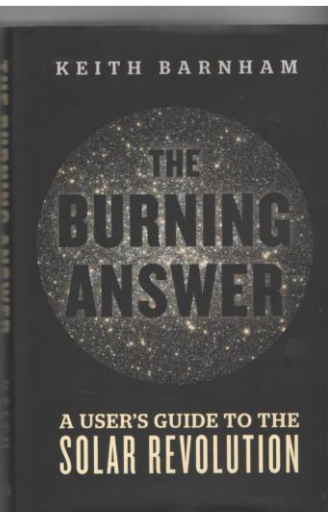


Could Wales beat Scotland to 100% renewable electricity?

Economics of an Independent Wales, Temple of Peace, 16-11-19

Keith Barnham

Emeritus Professor of Physics, Distinguished Research Fellow, Imperial College London



[The Burning Answer: a User's Guide to the Solar Revolution,](#)

Weidenfeld & Nicolson (2015)

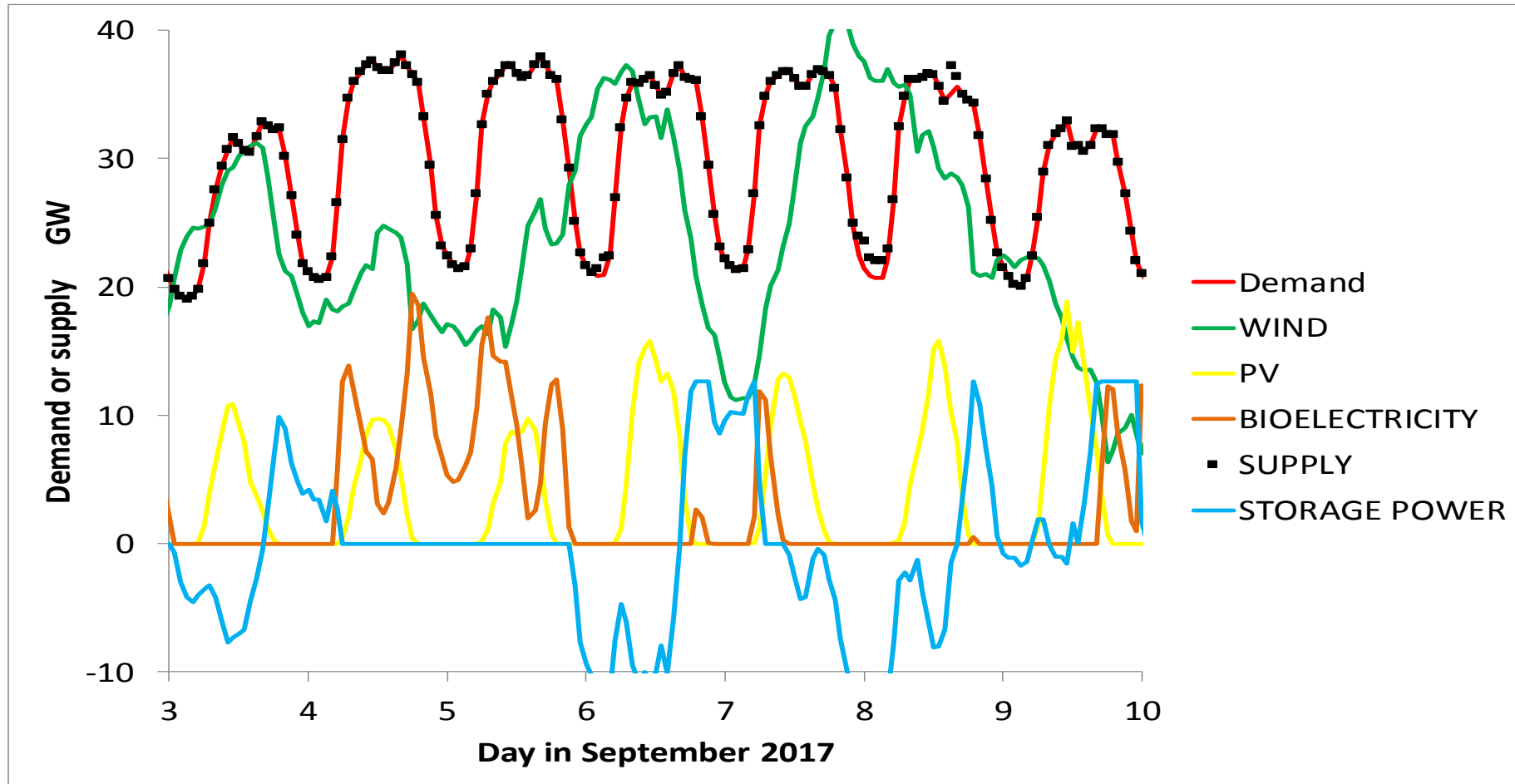
www.burninganswers.com

- 1) Would an all-renewable electricity supply be secure?
- 2) How soon could the UK be all-renewably powered?
- 3) Could **Wales** beat **Scotland** to a 100% renewable electricity supply?

1) Would an all-renewable electricity supply be secure?

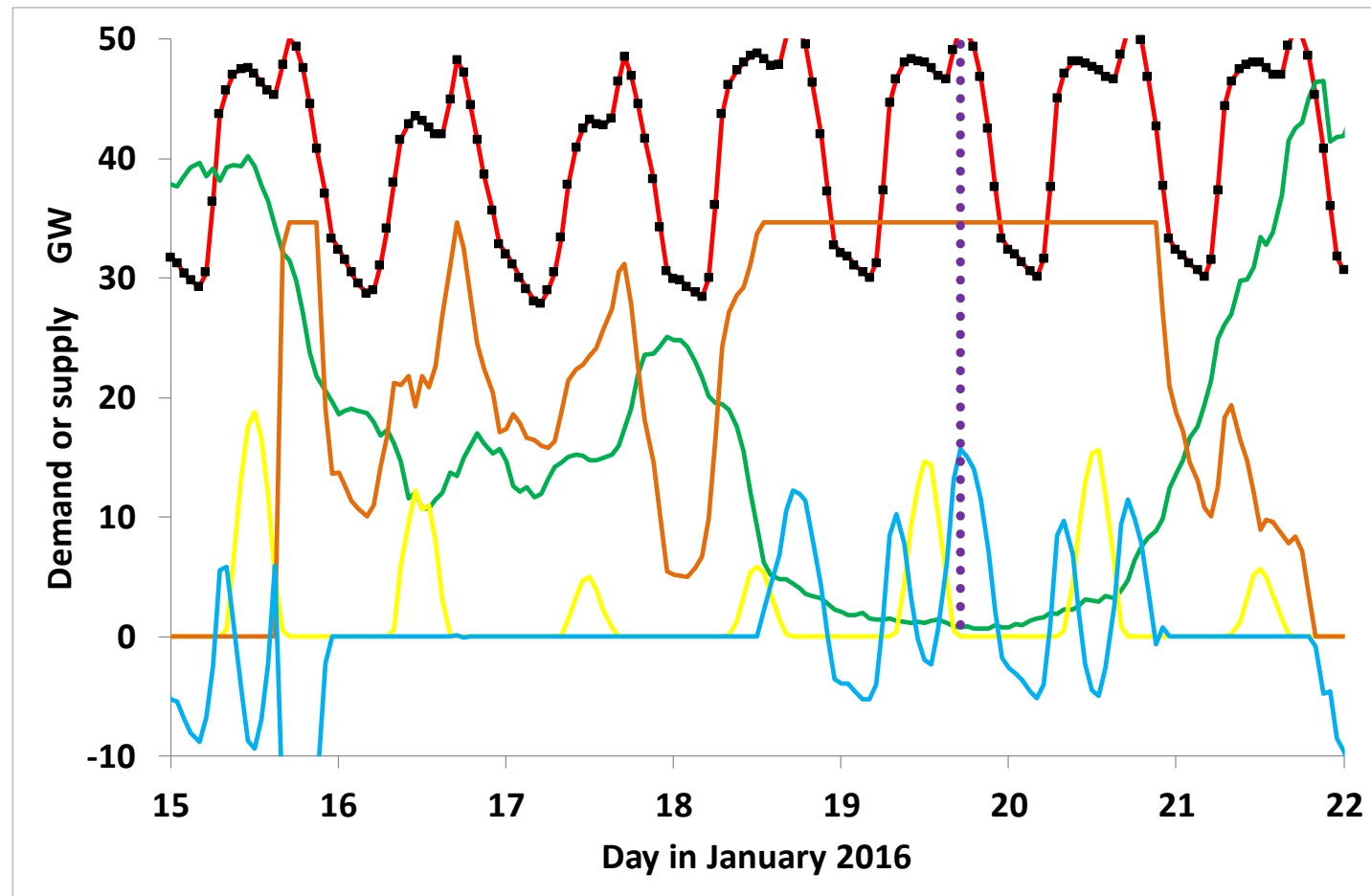
Get it from the Sun (GIFTS) 8760 line spreadsheet

Phil James (CAT), Jamie Taylor (Sheffield Solar), Orrin Lancaster (University of Queensland)



- (PV & Wind) \approx 80%, back-up bio-electricity \approx 15%, storage \approx 5%
- Back-up must be flexible - constant output of Hinkley C & Wylfa obsolete

Worse week for wind in the 5 years we simulated

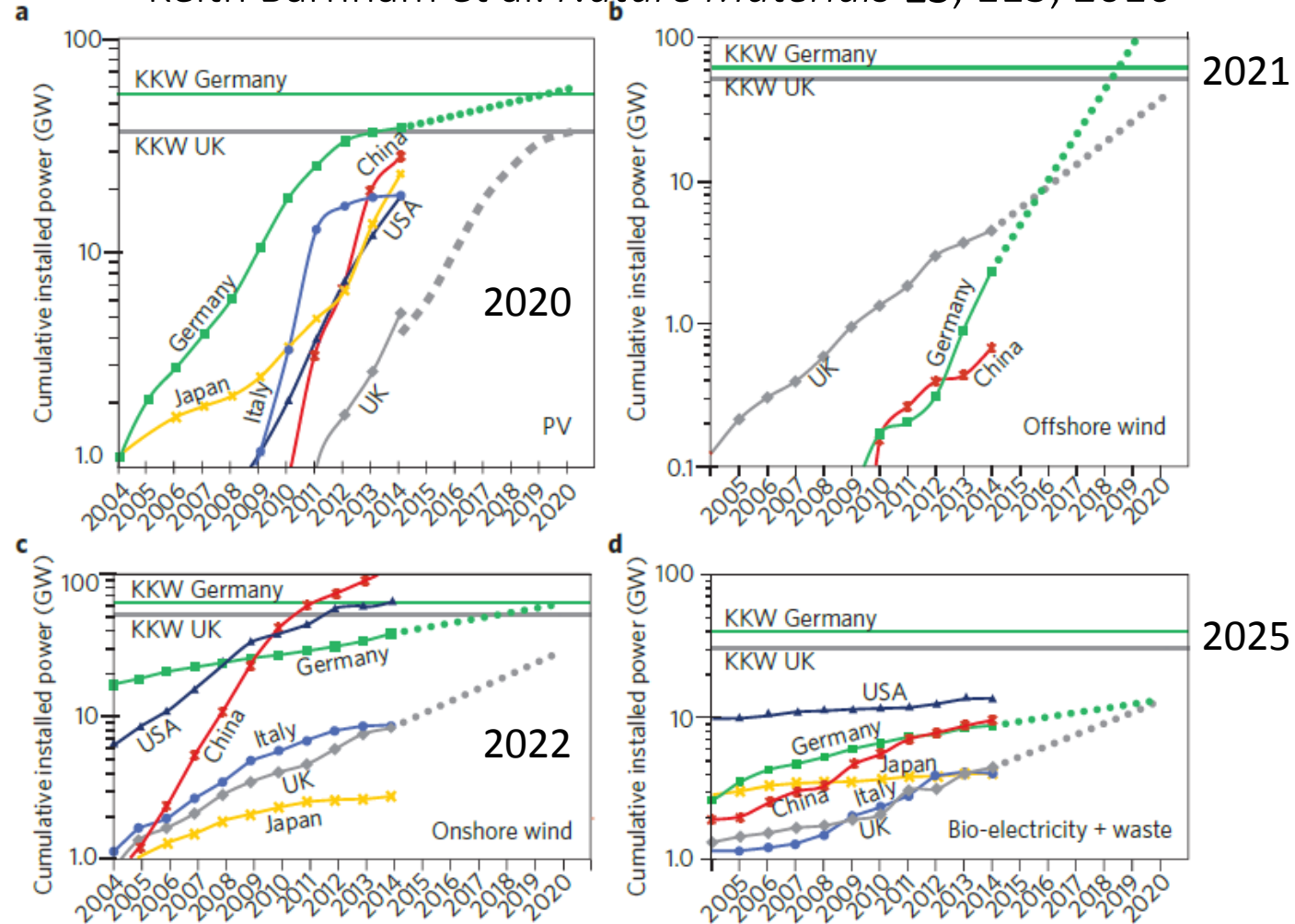


- 55 hours is longest constant back-up needed in 5 years studied
- 12 hours in week nuclear competes with cheap wind for storage
- PV important in January – Wales has more sunshine than Scotland

2) How soon could the UK be all-renewably powered?

But for Tory subsidy cuts UK all-renewable electricity supply by **2025**

Keith Barnham et al. *Nature Materials* 15, 115, 2016



- Bio-electricity slowest: UK could have beaten Germany before first Hinkley reactor starts

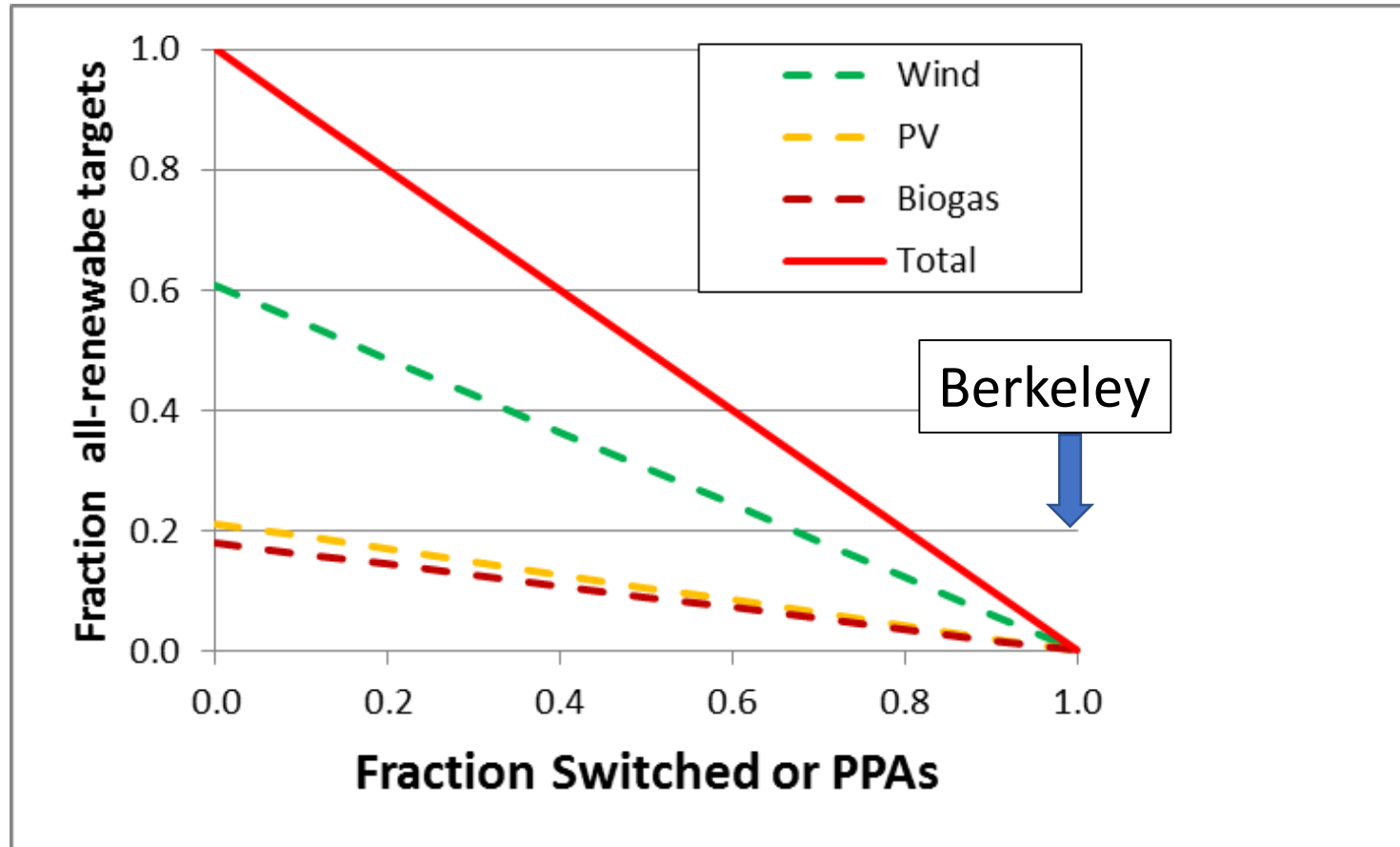
3) Bio-electricity from **Anaerobic Digestion (AD)** is taken more seriously in **Wales** than in **Scotland**

www.recycleforwales.org.uk/food

- Farm animal & crop waste + food waste => AD to generate **bio-methane** for **electricity** and **gas** grids
- Very low carbon footprint: avoids waste rotting on ground or in landfill to produce greenhouse gases
- AD cheap: supplies gas & **flexible** electricity to grids



3) How the *GIFTS* spreadsheet can help **Wales** beat **Scotland** to a 100% renewable electricity supply



- Biogas includes farm/food waste => AD (electric equivalent)
- Wind, PV, biogas targets reduce as homes & industry (PPAs) switch