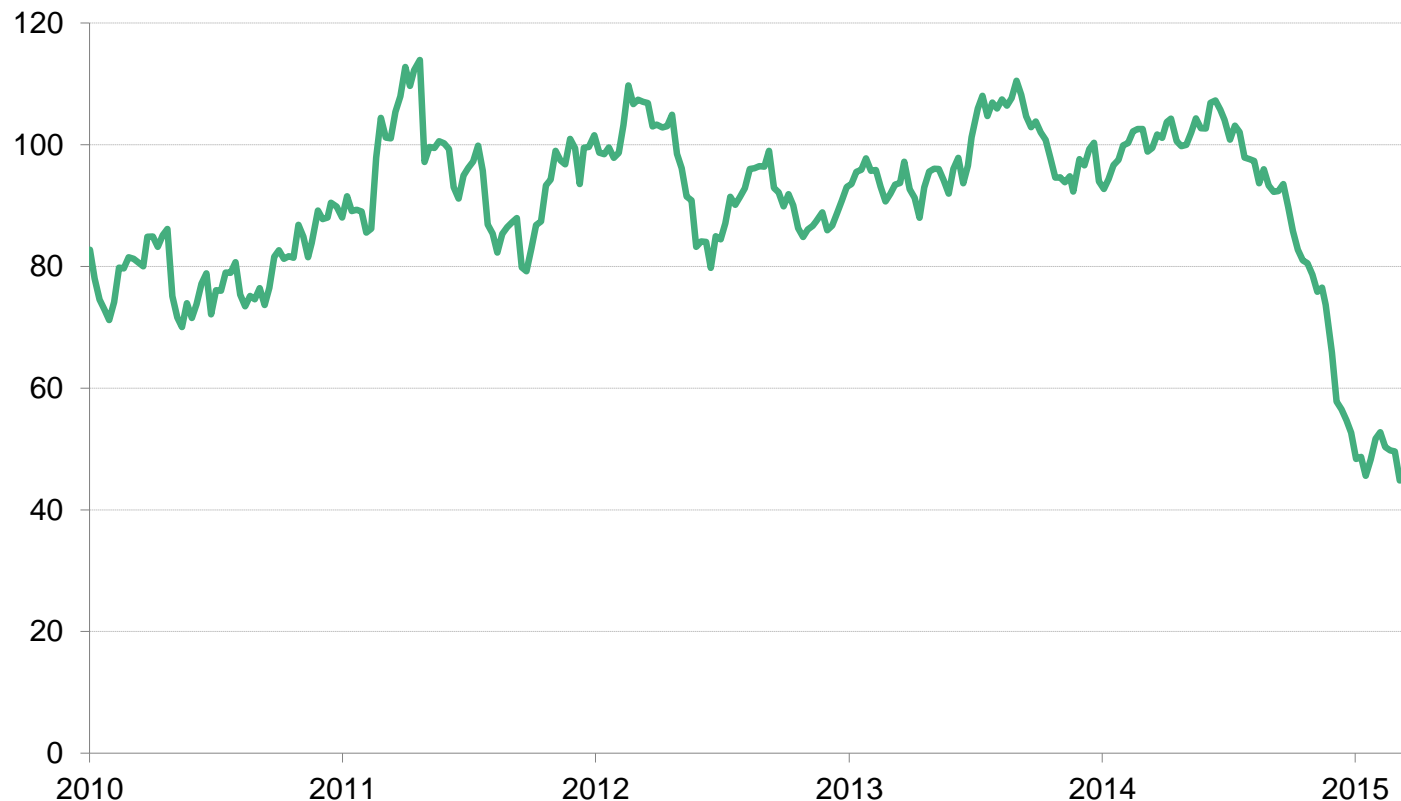


Note: Total values include estimates for undisclosed deals. Includes corporate and government R&D, and spending for digital energy and energy storage projects (not reported in quarterly statistics), as well as a BNEF estimate for large hydro investment.

Source: Bloomberg New Energy Finance

WTI CRUDE OIL PRICES, 2010–14

(\$2014 / BARREL)

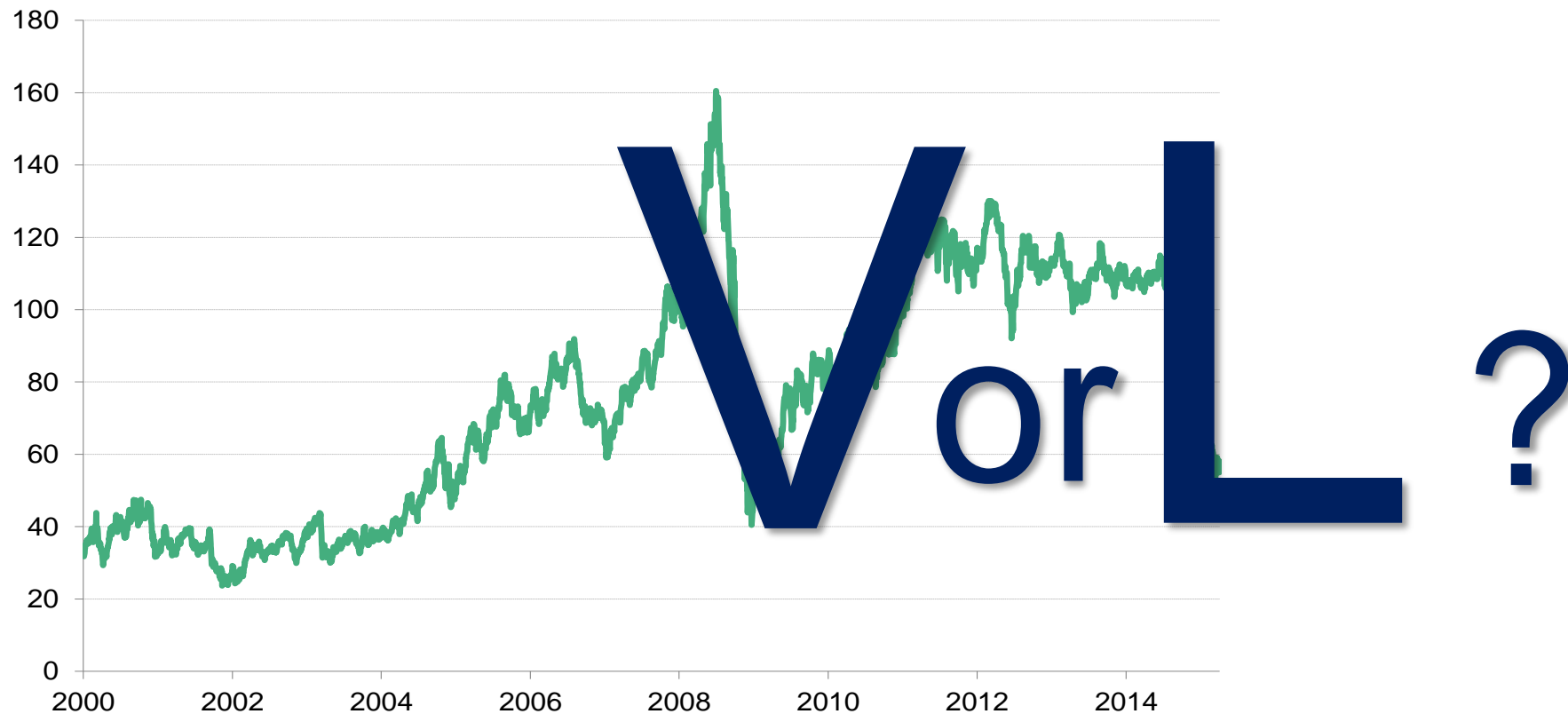


Note: WTI crude oil prices adjusted to inflation

Source: Bloomberg New Energy Finance, World Bank

WTI CRUDE OIL PRICES, 2000–14

(\$2014 / BARREL)



Source: Bloomberg New Energy Finance, World Bank

Note: WTI crude oil prices adjusted to inflation



Abdalla El-Badri, Secretary General,
OPEC

“If you don’t invest in oil
and gas, you will see
more than \$200”



Bob Dudley CEO, BP

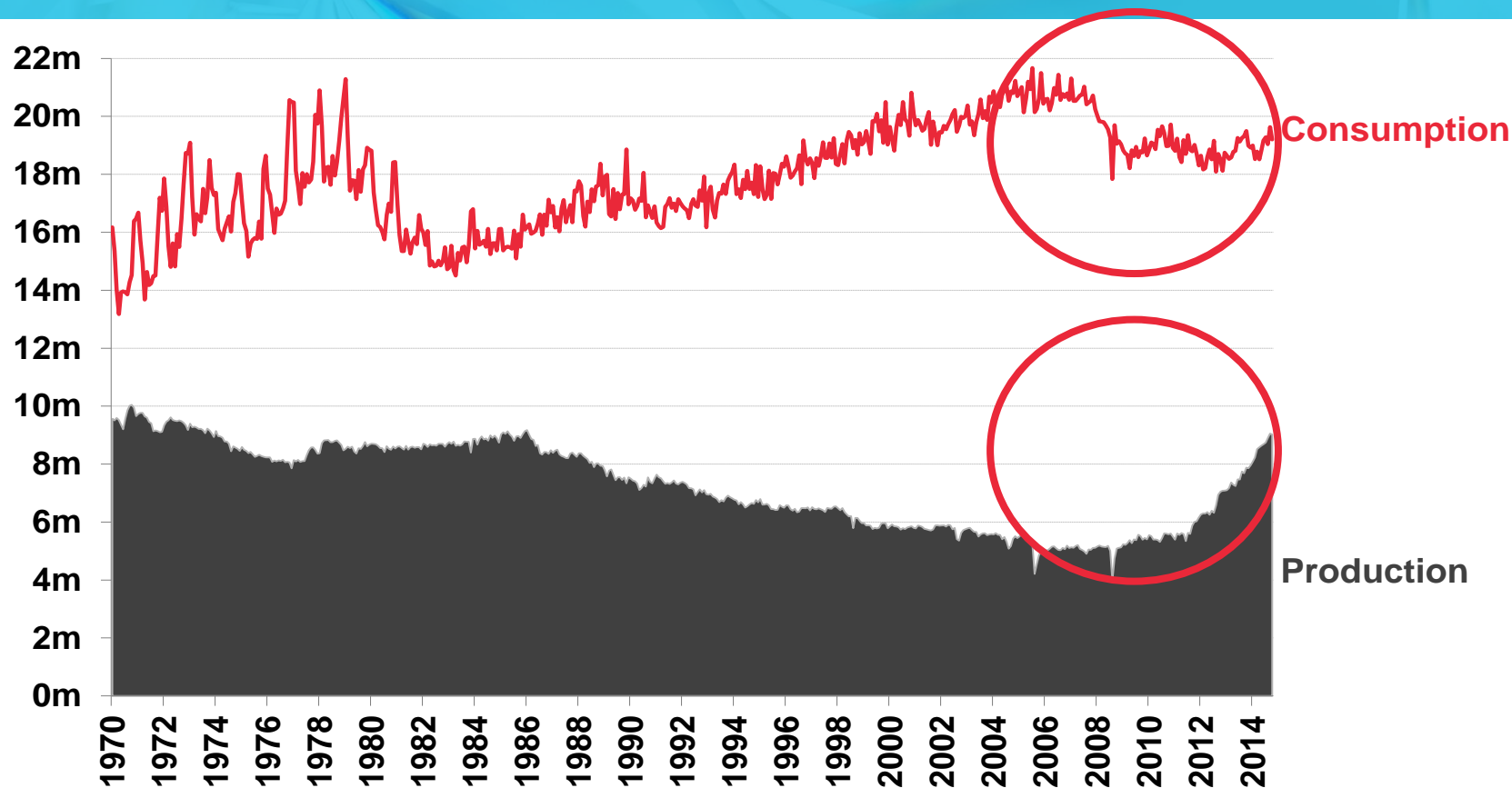
You won’t see \$100 oil
again “for a long time”

Images: Bloomberg



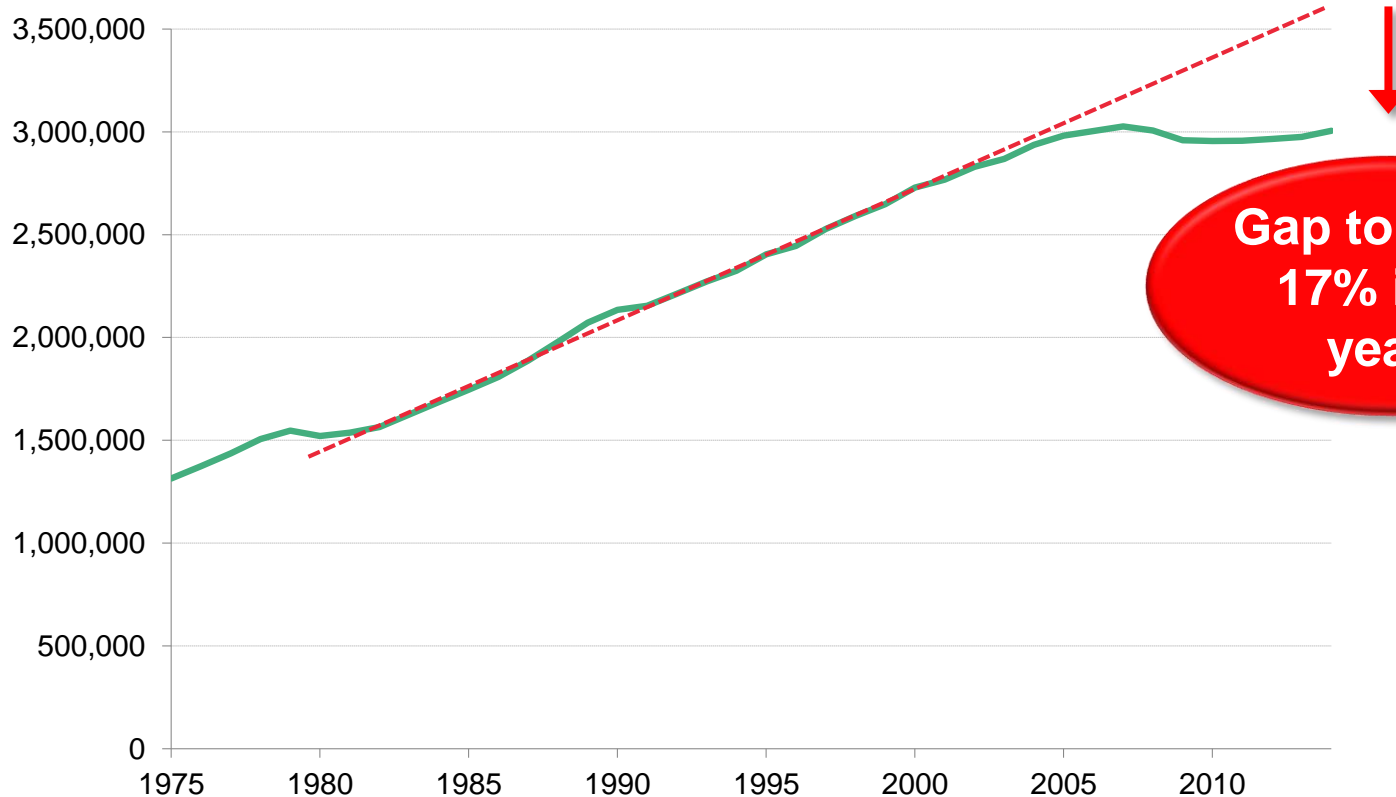
Source: The Economist

US PETROLEUM PRODUCTION AND CONSUMPTION, 1970–2014 (BARRELS PER DAY)



Source: EIA

US VEHICLE MILES TRAVELLED (MILLION MILES)



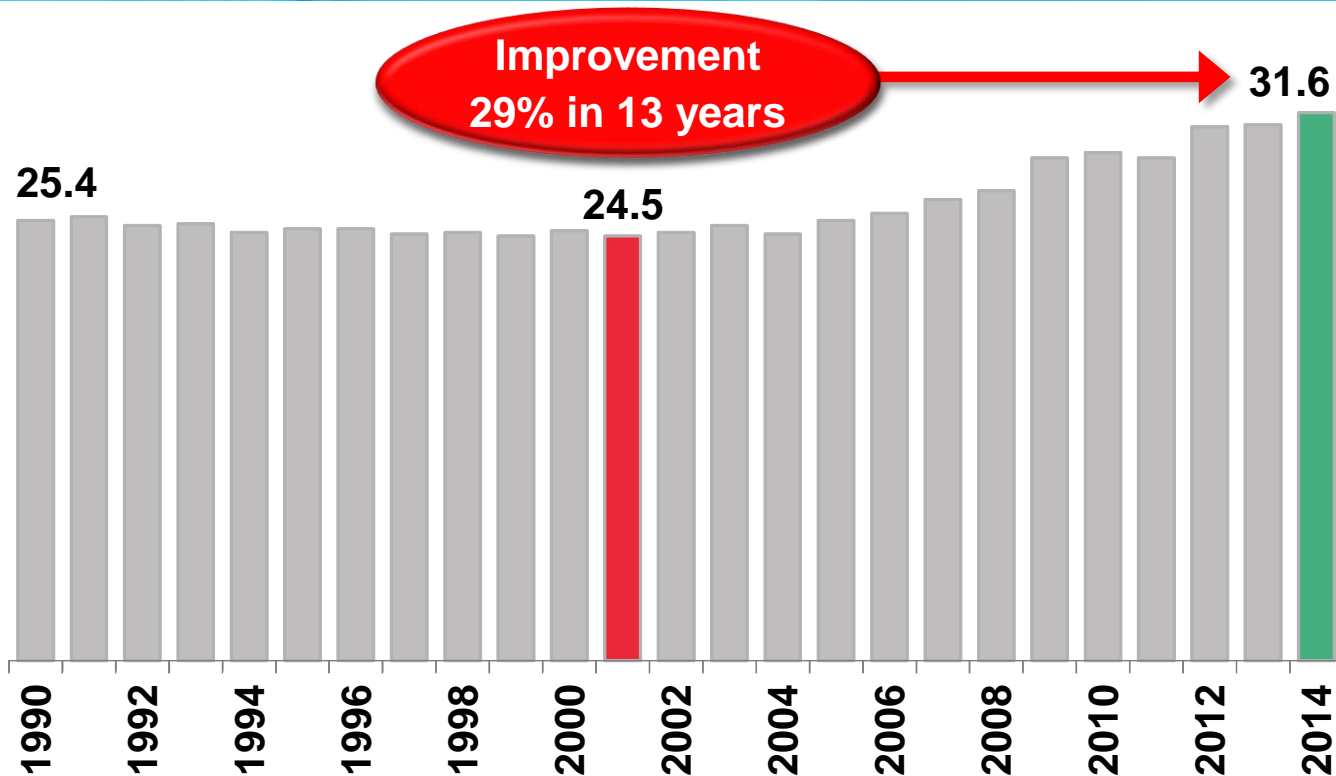
**Gap to trend:
17% in 10
years**

Note: Moving 12-month total of vehicle miles travelled in the US. Created from monthly data, and not seasonally adjusted

Source: US Federal Highways Administration

US TOTAL VEHICLE FLEET FUEL EFFICIENCY, 1990–2014

(AVERAGE MILES PER GALLON)



Note: In Michael Liebreich's Summit delivery, he stated in error that the improvement had been 60%.

Source: US Department of Transportation [NHTSA](#)



Prices on electric cars will continue to drop until they're within reach of the average family.



*The Washington
Post 1915*

Images: BMW, Detroit Electric, 2015, courtesy of EVASD

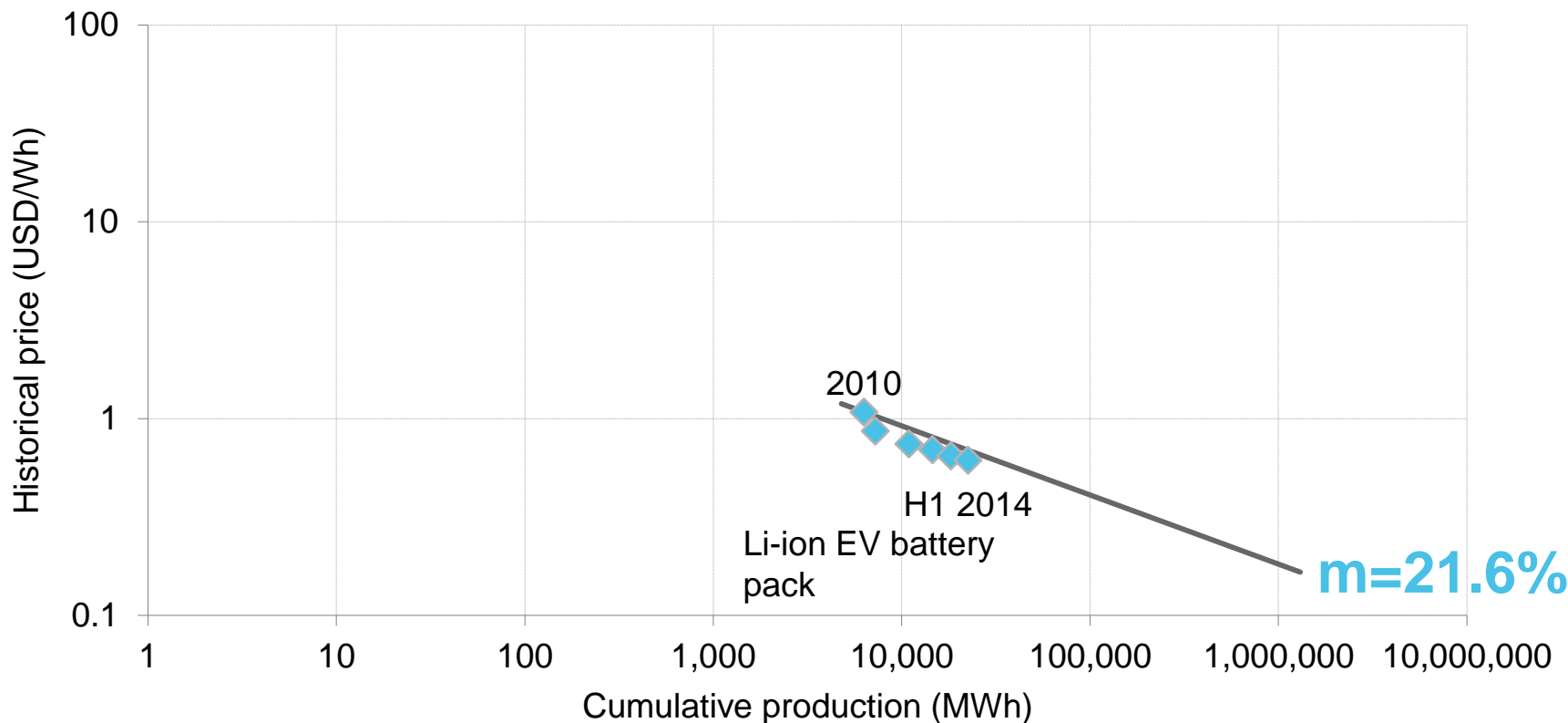
CARS AND TRUCKS IN USE WORLDWIDE, 2013 1.2 billion



**ELECTRIC VEHICLES IN
USE WORLDWIDE, 2014
0.75 million (to scale)**

Source: International Organization of Motor Vehicle Manufacturers, Bloomberg New Energy Finance

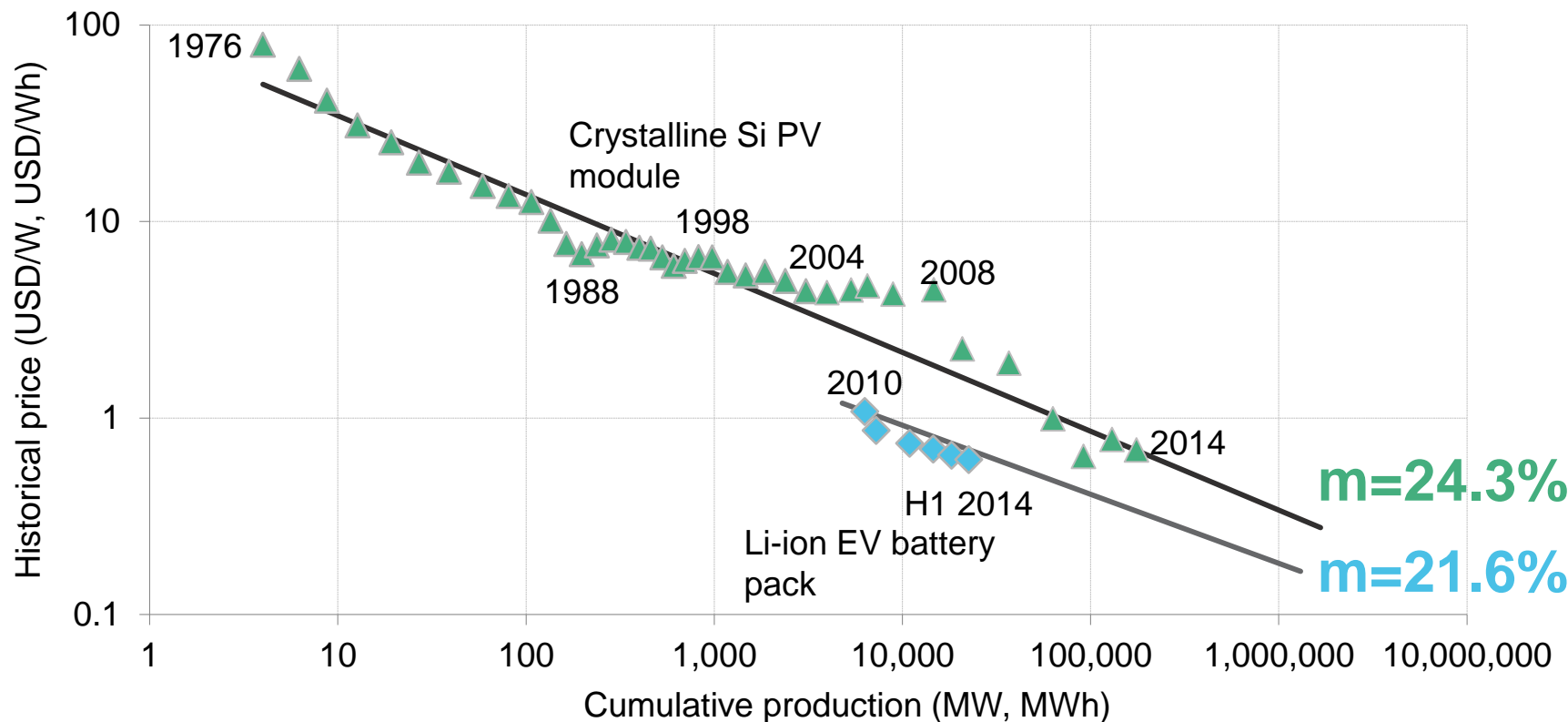
LITHIUM-ION EV BATTERY EXPERIENCE CURVE



Note: Prices are in real (2014) USD.

Source: Bloomberg New Energy Finance, Maycock, Battery University, MIT

LITHIUM-ION EV BATTERY EXPERIENCE CURVE COMPARED WITH SOLAR PV EXPERIENCE CURVE



Note: Prices are in real (2014) USD.

Source: Bloomberg New Energy Finance, Maycock, Battery University, MIT



Photo: Reuters/NASA



Photo: Brent Lewin/Bloomberg



Photo: TheMarySue



Photo: JE Poirrier, Creative Commons



Photo: Greenpacks



Photo: Bloomberg



Photo: Matt Champlin / Flickr



Photo: Shinil GCP



Photo: Thomas Hobbs



Photo: UCLA



Photo: EarthInTransition



Photo: DENNIS/Creative Commons

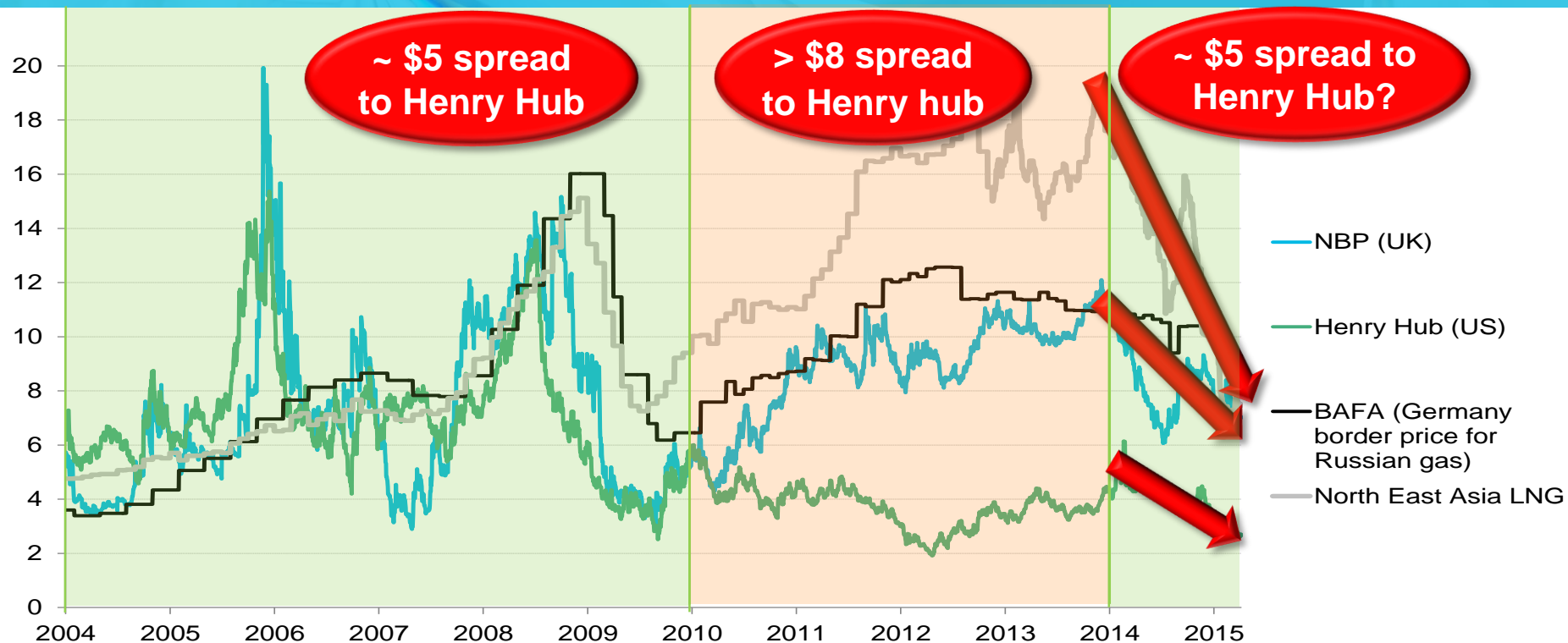


Photo: HHRCA



Images: Transport for London, Zipcar, Uber, Proterra

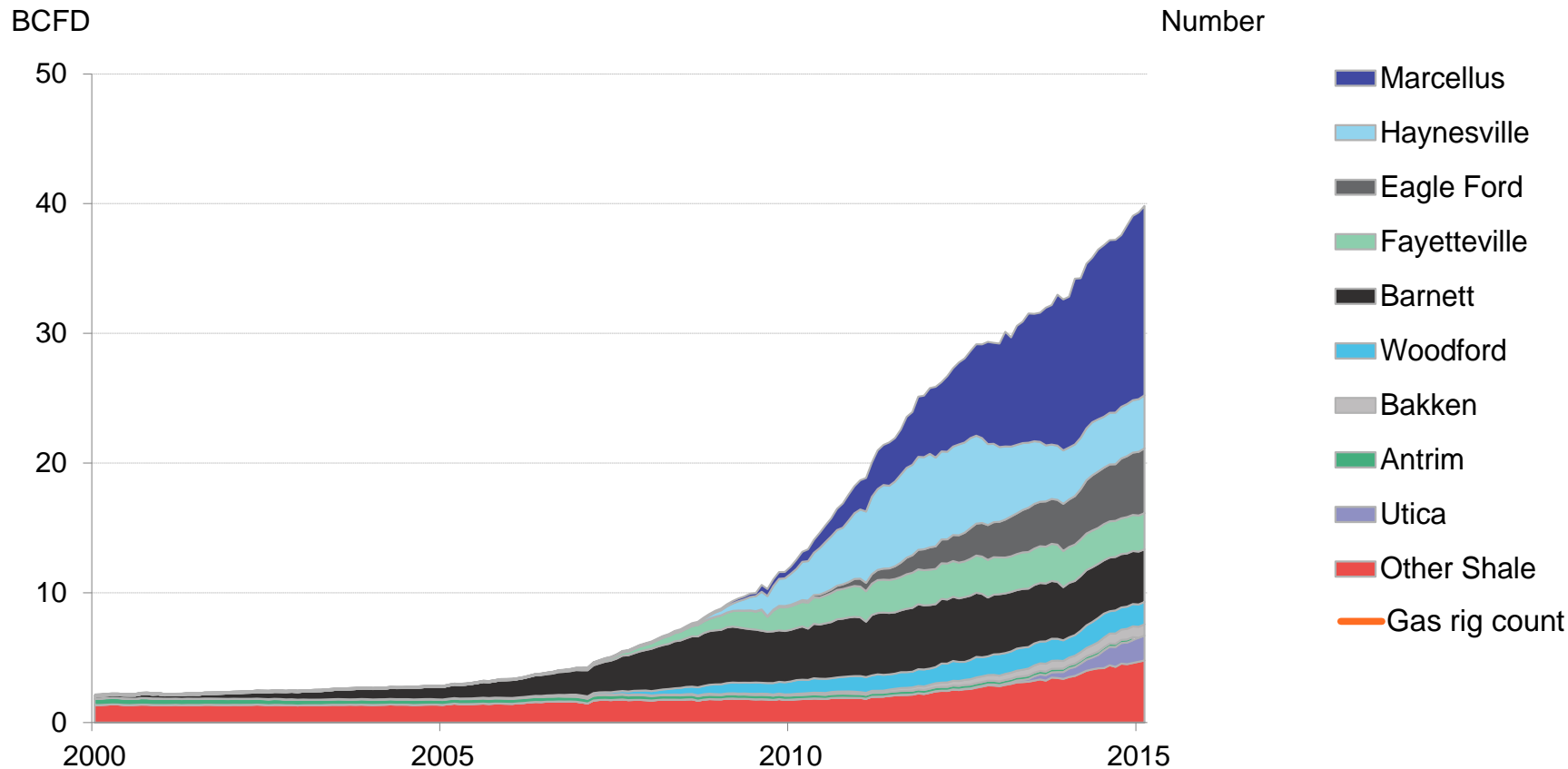
OIL AND GAS PRICES: HENRY HUB, NBP, BAFA, AND NE LNG, 2004-2015 (US\$/MM BTU)



Note: Japan-Korea Marker is based on broker assessments of the spot price of un-contracted LNG cargoes delivered into the Northeast Asia market.

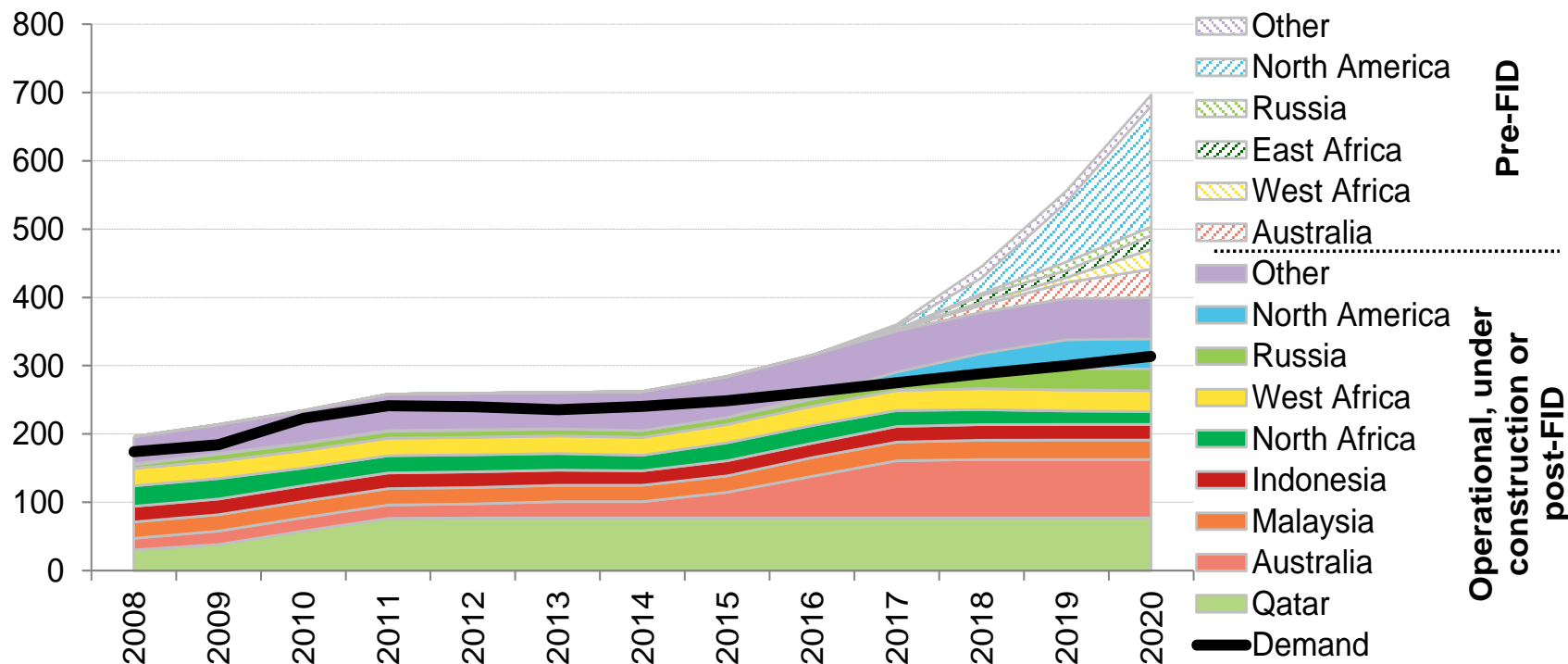
Source: Bloomberg New Energy Finance, ICAP, Platts

US SHALE GAS PRODUCTION BY FIELD, 2000–14



Source: EIA, Bloomberg New Energy Finance

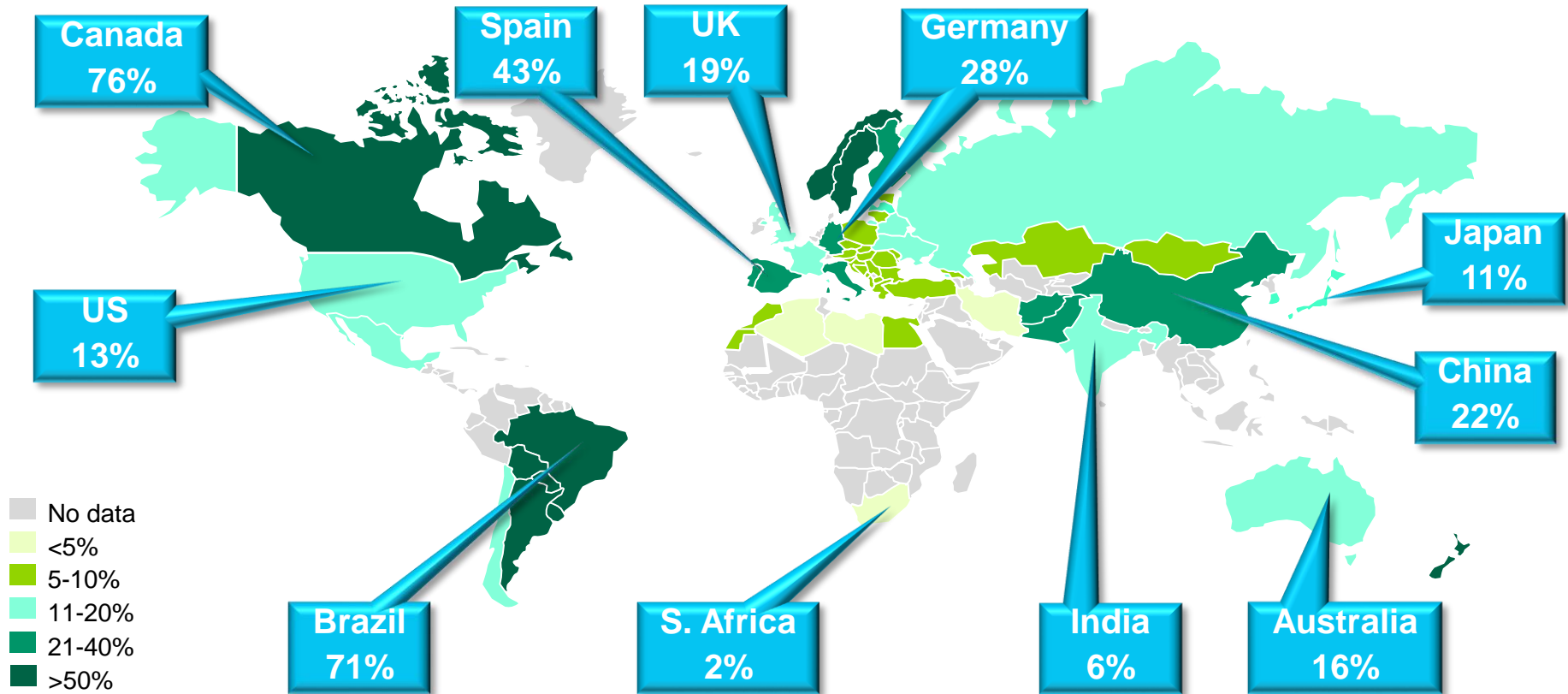
LNG EXPORT CAPACITY BY COUNTRY/REGION (MMTPA)



Note: For the underlying data to this chart, go to BI LNGGG<GO>

Source: Bloomberg New Energy Finance

RENEWABLE ENERGY PROPORTION OF POWER GENERATION, 2013 (%)



Source: Oxford Energy, China Electricity Council, BDEW, UK Govt, REE, NRCAN, EIA, USEA, Bloomberg New Energy Finance



Name: Usain Bolt

Event: 100m

Record: 9.58 seconds



Name: Paddy Padmanathan

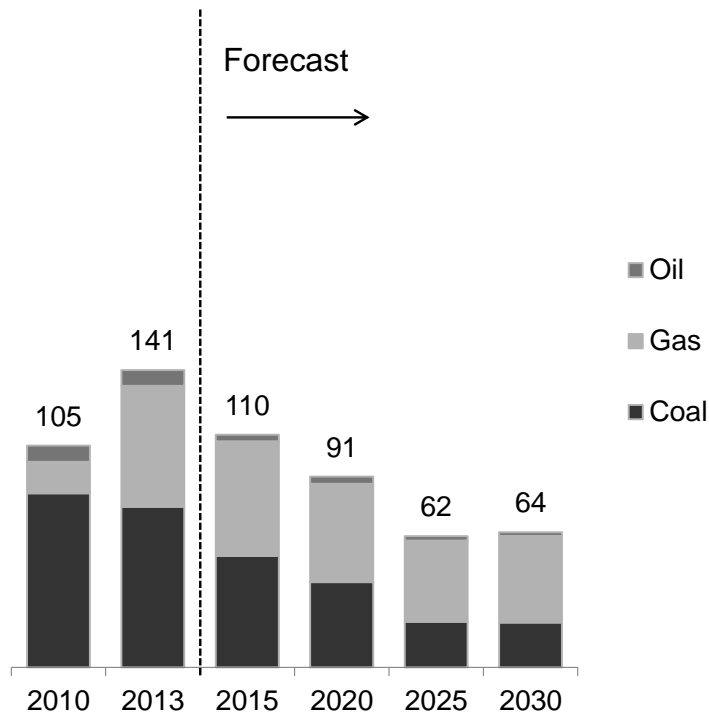
Event: Solar PV

Record: US\$5.84c

Source: Bloomberg New Energy Finance

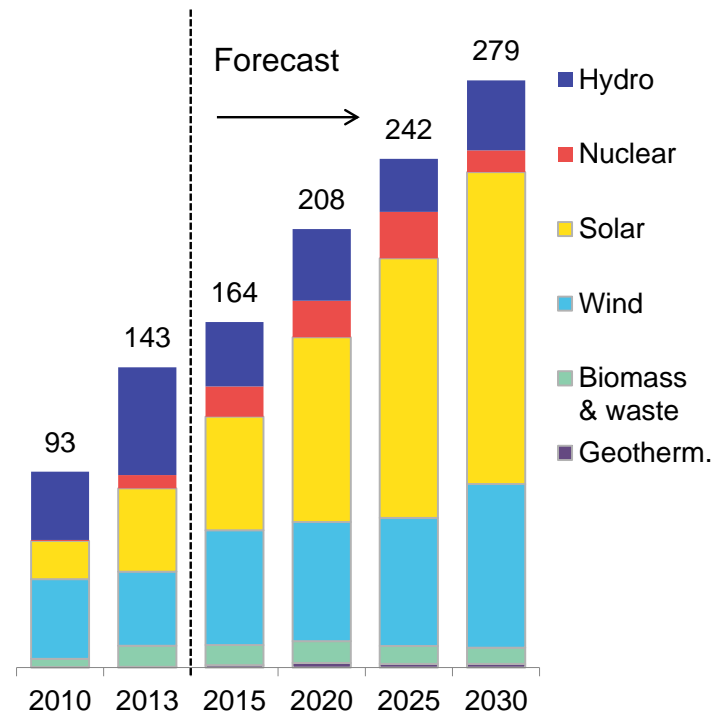
GLOBAL GROSS POWER GENERATION CAPACITY ADDITIONS, 2010–30 (GW)

FOSSIL FUEL



Note: Underlying data is from GREMO 2014

CLEAN ENERGY



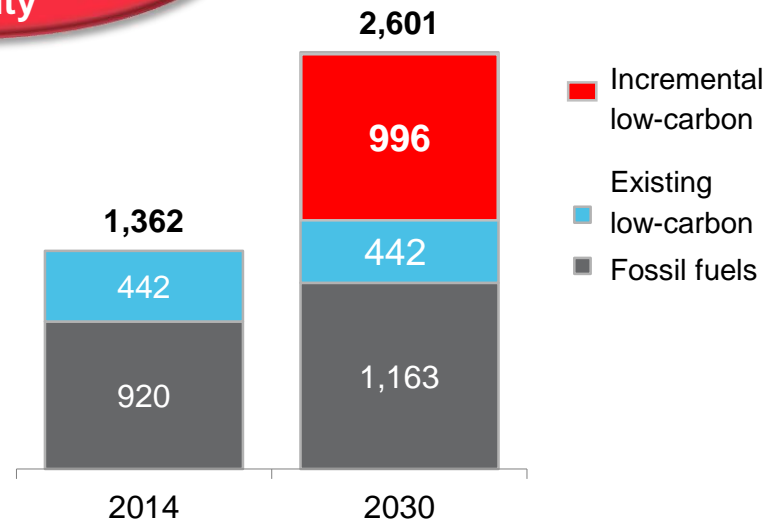
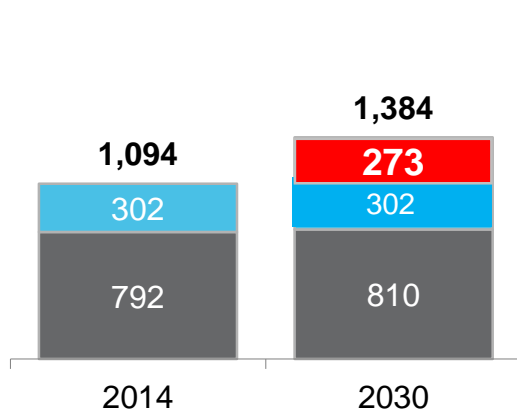
Source: Bloomberg New Energy Finance

US & CHINA CAPACITY BUILD OUT (GW)

US

China's low-carbon
additions 2015-2030
~ 90% of US 2015
capacity

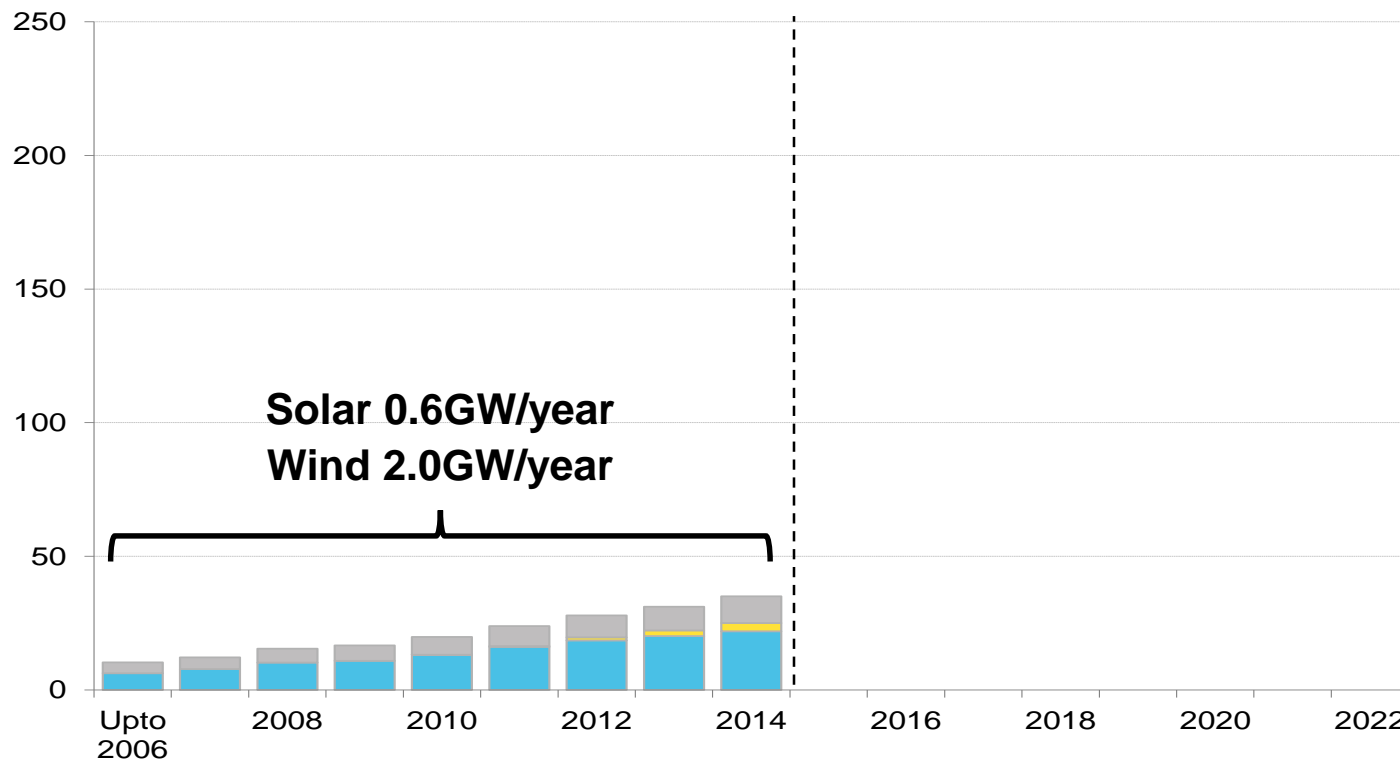
China



Source: Bloomberg New Energy Finance

RENEWABLES IN INDIA, 2006–22

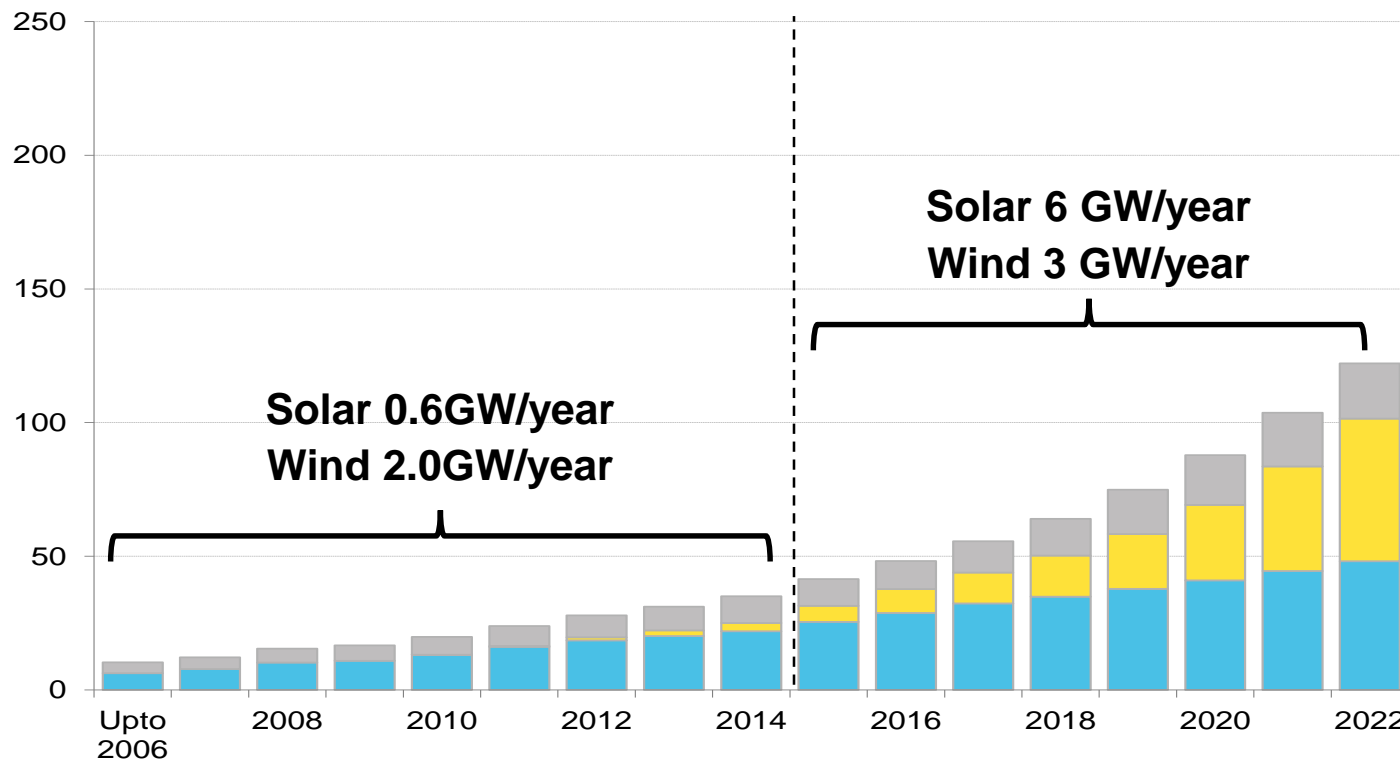
(GW)



Note: The original version of this chart mistakenly suggested that wind grew at 4.7GW/yr from 2006–14

Source: Bloomberg New Energy Finance

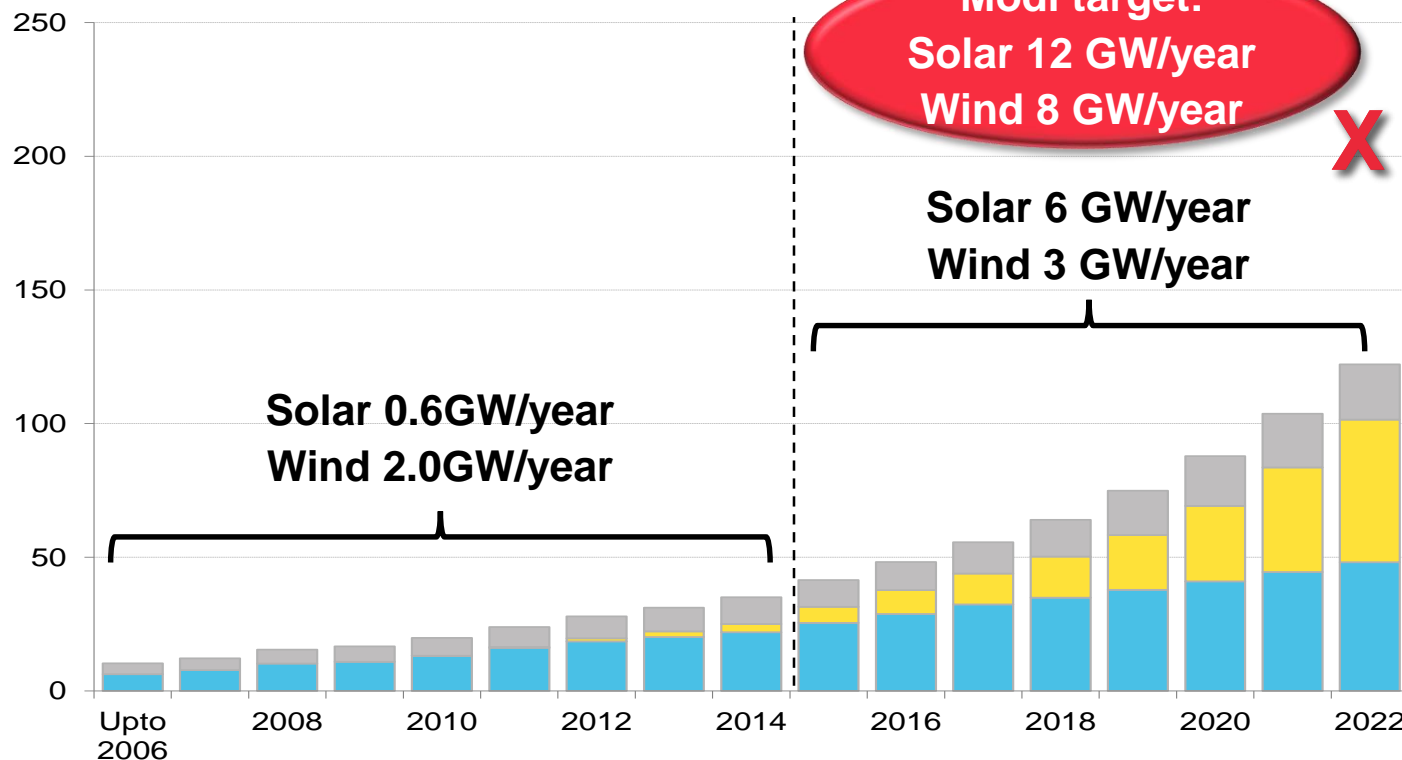
RENEWABLES IN INDIA, 2006–22 (GW)



Note: The original version of this chart mistakenly suggested that wind grew at 4.7GW/yr from 2006–14

Source: Bloomberg New Energy Finance

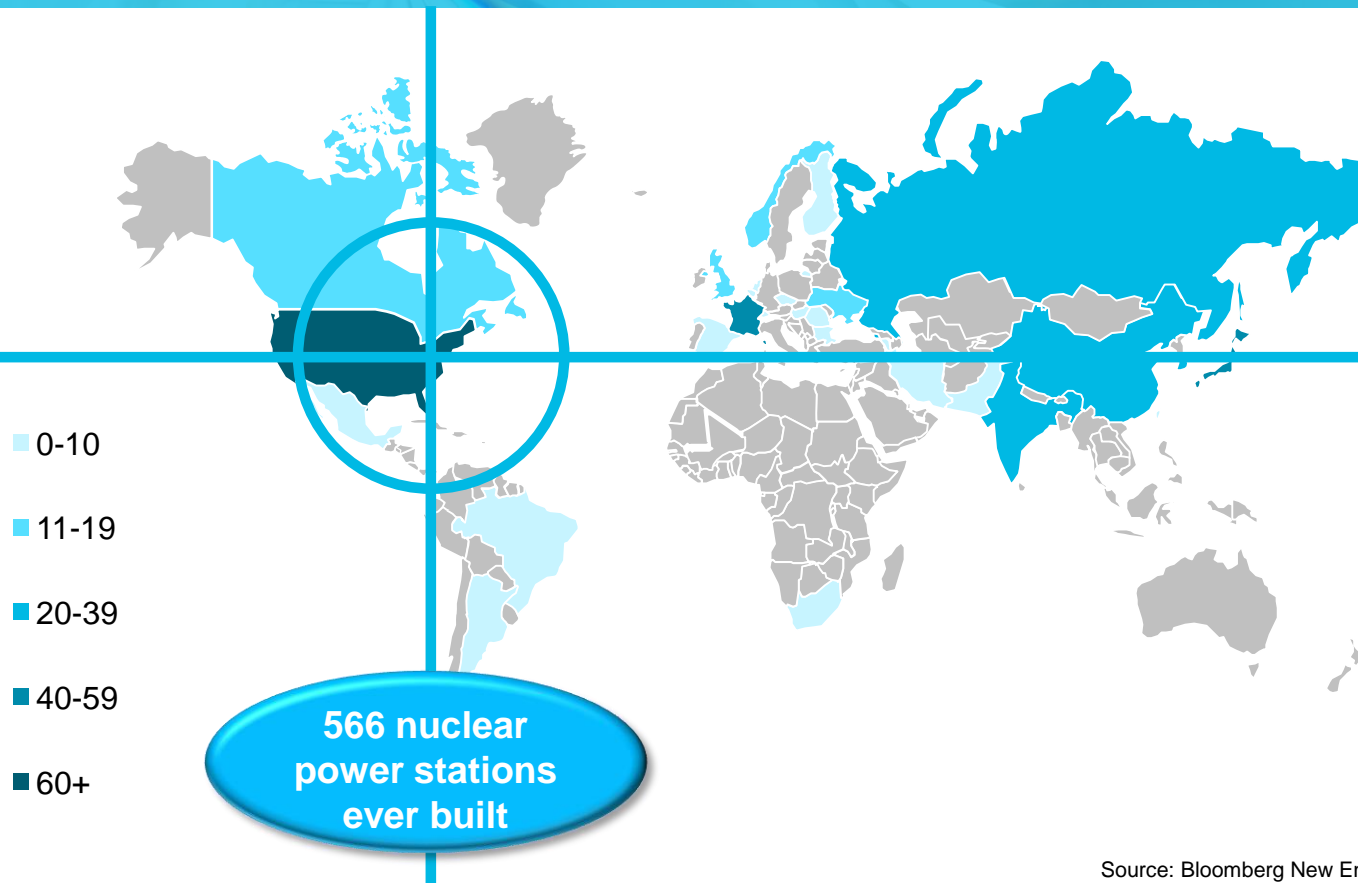
RENEWABLES IN INDIA, 2006–22 (GW)



Note: The original version of this chart mistakenly suggested that wind grew at 4.7GW/yr from 2006–14

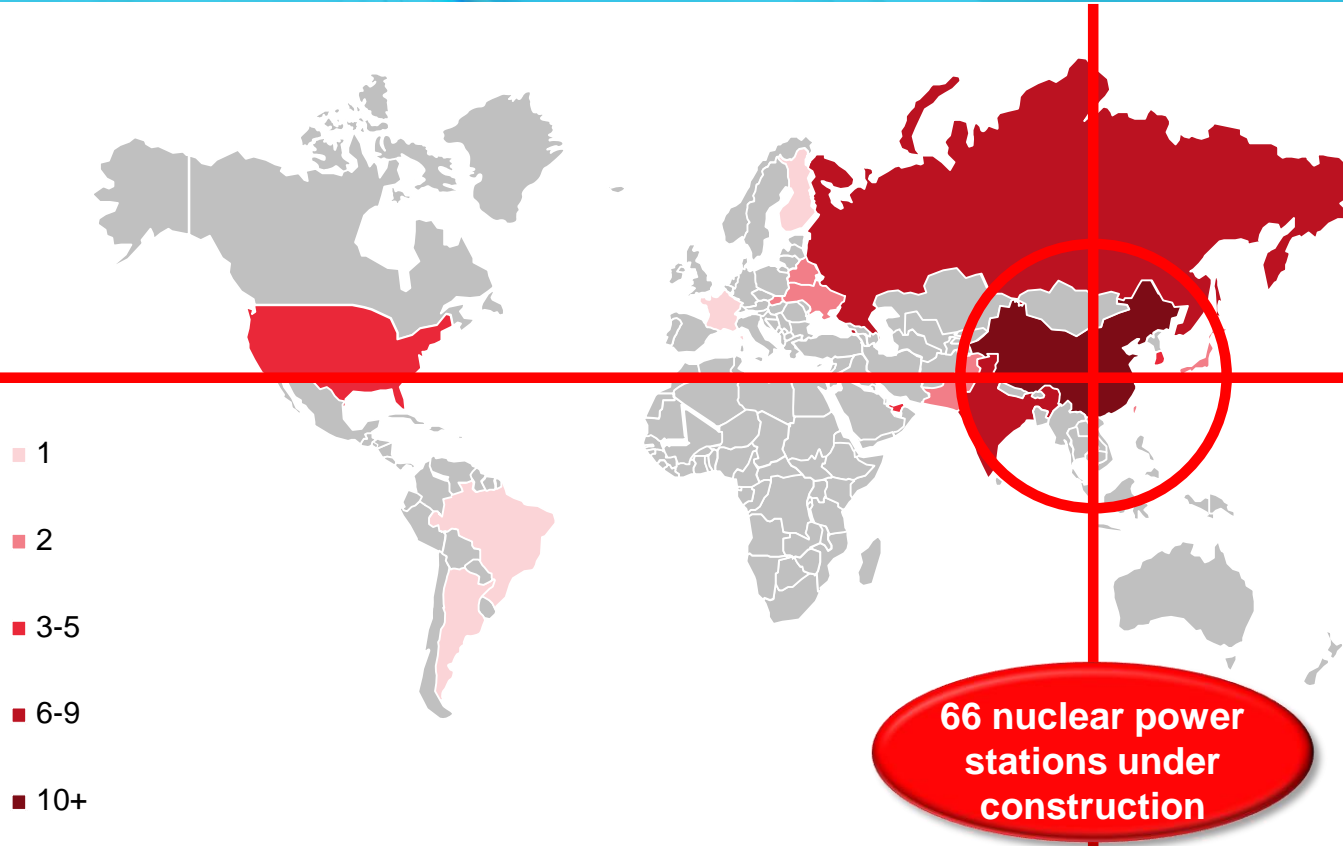
Source: Bloomberg New Energy Finance

NUCLEAR POWER PLANTS – HISTORIC CONSTRUCTION



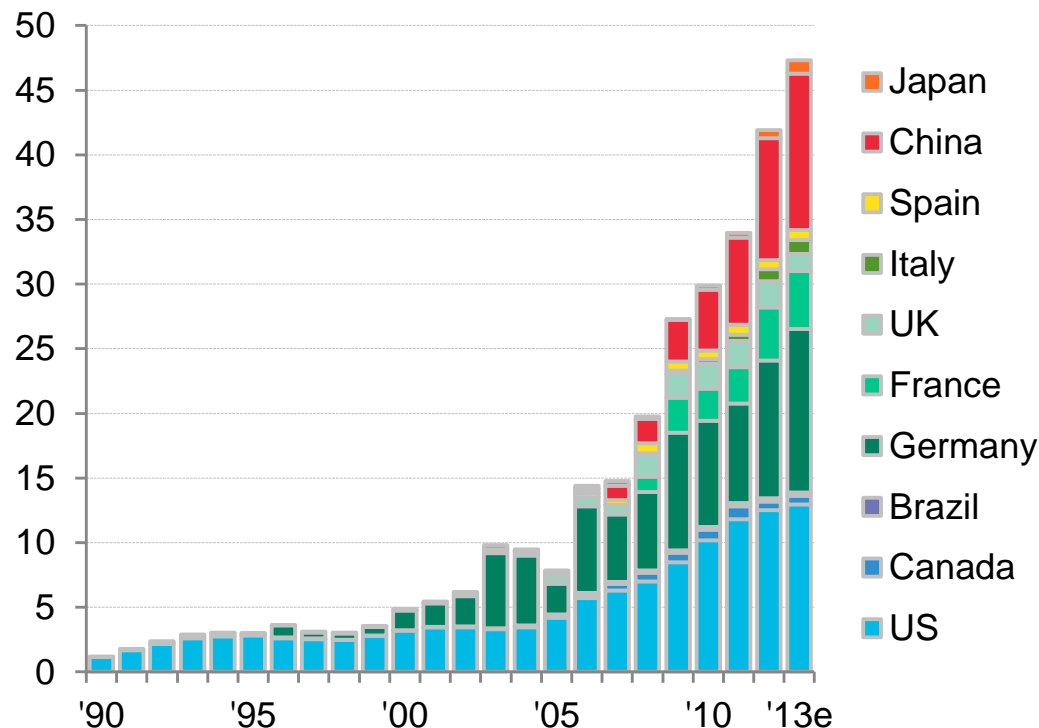
Source: Bloomberg New Energy Finance; IAEA, World Nuclear Association

NUCLEAR POWER PLANTS – CURRENT CONSTRUCTION



Source: Bloomberg New Energy Finance; IAEA, World Nuclear Association

ENERGY EFFICIENCY INVESTMENT VIA FORMAL FRAMEWORKS, 1990–2013 (\$BN)



Note: Nominal dollars. Includes residential, commercial and industrial spending. For more details, see our [H1 2014 Global Energy Efficiency Market Outlook](#)

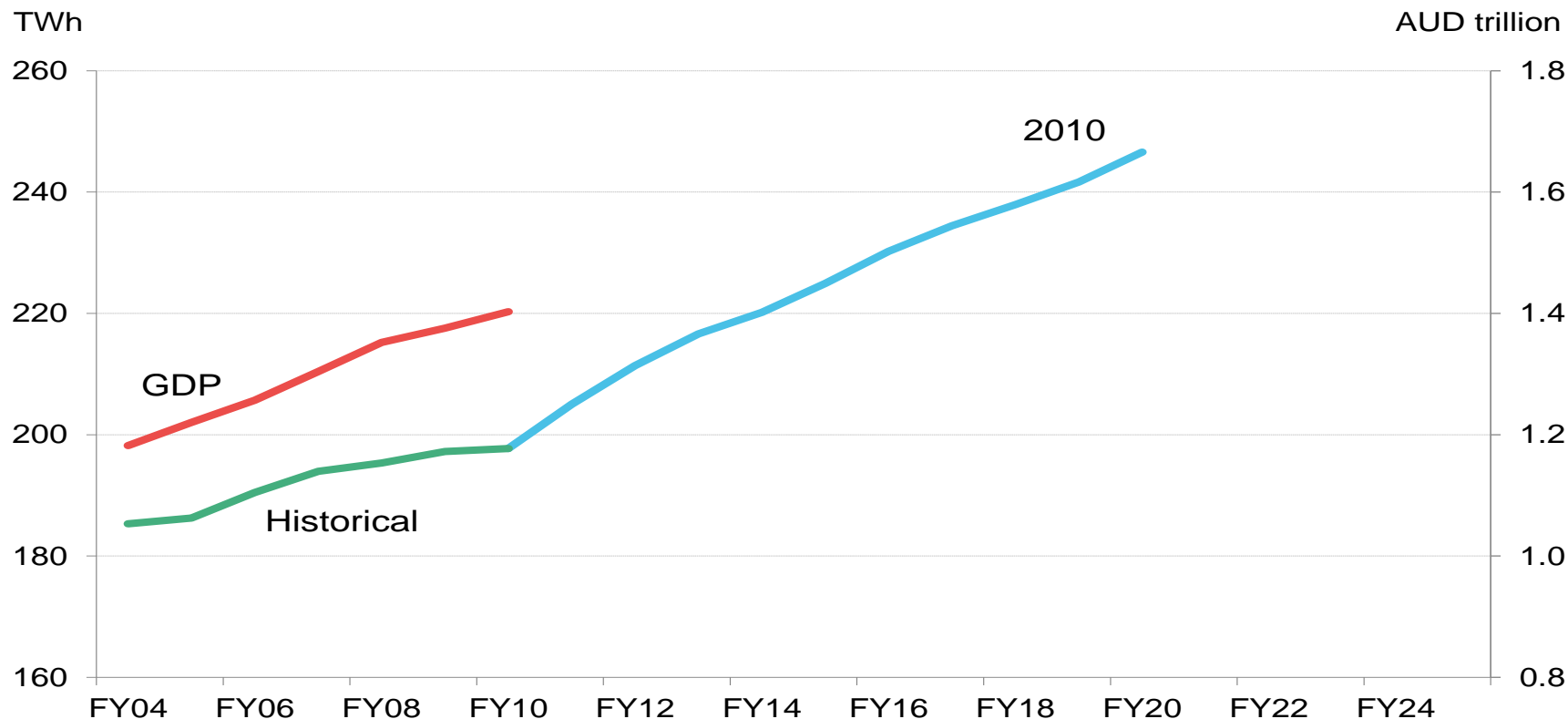
Source: ACEEE, NAESCO, LBNL, CEE, IAEE, ANEEL, BNDES, KfW, Emmy, ADEME, DECC, OFGEM, GME, GSE, AEEG, IDAE, EMCA, JAESCO, Bloomberg New Energy Finance.

AUSTRALIA NATIONAL ELECTRICITY MARKET ACTUAL VS FORECAST ELECTRICITY DEMAND FY2004–FY2025



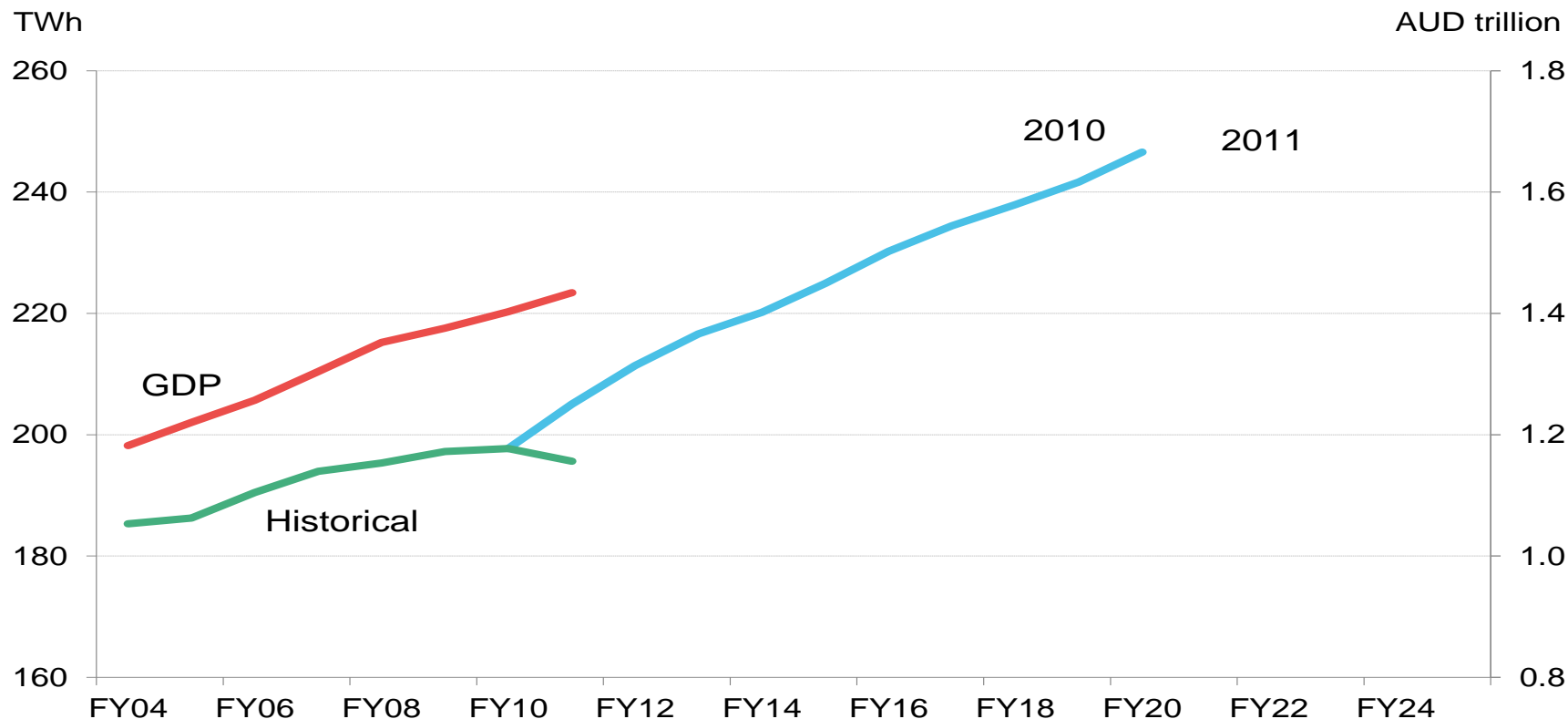
Source: Australian Energy Market Operator, Reserve Bank of Australia, Bloomberg New Energy Finance

AUSTRALIA NATIONAL ELECTRICITY MARKET ACTUAL VS FORECAST ELECTRICITY DEMAND FY2004–FY2025



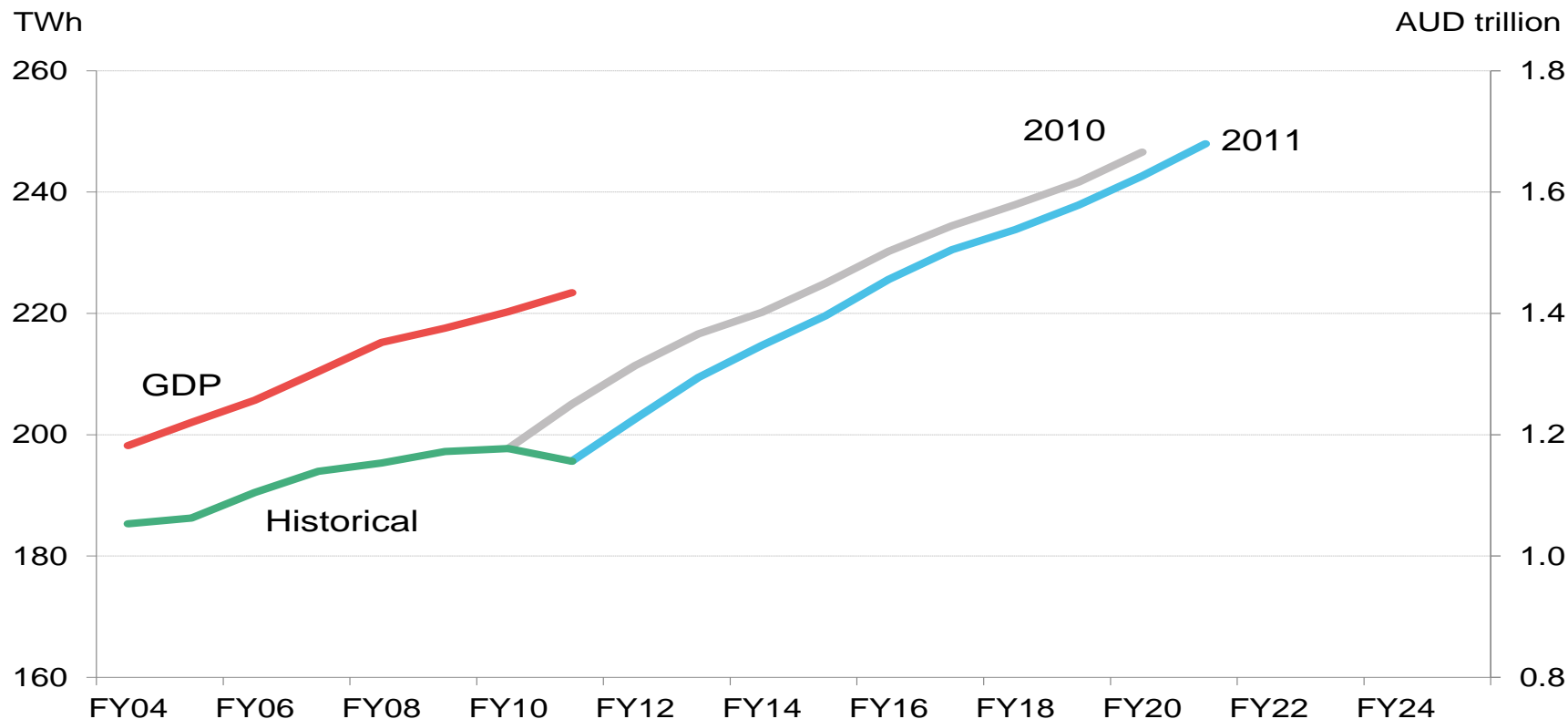
Source: Australian Energy Market Operator, Reserve Bank of Australia, Bloomberg New Energy Finance

AUSTRALIA NATIONAL ELECTRICITY MARKET ACTUAL VS FORECAST ELECTRICITY DEMAND FY2004–FY2025



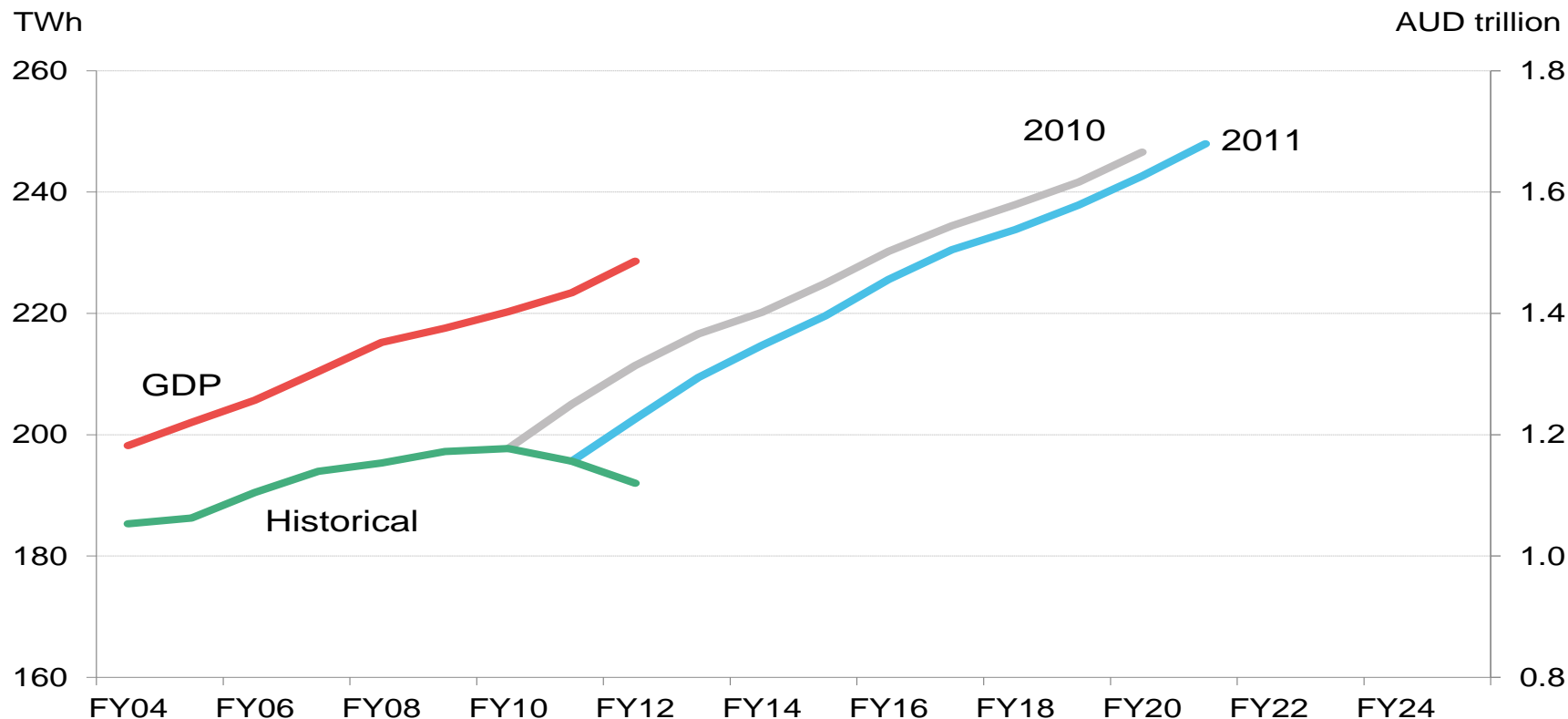
Source: Australian Energy Market Operator, Reserve Bank of Australia, Bloomberg New Energy Finance

AUSTRALIA NATIONAL ELECTRICITY MARKET ACTUAL VS FORECAST ELECTRICITY DEMAND FY2004–FY2025



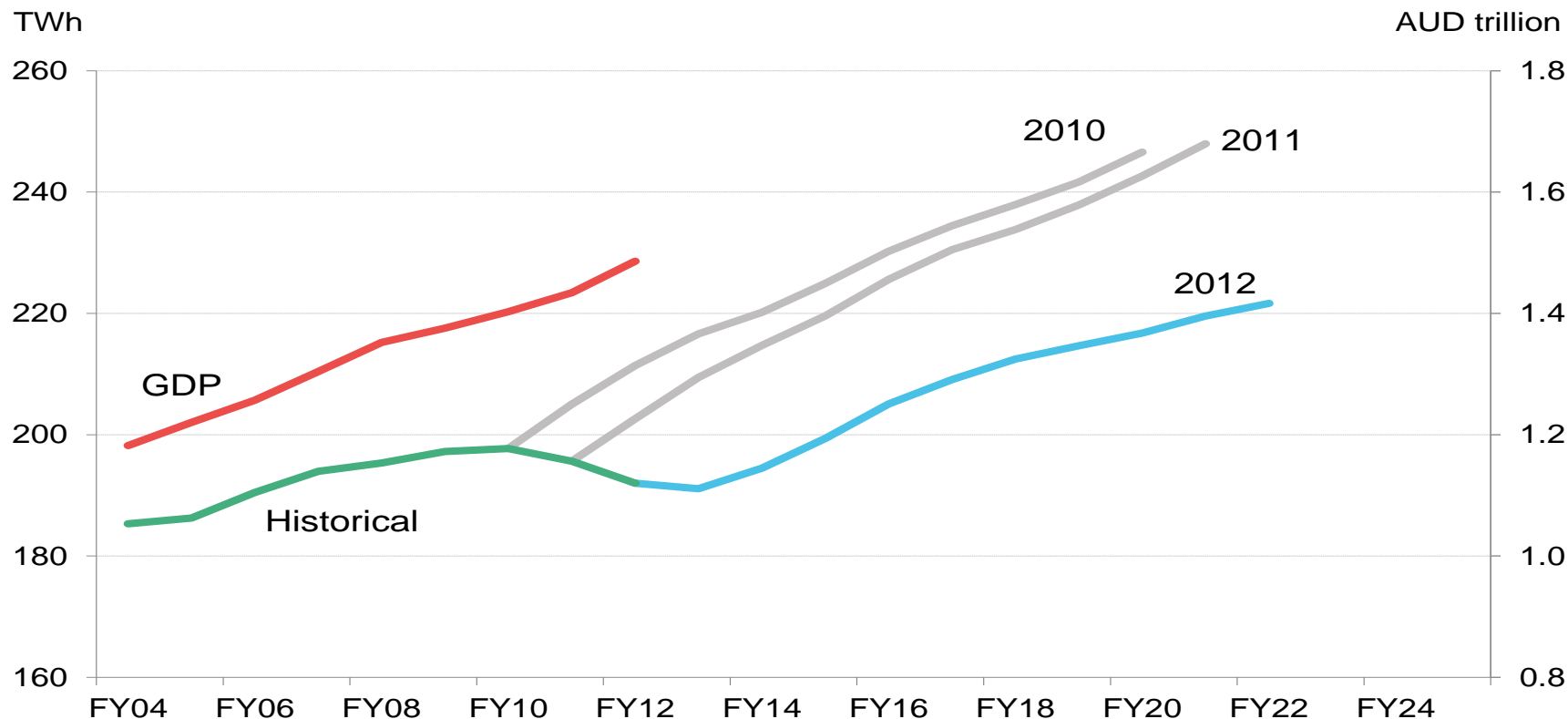
Source: Australian Energy Market Operator, Reserve Bank of Australia, Bloomberg New Energy Finance

AUSTRALIA NATIONAL ELECTRICITY MARKET ACTUAL VS FORECAST ELECTRICITY DEMAND FY2004–FY2025



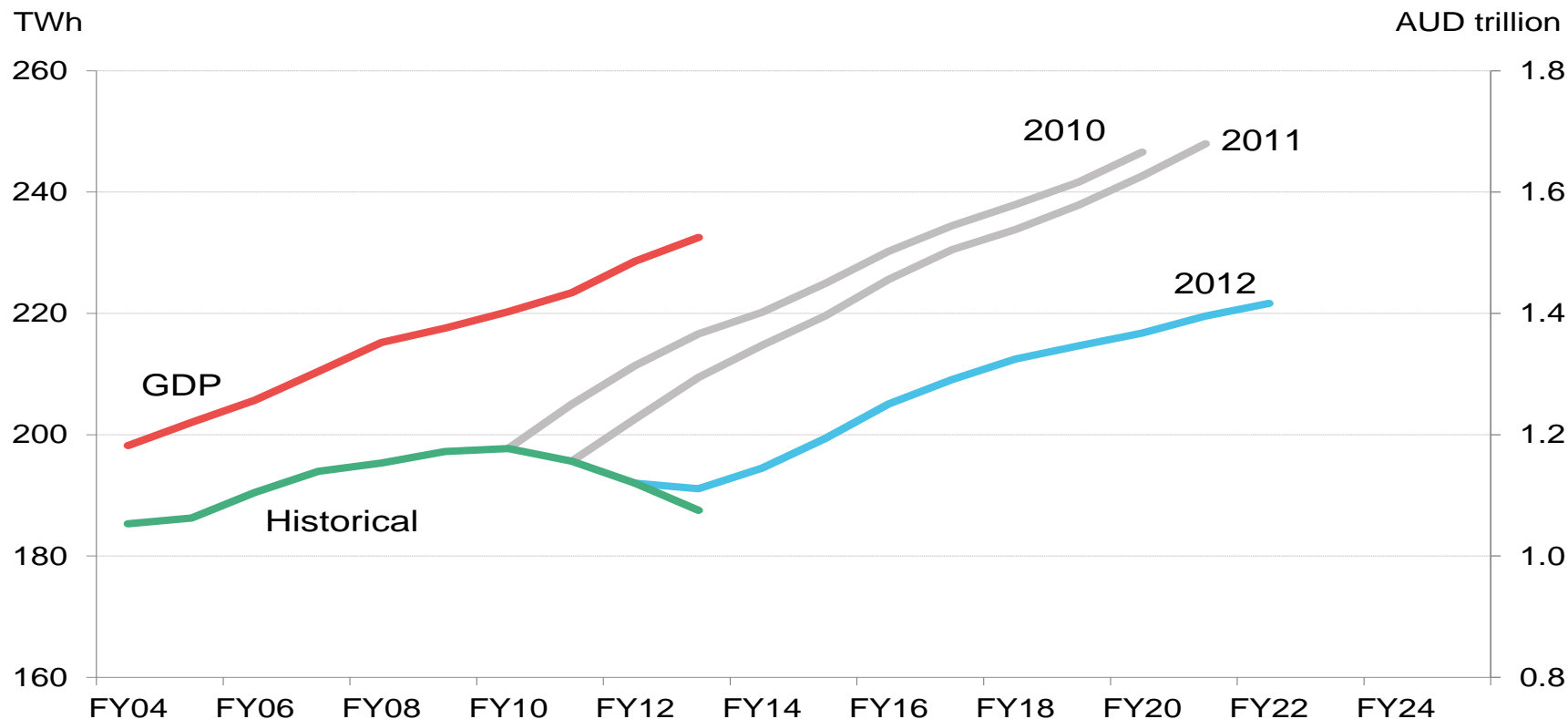
Source: Australian Energy Market Operator, Reserve Bank of Australia, Bloomberg New Energy Finance

AUSTRALIA NATIONAL ELECTRICITY MARKET ACTUAL VS FORECAST ELECTRICITY DEMAND FY2004–FY2025



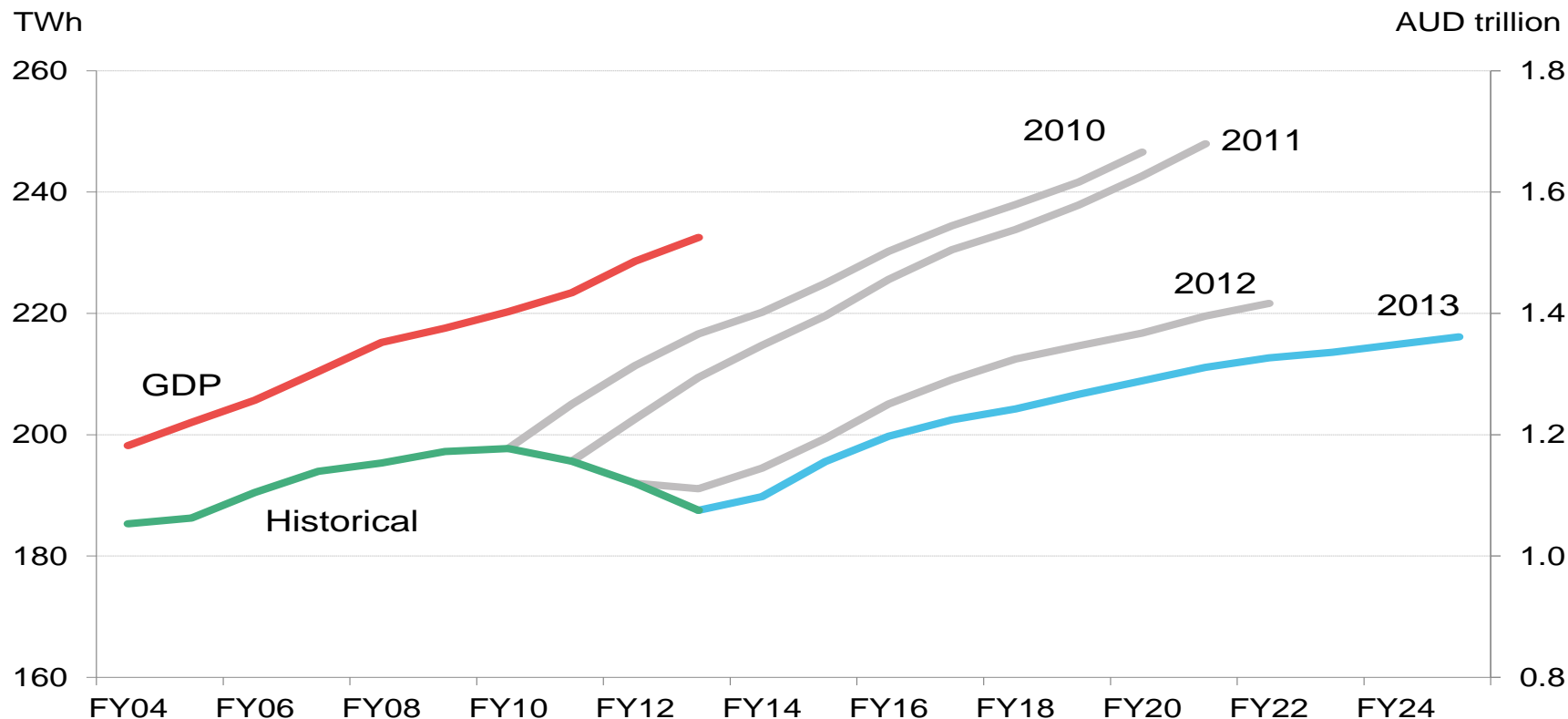
Source: Australian Energy Market Operator, Reserve Bank of Australia, Bloomberg New Energy Finance

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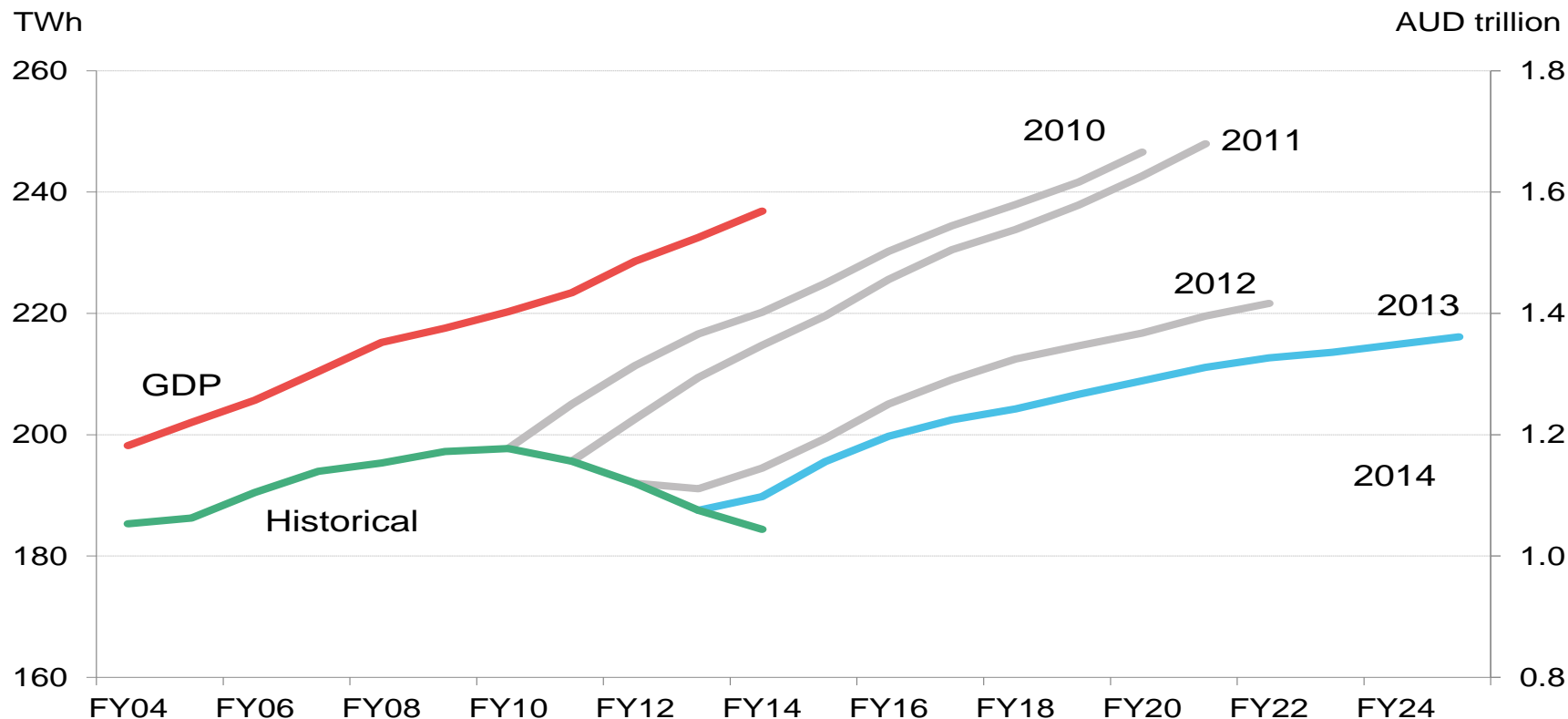
Source: Australian Energy Market Operator, Reserve Bank of Australia, Bloomberg New Energy Finance

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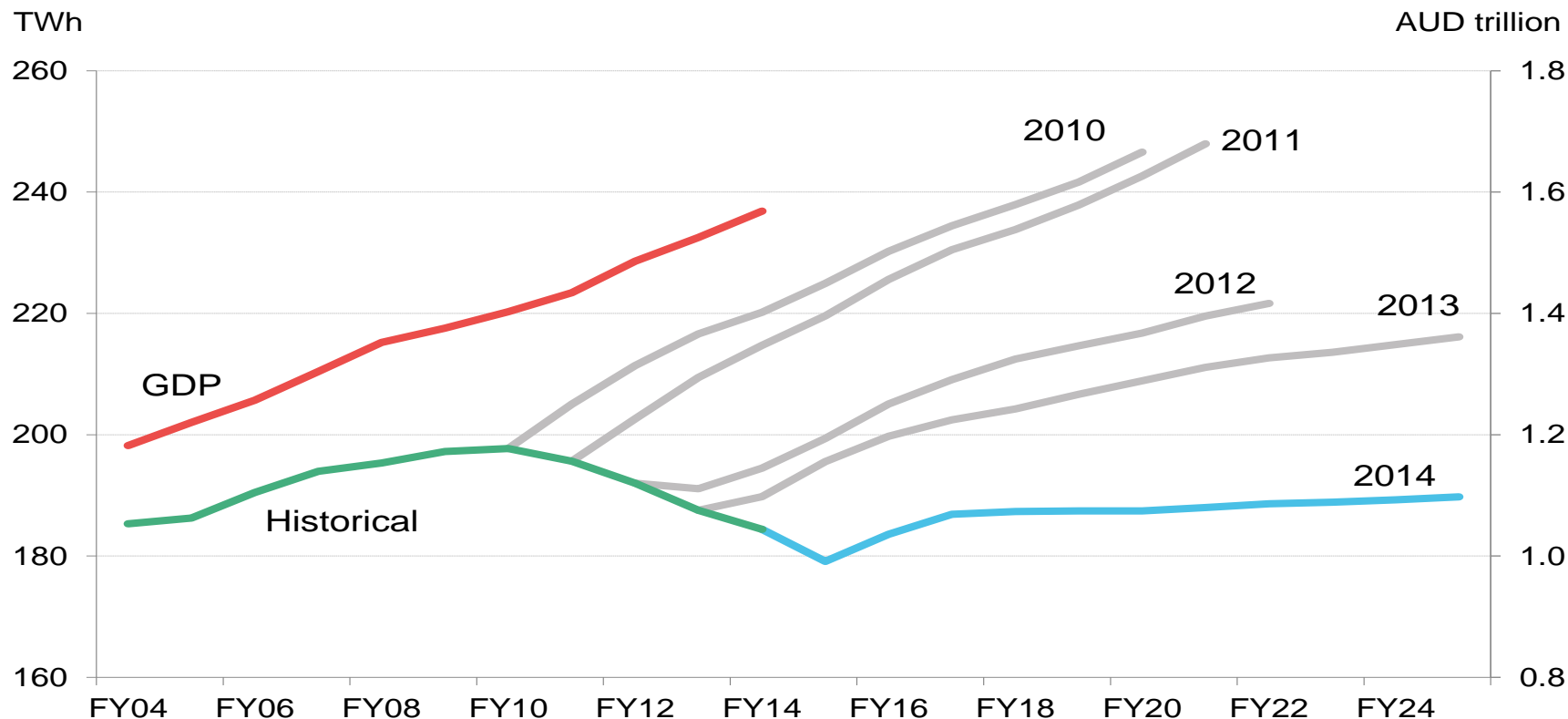
Source: Australian Energy Market Operator, Reserve Bank of Australia, Bloomberg New Energy Finance

AUSTRALIA NATIONAL ELECTRICITY MARKET ACTUAL VS FORECAST ELECTRICITY DEMAND FY2004–FY2025



Source: Australian Energy Market Operator, Reserve Bank of Australia, Bloomberg New Energy Finance

AUSTRALIA NATIONAL ELECTRICITY MARKET ACTUAL VS FORECAST ELECTRICITY DEMAND FY2004–FY2025



Source: Australian Energy Market Operator, Reserve Bank of Australia, Bloomberg New Energy Finance



**THE AGE OF
PLENTY...**

**...THE AGE OF
COMPETITION**

OIL AND GAS MERGERS AND ACQUISITIONS



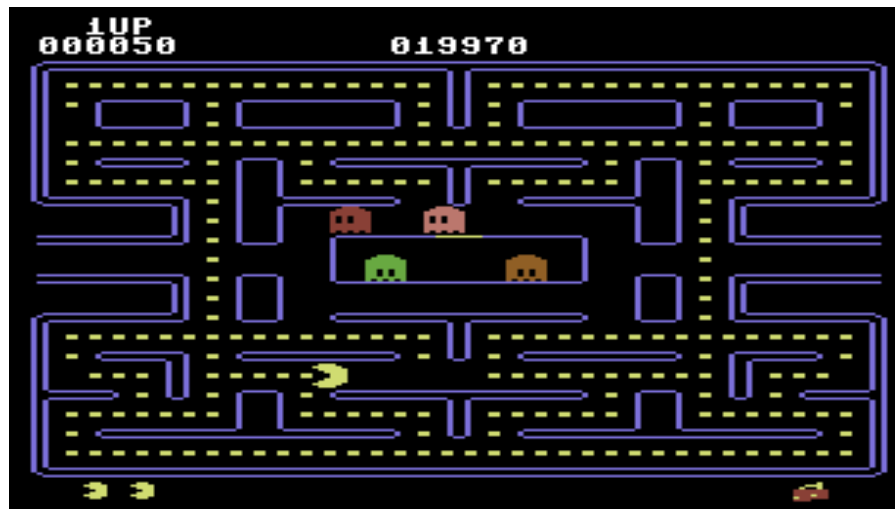
TALISMAN
ENERGY

HALLIBURTON



MACQUARIE

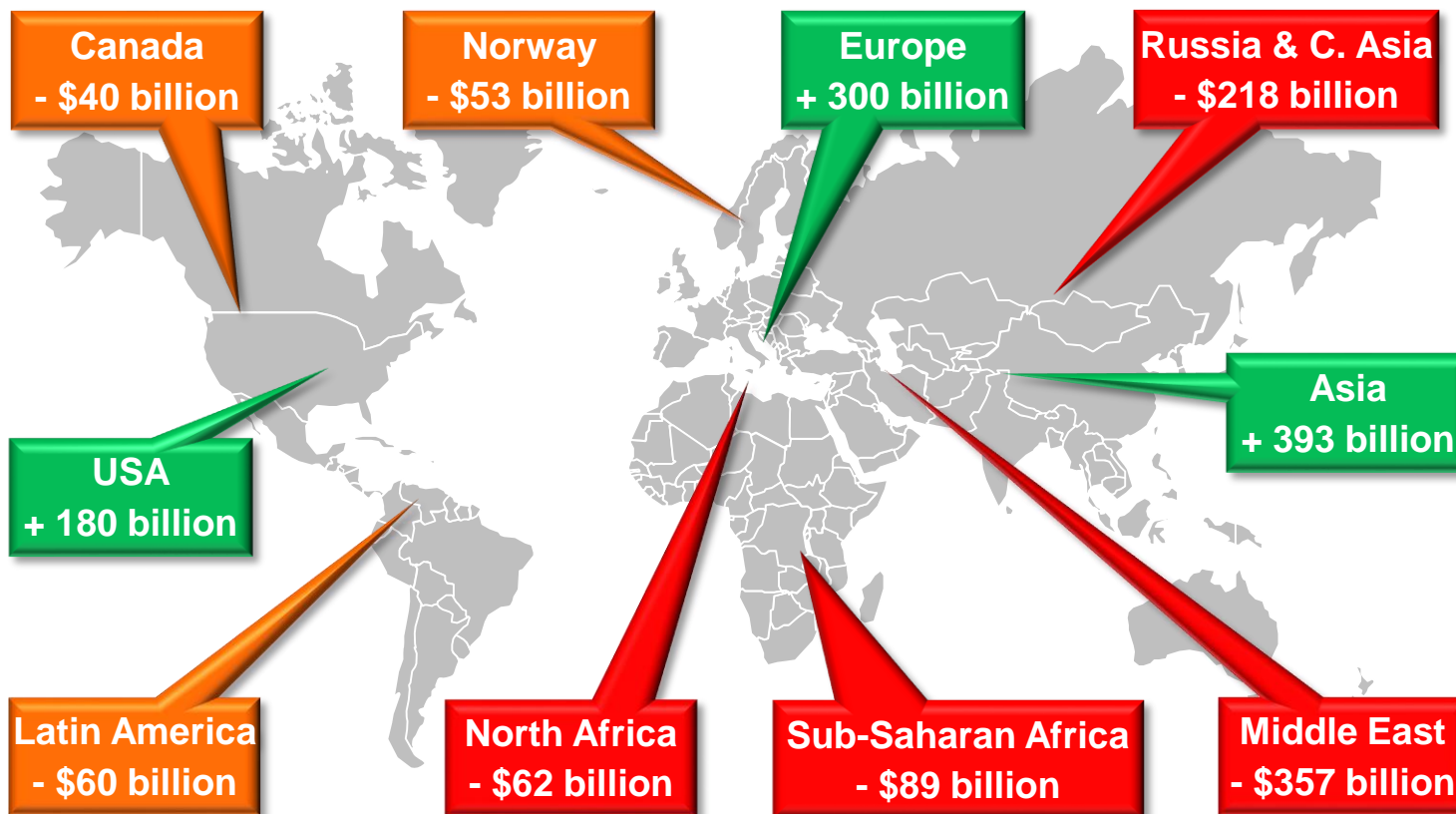
REPSOL



ENERGY TRANSFER

Apache

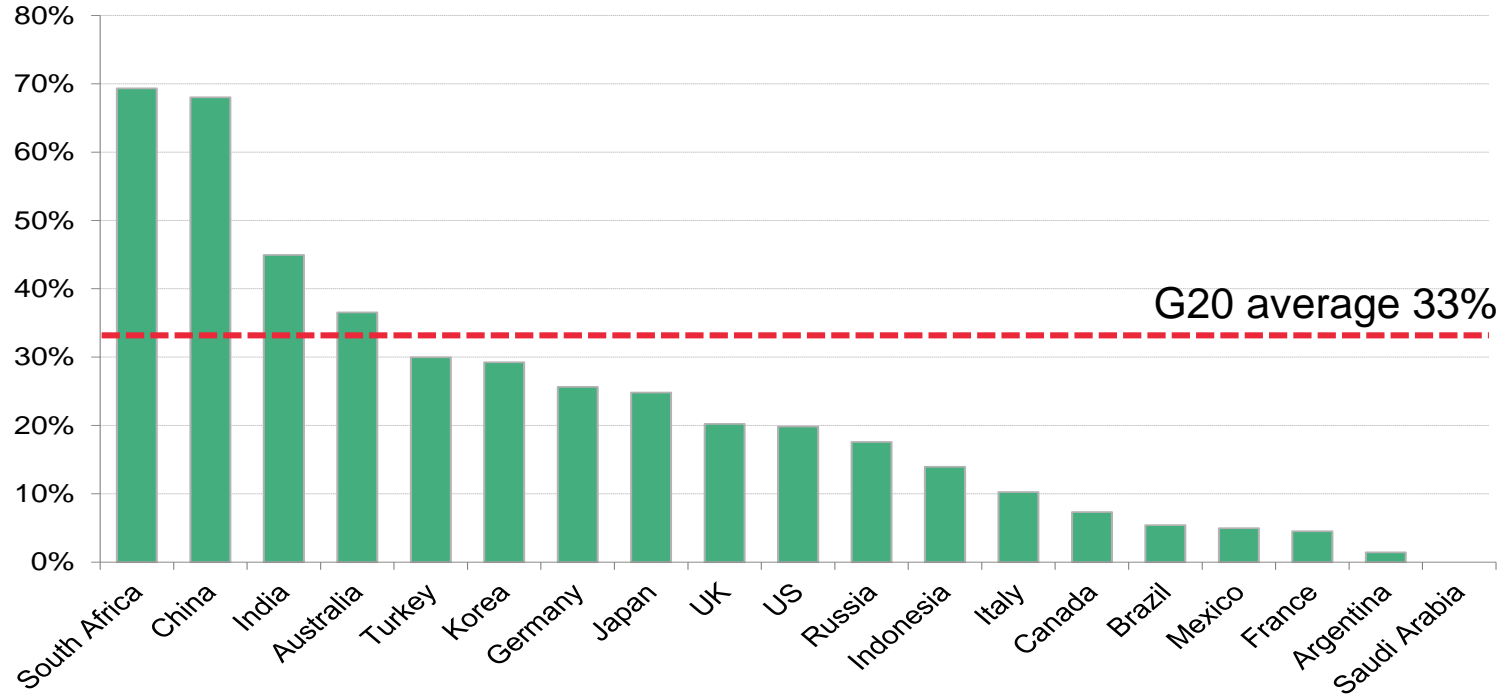
IMPACT OF LOWER OIL AND GAS PRICES (\$BN/YR)



Note: Calculation based on \$5 drop in natural gas price and \$50 drop in oil price; based on import/export volumes 2011-2013, excluding impact of changes in volumes since then

Source: Bloomberg New Energy Finance; CIA Fact Book; IEA; EIA; World Bank; IMF

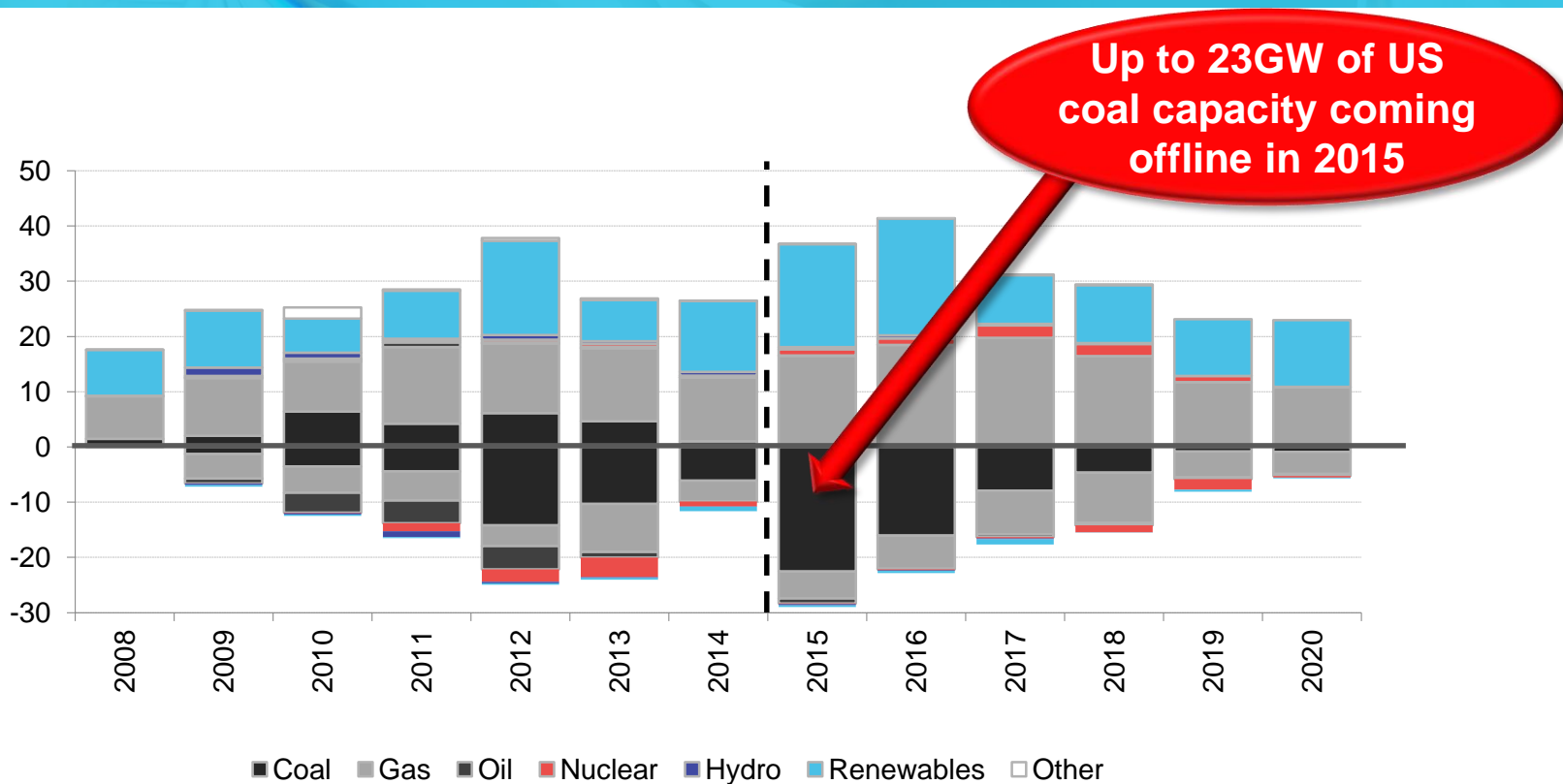
COAL DEPENDENCY, G20, 2013 (% OF PRIMARY ENERGY)



Note: Data comes from the IEA Global Statistics database. Where actual 2013 data was unavailable, IEA produced an estimate figure

Source: IEA, Bloomberg New Energy Finance

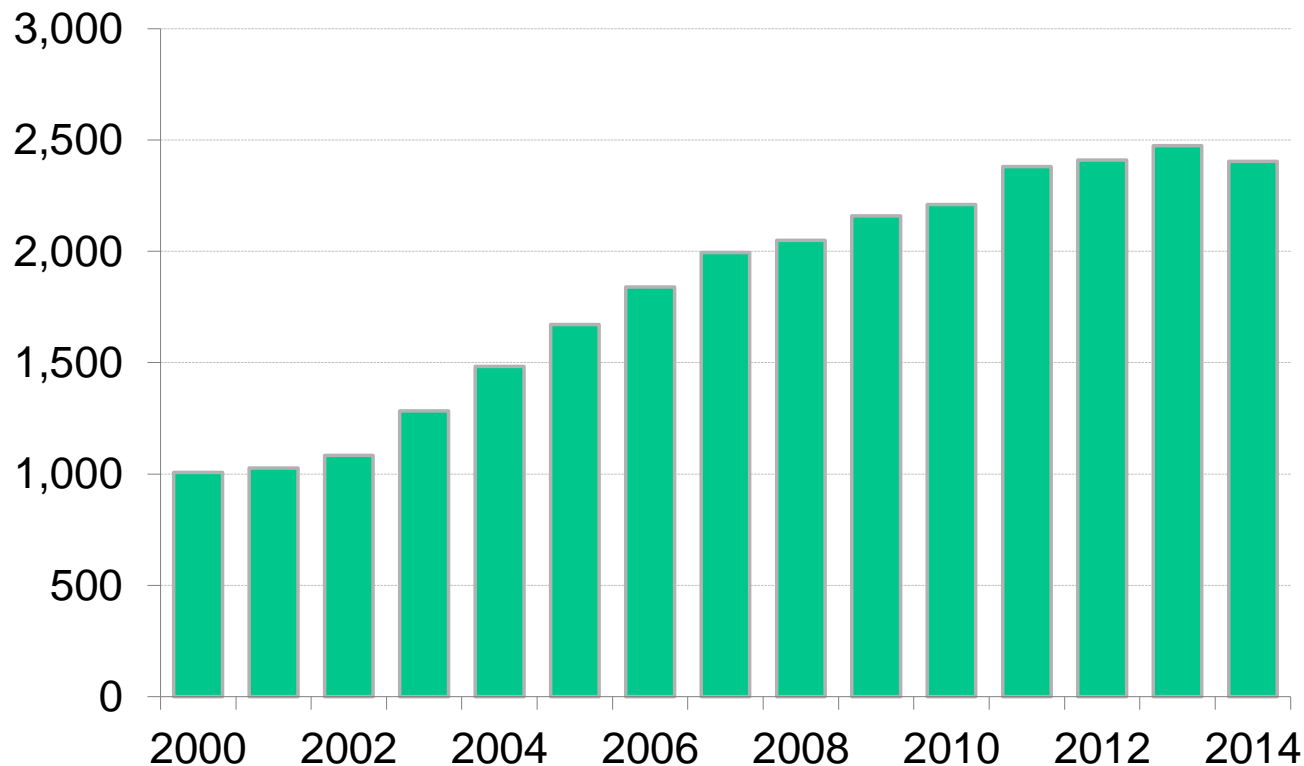
US CAPACITY BUILD, 2008–20 (GW)



Notes: Bloomberg New Energy Finance base case build forecasts; historical build from EIA Form 860

Source: Bloomberg New Energy Finance

CHINA COAL CONSUMPTION, 2000-14 (MILLION TONS)



Source: Bloomberg New Energy Finance, Chinese Government

“

In the old world, I'm selling
whale oil.

In the developing world,
I'm selling crack cocaine.

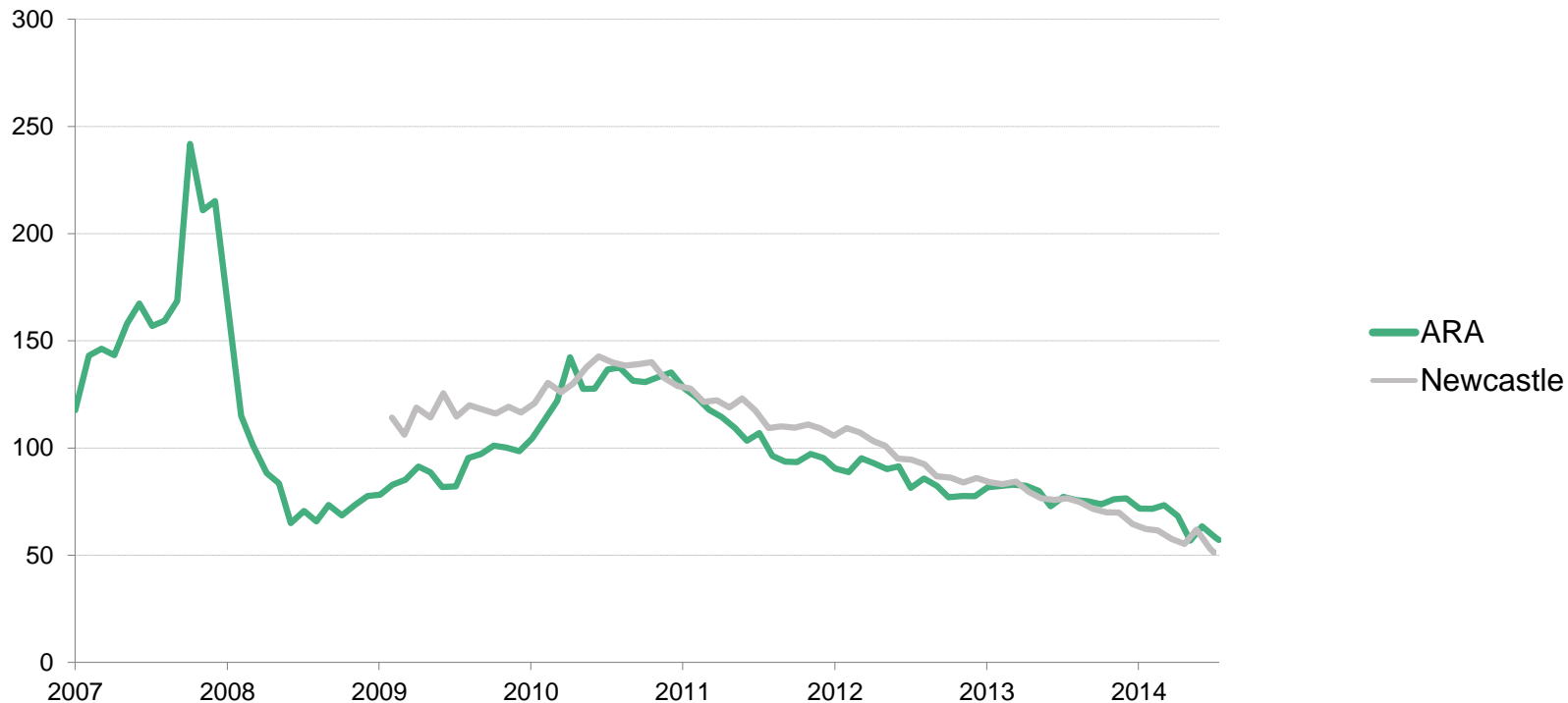
”

Anonymous
coal trader



ARA AND NEWCASTLE COAL PRICE 2007–15

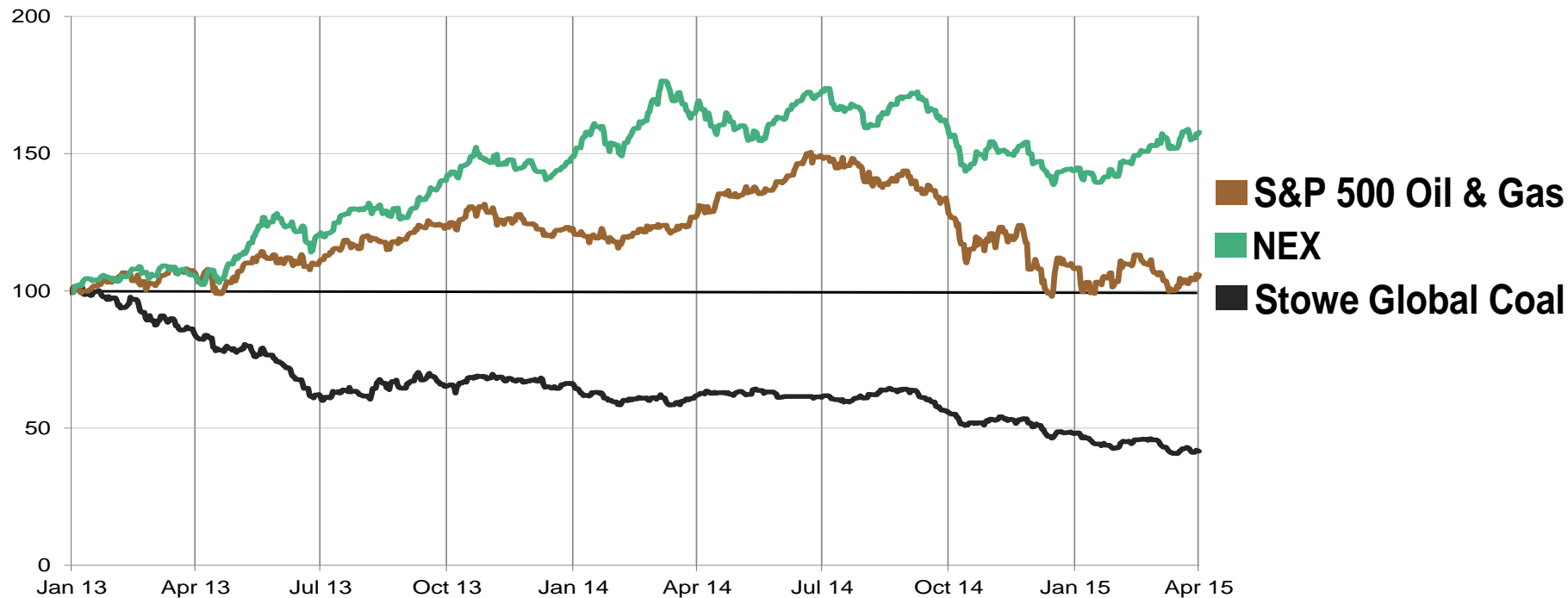
(2014 US\$/TONNE)



Note: Prices have been adjusted for inflation

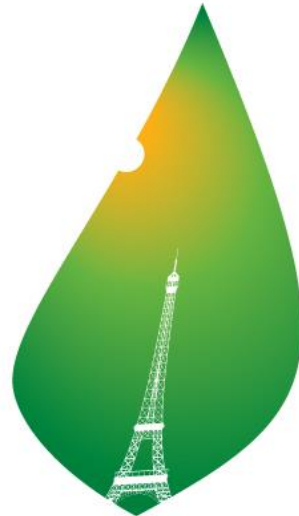
Source: Bloomberg New Energy Finance

NEX CLEAN ENERGY INDEX 2013–15 YTD



Note: Values as of 01 April 2015; Stowe and S&P 500 rebased to 100 on 01 Jan 2013

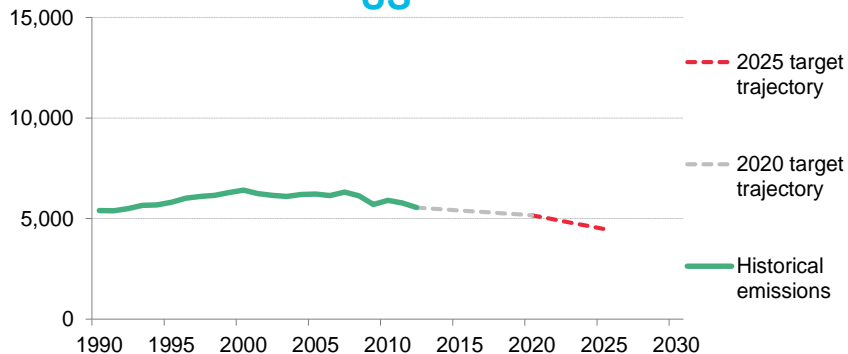
Source: Bloomberg New Energy Finance



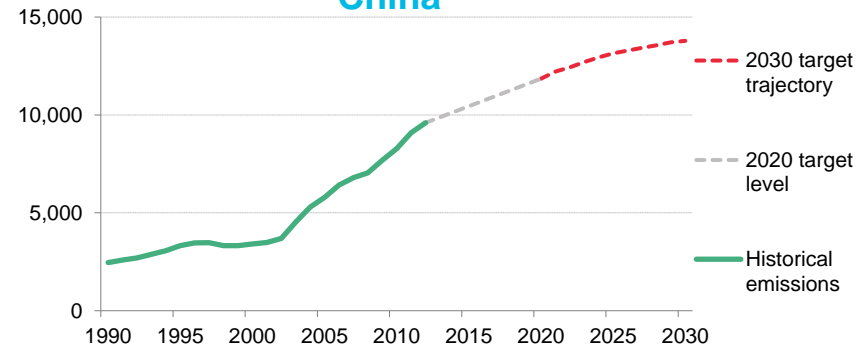
PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21•CMP11

EMERGING COMMITMENTS FOR COP21 IN PARIS (MTCO2E)

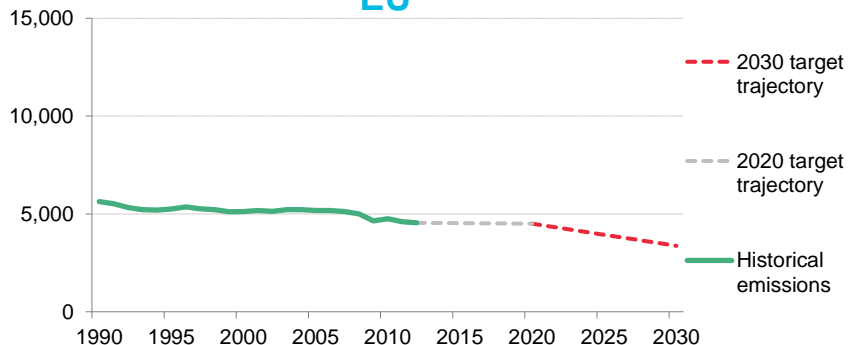
US



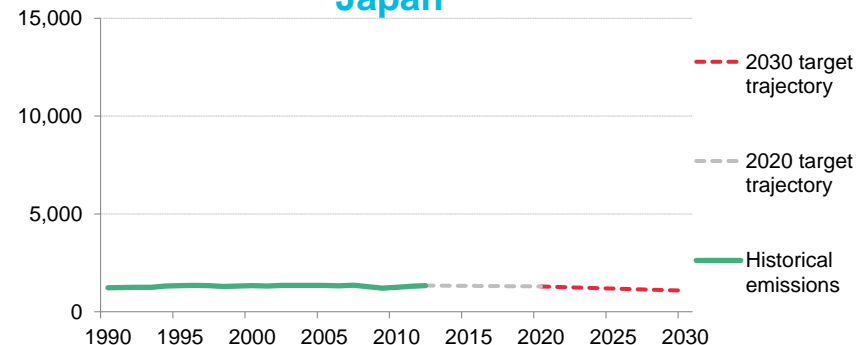
China



EU



Japan



Notes: Countries' inclusion of land-use and forestry in emissions calculations vary. China's 2020 target estimated from announced emissions intensity target per unit GDP, and no absolute emissions level set for its 2030 pledge.

Source: Bloomberg New Energy Finance,
UNFCCC

Defect?

- Distribution charges
- Resilience (black-out)
- Sense of independence



Don't defect?

- System right-sizing
- Sale of surplus power
- Resilience (back-up)
- System management and maintenance

Source: Bloomberg New Energy Finance

“

Having a solar panel that isn't connected to the grid is like having a computer that's not connected to the Internet.

”

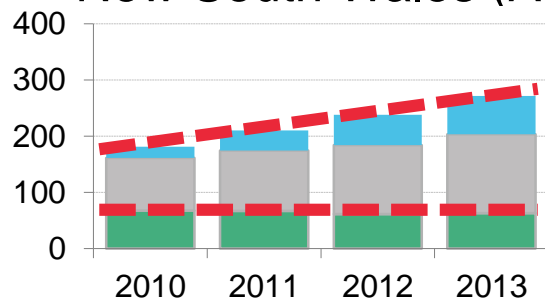
*Ellen Hayes, PG&E
spokeswoman*



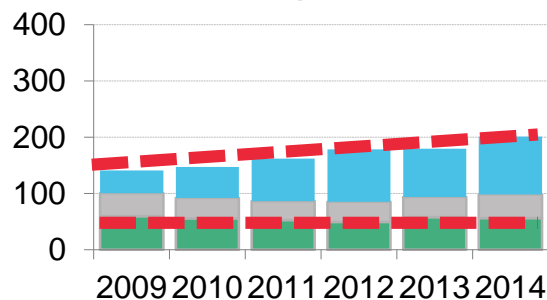
Picture: Ellen Hayes

COMPOSITION OF RESIDENTIAL ELECTRICITY TARIFFS ACROSS THE WORLD, 2008-2014 (EUR/MWh)

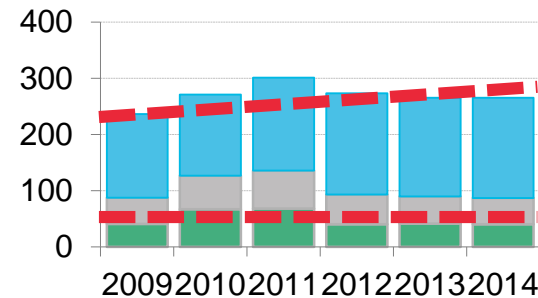
New South Wales (Aus)



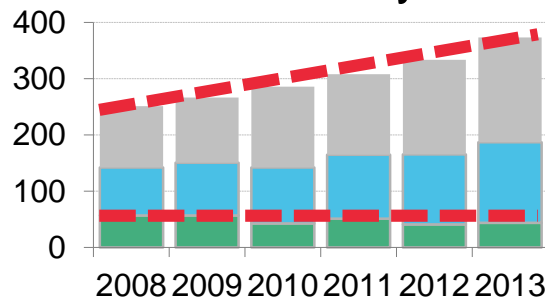
UK



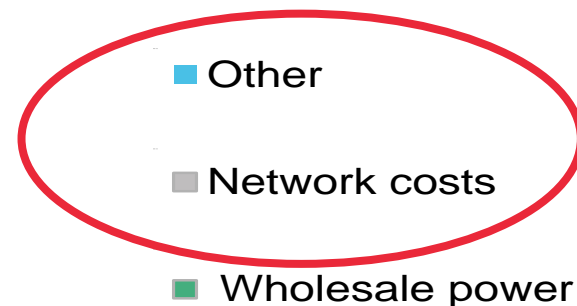
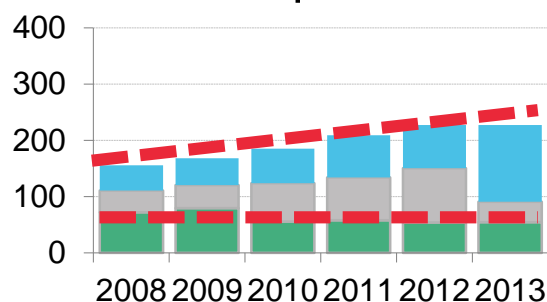
Denmark



Germany

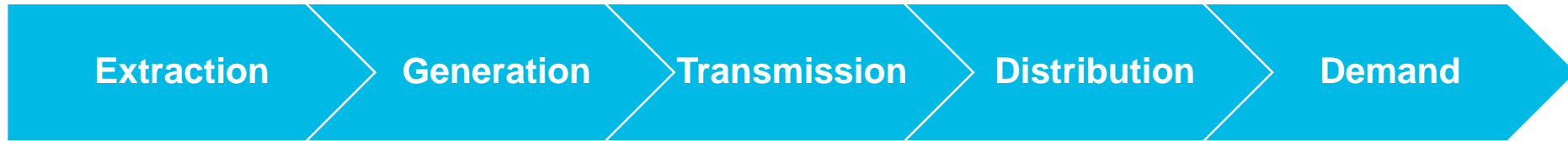


Spain



Note: Other includes taxes, levies, carbon costs, profits

Source: Australian Energy Regulator, Eurostat Bloomberg New Energy Finance



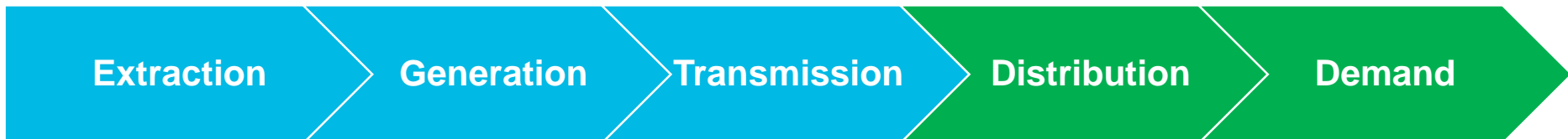
Old world



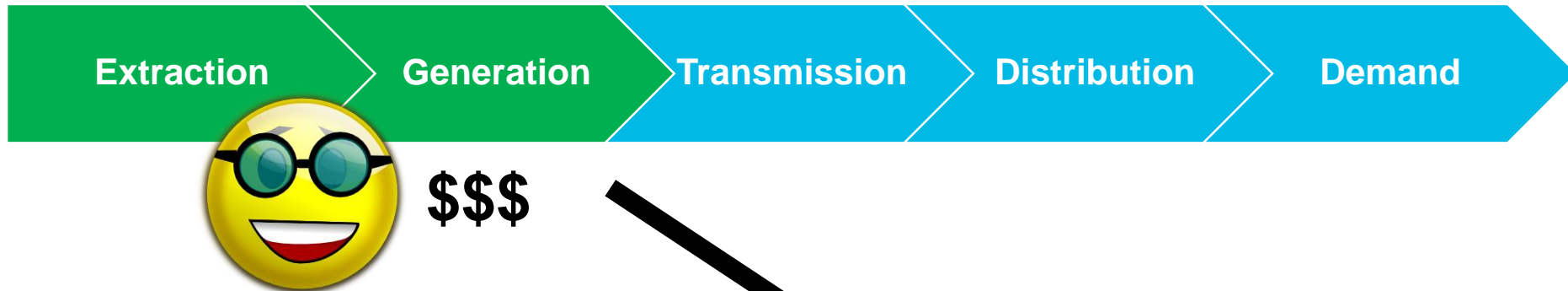
Old world



Age of plenty



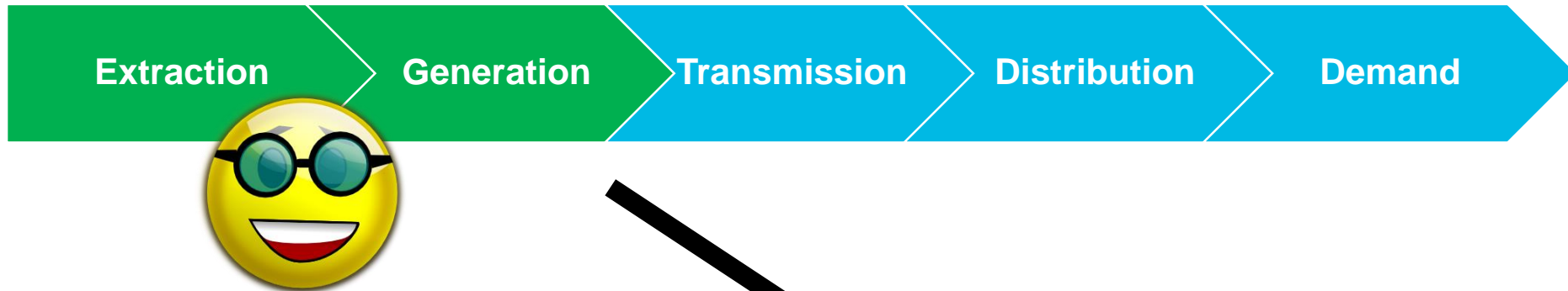
Old world



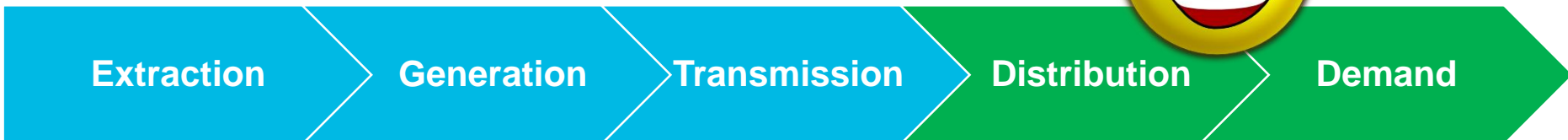
Age of plenty



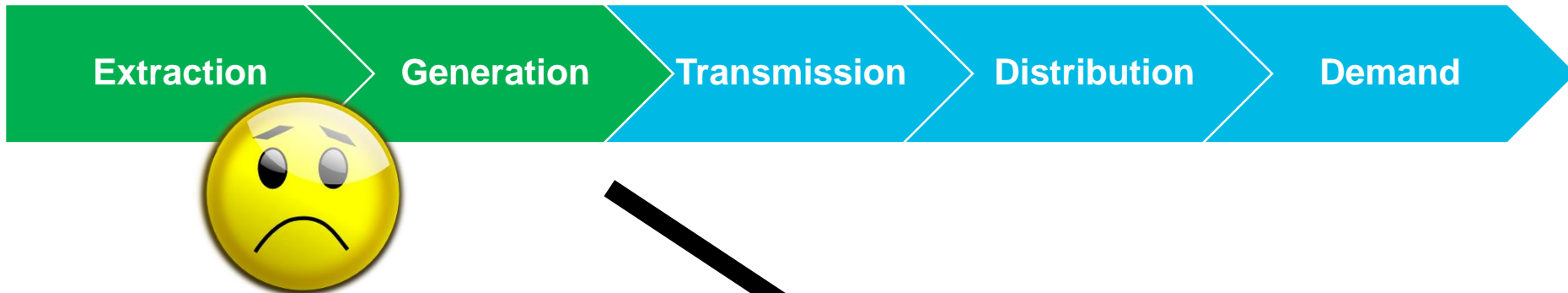
Old world



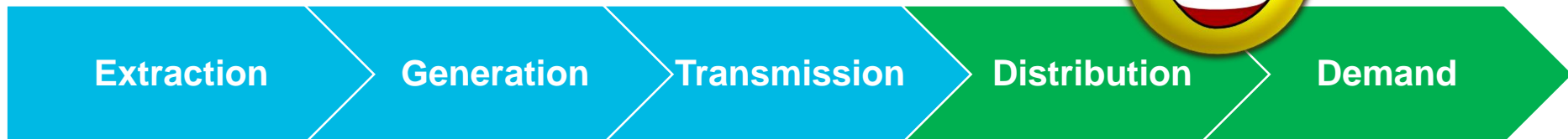
Age of plenty



Old world

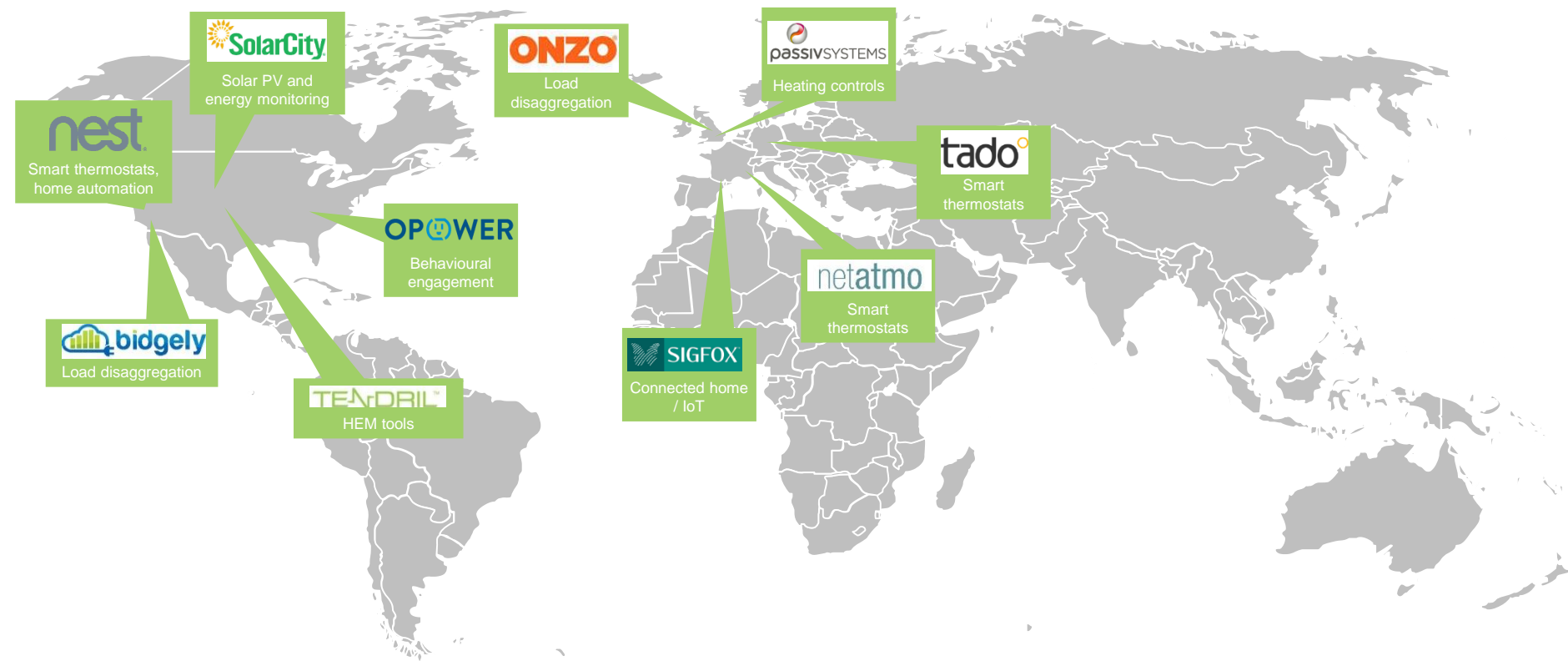


Age of plenty



e.ON
e.OFF

ENERGY RETAIL BATTLEFIELD NEW ENTRANTS - STARTUPS



Source: Bloomberg New Energy Finance

ENERGY RETAIL BATTLEFIELD

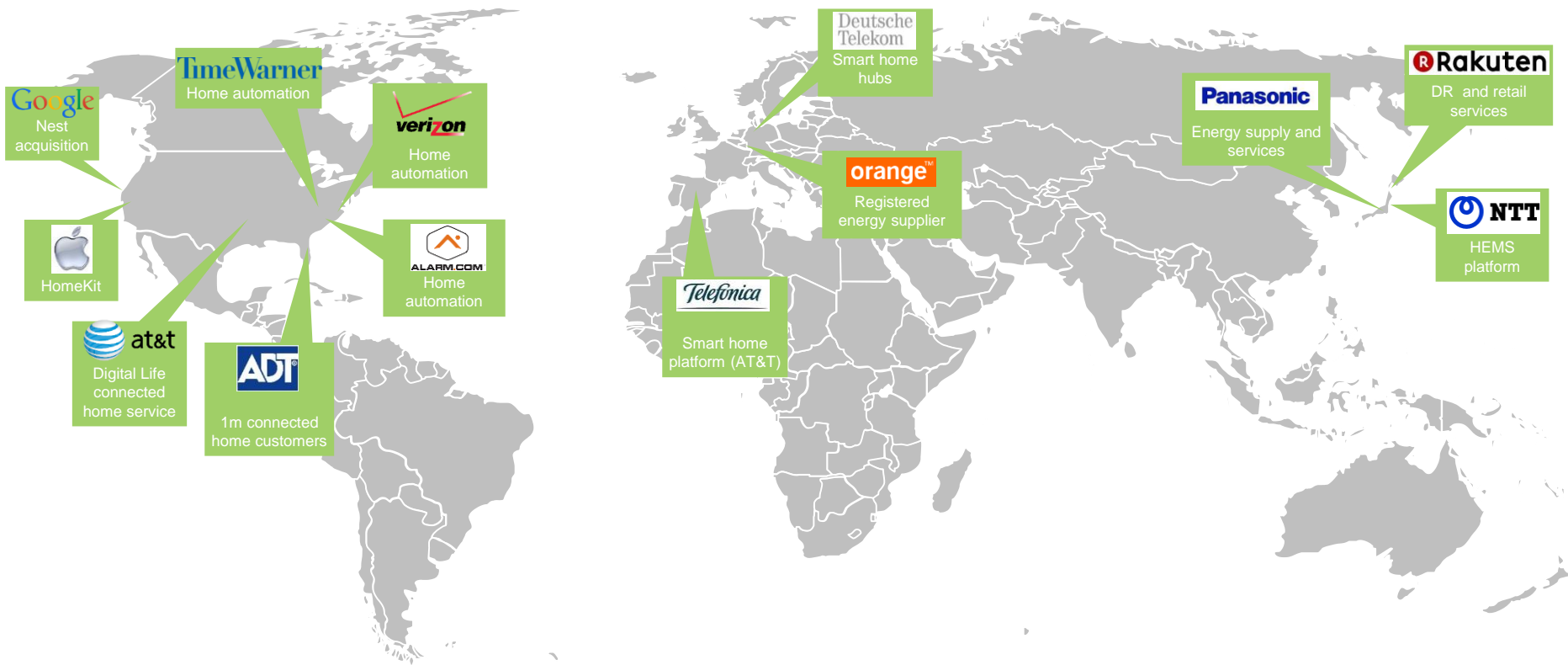
NEW SERVICES FROM INCUMBENTS



Source: Bloomberg New Energy Finance

ENERGY RETAIL BATTLEFIELD

NEW ENTRANTS - MAJORS



Source: Bloomberg New Energy Finance

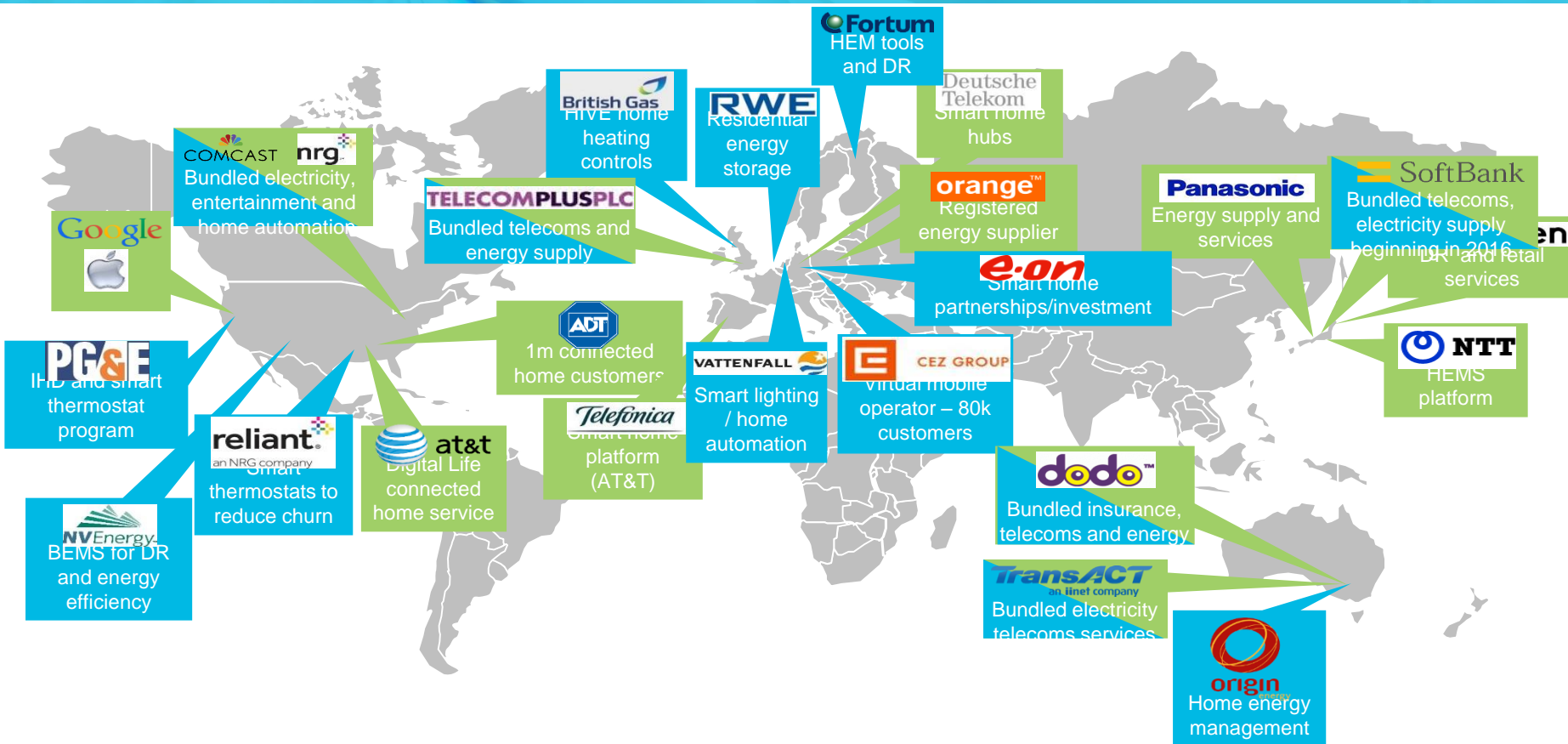
ENERGY RETAIL BATTLEFIELD

NEW SERVICE BUNDLES



Source: Bloomberg New Energy Finance

ENERGY RETAIL BATTLEFIELD



\$850 million
Over 25 years

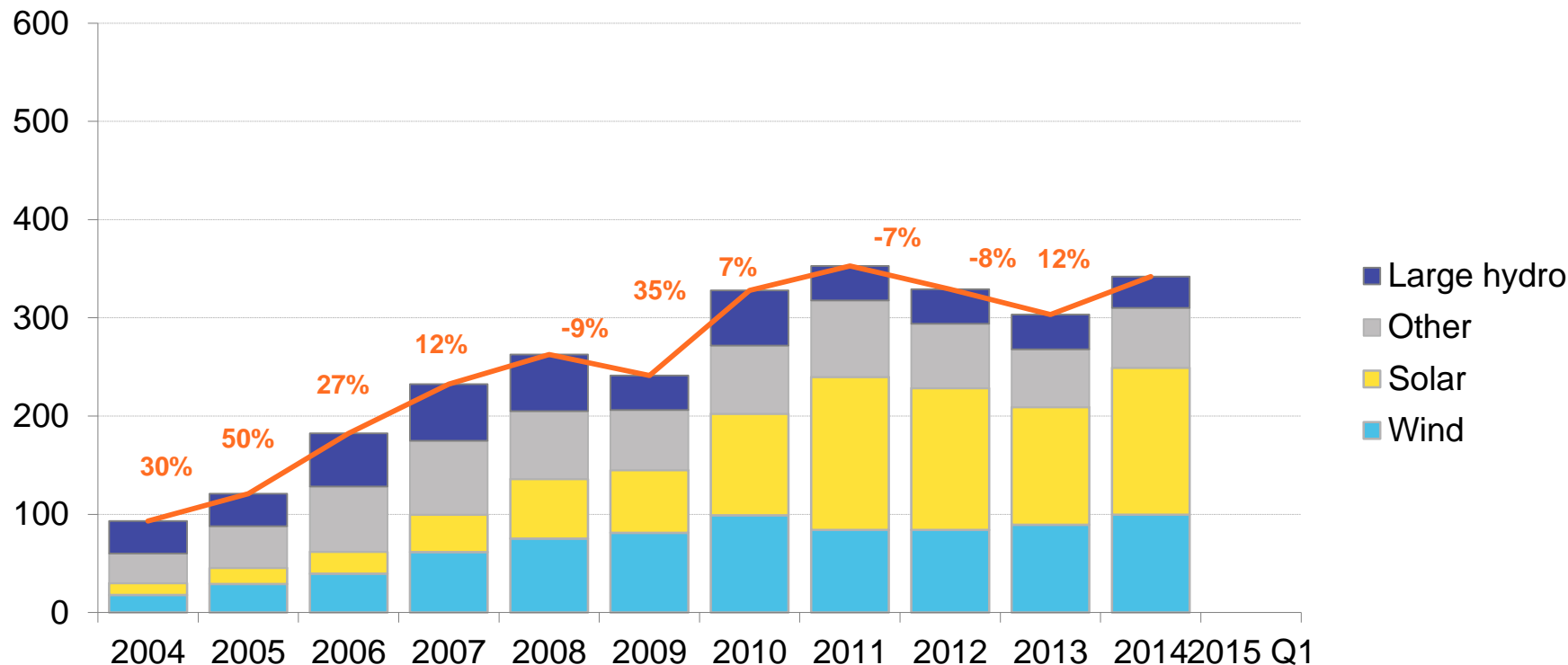


SELECTED COMMERCIAL BUILDERS OR BUYERS OF RENEWABLE ENERGY



Images: Various; Bloomberg New Energy Finance

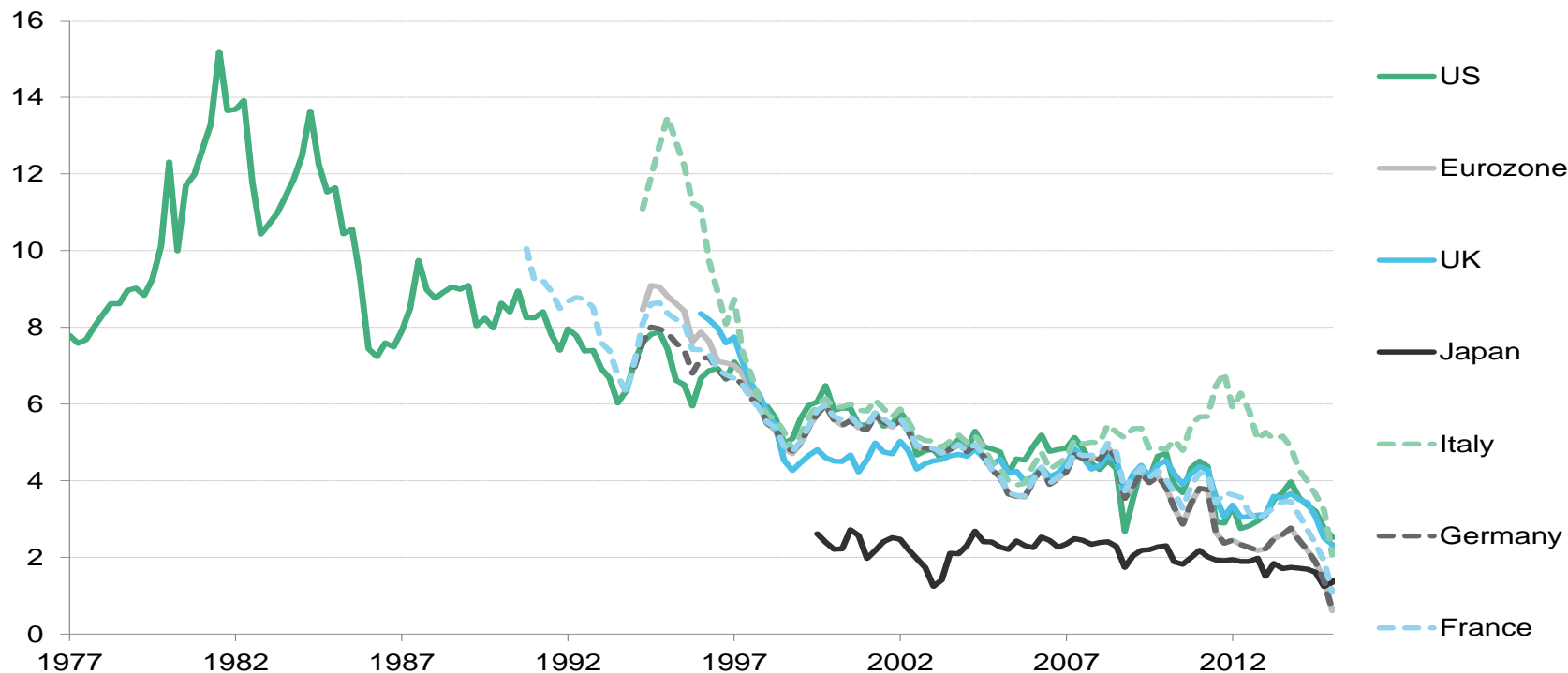
CLEAN VS FOSSIL ENERGY INVESTMENT (\$BN)



Note: Nominal values. Renewable energy includes large hydro, investment made at financial close. Fossil fuel is gross investment on coal, gas and oil capacity. We assume capacity retirement of 3.3%/yr for coal, 4%/yr for gas and 2.5%/yr for coal in all countries where fossil capacity is net positive. We assume retiring capacity is replaced in countries where fossil fuel capacity additions are net positive and not where additions are zero or negative. We count fossil fuel investment in the year when capacity was commissioned (owing to a lower visibility of data). Q1 2015 figures do not include corporate & government R&D, or EST asset finance estimates which are compiled on an annual basis only.

Source: Bloomberg New Energy Finance

YIELD ON 30-YEAR BONDS, 1977-2015 (%)



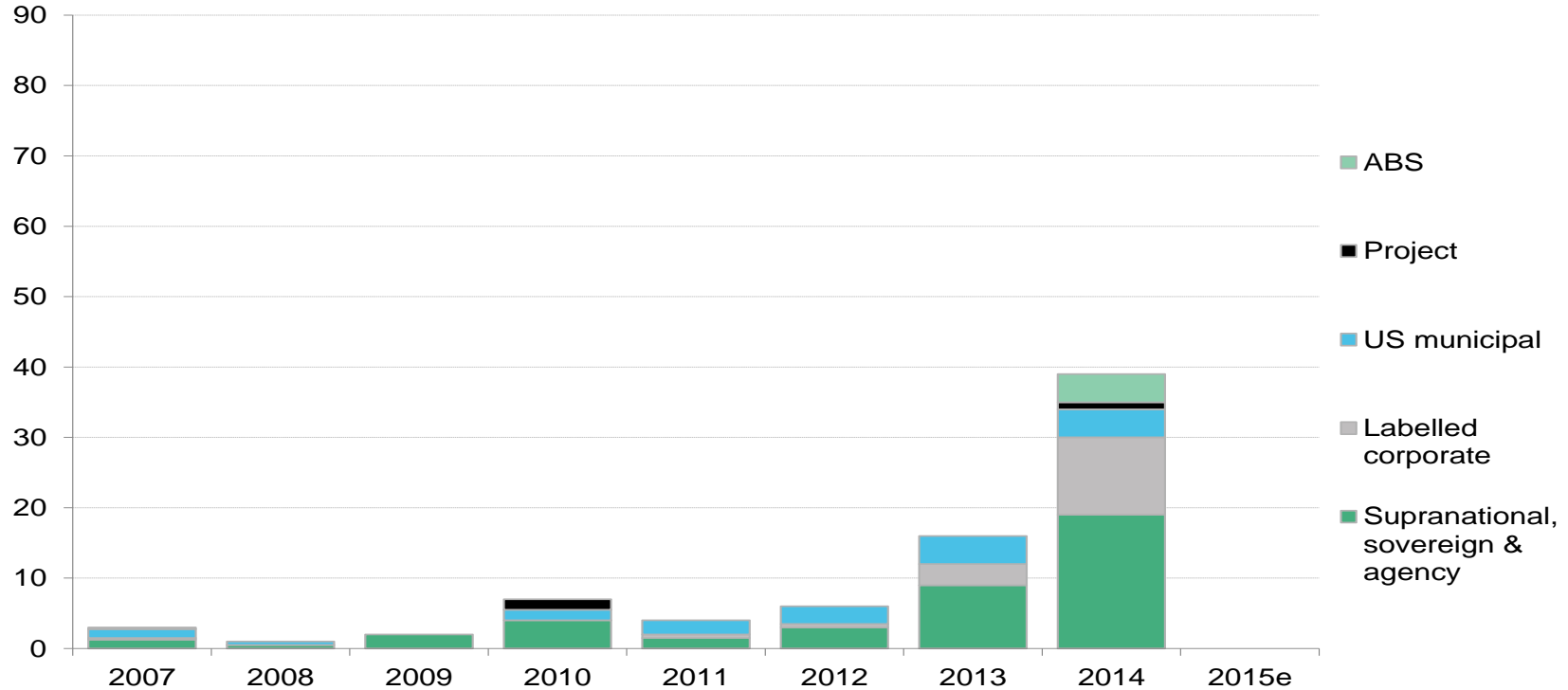
Note: This shows the percentage yield of 30 year generic government bond rates downloaded on 09/04/2015 from the Bloomberg Terminal

Source: Bloomberg New Energy Finance



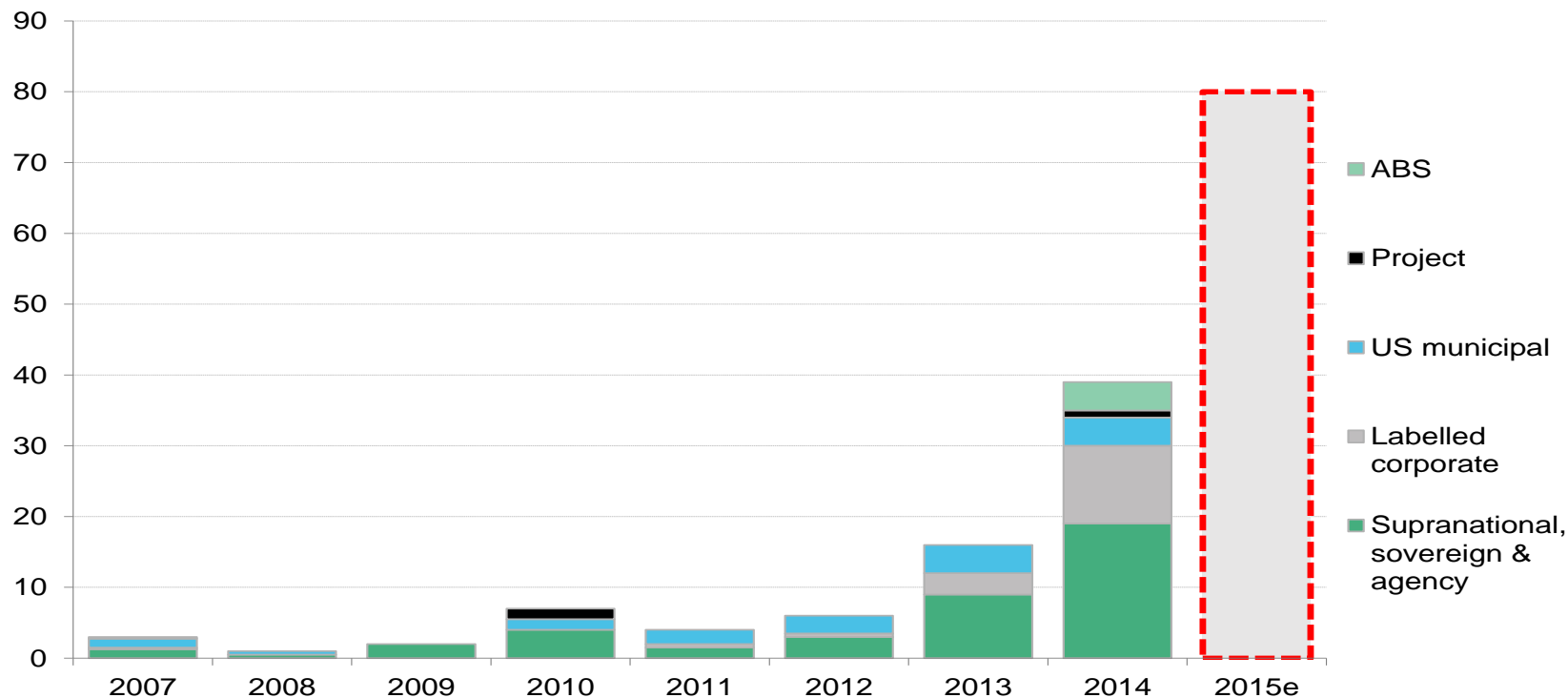
Photo: ZDF / Jan Böhmermann?

GREEN BOND ISSUANCE, 2007-14 (\$BN)



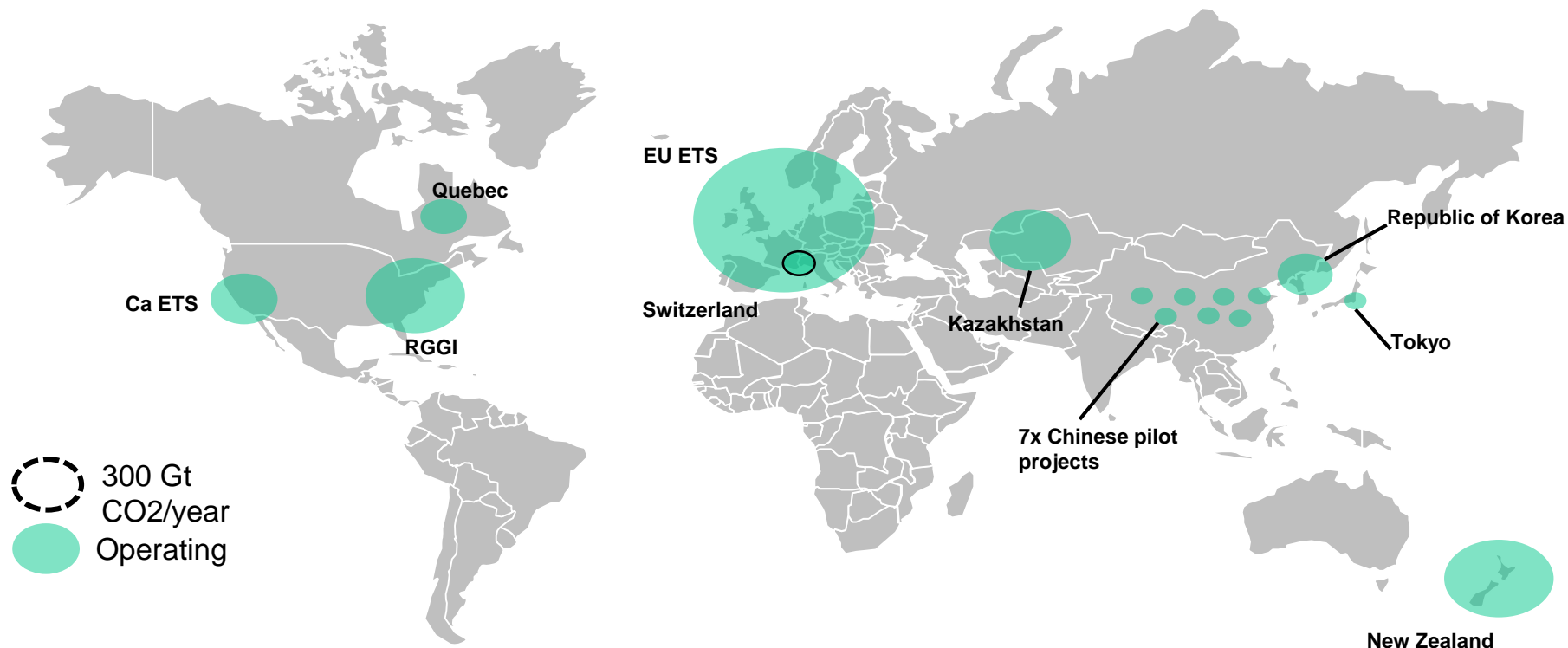
Source: Bloomberg New Energy Finance,
Bloomberg Terminal

GREEN BOND ISSUANCE, 2007-14 (\$BN)



Source: Bloomberg New Energy Finance,
Bloomberg Terminal

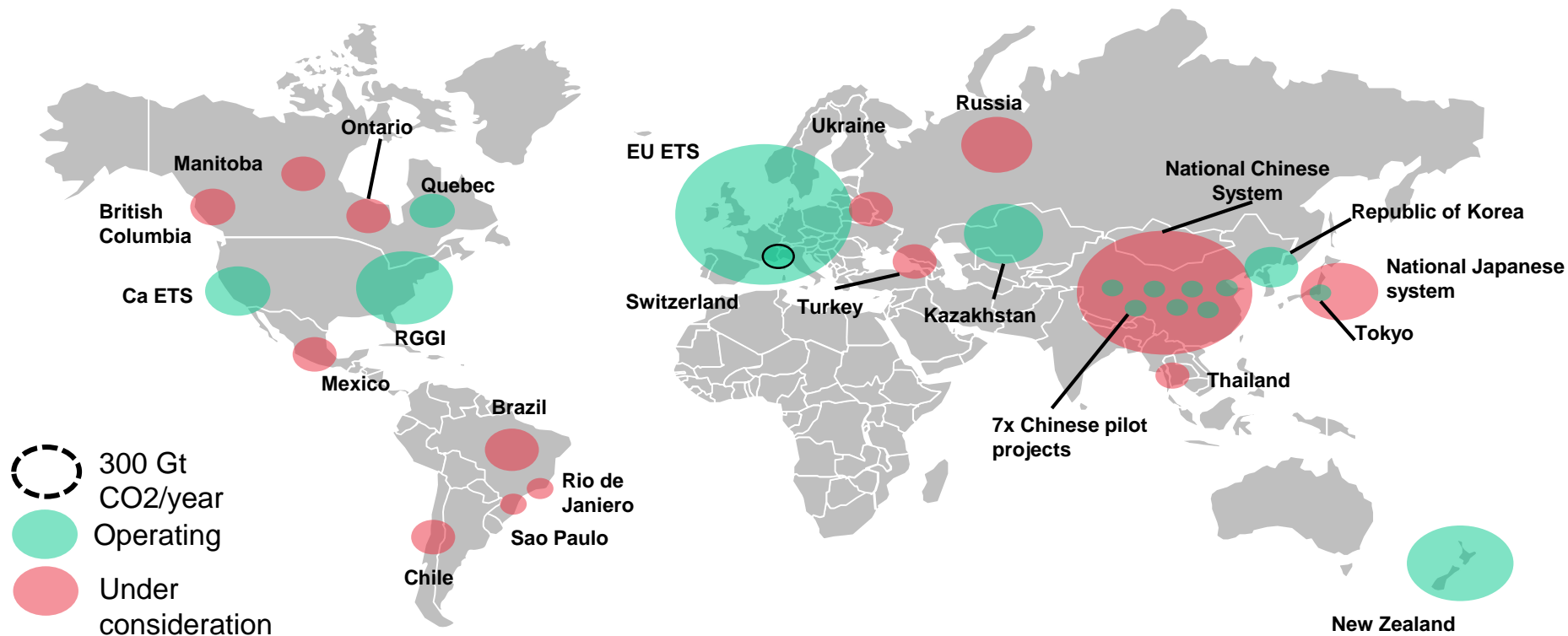
EMISSIONS TRADING SCHEMES, 2015



Note: The size of each circle is proportional to GHG emissions covered. Based off the CA ETS covering 334 million tonnes of CO₂ per year as of 2015

Source: IEA, Bloomberg New Energy Finance

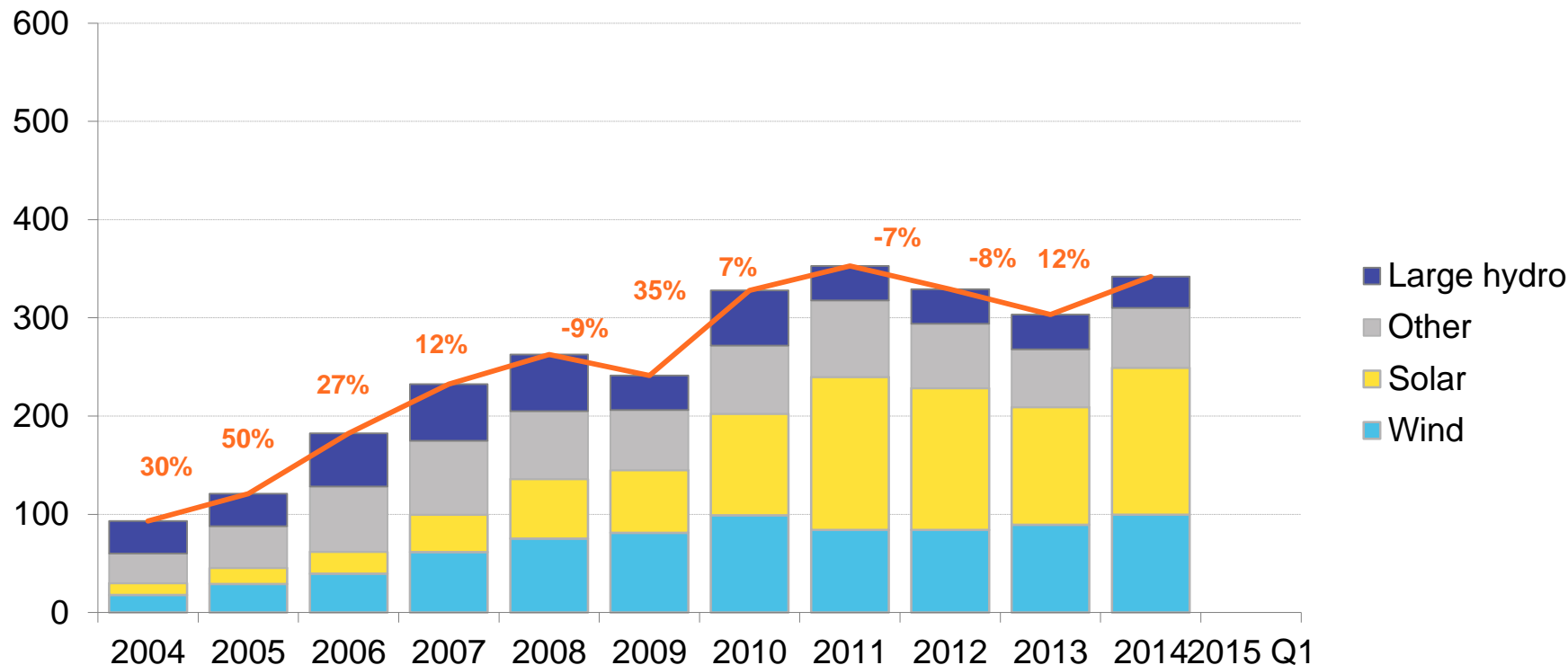
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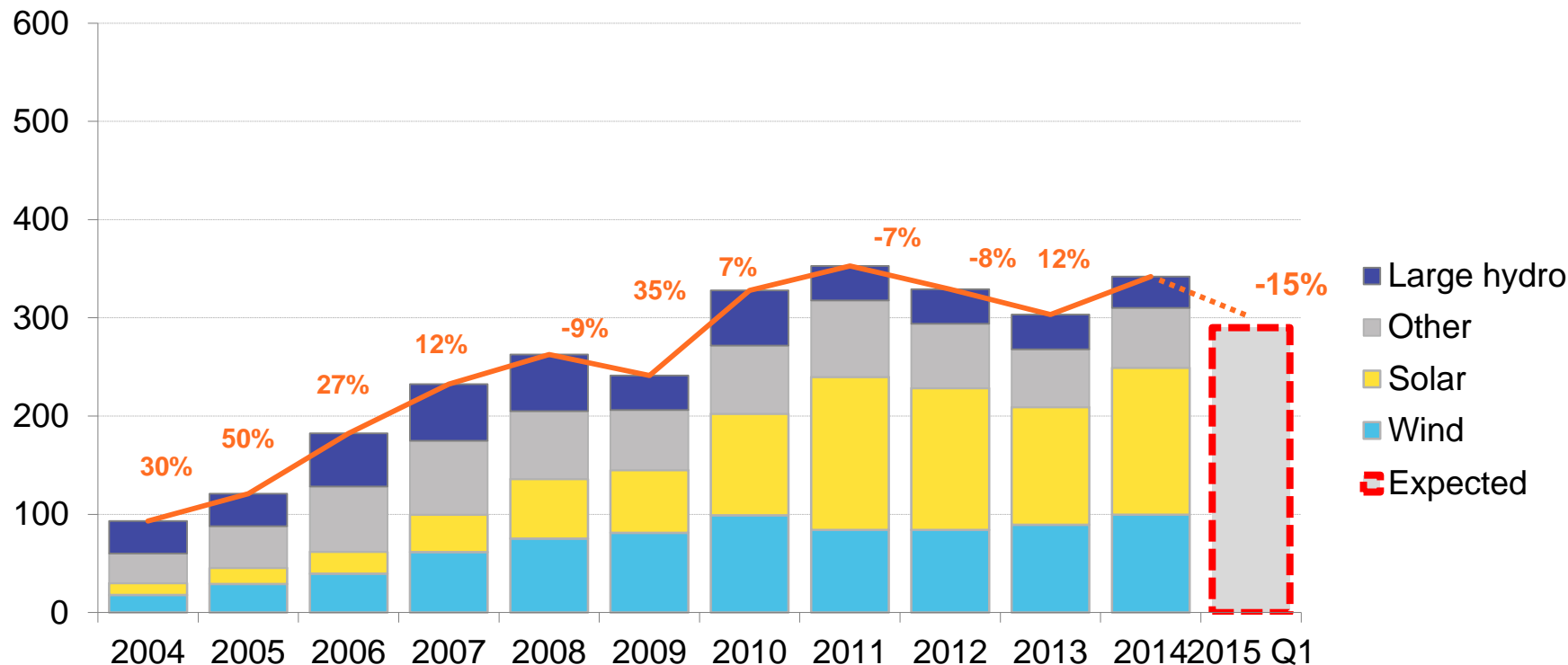
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Source: Bloomberg New Energy Finance

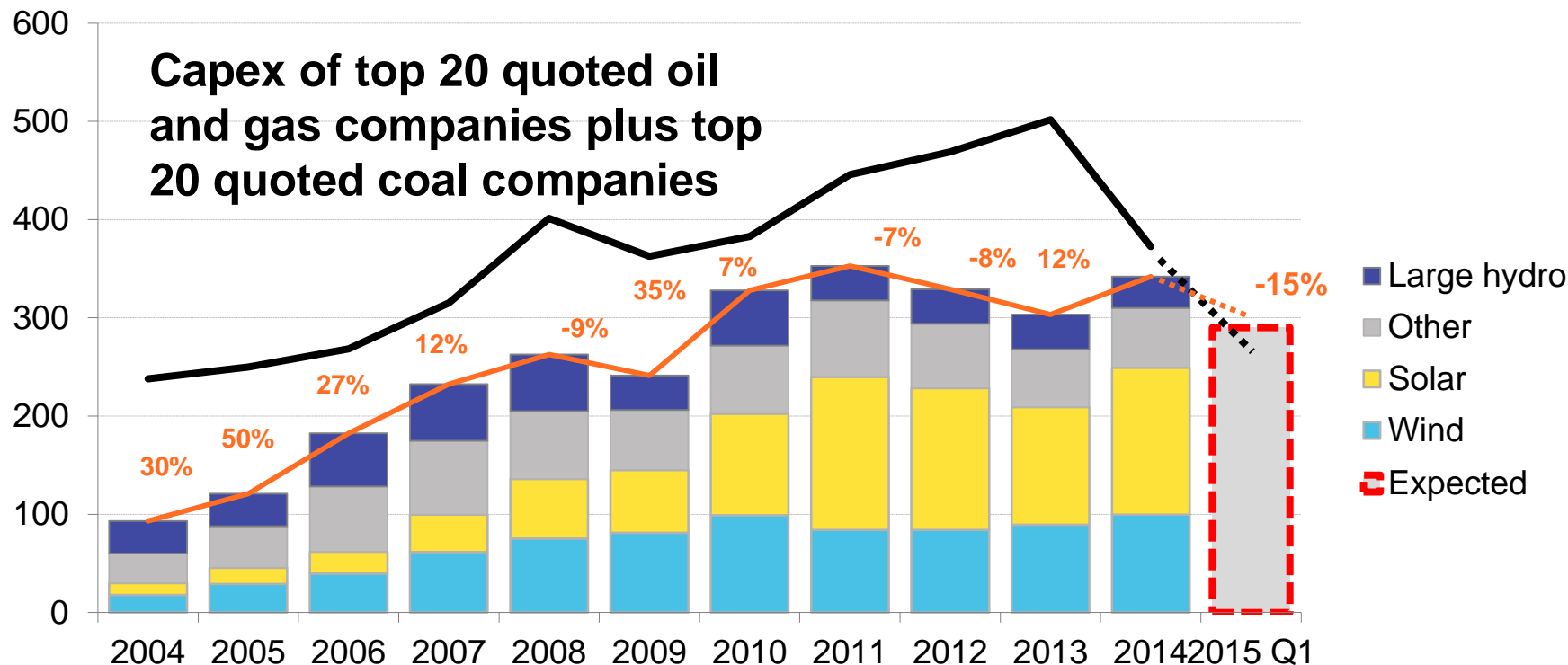
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Source: Bloomberg New Energy Finance

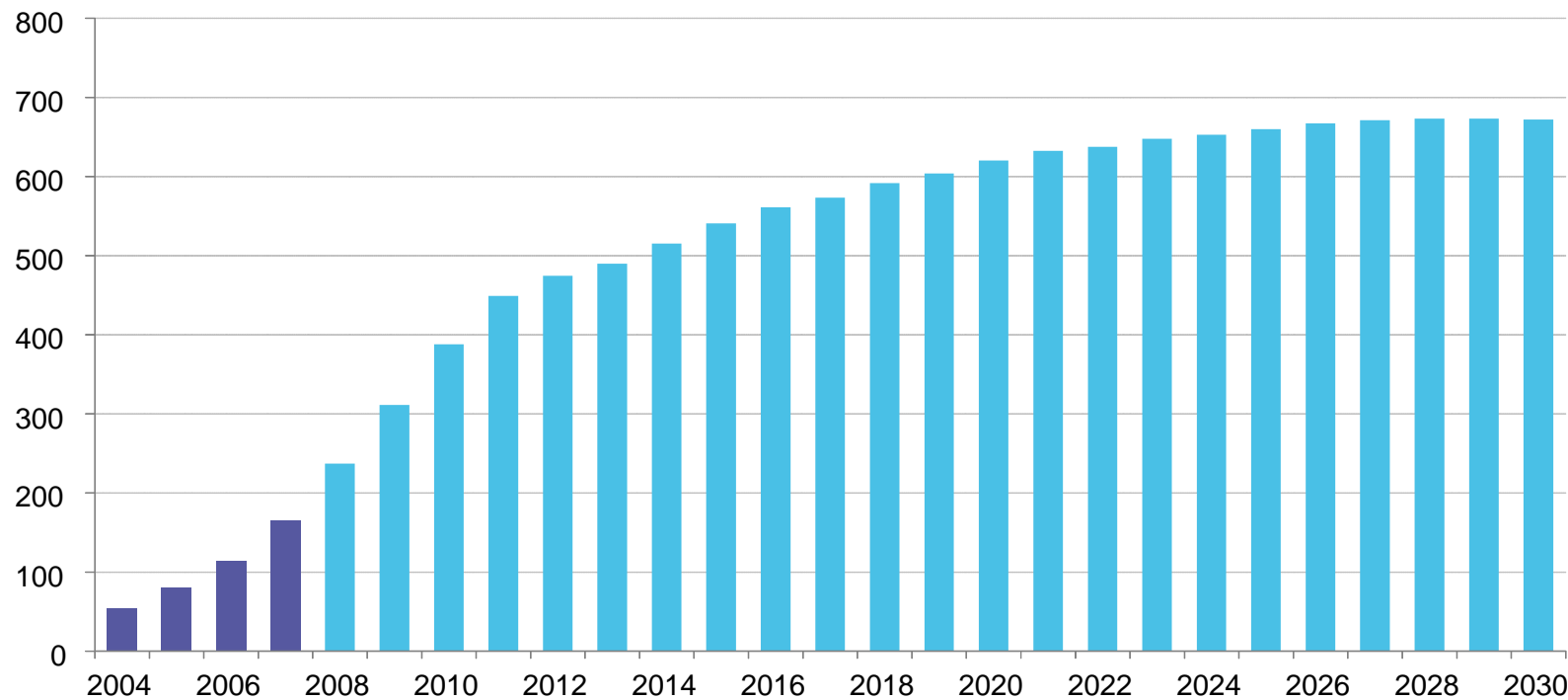
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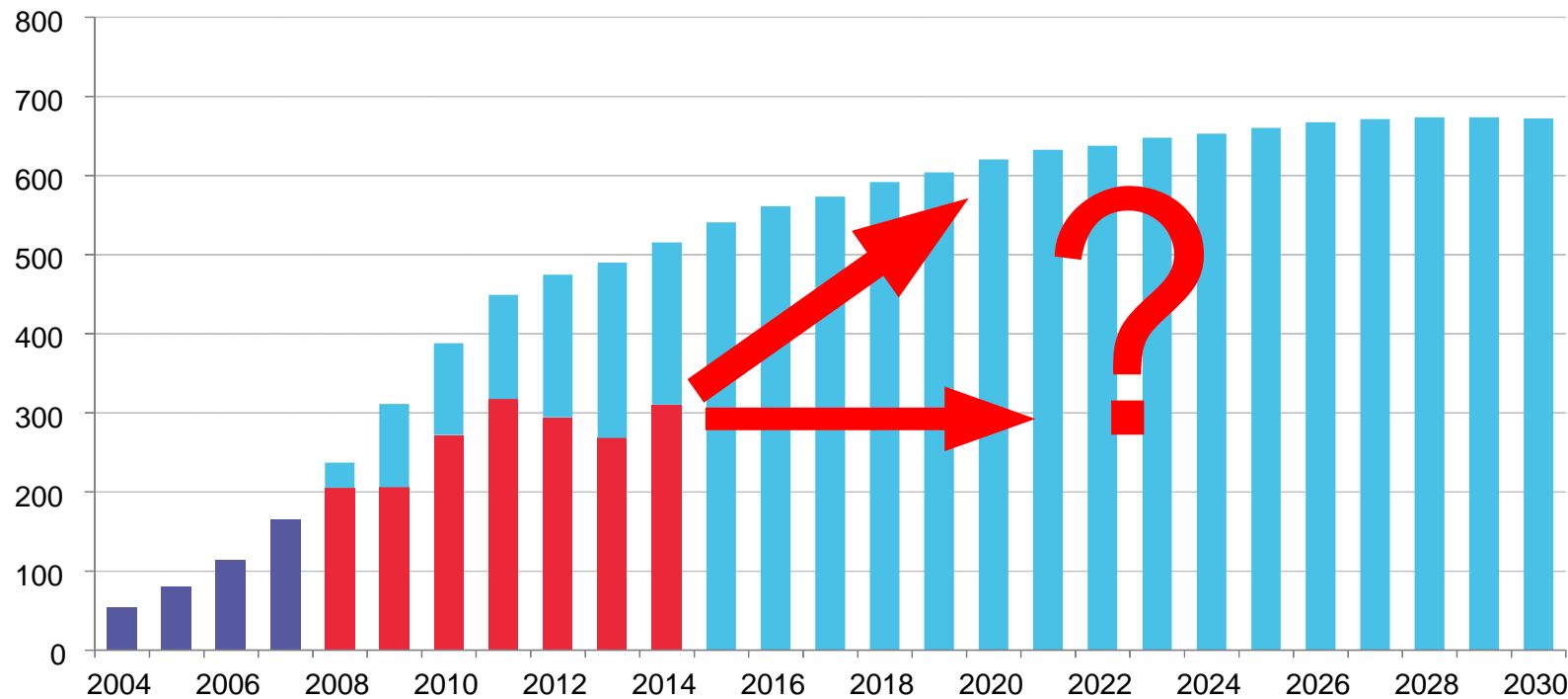
Source: Bloomberg New Energy Finance

CLEAN ENERGY CAPITAL REQUIREMENT TO 2030 (\$BN)



Source: New Energy Finance Global Futures 2008, Bloomberg New Energy Finance

CLEAN ENERGY CAPITAL REQUIREMENT TO 2030 (\$BN)



Source: New Energy Finance Global Futures 2008, Bloomberg New Energy Finance

Thanks!

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