Evolution of the wind resource over the last 30 to 45 years in 11 European regions

Summary sheet following the oral presentation at the WindEurope 2018 Conference

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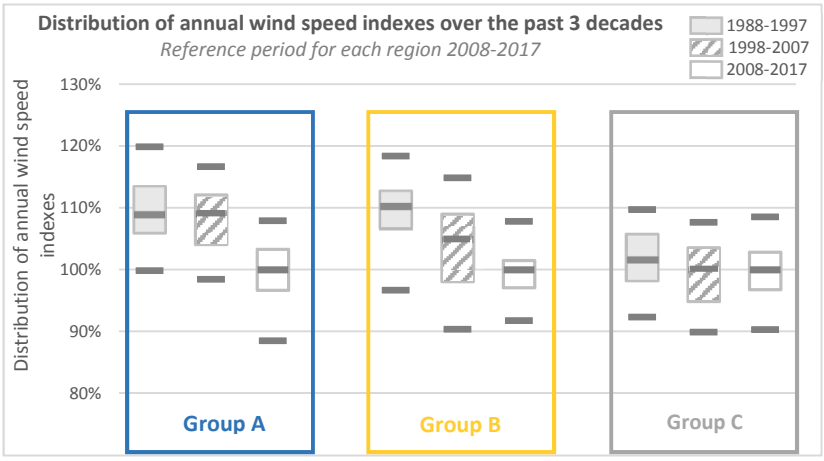
Context

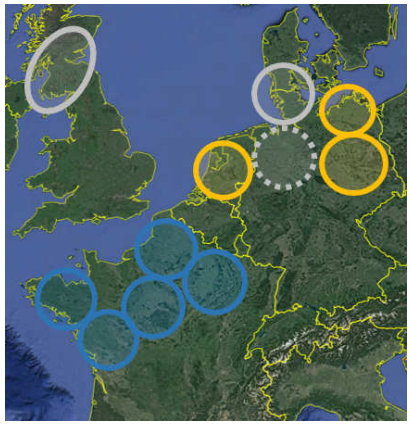
A significant decrease of the wind speed levels has been observed in Northern France since the early 2000s. To put this observation into perspective and understand the global pattern of the wind resource over the longer term, Eoltech carried out wind measurement analyses based on meteorological station data. Consistent regional wind trends could be established for several regions in France as well as other areas of North-western Europe over at least the past 30 years. These regional wind trends are based on the combination of rigorously selected wind data (sources coherent and independent from each other), in order to avoid biases due to the evolution of the environment or the measurement conditions.

These observations have raised questions with regards to the appropriate length of the long term period to be considered for reliable energy yield assessments: Longer might not necessarily be better…

Key words: Evolution of the wind resource, long term prediction, wind trends, energy yield assessment

Evolution of wind speed indexes over the past 30 years





How to interpret the chart?

- *For each region independently, all 12-month wind speed indexes were calculated since 1988 using 2008-2017 as reference.*
- *For each of the 3 past decades, quartiles and extrema are displayed on the plot box. For instance, if we consider the decade 1988-1997 for group A regions, the most windy year encountered was 20% more windy than the decade 2008-2017, and the least windy year was similar to 2008-2017 in terms of wind resource (minimal wind index close to 100%).*

Group A *Northern half of France*	• Significant decrease of the wind resource since the early 2000s (about 10 % of wind speed deficit between the decades including the beginning of the 90s and the decade 2008-2017) • Average annual indexes observed since 2008 correspond to the minimum indexes experienced the decades before
Group B *Northeast of Germany, the Netherlands*	• Continuous decreasing trend (about -5% per decade) • Highest wind levels encountered before 2000, not experienced ever since
Group C *Far North of Germany, Southern Scotland*	• No significant trends, stable volatility (decadal wind speed within a ±5 % range since 1988) • The region in the Northwest of Germany (dotted circle) presents similar wind patterns to the regions located East and West of group B but in a lower amplitude

Main outcomes

- ✓ In most studied regions, a significant downwards trend of the wind resource occurred over the past three decades, with **the latest decade being the least windy of the past 30 to 50 years**.
- ✓ In these regions, **the highest wind speed levels encountered before the early 2000s have never been experienced again**. However, since 2008, the trend has remained relatively stable.
- ✓ In the framework of an energy yield assessment, extending the length of the historical long term reference period improves the long term prediction only when no trend appears (decreasing or increasing).
- ✓ In regions where a downward trend has been highlighted, **selecting a past period of 10 years would have led to a much lower bias than using longer reference periods** to predict the coming 10 to 20 years.

A deep understanding of local historical trends via a rigorous selection of a combination consistent and independent measurement data sources allows for a better assessment of the risk associated with long term wind resource prediction.

For more details and analyses over longer periods of time, please download the full paper at:

http://www.eoltech.fr/doc/Full_paper_PO.013-WindEurope2018-Eoltech.pdf