

ECN Wind Measurement Services Plus



ECN brings state of the art innovative technologies and methods for measuring in and around your wind farm, both onshore and offshore.

Whether you require standard accredited measurements or are struggling with an underperforming asset, ECN has the solution for you. Along with the measurement services comes the vast experience and proven track record of ECN on prototyping / testing wind turbines and measurements as well as measurement systems. That knowledge is put to work in order to provide you the

most suitable measuring program to solve your problem. Every measurement campaign is organized in close collaboration with our experts. Having in-depth understanding of the measurements output, results in optimal application of the measurements efforts. For analysis ECN uses her dedicated tools to deliver cost-effective solutions.

Product	Description
Power Performance and Nacelle Transfer Function	Determination and validation of turbine's power performance (IEC 61400-12 accredited)
Mechanical Loads	Determination and validation of mechanical mean and fatigue loading of turbine components (IEC 61400-13 accredited)
Acoustic Noise	Acoustic noise measurements (IEC 61400-11)
(Floating) LiDAR Calibration	Services: • Validation and classification of new remote sensors • Calibration of remote sensors before being used in Wind Resource Assessments. Facilities; IEC compliant masts: • onshore test site • offshore meteorological mast
Wind Farm Performance Analysis & Improvement	1. Quick Scan for evaluation of performance 2. Measurements to identify key issues 3. Detailed Analysis of wind farm data incl. wake modelling 4. Implementation of cost-effective solutions incl. ECN technology
Yaw Misalignment Measurement	Nacelle based LiDAR measurements for quick and accurate determination of yaw misalignment
Component Performance Analysis	Measurements for component design validation, including vibration measurements (VDI-3834) and failure Root Cause Analysis
Blade Flow Visualization	Visualization measurements of the flow around the blade for optimization of design and power output.
Wind Resource Assessment	'Measure – Correlate – Predict' approach • Site effects • Farm effects • Forecasting
Bird Collision Monitoring	Bird impact monitoring >16 grams, making use of camera's and vibration sensors
Substructure monitoring	Monitoring of wind turbine substructure for model validation or during operational stage. 'Measure – Correlate – Predict'



Our integrated approach is the added value of ECN.
ECN puts the Plus in measurement services!

Measurement Products

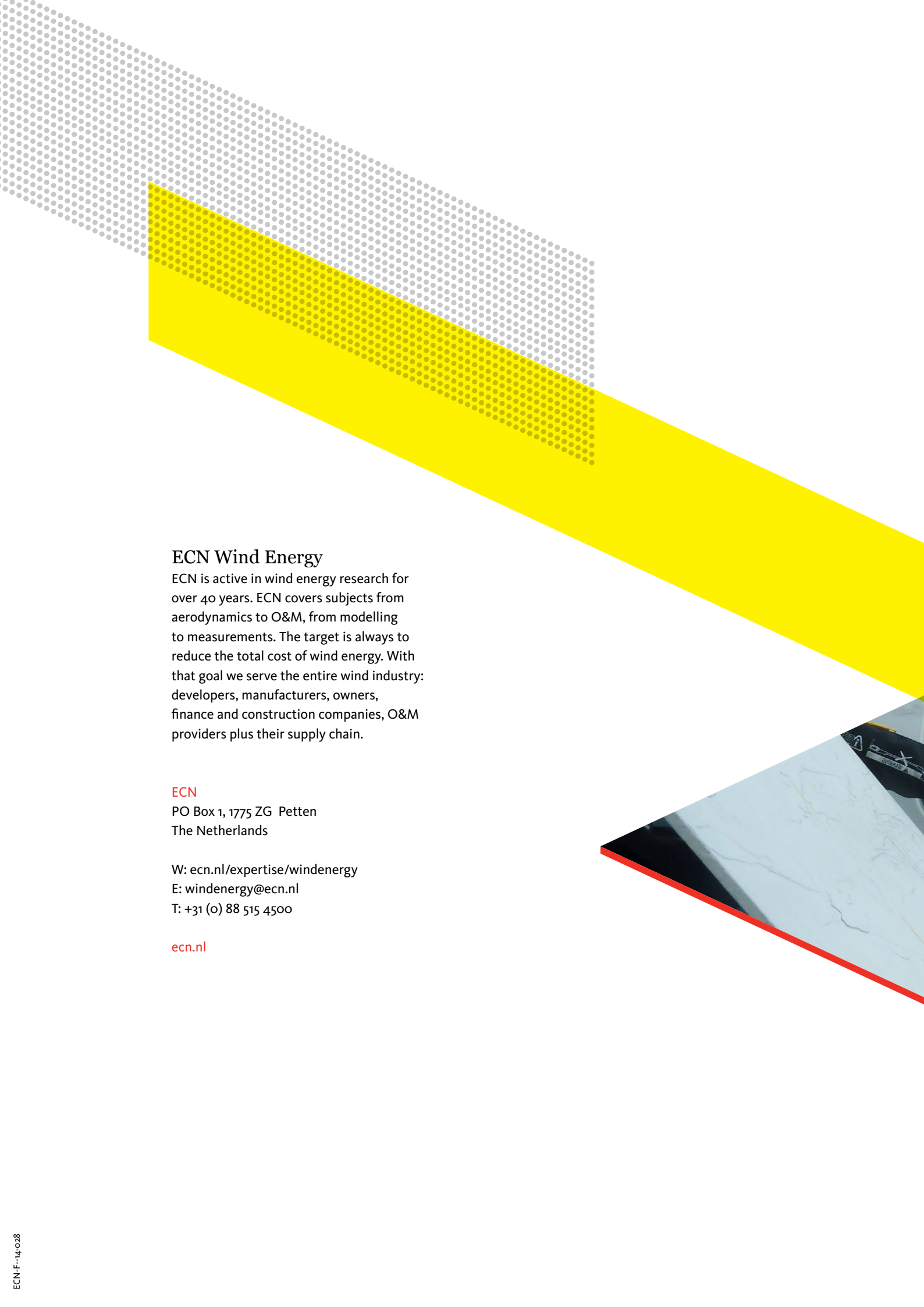
Application of ECN measurements		
Farm	Turbine	Component
Wind Resource		
Design validation		
	Certification	
Performance optimization		
		Failure Root Cause Analysis
	Software validation	

Facilities & Measurement locations

- Your location: onshore or offshore wind farm or test site
- Offshore meteorological mast IJmuiden
- LiDAR and Floating LiDAR calibration facility

Equipment

- 5 onshore + 1 offshore IEC compliant, 100m+ meteorological masts.
- 3 industry accepted ground based LiDARs.
- Experienced with: SoDAR, nacelle LiDAR, scanning LiDAR and floating LiDAR.



ECN Wind Energy

ECN is active in wind energy research for over 40 years. ECN covers subjects from aerodynamics to O&M, from modelling to measurements. The target is always to reduce the total cost of wind energy. With that goal we serve the entire wind industry: developers, manufacturers, owners, finance and construction companies, O&M providers plus their supply chain.

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