Bel'EoL

At the meeting point between art and technology, the nov'turbine is a vertical axis wind turbine with an aesthetic design. Its small dimensions and silent operation facilitates its integration in any urban and remote landscapes. It is especially designed to help dwellings, communities and businesses reducing their electricity bill and carbon footprint by producing their own green electricity from an endless source...

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BeL'EoL why ?

1)Quality

1.a) Designed AND manufactured in France

The BEL'turbine has been designed and developed by a team of motivated engineers convinced that the future of domestic wind generation belongs to silent, aesthetic, reliable and well-performing turbines.
We chose to keep both design and manufacture in France in order to better control the value chain and to react shortly if needed while reducing our carbon footprint.
The assembly of the nov'turbine takes place at our factory near Poitiers.

1.b) Up to 10 years warranty

Our warranty is among the longest in the world! Indeed the nov'turbines are guaranteed for 5 years, extensible to 8 or 10 years. It is our way to prove that we are confident regarding the quality, the performance and the reliability of our products.

1.c) Service life of 30 years minimum

BelEol components come from the best manufacturers in the world, especially our ball bearing provided by SKF World-number-one and our inverter from Power One, currently World number two, etc. Furthermore, in order to ensure a long life service, we chose to limit the number of wear parts to the ball bearing and the generator only, while increasing their sizes. The generator is therefore maintenance-free and the ball bearings (bigger than large truck ones!) are lubricated by your installers; that way, you are sure to always have a well- performing wind turbine.

2) Reliability

2.a) Site assessment for wind energy potential

We systematically recommend going through a site assessment prior to installing a wind turbine in order to evaluate the potential for wind power generation. This study will measure the average wind speed at the location chosen for the installation, which determines the average Annual Energy Production forecast. This is a key step before investing in a wind turbine!

2.b) Safety break

Most of the wind turbines are usually only equipped with a unique “electromagnetic break”, which short- circuits the generator in case of problem. However this operation tends to heat the components, which reduces components life span but can also damage the whole equipment. The nov’turbine therefore has two breaking systems to insure a complete safety, among which, a mechanical break, known as “failsafe A”. Beyond being a requirement from the current IEC* standard, the break insures rotational speed control even if the turbine gets disconnected from the grid or if the system turns out to be out-of-order.

*International Electro-technical Commission 61400-2-2006: Design requirements for small wind turbines

2.c) Compliance with standards

Small Wind Systems must meet the IEC 61400-2 standard, requiring a number of safety and performance criteria. From the start, the nov’turbine has been designed according to this standard. Be aware though, despite the existing IEC 61400-2, a certain number of wind turbines and manufacturers still do not respect this standard.

2.d) Real time surveillance

Thanks to an electronic control card, the BEL’turbine is monitored in real time. In case of a problem, we are immediately informed and can therefore, fix your turbine shortly; one more key element again that ranks the BEL’turbine among the most reliable wind turbines.

Bel'EoL

Specs ?

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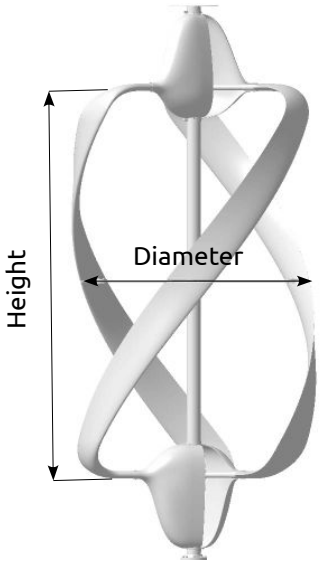
Specs ?

Family

Height :	2.8 m
Diameter:	1.7 m
Mast:	6, 9 ou 12 m
Cut-in speed:	3 m/s
Cut-out speed:	20 m/s
Maximal speed:	52.5 m/s
Swept area:	4.76 m²
Nominal power:	2 kW (1.2 kW at 11m/s)
Electrical output :	230 V / 50 Hz Batteries
Break:	Mecanical integrated safety ("failsafe") + electromagnetic
Working temperature:	-20 °C to 50 °C
Warranty :	5 years (ext. 7 or 10 yrs)

Estimated service life of over 30 years.



Collective

Height:	4.8 m
Diameter:	1.7 m
Mast:	9, 12 ou 15 m
Cut-in speed:	3 m/s
Cut-out speed:	20 m/s
Maximal speed:	52.5 m/s
Swept area:	14.55 m²
Nominal power:	6 kW (3 kW at 11m/s)
Electrical output:	230 V / 50 Hz Batteries
Break:	Mecanical integrated safety ("failsafe") + electromagnetic
Working temperature:	-20 °C to 50 °C
Warranty :	5 years (ext. 7 or 10 yrs))

Estimated service life of over 30 years.

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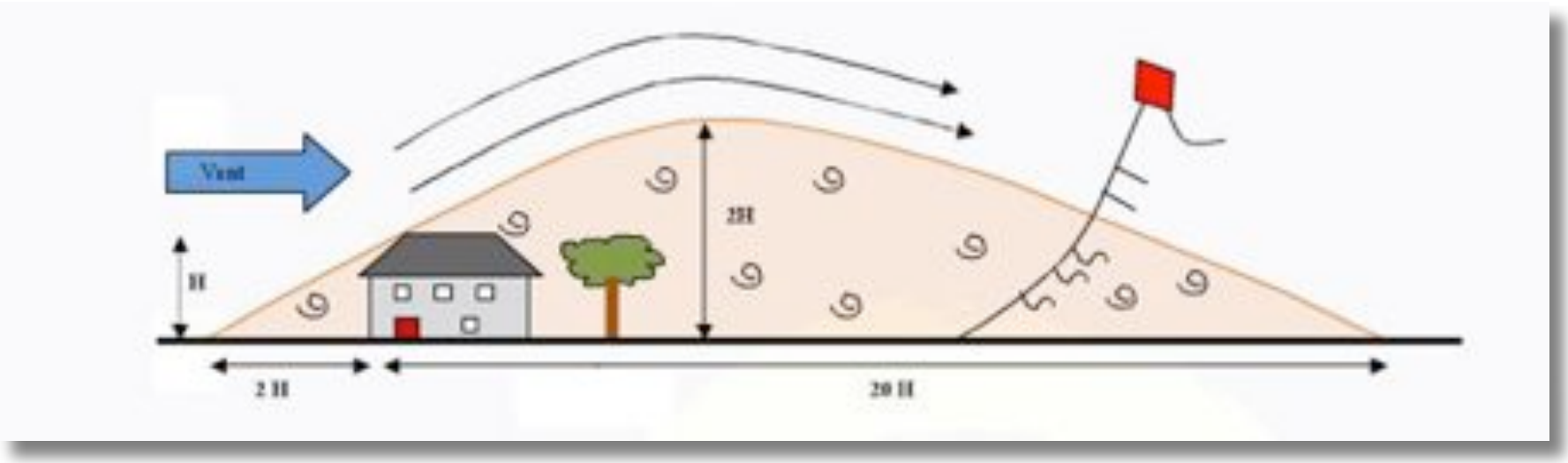
Bel'EoL Specs ?

Instant power is function of wind speed. As soon as a there is a breath of air (3m/s), the nov'turbine begins to rotate and generates more and more power until the wind is as fast as 15 m/s. If the wind goes stronger, the control card automatically regulates the rotation speed, enabling a complete safety. After 20 m/s, the turbine is automatically stopped.
The annual energy production of the nov'turbine can be estimated from the wind speed at the exact location of the installation and by using the graphs below. The graphs are given for obstacle-free space with a Weibull coefficient of 2.

turbulence zone of wind



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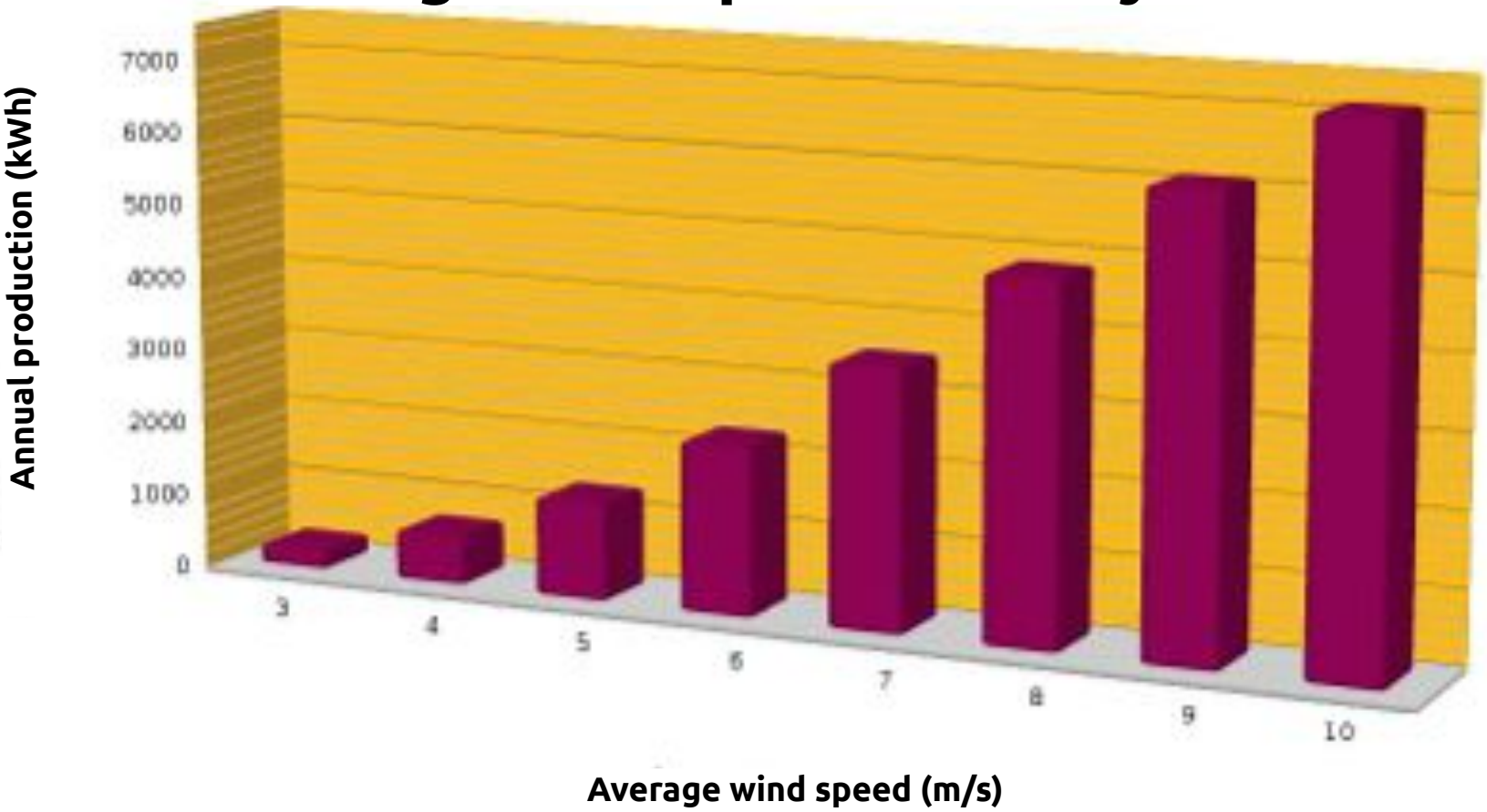
Bel'EoL

Specs ?

Annual production for various average wind speed – Family model



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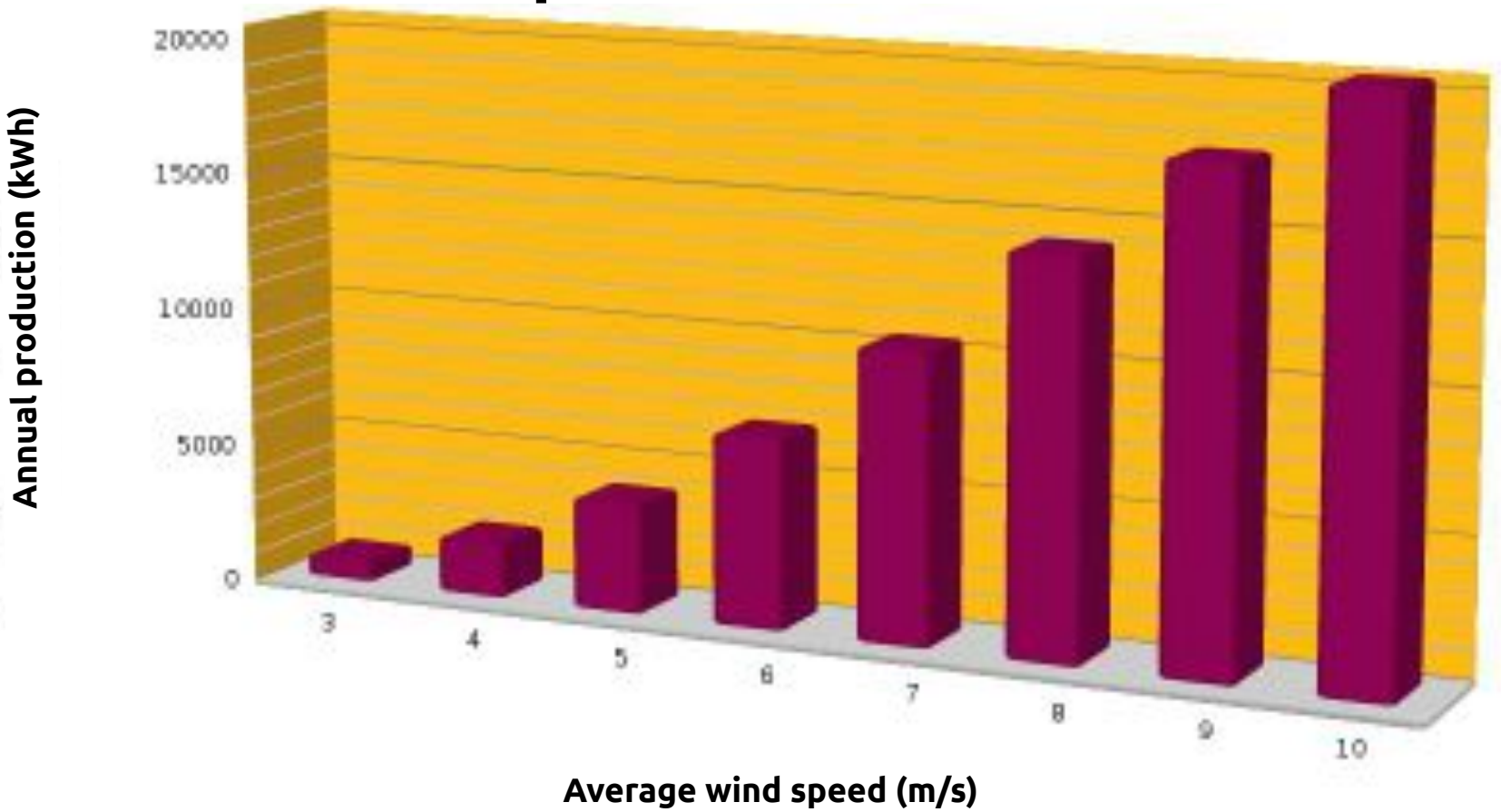
Bel'EoL

Specs ?

Annual production for various average wind speed – Collective model



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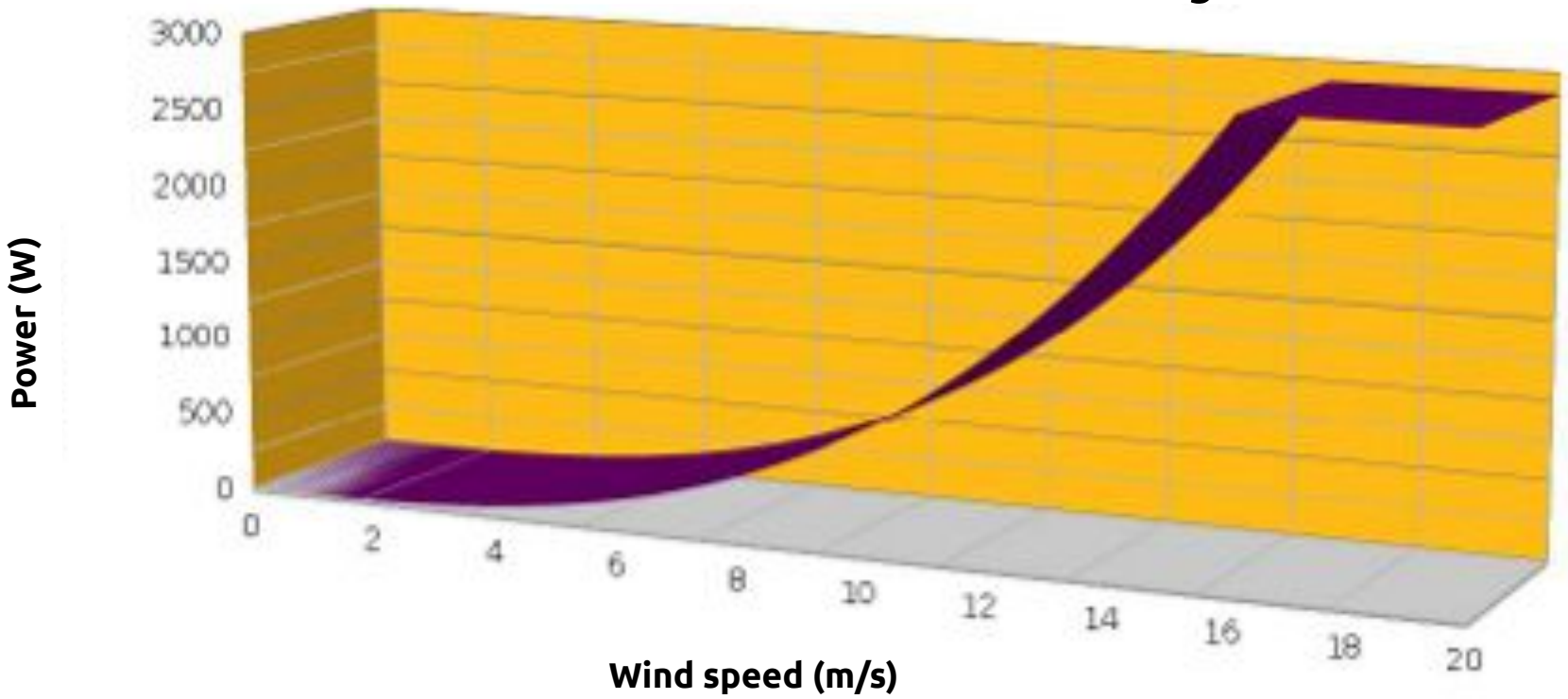
Bel'EoL

Specs ?

Power curve – Family



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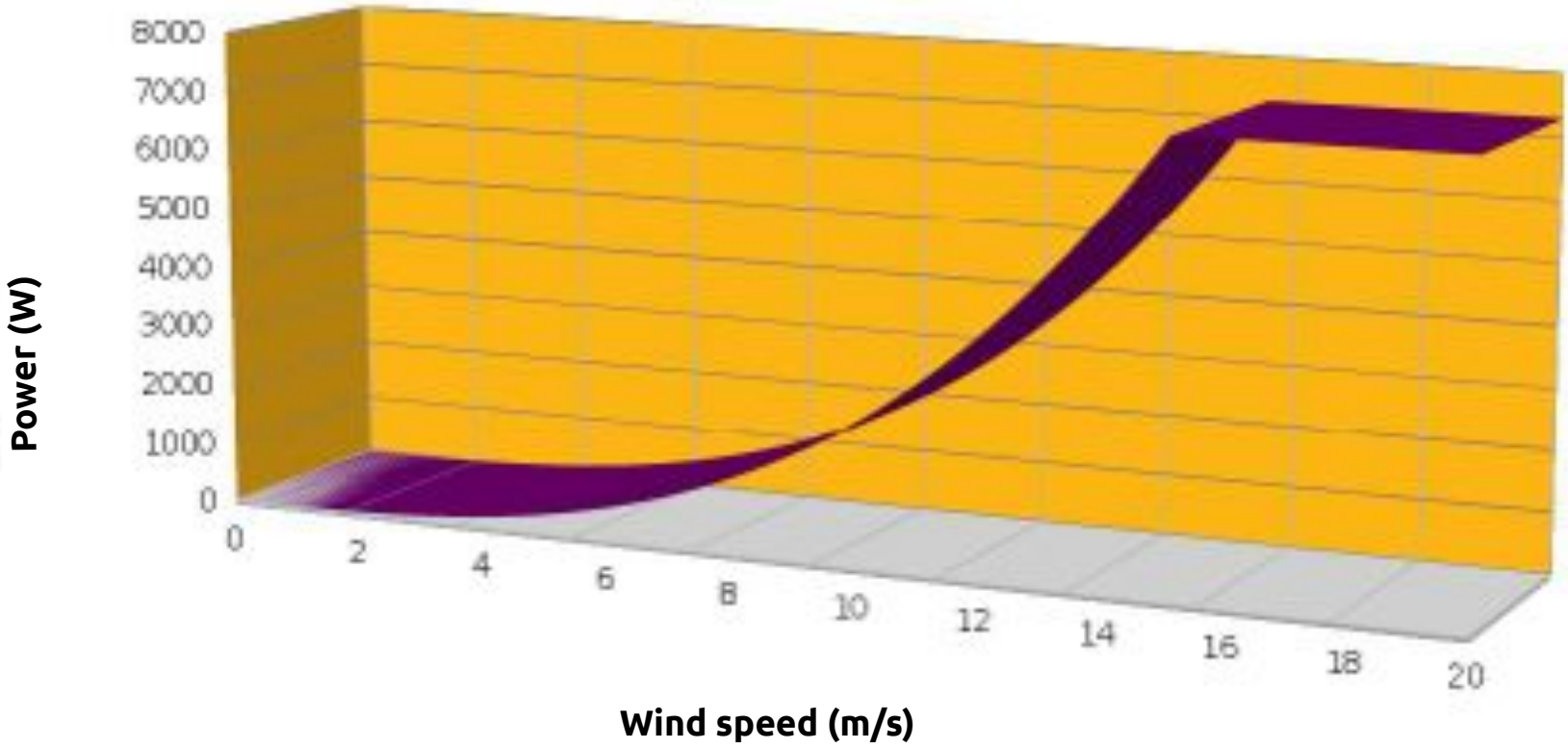
Bel'EoL

Specs ?

Power curve – Collective



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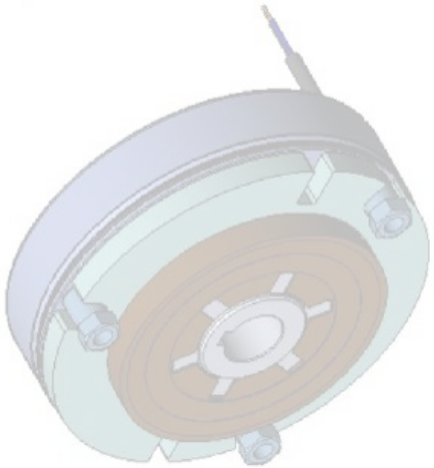
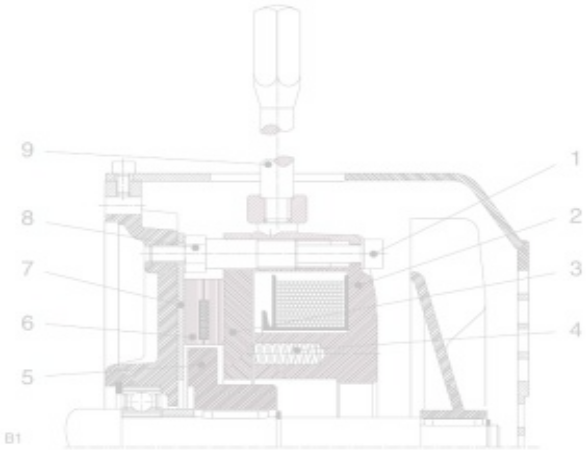
BeL'EoL

Regulations ?

The control of the nov'turbine is ensured by an electronic card.
Its role is to protect the turbine, managing several break modes and evacuating heat due to overproduction. In order to maximize the efficiency of the wind power, it has been fitted with an internal controller that automatically adjust the rotational speed of the turbine.





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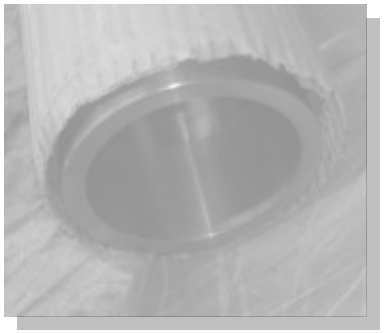
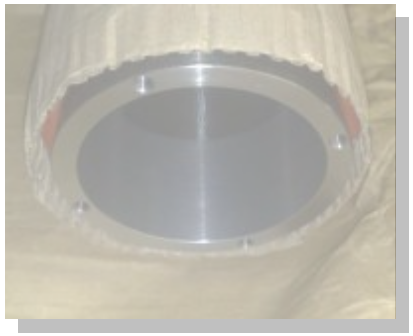
Bel'EoL Generator ?

The mechanical energy is converted into electricity thanks to the permanent magnet generator. This permanent magnet has multiple key advantages, one being that it doesn't require any maintenance. The generator is directly driven by the blades, without any speed multiplier, which allows again less maintenance.

CHARACTERISTICS	Family & Collective model
Type	Three-phase synchrony – permanent magnet generator
Transmission	Direct (speed multiplier-free)
Nominal tension at power and nominal speed between phases	230 Vac
Number of poles (pair of poles)	24 (12)
Others	Low cogging to start in low-speed winds
	Zero-maintenance





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Bel'Eol Inverter ?

The inverter converts direct tension into alternative tension. When the inverter is parallel to the electricity provider network, the alternative current generated by the inverter circulates inside the local domestic network. The wind power may thus feed all the electric devices.
If the electricity generated by the turbine is not sufficient, the surplus will come from the grid.

CHARACTERISTICS	Family model	Collective model
Type	Without transformer	
Yield	96,8 % (Euro of 96 %; 96 % CEC)	97 % (Euro 96.4 %)
Input tension range	600 Vdc	
Regulation	MPPT	
Output tension [Vrms]	Single-phase 200 – 245 Vac (180 – 264 Vac)	
Nominal frequency	50 Hz	
Current distortion AC	<2% THD	
Environmental protection level	IP 65 (NEMA 4)	
Space required H x L x P mm³	550 x 325 x 210	740 x 325 x 195

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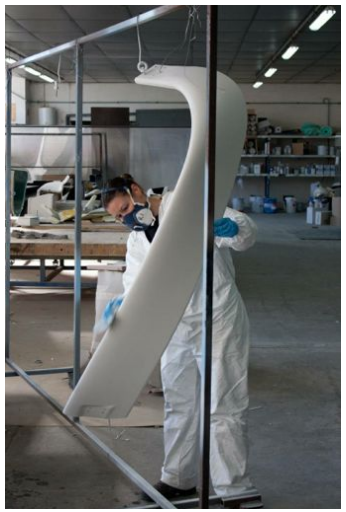
Bel'EoL blades ?

The geometry of the nov'turbine's blades results from years of research and investment in R&D resulting into this unique, patented, silent and performing design.

CHARACTERISTICS	Family model	Collective model
Number of blades	3	
Maximal rotation speed	350 rp.min^{-1}	205 rp.min^{-1}
Construction materials	Metal + plastic + composite	



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Bel'EoL Permits ?

Small wind energy installations require planning permission and local consultation with relevant stakeholders, such as neighbours. Deciding factors include environmental considerations, access to the site, noise and visual effect. Getting planning permission can be a barrier to householders wishing to install microgeneration technologies.

More specific : you need a local authorisation, or limited constrcution permit. This needs to be asked at the local planning authority for mas hights until 15 mtr. Higher masts (+15 mtr) need to be asked on province level.

Important is to mention :

- low noice level <35 dB
- no shadow effects
- picture of the turbine

For removable bases no permit is needed. But check with local authority.

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Bel'EoL Installation ?

See picture flow on website

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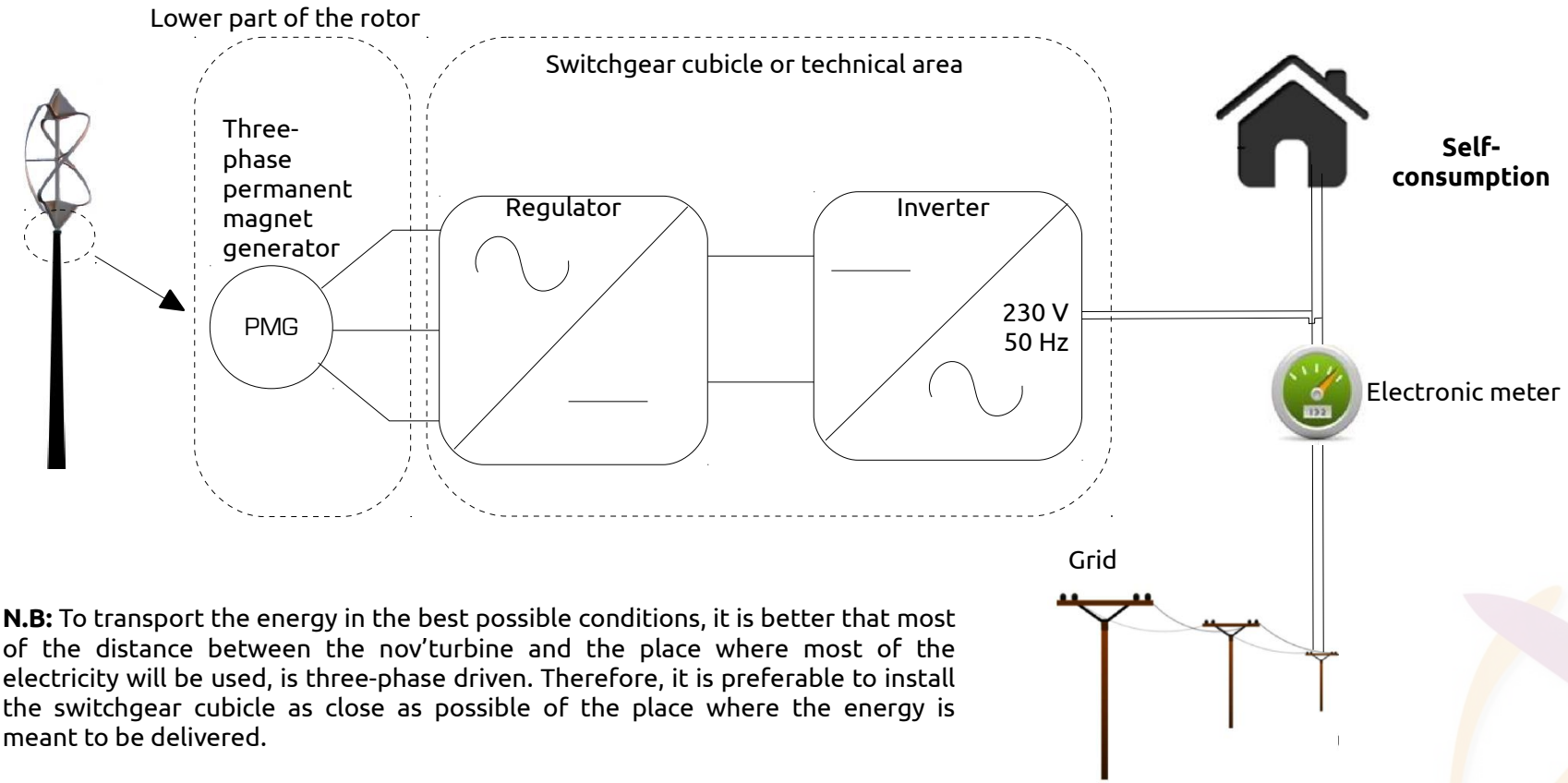
Bel'EoL Electrical ?

If the electricity produced is for self-consumption, the installer, following the simplified functional scheme below, must do the set-up and the delta connexion:



N.B: To transport the energy in the best possible conditions, it is better that most of the distance between the nov'turbine and the place where most of the electricity will be used, is three-phase driven. Therefore, it is preferable to install the switchgear cubicle as close as possible of the place where the energy is meant to be delivered.

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Bel'Eol Installation ?

Minimal distances have to be respected.
- General rule is to stay at least the height of the turbine away from the neighbours.
- Respect the distances between different turbines.
- Do not construct in turbulent wind zone (see page 8)

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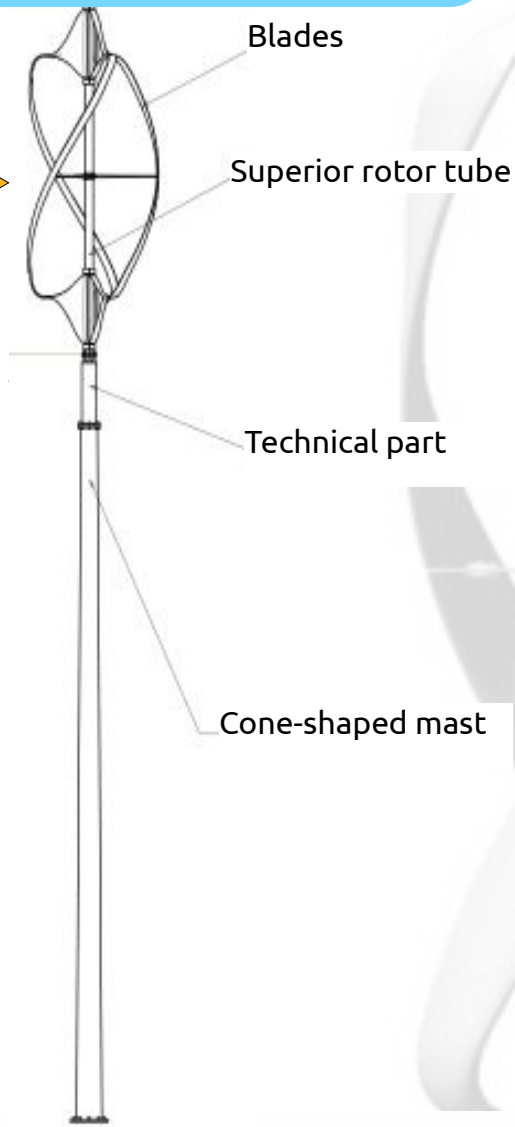
Bel'EoL Installation ?

Loads due to extreme wind :
Family 5 kN
Collective 15 kN

Mast heights include the technical part (see scheme->)

CHARACTERISTICS	Family model	Collective model
Mast weight 6 m (kg)	240	/
Mast weight 9 m (kg)	340	560
Mast weight 12 m (kg)	440	735
Mast weight 15 m (kg)	/	910
Technical part weight (kg)	145	260
Superior rotor tube weight + blades (kg)	175	285
Electronic power weight (kg)	35	40



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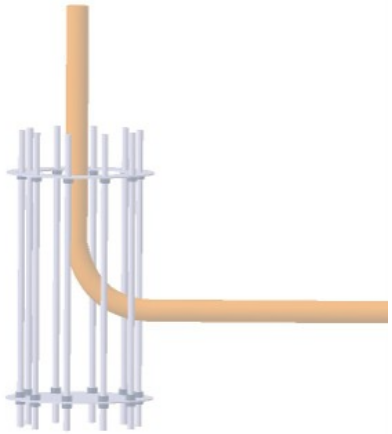
Bel'Eol underpin ?

It consists in making a reinforced concrete block adjusted to the height of the selected mast and the type of soil where the Bel'turbine is be installed.
Anchorage shanks fixed into the concrete will help to anchor the mast to the ground.
Noveol supplies shanks and anchor bolt. Note that an investigation regarding the nature of the soil is mandatory before each installation. It will help to determine the dimension of the block.
The grounding, following standards prevailing locally, will also be realised during this part of the process.
Only professionals authorised or certified by BelEol should execute underpinning (therefore please insure that installers have received such authorisation beforehand).



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Bel'Eol underpin ?

Example of base for a 12 mtr mast.

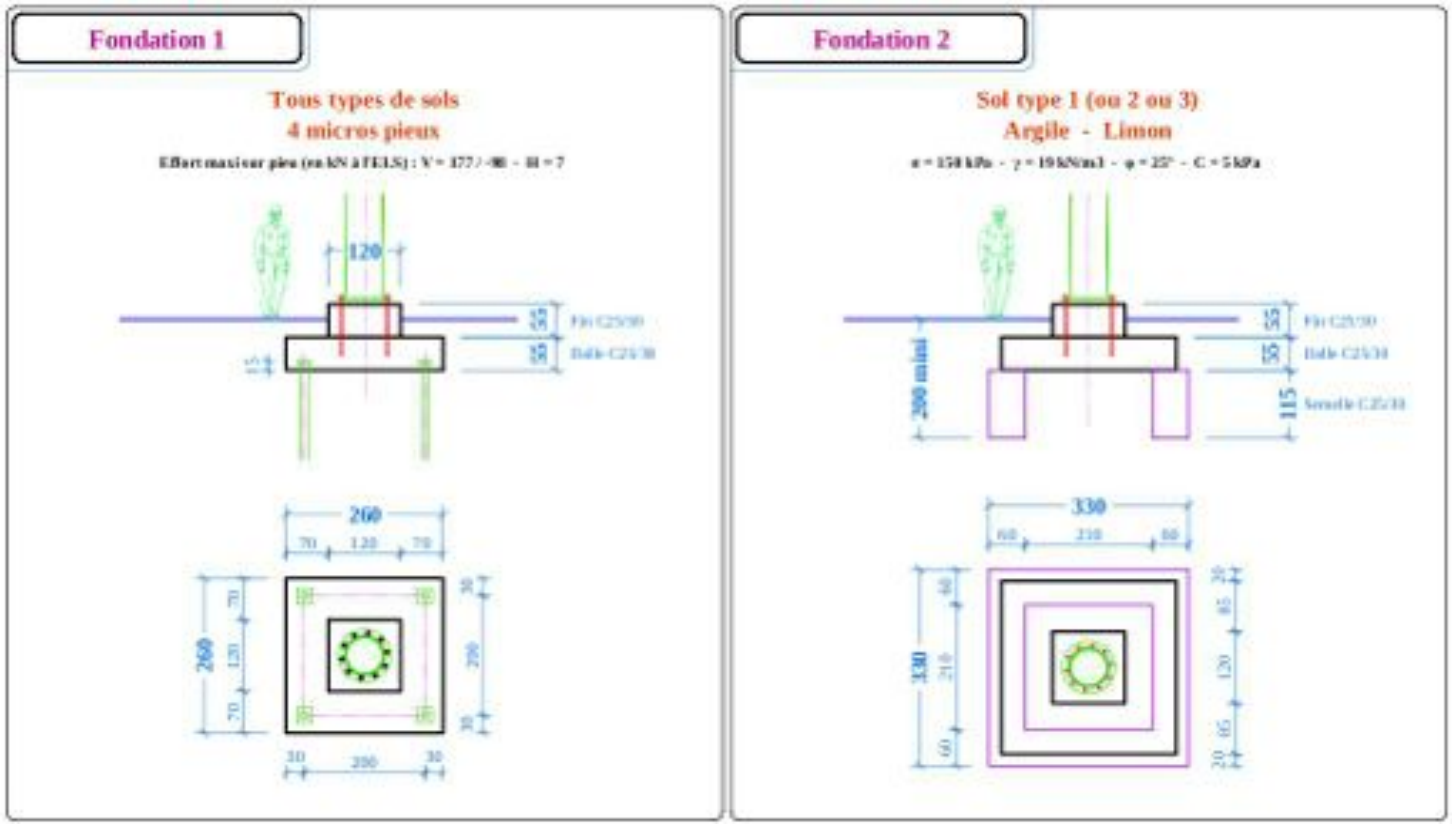

Figure 3: Indication only this data can be modified without notice.

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