

# PARTIAL REPOWERING



## INTRODUCTION

Beyond re-rotoring and recontrolling options to improve the wind farm production, a **partial repowering** campaign is also an option which is fitting many operator's needs.

## CONCEPT

Drive train replacements, gearboxes, or even complete nacelle replacements rely on very accurate studies to address any structural risk on the long term, focusing on tower and foundations. Moreover these structural components must demonstrate a long lifespan to justify the investment, and may be also subject to selective reinforcements, plus a long term maintenance plan, site specific, fed with high quality predictive insights to deliver sound preventive actions.

## METHODOLOGY

In order to make sure the chosen re-rotoring solution is safe from technical perspective, the turbine will be evaluated in terms of:

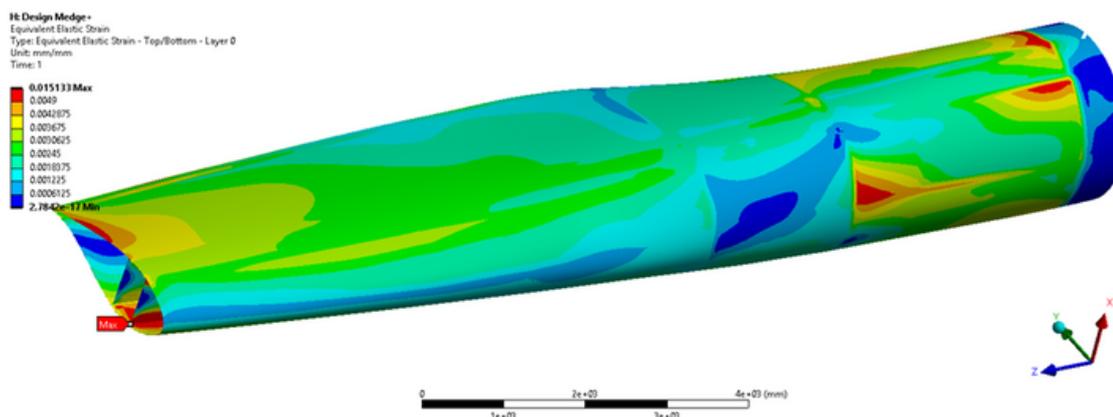
- **Extreme Loads:** ensuring that the solutions provided never exceed design loads (e.g. Vortex Generators increase maximum loads under gusts).
- **Blade deflections:** ensuring there is no risk of blade impact to tower surface (e.g. with longer blades or with controller modifications for higher nominal power).
- **Fatigue Life Consumption:** ensuring that new Life Expectancies with Power Upgrade solutions are inside Target for LCOE minimization (IRR Maximization).

In addition, the evaluation can be reinforced with state of the art engineering capacities, such as:

- **FEM - Finite Element Modeling**
- **FEA - Finite Element Analysis**
- **Damage Tolerance Analysis:**
  - Critical crack length (both elastic and plastic checks)
  - Crack Propagation Pattern
  - Leading to the build-up of the risk evaluation criteria for cracks, determining, given a certain crack and its length, how this crack will propagate and when will it become critical

- **Adaptation of Maintenance Protocols:**
  - Specific inspections and test to be done
  - Inspections Frequency
- **Detail definition of reinforcements**

**Blade FEM.**



## OUTCOMES

Nabla wind hub provides a full technical report providing all the Extreme Loads, Blade Deflection and Fatigue based Life Consumption analysis. Additional state of the art analysis will be reported if applicable.

## REFERENCES

**nabla wind hub** is an independent technology platform that delivers asset redevelopment projects for the wind industry worldwide. End-to-end & one-stop-shop partner for SPVs and Portfolios revaluation, through Life Extension, Performance Improvement and Maintenance Optimisation; based on state of the art technologies, such as top-accuracy aeroelastic models, in-house rerotoring components, and advanced monitoring solutions.



**600** wind farms assessed



**1200** sensors installed



**2000** blades installed



**+250** Wind Turbines monitored

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