WINDSWEPT & INTERESTING LTD

Portable Wind Power
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Overview

Off-Grid, On the Road
*Travel without polluting*

Windswept and Interesting Ltd (W&I) make powerful and portable, flying wind turbines.

**Any** electric vehicle can carry our portable wind turbine for clean energy.

Electric vehicles can now travel far off grid, sourcing their own energy, without polluting.

Airborne Wind Energy Systems (AWES)
*The science of flying wind turbines*

AWES harvest wind energy at high altitudes where the wind is stronger and more reliable.

Flying wind turbines capture more wind energy, with less material.

There are over 80 AWES companies, including Google X Makani, Shell KPS, TU Delft and Ampyx Power.

The energy from **powerful, lightweight** kite turbines has a tiny carbon footprint.

A Network of Kites
*Kites working in a team*

Networked kites are the **Safest, Most Efficient and Most Scalable** AWES designs.

The W&I networked kite turbine “Daisy” is the **Easiest** AWES to make and fly.

Daisy (a multi stage, tilted hollow axis, autogyro, network kite turbine) is very **stable** in flight.

Daisy is the only **continuous & autonomous** mechanical power AWES.

The Daisy kite turbine packs away to **1/7500** of its flying volume.

Many network kite parameters (# of kites, # stacks, solidity...) can be modularly reconfigured in the field.

Using only toy kites the Daisy prototype produced an incredible **300W/kg** power density.

*Windswept and Interesting sell Portable Wind Power.*
Background

Development from challenge

Innovation through play

Windswept & Interesting Ltd is run by Roderick Read from his home on the Isle of Lewis in Scotland. Rod grew up sailing, fishing and windsurfing on the island. Rod became an engineer and took up kitesurfing. He knew there must be a way to harness energy from kites going fast, sweeping power-zone loops.

After becoming a parent and a househusband, his love of sport and ecology lead Rod into inventing kite power concepts. Rod’s mum challenged him to make a cup of tea with kite power. By taking and completing that challenge, Rod also completed the someawe.org 100*100*100 challenge.

Rod started W&I to develop the world’s most ecologically efficient power systems.

At only 30kg CO2 emissions equivalent in production, the complete prototype has a predicted carbon cost of energy of only 17g CO2/kWh in year 1 (already better than solar over its lifespan) and only 1.7g CO2/kWh with consideration of replacement components thereafter.

Having charged e-bikes Rod is now testing how kite power can be used to charge electric cars.

W&I and University of Strathclyde are discovering how scalable kite turbine energy can possibly be.
Recognition

Collaboration and Awards

W&I shortlisted for the Interface Knowledge Exchange Awards Innovation of the Year 2018.
Daisy was the first (and still only) AWES to win the someawe.org 100*100*100 challenge.
W&I is industrial sponsor of a PhD researching Kite Networks in University of Strathclyde.
W&I displayed a Daisy prototype in Singapore thanks to an invitation from Singapore power.
W&I received an ETP knowledge Exchange Network Grant for Rotary Kite AWES Development.
Daisy kite development is popular online. One featured video was seen over 3 million times.
W&I secured a working agreement with Stornoway Airport and HIAL allowing Daisy to be the only AWES in the world, permitted to test inside an active Air Traffic Control Zone.

Development

Tensile, networked kite designs are very scalable.
Proving the Scalability

*Walking before talking*

Until recently, AWES experts said it was impossible to transmit useful torque from a kite power system and no kite power system could work without controls. Daisy designs have rewritten the rulebook. The problem now, is that nobody knows the scale limits for a working Daisy system. W&I and University of Strathclyde are investigating how far our designs can safely scale. Together we build, deploy and test mathematical and physical models of a fundamentally new mechanical power transmission method.

**Networks Improve Safety & Control**

*No single line failures*

Every component in a network kite is linked to mostly 3 but at least 2 other parts. No part would break away if any single part were to break. This massively improves not only system safety but also stability. Safer power systems are more insurable.

By being tethered normally as well as fore, aft and radially the driving kites on a Daisy system are always locked on course. In tests, a damaged network will still function, with diminished performance. A damaged kite can easily be brought down and repaired cheaply in the field.

**Affordability, Simplicity & Reliability**

*Off the shelf equipment in the field*

All of the components are easily sourced, repairable and recyclable. The modular, design means huge network kites can be made in small manufacturing facilities. Bearings are the only part of the system where two components run against each other. There is far less line wear & fatigue in Daisy AWES.

**Networks Improve Efficiency**

*Sharing power transmission lines for less drag*

In testing, we found that adding layers of driving kite rings to the turbine improves efficiency. The line drag per kite area is very much reduced. Efficiency and stability can also be added by using a network of lifting kites. Ground use efficiency improves by arraying turbines over ground areas and stability improves by having wide spread anchors and arch form networked kites. Lattice networks may work downtown.
IP & Standards

An Open Framework for Growth

Prioritising Safety

W&I granted an Open Source Hardware license for core intellectual property relating to small-scale (<1kW) network kite AWES. W&I expect this will encourage wider adoption of clean energy technology especially where access to clean energy systems has had prohibitive barriers. W&I will assist an open standards body to specify and publish a self-certifiable standards framework for systems under 1kW.

At <2kg and flying <30m Daisy is the only AWES in compliance with CAA Air Navigation Order CAP393.

Adherence to open standards on operational safety will keep larger systems in compliance with existing aviation regulation. There is still a huge scope for technical developments to have IP protections.

Market & Strategy

Breakthrough Niche Market Strategy

Enabling off-grid Adventure

W&I has sold prototypes to researchers but our next ideal customer is the outward-bound adventurer.

This market has the right mix of high value customers, with diverse interests. The customer already uses products of a similar nature, such as tents and surf kites. The customer is often in wide-open spaces. They can introduce our product into other markets through their events, surf camps and festivals.

The market is already served by established businesses who could be ideal manufacturing partners. The initial whole product charging solution can easily be extended to a range of products and services. Continued and full-scale product realisation can potentially transform energy markets on multiple fronts.

W&I will use personal experiences of low carbon adventures to demonstrate our understanding, commitment and alignment to the initial product market.

Key Partners

Electric mobility
Sail and kite
Adventure
YOU