

# 20 - Automatic Launch, Storage and Re-launching for a Kite Power System

For thousands of years man has used the wind in all types of ways, from the Persians using it to grind their grain to the Spaniards harnessing wind power to sail to new continents. Modern wind turbines started getting developed and studied during the end of the 18th and beginning of the 19th century, some of the forefathers that laid the fundamentals of this pioneering technology are C.F.Brush, P. la Cour, A. Betz and P.C. Putman. During the 1970s a large energy crisis shook the world, incentivising the research of new ways to harness clean renewable energy. One of these methods is using airborne wind energy (AWE), where the conversion of wind energy into electricity occurs thanks to a tethered flying object. The start-up Kitepower (Delft) was founded believing that this is the future of an efficient wind harnessing system where one of their main challenges is operating this system fully autonomously.

## Mission Objective

As stated previously, one of the primary difficulties Kitepower and other AWEs are facing is automated operation. Currently, a group of people is needed to deploy and retrieve these kites in a safe manner. The objective of this project is to provide a system that fully automates the landing, storage and re-launching process of an AWE system using soft kites. The aim is to have a fully functioning system commercially available by the year 2030. It goes without saying that the launching and landing have to be as reliable as possible, and the soft kite will be safely stored in a compact manner. Lastly, one of the requirements from the stakeholders is for this system to work in remote locations so it may be used across the world.

## System Design

After a careful trade-off process, a final concept was chosen. The selected concept was the "Off-set Winch Launch", where a swivel access point is set at a certain distance from the main container where the kite is located. The winch then reels in at a certain speed allowing the kite to rise, carrying this out multiple times is known as step-tow launch. This allows the kite to achieve really high target altitudes. In the main container, the landing tower and winch will be located whereas the off-set container contains to the battery which will also serve as an anchoring point. Regarding the landing, when the kite is reeled in, the leading edge tether will direct the kite to the tower reliably. Once the kite has landed, it will be clamped to the tower and the rolling storage system will start rolling the kite itself. It is also worth mentioning that when wind speeds are high enough the system is also able to launch the kite directly from the top of the tower. The

system has been designed in such a way that it can be fully transported inside a 20ft container, except for the battery container. The battery ensures a constant supply of energy to the grid and stores the required energy for the operation of the system.

