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"When legacy firms fail to innovate, start-ups jump into the market and thrive at the establishment's expense. That's disruption."

Gwynne Shotwell
SpaceX President

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The Problem:

New Zealand is the 2nd windiest place on Earth, however, unlike the vast wind resources of the North Atlantic which are of a **laminar air-flow** (non-turbulent), the air-flow of New Zealand is **chaotic** and poses a huge operational risk to wind turbines.

VESTAS, the world's largest wind turbine manufacturer, will not warranty any of their wind turbines sold and installed in NZ.

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Cut-Out Wind Speed

The cut-out wind speed of typical mast-style wind turbines is:

25 m/s (90 km/h)

At those speeds the turbine must shut off or risk damage. Instead of capitalizing on the increased wind, these devices simply stop.

The only New Zealand wind turbine manufacturer, Windflow Technologies, suffered the catastrophic total destruction of their prototype turbine during a storm in 2005.

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Cut-Out Wind Speed

The recent storm in Wellington (June 2013) had wind speeds measured at over **200km/h (55.56 m/s)**.

Every wind farm in the Wellington region was shut down during the storm -- *which was also a period of highest electrical demand due to the cold*.

It does not have to be this way.

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WindCatcher Cut-Out Wind Speed

The **WindCatcher** does not suffer any of the issues experienced by a chaotic wind-flow, as the design cleverly utilizes the torque delivered by multiple wind directions.

We have had the **WindCatcher** operate in wind speeds above:

47.22 m/s (170 km/h)

...without any ill effects whatsoever.

There is currently **no known cut-off wind speed** for the **WindCatcher**.

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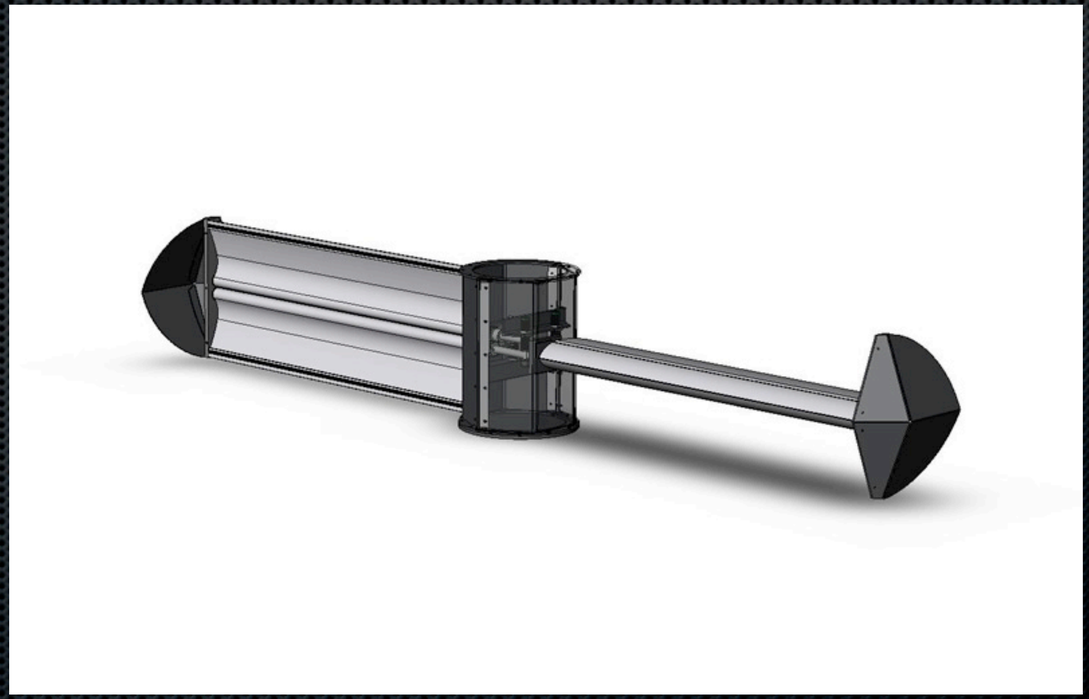
Why and How?

The **WindCatcher** is a Vertical Axis wind turbine which utilizes a patented ‘active’ wing design.

Active: The wing changes its shape during the wind cycle.

Wing is OPEN while ‘catching’ the wind.



Opposite side is CLOSED while facing into the wind.

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Leveraging Torque

Torque is how wind turbines convert wind into electricity.

The more **torque** you have, the larger the generator you can drive.

The **WindCatcher** generates the same amount of torque as the massive wind turbine in Brooklyn, Wellington.

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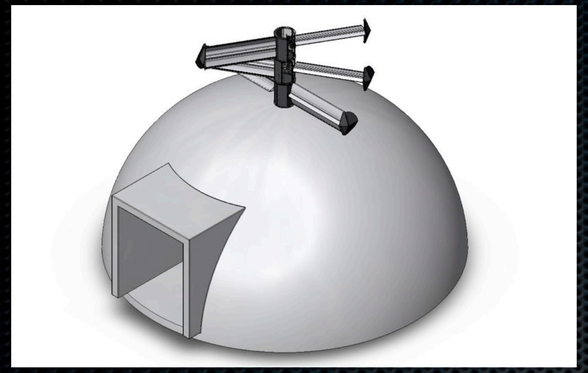
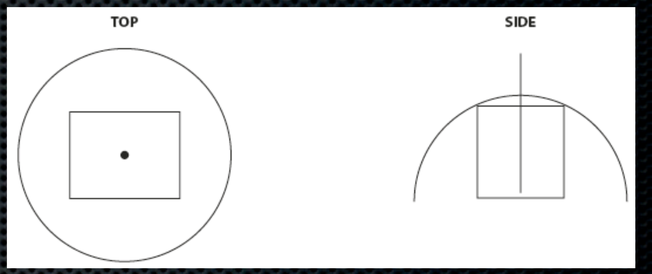
Typical Set-Up



Self-contained, free-standing unit.

Simple delivery and set-up:
drop it off, attach wings and dome,and plug it in.



Massive concrete bases are NOT required.

Huge infrastructure expenses are NOT needed.

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Comparison for 1MW Generator

Installed Costs

Typical Wind Tower: approx. $3,600 per kilowatt

WindCatcher: $1,500 per kilowatt (target)

Weight

Typical Wind Tower: 70 metric tons

WindCatcher: 4.5 –16.5 metric tons (options)

Installation Time

Typical Wind Tower: months

WindCatcher: 1 Day – 2 Weeks

Get 2.4X the Power for the Same Cost!

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Overview: The *WindCatcher*...

- is extremely QUIET
- has few moving parts
- is easily serviceable
- has a low visual footprint and aesthetic
- is designed to the ‘old-time’ engineering principal of building to surpass a 10x failure rate
- is expandable/upgradeable
- is portable and can be set up in less than one day
- does not require resource consent under current New Zealand law.*
- operates at very low wind speeds and has no known upper cut-off wind speed: it is fully high-wind and chaotic wind-flow capable

* – is under 10-meters in height and does not require that a concrete pad be constructed

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Need: *Electricity in New Zealand*

To cope with demand outstripping supply, the Government's latest energy scenario (for the period to 2025) includes a required growth of 3,355MW in new electricity generation capacity.

Ministry of Economic Development
October 2003, *New Zealand Energy Outlook to 2025*

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Who Are Our Customers?

Agriculture in New Zealand is the largest sector of the tradeable economy, contributing about two-thirds of exported goods in 2006-7. For the year ended March 2002, agricultural exports were valued at over $14.8 billion.

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Who Are Our Customers?

- **Dairy Farms**: the largest cost to milk production is electricity for pumps, hot water, lighting, and refrigeration. Power cuts (due to storms) costs the dairy industry millions per year in losses. There are over **12,786 dairy farms** in New Zealand.
- **Sheep and Meat Producing Farms:** high line costs to remote farms can be eliminated by local electricity production. **More than 15,000 sheep and meat farms**.

New Zealand Official Yearbook. Statistics New Zealand.

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Bringing down the cost of doing business for farmers is good for New Zealand.

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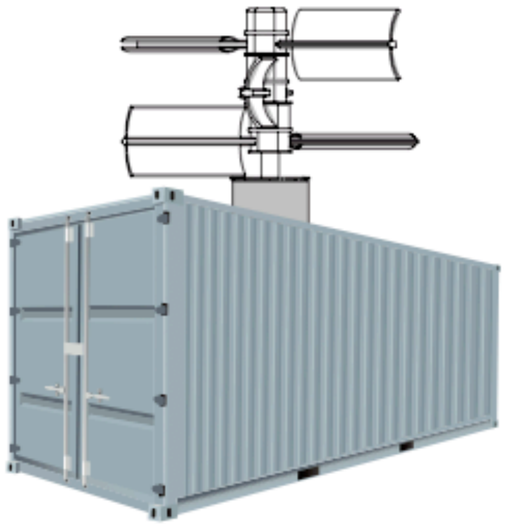
WindCatcher Container Project

The **World Bank** has expressed interest in the **WindCatcher Container** for bringing power to the many Pacific Island Nations and for civil emergency as the **WindCatcher Container** does not need any infrastructure to be built in order to be set up or used. *Power within hours of delivery.*



BENEFITS

- Easy to Transport
- Minimal Set-Up Needed
- Can be Used on Land or on Ship
- Stable Platform Does Not Require a Concrete Base
- Double-Sealed Entry is Water-Tight
- Easy to Customise Power Needs
- Can Provide Grid Power or Local
- Can Incorporate Battery Storage for Off-line Power Generation
- Can Be Leased or Purchased

USES

- Civil Emergency
- Military
- Remote Hospital
- Remote Construction and Rebuilding
- Communication and Satellite Uplink
- Remote Scientific Research Stations

Self-Contained Power Generation from 50kW to 500kW

The 50kW unit can be dropped by parachute from a C-130.

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Mt Climie Wind Site Project

Mt Climie is the tallest peak in the Wellington region. It stands at over 860m and is one of the consistently windiest places in New Zealand. The average wind speeds have been measured at **13.89 m/s**. Mt Climie has been scoped as a premier wind farm site for many decades. **But up until now, no wind turbine has been able to handle the extreme wind conditions.**

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Mt Climie Wind Site Project

Also, since Mt Climie is located in a preserve: the infrastructure costs for creating a road that could handle the big-rig trucks needed to transport the immense materials for traditional wind turbines would be in excess of $25 Million -- which would make creating a wind farm there untenable.

The high infrastructure costs for traditional wind turbines is a limiting factor in successfully harnessing wind energy across New Zealand.

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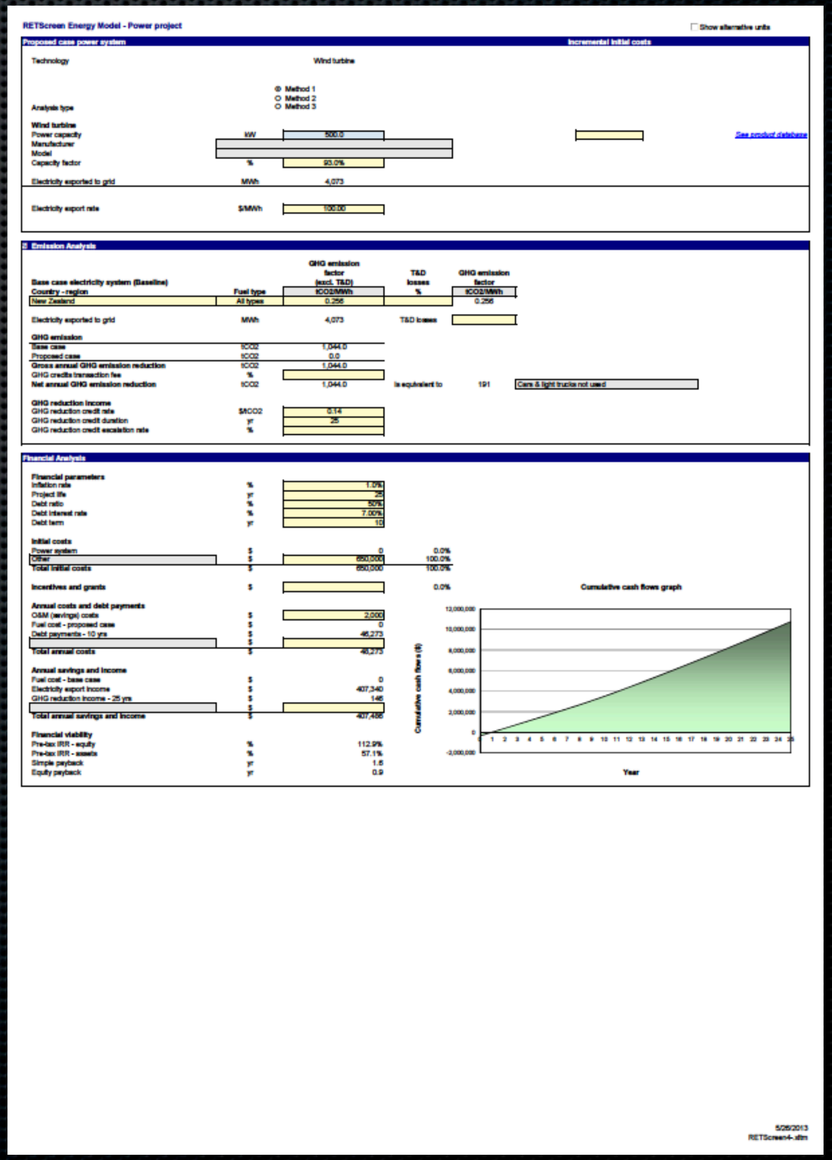
Mt Climie Wind Site Project

A **WindCatcher** turbine of 500kW – 1MW could be placed on Mt Climie. *Easily delivered by UTE on the existing dirt access roads.*

Cost: $675,000 – $900,000

Annual Income: $400,000 – $880,000

Pre-Tax IRR: 112.9%!


RETScreen Energy Model - Power project

Proposed case power system

Technology: Wind turbine

Analysis type: Method 1 / Method 2 / Method 3

Wind turbine
Power capacity: kW 500.0
Manufacturer
Model
Capacity factor: % 93.0%

Electricity exported to grid: MWh 4,073

Electricity export rate: $/MWh 100.00

Incremental initial costs

See product database

Emission Analysis

Base case electricity system (Baseline)		GHG emission factor (excl. T&D)	T&D losses	GHG emission factor
Country - region	Fuel type	tCO2/MWh	%	tCO2/MWh
New Zealand	All types	0.256		0.256

Electricity exported to grid: MWh 4,073 — T&D losses

GHG emission
Base case: tCO2 1,044.0
Proposed case: tCO2 0.0
Gross annual GHG emission reduction: tCO2 1,044.0
GHG credits transaction fee: %
Net annual GHG emission reduction: tCO2 1,044.0 — is equivalent to 191 Cars & light trucks not used

GHG reduction income
GHG reduction credit rate: $/tCO2 0.14
GHG reduction credit duration: yr 25
GHG reduction credit escalation rate: %

Financial Analysis

Financial parameters
Inflation rate: % 1.0%
Project life: yr 25
Debt ratio: % 50%
Debt interest rate: % 7.00%
Debt term: yr 15

Initial costs
Power system: $ 0 0.0%
Other: $ 650,000 100.0%
Total initial costs: $ 650,000 100.0%

Incentives and grants: $ 0.0%

Annual costs and debt payments
O&M (savings) costs: $ 2,000
Fuel cost - proposed case: $ 0
Debt payments - 10 yrs: $ 46,273
Total annual costs: $ 48,273

Annual savings and income
Fuel cost - base case: $ 0
Electricity export income: $ 407,340
GHG reduction income - 25 yrs: $ 146
Total annual savings and income: $ 407,486

Financial viability
Pre-tax IRR - equity: % 112.9%
Pre-tax IRR - assets: % 57.1%
Simple payback: yr 1.6
Equity payback: yr 0.9

Cumulative cash flows graph

Cumulative cash flows ($)

Year

5/26/2013
RETScreen4- .xlm

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Research and Funding

- The **WindCatcher** has been in development for 14 years and is patented.
- Prototype 1 is still in operation (10 years) and has not failed.
- Current prototype has been in daily operation for 5 years with no failures.
- $1.4Million in private capital has been used
  - $1Million by the inventor
  - $400K by a private investor

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Research and Funding

WindCatcher is looking for 2nd round funding of $1Million NZD.

This would be used to fund the Mt Climie wind site and hire personnel to shift the WindCatcher from ‘prototype’ to ‘manufactured product’.

- the engineering drawings need to be optimized in CAD/CAM so that wind tunnel simulations can be performed
- the braking/feathering system needs to be made into a computer-controlled automated system
- manufacturing partners and methods need to be sourced

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The Team and Future Partners

- **Ed Mulholland**: Inventor. Retired aircraft industry engineer.

Future Partners:

- **Michael Stace**: Was a partner in an Angel Financing group for 6 years. Has brought dozens of products from inception to market. Specialist in project management, manufacturing, and risk assessment.
- **Dennis Hill**: Director of Ventech Systems. Developed a patented protection and enclosure system for electronics in harsh environments.

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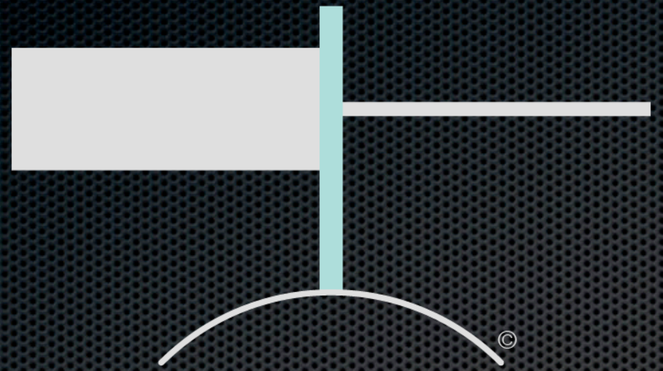

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Contact:

Michael Stace
info@windcatcher.co.nz
www.windcatcher.co.nz
(027) 508 1417 • +64-27-508-1417
USA: (626) 771-2369