

Sodar vs. Lidar: By the Numbers

OBJECTIVE

The purpose of this poster is to facilitate a discussion about remote sensing technologies available in the market to provide bankable yield assessment for wind farm developments. Focused on Sodar and Lidar the below information takes into consideration technological differences, bankability and uncertainty.

Not all Remote Sensing Devices (RSD) are equal.

ASSUMPTIONS

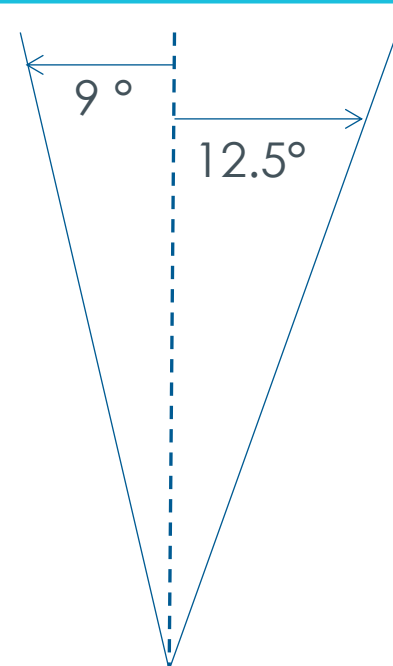
Sodar and Lidar both offer:

- Low insurance risk
- No permitting requirements
- No requirement for planning approvals, construction lead times, or contingencies for adverse weather.
- Ease and low cost of deployment & redeployment

DEFINITIONS

SODAR

Sodars work like submarine sonar, but instead of sound waves bouncing off fish and rocks, sound waves scatter off atmospheric turbulence. The Sodar receives the scattered sound waves and uses the Doppler shift and math to calculate wind speeds.



LIDAR

Lidars use a laser light pulse. The light is scattered by atmospheric aerosols, dusts, water drops. Backscattered light is collected, and it interferes with an optical local oscillator. The optical signal is digitized and processed to retrieve Doppler shift induced by aerosols' motion.

WHAT IS BANKABLE?

Measurements are not bankable, projects are bankable.

A project is bankable when it achieves a P90 to P50 ratio of 0.85 or higher.

Measurement technology and assessment plans drive P90 to P50 ratio.

Ultimately developers need to choose the most appropriate technology on a site-by-site basis.

REDUCING UNCERTAINTY

RSD data is most commonly used to reduce overall project uncertainty in complex terrain and large sites.

The Fulcrum3D Sodar and vertical wind profiling Lidars commonly used in the wind energy industry have comparable uncertainty following IEC 61400 methods, as shown below.

Developers can choose the number of monitoring locations, length of campaigns and the RSD devices used to optimize the overall project uncertainty and risk for a given budget and schedule. Fulcrum3D Sodars have a track record of effective resource assessment for bankable projects in complex terrain.

Typical Lidar validation uncertainty¹

Fulcrum3D Sodar validation uncertainty²

Fulcrum3D Sodar v Lidar³

- Comparison of two co-located Fulcrum3D Sodars and one WindCUBE at a client project in Queensland (2022).
- Just like not all Lidar manufacturers are equal, not all Sodars are the same...

Sodar1 vs Lidar Availability

Sodar2 vs Lidar Availability

RSD COMPARISON	F3D Sodar	WindCube & ZX Lidars
UNIT		
Unit cost	\$	\$\$-\$\$\$
Power supply cost	Included	Separate
Power Consumption	15W	+100W
Susceptibility to mechanical failure & lightning strikes	Low	Medium
Maintenance Cost	Low	Medium
Maintenance Downtime	Low	High
DATA		
IEC Classification	2024	Yes
Bankable energy assessments	Yes	Yes
Power Performance Testing	Yes	Yes
Raw data captured for full traceability & upgraded processing	Yes	No
Wind data availability up to 200m	Yes	Yes
Wind speed & wind shear data at multiple heights	Yes	Yes
Measures swept area of blades	Yes	Yes
Hub height temperature, pressure & humidity	No	No
TERRAIN		
Suitable for simple terrain	Yes	Yes
Optimised for complex terrain	Yes	No
Data correction required for complex terrain	Rarely	Yes
Raw data captured for full traceability & upgraded processing	Yes	No

CONCLUSIONS

Variables such as terrain, project scope, development budget, and other factors contribute to determining the most appropriate RSD solution for each project. Both Lidar and Sodar technologies are proven to provide accurate, bankable data; however, differences in quality, cost, and reliability of each of these can make a significant difference when determining project success.

Fulcrum 3D Sodars meet the suitability criteria discussed above and have a strong track record of providing bankable, reliable data that assists in driving projects through the development cycle to achieve an acceptable P90 to P50 ratio and ultimately reach financial close.

ACKNOWLEDGEMENTS

¹ Source: TNO 2019 R10398: Verification of Leosphere Windcube WLS7-577 at ECN part of TNO LiDAR Calibration Facility. ² Source: Confidential Fulcrum3D Client project validation against tall mast in flat terrain. ³ Source: Confidential Fulcrum3D Client project with two Fulcrum3D Sodars and one Windcube.

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