

## Supporting continuous wind measurement campaigns throughout all project phases: How Celsia uses WindCube to reduce uncertainties by ensuring measurement accuracy and bankability



An energy transmission and distribution company based in Colombia that is passionate about renewable energies and energy efficiency, Celsia focuses on generating and transmitting efficient solar, wind, and hydro energy. Operating in the Latin American countries of Colombia, Costa Rica, Honduras, and Panama, Celsia serves more than one million customers across 87 municipalities.

Celsia's business development team oversees the company's growth with new opportunities through the acquisition of operational plants or plants that are under development, and by directly launching new power plant projects.

### **The challenge:** Measuring wind shear and wind speed at increasingly taller wind turbine heights

With multiple wind farm projects planned in Colombia, mainly on the Atlantic Coast, Celsia sought the optimal wind measurement technology to provide not only the bankable data needed to secure funding but also the precise measurements for energy yield assessments. Leveraging the support of industry experts and consultancies, Celsia reviewed various wind measurement technologies, including meteorological mast (met mast), sodar, and lidar, ultimately choosing lidar to measure wind shear because the technology ensures measurement accuracy and bankability while providing less uncertainty than other technologies and is also very easy to install.

Accurate knowledge of the wind's behavior is necessary to know how much energy will be produced and whether on-site turbines will survive at a specific location. In past projects, Celsia performed wind measurements using an 80m met mast, but with turbines growing larger and reaching higher into the atmosphere, it had become increasingly difficult for the company to measure wind shear and wind speed over 120m using just a met mast.

### **The solution:** The industry standard lidar for accurate, bankable wind data

The global positioning and expertise of Vaisala were important factors in Celsia's decision. WindCube® is the most flexible and accurate wind measurement technology available, and, in order to reduce uncertainties, the technology's data has been proven by experts and international standards and guidelines. WindCube has also been deployed by thousands of customers across the globe.

*"We saw that WindCube is a technology that meets our expectations in terms of equipment performance, reliability, track record, and industry expertise. Thanks to the references of different companies worldwide, we found WindCube very well positioned, so we have trusted and chosen it to be used for the first time in our country."*

**Ilba Cuadrado**  
Development  
Engineer at Celsia

For Celsia, building, permitting, and installing met masts and instrumentation at the great heights required for these projects would have been increasingly cumbersome, time intensive, and expensive. Consequently, the best solution for Celsia to collect the most accurate wind data at great heights was to use WindCube lidar, which measures the full wind profile from wind speed and direction — above 200m in height. (The newest version of WindCube now reaches up to 300m.)

In 2018, Celsia installed WindCube next to a traditional met mast for a one-year measurement campaign to extrapolate wind speed. WindCube lidar was then moved to precisely where the turbines would be installed to measure and assess where the wind would be most representative for the future wind farm.

“Once the sites are a bit complex, the uncertainty must be reduced by measuring ideally where the wind turbines will be installed in order to validate theoretical estimation that is made,” said Ilba Cuadrado, Celsia’s development engineer.

**The benefits:  
More flexibility and more accurate, detailed, and bankable data**

With WindCube, Celsia was able to collect accurate, detailed, and bankable wind data at much higher heights compared to a met mast, easily relocate the device to other locations as needed, and truly understand the wind’s behavior at project locations.

By using a met mast, Celsia would have needed to do the interpolations, whereas with WindCube it was not necessary; the company only needed to configure the height at which it wanted to conduct measurements, which can be easily configured to measure at 12 user-defined distanced simultaneously in order to meet wind resource assessment needs at various turbine heights. (The latest version of WindCube now measures at 20 heights.)

“We cannot install so many levels of anemometers to cover multiple hub height options because it would not be practical,” said Cuadrado.

In terms of performance, a widely recognized consultant has validated the measurements made at different heights, revealing the uncertainty due to shear was lower since Celsia was able to make a very complete measurement campaign with WindCube.

Even better, the installation, setup, and connection were so fast and simple that WindCube was installed early in the day, and Celsia was already receiving data by the afternoon. Another benefit Celsia enjoyed was WindCube Insights — Fleet, the easy-to-use, secure, cloud-based software tool that provides real-time insights, allowing Celsia to access and manage the lidars and data.

“We really like to see the data online, the graphs. It has been very useful for us to review the daily profiles — you only have to click on the data of the day that you want to see, and the

system automatically graphs it,” said Cuadrado. “With WindCube Insights — Fleet, we can see everything online, in real time, at once.”

Celsia intends to continue using WindCube lidar on wind farm projects in the future, and due to its ease of installation and enormous capabilities, the company believes lidars will ultimately replace traditional met masts not only on its future projects but across the entire industry.



*WindCube lidar in trailer.*

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