Top tips for successful Lidar deployment

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Remote ZX 300 deployment

Lidar wind measurement campaigns can offer a number of key benefits over a traditional met mast approach to wind resource assessment in the development of wind farms. As always, to get the best data solution it's important to take a few simple steps. Here are our top tips.

In many respects Lidar can represent an improvement on traditional met masts within wind energy applications such as pre-construction energy yield assessments. Logistically, they can be rapidly deployed, don't require any major ground works or foundations and offer a significant reduction in health and safety challenges. With the technology now mature, data produced by Lidar measurements are as accurate and bankable as a conventional meteorological wind measurements mast and can meet the requirements that the industry demands.

Lidars also present an opportunity to define wind characteristics well above the height of a conventional met mast, providing wind data across the full wind turbine rotor diameter of today's and indeed tomorrow's wind turbines. With the opportunity to easily and quickly relocate and micro-site Lidars throughout the proposed wind development site and the ability to accurately measure wind data from ground level to an elevation of more than 200 metres, Lidars can provide an unprecedented degree of flexibility. This gives a better understanding of the wind resource throughout the site, with a corresponding reduction in the vertical shear uncertainty and the horizontal spatial variation uncertainty.

A few simple steps can get the absolute best from this new standard in measurement technology.

Plan

Communicate your wind measurement campaign goals! It may seem obvious, but making sure that clear measurement campaign objectives are established early on in the process is key to successful wind measurements. Data forms the cornerstone of a wind farm development process that can take a number of years to collect. Without the data there is no development and if the data is poor or has a high degree of uncertainty then the resultant financial uncertainty could make the project marginal.

Getting the right data for a particular project to reduce any uncertainties and progress it to the next stage of development is often the ultimate goal. By fundamentally understanding how to establish a good measurement campaign and where any uncertainties might sit, clear communications play a big part in making sure things run smoothly from day one.

Prepare

Pre-installation, the Lidar can be configured ready for the campaign, minimising time on site. Correct remote measurement elevations (from 10 to over 200 metres) for the specific site can be added, the full system tested and all logistical requirements necessary for a successful physical deployment considered and documented. All deployment and installation constraints and risks can be captured in the planning process through risk assessments and method statements.

As an example, weather conditions at a site could present site access constraints. If so, a mitigation strategy should be in place, like having an all-terrain vehicle available. Similarly, something as simple as discovering a forgotten screwdriver or cable at a remote site can ultimately leave an installation in limbo. Inevitably such discoveries are made when the weather has picked up, it's pouring with rain and night is closing in...

Placement

Siting of your fixed reference Lidar should be optimised for the best representative measurement for your project – a good consultancy helps in planning your wider Wind Resource Assessment. Consider using a secondary Lidar on site. Mobilising a roaming Lidar can significantly reduce uncertainty. Additional Lidar measurements also build confidence in turbine type selection across the whole site and may allow for micro-siting – the individual placement of turbines to make the optimal use of the wind resource available at that specific location.

If existing met masts exist, or if there is a particular need in the project to include this technology, then the Lidar placement next to the mast can be used to validate not only the mast itself but the wind shear above the mast. With uncertainty penalties of 0.5-1% for every 10 m gap between the mast height and eventual turbine hub height, the Lidar removes this data gap for even the biggest turbines and reduces any uncertainties.

Peripherals

To maximise data availability during the measurement campaign, Lidars need a constant and reliable power source. Don't compromise on the power. Data that isn't recorded can never be recovered. If a mains supply is available then what about back up? If it is a remote site then make sure the power supply is continuous and adequate for the system requirements.

In typically remote, and exposed, off-grid locations, we would for example, use a PV-based Power Supply Unit (PSU) combined with an appropriately-sized methanol fuel cell. A forested site in the northern latitudes may get hardly any sunlight during winter months, resulting in extended use of the fuel cell generator, so plan for more frequent refuelling. Confirm a good location for the PV element or ensure the PSU is suitable for the deployment location.

Communications are also vital to ensure high data availability from a Lidar unit. A developer may believe that a site offers an adequate mobile phone signal, but this might not prove to be the case when looking at the transmission of data. This could lead to problems monitoring system performance – unlike power loss, fortunately the Lidar does store all data locally and this data can be recovered. There is no substitute for a better understanding of the site and exploring how factors such as exposure, the design of the power supply and communications may affect performance.

ZX 300 winter deployment with All Terrain Vehicle

Performance

Data is routinely delivered automatically by the Lidar through a variety of communications protocols ensuring it can be incorporated within client or third-party tools and processes. Frequent analysis of this data is recommended to ensure system availability remains optimally high. It is critically important to be able to see what's happening with the system on a day-to-day basis so project decisions can be made in a timely fashion as to whether to progress with the campaign, or move on.

Routine monitoring should include a daily alarm check and review of any potential systems issues such as the power supply unit or communications. A high-level check at least twice a week should look at the data for verification that it is credible. If an issue is identified it is possible to react very quickly and have someone on site, typically within 24 to 48 hours, to resolve any issues and return the system to full operations. Monitoring and understanding the performance data of the Lidar provides the necessary clarity to deliver in excess of 99% system availability that ZX Measurement Services achieve across its wind measurement campaigns.

Procurement: turbines

Think ahead, make the data being collected part of the turbine procurement process. A significant amount of data from the site could benefit a turbine OEM and, as the customer, you the developer too. Consider how the data being collected today may impact the operation and performance of the wind farm for the next 30 years and begin the breadcrumb trail of lifetime asset monitoring.

In an increasingly digital world, any data collected today could begin forming future operational elements such as a Digital Twin. Could the ground-based Lidar you install today help improve turbine supply agreements by more accurately assessing the conditions of the eventual power curve? If the use of IEC 61400-50-3 and a nacelle Lidar to undertake Power Performance Measurements are being considered, then siting of the ground-based Lidar now may help link these eventual data sets on site.

While the focus now may be on the next 12-18 months of wind data collection, there is real value in taking a long-term view of 'the data journey' over the next 30 years.

Remember, you will never get this opportunity again on this particular site.

Partners

You don't have to do this alone. Finding a trusted, local partner can be beneficial to delivering much of the above. And the word 'partner' is key. The right measurement services provider is a true partner with an investment in securing the best measurement outcome possible.

Experienced Lidar service providers can, through site visits, identify any potential issues with the proposed measurement system during the planning stage, for instance. The right partner also provides access to a skills base and expertise that covers a wide spectrum of different measurement tools and services. This technical expertise comes with a deep understanding of the measurement equipment and what can and cannot be achieved with that data.

There is also the provision of equipment to consider. Partnering up with the right company means access to a whole range of equipment that wouldn't normally be available in-house.

ZX 300 validating shear profile of met mast and above up to 200m+

Ownership and responsibility are central to the best partnerships though. Teaming up with ZX Measurement Services, for example, means we take ownership of that system. We do everything we can to maximise that data for the client to ensure that the next stage is as successful as possible.

Integration of a particular skills base within the project team means the right partner will apply the same level of care and due diligence as if they were doing the measurement campaign for themselves. The best partners give developers confidence and eliminate much of the worry and risk from a wind measurement campaign.

Promotion... and pride

Getting the best from Lidar is simple, if you know how. With the richness of wind data available from Lidar, it is easy to rapidly establish a wind shear profile up to and above 200 metres on site. Conversely, losing data during a crucial period can extend the whole measurement campaign by months. For instance, in order to complete the industry standard measure, correlate and predict (MCP) process, at least 12 months-worth of data is recommended to reduce systematic errors. If this data isn't available then additional measurements may be required the following year to reduce uncertainty. The outcome could be a significant delay before the development can move forward.

There are some fantastic case studies and examples of what works, and what doesn't. We encourage all clients to promote what good looks like so that, as an industry, we can progress. Jason McCall, Technical Manager at Banks Group, is a good example of this: 'ZX Measurement Services have a pro-active approach to managing the measurement campaigns, ensuring that we were constantly informed of the campaign progress, data quality and availability. Their fundamental understanding of the overall measurement process, coupled with their attention to detail during the planning, deployment and operational management of each system ensured we had a robust measurement campaign available for each site'.

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Low visual impact Island deployment of ZX 300

Biography

Ian Ravey is Managing Director of ZX Measurement Services. With over 30 years' experience in the renewable energy industry, Ian studied electrical and electronic engineering before developing his career working on remote monitoring systems, procedures and standards.