

Wind lidar stands alone for WRA

VAISALA

Case Study



The client:

RES

Vaisala solution:

WindCube® vertical profiling lidar

THE CHALLENGE:

Ensure safety, cut costs and time

RES has deployed about 2,000 wind measurement systems over the past 30 years, including 1,700 met masts. During this time, 2% of those met masts have collapsed – posing a serious safety hazard. RES wants to make WRA campaigns safer, cheaper, faster and bankable by replacing met masts with accurate and reliable remote sensing lidar technology.

As the deployment of remote sensing devices has increased over the last decade or so, the number of datasets for collocated met mast and remote sensing pairs has also grown, along with their acceptance for quantitative use in WRA.

RES has been using ground-based and nacelle-mounted wind lidar and sodar for 20 years, and has undertaken various projects to demonstrate the value of remote sensing for wind measurements.

After verifying that wind lidar provides a level of uncertainty that is similar to a traditional met mast, RES set out to prove whether the technology is viable as a standalone wind measurement solution for WRA.

THE APPROACH:

Proved that wind lidar stands alone

Working with respected, independent industry engineers, RES conducted a 12-month standalone lidar measurement study at their Corlacky Hill wind farm site in Northern Ireland. This 11 turbine, 47 MW wind farm is set in gently sloping, relatively benign terrain with minimal forestry.

RES selected a Vaisala WindCube vertical profiling wind lidar for the project. Trusted as the gold standard worldwide, WindCube excels in every aspect of wind measurement projects – onshore and offshore, from simple to complex terrain.

"Our current standalone remote sensing measurement strategy is borne out of the work undertaken at Corlacky Hill and another wind farm in northern Scotland. Not only does this strategy result in safer, bankable measurement campaigns, a 12-month standalone lidar measurement campaign is also faster (no planning or permission delays) and cheaper (37% savings) than a traditional met mast measurement campaign."

*Iain Campbell
Senior Technical Analyst and
Wind Resource Manager, RES*

Prior to deployment, DNV verified the lidar offsite against a tall met mast at their Janneby test site. The lidar installation was then completed in one day with no safety incidents.

DNV used the WindCube lidar measurements as the sole wind measurements for their independent energy production assessment for the wind farm. Wind turbine manufacturers also received the data to conduct turbine suitability assessments.

THE RESULTS:

Verified accuracy, safety and bankability

WindCube exceeded RES' expectations. The wind lidar's overall measurement uncertainty applied to the lidar at hub height was 2.4%, based on the IEC recommendations for assessing uncertainty and weighted by the site-specific wind frequency distribution observed at Corlacky Hill.

The project obtained a p90/p50 value of about 90% – which achieved market standard uncertainty levels and was greater than the expected market threshold. The lidar data was accepted and considered bankable by all parties. DNV produced their independent energy

production assessment, and RES sold the wind farm to their client.

RES sees four distinct advantages that lidar has over met masts:

- **Safety:** There is a small and unnecessary safety risk of using a met mast when wind lidar is acceptable.
- **Bias:** When using a met mast shorter than hub height, there can be bias in the hub height wind speed from the vertical extrapolation of the mast measurements to hub height (if the shear observed by the mast is not representative for the extrapolation to hub height).
- **Uncertainty:** When using a met mast shorter than hub height, there can be an increased uncertainty on the hub height wind speed from the vertical extrapolation of the mast measurements to hub height, compared with the lidar hub height measurements.
- **Cost:** Traditional wind measurement campaigns using met masts for primary measurements are significantly more expensive than lidar.

Why Vaisala?

We are innovators, scientists, and discoverers who are helping fundamentally change how the world is powered. Vaisala elevates wind and solar customers around the globe so they can meet the greatest energy challenges of our time. Our pioneering approach reflects our priorities of thoughtful evolution in a time of change and extending our legacy of leadership.

Vaisala is the only company to offer 360° of weather intelligence for smarter renewable energy, nearly anywhere on the planet. Every solution benefits from our 85+ years of experience, deployments in 170+ countries, and unrivaled thought leadership.

Our innovation story, like the renewable energy story, continues.

