SMART-SAFE: wind, solar, demand and temperature

Iain Staffell and Kate Ward ~ 13/12/2016

Format:

CSV. 271,728 rows x 9 columns. 1 header row.

Columns:

UTC Time: Time in GMT (1985 to 2015 in hourly resolution). No adjustment has been made for daylight savings (so no hours are missing or repeated)

Local Time: Time in Britain, as given by National Grid. Clocks go forwards (an hour is missed) and back (an hour is repeated) each year.

wind_merra1: Wind output time series generated from the NASA MERRA1 reanalysis.
Covers 1985 to 2014. This will be converted to MERRA2 and extended to 2015.

solar_merra2: Solar output time series generated from the NASA MERRA2 reanalysis.
Covers 1985 to 2014 – and will be extended to 2015.

solar_sarah: Solar output time series generated from CMSAF SARAH satellite images.
Covers 1985 to 2014 – and will be extended to 2015.

demand_ng: Demand for all of GB as reported by National Grid, averaged from half-hourly to hourly. This is measured as supply from all major power stations minus exports minus pumping for hydro minus transformer load. Alternatively it is end-user consumption minus embedded generation.

Covers 1991 to 2015. Data from 1991 to 2001 is an estimation based on metered England & Wales demand (Scotland estimated via regression). From 2001 to 2015 it is raw data.

demand_gross: As above but with embedded renewables added back in. Embedded data available from 2009 onwards, from National Grid.

demand_net: Gross demand minus output from all renewables (embedded and transmission-connected).

temp_merra1: British population-weighted average temperature from MERRA1.
Covers 1991 to 2014. This will be converted to MERRA2 and extended to 2015.

The three wind and solar columns give hourly capacity factors in the range of [0, 1]. These represent the GB national fleet as of Jan-2015. These are instantaneous values for the central point between the hour, i.e the values listed for 00:00 are the instantaneous output at 00:30; so it is probably fair enough to treat them as being the average over the hour beginning 00:00.

The three demand columns are measured in MW. The temperature column is measured in °C.

Source:

Wind and solar data from www.renewables.ninja/downloads
An explanation of how these data were produced is available from the papers linked to on that site, and in the footnotes here.

Demand data from National Grid. Recent data from http://www2.nationalgrid.com/UK/Industry-information/Electricity-transmission-operational-data/Data-Explorer/
Older data downloaded during the 1990s and 2000s.

Net demand calculated using metered wind farm output from Elexon.
https://www.elexonportal.co.uk/fuelhh

Temperature data extracted from MERRA1 directly.

License:

Data may be freely shared inside and outside of the consortium so long as this license text is also provided. Data may be used only for non-commercial purposes without prior permission from Iain Staffell and Stefan Pfenninger.

Wind data may be used with a citation to (Staffell and Pfenninger, 2016).[1]
Solar data may be used with a citation to (Pfenninger and Staffell, 2016).[2]
Demand data may be used with a citation to (Staffell and Pfenninger, 2017).[3]

[1] I. Staffell and S. Pfenninger, 2016. *Using Bias-Corrected Reanalysis to Simulate Current and Future Wind Power Output.* Energy, 114, 1224–1239.

[2] S. Pfenninger and I. Staffell, 2016. *Long-term patterns of European PV output using 30 years of validated hourly reanalysis and satellite data.* Energy, 114, 1251–1265.

[3] I. Staffell and S. Pfenninger, 2017. *The increasing impact of weather on electricity supply and demand: A 25-year British case study.* In preparation.