WINDAR

PHOTONICS

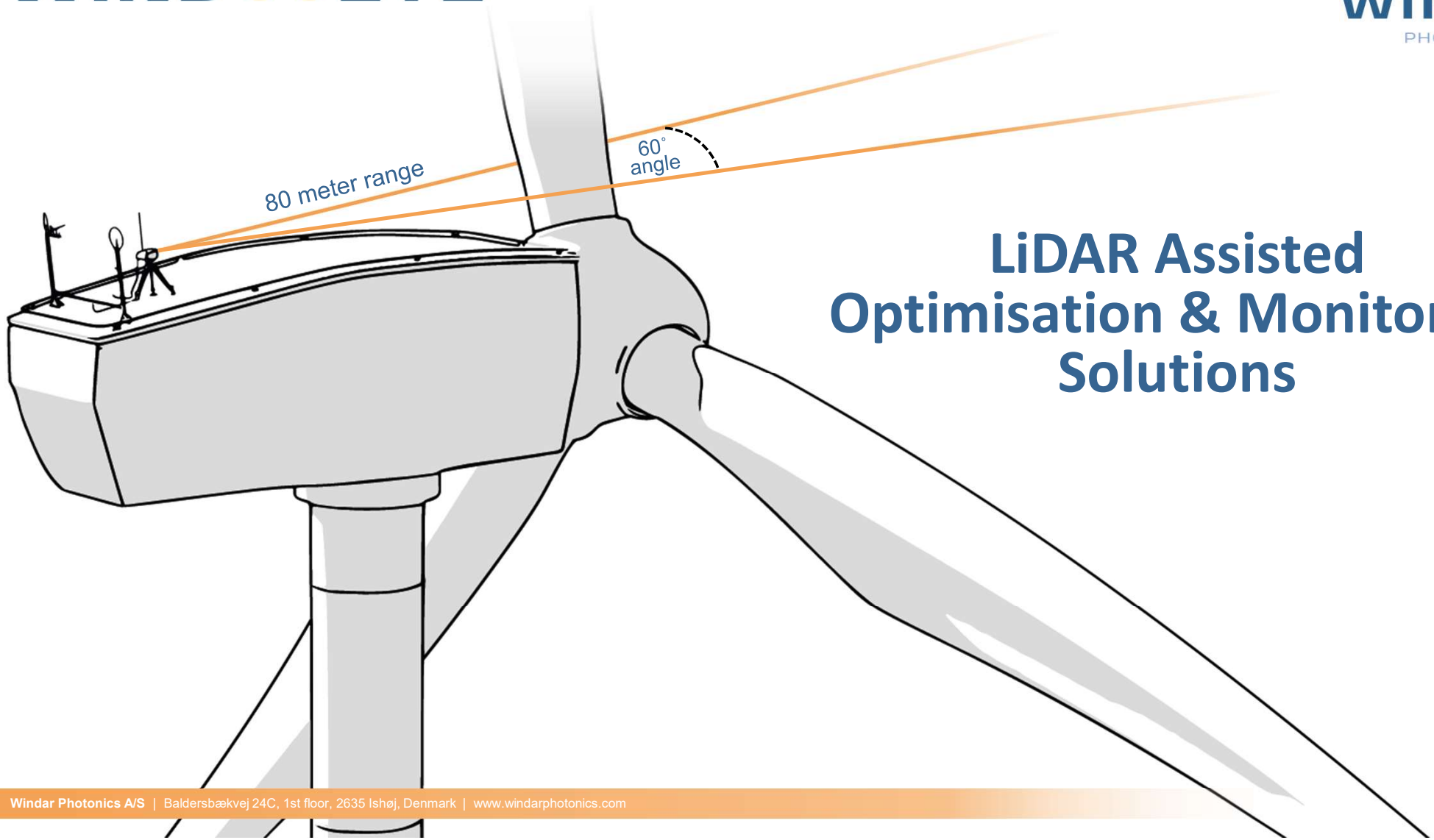
LiDAR assisted

Optimisation and Monitoring solutions

HUSUM WIND 2025

WINDEYE™

WINDAR PHOTONICS



LiDAR Assisted Optimisation & Monitoring Solutions

WindEYE Optimisation Solution

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- Remote wind sensing 70 meters ahead of wind turbines in free air flow
- No need for turbine control modifications due to the Plug'n'Play WindTimizer integration technology
- Typical AEP increase of 2-4%
- More than 1,600 wind turbines installed with the WindEYE Optimisation Solution

A unique solution to optimise power generation and turbine operation

WINDTIMIZER™

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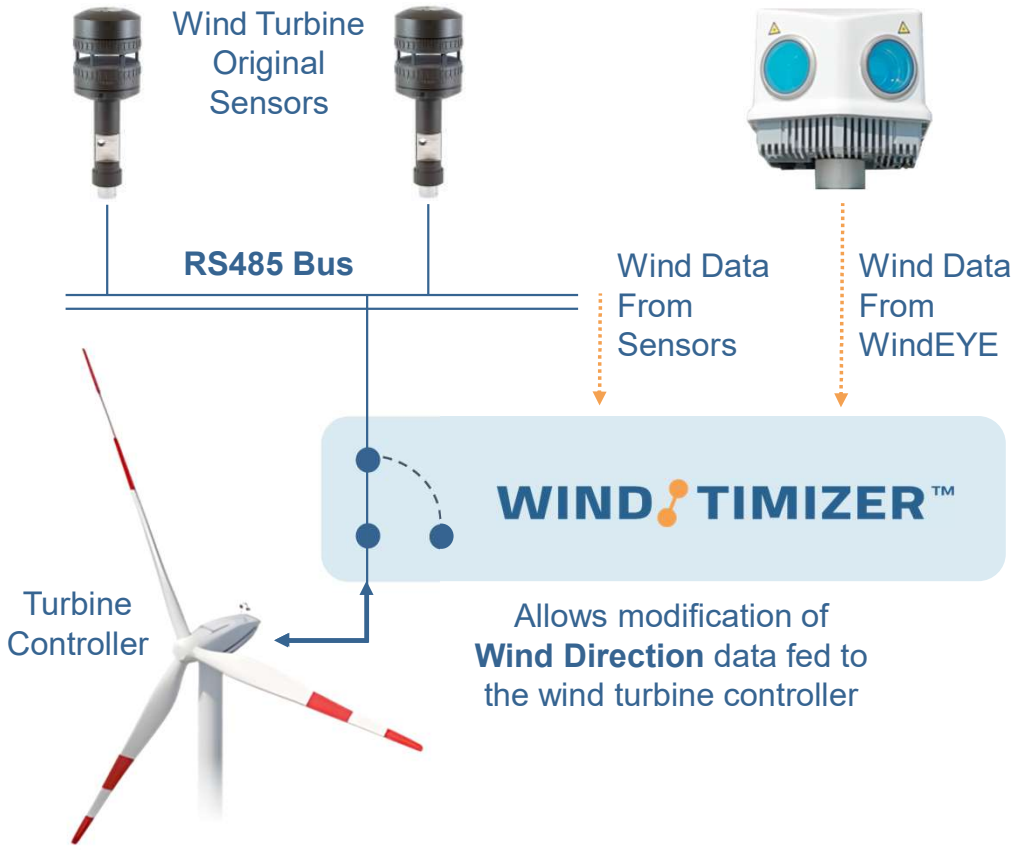
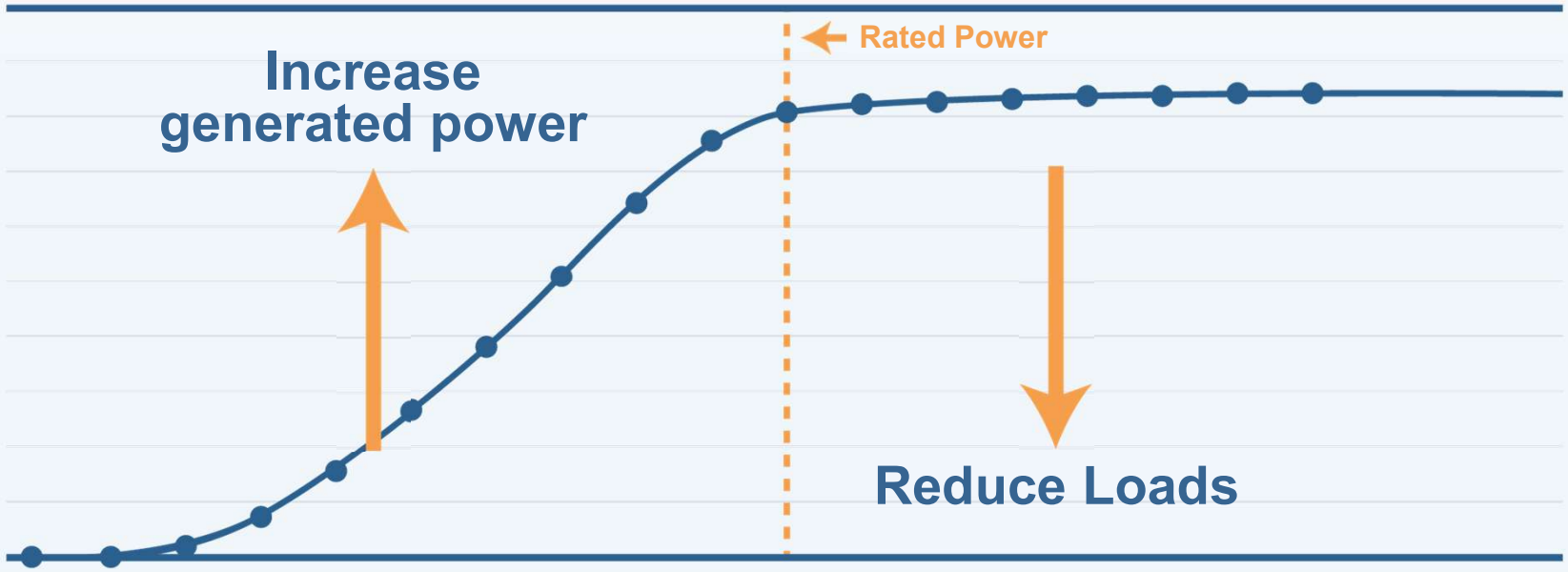


Enabling unique wind turbine optimization

- Enables to realign any given wind turbine to the incoming wind direction below rated wind speed and increase power production
- Misalign wind turbines above rated wind speed to alleviate critical loads
- Does not require modification of the turbine controller
- Supports and automatically identifies majority of turbine sensors on the market

WindEYE Optimisation Solution



Below rated power

Aligning the wind turbine to incoming wind flow direction in order to increase power production

Above rated power

Gradually misaligning the wind turbine to reduce wind turbine loads without sacrifying power production

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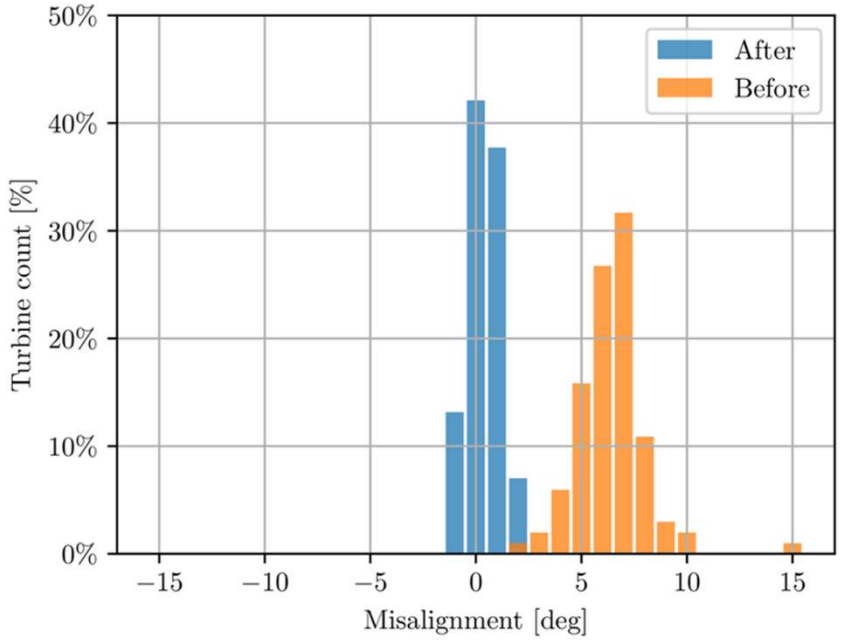
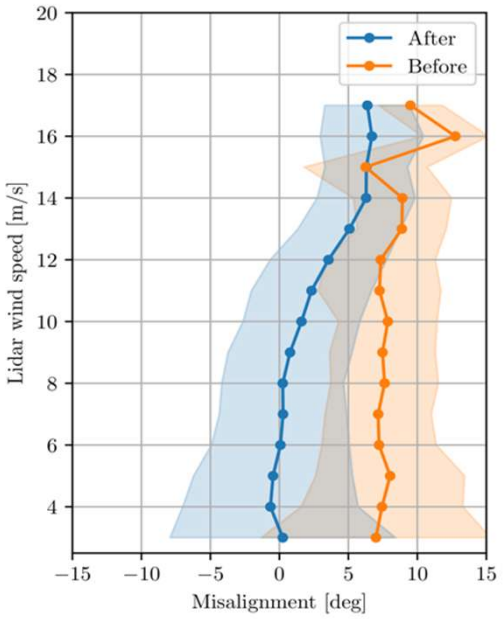
Misalignment measurements
from a typical wind farm (Vestas V82)



Example from a realignment strategy
(Vestas V82)



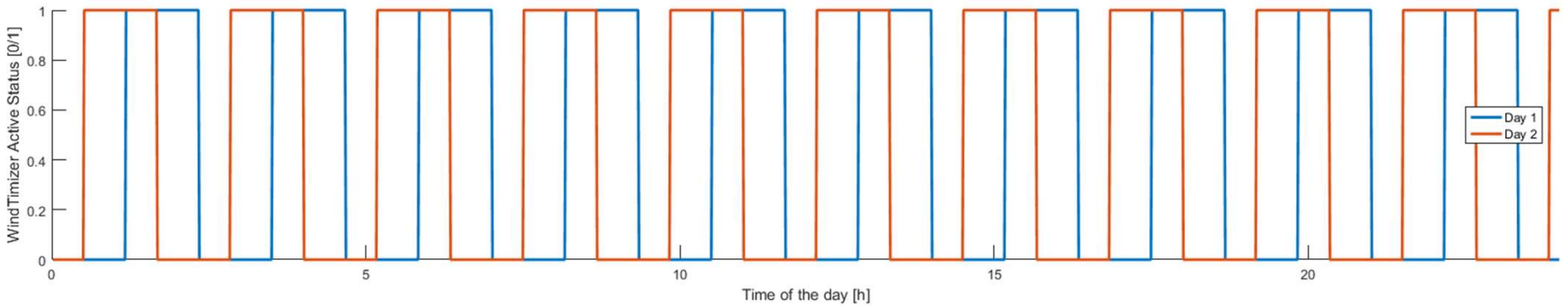
= >2.5% increase to AEP!

Power Gain Verification

Toggling campaign enables tracking of power gain from WindTimizer activation

Automatically toggles WindTimizer from ON to OFF every 70 minutes to mitigate:

- Influence of atmospherical conditions (change in air density)
- Influence of recurrent phenomena (e.g: diurnal atmospheric stability)



Then power productions of Turbine Control periods vs. WindTimizer control periods are compared to derive power gains during the 3 months long campaign.

Retrofit optimisation for any model of wind turbine

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Load alleviation by misalignment

Our approach to specific turbine model strategies

Tailored load reduction strategy

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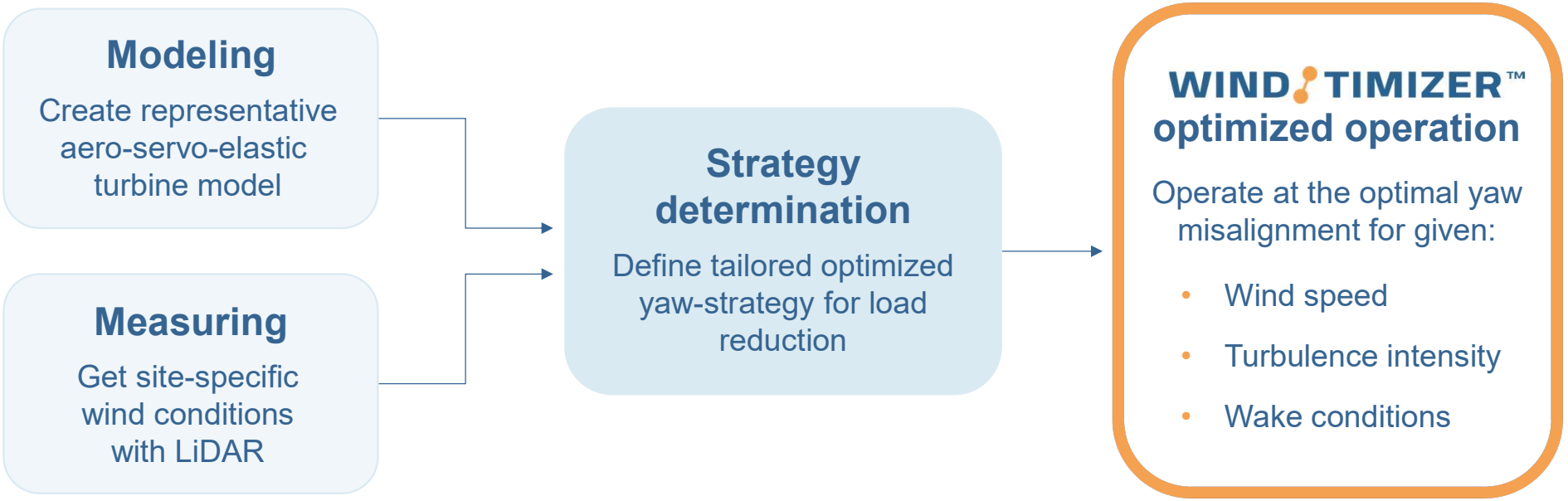
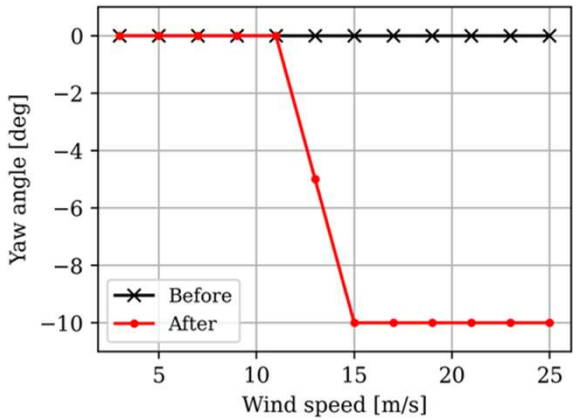
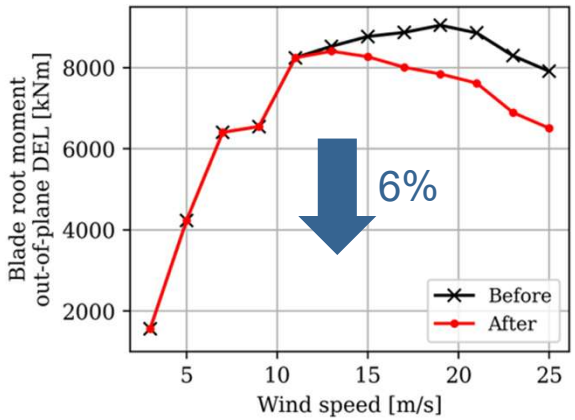
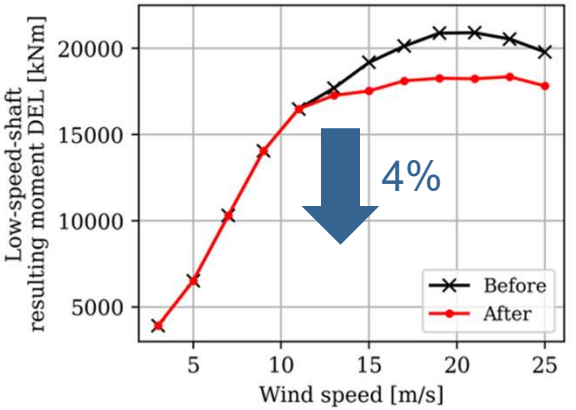


…without any controller change!

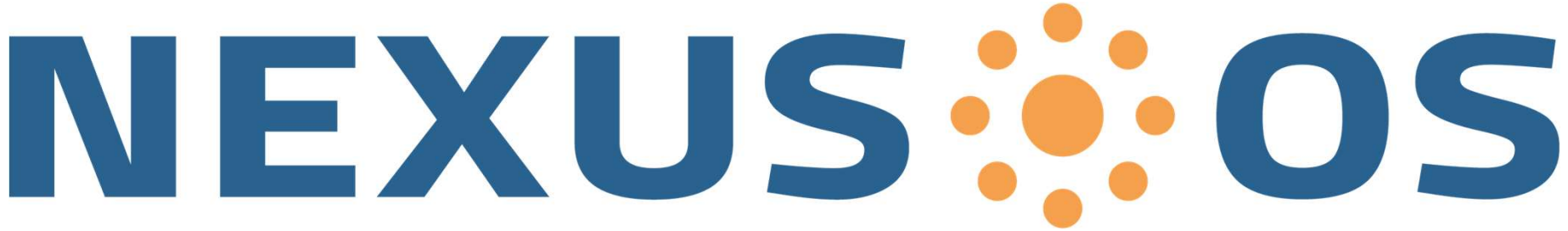
Simple strategy example







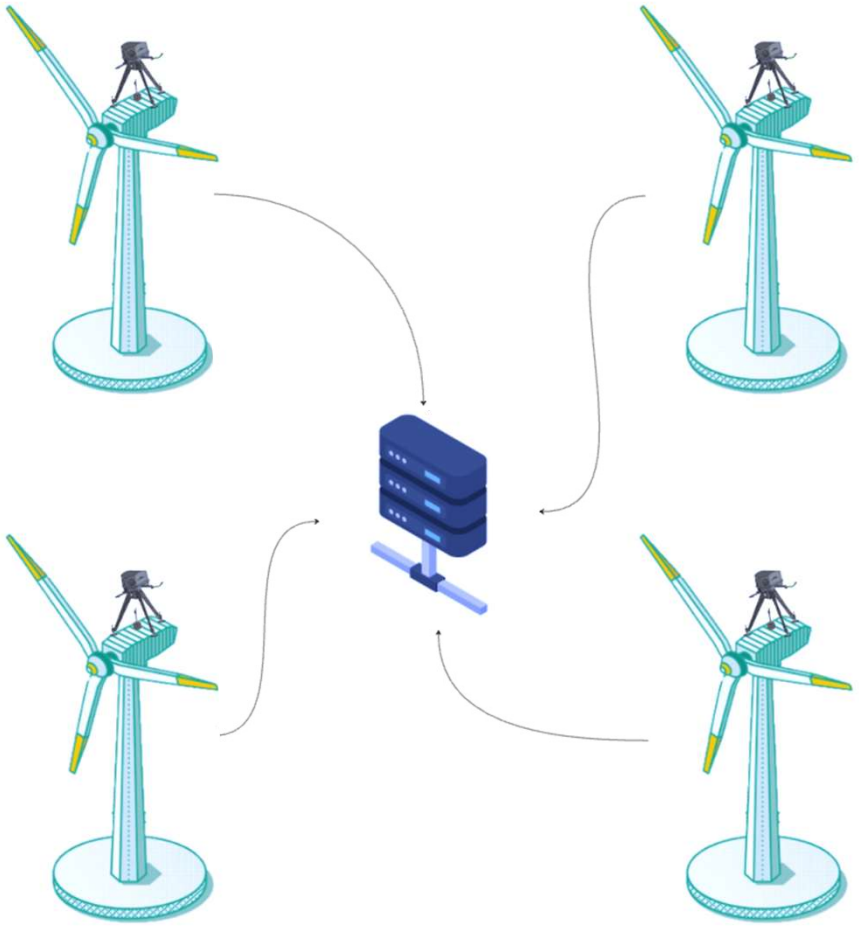
- No power production loss
- Fatigue reduction at high wind speeds on Blade and Low-Speed Shaft



A decade of LiDAR and Wind Turbine knowhow

distilled into one Operating System

Nexus OS – On-premises Solution



Nexus OS is an on-premises LiDAR Fleet Management System and is:

- **CyberSafe**
  Nexus OS is fully deployable and operates offline thus fulfilling customer's Cyber-security policies without compromising on the benefits of the LiDARs.

  Browser-based interfaces avoids any local installations on operators' devices.

- **Autonomous**
  Operates with minimal manual intervention to continuously monitor and optimise the performance of the LiDARs.

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NEXUS TPM

NEXUS TPM traces performance automatically and
independently from SCADA and OEM data

WINDEYE™ provides reliable data

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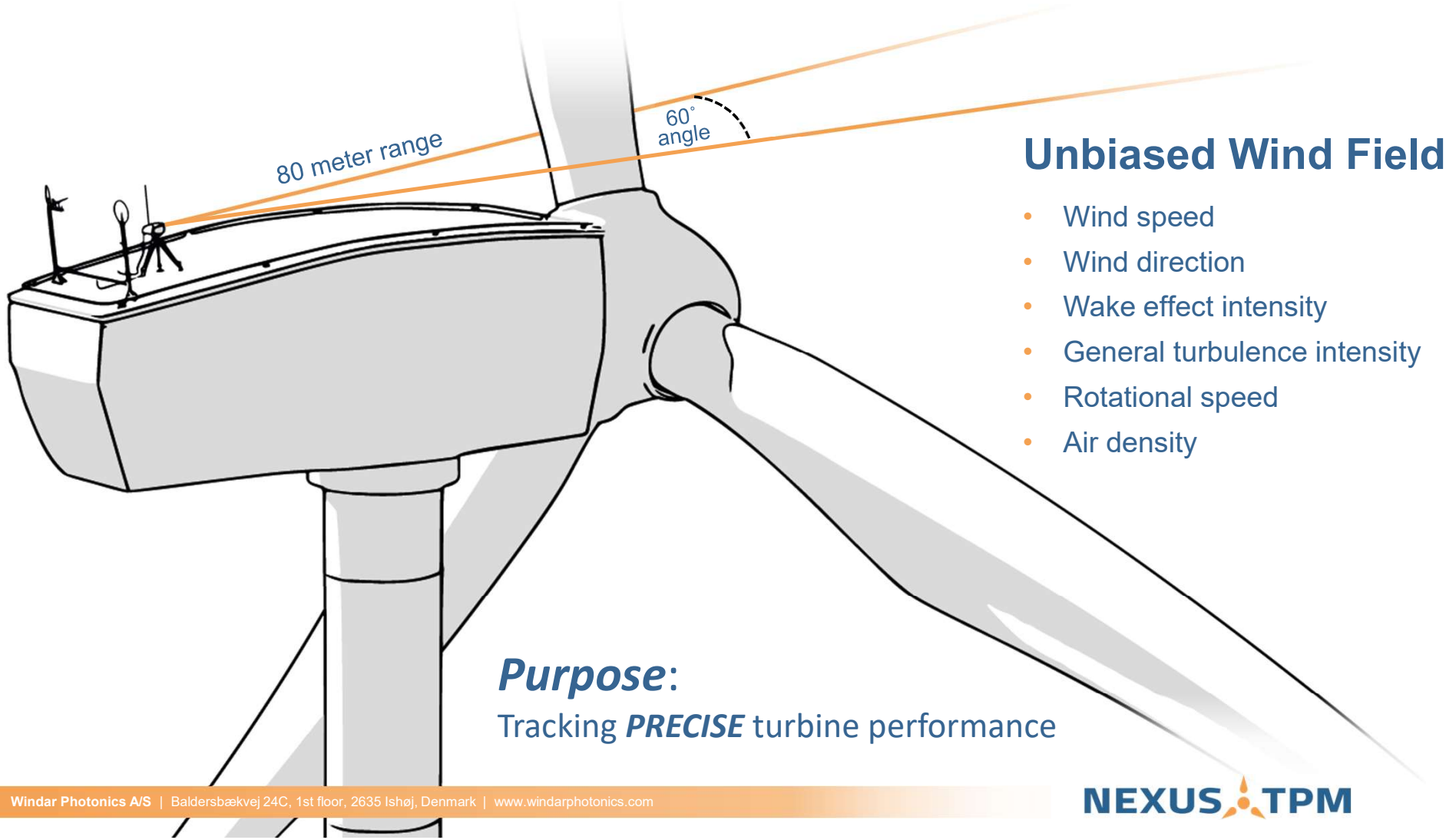


Unbiased Wind Field Data:

- Wind speed
- Wind direction
- Wake effect intensity
- General turbulence intensity
- Rotational speed
- Air density

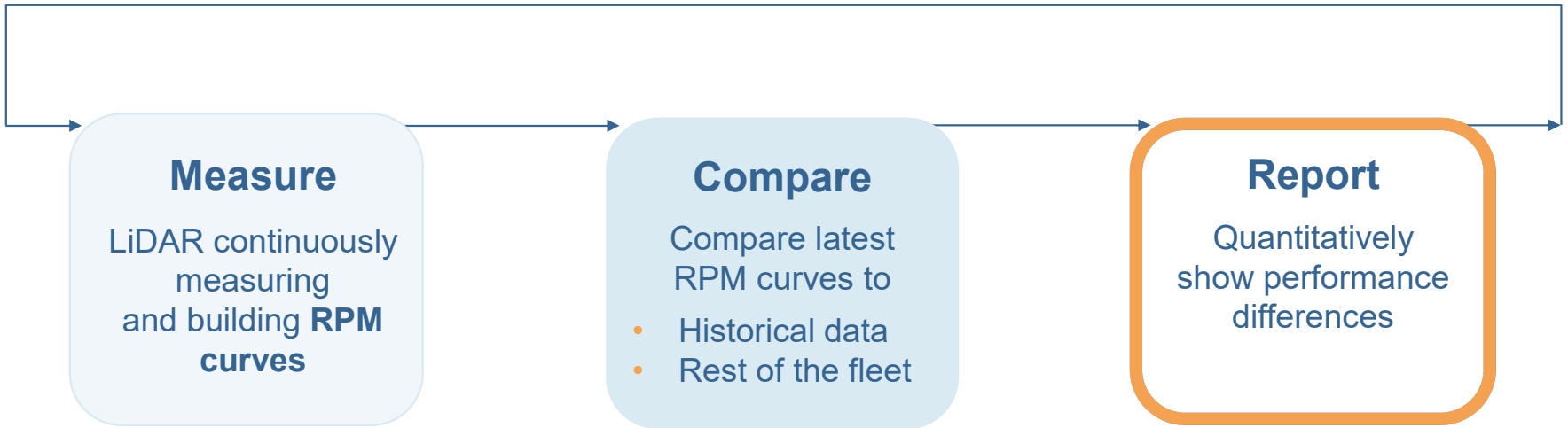
Purpose:

Tracking ***PRECISE*** turbine performance

NEXUS TPM

Tracking performance with LiDAR

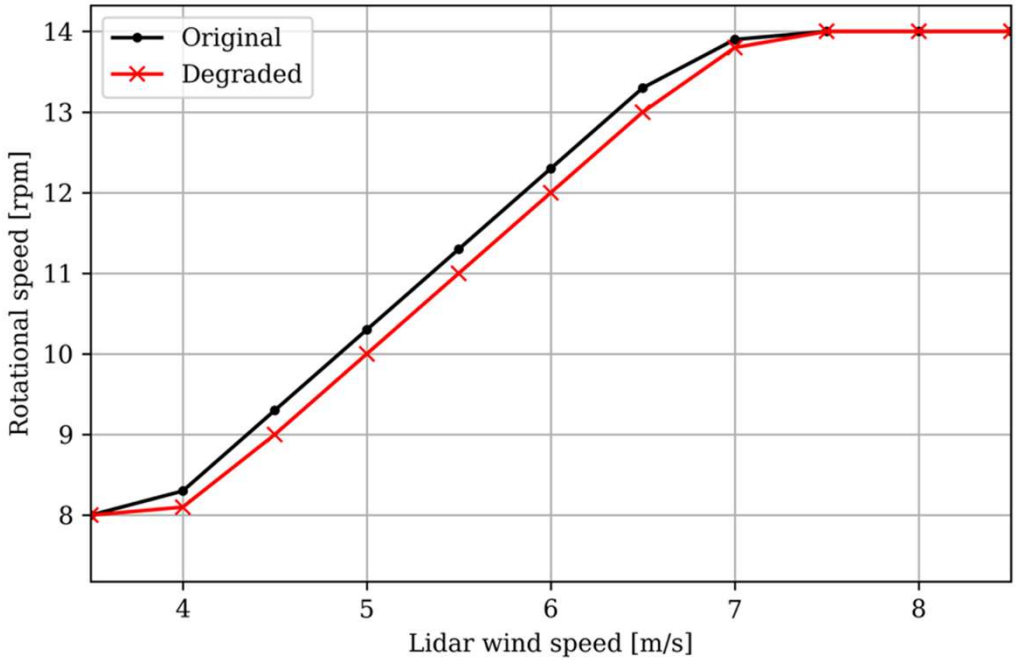
Key idea: power differences are related to RPM differences



RPM-Wind Speed curve: example

The rotational speed related to power production

The turbine performance is derived from the rotational curve



NEXUS TPM Unit Dashboard – Overview

NEXUS TPM Fleet Dashboard – Overview

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Contact

Birol Yosul, VP Sales Europe

byo@windarphotonics.com

+49 15563735170

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