

ENERKITE

AIRBORNE WIND ENERGY



USING STRONG AND CONSISTENT HIGH ALTITUDE WINDS WITH FULLY AUTOMATED AND TETHERED KITESYSTEMS

ECONOMY

- › Doubling the annual wind energy production at the same power
- › Up to 6,000 full load hours onshore
- › Suitable for low wind sites
- › Halving the levelized cost of energy
- › Short return on investment

SUSTAINABILITY

- › 100% renewable energy
- › 95% less material consumption*
- › 75% less carbon footprint*
- › Saves up to 200,000 l diesel or 540t CO₂ p.a.**

*related to the yield of conventional wind turbines

**EK 200 at 6,000 full load hours

AUTONOMY

- › Mobility, portability, flexibility
- › Integrated, expandable storage
- › Halving storage demand for secure supplies
- › Enabling renewable autonomy at grid parity
- › Easy dismanteling and repowering



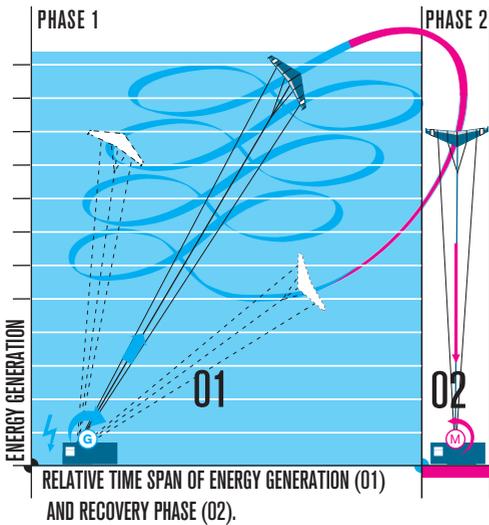
Prospective deployments from stand-alone to onshore and offshore arrays.

HOW IT WORKS

PRINCIPLE

CYCLIC PRINCIPLE

EnerKites operate in two phases according to the so-called reverse Yo-Yo concept. During the generation phase the wing flies cross-wind, unfurling the three tether lines with optimal force and speed.



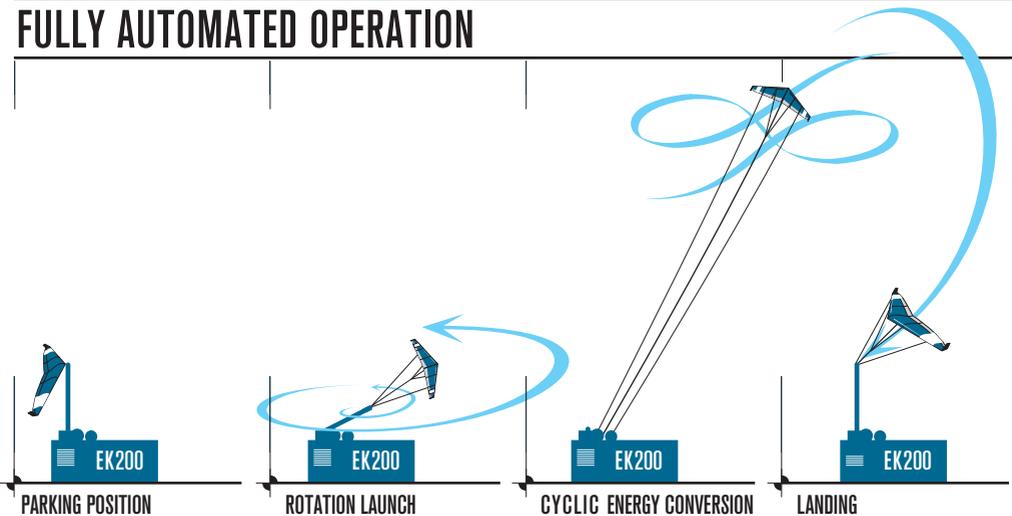
The ground station generates electrical power from the torque of the tether whilst the two outer leashes are steering the wing using differential drum drives. During the recovery phase the wing returns to the starting point as fast and smooth as possible with minimal energy consumption.

High torque and tether forces are enabled by the high lift configuration of the ultra-light semi-rigid wings. For quick and smooth retraction the wings are designed for minimal lift and passive stability.

EnerKite's unique concept reduces the masses, the energy demand and the required functionality of the expensive airborne part to a necessary minimum while guaranteeing high efficiency and durability of the wings, redundant tether and drive train configuration.

With the priority for an overall high and affordable level of safety, *EnerKites* will operate very efficiently and fully autonomous.

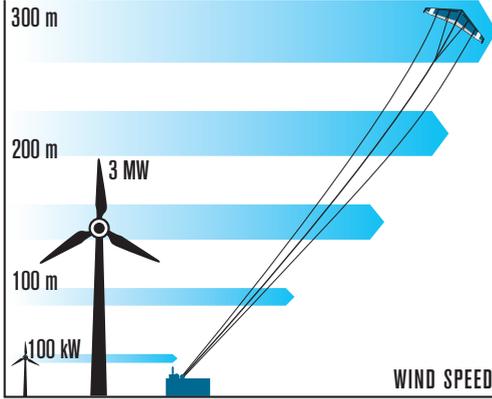
FULLY AUTOMATED OPERATION



FLYING HIGH

HIGH ALTITUDE WIND

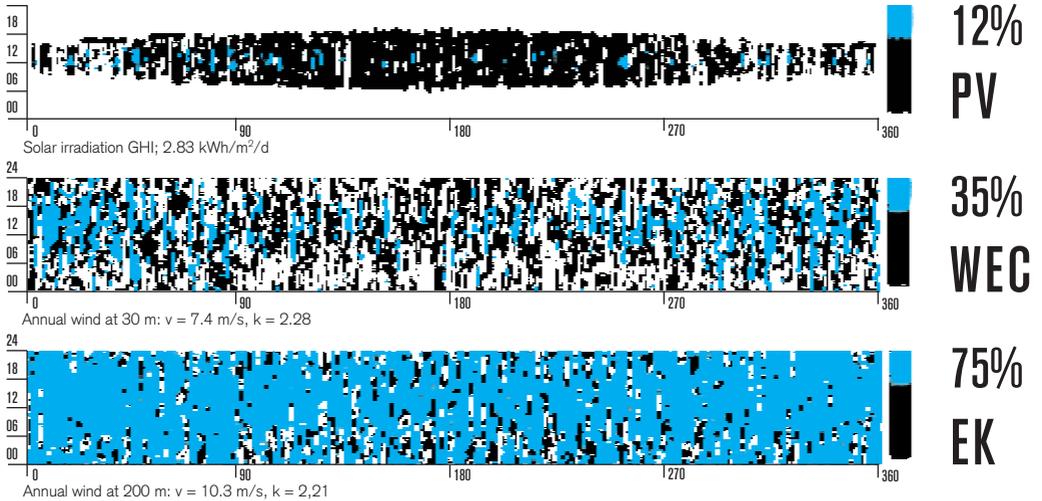
ALTITUDE & WINDSPEED



Advanced materials and intelligent control technologies enable harnessing strong and consistent high-altitude winds. *EnerKite's* airborne wind turbines harness energy in altitudes where resources are almost inexhaustible. And the kite finds the local and time depending winds to catch them in the most efficient manner.

EnerKites are able to generate energy in 90% of the time and therefore assure high availability of the nominal power e.g. capacity factors of 70% and more. In combination with suitable storage systems, the secured renewable energy supply is possible without massive ground-based grid expansion.

CAPACITY FACTOR



In order to increase the steadiness of power production, *EnerKites* use two strategies. First: To harness the energy above the blade tips of today's wind turbines. Second: To use ultralight semi-rigid wings designed for very low nominal wind speeds. The calculated annual yield of the EK200 illustrates:

EnerKites may generate twice as much electricity in comparison to a conventional wind turbine and gains six times the yield of a photovoltaic plant with equal installed power. *EnerKites* have almost baseload capability and drastically reduce the demand for storage systems or diesel in autonomous island grids.

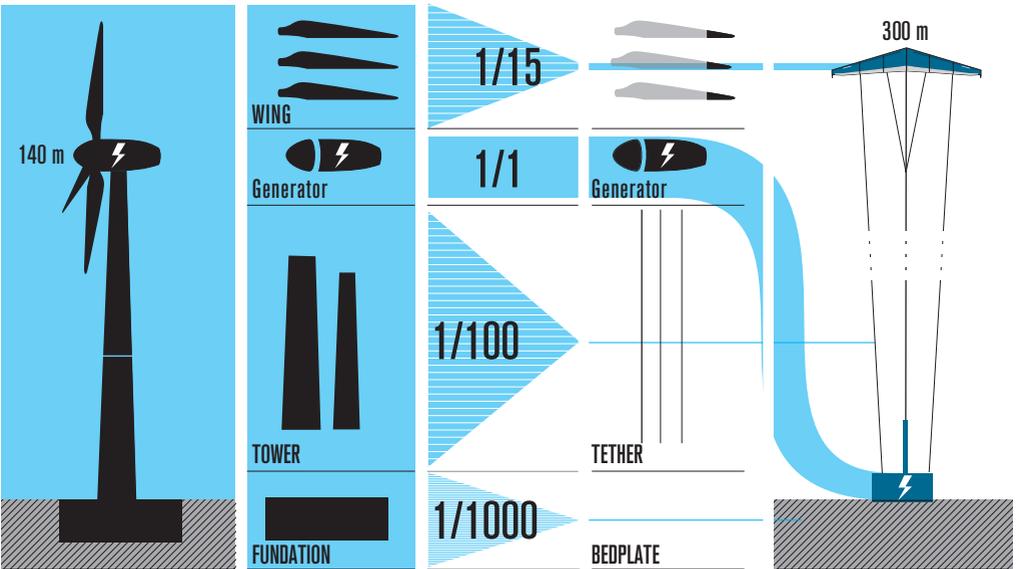
LESS IS MORE

95%^{*} SAVINGS

In order to use strong and persistent winds with conventional wind turbines 1,000 tons of steel and concrete per installed megawatt are necessary. Resources for energy storage and net expansion come along. With a doubling of the energy yield at 95% savings in material, a 75% improved carbon footprint* and less variation in the availability of wind power *EnerKite* defines new goals in terms of the efficient use of resources and towards 100% renewable energy.

*related to the energy yield

RESOURCES TURNAROUND



**25-35%
CAPACITY FACTOR**



**10%
MATERIAL**



**50-70%
CAPACITY FACTOR**

at hub heights of
80 - 140 m

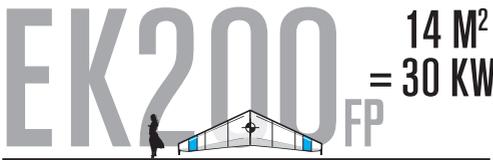
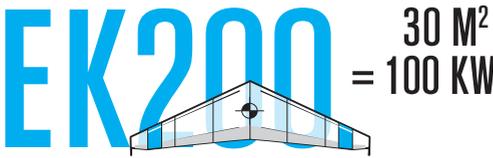
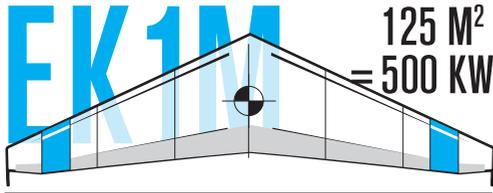
75% smaller
carbon footprint

at operational altitudes
between 80 - 300 m

PRODUCTS

ROADMAP

SCALING UP

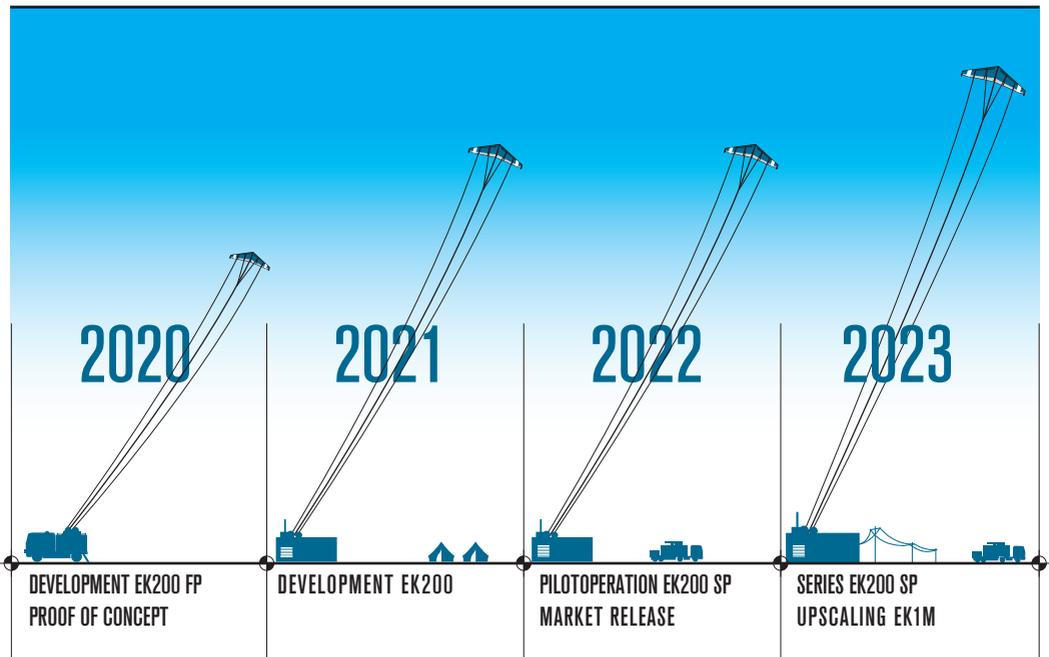


Stationary and mobile container-based small wind turbines with up to 100 kW nominal power develop existing and new applications in a dynamically growing market. For the user, wind electricity will become in the long run cheaper and more projectable than energy supply from conventional power plants or diesel generators.

Megawatt-*EnerKites* will be able to convert wind energy economically at grid parity, i.e. without feed-in tariffs. So far undeveloped sites in the low wind inland, in complex terrains or at greater ocean depths can now be utilized economically.

Besides scaling up in rated power the industrial upscaling and serial production brings significant potential in cost reduction.

ROADMAP



INVESTMENT

IT PAYS OFF

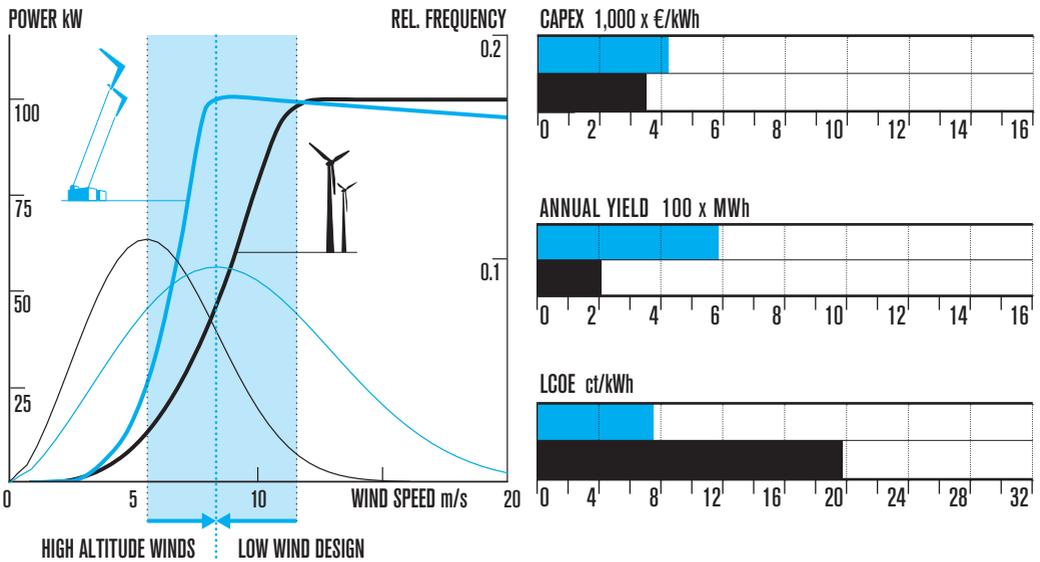
100 kW SYSTEM COMPARISON

ENERKITE EK200

WINDTURBINE 100 kW

EnerKites operate at a multiple altitude compared to the hub heights of conventional wind turbines. Rated wind speed can be chosen to equal the annual winds at high altitudes.

Thus, even at almost equal capital expenses the almost tripled annual yield leads to leveled cost of electricity in the range of 6 - 9 euro cents.



INVEST

For product development and market entry of this game-changing and patent pending technology *EnerKite* offers company shares and shareholder bullet loans. Since 2010, based on valuable results, breakthroughs and funding, the company value has increased constantly.

Strategic and impact investors are welcome. Based on confidentiality we are glad to present our prospective products, the outperforming team and technologies more in detail.

Sample calculation for a reference site:
Annual wind 5.5 m/s at 30 m, roughness $z_0 = 0.1$, Railegh-distribution $k = 2$.

EnerKite was founded 2010 with the goal to develop and bring to market airborne wind energy systems. The foundation of the *EnerKite GmbH*: 25 years of experience, expertise and excellence in the field of wind energy, flight mechanics, control and automation and all above kite technologies. In only 12 months, the mobile 30kW pilot - a standalone airborne wind energy system was built as the base for technology development and demonstration. The interdisciplinary team covers cross-system

competences and is supported by leading research partners and an advisory board with managers from relevant industries. The EK30 represents the proof of concept for robust ground-based conversion and controls, efficient semirigid ultra-lightweight wings and the autonomous launch and landing system. These unique selling propositions have convinced one of the largest energy utilities to join *EnerKite* on its path thru development, validation and market introduction.

CONTACT

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