

Renewables are reducing the wholesale cost of electricity

Keith Barnham

Emeritus Professor of Physics
Imperial College London

k.barnham@ic.ac.uk

*The Burning Answer:
a User's Guide to the Solar Revolution*

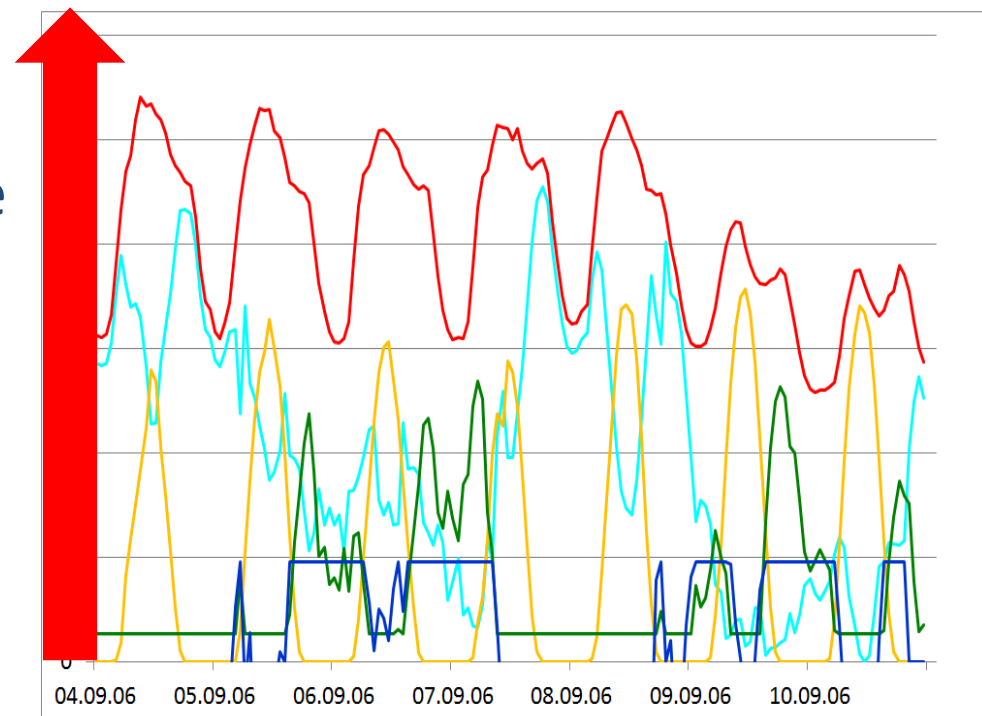
Weidenfeld and Nicholson 2014

www.burninganswers.com

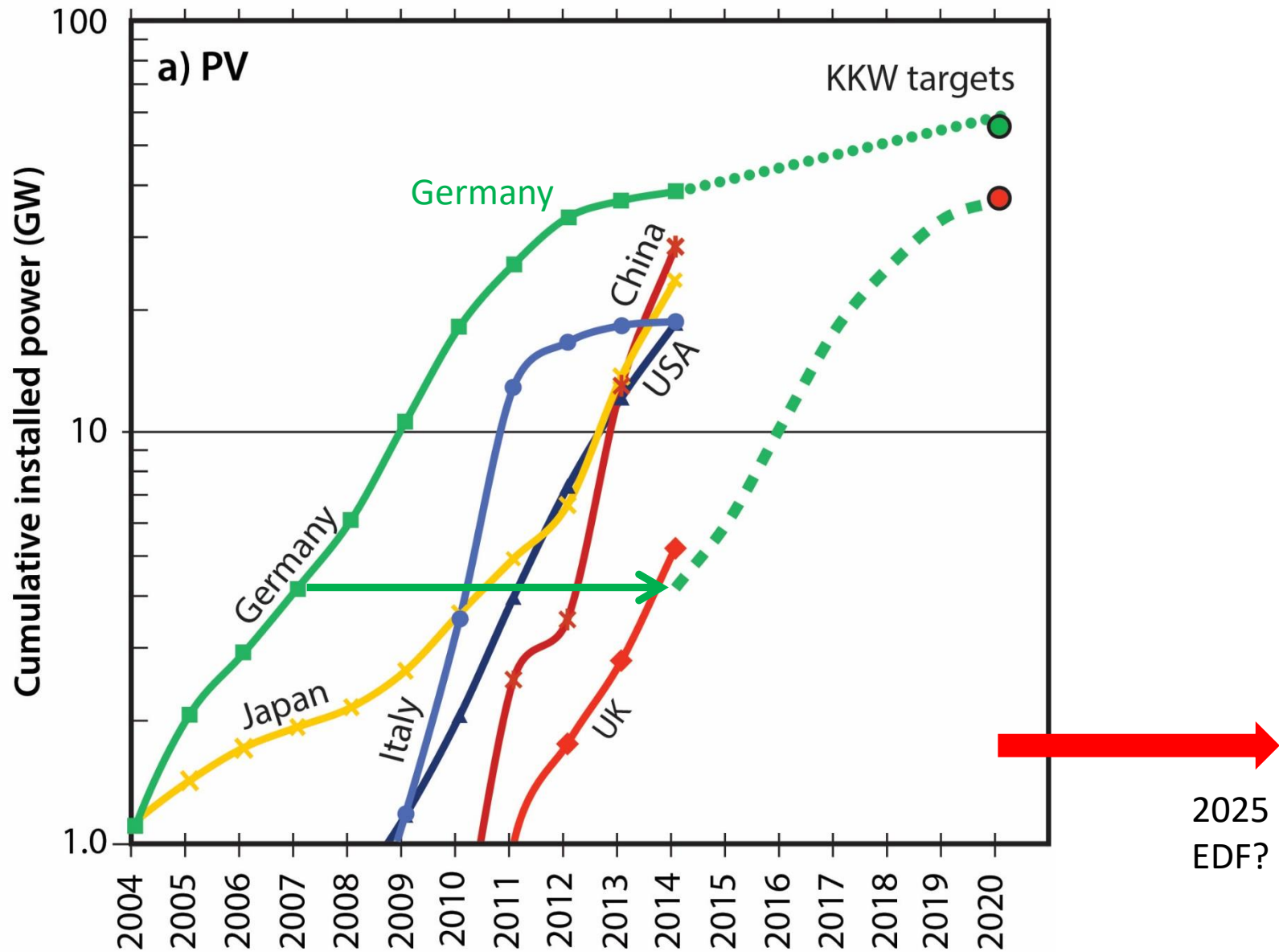
Keith Barnham, Kaspar Knorr, Massimo Mazzer, “Recent progress towards all-renewable electricity supplies” *Nature Materials*, **15** (2), pp. 115-116, (2016)

KKW: combined power plant

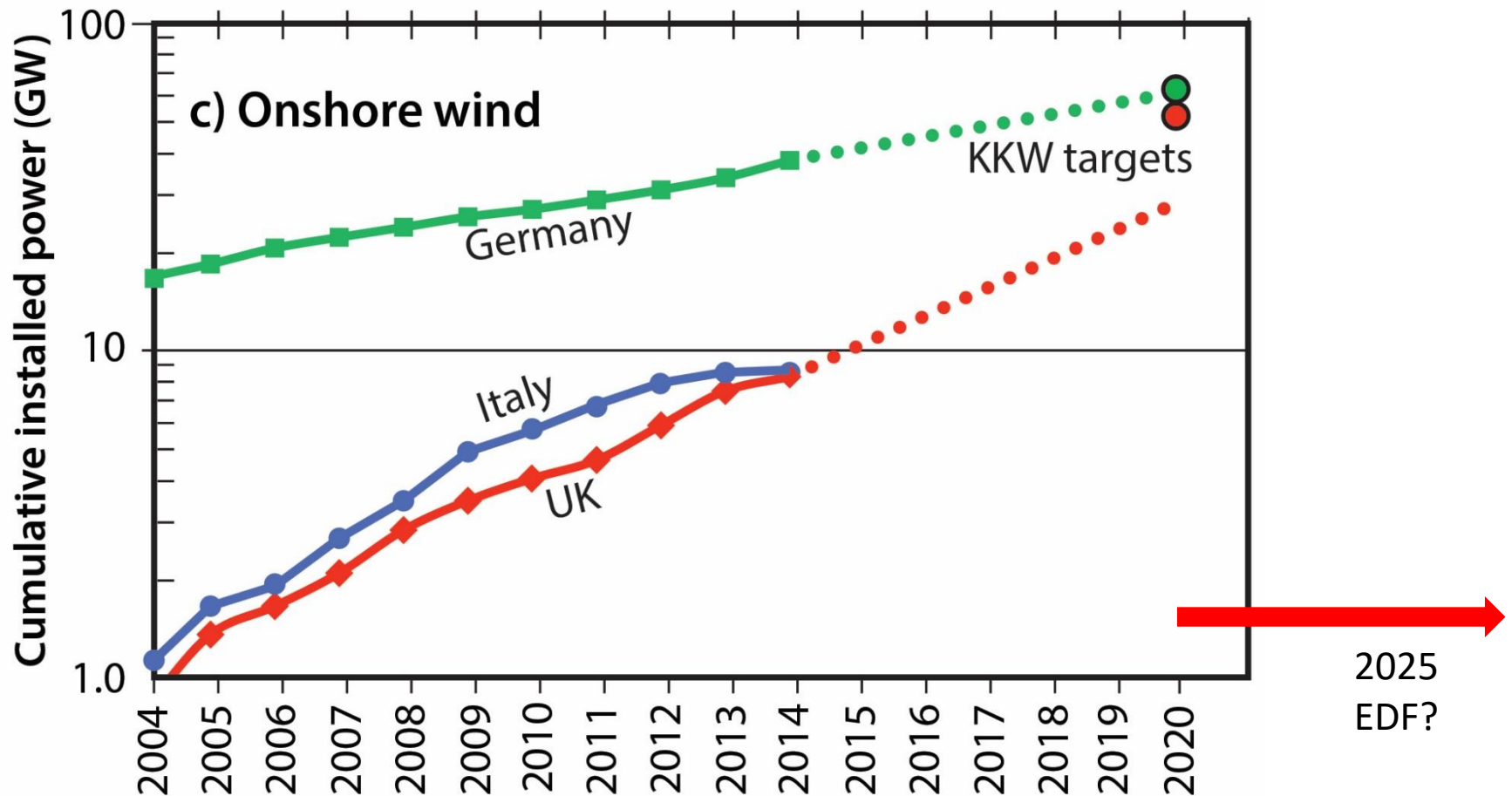
- Kombikraftwerk all-renewable project started in 2006
- Over 2006 it matched 1/10,000 of actual German electric power demand with real-time output of PV, wind & biogas generators
- PV and wind together can supply 78% German power demand
- Only 17% back-up power by biogas electricity required
- Only 5% back-up from storage was necessary
- KKW gives targets for all-renewable Germany - adapt for UK (tomorrow)



PV power increasing exponentially



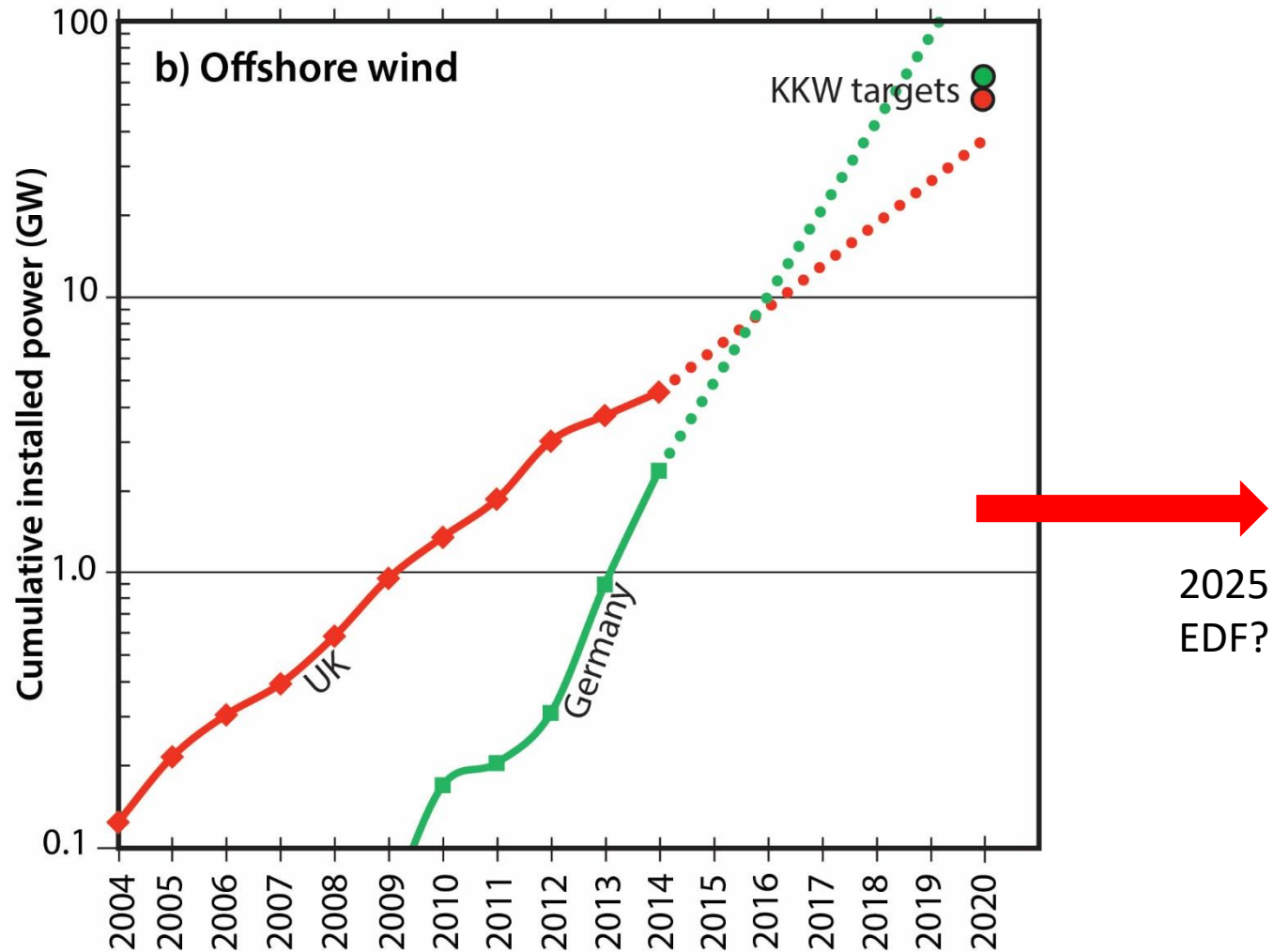
Onshore Wind Power Germany, Italy & UK



Germany will hit KKW target by 2020. UK without cuts by 2022

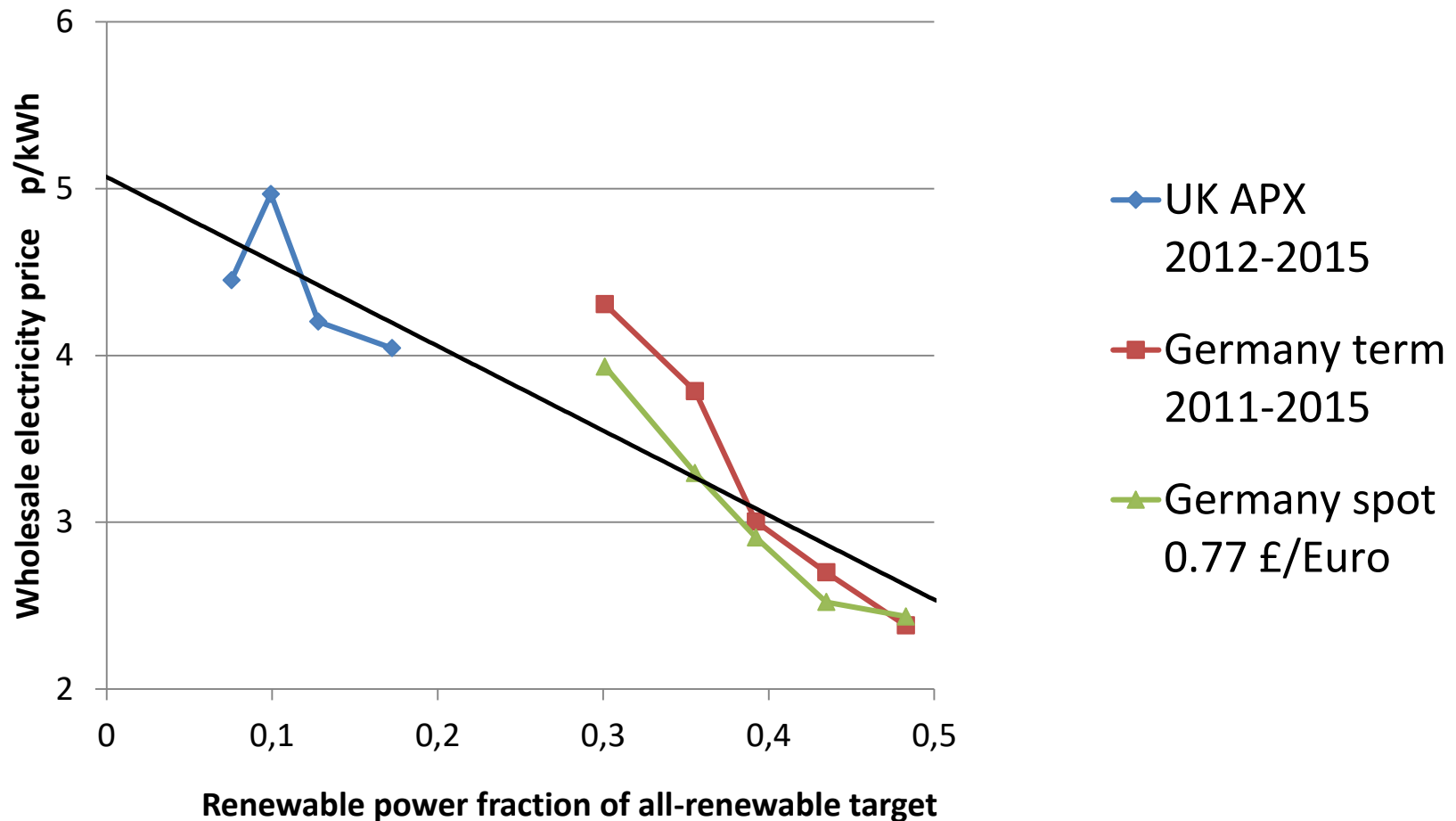
Need local ownership/benefit as pioneered in Denmark

Offshore Wind Power Germany & UK



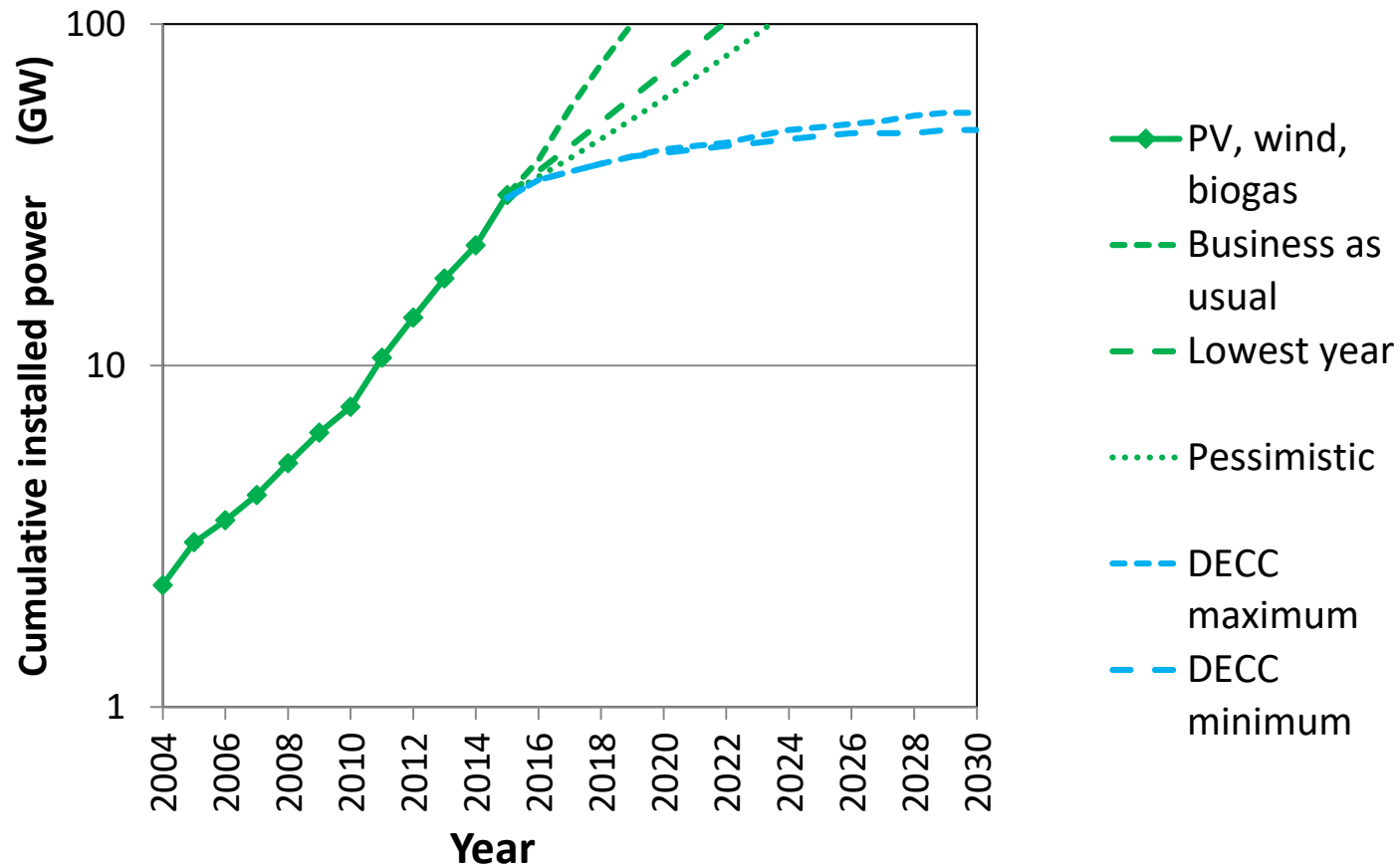
Despite being large scale in a difficult environment, off-shore wind power has increased exponentially like much smaller scale PV

Exponential rising markets lead to falling wholesale prices

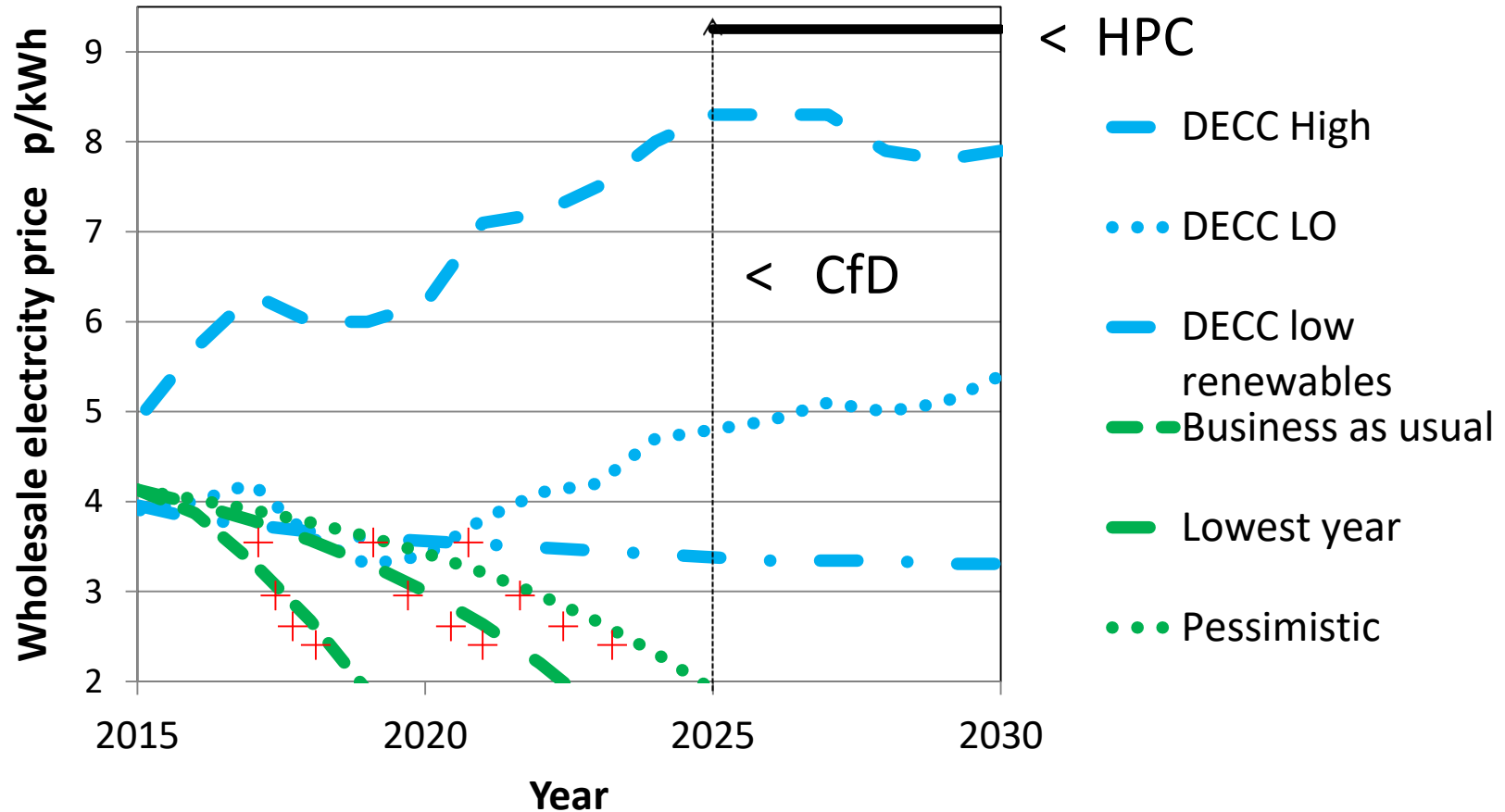


- Good Energy showed 2014 fall in UK due to cheaper renewables

Possible effects of UK subsidy cuts



Wholesale electricity prices 2025



+ Wholesale electricity costs already achieved in Germany 2012 - 2015

Conclusions

- German PV & wind on course for all-renewable electricity targets by 2020
- Without the cuts UK would follow by 2022
- Wholesale electricity cost fall consistent UK & Germany as fraction of renewable penetration
- Aim of cuts to PV & onshore wind - space for expensive & high carbon gas & nuclear
- By 2025 “pessimistic” assumption for renewables means “hard-working bill payers” will fund 7p of 9p nuclear cost for each kWh