

# Digitalization in Wind Power

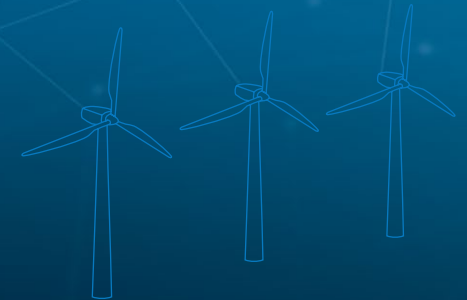
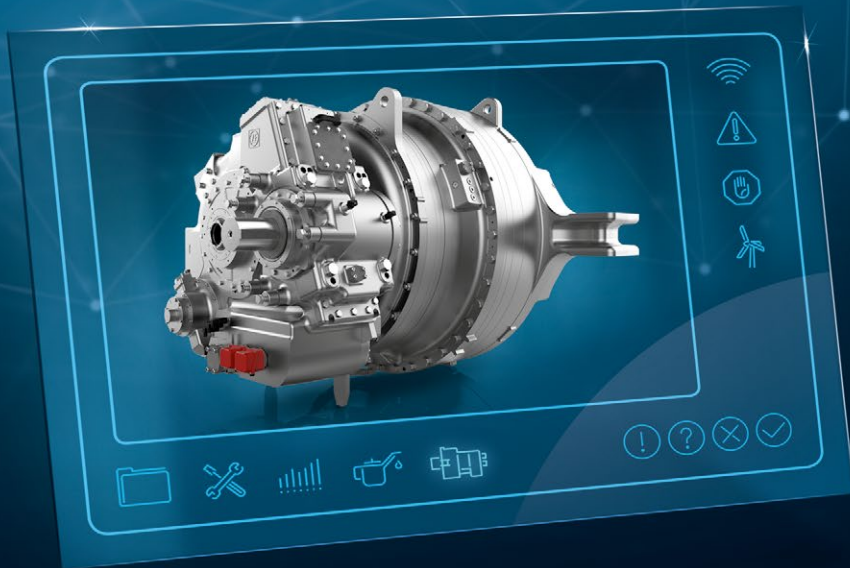
DATA ANALYTICS

LIFE CYCLE ANALYTICS

GEARBOX EXPERTISE

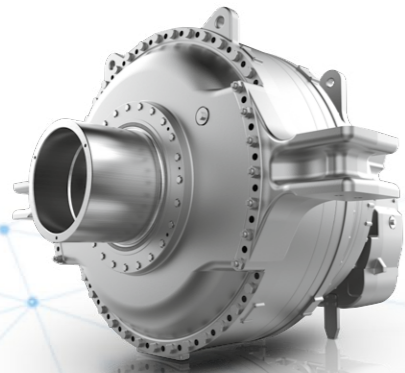
DATA PLATFORMS

DIGITAL BIRTH CERTIFICATE



# Intelligent connection solutions

Continuously innovating, ZF's pioneering "Services powered by Analytics" will help reduce the levelized cost of energy. Digital solutions integrated with ZF's high performance mechanical systems will bring new opportunities to optimize the energy yield and decrease the operational cost of wind farms.



## ZF's Services powered by Analytics



### O&M documentation

Technical manuals and spare parts lists available online for field crews to perform qualitative service



### Spare parts recommendations

With the right spare parts at the right location at the right time, turbine downtime is reduced to a minimum

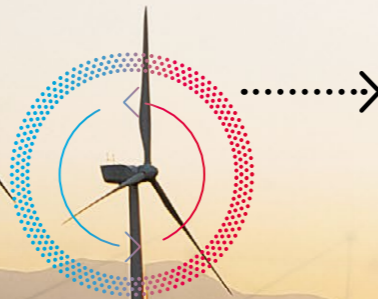


### Alert-based recommendations

Service recommendations based on live data from the turbine, driving the transition from reactive to proactive service

### LIFE CYCLE MONITOR

Performance data, SCADA data, CMS alerts



### GEARBOX EXPERTISE

Failure modes and solutions



### LIFE CYCLE ANALYTICS

Consumed and remaining lifetime analytics, alert-based recommendations



### DIGITAL BIRTH CERTIFICATE

Design models, as-built gearbox information



## More power output and reduced operational costs

ZF's "Services powered by Analytics" offering is a key driver for the Optimization of Operations and Maintenance of wind turbines. State-of-the-art analytics combine data from gearbox manufacturing and life cycle monitoring with advanced reliability models and gearbox expertise to enable spare parts optimization and a fast return to operation, increasing availability and output of turbines. Using data from the existing SCADA system, no additional hardware is needed to start experiencing the benefits of ZF's digital services.



### Benefits

#### Avoid downtime due to unexpected breakdowns

Reduce downtime by better management of predictive maintenance and spare part availability.

#### Get more energy out of every turbine

Increase the output of turbines operating at nominal value, without reducing the lifetime.

#### Spread the investment over time

Extend the lifetime of the gearbox using remaining lifetime estimates.



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