



Case-study – field validation

One year of real-time gearbox torque data, high accuracy, field validation and zero downtime on the sensor system.

Validated with

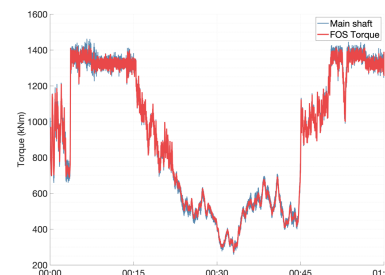
NREL

SiemensGamesa

Technical university Delft

Use-case

Field validation of fiber-optical sensing on a Siemens Gamesa 2 MW turbine at NREL's Flatirons campus. Proving that accurate, continuous optical gearbox load monitoring is ready for fleet-scale deployment.



Challenge

Gearbox failures remain the costliest maintenance event in wind. Existing vibration CMS detects damage already in progress but can't tell you why it happened — or give you months of warning. The industry needed a way to measure actual mechanical loads, continuously, in a real turbine environment.

Solution

Sensing360's fiber-optical sensor strip was retrofitted onto the ring gear of a Siemens Gamesa G97 2 MW gearbox at NREL campus, Colorado. The system streamed real-time input torque, rotational speed, and planet load sharing. Validated against NREL's calibrated main-shaft torque sensor.

Result

One full year of continuous operation. The sensor captured dynamic events that generator torque measurements miss entirely; start-stop transients, braking loads, and torque spikes. The system ran with 100% availability and zero maintenance throughout the campaign.

What we measured



Input torque

Real-time shaft torque at 100 Hz, validated against main-shaft reference sensor with <1% error.



Planet load sharing

Load distribution across all planet gears, detecting imbalance that causes accelerated wear.



Dynamic events

Start-stop transients, braking events, and torque spikes, invisible to generator measurements.

1 year

Continuous field operation

100%

Sensor system availability

<1%

Torque error vs. main shaft reference

0

Maintenance interventions sensors

Key takeaway

This field campaign proved that fiber-optical sensing delivers accurate, maintenance-free gearbox load monitoring in real turbine conditions. The technology is ready for serial deployment, both as OEM-integrated and retrofit. It enables a shift from vibration monitoring to load-based fleet management.