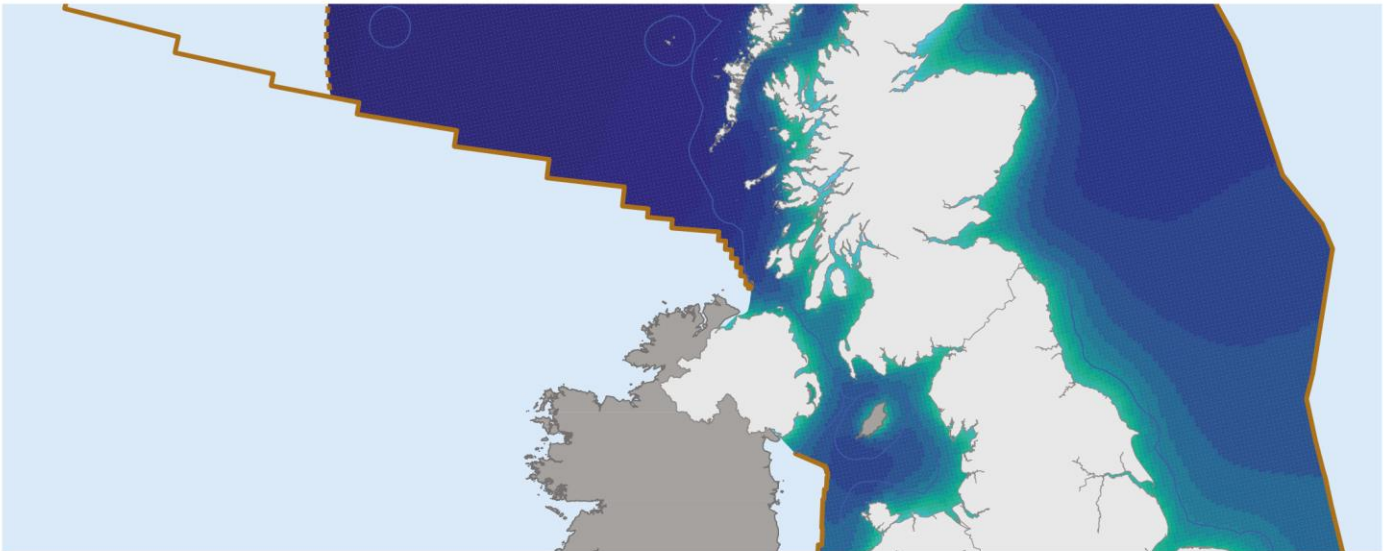


UK Offshore Wind Resource Dataset 2015

Summary report



UK Offshore Wind Resource Dataset 2015 – Summary report

Introduction

The offshore wind industry is growing into a more established sector with 5 GW installed capacity in UK waters. This is set to increase further in the UK and across Europe. With the development of the sector there has been an increased demand for, and ability to provide, better data. One method of obtaining data on wind resource is mathematical modelling. This does not replace the requirement for site specific measurements and monitoring.

The data set that has been used widely to date is the Atlas of UK Marine Energy Resources (2008 Atlas), which was originally produced in 2008 (www.renewables-atlas.info) when the UK had less than 1 GW offshore wind installed. This wind atlas has served the wind industry very well; however, since 2008 there have been significant improvements in wind modelling, computing powers and there is considerably more data available for validation. The Crown Estate therefore identified the potential for improvement in understanding of the UK's offshore wind resource that could be gained from such an update and the benefit that this could bring to the sector.

Following a competitive tendering process The Met Office was awarded a contract by The Crown Estate to produce the UK Offshore Wind Dataset 2015 (2015 wind dataset).

The 2015 wind dataset has been produced at 110m above sea level at horizontal resolutions of 4.4km (over the Renewable Energy Zone (REZ) Waters). The dataset is based on 30 years of modelled 4.4km data (December 1984 - November 2014).

2015 dataset – key features

- Hindcast period is 30 years
- Hub height modelled at 110m
- Increased spatial resolution to 4.4km resolution
- Additional modelling using a 1.5km model around the coastline

General conclusions

The results of the modelling completed as part of this project to produce the 2015 wind dataset show, as expected, that there is significant wind resource offshore around the UK, particularly away from the coast.

The north of the REZ Waters generally experiences higher winds than the south. At a hub-height of 110m offshore, where the data is modelled, most areas have average wind speeds in excess of 10m/s and but to the north of the REZ Waters average wind speeds are in excess of 11m/s.

Near the coast the average wind speeds are generally lower (in comparison to offshore) as would be expected. On exposed coasts, such as the east coast of England the wind speeds are generally in excess of 8m/s and in more sheltered and complex areas such as the islands off the west coast of Scotland the wind speeds are lower; in excess of 6m/s. Some inlets experience lower average wind speeds than this.

Model build

Two models were utilised as part of this complete work package. A 4.4km hindcast model (from 1979 to present), known as the Euro4 model, provides a good resolution dataset across the whole of Europe and therefore covers the entire UK Continental Shelf. A second model is a configuration of the Met Office Unified Model called the UKV which has a resolution of 1.5km in areas of interest around the coastline. The increase in resolution of the UKV over the Euro4 (1.5km vs. 4.4km) means

that there is an improved land sea mask, which is important when looking at winds in coastal regions. This dataset has produced 4 years of modelled data (December 2010 - November 2014).

The outputs from the Euro4 model at 4.4km resolution have been released as a dataset with this report.

Discussion

Overall, due to the increased resolution in the model from 12km in the 2008 Atlas to 4.4km in the 2015 wind dataset, and the increase length of hindcast data set from 7 years to 30 years, an increase in wind speeds between the models has been observed.

Improvements of resolution from 12km to 4.4km mean that there is a better representation of the coastlines around the UK where previously, due to the size of the cells, the data was more irregular. See Figures 1 and 2, below, which demonstrate the impact of the increased resolution of modelling around the coastline.

The 2008 atlas uses data spanning June 2000 to May 2007 (7 years) and hence is a much shorter period than the 30 years in this new dataset. Comparisons of the impact of the increase in the time period have been conducted and for much of the area, in particular east of the UK, the UK Offshore Wind Dataset has higher wind speeds (between 0.25 and 0.75m/s faster). Further from the UK the differences are smaller within ± 0.25 m/s. This is because longer term fluctuations are now captured.

Full details of how these datasets have been produced can be found in the Met Office Technical Report along with details around the modelling approach and further comparisons of the differences between the 2015 wind dataset and the 2008 Atlas. The Met Office Technical Report is available for download (see below for information on downloads).

Validation

For the purposes of validation, the Crown Estate supplied the Met Office with high quality processed met mast data from 8 offshore met mast locations around the UK. Table 1 below is a summary table of the mean bias and the mean absolute bias at each location, both as a percentage of mean wind speed.

Table 1 Euro4 verification breakdown over all 8 sites and averaged over all heights for each site - observed mean wind speeds ranged from 8.72-9.26ms-1

Station Name	Mean Bias as a percentage of observed mean wind speed (%)	Mean Absolute Bias as a percentage of observed mean wind speed (%)
Site A	1.8	16.9
Site B	0.8	15.6
Site C	4.1	17.0
Site D	0.6	17.0
Site E	0.2	15.2
Site F	1.6	17.0
Site G	0.6	19.4
Site H	2.2	17.6

More details of the validation approach can be found in the full Met Office technical report.

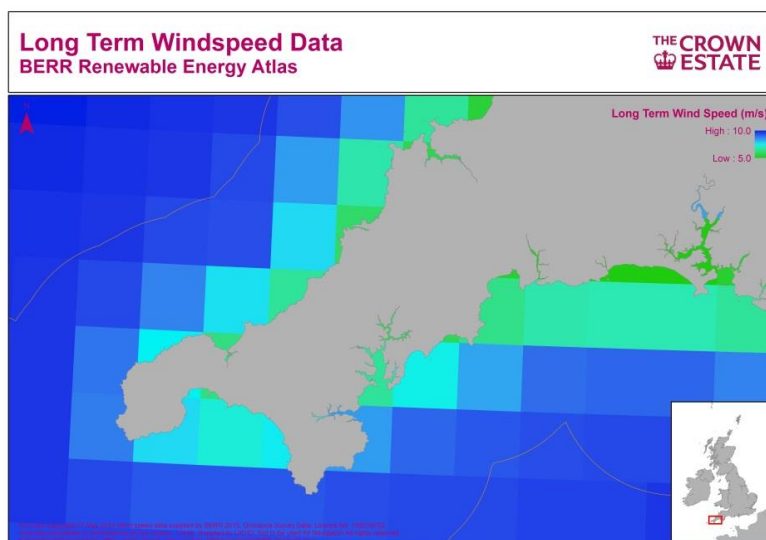


Figure 1 The Atlas of UK Marine Energy Resources 2008 - Cornwall

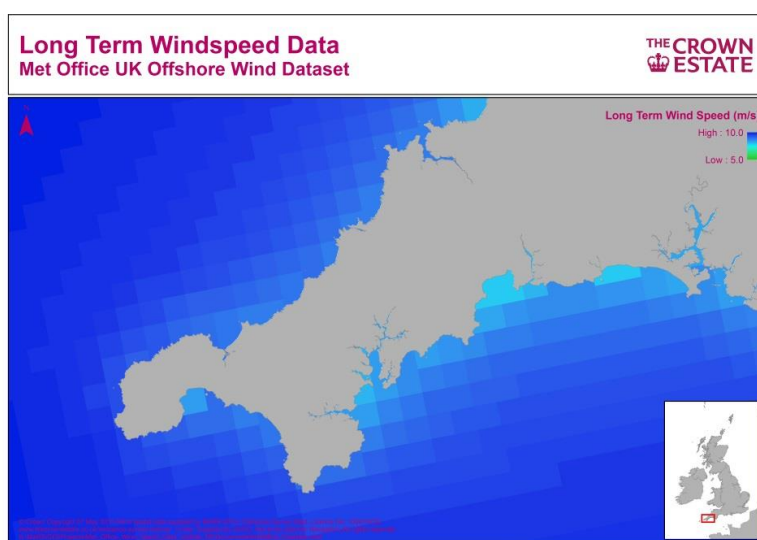


Figure 2 The UK Offshore Wind Dataset 2015 - Cornwall

What is available for download?

The Crown Estate is now making the findings of this work available in the form of a report and the underlying datasets. Available for download from the Marine Data Exchange (www.marinedataexchange.co.uk) are the following documents.

UK Offshore Wind Resource Dataset 2015:

- The Crown Estate summary report
- UK Offshore Wind Resource Dataset 2015_Zipped data file:
 - I. Met Office Technical Report
 - II. Hi-resolution PDF image of the annual average wind speeds
 - III. GIS Shape files for 4.4km resolution dataset

Please note all the raw data is available for download as shape files. They are designed to operate with ArcGIS but are compatible with other Geographical Information Systems but a GIS analyst would be required to utilise the data.

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