

Wind Energy Technology Platform

Working Group 1: Wind Energy Resource

The 3% vision

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WG1 Participants

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- Tomas Blodau-Konick – REPower
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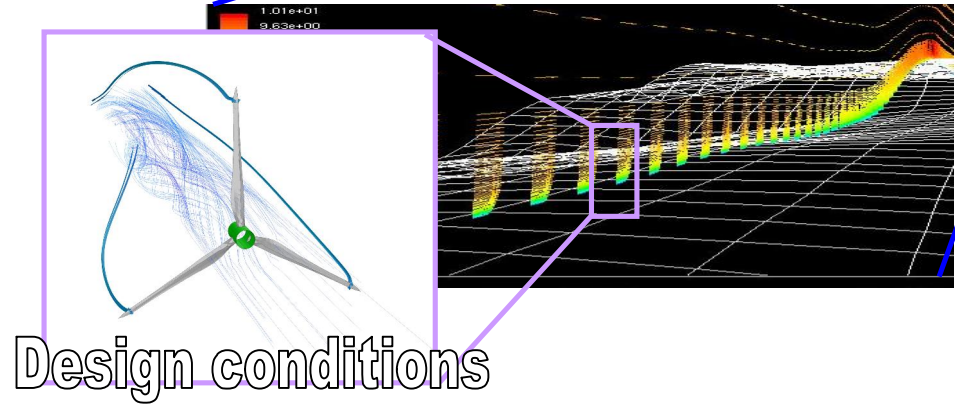
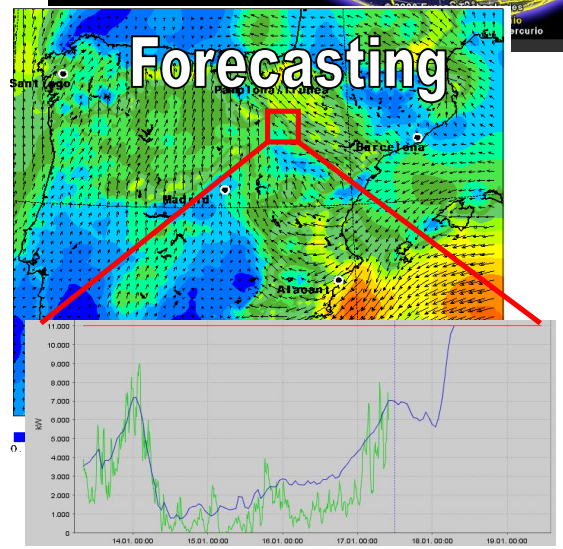
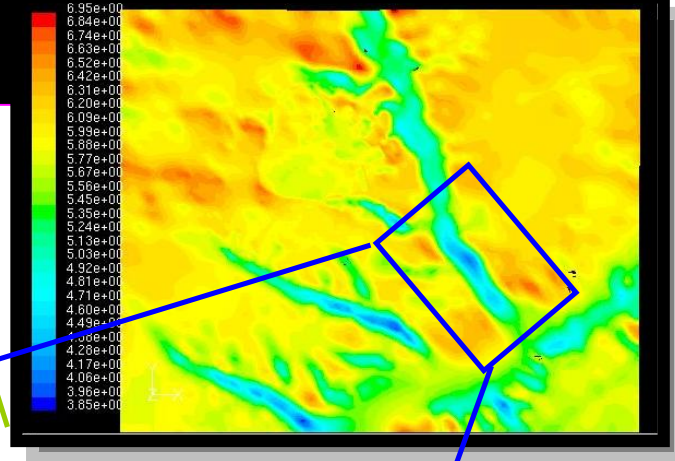
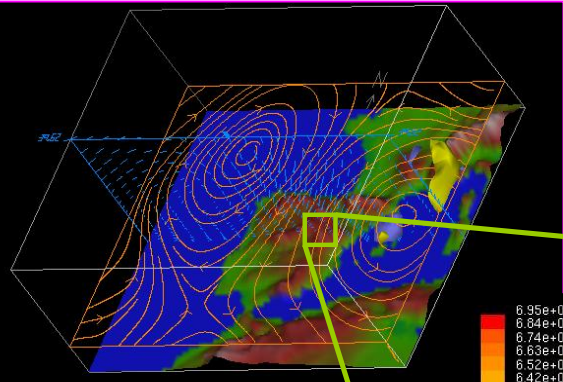
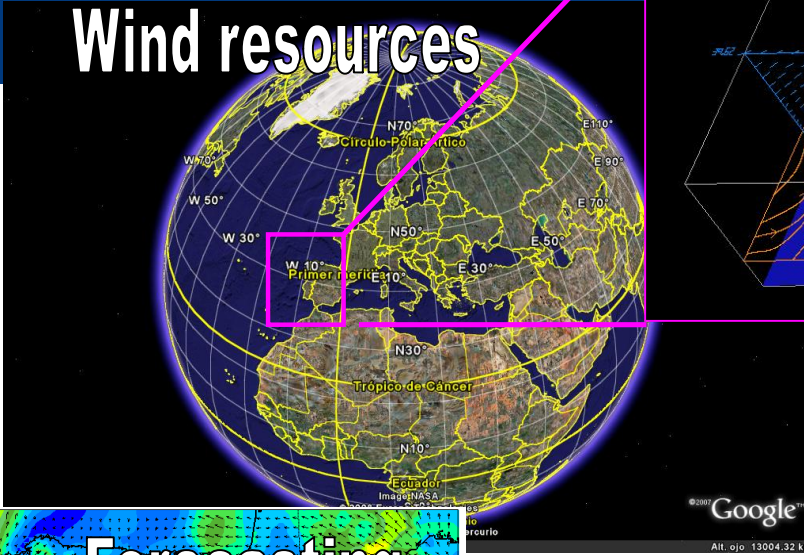
2030 objectives: 3% vision

Knowing the geographic coordinates of the site (flat terrain, complex terrain or offshore), with or without measurements, 2030 techniques will provide estimations of:

- Wind energy potential with an uncertainty <3% (“**resource**”).
- Design wind characteristics with an uncertainty <3% (“**design conditions**”).
- **Short-term forecasting** scheme for power production and wind conditions with an uncertainty <3%.

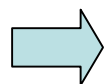
2030 objectives: 3% vision

Wind resources



Expected impacts of 3% vision

- **Technical impact:** The '3% vision' will lead to improved standards, improved software, site optimised turbines, and an optimal use of the wind energy resource.
- **Economic impact:** The cost per installation will be reduced through better site information and a reduced risk on the projects.



Necessary to achieve 23% of EU electricity coming from wind by 2030.

Research topics

- The three research objectives are supported through six research topics:
 - ***Siting in complex terrain and forested areas,***
 - ***Wakes,***
 - ***Extreme wind speeds,***
 - Offshore,
 - Wind profiles at greater heights, and
 - Short-term Forecasting.
- New experimental data needed.
- Needed tools: **remote sensing** (e.g. Lidars, Sodars, satellites) and **CFD**.
- Results: easy-to-use numerical **wind atlas**, both for **resource** and for **extreme winds**.

**Urgent need
for funding**

Siting in complex terrain or forested areas

- ***Askervein II.*** A full scale measurement campaign is needed to improve and validate models. } Short Term
- ***Advanced models*** for wind resource, and turbulence:
 - **CFD** coupled with **mesoscale** models. Data assimilation. Best practice guide. } Short Term
 - **Turbulence models** and a **unified model** (global to local scales). } Long Term
- ***New measurement techniques*** based on remote sensing } Short Term
- ***Standards*** for wind resource assessment are needed. } Medium Term

Offshore Wind Power Meteorology (I)

- Establishment of a method to determine the ***design conditions*** for offshore sites. } Short Term
- Development of ***standard models*** for resource assessment. } Short Term
Long Term
- Development of dedicated offshore ***short-term forecasting models***. } Short Term
Medium Term
- Development of fully integrated ***wind-wave-current interaction models***. } Medium Term

Offshore Wind Power Meteorology (II)

- Improve the knowledge about the ***offshore specific effects in the marine atmosphere.*** } Short Term
- ***Improvement of NWP models*** and other met. models for offshore conditions. } Short Term
- Development new measurement methods for offshore based on ***ground (and floating) remote sensors and satellites.*** } Short Term
Long Term

Wakes (I)

- ***Data analysis:***

- **New measurement campaigns** in offshore and complex terrains.

} Short Term

- **3D measurements** of wind and turbulence in the wakes.

} Medium Term

Wakes (II)

- **Advanced models:**

- Evaluate **CFD models** particularly in complex terrain.

} Short Term

- Better **wind farm models**. Include **stability** effects on wakes.

} Medium Term

- Combine **power loss and loads** from wakes in the same models.

} Long Term

Extreme wind speeds

- **Data analysis and advanced models:**

- Explore the use of **Reanalysis** data for extremes.
- **Classification scheme** for extremes.
- Develop methods for **downscaling** of the reanalysis data.
- Develop a new method for the calculation of extreme winds.
- Investigate **Vref uncertainties**.
- Investigate the **coherent structure of the extremes**.
- Produce a Global integrated **Extreme and Resources Climate Atlas**.

Short Term

Medium Term

Long Term

Wind profiles at great heights

- ***Data analysis:***

- **New measurements** of wind and turbulence profiles at 100 metres and above.

} Short Term

- ***Advanced models:***

- Implement **LES modelling** of the wind profile.
- Methods to derive the boundary layer height in **NWP and meso-scale** models.
- Investigate the wind profile and boundary layer over **complex terrain**.
- **4D** modelling of **design parameters** and turbulence for boundary layer.

} Medium Term

} Long Term

Short term forecasting (I)

- ***Data analysis and new measurement techniques:***

- Use of **real time measurements** for very short-term forecast for safe grid operation,

} Short Term

- Better integration of online wind measurements (masts, remote sensing, turbines) to improve average and extreme errors.

} Short Term

Short term forecasting (II)

- ***Advanced models:***

- **Improved meteorological models.** Dedicated models for extreme events. Coupling of wind and wave models.
- Better characterization of **forecast uncertainty.**
- Integration of **wind farm data into NWP** models and wind power.

} **Medium Term**

} **Long Term**



European Wind Energy Technology Platform

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