

Foldable Box Kites for Generating Electricity (#8185)

A robust box-kite design to better capture wind energy and increase generation significantly.

Georgia Tech inventors developed a system comprised of foldable box kites to harness wind energy at high altitudes (>300 m). Two foldable box kites are flown to a prescribed altitude by unreeling the tether from their respective spools. One kite, set in generation mode, remains unfolded and ascends further by unwinding the tether from the spool drum. Simultaneously, the other kite is set to retraction mode, where it folds and retracts toward the ground by the winding action of another spool drum that is connected to the first kite's spool drum. This rotary motion of the first kite's spool drum powers the connected generator mounted on the ground. The efficient and quick folding mechanism of the kites during retraction significantly lowers the aerodynamic forces on the wings, and therefore lowers the energy expenditure for retraction. Upon reaching a specified altitude difference between the two kites, the generation and retraction modes are switched, thus reversing the kites' vertical movements. By alternating the kites between generation and retraction modes using autonomous control, a continuous positive net power output can be generated.

Benefits/Advantages

- **Robust** – dynamic stability enables much easier control of the comprised of box kites
- **Increased generation** –the kite can access and capture much stronger and steadier winds
- **Simple** – components are easier to manufacture and install and maintain
- **Cheaper** – much less expensive than tower-based turbines

Potential Commercial Applications

Market Entry Customers:

- On-site kite energy systems to communities, businesses, residential housing positioned in remote, off-the-grid locations
- Energy from large, off-shore wind farms to utilities companies

Background/Context for This Invention

Harnessing wind energy has been possible for decades with the help of conventional turbine towers. Recent advances in offshore turbine technology have begun to yield a cost of energy that is competitive with nuclear and fossil fuel energy generation. However, there are many opportunities for improvement of wind power generation techniques. First of all, turbine towers require a massive capital investment and hundreds of tons of materials to build at the scale that is necessary to be competitive, and costs of operation and maintenance only add to that initial expenditure. Beyond financial and material aspects, there

are also many opportunities for technological improvement. Additionally, these structures are confined in their feasible height of operation to very low altitudes, exposing them to highly intermittent and low-velocity wind. This intermittency and inefficiency reduce the energy generating capacity of wind turbines as well as place an undue strain on the energy distribution grid.

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More Information

Publications

For more information about this technology, please visit:

<https://licensing.research.gatech.edu/technology/foldable-box-kites-generating-electricity>

Images:

The automated sequential delivery of multiple fluids. A varying number of delay gates imprinted in the branches are shown in the figure.

COVID-19 and flu saliva test on paper: (A) The automatic sequential delivery of multiple reagents required for virus test; (B) Water pouring into the device triggers the virus assay, allowing the presence of SARS-CoV-2 and influenza A & B viruses to be visually identified by the color changes in the corresponding detection spot

