

O&M ENGINEERING



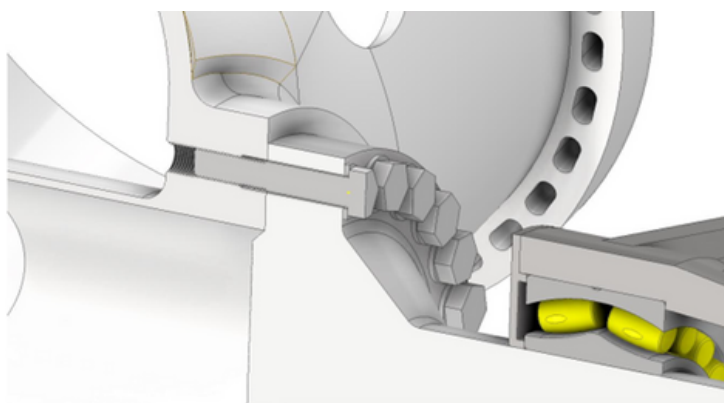
INTRODUCTION

For O&M contracts renegotiation under the best win-win conditions, or for O&M bidding, nabla inputs bring the key elements.

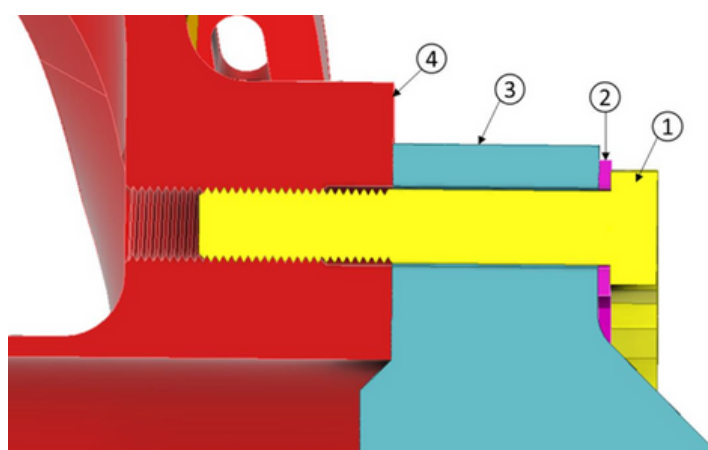
CONCEPT

Knowledge mitigates risk, which is directly translated into cost reduction. Nabla is specialized on optimising O&M, by its adaptation from a reactive scheme to a site-condition based preventive scheme, fed by high accuracy preventive inputs.

Once the results of the Life Expectancy Analysis (full or exploratory) have identified the time-to-failure of the different components, an FMECA – Failure Modes, Effects and Criticality Analysis per component that needs to be addressed in the Life Extension Plan will be carried out.



Detailed view of wind turbine Hub to Main Shaft Bolted Union.



Cross section view of wind turbine Hub to Main Shaft Bolted Union

METHODOLOGY

Such FMECA will consist of:

- **Failure Modes identification** combining the expertise of load vectors analyzed with component substructures load paths and materials.
- **Effects on the structure** describing the boundary conditions for the structural performance of the component and the affection of the compromised loads will be provided for better understanding of the problem and possible solutions.

- **Criticality**, evaluating the risk profile associated to such failure mode and deriving the recommended:
 - Containment Actions
 - Corrective Actions
 - Preventive Actions
- **Analysis of existing Maintenance Protocols** and best practices.
- **Completion of the Long Term Maintenance Protocols with the FMECA Maintenance Recommendations.**

OUTCOMES

Nabla Wind Hub provides a **Long Term Maintenance Recommendation Report** in which the identification of selective retrofits that need to be implemented according to different Life Extension investment scenarios, proposals for adaptation of O&M protocols against Loads, and identification of candidates for a selective CMS, based on all analysis performed plus maintenance the FMECA.

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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