Optimising turbine performance using smart data and tools

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Vestas & Smart Data
The ambition straddles four domains of opportunity

Change the game

Change the economics

Rethink O&M

Optimize O&M using data

- Use data to provide visibility, prediction, planning optimization, reporting, contract enforcement, yield/AEP/LPF optimization, at turbine, park and fleet level
- Provide benchmark data on performance, availability and direct costs of service

Current scope
Vestas Smart Data & Consultancy Services

Optimizes your business based on data

Vestas has been monitoring, collecting and learning from volumes of data from wind turbines for more than 30 years - now we want to share this knowledge with our customers.
a suite of data and analytics driven tools and consultancy services
covers the whole value chain of your wind energy business
combines unique operational insight with industry leading tools
supports your processes, increases production and reduces maintenance cost
changes the way your employees work, smarter decisions leading to more value
Vestas Smart Data & Consultancy Services

Vestas leads predictive maintenance in wind industry by:

#1 TECHNOLOGY

An effective combination of methodologies to detect abnormal behaviors and potential risks in the turbines

Online data
- vibrations
- scalar data
- oil analysis
- Any other data automatically collected

Ad-hoc data
- endoscopies
- motor tester
- Blade care
- Any other data

Fully integrated with your business
- ERP integration
Smart Data on *Failure prediction
With ClearSight.Activator

- We can detect if a turbine has an abnormal behavior
- Performing statistical analysis over more than 140 signals in average
- With +33,000 turbines fleet around the world
- Having the biggest population, the tool is very powerful
- Totally automated
- Obtaining graphs easy to understand
Using data to continuously improve *asset performance

Smart data visible through smart applications ensures easy fast decision making

Historic and real-time data + New hardware and software technologies = Optimised fleet
Smart Data from reducing LPF to *increasing AEP

Optimising turbine performance

Full visibility to drive down Lost Production

…but what about when turbines are running?

Turbine data can be used to identify:

- periods of abnormal operation and non-availability
- changes in performance
- potential upcoming failures
- energy losses classification
- the potential to increase AEP through upgrades
- life extension potential
Turn smart data insights into more power
Using smart data to implement PowerPlus™ software and hardware technology

- Site-specific tuning of operational parameters
- Implementation of intelligent software algorithms
- Enhanced aerodynamic add-ons
Implementation of intelligent software algorithms
Power Performance Optimisation improves efficiency and output by means of smart data

Wind Estimator

Wind Estimator improves measurement accuracy of the wind turbine. The correct rotor speed and pitch angle is needed to for optimal power production – the more accurate, the more power

Adaptive Wind Sensing

The correct upwind yaw position is needed to for optimal power production, and loads. The algorithm uses the natural variation in wind direction (+/- 6 degrees) to calculate optimum yaw position based on average peak power production

Extended Power Boost

Extended Power Boost improves production by “sharpening the knee” of a power curve through a short boost in the “boost area”. The short term boosting of power is carried out when the turbine reaches rated wind speed, and without increasing the name plate capacity of the turbine
Based on a detailed post-installation siting study, using a DNV-GL certified process, Vestas may be able to increase the nominal power of the wind turbines, and allow higher production at virtually no risk.

**Power Uprate**

**Extended Cut Out**

**Extended Cut Out**
Aerodynamic improvements to increase yield
Specifically designed blade add-ons can lift AEP by up to 2%

Based on a detailed post-installation siting study, using a DNV-GL certified process, Vestas may be able to increase power production on the slope of the power curve, and allow higher production at virtually no risk.
Estimation and validation of performance improvements

Proof of value is highest priority, both for Vestas and our customers
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Estimating potential performance improvement

Validating actual performance improvement

Wind Power Plant Assessment, including:

- SiteCheck analysis
- Turbine-specific forecast
- Gain tables over wind bins

Different methods for different applications

- Validation accuracy depends on sample size and quality
- Different methods for on-slope and rated power upgrades
- Validation plan made together with customer
Using data to evaluate potential performance improvements

Vestas uses DNV-GL certified tools in SiteCheck® to estimate production benefits

Data inputs
- Turbulence data
- Weibull parameters
- Turbine positions
- Topography
- Inflow angles
- Climatic conditions

Vestas SiteCheck®
- Relative fatigue loads
- Relative extreme TI loads
- Extreme wind speed check
- Inflow angles check
- Turbine spacing check

Upgrade implementation
- Validation plan
- Implementation
- Performance validation

Optimised fleet
Track record and data experience

PowerPlus™

More data and experience than anyone
- 50,000+ turbines installed worldwide
- 35,000+ turbines continuously monitored
- Data from 60,000+ turbine years in the Vestas data lake

Unrivalled capacity
360° Asset Performance Reviews conducted

Analysis that creates value
Average AEP improvements (%) identified
Learn more
Visit Smartdata.vestas.com

Vestas Smart Data & Consultancy Services
Get insights from over 30,000 monitored wind turbines and transform data into actions. With Vestas Smart Data & Consultancy Services you can increase your AEP, reduce costs, improve business certainty and levelize the cost of energy.

Discover our **SMART DATA** business

Discover our **ClearSight** offerings