

# IN THE MIDST OF A PHASE CHANGE

**NEW ZEALAND WIND ENERGY ASSOCIATION  
CONFERENCE, WELLINGTON 2014**

**KOBAD BHAVNAGRI**

**TWITTER: @KOBADB**



# ABOUT BLOOMBERG NEW ENERGY FINANCE

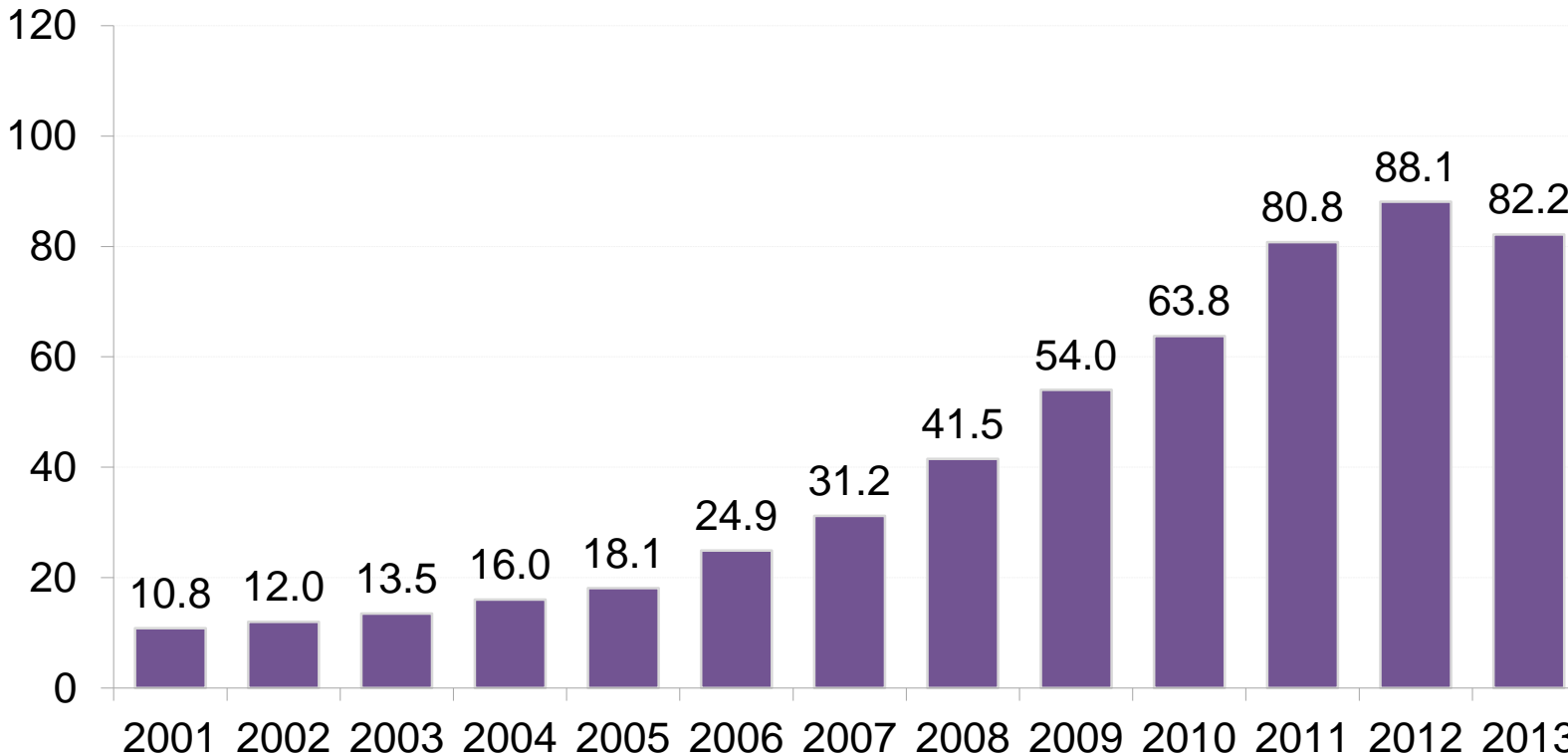
200 staff in 13 offices worldwide

**Objective:** serve clients with the best intelligence on finance, technology and policy developments in clean energy, energy efficiency and carbon markets



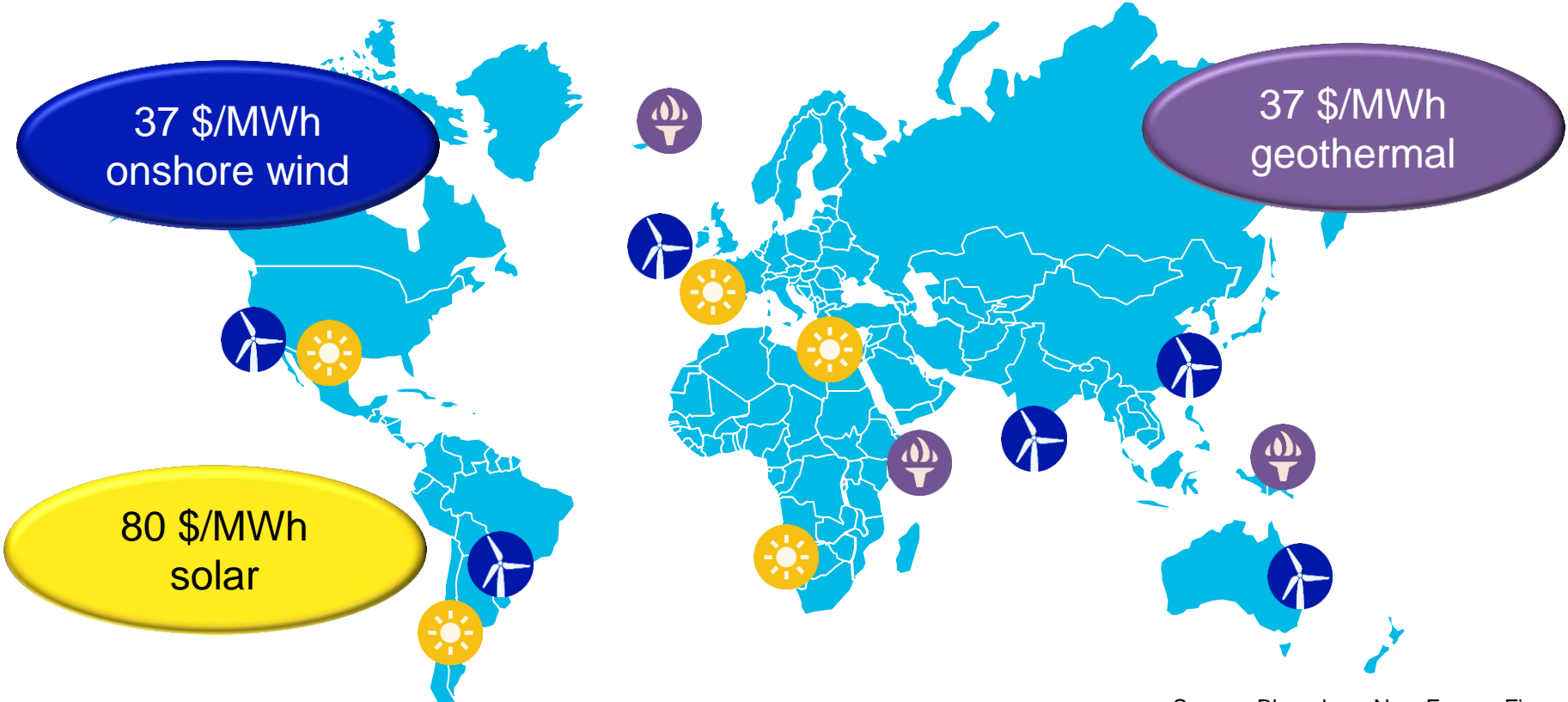
# CLEAN ENERGY NEW BUILD INSTALLATIONS

## 2001-2013 (GW)



Source: Bloomberg New Energy Finance

# PRICE COMPETITIVE CLEAN ENERGY: 2014 (LCOE)

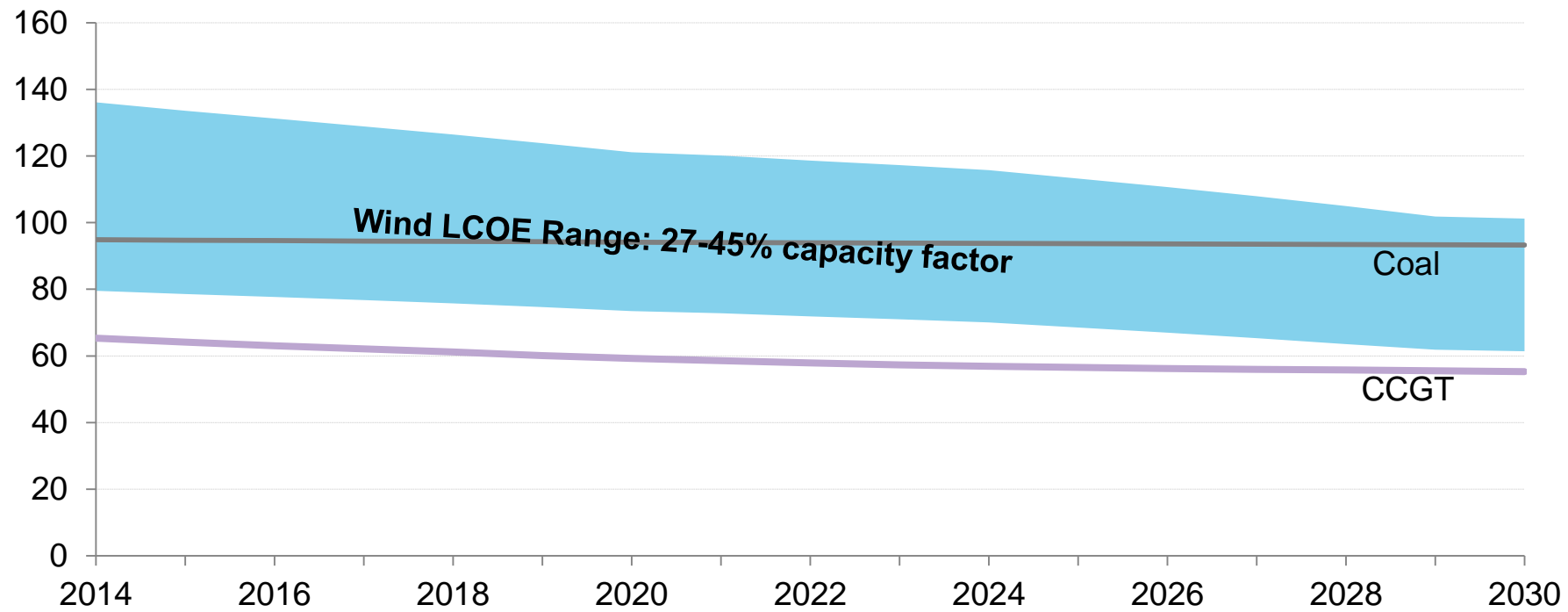


Note: Levelised cost of electricity excludes impact of subsidies.

Source: Bloomberg New Energy Finance

# WIND IS NOW CHEAPER THAN NEW COAL

## LCOE IN AUSTRALIA (AUD/MWH)

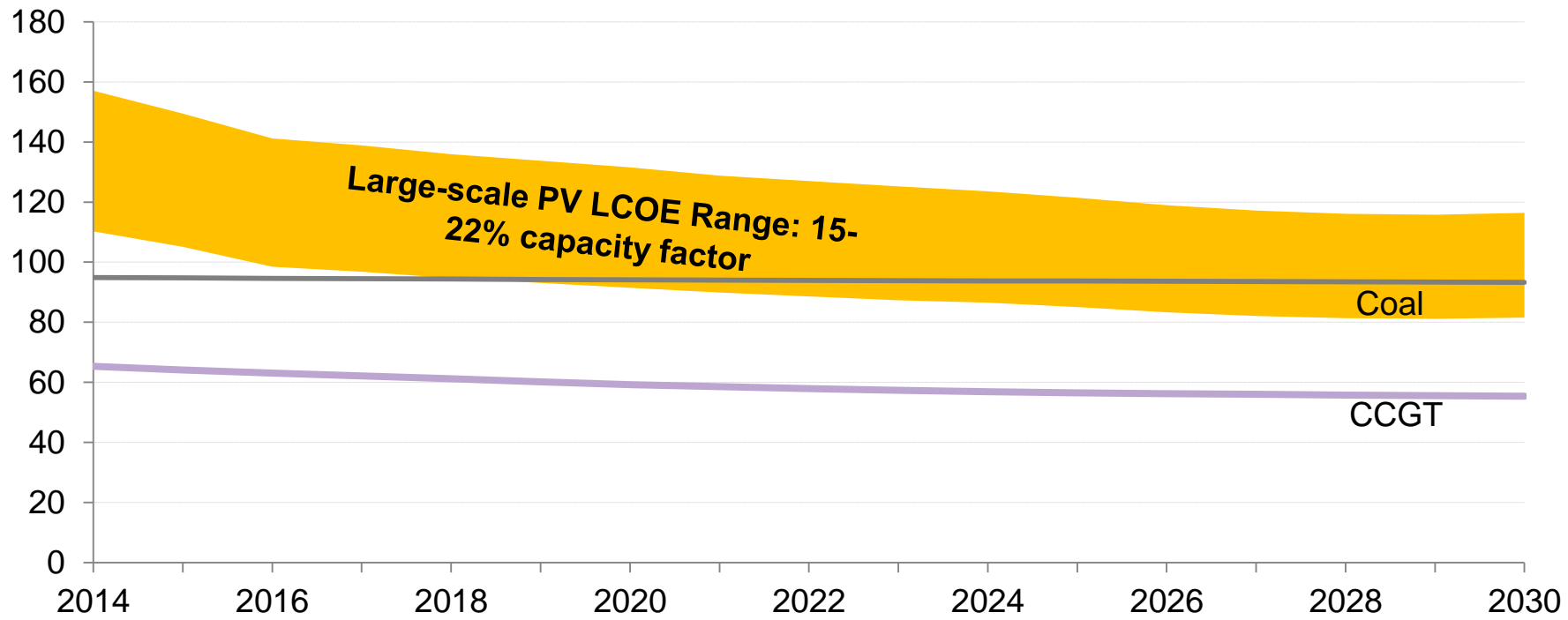


Note: Excludes carbon price. Levelised cost of energy is the dollar per megawatt-hour price for an inflation adjusted, fixed-price power off-take agreement that, taking into account all project specific costs, offers the sponsor and/or project developer the minimum equity return necessary to undertake the project without subsidy.

Source: Bloomberg New Energy Finance

# LARGE-SCALE PV WILL ALSO SOON BE COMPETITIVE

## LCOE IN AUSTRALIA (AUD/MWH)

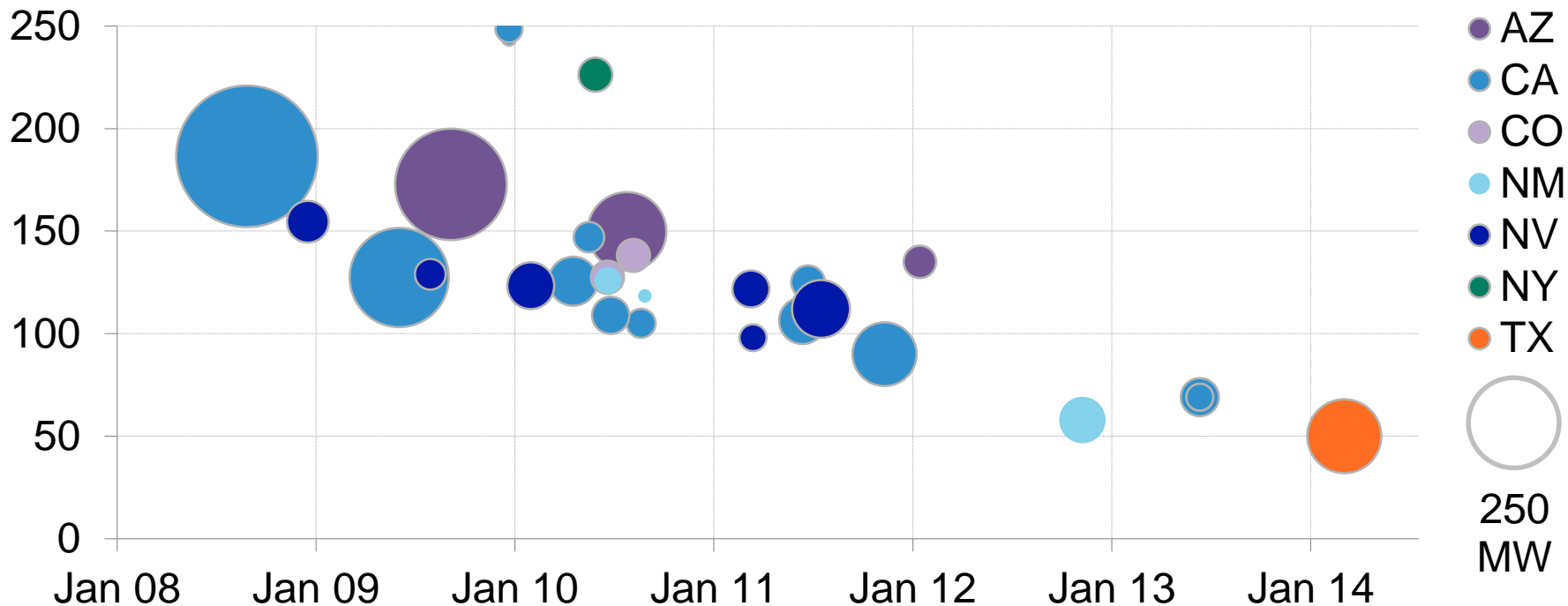


Note: Excludes carbon price. Levelised cost of energy is the dollar per megawatt-hour price for an inflation adjusted, fixed-price power off-take agreement that, taking into account all project specific costs, offers the sponsor and/or project developer the minimum equity return necessary to undertake the project without subsidy.

Source: Bloomberg New Energy Finance

# US SOLAR PPA PRICES BY SIGNING DATE

## H1 2008 – H2 2013 (\$/MWH)

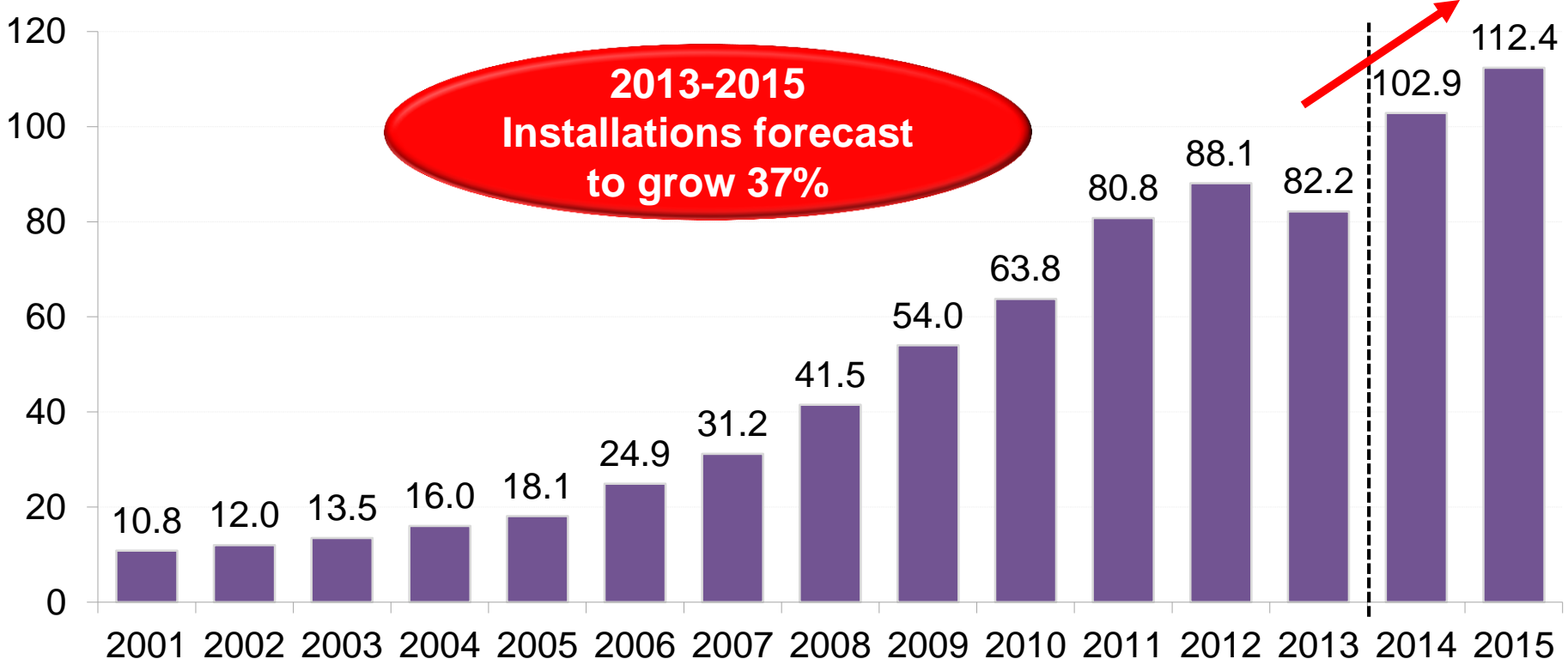


Note: Does not include PPAs under 5MW. 'PPA price' is calculated as the average offtake price over the period of project operation. For projects reporting to FERC, the PPA price is calculated as the average selling price over the operating history of the project. For projects not reporting to FERC, the PPA price represents the 'year1' selling price.

Source: Bloomberg New Energy Finance, FERC

# CLEAN ENERGY NEW BUILD INSTALLATIONS

## 2001-2013 (GW)



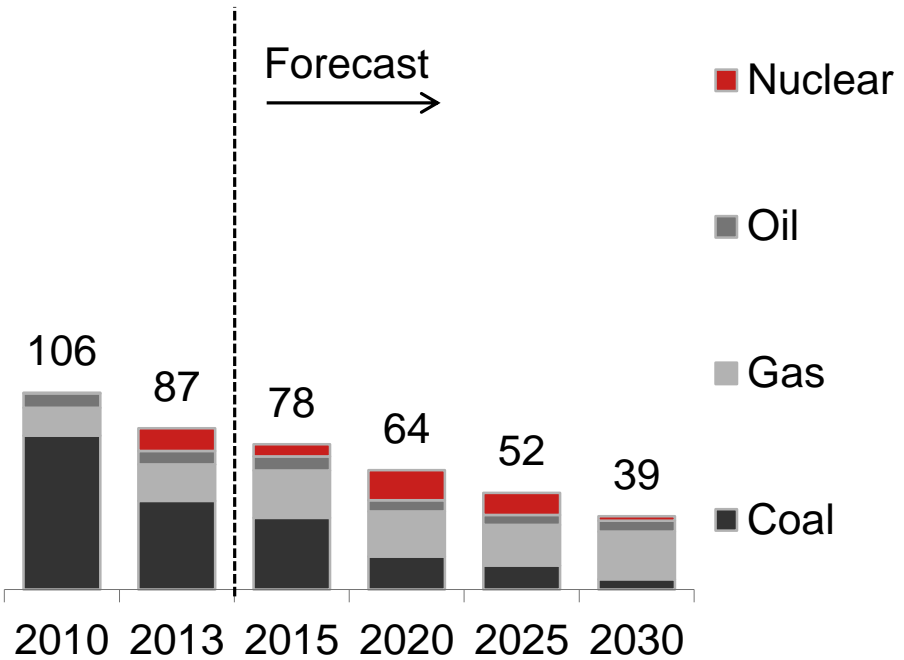
Source: Bloomberg New Energy Finance



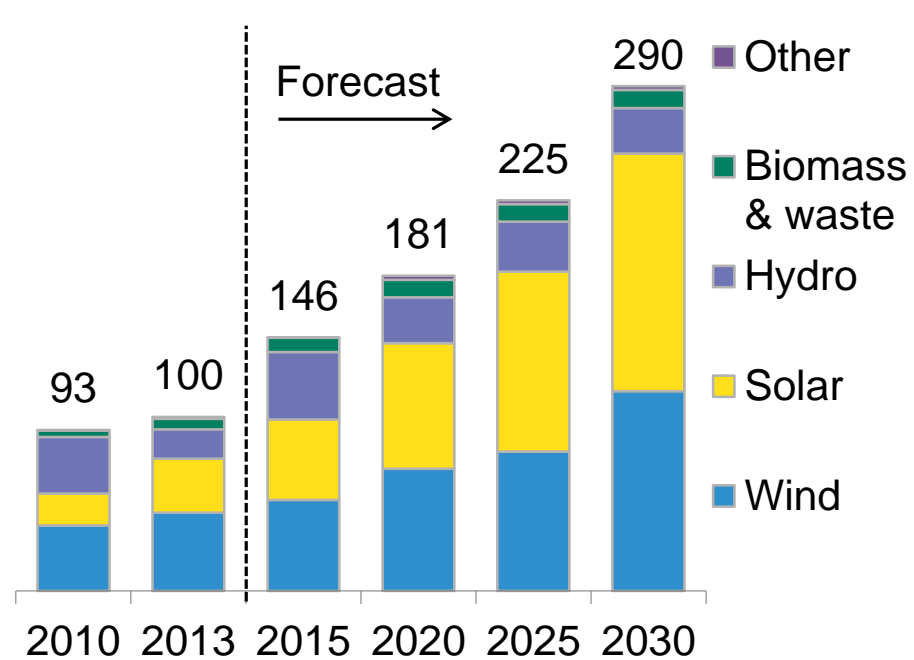
# GLOBAL POWER GENERATION CAPACITY ADDITIONS

## 2010 – 2030 (GW)

### FOSSIL FUEL AND NUCLEAR



### RENEWABLES



Source: Bloomberg New Energy Finance

# CUMULATIVE INSTALLED POWER GENERATION CAPACITY

(GW)

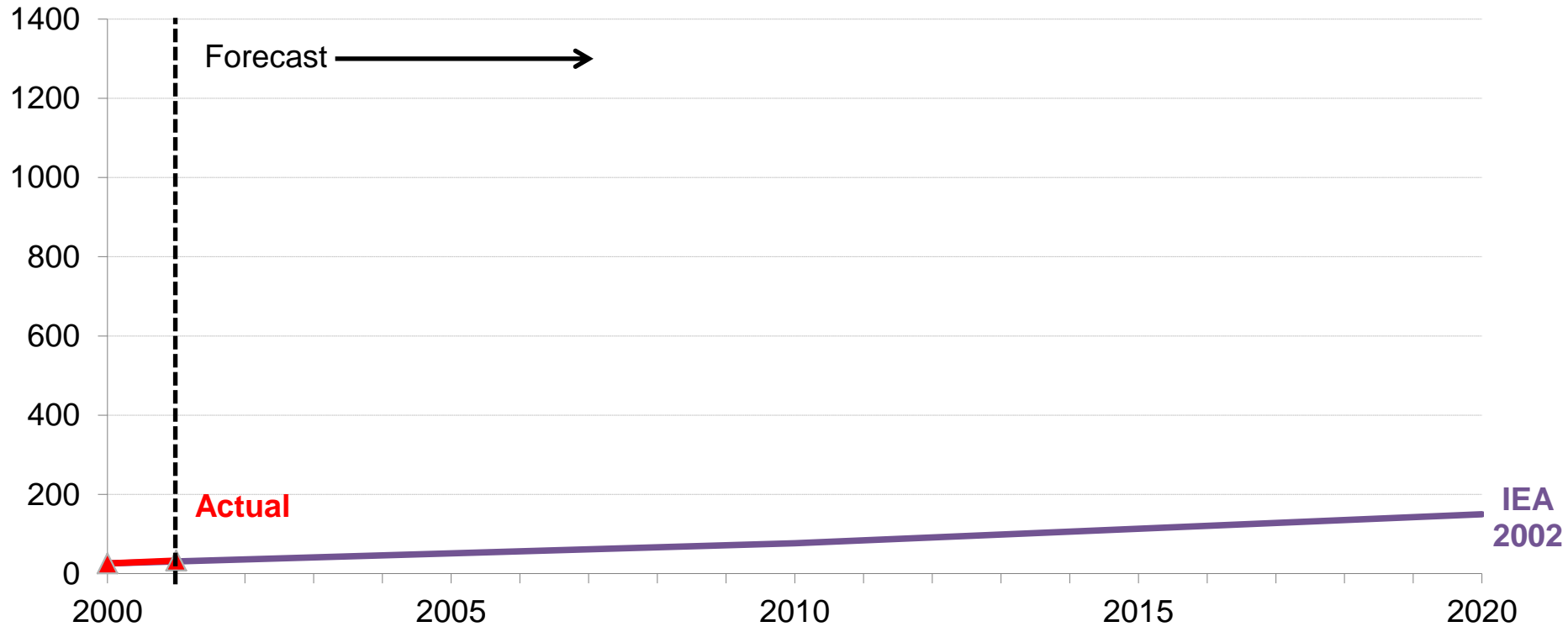
By 2030 renewables will account for 50% of installed power generation capacity



Note: EfW is energy from waste, Small-scale PV includes commercial and residential scale rooftop PV.

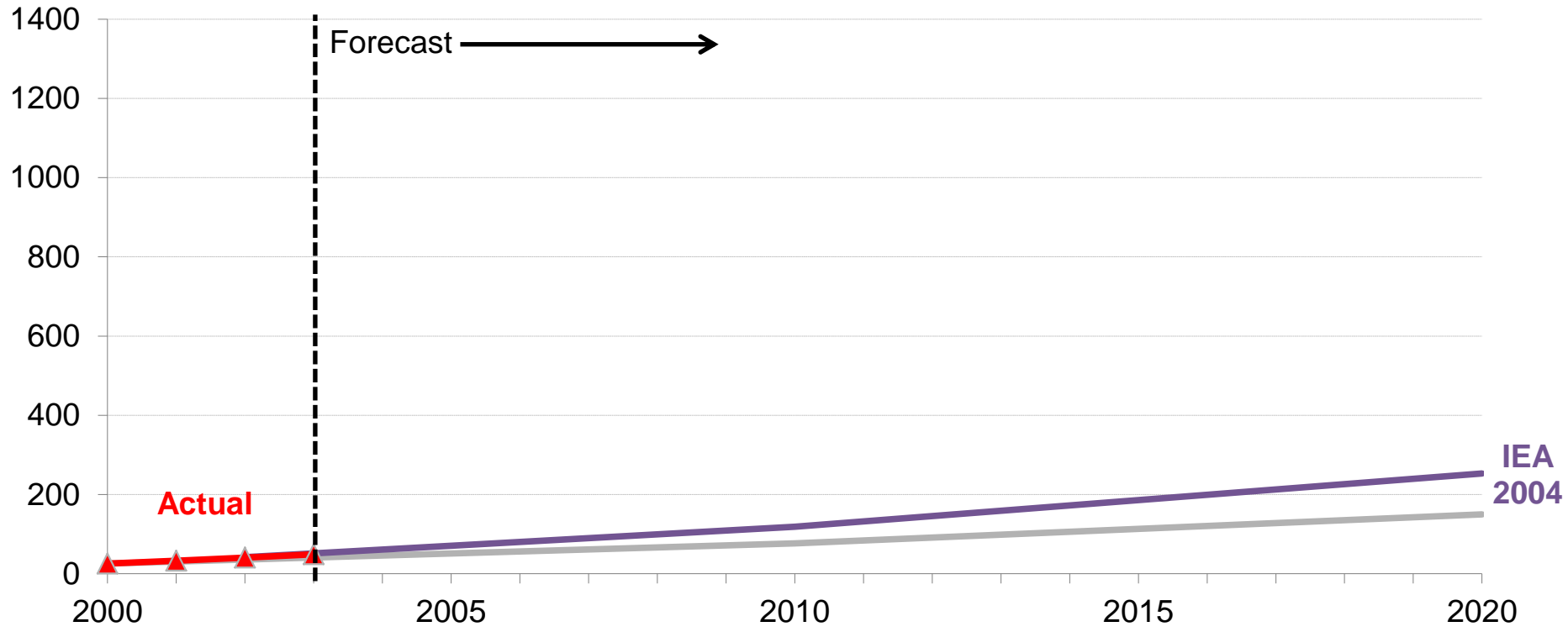
Source: Bloomberg New Energy Finance

# FORECASTING INSTALLED RENEWABLE GENERATION CAPACITIES (GW)



Note: Renewables exclude biomass and hydro. IEA base case forecasts shown. Source: IEA Bloomberg New Energy Finance

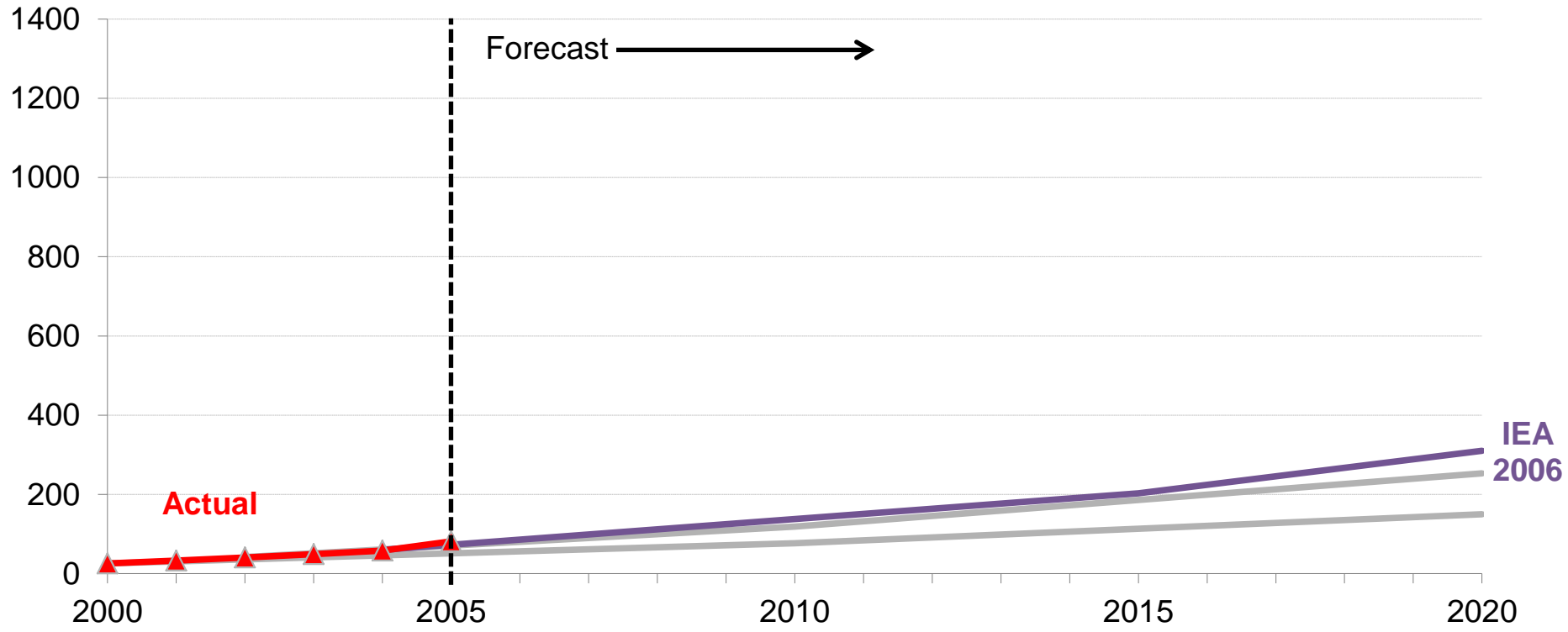
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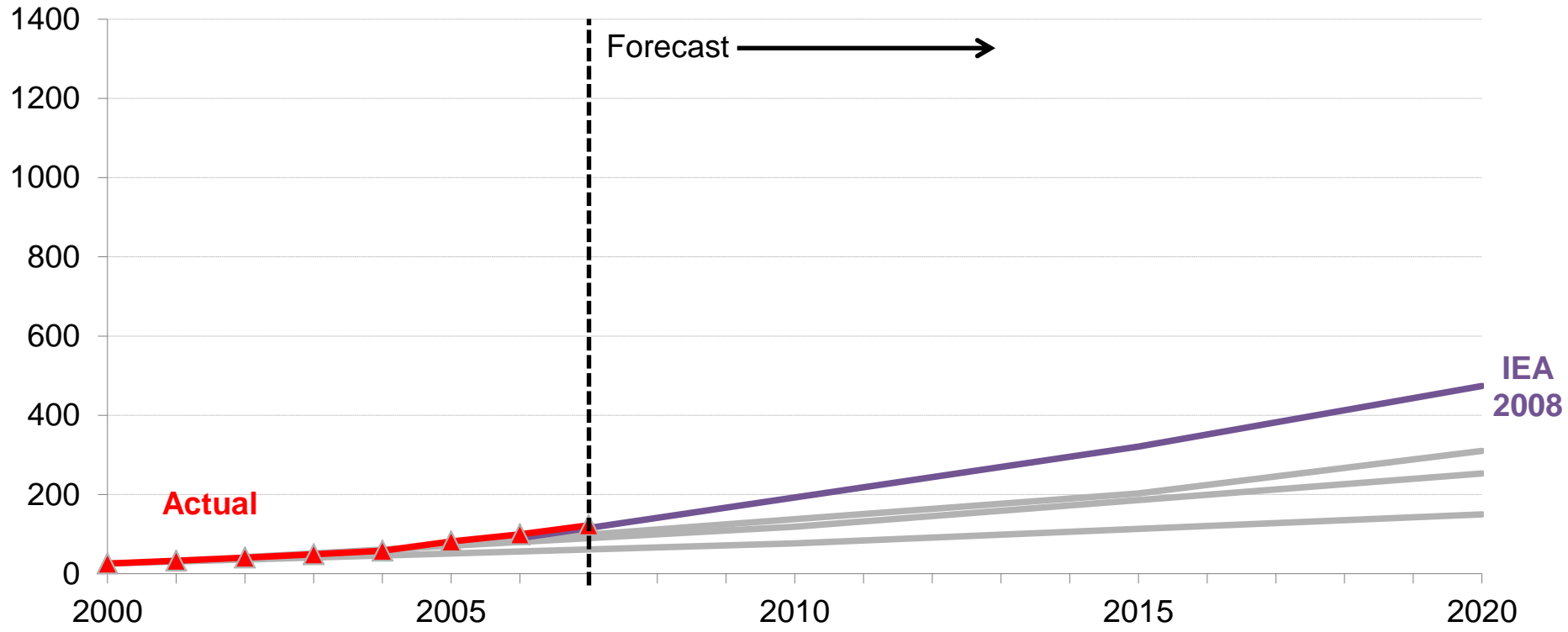
Source: IEA Bloomberg New Energy Finance

# FORECASTING INSTALLED RENEWABLE GENERATION CAPACITIES (GW)



Note: Renewables exclude biomass and hydro. IEA base case forecasts shown. Source: IEA Bloomberg New Energy Finance

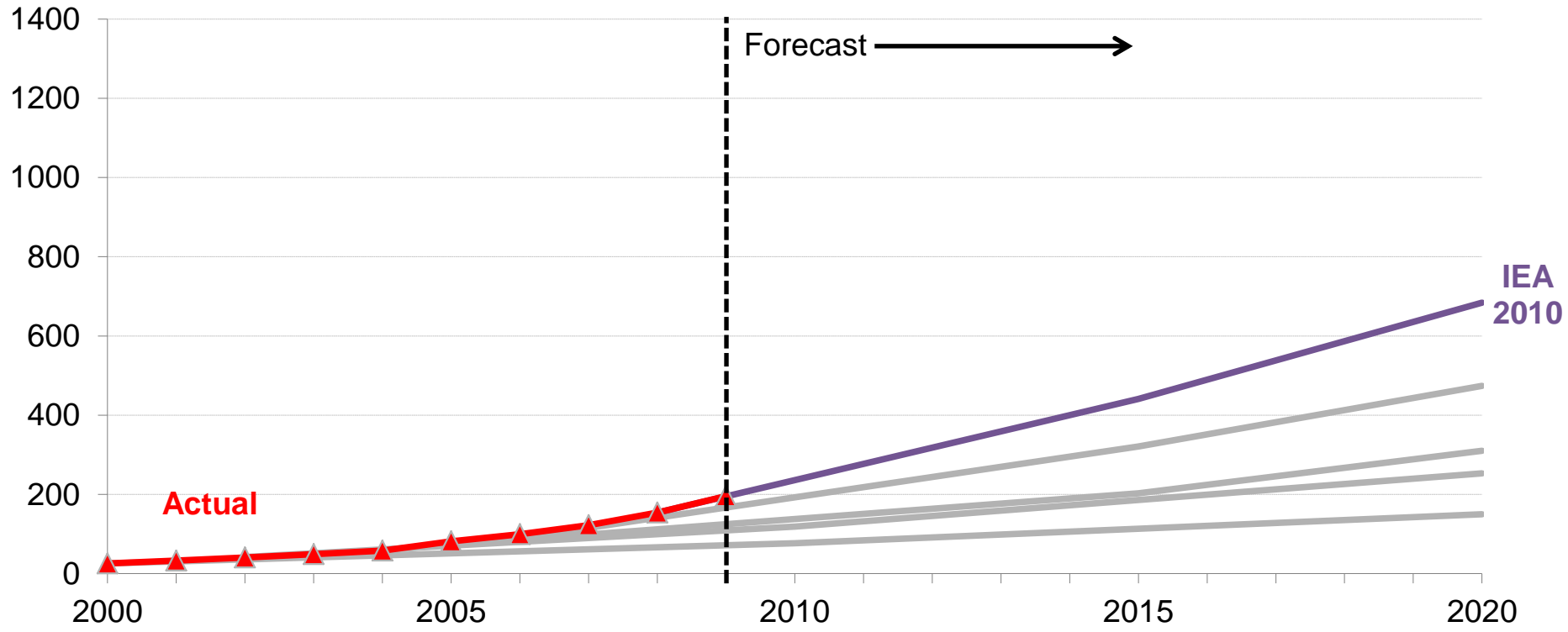
# FORECASTING INSTALLED RENEWABLE GENERATION CAPACITIES (GW)



Note: Renewables exclude biomass and hydro. IEA base case forecasts shown.

Source: IEA Bloomberg New Energy Finance

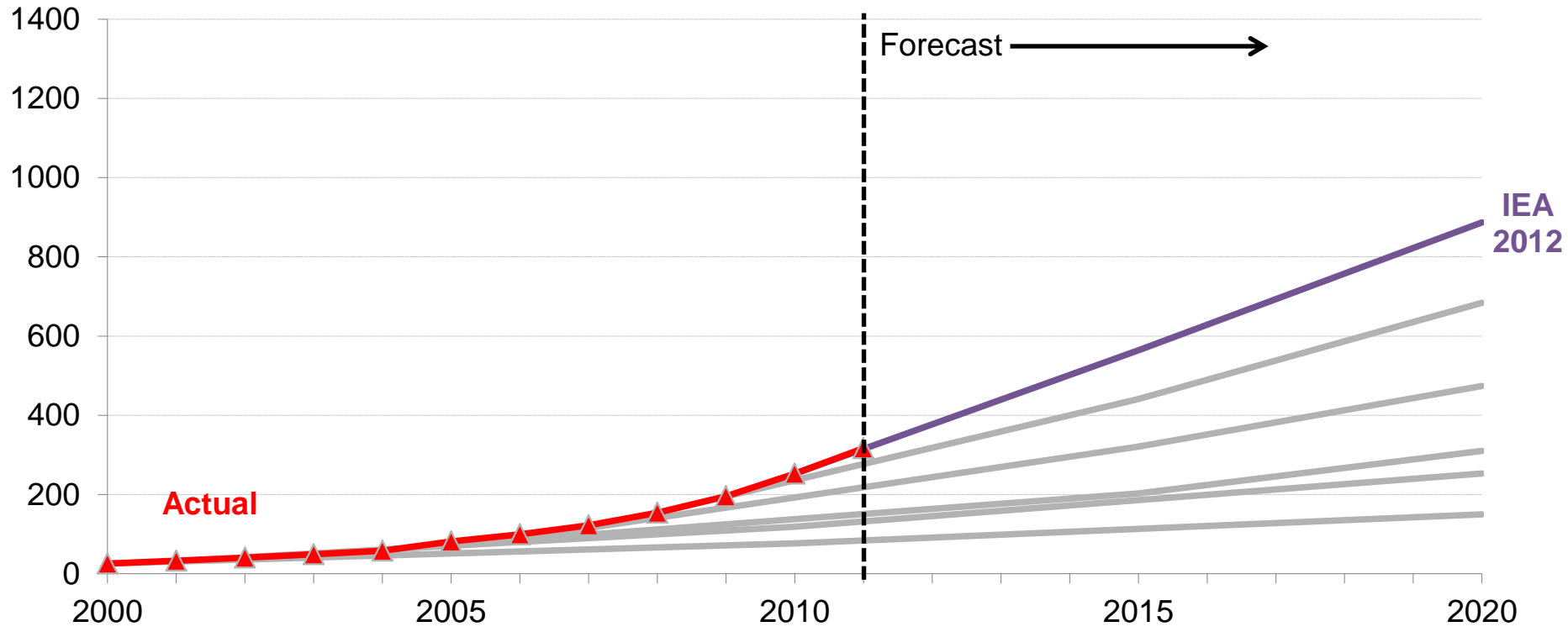
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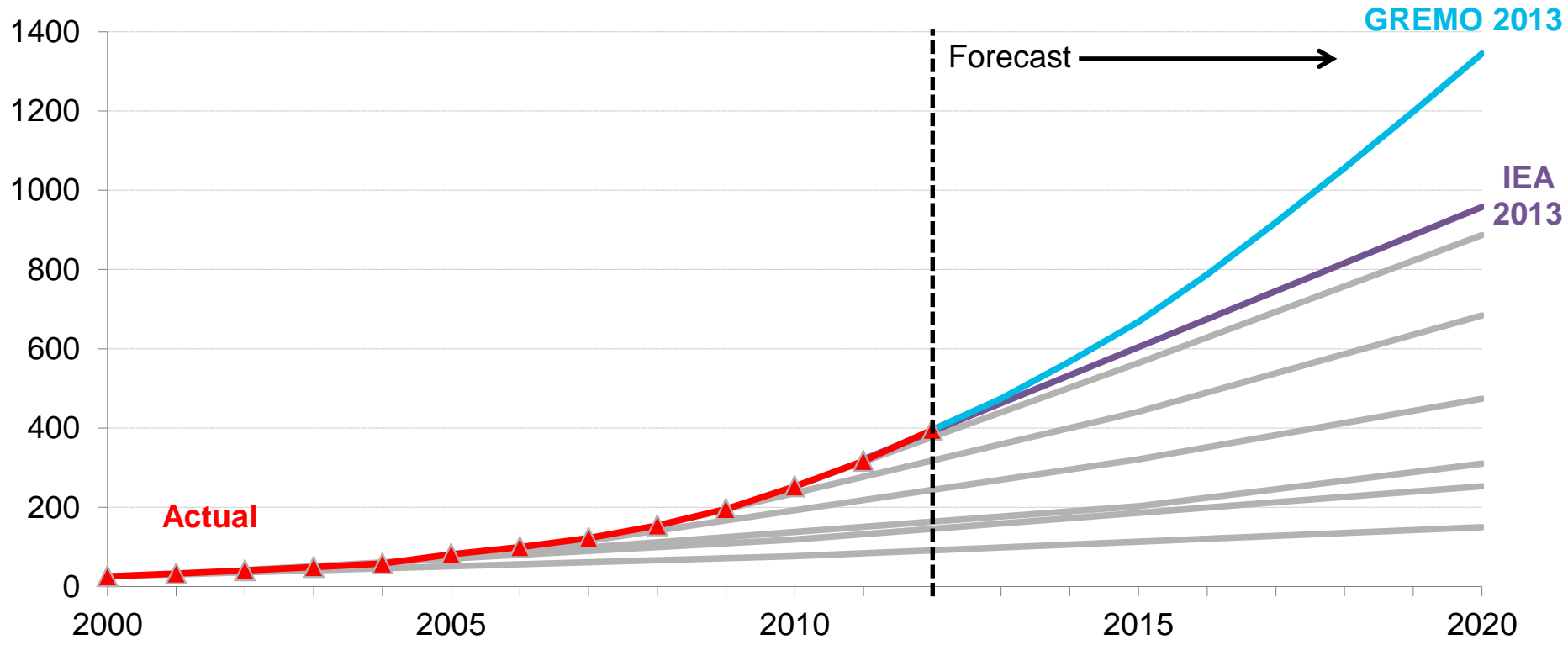


Note: Renewables exclude biomass and hydro. IEA base case forecasts shown.

Source: IEA Bloomberg New Energy Finance



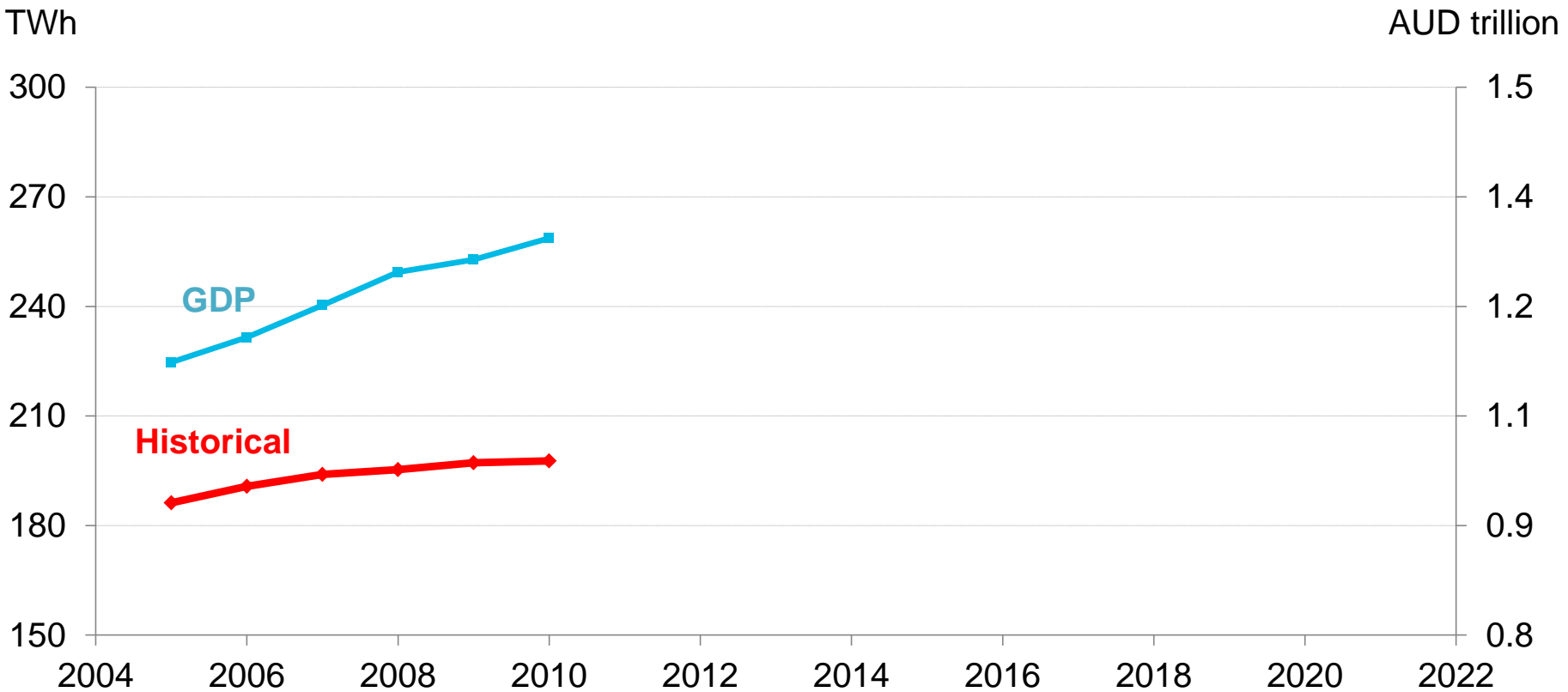
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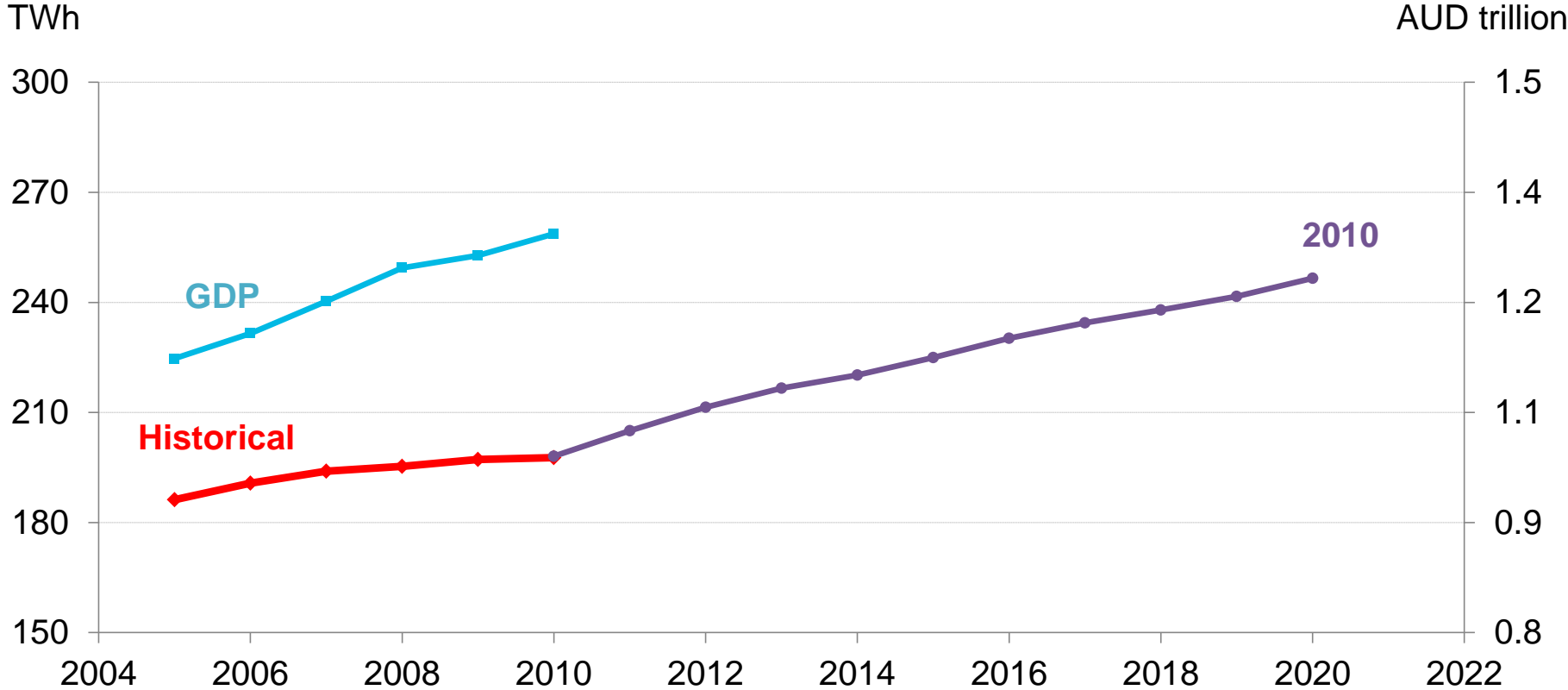
Source: IEA Bloomberg New Energy Finance

# AUSTRALIA NATIONAL ELECTRICITY MARKET ACTUAL VS FORECAST ELECTRICITY DEMAND 2005–2022



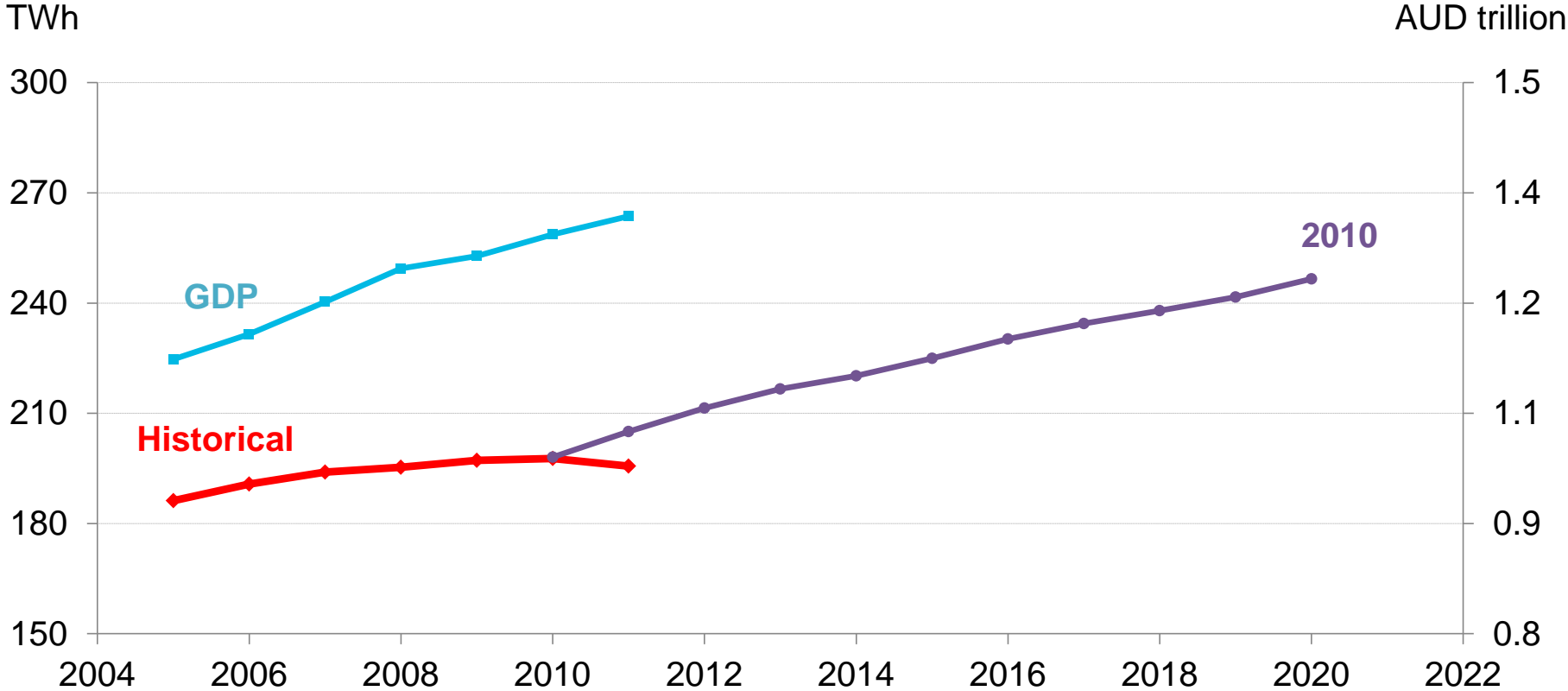
Source: Australian Energy Market Operator, Reserve Bank of Australia, Bloomberg New Energy Finance

# AUSTRALIA NATIONAL ELECTRICITY MARKET ACTUAL VS FORECAST ELECTRICITY DEMAND 2005–2022



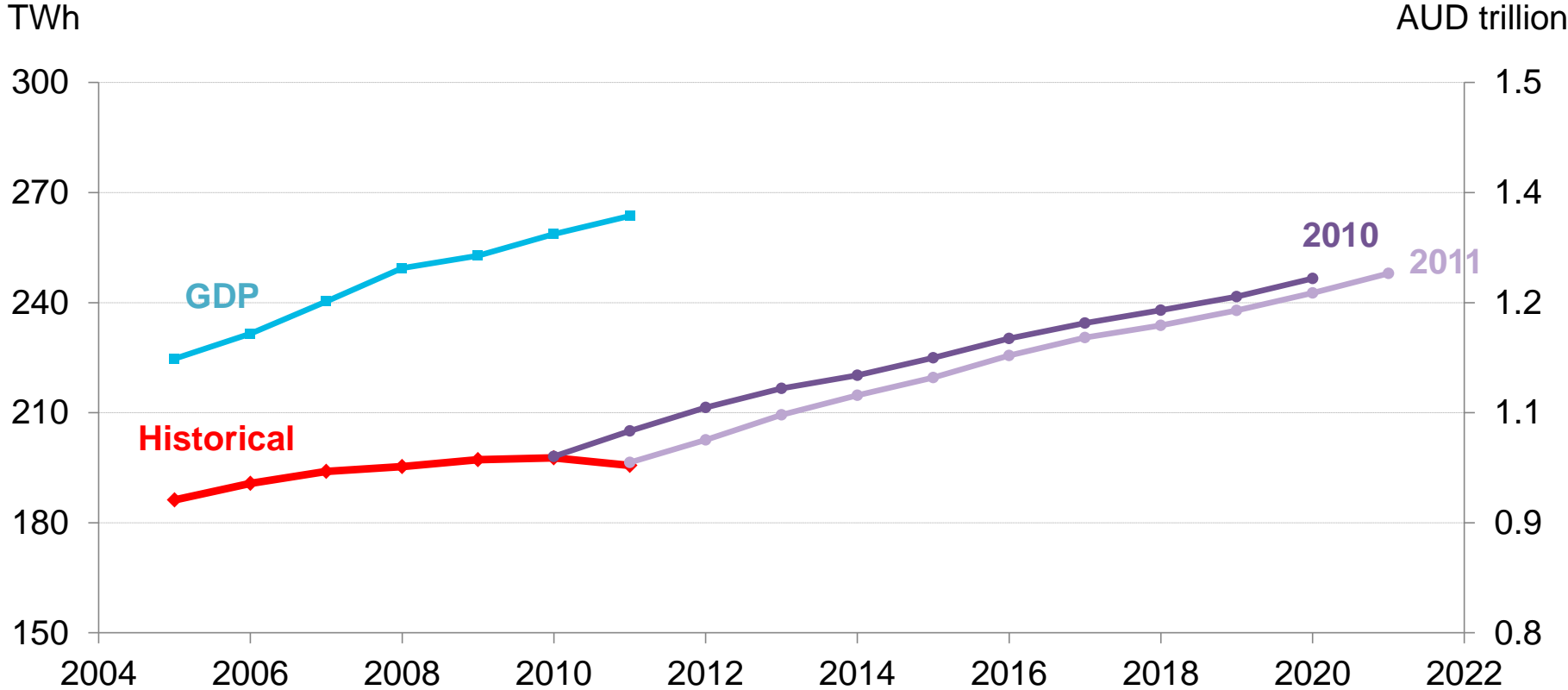
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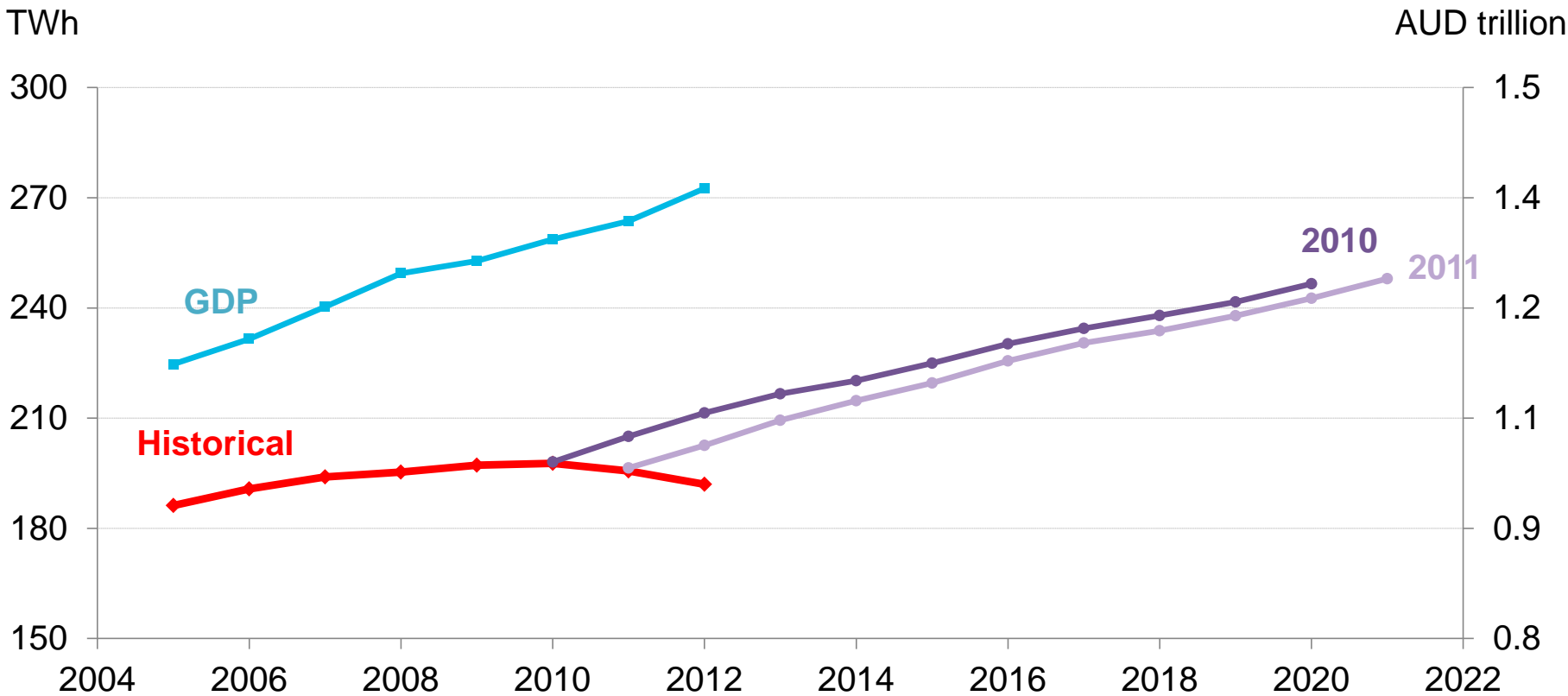
Source: Australian Energy Market Operator, Reserve Bank of Australia, Bloomberg New Energy Finance

# AUSTRALIA NATIONAL ELECTRICITY MARKET ACTUAL VS FORECAST ELECTRICITY DEMAND 2005–2022



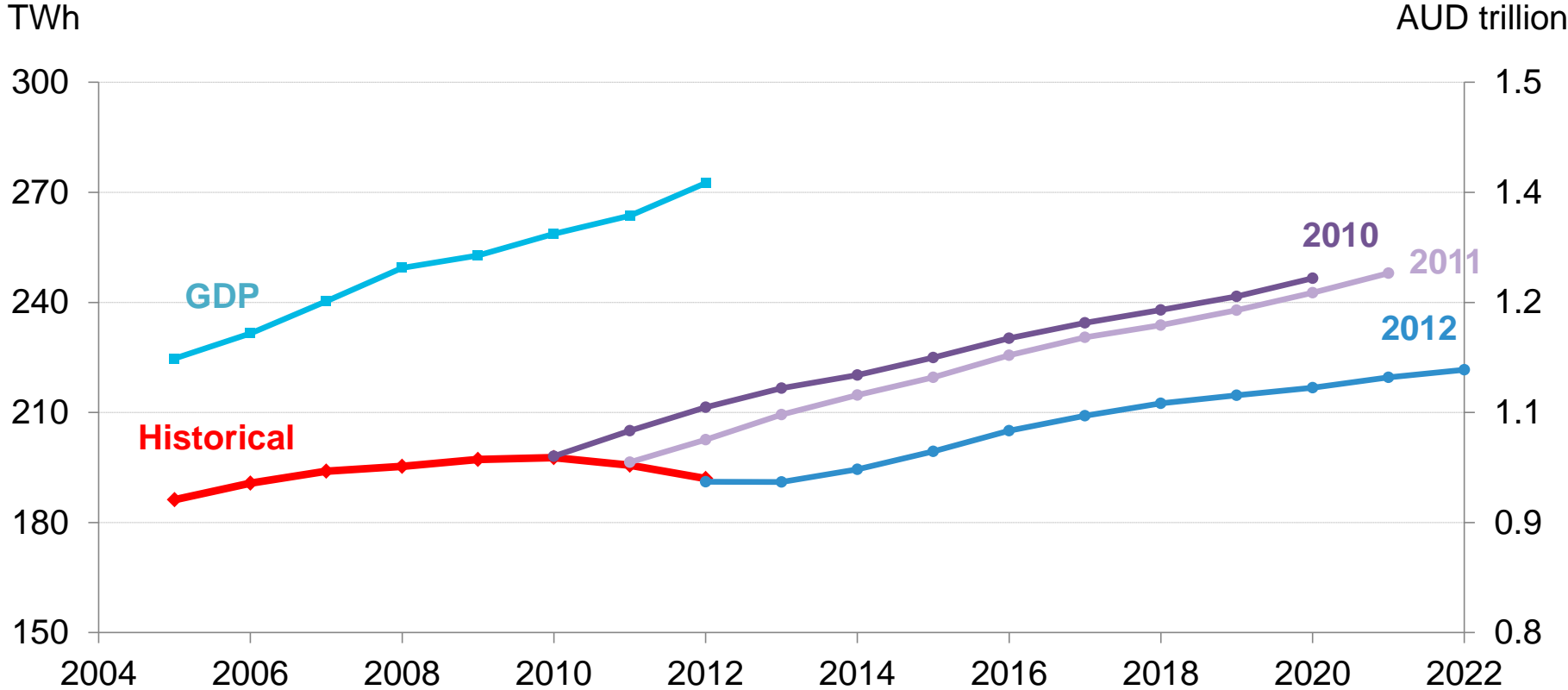
Source: Australian Energy Market Operator, Reserve Bank of Australia, Bloomberg New Energy Finance

# AUSTRALIA NATIONAL ELECTRICITY MARKET ACTUAL VS FORECAST ELECTRICITY DEMAND 2005–2022



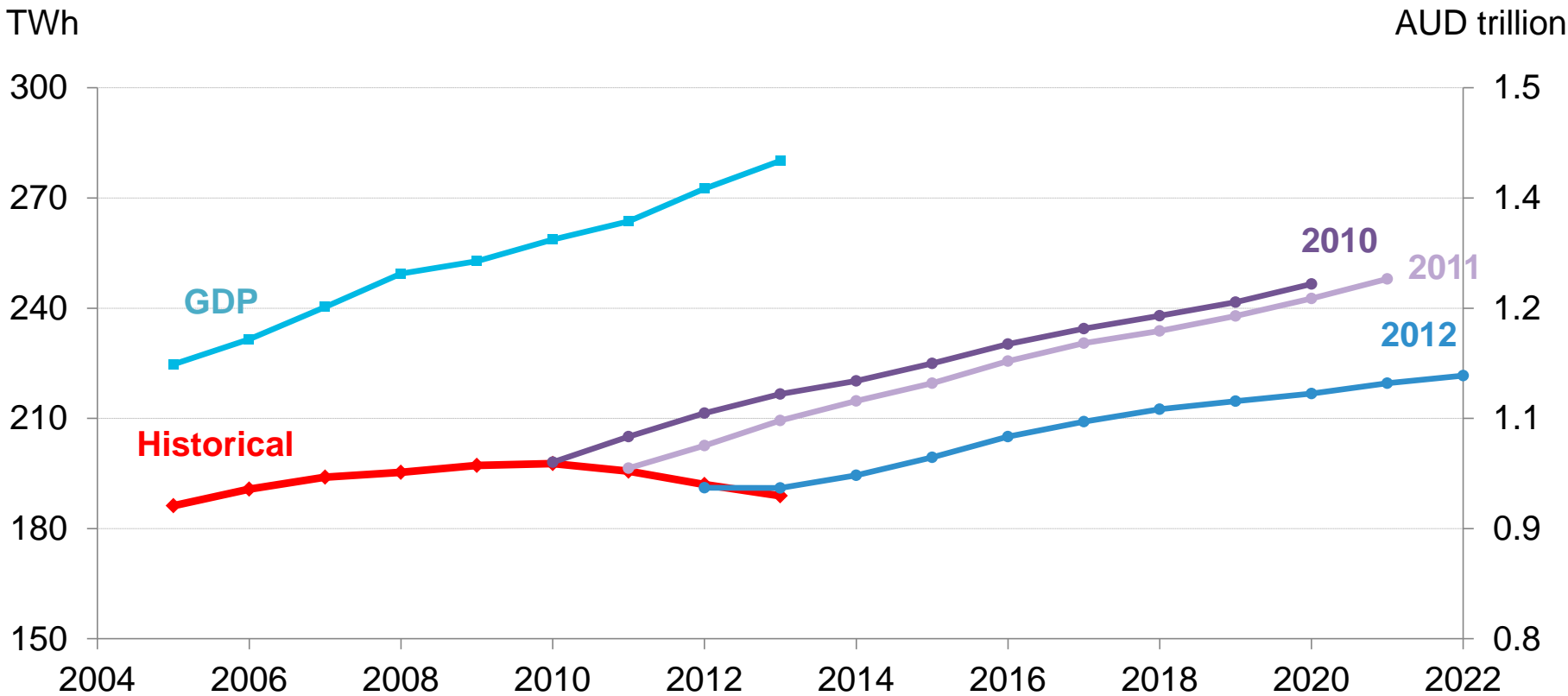
Source: Australian Energy Market Operator, Reserve Bank of Australia, Bloomberg New Energy Finance

# AUSTRALIA NATIONAL ELECTRICITY MARKET ACTUAL VS FORECAST ELECTRICITY DEMAND 2005–2022



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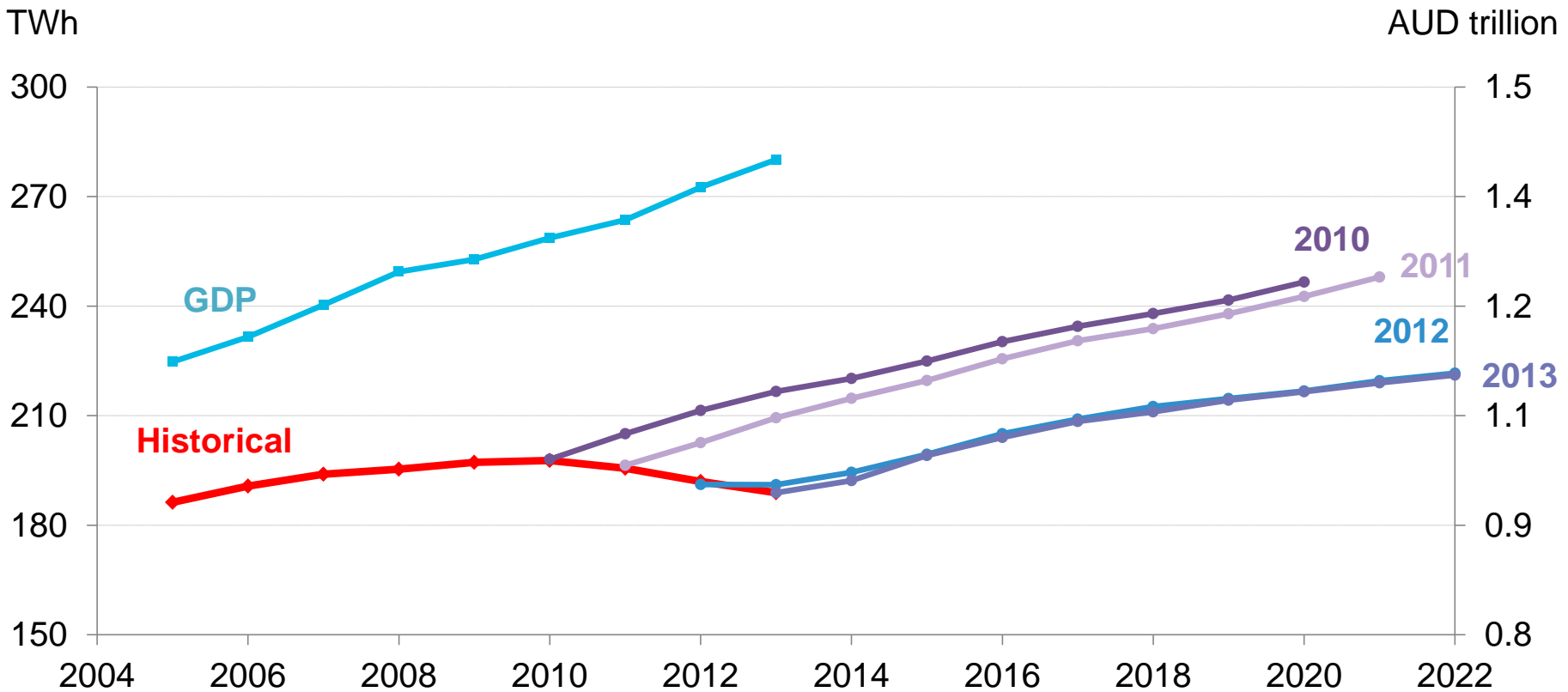
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Source: Australian Energy Market Operator, Reserve Bank of Australia, Bloomberg New Energy Finance



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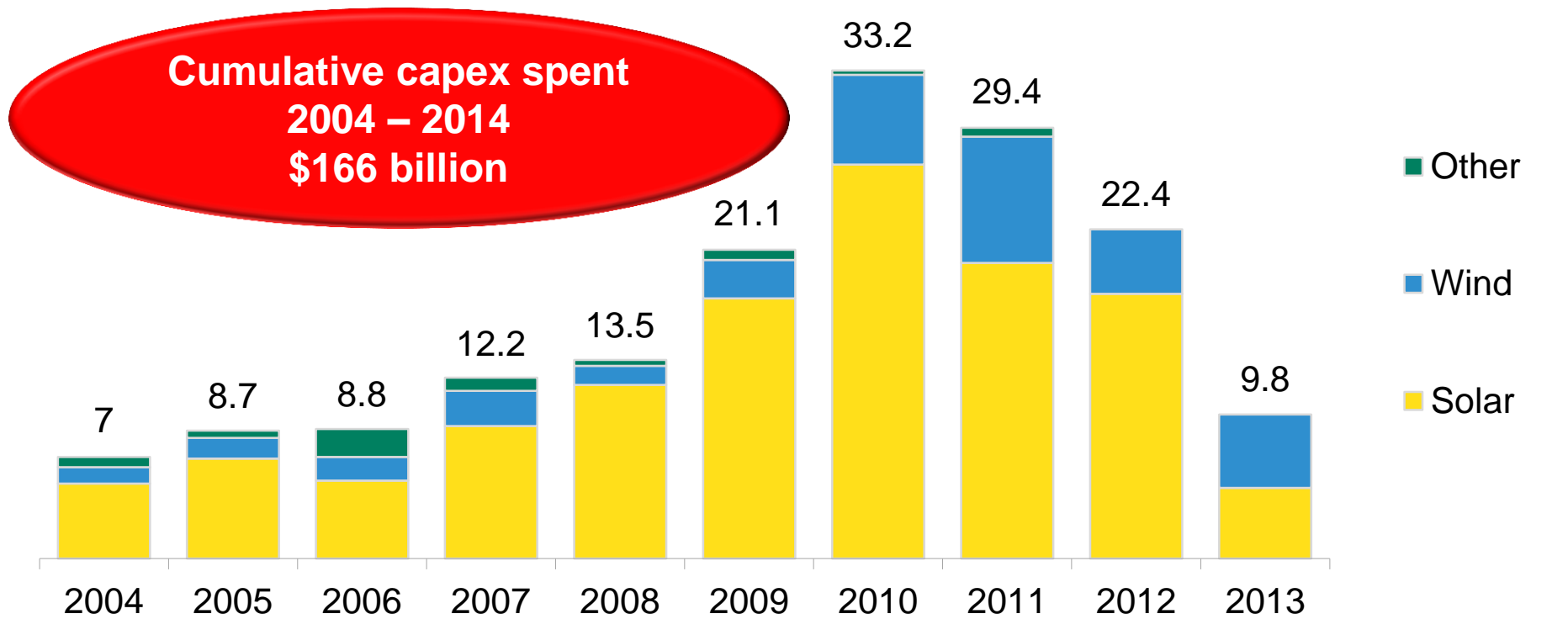
2014 BNEF SUMMIT THEME

# PHASE CHANGE:

NEW MARKET STRUCTURES

NEW BUSINESS MODELS

# INVESTMENT IN RENEWABLE POWER GENERATING CAPACITY IN GERMANY (\$ BN)

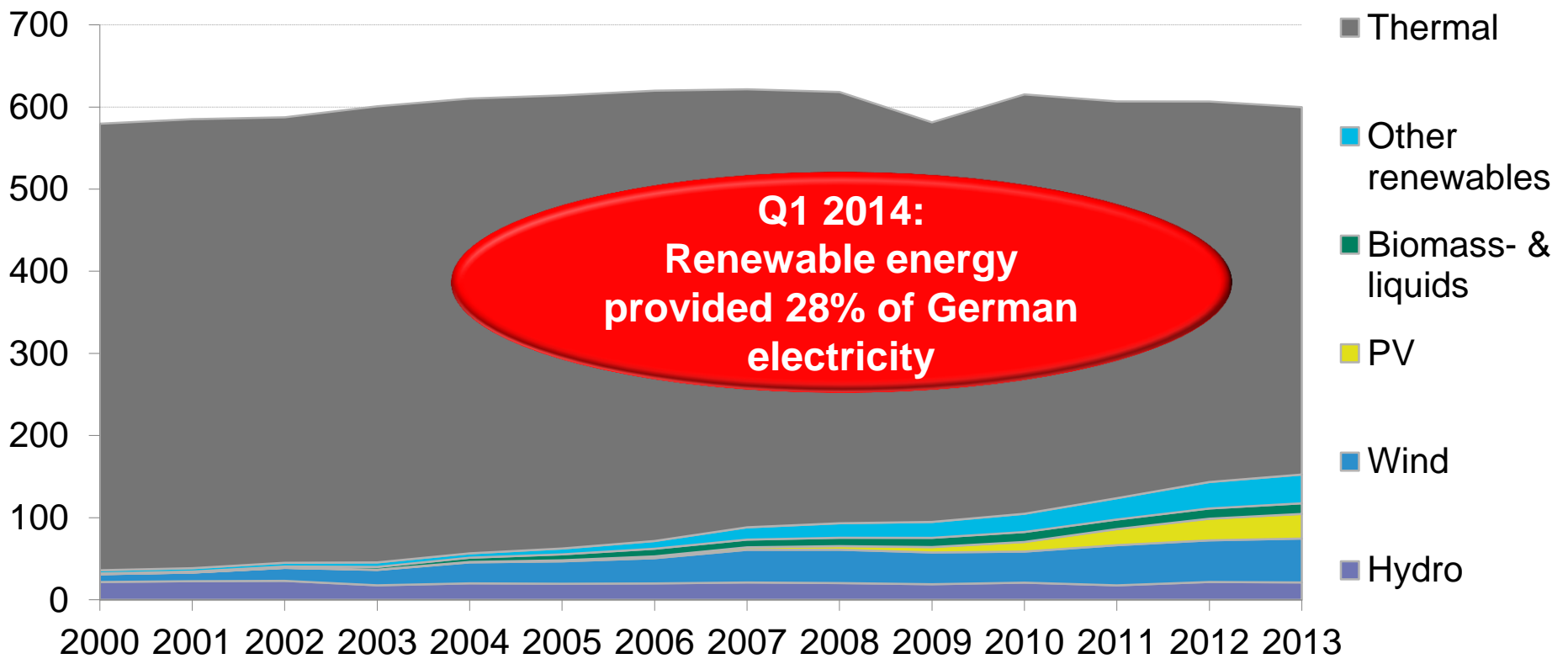


Note: Investment figures includes asset finance and small distributed capacity investment. Biofuels and other non-power generation sectors excluded.

Source: Bloomberg New Energy Finance.

# CHANGES IN GENERATING MIX IN GERMANY

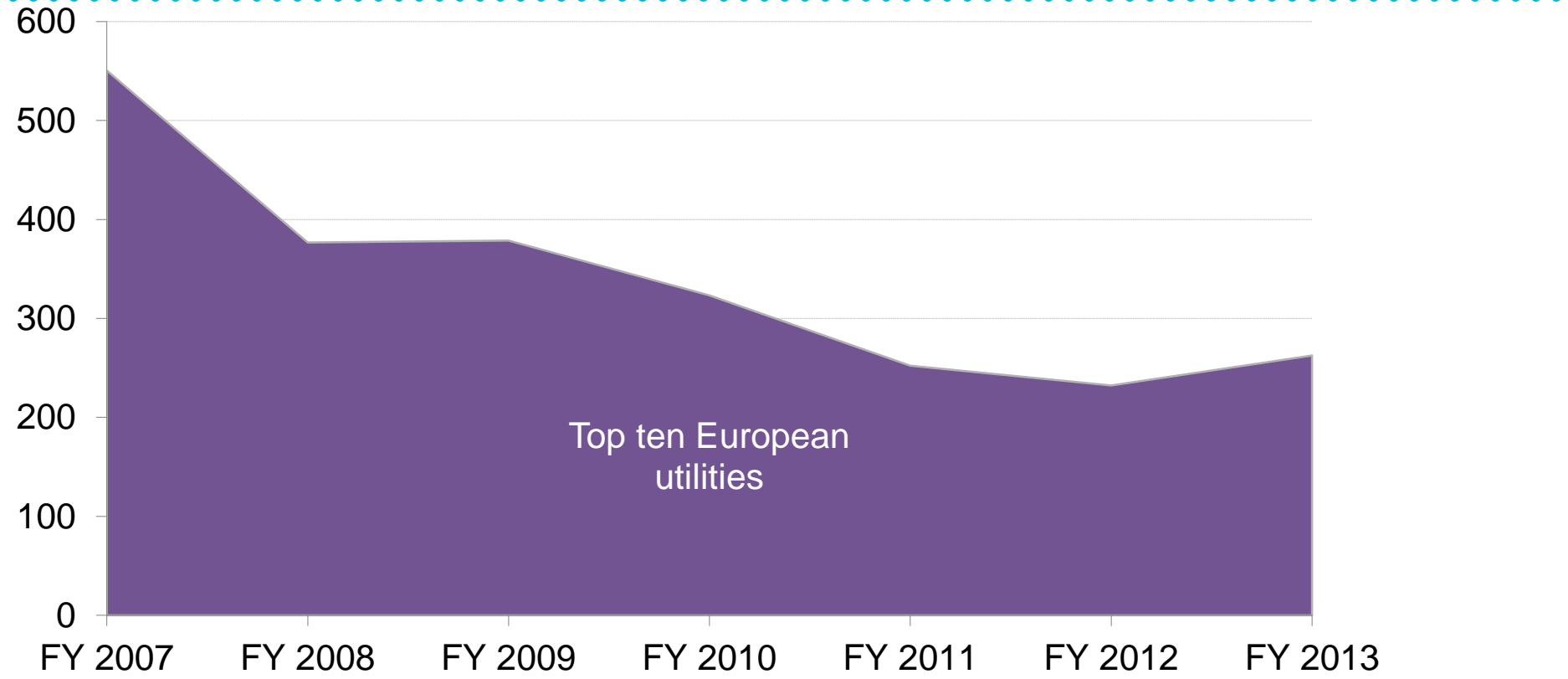
(TWH)



Source: Bloomberg New Energy Finance, BMWI

# TOP TEN EUROPEAN UTILITIES MARKET CAP

(BN EUR)



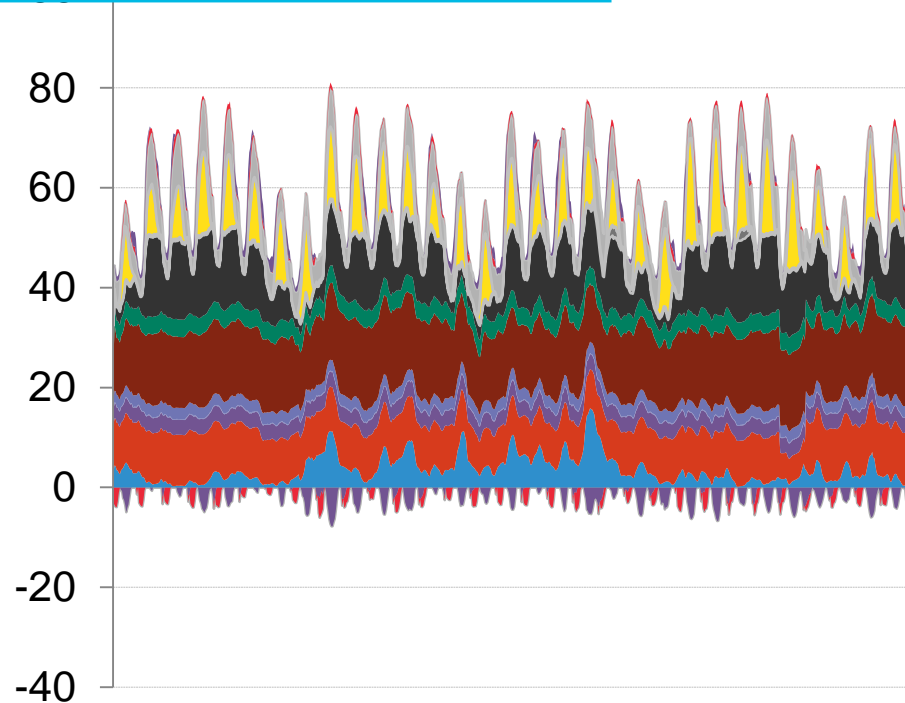
Note: Data includes ten largest companies by 2012 market cap.

Source: Bloomberg L.P. Bloomberg New Energy Finance

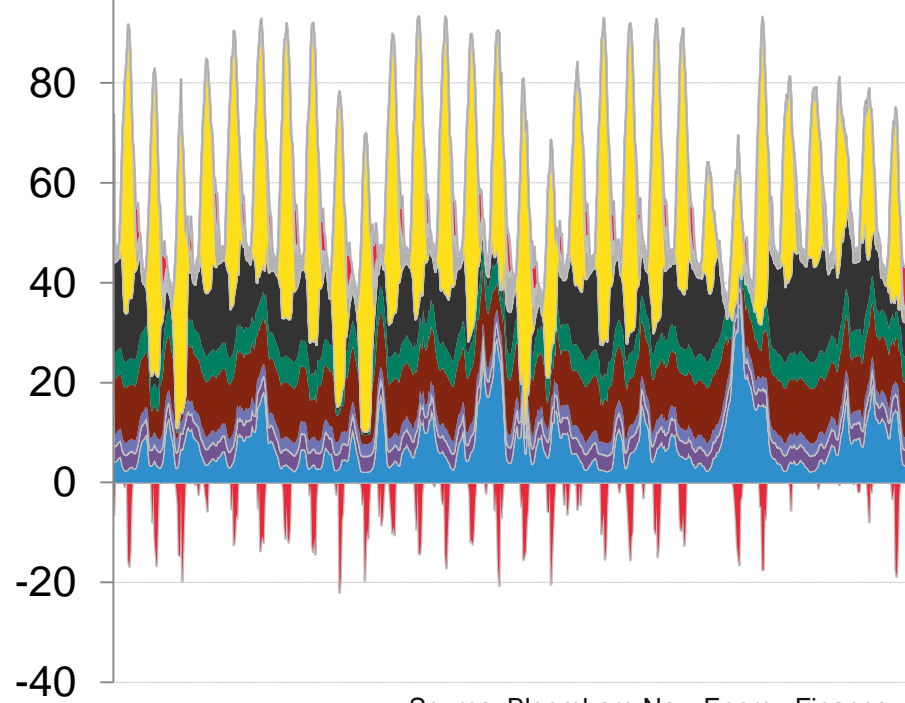
# GERMAN HOURLY GENERATION PROFILE

(GW)

JULY 2012



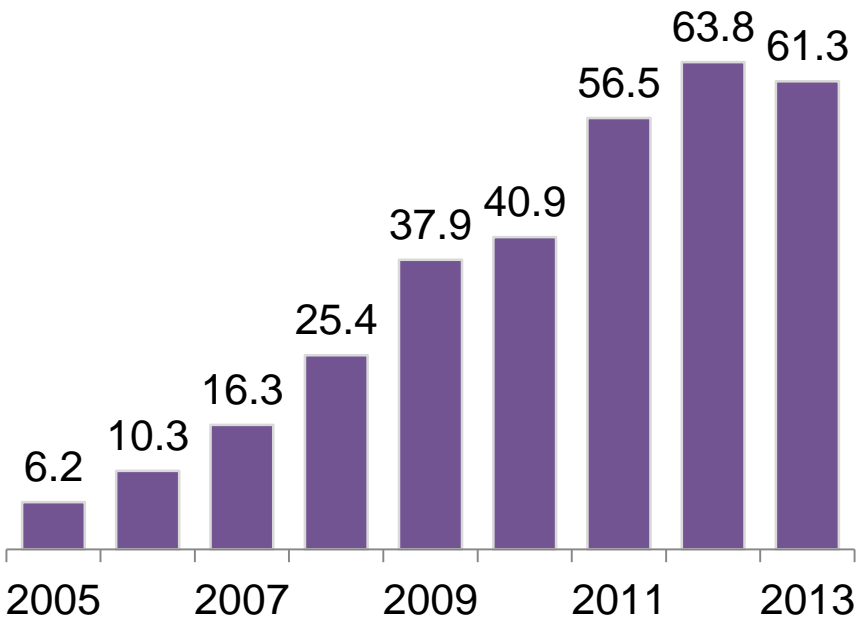
JULY 2033



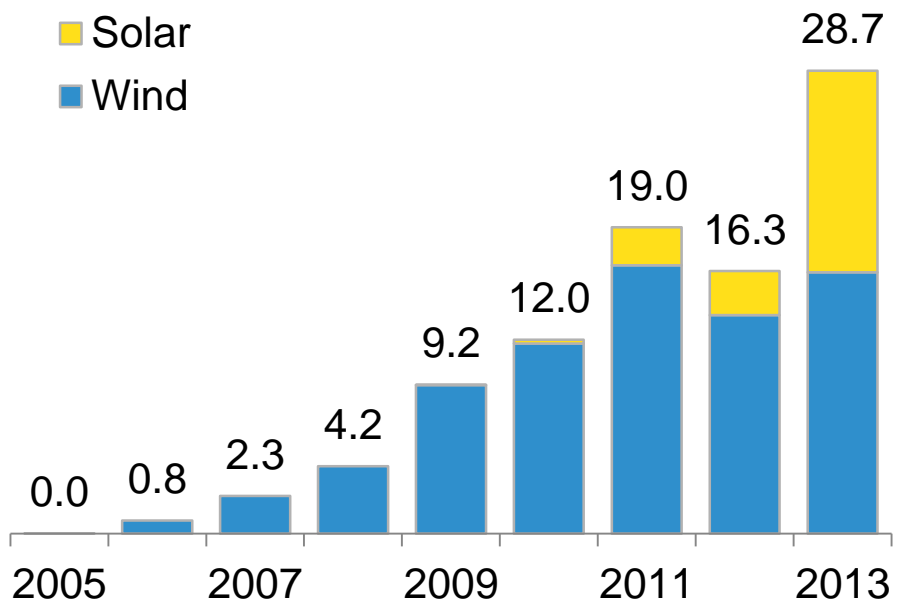
Source: Bloomberg New Energy Finance

# CHINA BENDING THE ARC: INVESTMENT

## NEW CLEAN ENERGY INVESTMENT (\$ BN)



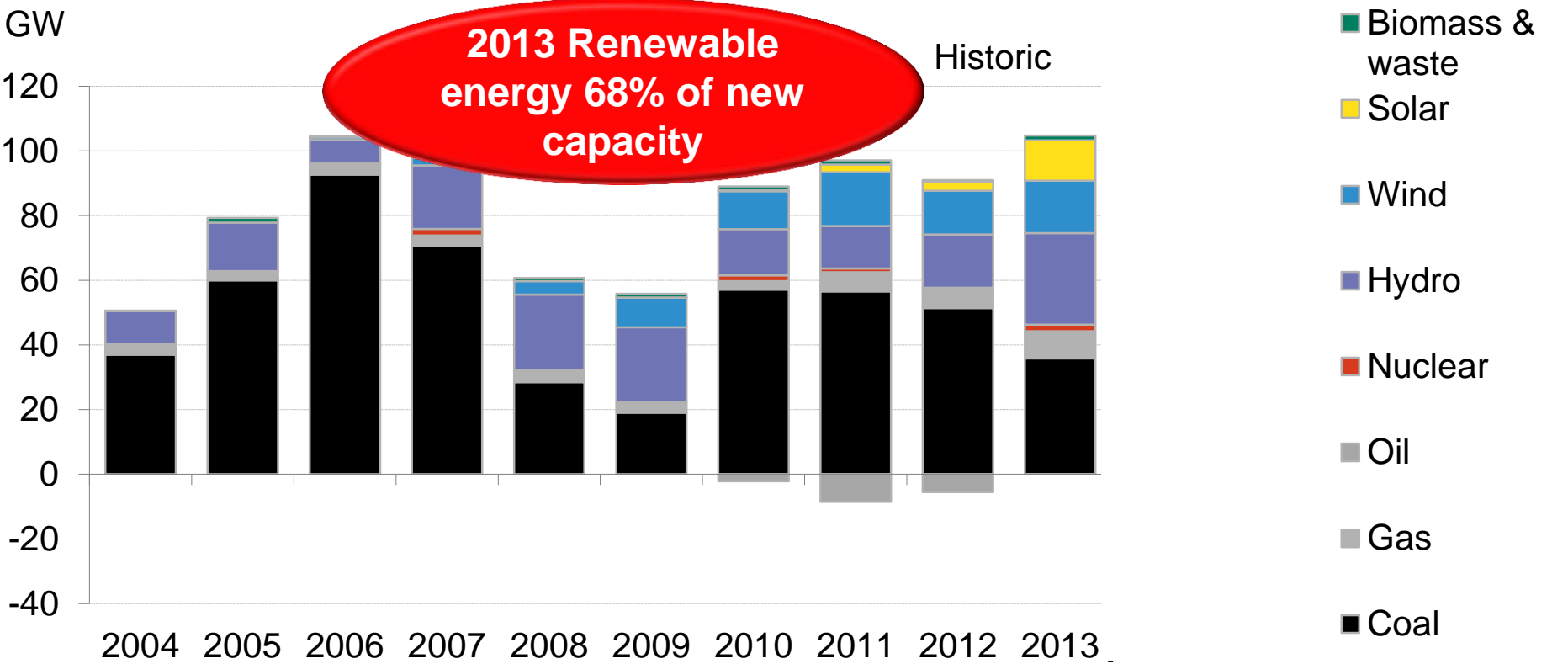
## WIND AND SOLAR CAPACITY ADD (GW)



Source: Bloomberg New Energy Finance

Note: Investment figures include all clean energy sectors (renewable power, biofuels, EST etc) and all new investment asset classes.

# CHINA POWER GENERATION CAPACITY ADD BY TECHNOLOGY 2004-13



Note: 2020 & 2030 forecasts from BNEF Global Renewable Energy Outlook 2014. Source: Bloomberg New Energy Finance, China Electricity Council



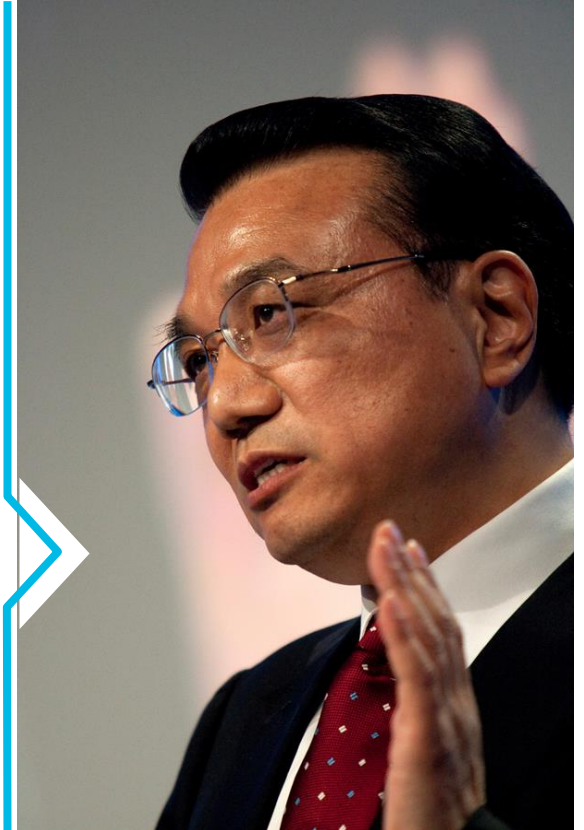
# CHINA DECLARES WAR ON POLLUTION

“

We will resolutely declare war against pollution as we declared war against poverty

”

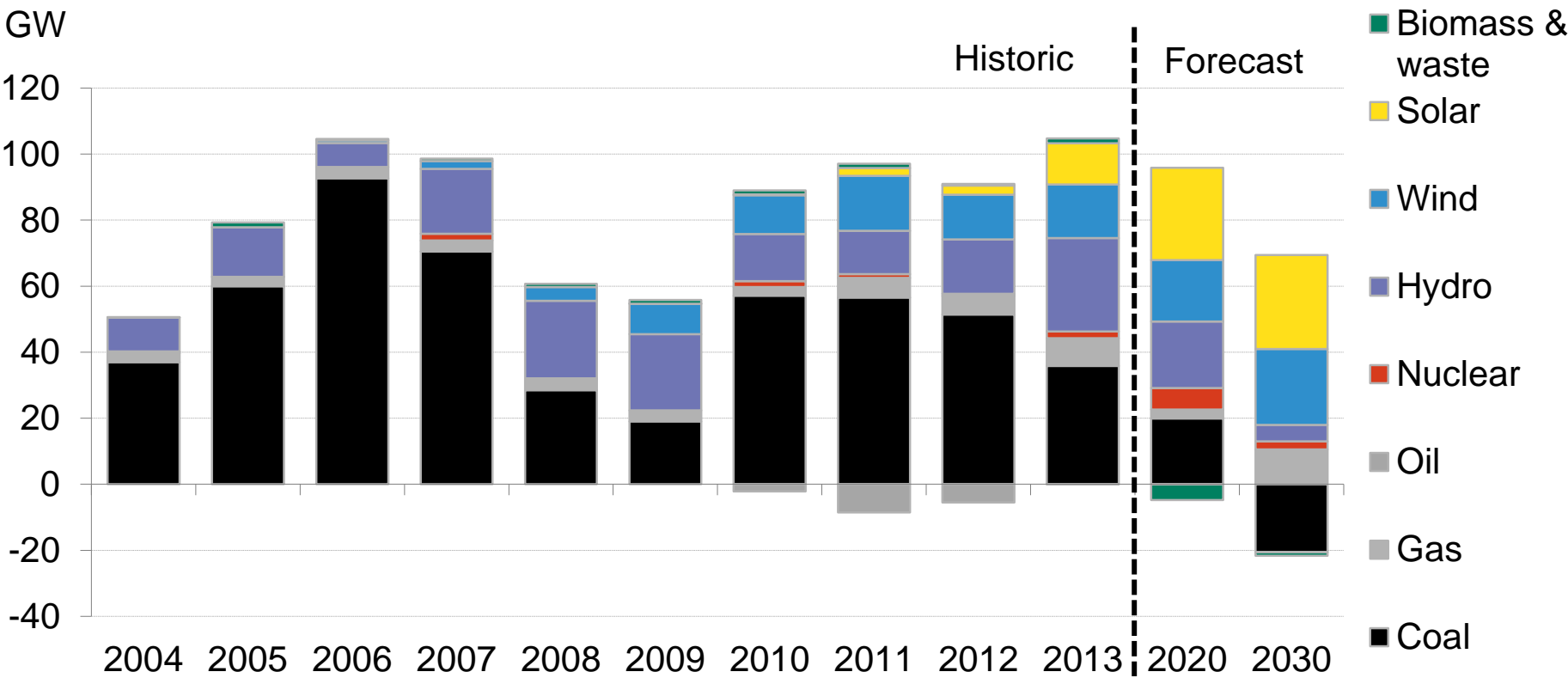
*Li Keqiang  
Premier of the People's Republic of China  
March 2014*



Credit: Bloomberg

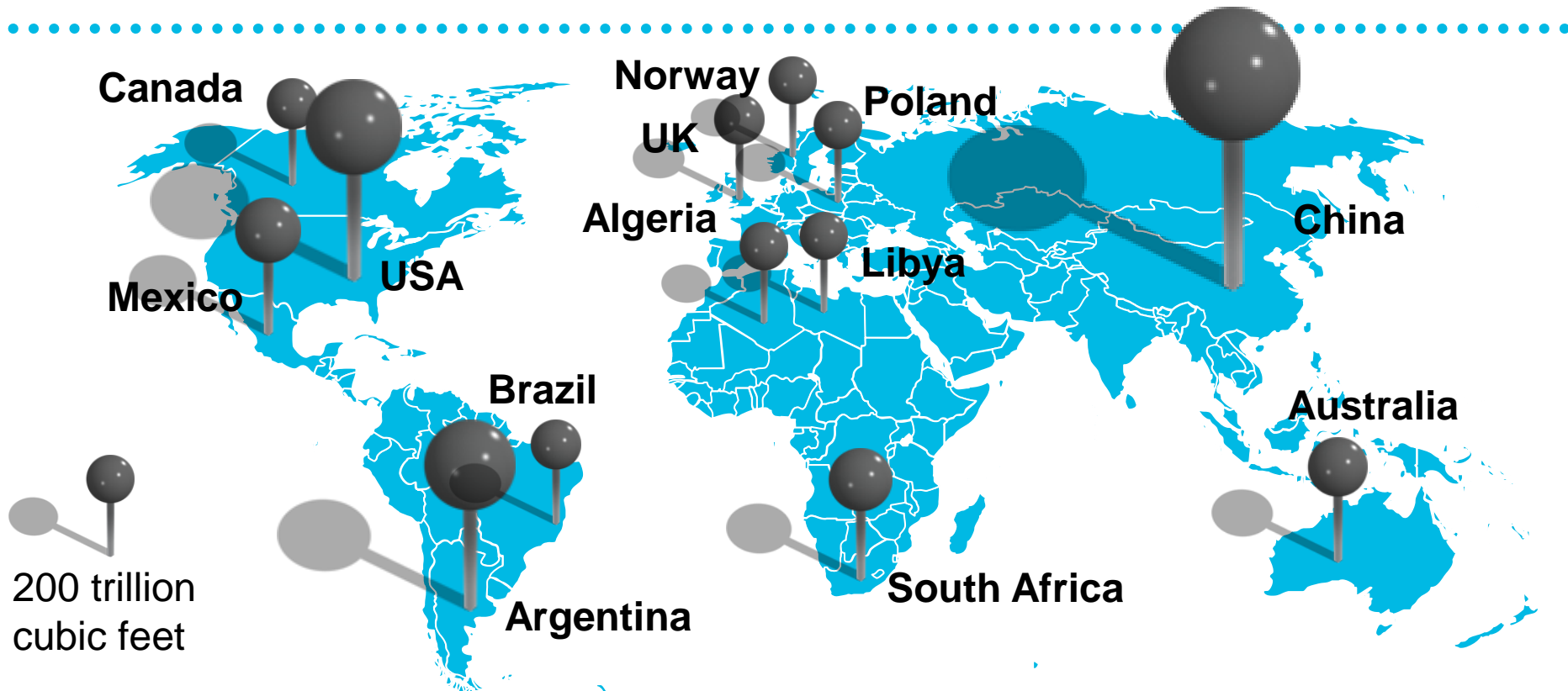
# CHINA POWER GENERATION CAPACITY ADD BY TECHNOLOGY

## 2004-13, 2020 & 2030



Note: 2020 & 2030 forecasts from BNEF Global Renewable Energy Outlook 2014. Source: Bloomberg New Energy Finance, China Electricity Council

# MAJOR GLOBAL SHALE FIELDS



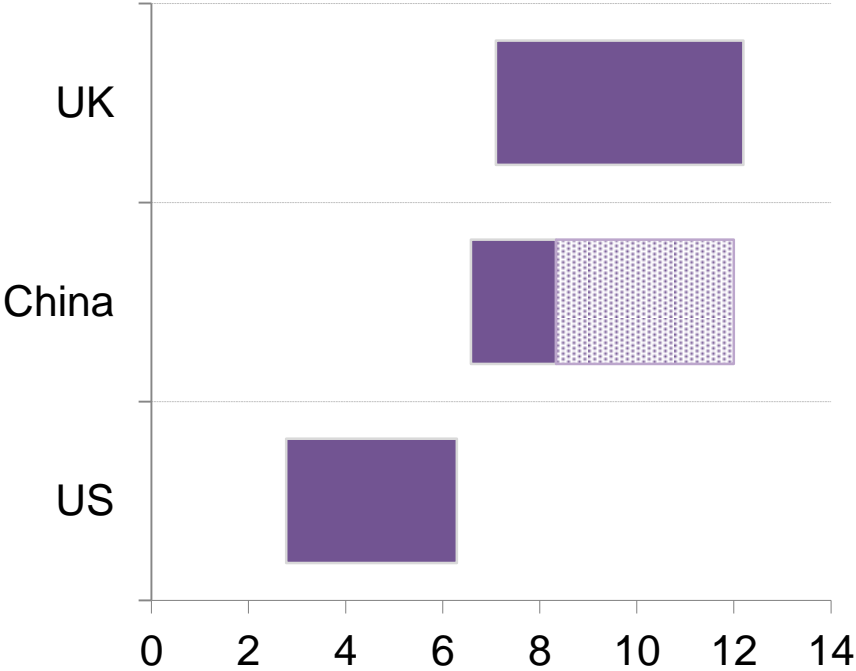
200 trillion cubic feet

Note: Technically recoverable shale gas resources shown

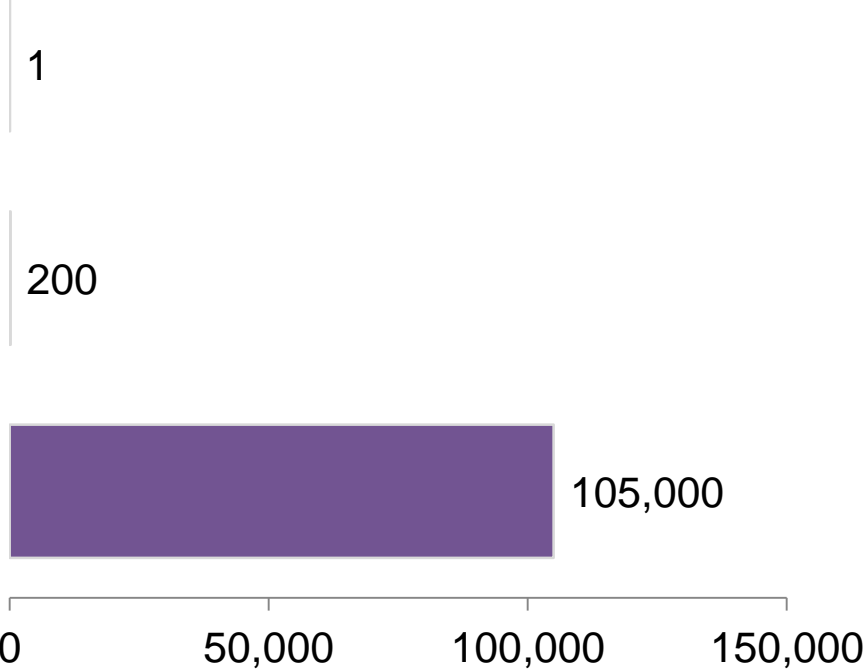
Source: EIA Assessment of World Shale Gas Resources, April 2011

# ECONOMICS OF SHALE GAS FRACKING

## LIKELY PRICE RANGE (\$/MMBTU)



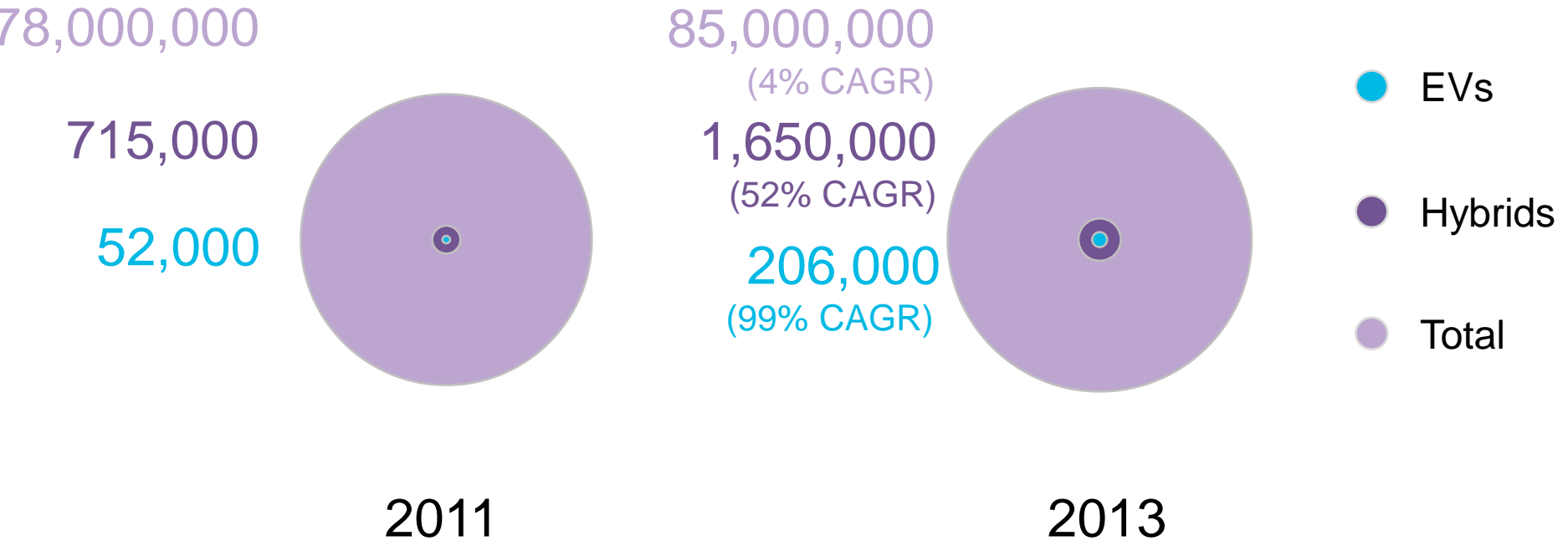
## NO. OF SHALE GAS WELLS FRACKED



Source: Bloomberg New Energy Finance, Wall Street Journal

# GLOBAL ANNUAL ELECTRIC VEHICLE SALES

## 2011 & 2013

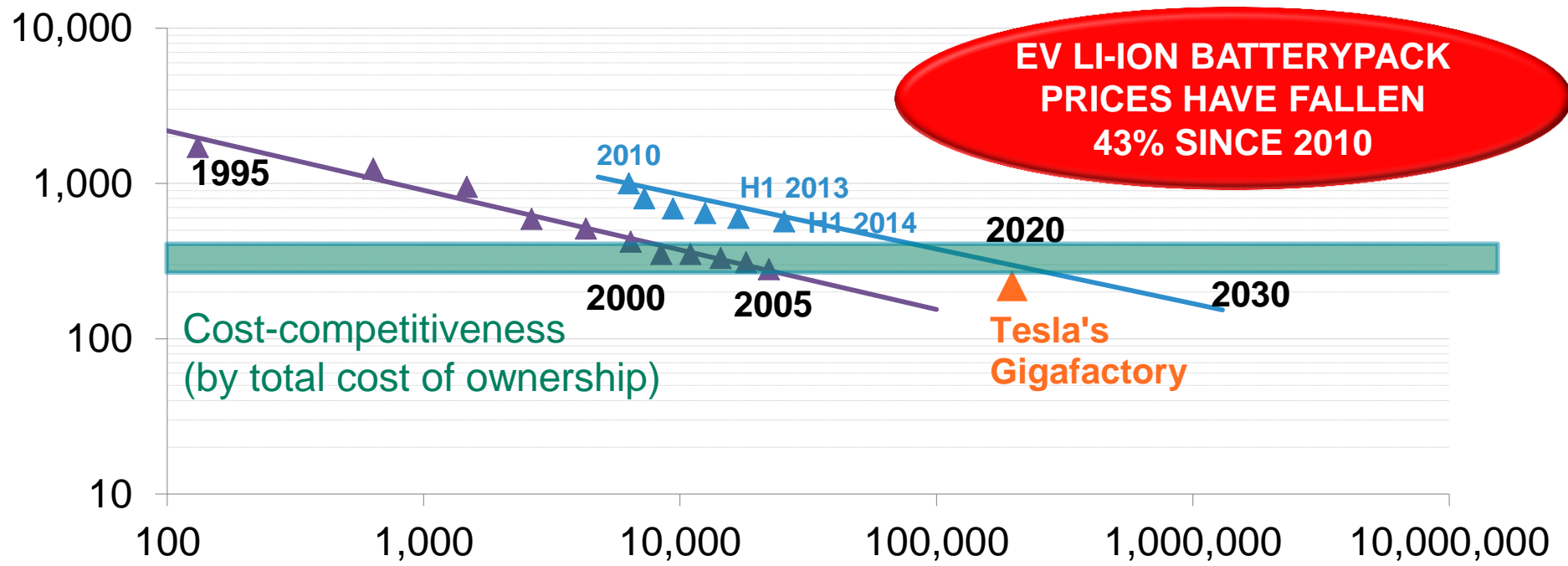


Note: Numbers are rounded.

Source: Bloomberg New Energy Finance

# LITHIUM-ION BATTERY EXPERIENCE CURVE

(\$/KWH)



**EV LI-ION BATTERY PACK PRICES HAVE FALLEN 43% SINCE 2010**

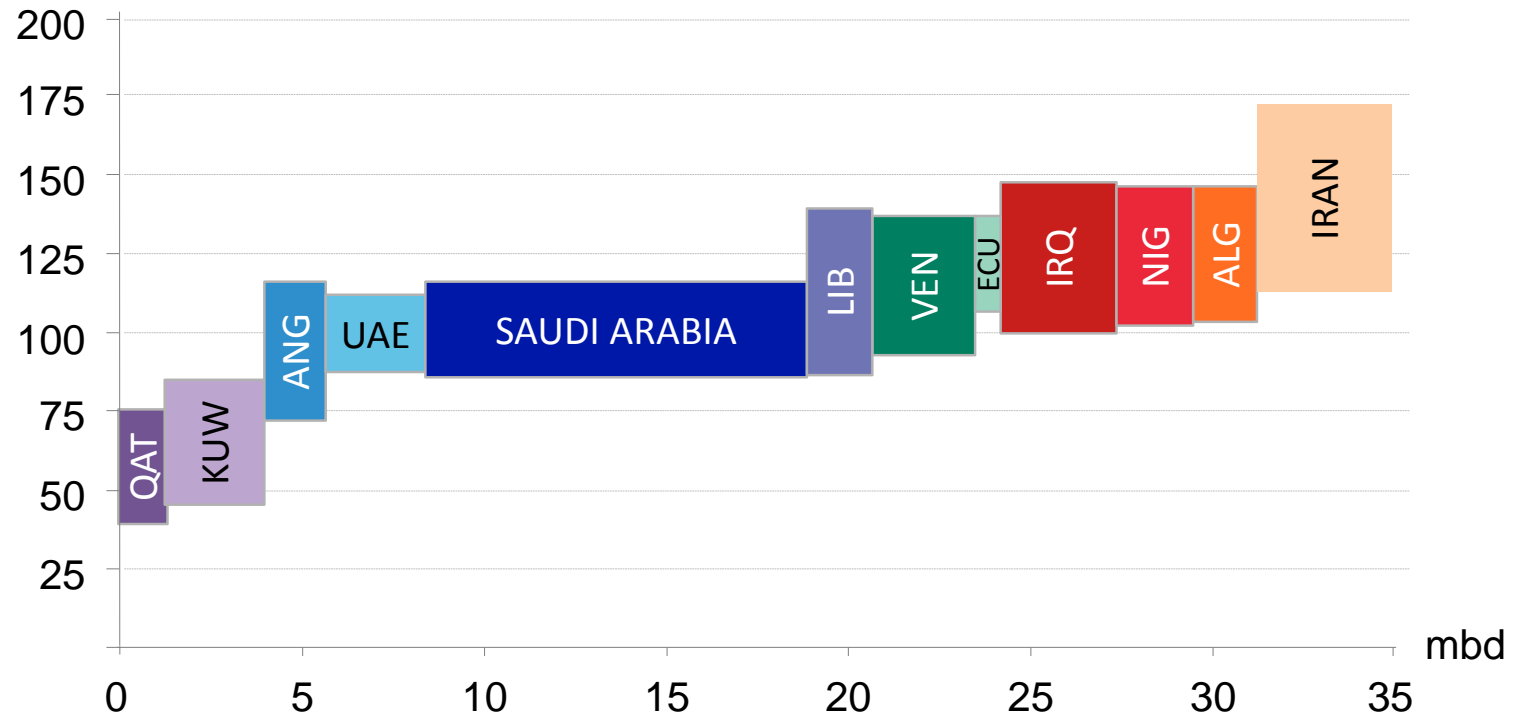
- Consumer LiB experience curve
- ▲ Historic consumer LiB prices
- BNEF EV LiB cost forecast
- ▲ Historic EV battery pack prices
- Cumulative prod. capacity (MWh)

Note: Battery pack prices in 2010 dollars.

Source: Battery University, MIIT, IIT, Bloomberg New Energy Finance

# OPEC FISCAL BREAK-EVEN OIL PRICES AND EV COSTS, 2013

\$ per barrel



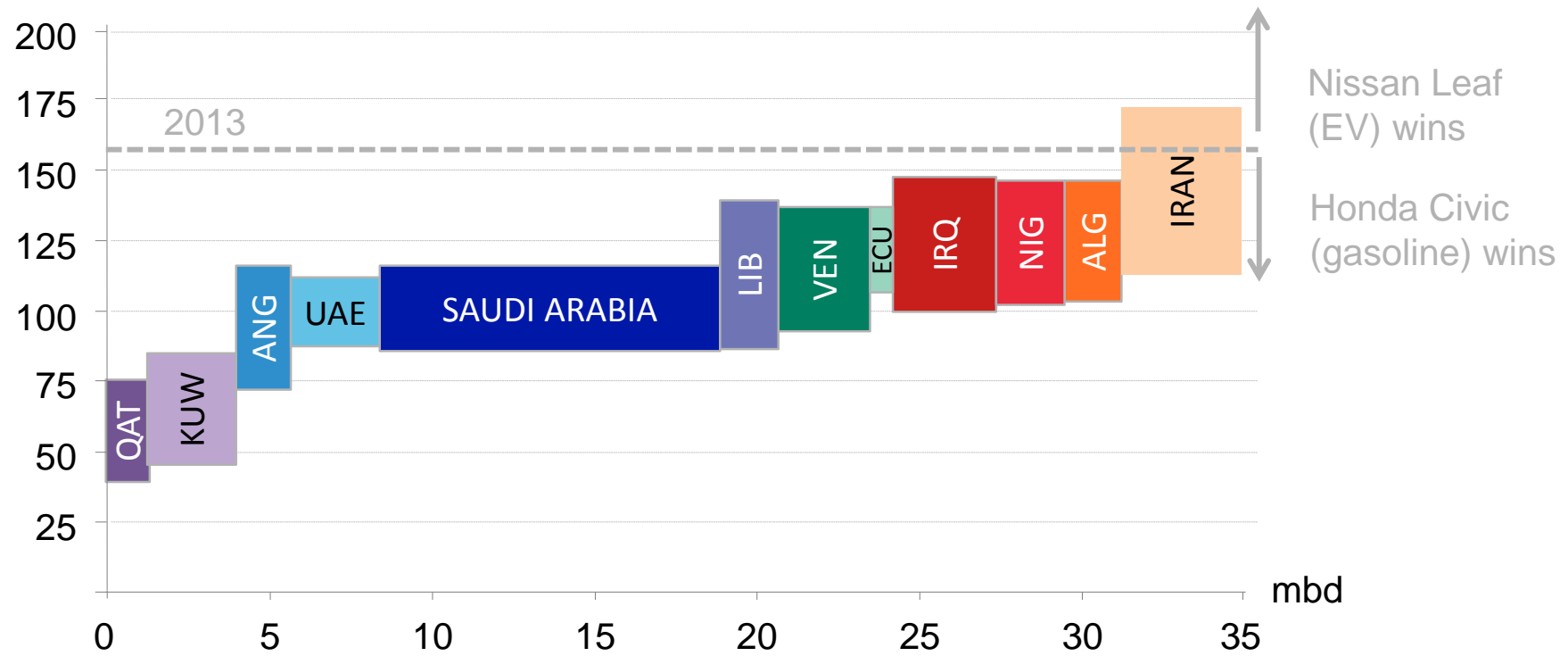
Note: Based on normal usage patterns, 10,000 miles per year driven

Source: Bloomberg New Energy Finance, APICORP Research

# OPEC FISCAL BREAK-EVEN OIL PRICES AND EV COSTS, 2013

2013

\$ per barrel



Note: Based on normal usage patterns, 10,000 miles per year driven

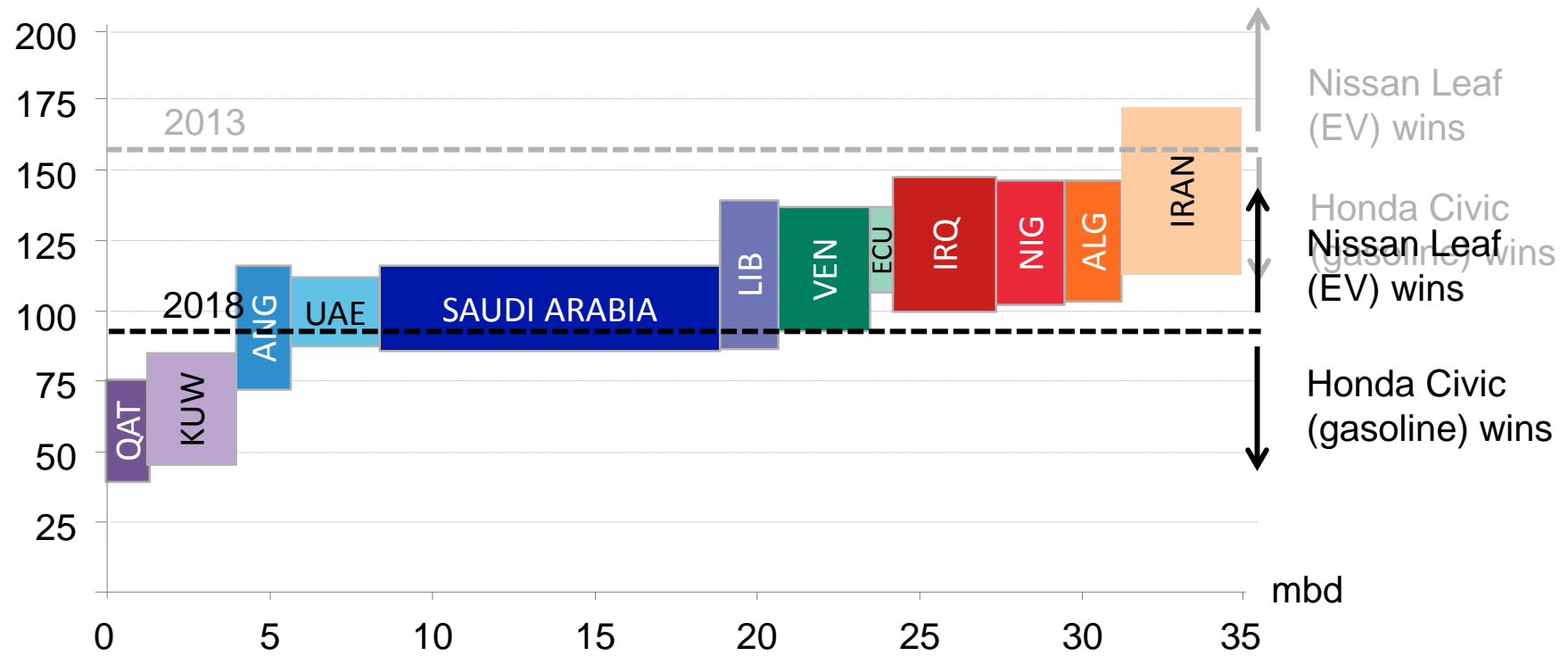
Source: Bloomberg New Energy Finance, APICORP Research



# OPEC FISCAL BREAK-EVEN OIL PRICES AND EV COSTS, 2018

2018

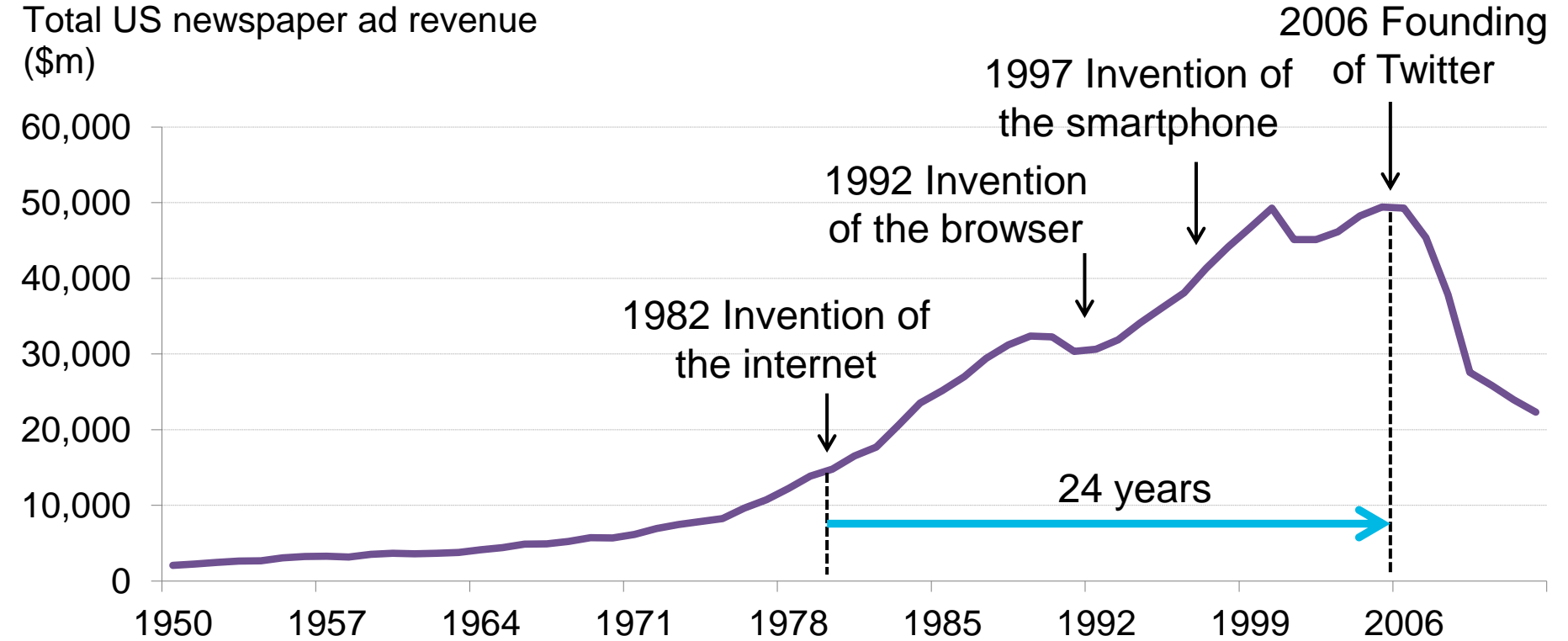
\$ per barrel



Note: Based on normal usage patterns, 10,000 miles per year driven

Source: Bloomberg New Energy Finance, APICORP Research

# PHASE CHANGE - NEWSPAPERS



Source: Bloomberg L.P. Bloomberg New Energy Finance

# IN THE MIDST OF A PHASE CHANGE

KOBAD BHAVNAGRI, KBHAVNAGRI@BLOOMBERG.NET

TWITTER: @KOBADB

## MARKETS

Renewable Energy

Carbon Markets

Energy Smart Technologies

Renewable Energy Certificates

Carbon Capture & Storage

Power

Gas

Nuclear

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**Applied Research:** custom research & data mining

**Knowledge Services:** Summit, Leadership Forums, Executive Briefings & workshops

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decisions in clean energy, power  
and water and the carbon markets

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