



The Uncertain Costs of the Future Transition

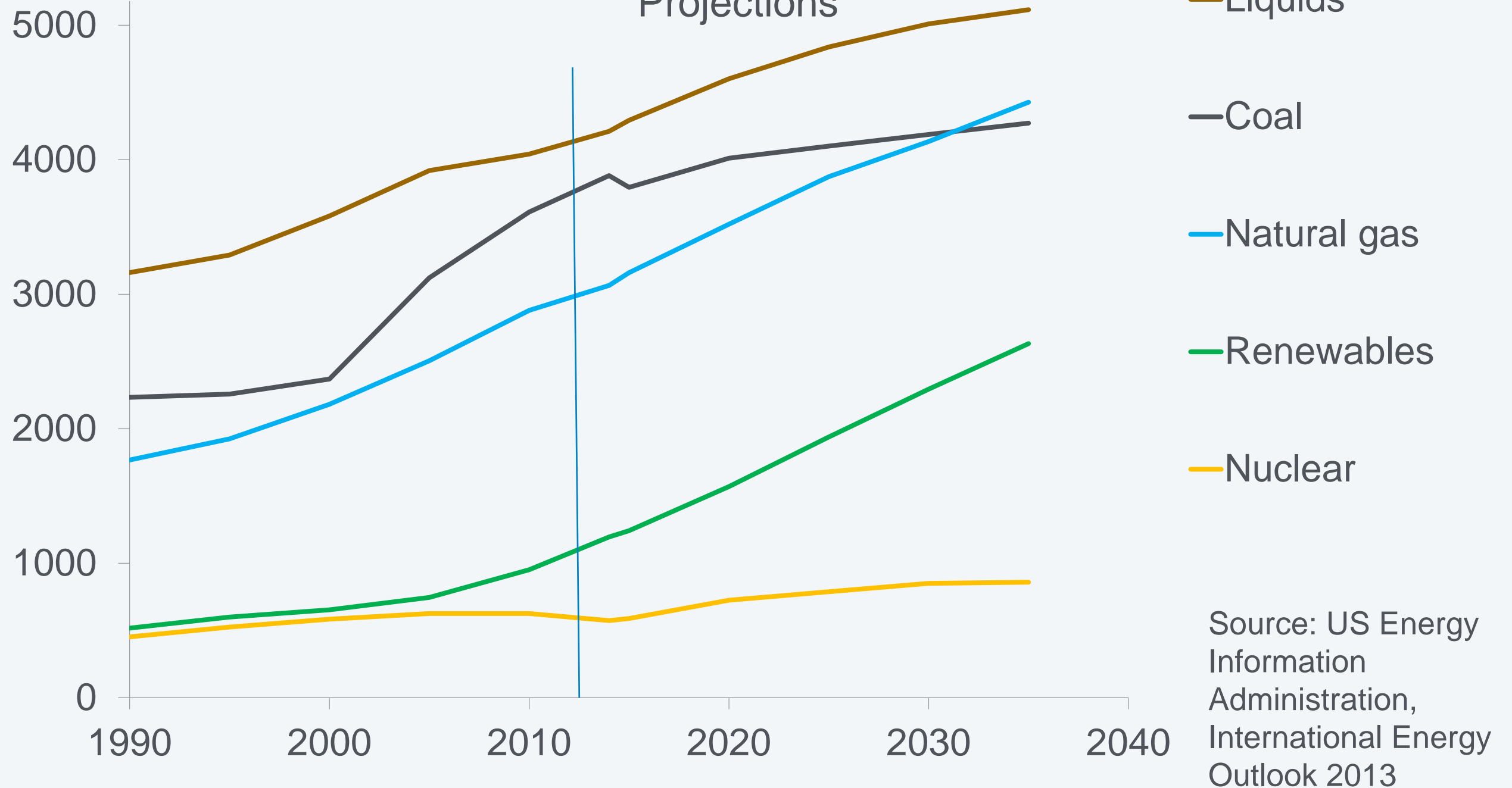
Richard Green

Transitions Pathways Final
Dissemination Conference
February 2016

An ambitious forecast

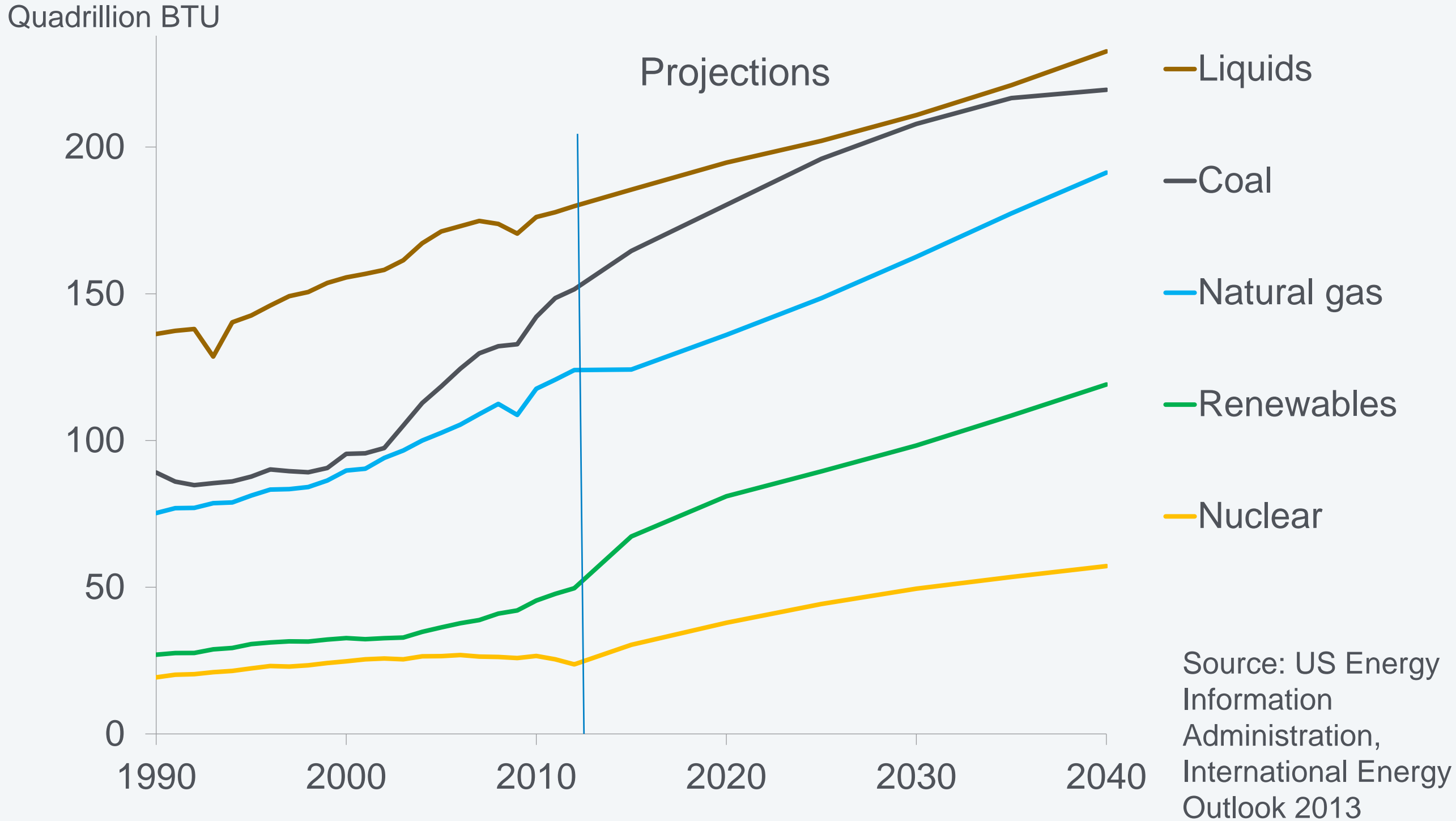
World primary energy consumption by fuel type

Million tonnes of Oil equivalent



An ambitious forecast

World primary energy consumption by fuel type





Thinking about the future

A great many rulers, good and bad and quite often dead, know what has happened.

A few, through dint of considerable effort, are able to know what is happening.

Vetinari considered both to lack ambition.

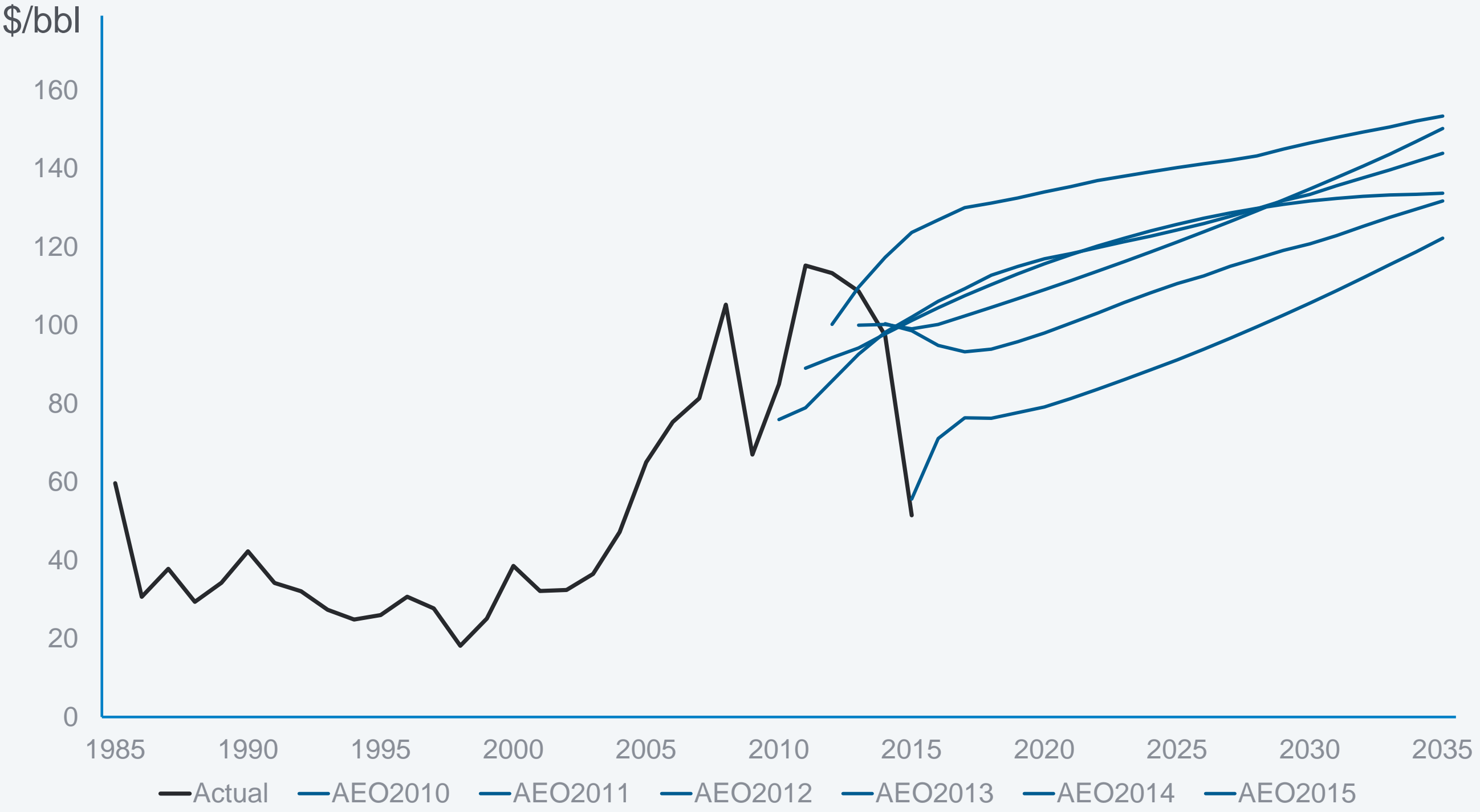
- Terry Pratchett, *Men at Arms*

All models are wrong, but some are useful

- George Box

A challenging target

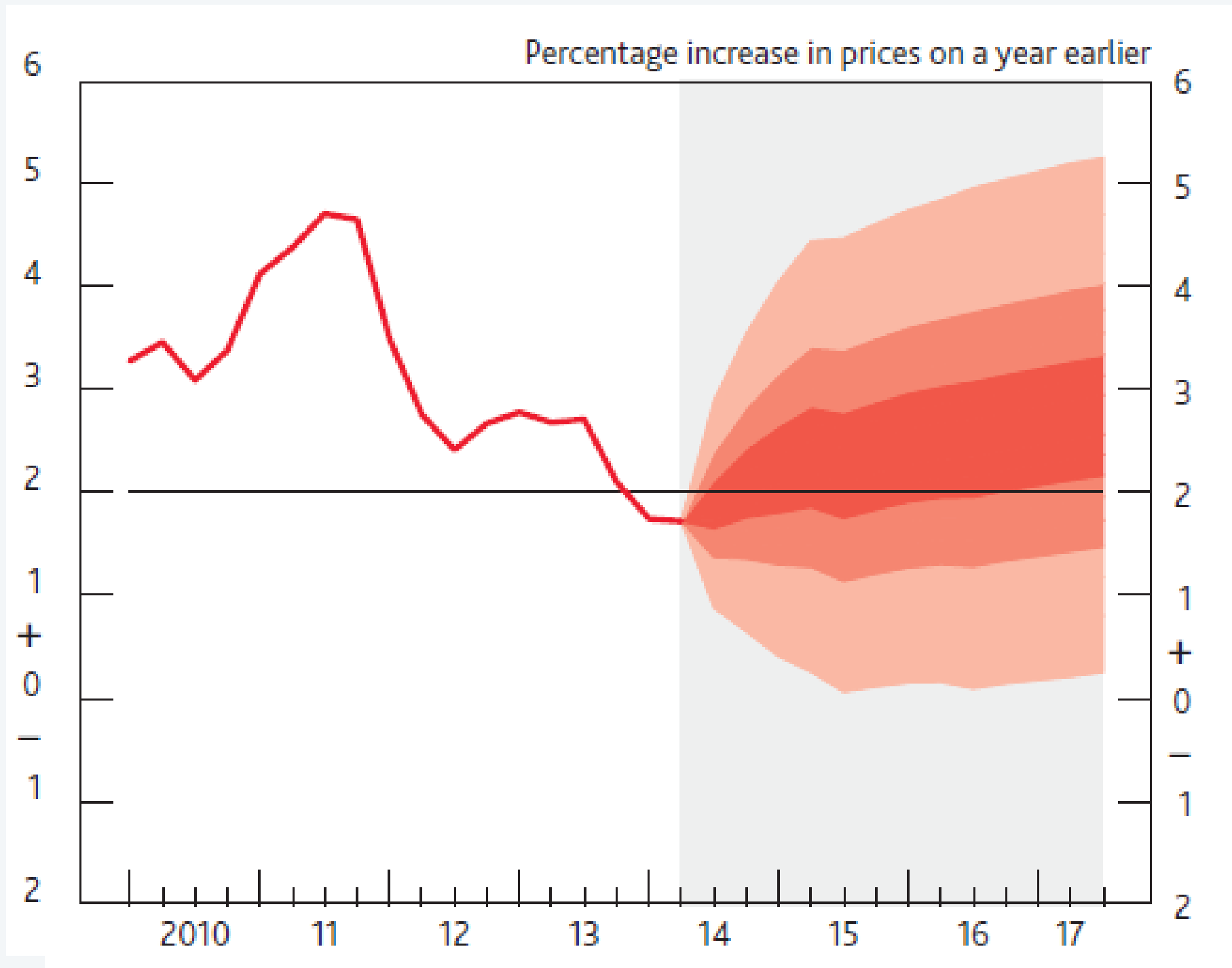
Brent Oil Price (in 2013 dollars) and EIA Annual Energy Outlook Forecasts



Sources: BP and US EIA Annual Energy Outlook

Forecasting with humility

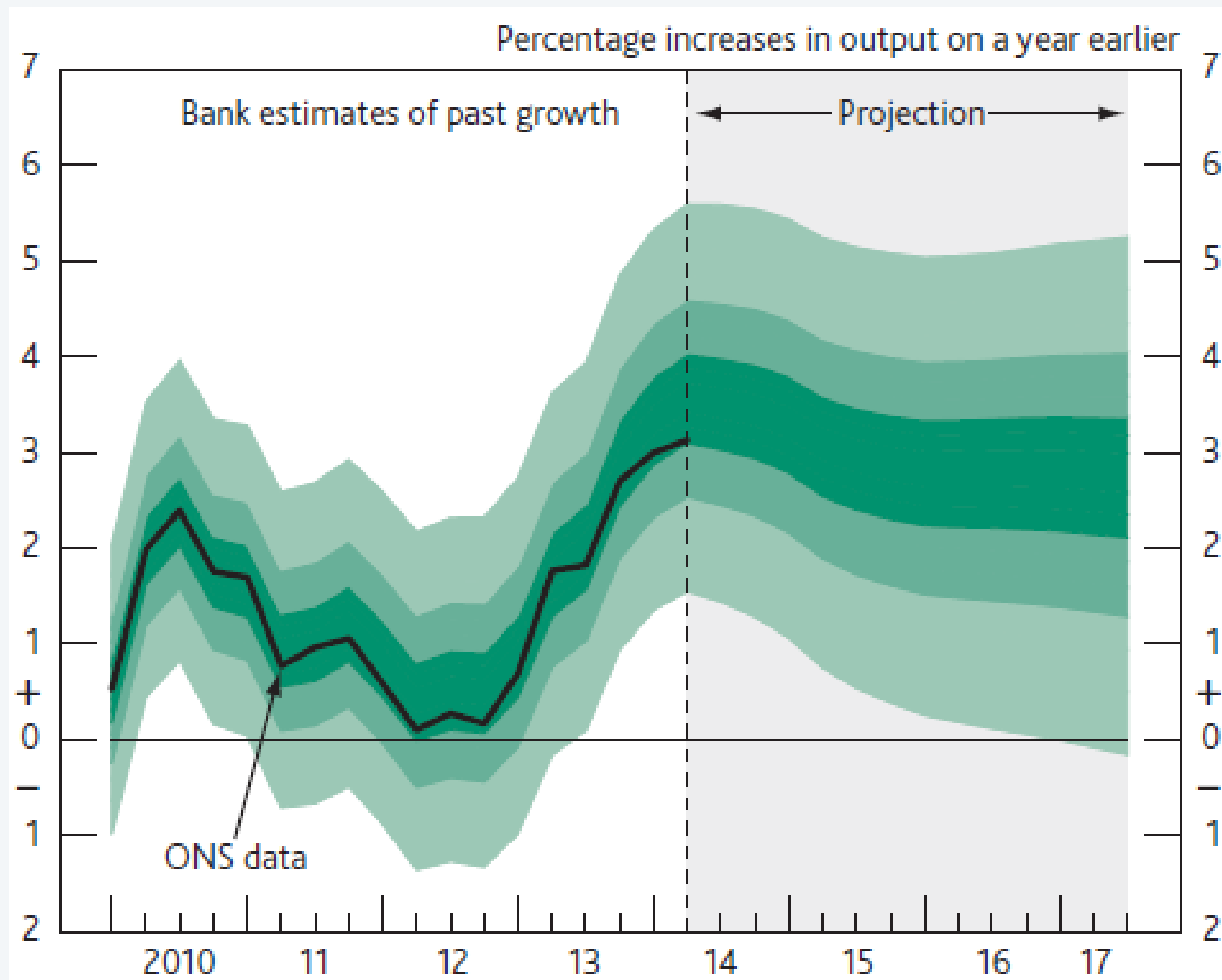
Bank of England “Fan Chart” for future inflation



Bank of England Quarterly Inflation Report, August 2014

A humble forecaster with much to be humble about

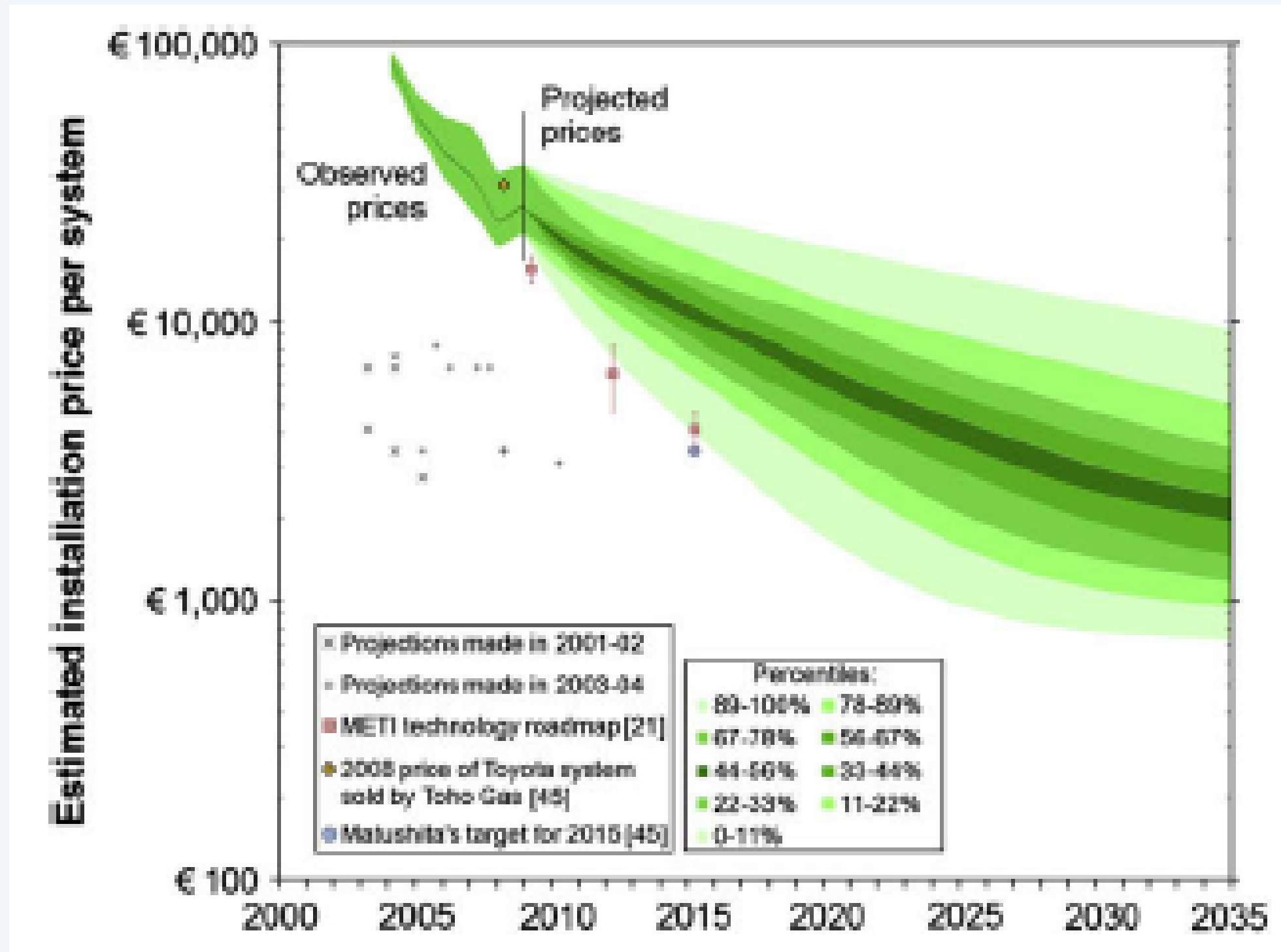
Bank of England estimates of past income growth



Bank of England Quarterly Inflation Report, August 2014

Present a range of outcomes

Staffell and Green (2009) modelling the cost of Fuel Cell Micro-CHP systems

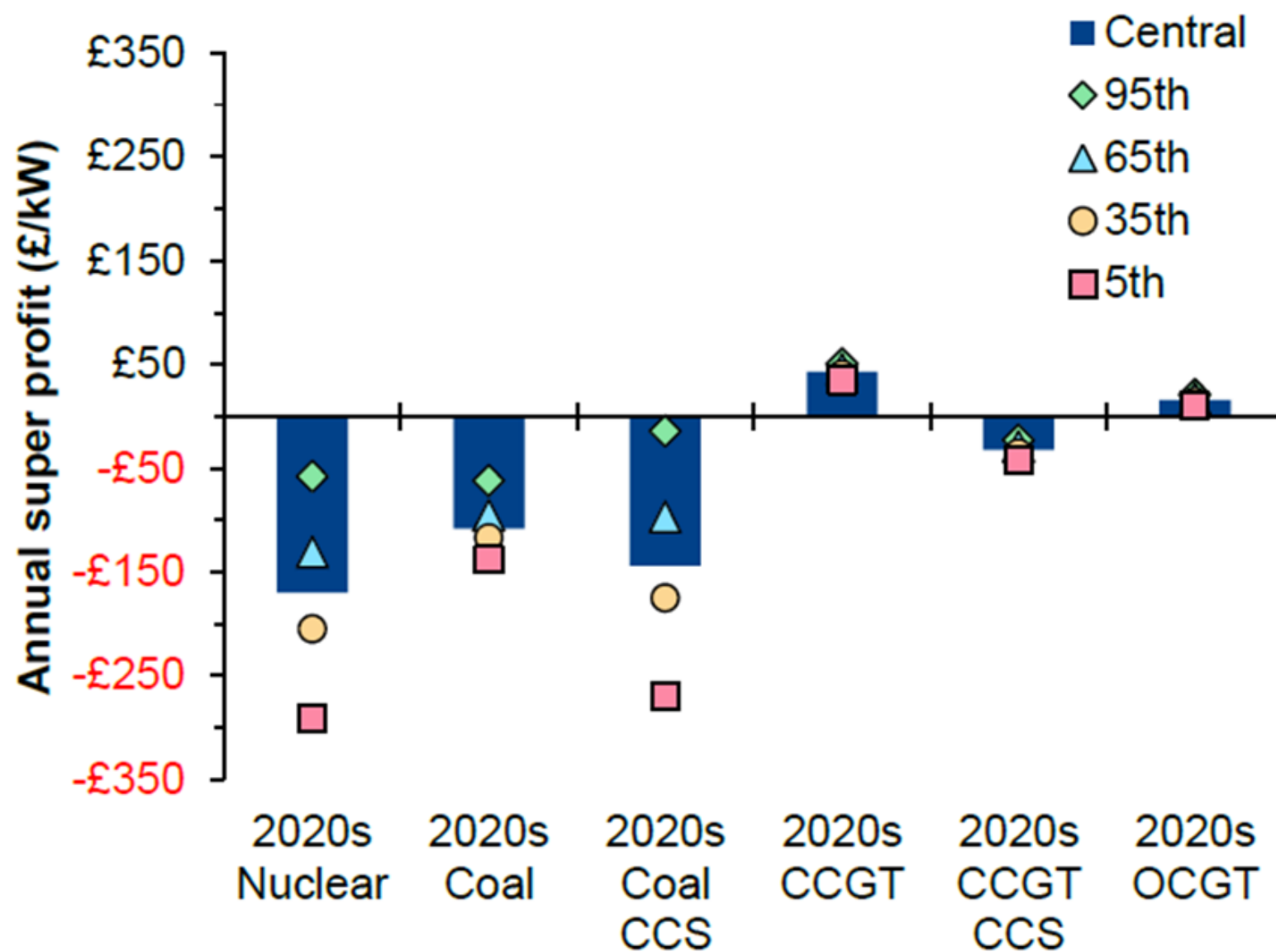
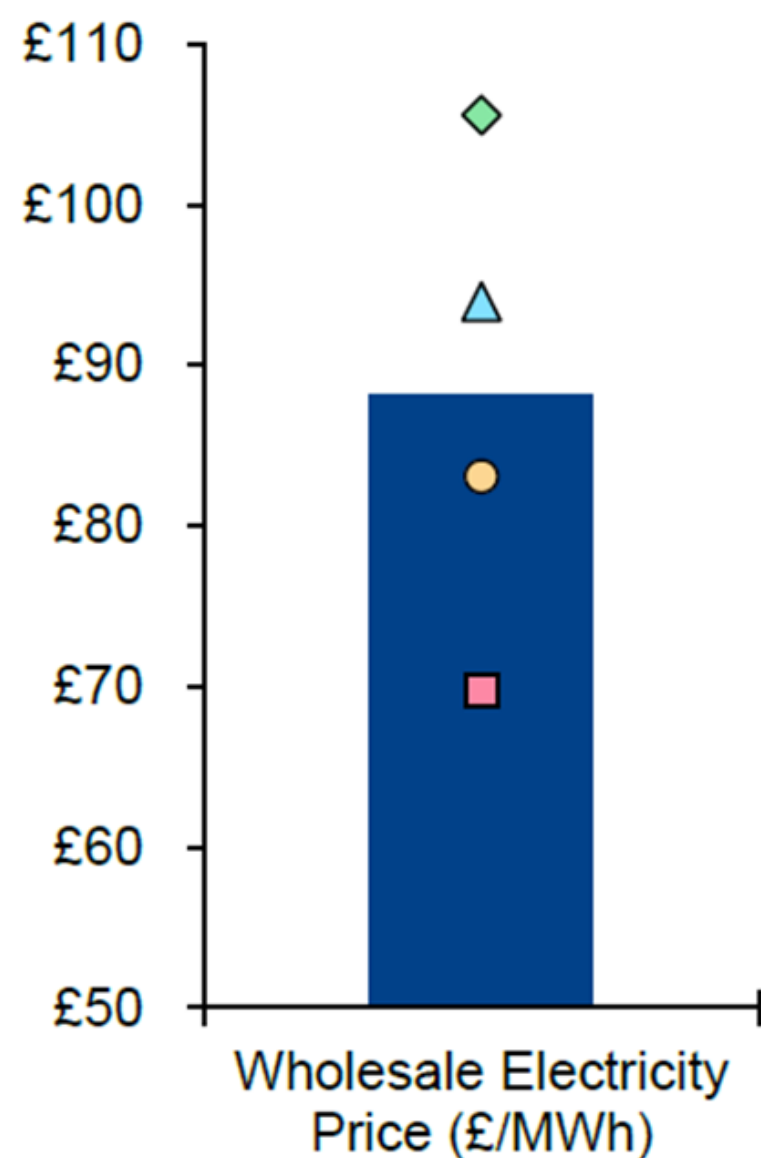


Present a range of outcomes

Green and Staffell (2013) modelling generator profits for DG Comp

Wholesale price

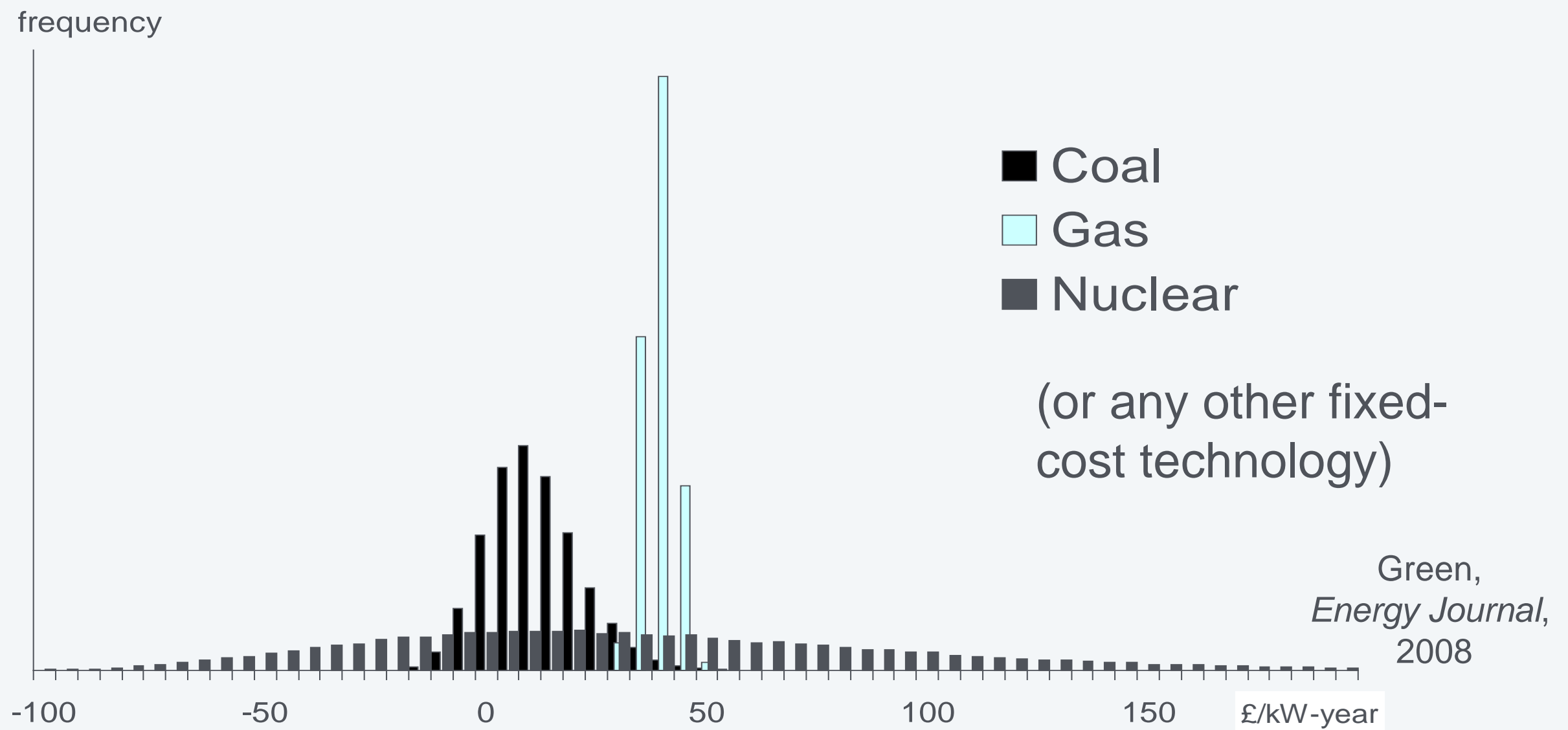
Returns over and above the cost of capital





Look for robust results

Generators' profit distributions under emissions trading

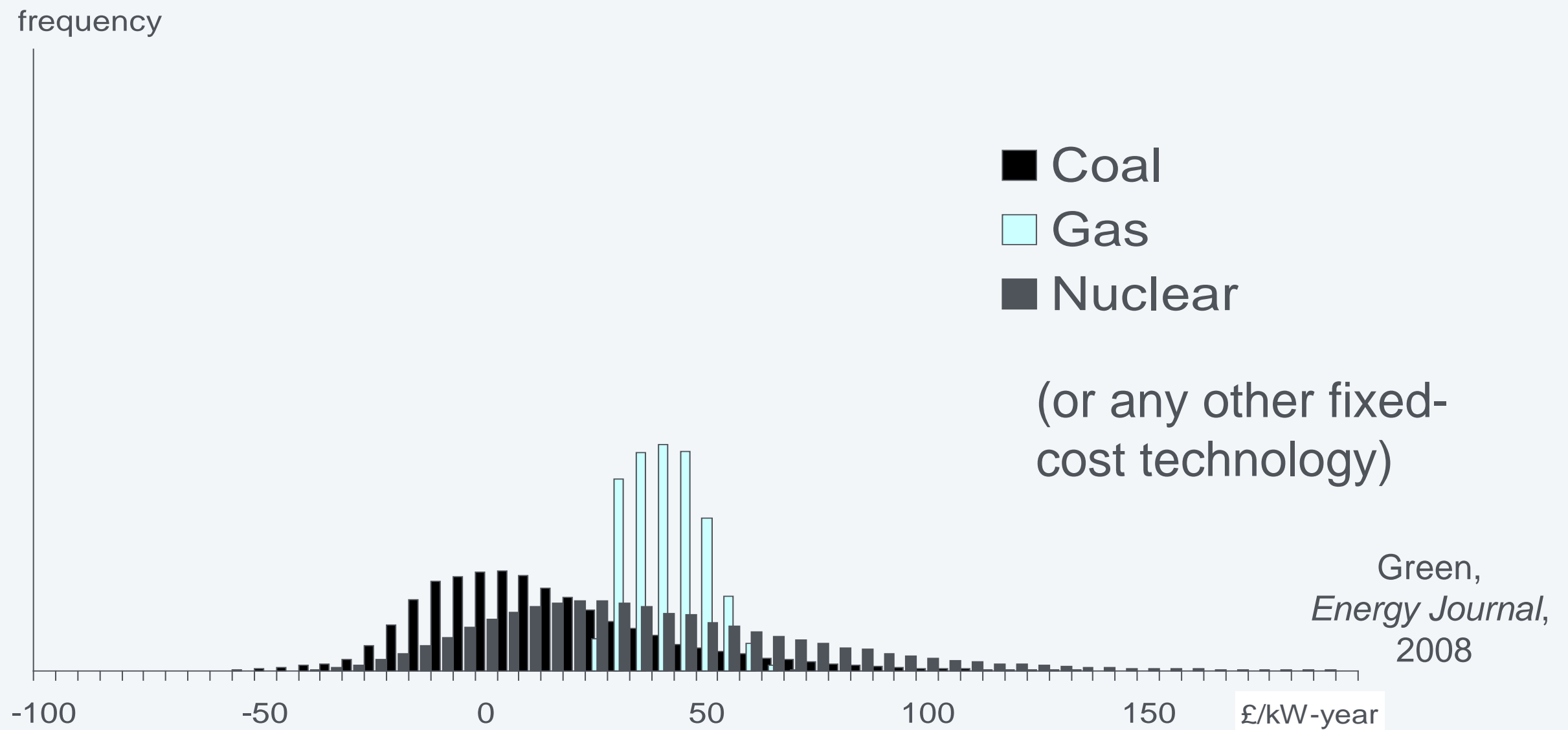


(the *positions* depend on particular cost assumptions; the *shapes* do not)



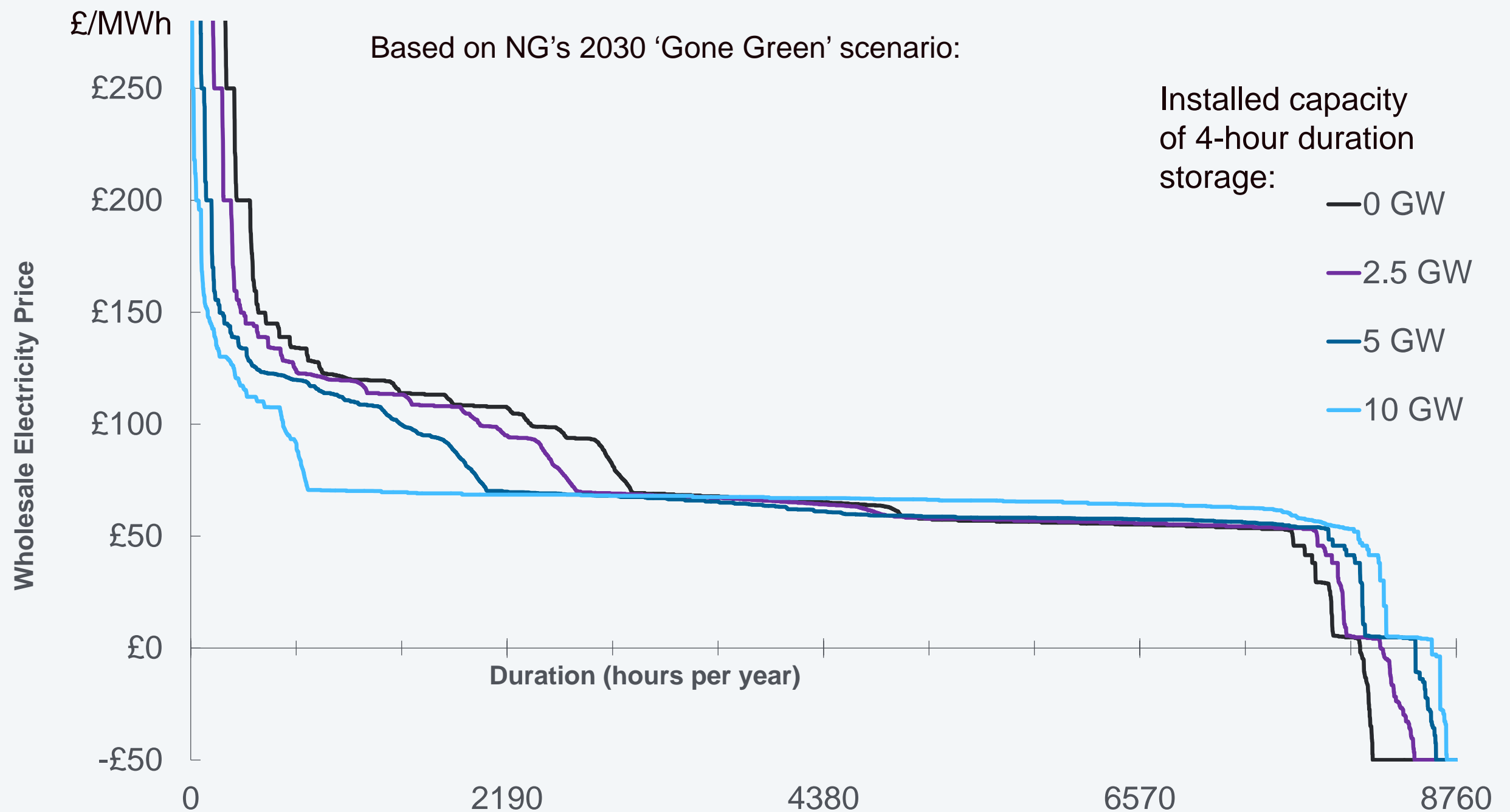
Look for robust results

Generators' profit distributions with a fixed carbon price



Think in “diff in diff” terms

Electricity wholesale price-duration curves with varying amounts of storage



Source: Green and Staffell (2015)



A concluding thought

The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood

- John Maynard Keynes, *The General Theory*