

# The Renewables.ninja European wind data set

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Iain Staffell and Stefan Pfenninger, 2016. *Using Bias-Corrected Reanalysis to Simulate Current and Future Wind Power Output*. Energy.

Four data files are provided in this download: a metadata file giving the installed capacity and summarising long-term average capacity factors, and then three files giving the hourly capacity factors for the 'current' wind fleet, and then additional farms that represent the 'near-term' future and 'long-term' future. These data are stored in plain-text CSV format, and contains 30 years of data at hourly resolution, giving 262,968 rows of data (plus one header row). For completeness, all countries in the EU-28 plus Norway and Switzerland are included in the 'current' file. This includes seven countries<sup>1</sup> which are not discussed in the journal paper due to their limited wind capacity or isolation from mainland Europe. The 'near-term' and 'long-term' files only contain data for countries where we know of wind farms in the planning pipeline.

All times are given in GMT / UCT, with no shift for summer-time / daylight savings time. When matching these wind capacity factors to other data sources, such as electricity demand from national system operators, you may need to shift the capacity factors forwards to match the local time zone.

Capacity factors are given in the range of [0, 1]. These can be multiplied by the values for installed capacity in each country (given in the metadata file) to give the hourly power output from national wind fleets.

Note that the 'near-term' and 'long-term' files contain the average capacity factors for the *additional* farms, rather than the combined fleet (including also current farms). Therefore, to calculate the average capacity factor of the entire fleet in the near-term future, you would multiply the values in the 'current' file ( $CF_1$ ) by the current capacity ( $Q_1$ ), add the values in the 'near-term' file ( $CF_2$ ) multiplied by the near-term capacity ( $Q_2$ ), and then divide by the total capacity:

$$\text{In the near-term: } CF_{\text{average}} = \frac{CF_1 \cdot Q_1 + CF_2 \cdot Q_2}{Q_1 + Q_2}$$

For example, with the near-term future wind fleet, the capacity factor of wind in Britain would have been:  $CF_{\text{Britain}} = \frac{0.7308 \cdot 11,438 + 0.7837 \cdot 11,990}{23,428} = 0.7579$  in the final hour of 2014.

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<sup>1</sup> The additional countries are Croatia, Cyprus, Luxembourg, Malta, Slovakia, Slovenia, Switzerland