ZephIR Lidar

our vision: a wind lidar on every commercial wind project
and integrated into every large wind turbine

this is ZephIR Lidar

Affordable, accurate and accepted.
Measure higher and further, operate in all environments and reduce project uncertainty and operating costs to increase project value.
Manage your wind resource risk and optimise your assets by employing the single most validated remote sensor available.

we are wind lidar

For over ten years ZephIR Lidar has been providing high-resolution wind measurements onshore, offshore - on both fixed and floating platforms - and mounted on wind turbines for wind energy and meteorological applications globally.

All with the original wind lidar product family ZephIR 300 and ZephIR DM.

continuous wave wind lidar

At the heart of ZephIR 300 and ZephIR DM continuous wave technology lives one of the most robust and sensitive lasers available.

And that's important because it let's us give you a 3 year service period onshore helping to reduce your operational costs, a wind data point every 20 milliseconds to 'freeze' any motion encountered when mounted on turbines or on floating buoys, full rotor scanning for turbine upwind characteristics expected in forthcoming IEC guidelines, and 50Hz data capture for true 1 second measurements.

Not all lidars are the same, ours is easy to remember though -

3 years warranty, DNV GL Stage 3,
3% lower energy uncertainty than an IEC onshore met mast
at an equivalent cost over 3 years
and has 3 legs.

ZephIR 300

The industry's most validated wind lidar[1] for ground-based, 10 metre to 200+ metre wind measurements ideal for site resource assessment, power curve measurements and bankable Annual Energy Prediction (AEP) campaigns at the lowest cost of lidar ownership available and a 3 year ZephIR Care warranty as standard onshore with no requirement for annual servicing or calibration.

[1]Over 200 performance validations against a consistent, IEC compliant met mast site

ZephIR DM

The unique Dual-Mode wind lidar for turbine-mounted, high resolution, full rotor wind measurements upwind of a wind turbine from 10 metres to 300+ metres to benchmark turbine performance, identify opportunities for increased production and inform O&M strategies. All with the added functionality of ground-based deployments from the same core product.

focused on accuracy

The Doppler effect – a very small change in frequency of the backscattered light – caused by moving air-borne particles passing through the laser beam's focus in the atmosphere allows ZephIR Lidars to remotely measure wind characteristics.

ZephIR Lidars are also uniquely Continuous Wave Lidars:

- designed specifically for the wind industry
- focusing the laser at the desired measurement height ensuring that sensitivity is maximised, producing the highest levels of data availability even in the clearest of air
- lowest lidar eye safety laser classification available
- wind data measurement up to every 20 milliseconds freezing out motion encountered in turbines or on floating buoys
- optimised probe volume down to just 7 cm to capture rapidly changing wind flows experienced close to terrain, around structures and even in wind turbine induction zones

At this point in space, and 49 more points every single second, ZephIR Lidars provide accurate wind speed measurements to match IEC compliant meteorological masts

accepted and bankable

Through extensive and close working with the industry's leading technical advisors such as DNV GL, Natural Power and Ecofys, you can be confident that in each application, ZephIR Lidars perform in line with defined acceptance criteria.

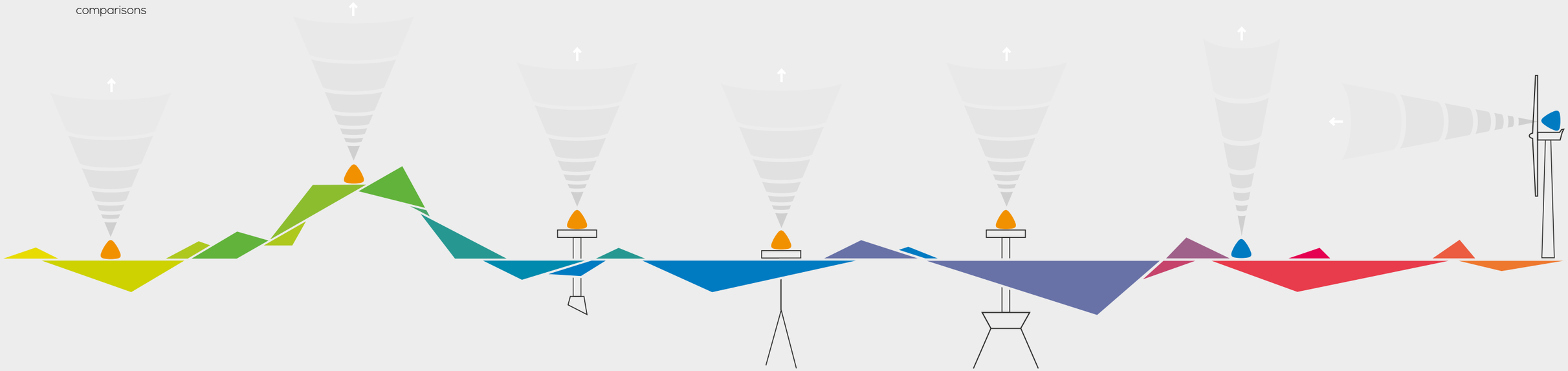
DNV GL -
Stage 3 - bankable / finance-grade wind speed and energy assessments with either no or limited on-site met mast comparisons

Natural Power -
finance-grade measurements in complex flow when converted with Dynamics CFD with either no or limited on site met mast comparisons

DNV GL -
equivalent accuracy and uncertainty results obtained from an energy prediction based on data from ZephIR 300 mounted on a stationary offshore platform as from an energy prediction based on data from a conventional offshore hub height met mast

Carbon Trust Offshore Wind Accelerator roadmap for the commercial acceptance of floating LIDAR technology - may be utilised in specific circumstances commercially

IEC Standard 61400-12-1 - hub height measurement (+/-1% hub height) of free stream wind incident on the turbine (>2D upwind of turbine)



Onshore: benign site

Onshore: complex site

Offshore: fixed platform

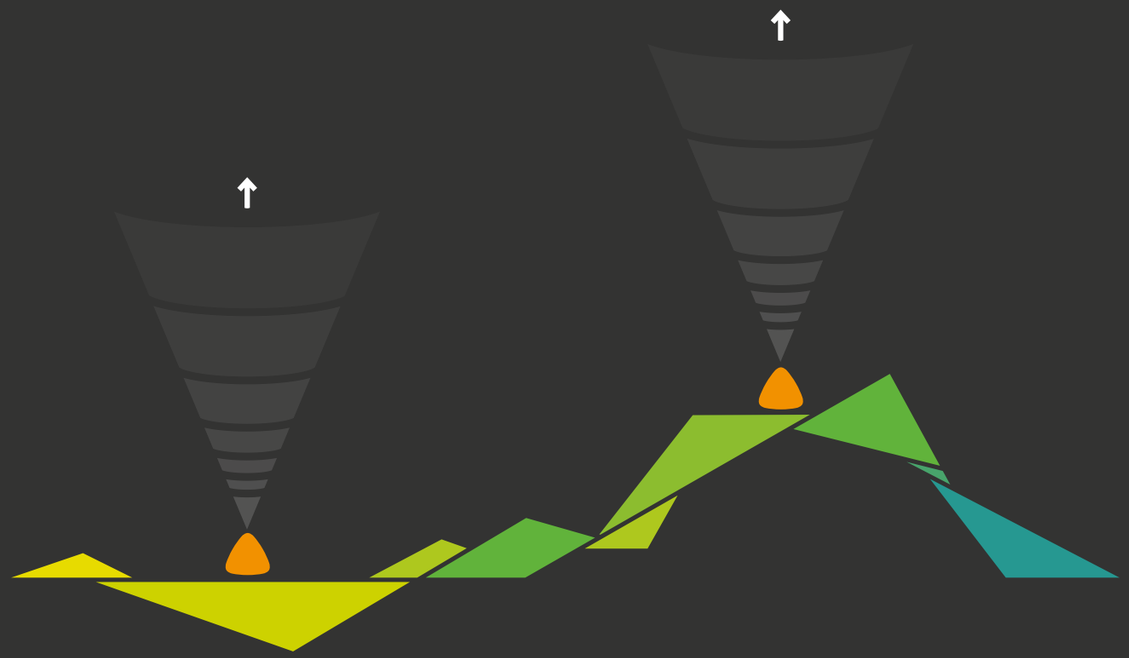
Offshore: floating platform - buoy

Offshore: floating platform - tension leg

Onshore/Offshore: ground-based

Onshore/Offshore: turbine-mounted

resource assessment onshore



Onshore: benign site

Onshore: complex site

ZephIR 300

ZephIR 300 wind lidars are used extensively through the pre-planning / scoping, planning, development, construction and operational phases of an onshore wind energy project. ZephIR 300 can be used in combination with short / tall met masts, roaming, or stand-alone in replacement of a met mast during site-prospecting and AEP campaigns. It can also be used as a fixed reference control mast on operational sites and roaming for condition monitoring and trouble-shooting.

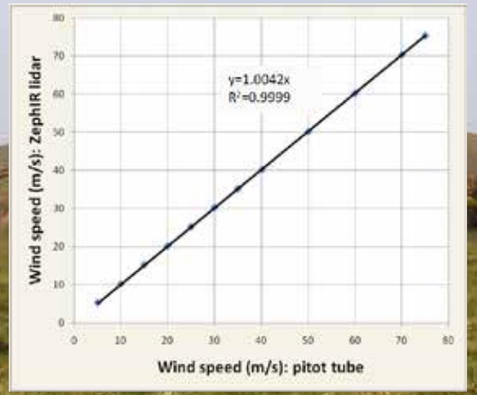
In benign terrain, ZephIR 300 delivers bankable / finance-grade wind speed and energy assessments with either no or limited on-site met mast comparisons.

In complex terrain, ZephIR 300 is packaged with Dynamics Computational Fluid Dynamics (CFD), developed by technical advisor Natural Power, to deliver an accepted and quantified uncertainty on data to enable bankable / finance-grade wind speed and energy assessments with either no or limited on-site met mast comparisons.

absolute accuracy

ZephIR 300 has been deployed in a world first 'absolute accuracy' test in LM Windpower's wind tunnel, Denmark.

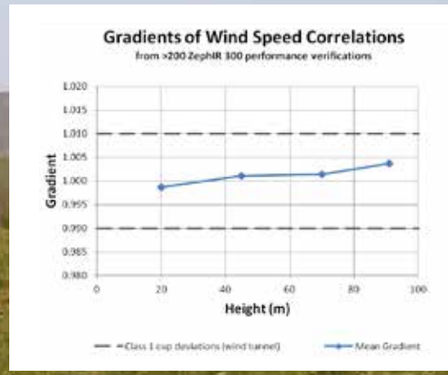
ZephIR 300 successfully measured wind speeds
with an averaged difference of just 0.4%
for a sustained period of time and across all measured speeds.

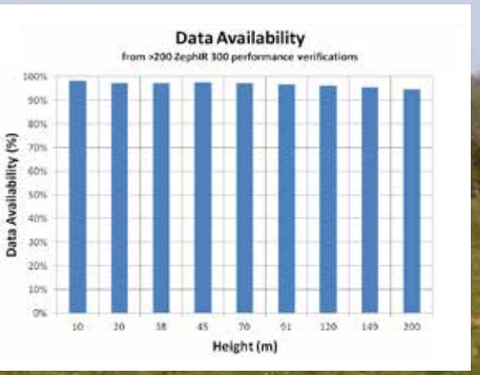


from the most* validated remote sensor

ZephIR 300 has been successfully validated in more than 200 Performance Verifications *at a consistent IEC 61400-12-1 Compliant Site, approved for use by technical and engineering services providers DNV GL, and Natural Power.

Data availability is, on average, 97% through all heights measured
and up to 200 metres from ground level.





key features & benefits

DNV GL Stage 3 approved finance-grade data in benign terrain
Natural Power approved finance-grade data in complex terrain
200+ single type batch verification at IEC compliant site
Absolute accuracy demonstrated through wind tunnel testing

- Hub height wind direction, horizontal and vertical wind speeds
- True 1 second, or averaged 10 minute wind data
- Vertical wind shear
- Wind veer (variation of wind direction with height)
- Turbulence Intensity (TI) and other turbulence measures
- 36 months warranty
- No annual servicing or annual calibration

the economic benefits

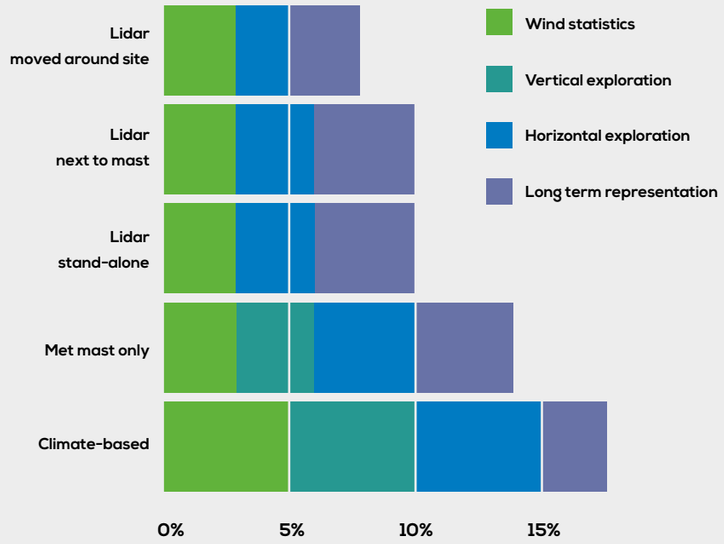
Wind resource assessment determines the long-term wind resource and flow characteristics across the project site so that wind turbine siting, specification and suitability studies can be performed, and to determine the long-term wind resource so that accurate annual and life-time energy yield predictions can be made, including an assessment of the uncertainty in such calculations.

ZephIR 300 delivers measurements at heights across the entire rotor-swept area, confirming hub-height resource as well as wind shear, veer and turbulence across the rotor. Shear extrapolation bias and uncertainty are therefore greatly reduced.

ZephIR 300 improves flow model accuracy through multiple spatially separated measurement points on the site for model verification and tuning. Advanced flow models provide significantly improved horizontal and vertical extrapolation of measured wind resource, especially in complex and forested terrain.

ZephIR 300 is re-deployable, portable and does not require lengthy planning applications before installation. Data can be collected easily at multiple points on a site to provide representative measured data for all turbine locations and tuning / verification points for flow models further reducing uncertainty.

These reductions in uncertainty and bias improve the potential profitability of a wind farm through more accurate wind resource assessment. Further, understanding of wind flow for wind turbine performance through power curve measurements across the entire rotor diameter to IEC 61400-12-1 is achieved.



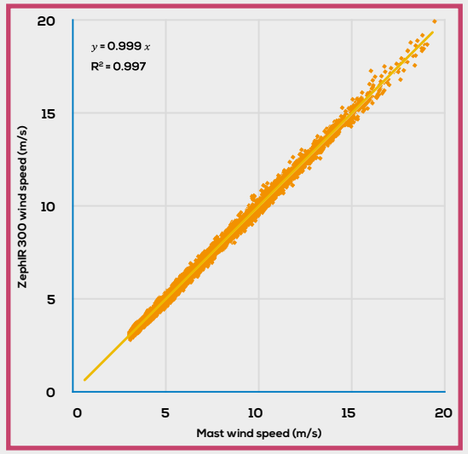
Reduction in uncertainty by measurement method,
demonstrated by technical advisor Ecofys,
full paper available by request.

commercial experience

Operational site measurements

Extreme snow conditions

ZephIR + Short-mast project financing



Proven accuracy onshore

Wind farm trouble-shooting

Packaged power and ZephIR

Autonomous operation

Satellite communications pack

Desert conditions and extreme high temperatures

Complex terrain finance-grade measurements

specification

DATA HEADING	UNIT	EXPLANATION
Reference	-	Numerical reference of each record
Time and date	-	In text format, to the nearest second
Timestamp	Seconds	Time and date of the reading as numerical value in seconds
Info. flags	-	Operational mode information
Status flags	-	Internal ZephIR status
Battery	Volts	Internal battery voltage
Generator	Volts	External supply voltage, if present
Upper temp / lower temp	Degrees Celsius	Pod temperature
Pod humidity	Percent	Internal ZephIR humidity
GPS	Decimal Degrees	GPS location (lat and long)
ZephIR bearing	Degrees	Direction of the ZephIR wrt True North
Tilt	Degrees	Pitch and roll away from vertical
Air Temp.	Degrees Celsius	Ambient temperature
Pressure	Millibar / Hectopas-cals	Ambient pressure
Humidity	Percent	Ambient humidity
Met station wind speed	Metres per second	Horizontal wind speed measured by the Met station
Met station direction	Degrees	Wind direction measurement by the Met station
Raining	-	Rain sensor detects rain
Horizontal wind speed	Metres per second	Horizontal wind speed measured by ZephIR
Vertical wind speed	Metres per second	Vertical wind speed measured by ZephIR
Horizontal min / max	Metres per second	Minimum / maximum horizontal wind speeds measured by ZephIR
TI	-	Turbulence Intensity

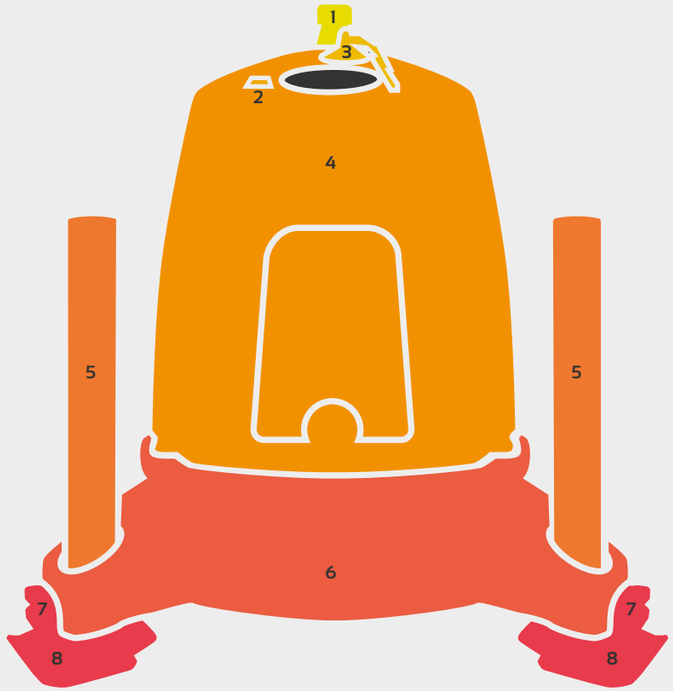
PERFORMANCE	ZephIR 300
Range (min.) Range (max.)	10 metres 200 metres
Probe length @ 10 m Probe length @ 100 m	± 0.07 metres ± 7.70 metres
Heights measured	10 (user-configurable)
Sampling rate	50Hz
Averaging period	user configurable (1 second as standard)
Scanning cone angle	30° (other angles available)
Speed accuracy variation*	< 0.1 m/s
Speed range	< 1 m/s to 70 m/s
Direction accuracy variation*	< 0.5°

OPERATIONS	ZephIR 300
Temp range (min.) Temp range (max.)	-40°C +50°C
Power consumption	69 Watts**
Power input	12 V
Weight (excluding flight casing)	55 kg
Service interval	36 months

DATA	ZephIR 300
10 minute averaging	90Kb / day
1 second data	3MB / day
On board storage	36 months
Data transfer	LAN; MODBUS; WiFi; Global SIM; Sat Comms
Timestamp / Location	GPS

SAFETY	ZephIR 300
Laser classification	Class 1
Eye safety standard	IEC 60825-1
IP Rating	IP67
Compliance	Full CE accreditation

* As measured against a calibrated moving target. ** In off-grid, DC power situations, excluding any convertor losses and in standard climates. Always refer to manufacturers guidelines on power before specifying 3rd party power solutions. Alternatively use the ZephIR Power support package.



1. **MARINE METEOROLOGICAL STATION** providing temperature, pressure and humidity measurements, designed to operate in harsh marine environments and includes a GPS device for data timestamp & location facilitating synchronisation with other devices

2. **AUTOMOTIVE MOISTURE SENSOR** for activating wiper arm, flagging periods of precipitation and designed to operate in exhaustive automotive applications

3. **MARINE WIPER SYSTEM** with silicone wiper blade for extended operation, keeping window surface clear of moisture and debris, designed to operate in the harshest of environments fed by industrial specification screen wash capable of operation in sub-zero temperatures

4. **INSULATED ENCLOSURE** manufactured in twin-skin Polyethylene, operating across all temperature ranges (-40°C to +50°C) and with IP seals across all surfaces and connector panels

5. **3 X CARBON FIBRE LEGS** resistant to horizontal wind loading while keeping overall weight minimised, and providing a proven tripod levelling system

6. **MARINE GRADE ROPE** at three locations around waist of product for ease of lifting across uneven terrain

7. **QUICK RELEASE HANDLES** for simple levelling adjustments and designed for gloved operation

8. **WIDE SPREAD FEET** for stable footing in all terrains and all ground surfaces with security bolt through apertures

ZephIR Care

3 years warranty and support, 3 year service interval
and 3 years courtesy lidar cover.

ZephIR Care answers the need for truly autonomous provision of wind data onshore and provides you with the ability to operate ZephIR 300 in the field for unbroken measurement campaigns of 3 years particularly suitable in applications where the sensor must remain in place long-term such as during an Annual Energy Prediction. In these campaigns the economic viability of recovering a sensor demands the highest levels of reliability and support, now delivered by ZephIR Lidar.

3 years warranty
3 years dedicated technical support engineer
via telephone and to perform remote diagnostics
An IEC compliant met mast validation
Optional daily monitoring
Choice of data delivery (email, FTP, web interface, real-time)
A 'courtesy' ZephIR 300 in any event where an infield issue cannot be quickly resolved remotely

How? This support offering is as unique as the continuous wave laser technology inside ZephIR, and continuous wave = continuous operation.

ZephIR Power

We provide a low-cost, stand-alone power system designed specifically for the wind industry's continuing adoption of remote sensing.

ZephIR Power is a fully modular off-grid power supply which can be set up for the most arduous of deployments and uses a combination of a methanol fuel cell with 220Ah batteries. The modular concept allows you to a add a wind turbine of up to 450W and solar PV micro panels together with an optional battery extension pack to maximise the renewable inputs. With extended complete autonomy of up to 12 months and a specified operating temperature range of -40°C to +50°C, ZephIR Power is of optimal design for the remote conditions often encountered by remote sensors such as the ZephIR 300 wind lidar.

With just a small number of visits to site required annually and the lowest capital investment we are confident that ZephIR Power answers many of your needs alongside our bankable wind lidar.

ZephIR Power ensures the highest possible system availability for your ZephIR solution in off-grid locations where the power supply is a fundamental requirement of secure autonomous operation.

ZephIR Direct

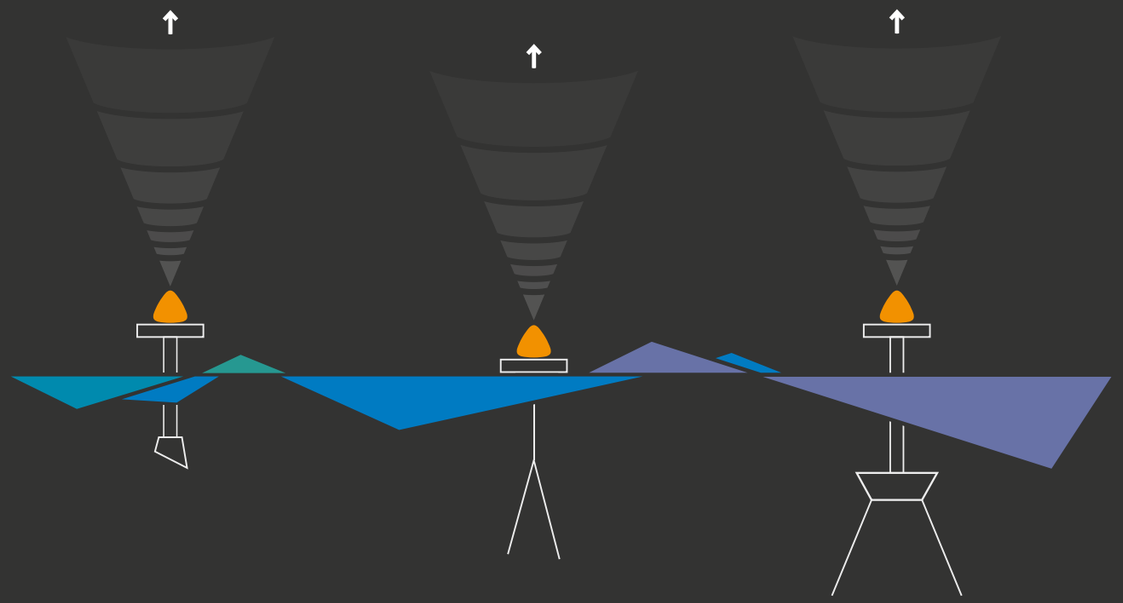
ZephIR Direct* delivers a 24 months fixed rental period of ZephIR 300 wind lidar provision with the industry leading ZephIR Care warranty and support package for the duration of the contract:

No annual servicing or calibration
Courtesy lidar coverage
DNV GL Stage 3 / Natural Power finance-grade wind data**
IEC compliant met mast validation
Dedicated technical support engineer
Choice of data delivery

ZephIR Direct represents the lowest annual cost of "hub-height and above" finance-grade wind data from the most validated wind lidar available.

*subject to limited availability, terms & conditions
**onshore (benign and complex) and offshore (fixed platforms)

resource assessment offshore



Offshore: fixed platform

Offshore: floating platform - buoy

Offshore: floating platform - tension leg

ZephIR 300

85% of floating wind lidar platform manufacturers choose ZephIR for resource assessment offshore.

On fixed platforms, technical advisors DNV GL and Natural Power place equivalent accuracy and uncertainty results from an energy prediction based on data from ZephIR 300 mounted on a stationary offshore platform as from an energy prediction based on data from a conventional offshore hub height met mast.

Economic savings can also be realised in the area of offshore wind resource assessment in addition to overcoming practical challenges where met masts are not a viable option. And, with ever larger turbines offshore the need to understand the full swept area wind characteristics / resource becomes increasingly important.

babcock

"ZephIR Lidar is the industry's leading wind lidar due to its proven accuracy and reliability.

Hosting it on a stable platform, combined with ZephIR Lidars' unique Continuous Wave laser technology which delivers unparalleled 50Hz wind data, completely removes the need for mechanical motion compensation or post processing algorithms for data correction. This provides exceptionally high data availability without compromising on accuracy and eliminates potential sources of error and uncertainty."

the practical benefits

Wind resource assessment offshore can be conducted with tall met mast structures however there are a number of practical and economic limitations.

ZephIR 300 ensures no flow distortion on measured data as there is no requirement for tall structures at or near the measurement height.

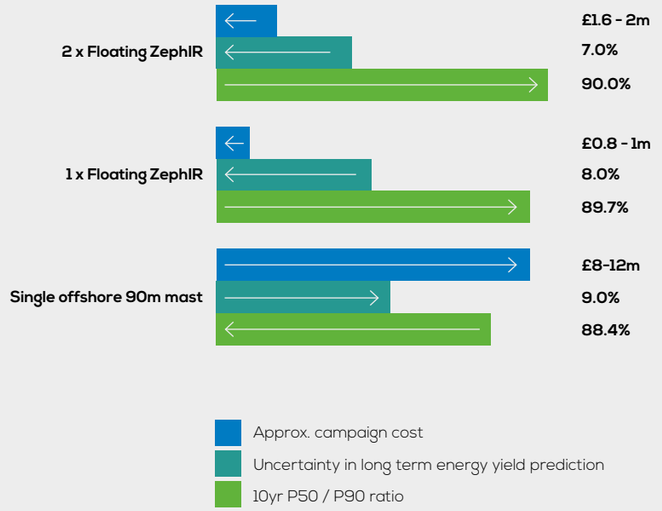
ZephIR 300 enables accurate measurement of resource and shear profiles across ranges between 10m and 200m above platform height

Proven accuracy and confidence of ZephIR onshore measured wind resource is maintained offshore due to the uniform wind flow conditions.

Reduced logistical costs, time-scales and risk with no requirements for working at height.

Operational costs are greatly reduced with no requirement for routine maintenance or sensor recalibration during the warranted period.

The reductions in uncertainty and bias alone improve the potential profitability of a wind farm through more accurate wind resource assessment and understanding of wind flow for wind turbine performance through power curve measurements across the entire rotor diameter in accordance with IEC 61400-12-1.



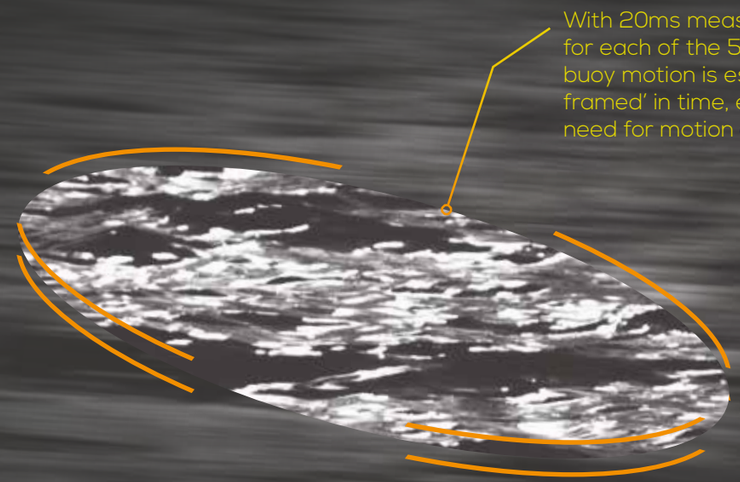
Reduction in uncertainty by measurement method, demonstrated by technical advisor Natural Power.

offshore floating lidar

Floating lidar provides significant opportunities for up-front cost savings in any offshore anemometry campaign. However, devices are subjected to motion which could, if not understood, increase the uncertainty connected to the measurement. Increased measurement uncertainties may make the solution unviable and negatively offset any potential CAPEX savings, impacting across the lifetime of the wind farm.

Buoys typically exhibit translational (surge, sway and heave) and rotational motions (pitch, roll and yaw). Continuous Wave lidar, at the heart of ZephIR 300, offers unique properties to manage these motions.

All of the available laser energy is focussed at the user defined measurement height leading to a consistently high carrier-to-noise-ratio (CNR) and consequently very high line-of-sight velocity data rates of 50 Hz. This leads to 50 line-of-sight wind data points being acquired during a 1 second scan at each height. The nature of buoy motion is such that very little movement occurs over the 20 ms required for each line-of-sight measurement, and even over the 1 second required to measure at each height, the motion is limited resulting in a negligible measured and simulated bias in wind speeds, all without the need for a mechanical gimbal.



Both simulations and offshore trials demonstrate that the 10-minute averaged wind speed recorded by ZephIR 300 is very resilient to the presence of the type of motion experienced by a range of buoy designs, even when no mechanical stabilisation or software compensation is applied. Yaw is easily compensated for by using a compass to determine the actual bearing at the time of the measurement, translation motions tend to average to zero over 10-minutes and do not degrade the results.

85% of floating wind lidar platform manufacturers agree, and choose ZephIR 300 for resource assessment offshore.

commercial experience

EOLOS Buoy

Forewind offshore platform

Fugro SEAWATCH

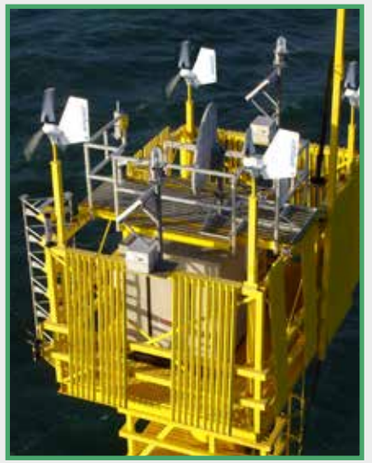
Fraunhofer IWES floating wind lidar

Inch Cape Offshore Wind Farm

Babcock Forecast

RWE offshore platform

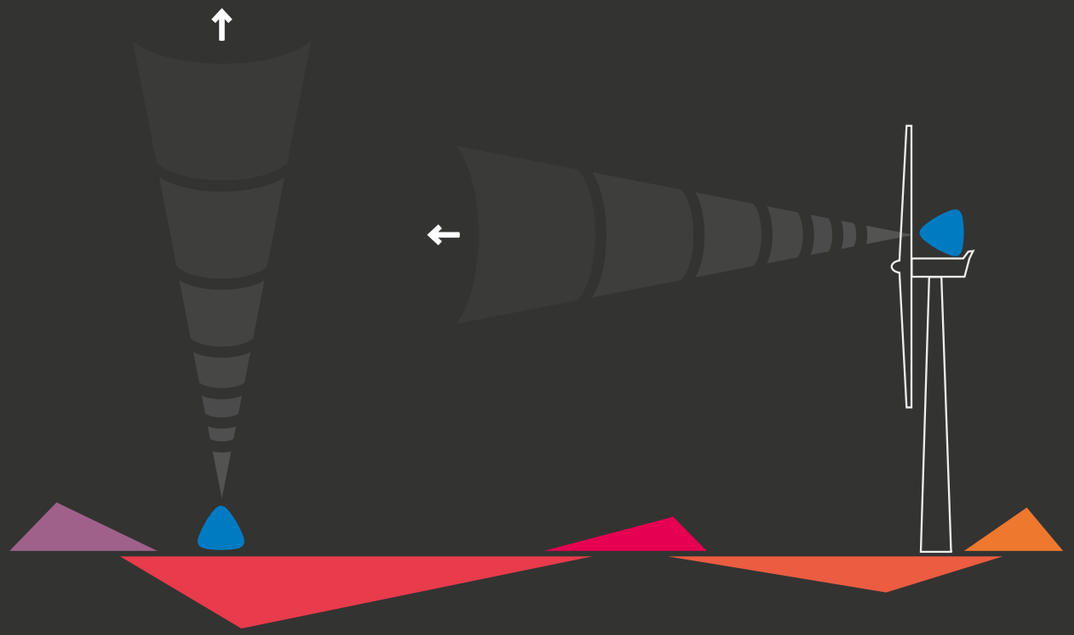
SeaRoc SeaZephIR



NaiKun offshore platform

ECN Ijmuiden offshore met mast

turbine performance assessment



Onshore/Offshore: ground-based

Onshore/Offshore: turbine-mounted

ZephIR DM

ZephIR DM is used on operational wind farms to determine available wind resource, uniquely in dual modes of operation - both ground-based and turbine-mounted.

ZephIR DM assesses turbine performance and highlights potential production increases or O&M strategy refinements to extend turbine life or reduce wind farm operating costs.

Fast, on-nacelle or ground-based turbine power performance curves can be measured against warranted power curves without the need for a met mast.

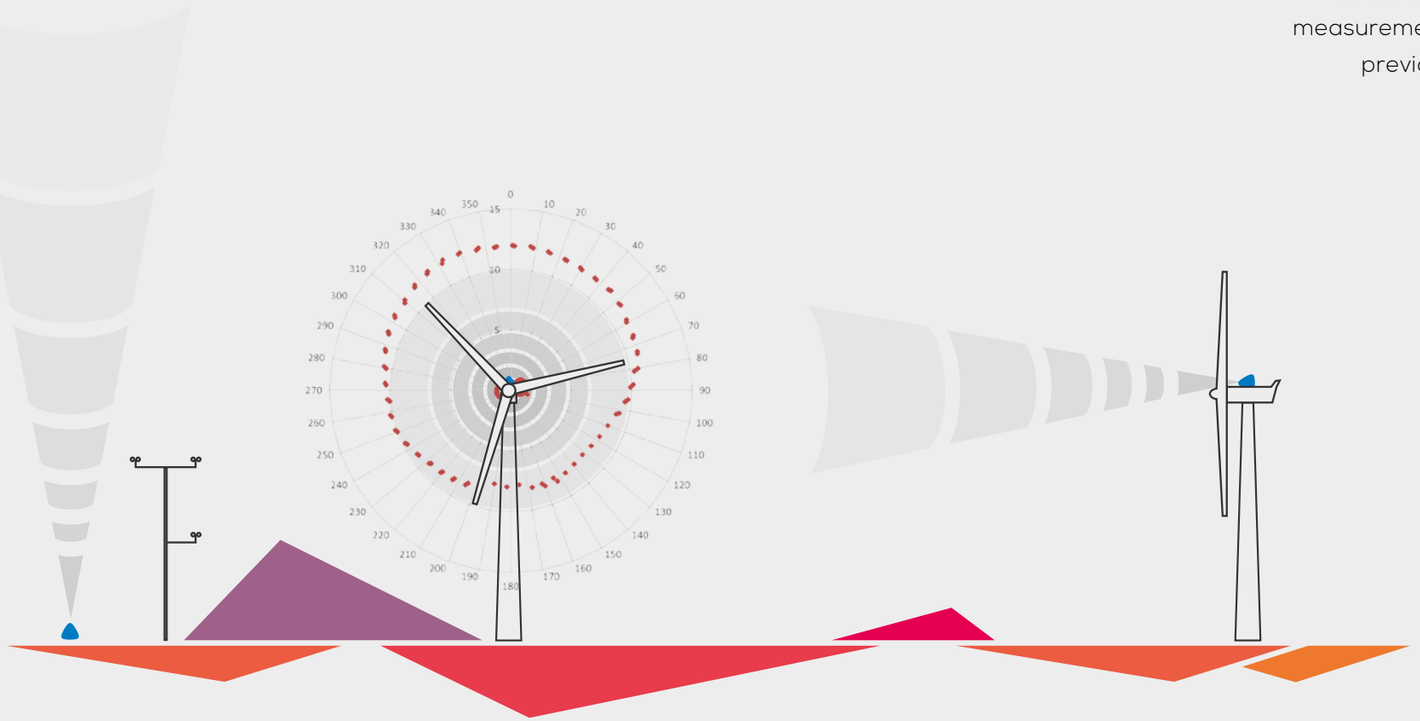
Yaw misalignment and other sensor calibration issues can be detected and rectified routinely.

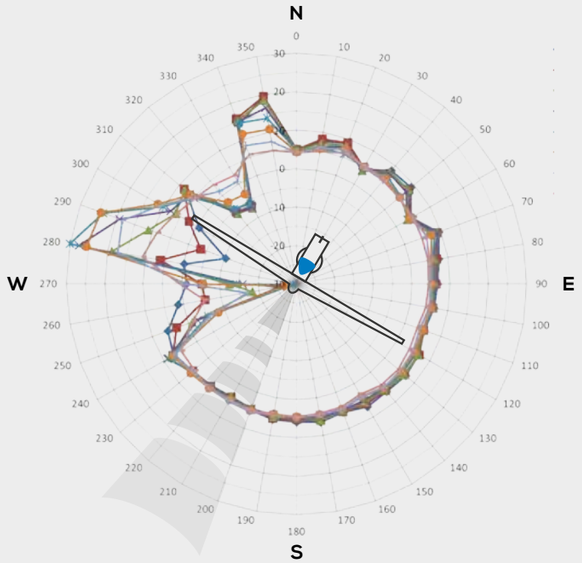
Wake and complex terrain effects can be detected and quantified.

Measurements of full rotor equivalent wind speeds, yaw misalignment, shear, veer and turbulence are required for accurate power curve measurements and optimum turbine control and are only possible with the continuous wave lidar in ZephIR DM.

versatility and transparency

From a single product, ground-based and nacelle-mounted measurements allow for complete asset performance transparency previously not possible with site and SCADA data alone.





key benefits

Measure power curves to compare against warranted power curves without the need for a met mast, allowing you to fully understand the performance of your operating asset.

Benchmark performance with our standardised reports to classify and prioritise each turbine in your portfolio to action tailored O&M strategies down to turbine level.

Detect yaw misalignment and other sensor calibration issues which when rectified routinely delivers 1-5% AEP increase.

Reduce the load experienced by a WTG through the measurement of extreme wind events and enable wake detection / sector management to extend turbine life or reduce wind farm operating costs.

key features

- Hub height and rotor equivalent horizontal wind speeds
- Wind yaw alignment relative to turbine
- Power law and non-power law vertical wind shear quantification, including low level jets
- Wind veer (variation of wind direction with height)
- TI and other turbulence measurements
- Wind field complexity
- Turbine wakes and effects of complex terrain for sector management
- 24 months warranty
- No annual servicing or annual calibration within warranty period

New methodology for power curve assessments using nacelle lidars (Project Cyclops)

ZephIR DM was chosen for this methodology due to its unique capability of measuring upwind hub and rotor equivalent wind speeds, vertical and horizontal shear, turbulence and veer. This in turn provided RES with the ability to take both absolute and relative power curves with both Hub Height (HH) and Rotor Equivalent Wind Speeds (REWS).

"ZephIR DM was the perfect choice for this trial - the results prove as much.

Traditional methodologies for measuring power curves have practical and technical challenges. A new methodology utilising lidar can build on current practices, address existing challenges and improve commercial relationships between developers, operators and turbine suppliers by better understanding the relationship between wind and turbine performance.

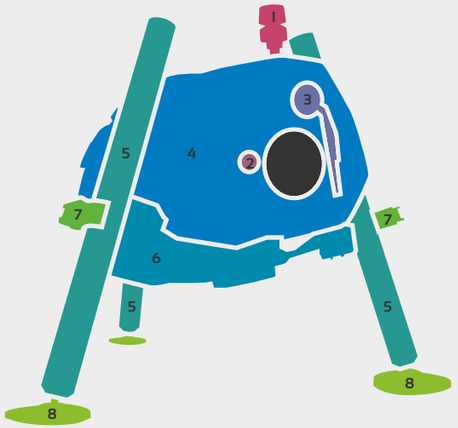
As well being able to measure upwind at extremely short distances, **no other lidar system was able to incorporate shear, turbulence and veer measurements to allow calculation of hub height and rotor equivalent power curves."**

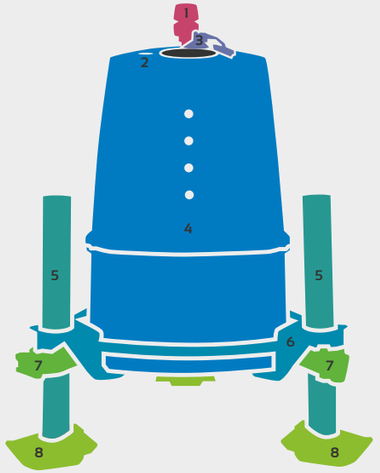
specification

PERFORMANCE	ZephIR DM
Range (min.) Range (max.)	10 metres 300+ metres
Probe length @ 10 m Probe length @ 100 m	± 0.07 metres ± 7.70 metres
Ranges measured	10 (user-configurable)
Sampling rate	50Hz
Averaging period	1 second as standard (user-configurable)
Readout rate	100ms (user-configurable)
Scanning cone angle	30° or 15° (other angles available)
Speed accuracy	0.1 m/s
Speed range	‹ 1 m/s to 70 m/s
Direction accuracy	‹ 0.5°
Visible laser alignment accuracy	1°
Measurement accuracy compensation	0.1 m/s
Inclination and roll measurement compensation accuracy	0.1°
Temp range (min.) Temp range (max.)	-25°C +50°C
Power consumption	85 Watts
Power input	250 -90 V AC 50-60Hz or 12V DC
Weight (excluding flight casing)	41kg
10 minute averaging 1 second data On board storage	90Kb / day 3Mb / day 36 months
Service interval	24 months
Data transfer	LAN, MODBUS, WiFi, Global SIM, Sat Comms
Timestamp / Location	GPS
Laser classification	Class 1
Eye safety standard	IEC 60825-1
Enclosure IP Rating	IP69
Compliance	Full CE accreditation

ZephIR DM OUTPUT	UNIT	EXPLANATION
Reference	-	Numerical reference of each record
Time and date	-	In text format, to the nearest second
Timestamp	Seconds	Time and date of the reading as numerical value in seconds
Hub height horizontal wind speed	Metres per second	Horizontal wind speed measured by the ZephIR DM at hub height, with real-time inclination correction
Rotor-equivalent horizontal wind speed	-	Rotor equivalent horizontal wind speed, as described in IEC 61400-12-1 CD, additionally incorporating real-time inclination correction and wind veer across the turbine
Vertical Wind Shear Exponent	-	Power law wind shear exponent as measured by the ZephIR DM around the centre of the scan. Positive values indicate that the wind speed is higher above the optical axis than below.
Wind Yaw Misalignment	Degrees	Angle of the horizontal wind direction vector to the ZephIR DM optical axis (i.e. yaw) as measured by the ZephIR DM. Positive values indicate that the wind direction is crossing from right to left (when looking from behind the ZephIR DM into the wind.
Horizontal Std. Dev.	Metres per second	Standard deviation of un-averaged horizontal wind speeds included in 10-min average.
Wind Yaw Misalignment Std.Dev.	Degrees	Standard deviation of the un-averaged wind yaw angles included in the 10-min average.
Vertical veer	Degrees per metre	Variation of wind direction with height
Range	Metres	Range at which the various wind quantities are determined
Flow complexity	-	A quantified measure of the wind flow complexity measured around the ZephIR DM scan. Useful for identifying wakes and complex wind flow conditions
Inclination Angle Min	Degrees	Minimum inclination angle detected by the motion sensors. Positive inclination angles indicate that the ZephIR DM optical axis in the direction of laser emission is tilted above the horizontal axis.

ZephIR DM OUTPUT	UNIT	EXPLANATION
Inclination Angle Max	Degrees	Maximum inclination angle detected by the motion sensors.
Inclination Angle Mean (deg)	Degrees	Mean inclination angle detected by the motion sensors.
Inclination Angle Std. Dev	Degrees	Standard deviation of inclination angle detected by the motion sensors.
Fore-Aft Velocity Max	Metres per second	Maximum fore-aft velocity detected by the motion sensors.
Fore-Aft Velocity Mean	Metres per second	Mean fore-aft velocity detected by the motion sensors.
Fore-Aft Velocity Std. Dev		
Fit Flags	-	A bit field representing the result of fitting process. Flag values.
Mean Fit Residual	Metres per second	The average fit residual of all the measurement points included in the fitting of the wind model.
TI	-	Turbulence Intensity
Upper temp / lower temp	Degrees Celsius	Pod temperature
Enclosure humidity	Percent	Internal humidity
GPS	Decimal Degrees	GPS location (lat and long)
ZephIR bearing	Degrees	Direction of the ZephIR with respect to True North
Tilt	Degrees	Pitch and roll away from vertical
Air Temp.	Degrees Celsius	Ambient temperature
Pressure	Millibar	Ambient pressure
Humidity	Percent	Ambient humidity
MET wind speed	Metres per second	Horizontal wind speed measured by the MET station
MET direction	Degrees	Wind direction measurement by the MET station
Raining	-	Rain sensor detects rain
Status Flags	Colour coded	Continuous operational status





1. **MARINE METEOROLOGICAL STATION** providing temperature, pressure and humidity measurements, designed to operate in harsh marine environments and includes a GPS device for data time-stamp & location facilitating synchronisation with other devices

2. **AUTOMOTIVE MOISTURE SENSOR** for activating wiper arm, designed to operate in exhaustive automotive applications

3. **MARINE WIPER SYSTEM** with silicone wiper blade for extended operation, keeping window surface clear of moisture and debris, designed to operate in the harshest of environments fed by industrial specification screen wash capable of operation in sub-zero temperatures

4. **INSULATED ENCLOSURE** manufactured in twin-skin Polyethylene, with IP seals across all surfaces and connector panels

5. **CARBON FIBRE LEGS** resistant to horizontal wind loading while keeping overall weight minimised

6. **DUAL-MODE FRAME** to allow both ground-based and turbine-mounted installation from the same platform

7. **QUICK RELEASE HANDLES** for simple levelling adjustments and designed for gloved operation

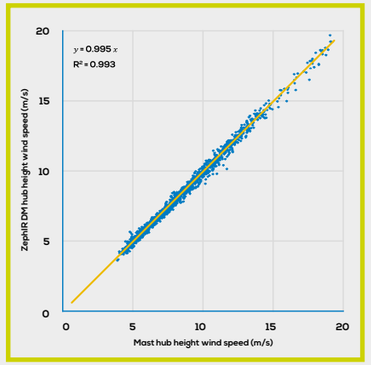
8. **WIDE SPREAD FEET** for stable footing on nacelle roof, and bolt through apertures for quick fixing to all surface materials

commercial experience

Power curve measurements

Operational trouble-shooting

Redefining IEC standards



Proven accuracy

Power curve measurements and optimisation

Wind turbine control

Dual Mode capability

Yaw misalignment detection

Performance optimisation and reporting

ZephIR Lidar

We are the home of wind lidar for the wind industry.

We were the original,
we continue to be the ‘first’ in every application
and we strive always to be the best.

We are wind lidar.

the original wind lidar

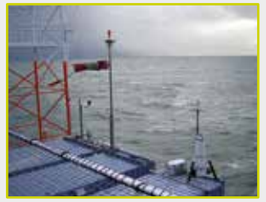
In 2003 we released the first commercial wind lidar, ZephIR, exploiting decades of research at UK government Research & Development establishment QinetiQ. Designed specifically for the wind industry ZephIR has paved the way for many of the remote sensing devices seen in the market today.

Our original lidar technology continues to innovate with world firsts such as taking measurements from a wind turbine spinner and being the first to deploy an offshore wind lidar, both fixed and floating. ZephIR has also now amassed more than 10 million hours of operation across 1000+ deployments globally spanning a decade of commercial experience.

The launch of ZephIR Care and ZephIR Direct build on technology innovation to deliver truly innovative commercial solutions for wind lidar ownership at the lowest cost available to you.

2003
The first wind lidar to make upwind measurements from a turbine nacelle.

2004
The first and original commercially available lidar for the wind industry. The first wind lidar to investigate the behaviour of turbine wakes.



2005
The first wind lidar to be deployed offshore on a fixed platform.

2007
The first wind lidar to take measurements from a turbine spinner.

2008
The first wind lidar to be signed off against an industry-accepted validation process.

2009
The first wind lidar to be deployed offshore on a floating platform.

2010
The first wind lidar to re-finance and re-power a wind farm.

2011
New ZephIR 300 launched with optimised original, proven core technology at the heart, and the first wind lidar to be proven in a wind tunnel.

2012
The first wind lidar to be used with very short masts and secure project financing.

2013
The first wind lidar to provide true dual mode functionality in one platform (ZephIR DM).

2014
Largest batch of single-type lidar verifications against an IEC-compliant met mast.

2015
ZephIR Care and ZephIR Direct deliver the lowest cost of lidar ownership available

zephirlidar.com
sales@zephirlidar.com