nabla
wind hub

LIFE AND TECHNOLOGY DD

more info at www.nablawindhub.com

INTRODUCTION

Nabla wind hub's approach for supporting technical due diligences, in both vendor or acquisitor positions, offers key inputs for decision-makers supported by a solid methodology and strong expertise.

CONCEPT & METHODOLOGY

In the **Vendors side**, nabla has the methodologies and technology to unveil the life extension and performance improvement potential of the wind assets subject to rotation, and accompany the vendor for defending these assessments in the bidders sessions and Q&A. In this context there is normally time to run loads simulations, perform inspections and run reliability models.

The typical nabla will build the vendor TDD for wind assets based on:

- **Exploratory Life Analysis (P80),** to map the fatigue related risks in the long term and deploy preventive strategies for its delay or mitigation. This analysis can also unveil performance improvement potentials through tailor-made retrofits/partial repowering.
- **Reliability Models,** to map the random and non-fatigue related risks, so to complete the Exploratory Life Analysis picture.
- **Life extension inspections** (visual check in particular key points related to life extension programs).

In the **Acquisitor side**, lead times become critical, and there is normally no time for running loads calculation for all the assets under evaluation, in such case nabla provides the following approach:

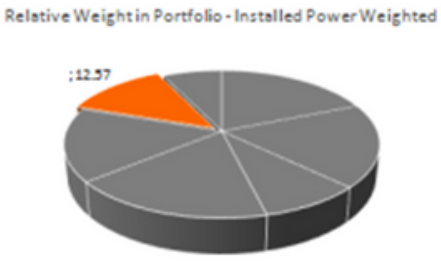
- **EYA review**, identifying Technology/setup risks and mitigations.
- **WTG design review**, identifying Technology/setup risks and mitigations, evaluating the suitability of the platforms in each of the site-specific conditions, in order to determine the potential for a long-term operation.
- **WTG life expectancy** (type vs site) giving a high level map of failure rates, fatigue and random events, plus recommended preventive actions. If lead time allows it nabla will recommend a representative part of the portfolio to be analysed under Exploratory Life Analysis.
- **Review of CAPEX/OPEX** Financial model assumptions.
- **Review of Vendor\'s life report**, if any.
- **VDR** GAPs, red flags, Q&A, meetings if needed, reports.

Turbine Model	[-]	Vestas V162
Power	[kW]	6000
Number of Units within Portfolio	[-]	
	[%]	
Installed Power within Portfolio	[MW]	42.0
	[%]	12.57
COD	[-]	

Design Class	[-]	

TIME-TO-FAILURE PER TYPE OF WIND FARM

Wind Farm	[-]	
Power	[MW]	6
Turbine Model	[-]	V162
TWR	[m]	
COD	[years]	
Mean Wind Speed	[m/s]	
Iu(15m/s)	[%]	
Alpha	[-]	
Air Density	[kg/m3]	
BLADE-HUB BOLTS		30
COMPOSITE BLADES		32
PITCH BEARING		32
PITCH ACTUATORS AND SUPPORTS		40
HUB		40
MAIN BEARING		32
MAIN BEARING SUPPORTS		40
MAINSHAFT		
Mainshaft-Hub Joint		30
Mainshaft Body		40
GEARBOX		20
MAINFRAME		35
YAW BEARING		30
YAW BEARING SUPPORTS		40
TOWER		40



OUTCOMES

In the **Vendors side**, nabla delivers a technical report including the life expectancies of the assets in addition to the reliabilities model and inspection reports. These reports can be supported by nablas technical teams during Q&A sessions.

On the other side, the output is materialized in a High Level Analysis report for the **Acquisitor**, which includes depending on the data available by in the VDR, the EYA review, WTG design review, WTG life expectancy and/or Vendors Life Expectancy report review, Review of CAPEX/OPEX and the identification of the GAPs.

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 Porftolios 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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