

The Renewables.ninja European wind data set – Version 1.1

Please cite these data and this document as:

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

<http://dx.doi.org/10.1016/j.energy.2016.08.068>

The data are stored in plain-text CSV format and contain 37 years of hourly capacity factors (1980 to 2016 inclusive). All countries in the EU-28 plus Norway and Switzerland are included within two types of data file: one with capacity factors aggregated by country, the second with a further separation into onshore and offshore.

Three versions of the wind simulations are included:

- Current: which covers the operating wind fleet as of December 2016;
- Near-term future: which covers wind farms under construction or with planning approval as of December 2016;
- Long-term future: which covers wind farms that are in the planning pipeline have not received approval.

A meta-data file is included in the download which details the installed capacity that was simulated in each country, along with the long-run average capacity factors.

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

Column headings are in the format of two letter ISO codes, with 'ON' for onshore and 'OFF' for offshore. Capacity factors are given in the range of [0, 1]. These can be multiplied by assumptions for installed capacity in each country to give the hourly power output from national PV fleets.

The most recent version of this data can always be found on www.renewables.ninja.

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Appropriate credit means citing Staffell and Pfenninger (2016) for use in academic reports and presentations, or linking to www.renewables.ninja as appropriate.

If you wish to use the data for commercial purposes, please contact us.

Updates to the wind fleet in version 1.1

- The current fleet is updated by two calendar years;
- Farms under 5 MW of size with a single turbine have been excluded to improve computational tractability;
- The near-term future fleet no longer contains farms that had been built “since the time of writing” the Staffell and Pfenninger 2016 paper. In the V1.0 data, the near-term fleet also included farms that had been built between December 2014 and December 2015 – these have now moved to the current fleet.
- The long-term fleet is updated by two calendar years, and in particular has shrunk due to potential farms being cancelled.

Figure 1 visualises the composition of the three wind farm fleets, and the changes that have occurred since the V1.0 release:

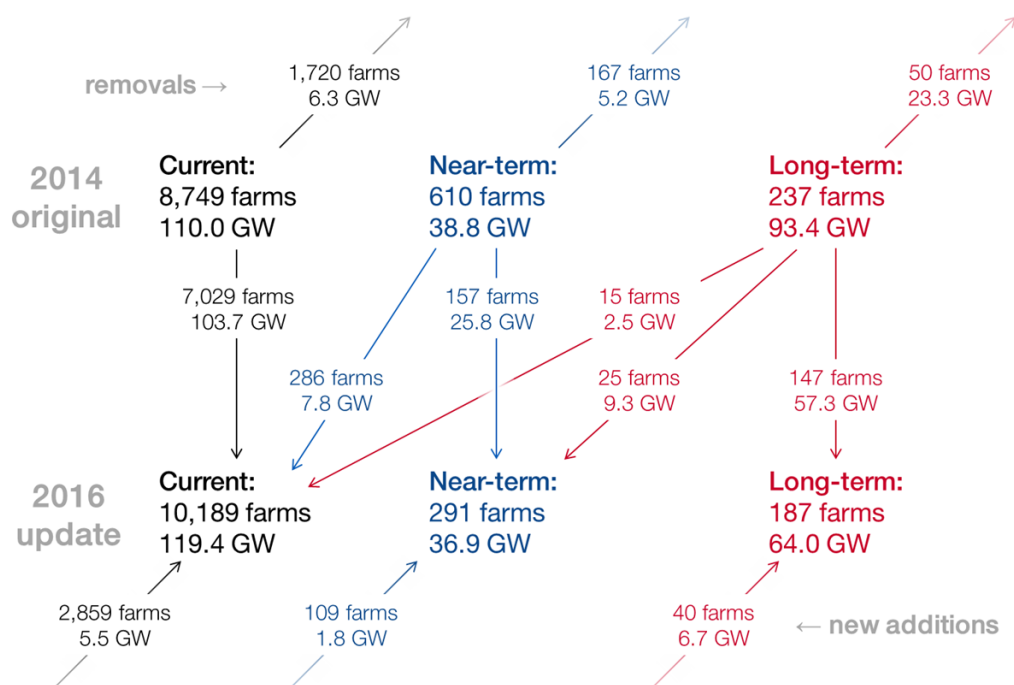


Figure 1: Summary of the changes to the European wind fleet being simulated. This flow chart shows the farms and capacity that has moved between the different classifications (current, near-term future and long-term future) between the original wind simulation (v1.0) and this current update (v1.1).

For example, the “current” wind farm fleet simulated in this report contains 7,029 of the same farms that were simulated in the “current” fleet in the original report, plus 286 farms that were in the “near-term” fleet and have since been built, 15 from the long-term fleet (which managed to obtain planning permission and be built in intervening two years) and 2,859 new farms that were not previously in any of the simulations. A further 1,720 of the wind farms that were simulated as part of the “current” fleet in the original report are no longer

included in this update, either as they decommissioned, or because they were now deemed too small to be simulated.¹

Figures 2 and 3 depict the locations of the wind farms in the three fleets.

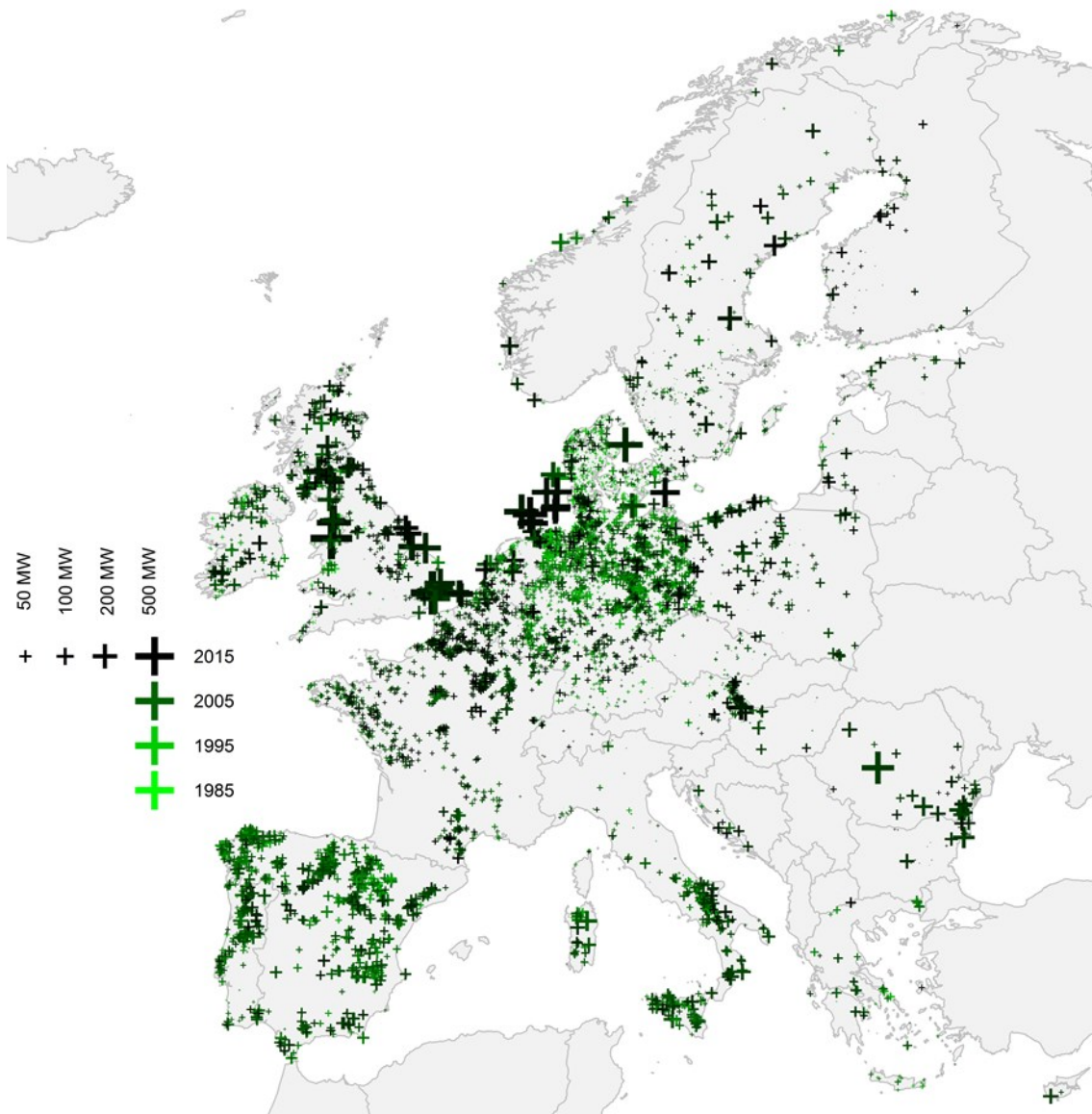


Figure 2: Map of the current fleet: Europe's operating wind farms as of 2017. Darker colours signify newer farms, and marker size is proportional to farm capacity. Data from The Wind Power Database.

¹ The lower threshold for simulating a farm was increased from 1 MW to 5 MW to maintain computational tractability.

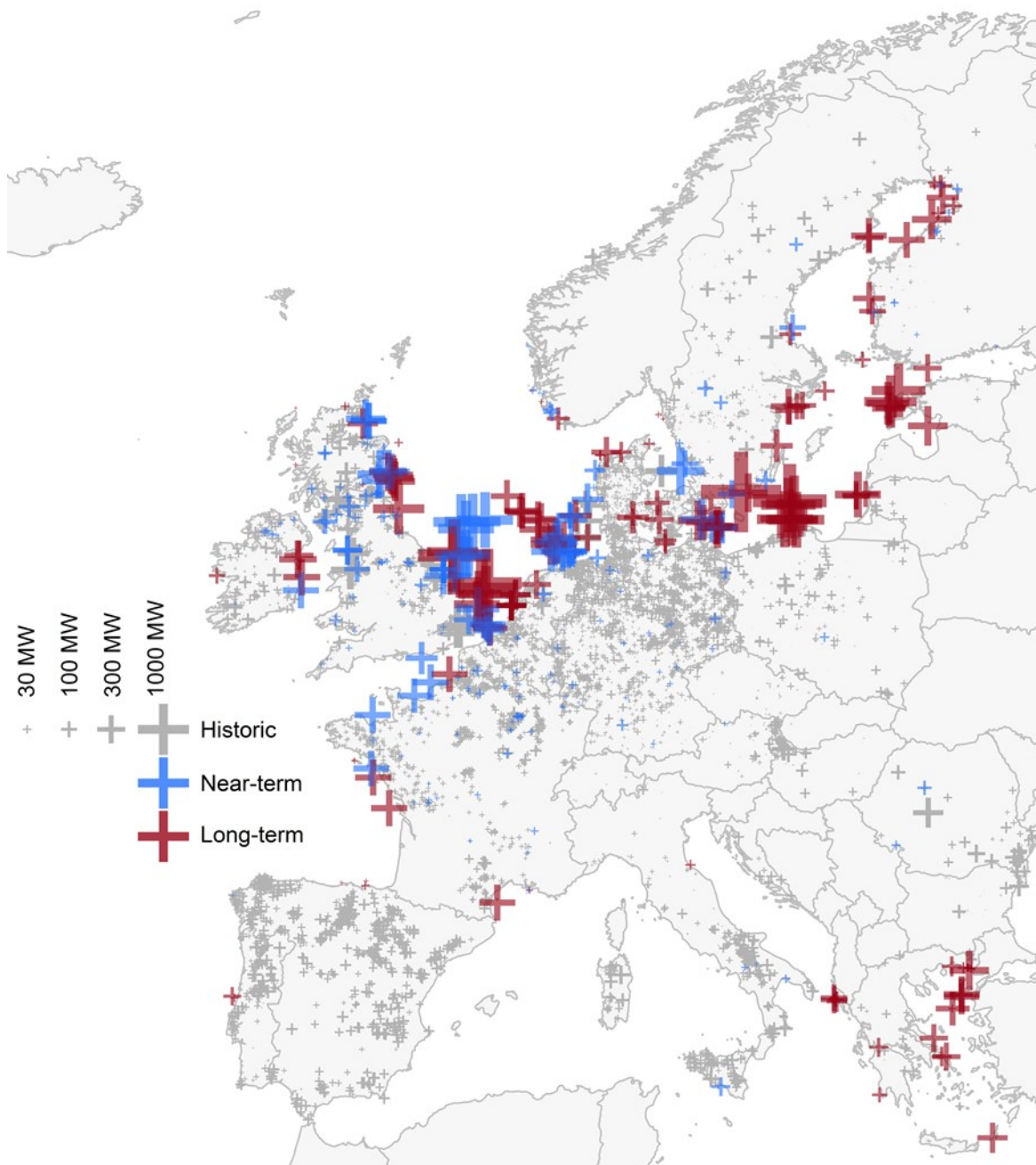


Figure 3: Map of the near-term and long-term future fleets: Europe's wind farms under construction or with planning permission; and without planning permission as of 2017. Data from The Wind Power Database.

Version history

1.1 (March 2017)

- Extends v1.0 data to include weather data from 2015 and 2016
- Simulated wind fleet updated from December 2014 (110 GW current; 38.8 GW near-term future; 93.4 GW long-term future) to December 2016 (119.4 GW current; 36.9 GW near-term future; 64 GW long-term future)
- The reanalysis used to create wind speeds was updated from MERRA to MERRA-2, as NASA discontinued the former product.

1.0 (September 2016)

- 1985-2014 dataset described in Staffell and Pfenninger (2016)