

P80 EXPLORATORY LIFE ANALYSIS

INTRODUCTION

A **P80 Life Analytical Assessment** to “see what is invisible”, identifies the Life Expectancy per turbine component per wind farm, and detecting and evaluating causes that may lead to a premature time to failure which are not visible during a practical assessment.

CONCEPT

When a fast and accurate beyond market standards analysis of assets is required to be performed, nabla applies a **multivariable, simultaneous and coupled analysis of structural life consumption** (i.e. wind and operation conditions and turbine morphology and sensitivity) of wind turbines Security SSCs (SSC – Structure, System or Component), modeled and analyzed per each wind site in order to:

- **Redefine Design Life of turbine components** according to each wind site specific conditions.
- And provide **the most effective Damage Mitigation strategies** based on the causes and the avoidance of most life consuming conditions.

METHODOLOGY

As a simplification of the P90 Full Life Analysis, in the **P80 Exploratory Life Analysis**, the effect of the real conditions on the turbines are merged and evaluated together in a simultaneous and coupled analysis by means of a **Aeroelastic Loads Calculation** for which the turbines dynamic performance is simulated according the specific conditions (turbine morphology, site conditions, detail operation conditions and type of materials) and compared with the design conditions.

In this case each wind farm is considered as a representative position in which the site conditions are the same and the loads are performed from the main wind direction, in order to obtain the Life Expectancy Results in a short delivery time.

The process for the Analysis and its details are protected by a WO PCT “International Patent” by nabla wind hub **PCT/ES2013/070537 (WO2015/011301)**.

OUTCOMES

Nabla wind hub delivers a technical report per wind farm with the Life Results (Time-to-Failure) of the turbine components with the identification of selective retrofits necessary to achieve different Life Extension Scenarios. Inputs, processes and results.

Wind Farm	[-]	Vale Grande-Burrela	Arouca-Silva	Toita
Power	[MW]	24	42	36
Turbine Model	[-]	V90	V90	V90
Start-Up	[year]	2009	2009	2009
Annual Speed	[m/s]	5.21	6.18	5.75
Iu(15m/s)	[%]	14.00	13.00	19.00
Inflow	[deg]	6.20	9.14	3.30
Alpha	[-]	0.24	0.12	0.14
Air Density	[kg/m3]	1.14	1.14	1.14
Availability	[%]	95.44	97.20	96.92
COMPOSITE BLADES				
	Composite Root	22	22	21
	Section R1	22	23	22
	Section R3	23	23	24
	Section R6	26	26	27
	Section R10	30	31	35
	Section R14	35	35	35
	Section R18	35	35	35
	Section R22	35	35	35
	Section R26	35	35	35
	Section R30	35	35	35
	Section R34	32	35	33
	Section R38	28	32	30
	Section R42	22	26	27
	BLADE - BEARING - HUB BOLTS	21	18	20
	PITCH BEARING	35	35	35
	PITCH ACTUATORS AND SUPPORTS	35	35	35
	HUB	35	35	35
	MAIN BEARING	22	26	24
	MAIN BEARING SUPPORTS	35	35	35
	MAIN FRAME	30	32	30
	DRIVE TRAIN MOUNTING	22	26	24
	DRIVE TRAIN / GEARBOX	9	9	7
	YAW BEARING	35	35	35
	YAW BEARING SUPPORTS	35	35	35
	TOWER			
	Section H8	28	32	32
	Section H16	35	35	32
	Section H24	35	35	32
	Section H32	35	35	32
	Section H40	35	35	35
	Section H48	35	35	35
	Section H58	35	35	35
	Section H68	35	35	35
	Section H76.8	35	35	35
	FOUNDATION	26	28	27

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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