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News

Innovation and Industry

Wind Energy



VAISALA

As part of the partnership undertaken with Vaisala since 2015 in the field of advanced wind turbine control systems, IFP Energies nouvelles (IFPEN), through its Carnot IFPEN Ressources Énergétiques, has developed in collaboration with [Vaisala](#) the WindBox software for 3D reconstruction of the wind field from measurements made by a LiDAR. The LiDAR with WindBox improves the performance of wind turbines and allows better control of the wind disturbances, resulting in gains in gear, load and cost reduction, and extended operation of wind turbines.

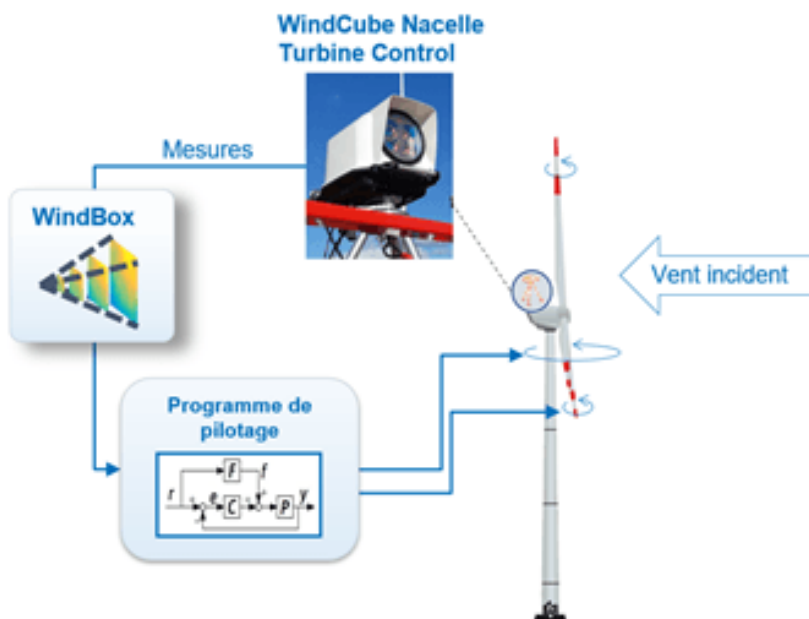
AN UNPRECEDENTED TECHNOLOGICAL ADVANCE

By exploiting the high detection capabilities of the LiDAR "WindCube® Nacelle for Turbine Control" (WCN-TC) and by integrating the real-time wind field reconstruction and prediction algorithm developed by IFPEN, WindBox significantly improves wind measurement.

As part of WindBox's experimental evaluation and validation campaigns, data availability has been increased by 10% thanks to a specific algorithm, with performance of up to 30% when measurement conditions are degraded. WindBox also offers data for anticipating wind properties several seconds in advance, as well as an indicator of the validity of the prediction, allowing a more robust anticipatory control.

Daniel Averbuch, Wind and Marine Energy Program Manager at IFPEN, says: "*As part of our partnership with Vaisala, we have used our expertise in the fields of signal processing and automation to offer the highest possible wind measurement accuracy in real time, and improve wind turbine control.*"

"*The synergy of IFPEN's advanced signal processing skills and our expertise as a world leader in wind Lidar technologies has made it possible to bring more benefits to our customers, drastically increasing the added-value of turbine control Lidars.*" says Matthieu Boquet, Head of Market & Offering – Renewable Energy at Vaisala.



OPTIMIZED CONTROL OF WIND TURBINES: A LEVER TO REDUCE THE COST OF ENERGY

The prediction of the wind state at the rotor of the wind turbine, operated by an adapted controller, called "assisted by LiDAR", ensures a pilotage of wind turbines in a much more efficient way by

adapting at each moment to wind conditions thus improving their productivity.

The use of this technology also has a positive impact on the protection of the components and structures of the wind turbine, thanks to the anticipation of the knowledge of the wind obtained by the LiDAR measurement. The reduction in the mechanical fatigue of the wind turbine results in a reduction in maintenance costs and an increase in the life of the wind turbines.

Finally, this better adaptability of wind turbines makes it possible to optimize their design by designing larger pales or taller towers, reduce investment costs and maximize energy production.

How does the LiDAR assisted control of wind turbines work?

Placed on the wind turbine nacelle, LiDAR sensors provide raw wind measurement data. This data must be processed within an embedded software component, in order to compute an estimate of the wind at different distances upstream of the wind turbine. The reconstructed wind measurement makes it possible to generate instructions on the orientation of the blades best adapted to the wind state on approach thus improving the productivity of the wind turbines.

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About IFP Energies nouvelles

IFP Energies nouvelles (IFPEN) is a major player in research and training in the fields of energy, transport and the environment. From scientific concepts in fundamental research to technological solutions in applied research, innovation is at the heart of its action, articulated around four strategic orientations: climate, environment and circular economy; renewable energies; sustainable mobility; responsible hydrocarbons. www.ifpen.fr



About Carnot IFPEN Energy Resources

The [CARNOT IFPEN Ressources Énergétiques](#), labeled in 2020, brings together 14 New IFP Energies Laboratories and works to meet the challenges of the energy transition. Based, among other things, on the opportunities offered by digital technology, its research activity is focused on innovation

within the framework of industrial partnerships in order to develop competitive renewable energies, to minimize the climate impact of industrial activities and to produce in a more environmentally friendly way the fossil fuels strictly necessary in this transition period.

About Vaisala

[Vaisala](#) is a global leader in weather, environmental, and industrial measurements. Building on over 85 years of experience, Vaisala provides observations for a better world, with space-proof technology even exploring Mars and beyond. We are a reliable partner for customers around the world, offering a comprehensive range of innovative observation and measurement products and services.

Headquartered in Finland, Vaisala employs over 2,000 professionals worldwide and is listed on the Nasdaq Helsinki stock exchange.

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IFPEN and Vaisala improve wind measurement to reduce wind energy costs

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