

# retroX - Digital Backbone for Existing Turbines

fos<sup>4</sup>X

retroX offers a stand-alone retrofit solution for digitalization and efficiency optimization of existing turbines. Collecting and extrapolating load data provides relevant information about the remaining lifetime of the turbine.



- + Digitalization  
Know your turbine.
- + Optimization  
Higher yield.
- + Continued Operation  
Be optimally prepared.

fos4Blade Hardware

X4edge Apps

Cloud Data Access

AEP  
Increase



OpEx  
Reduction



Life Time  
Extension



Risk  
Mitigation



## Asset Transparency as Key for Optimization

Increase performance transparency as well as condition transparency through real-time data access to enable the optimization potential of your turbine and wind farm.

## More Information

[www.fos4x.de/retroX](http://www.fos4x.de/retroX)

# retroX - Customer Value & Investment

## OpEx Reduction

Get greater transparency of assets through more and smarter data

Automate recurring analyses and make informed decisions

Improve maintenance planning and empower predictive approaches

## Life Time Extension

Improve commercial decision making for continued operation

Use real load data to allow less conservative lifetime assessment

Be able to trade life time for output or make better PPAs

## AEP Increase

Create turbine specific portfolio of initiatives for AEP optimization

Tackle static performance issues (e.g. rotor imbalance)

Reduce curtailments with additional apps (e.g. blade ice detection)

## Risk Mitigation

Detect premature structural damages early on

Be informed about the structural pain points of your assets

Improve risk reporting for management and owners

## X4edge Performance Apps



### Rotor Ice Control

*Detects critical ice masses and alarms when a threshold is reached.*



### Turbine Load Control

*Avoids detrimental loads, helps optimizing blade design, and enables turbine lifetime extension.*



### Turbine Integrity Control

*Identifies different types of degradation and damage based on analytical and empirical tools.*

## Basic Solution

### Initial Investment

#### **fos4Blade sensor platform**

Proven serial product used in hundreds of turbines

#### **Edge computer**

DPU with real-time digital twin (basic version)

#### **Connectivity**

3G/4G connection and field bus/SCADA integration

### Operation

#### **Data transfer and storage**

Buffer of dynamic data and continuous cloud transfer

#### **IIoT cloud platform**

Offline analysis, updates and device management

#### **SCADA integration**

Integration via API into existing 2nd level SCADA software

## Upgrades

### Performance Optimization

#### **Performance & condition reports**

Event-based or periodical load, performance and condition reports

#### **Performance apps**

fos4X and 3rd party software optimization products

#### **Individual services**

Automate specific analyses, deep-dives into your data



TEC

Turbine Efficiency Control

*Improves sector curtailment and power curve over the entire range of wind speeds and terrains.*



BNC

Blade Noise Control

*Manages noise curtailment to increase overall energy output or even enable a specific site at all.*



WFCC

Wind Farm Control

*Supports the optimization of the entire wind park, for example by balancing wake effects.*

# About / Contact

## fos4Blade & X4edge

We provide sensors and solutions to drive smart wind energy



Under the umbrella brand “X4edge” we bundle our portfolio of digital products for the optimization of wind turbine performance. These products are based on our reliable sensor platform “fos4Blade”.

The X4edge performance apps close the gap between the fundamental measurement of blade properties and real customer value. With our industry expertise and cutting edge model-based analytics, machine-learning and AI techniques, we convert sensor data from the edge into relevant, actionable insights that can be accessed from wherever you are.



Founded in Munich in 2010, fos4X GmbH is a specialist for reliable fiber-optic measurement technology and sensor technology as well as for innovative data analysis. It develops IIoT and edge computing solutions and enables digital transparency, significant cost reductions and efficiency increases for the wind industry.



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