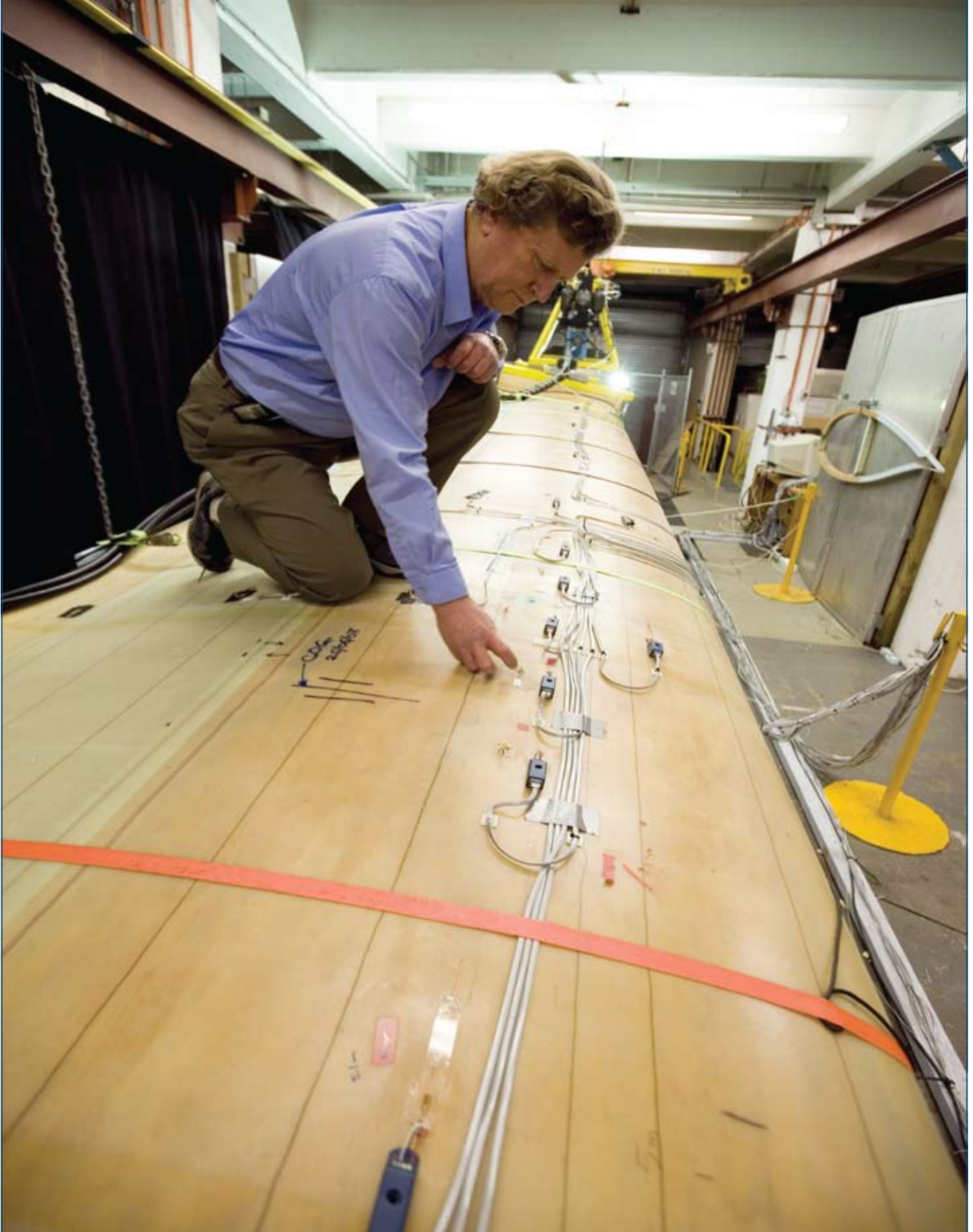


A Global Leader in Wind Turbine Technology Innovation



WINDFLOW
TECHNOLOGY





INTRODUCTION TO WINDFLOW TECHNOLOGY LIMITED



Windflow Technology is a New Zealand-based, share-holder owned company that was floated in 2001 and listed on the NZAX in 2003. The company was founded on the proposition that demand for renewable energy sources represented a new economy and sustainable future, and that wind energy is the most abundant and least-cost form of renewable energy for very fundamental reasons of resource availability and land-use. To become global leaders in the field, we recognised that engineering innovation was needed to develop a more cost-effective and reliable wind turbine capable of harnessing strong and turbulent winds such as those experienced in New Zealand.

The story of Windflow Technology is one of commitment, precision and teamwork, from the installation and testing of the first Windflow 500 prototype in 2003 to the new assembly facilities capable of producing up to 200 turbines a year. I am particularly proud that the company, which was founded out of a personal commitment to wind energy for New Zealand dating back to 1976, is now such a team-venture of total commitment to a shared vision.

In 2001 the vision of an engineering company employing more than 50 staff manufacturing revolutionary 2-blade Windflow 500 wind turbines in New Zealand was both entrepreneurial and ambitious.

In 2008 confirmed orders will see production of Windflow 500 turbines at the new 900 m² nacelle assembly facilities reach the company's initial target of 60 turbines per year. Staff numbers in the Windflow Group of companies already exceed 50, and many more are employed in the dozens of supplier companies we use in New Zealand and overseas.

Today investors, customers and broader stakeholders can recognise Windflow Technology as a company that has become a dynamic manufacturer. Ongoing research and development is underway to optimise the value and relevance of the Windflow 500. As markets and wind farm developers address the global challenge to reduce carbon emissions and increase the uptake of renewable energy the company has, rightly so, become accepted as a leader in its field.

As Windflow Technology ramps up production to meet firm orders of Windflow 500 turbines, it is evident that the company and its unique turbine have international potential. We will continue to expand our horizons with the vision that this proudly New Zealand company can help wind energy become an even more significant contributor to our world's renewable energy future.



A handwritten signature in black ink that reads "Geoff Henderson".

Geoff Henderson
Chief Executive Officer and Director

CAPABILITIES

Windflow Technology has a staff of 50+ talented people in New Zealand who are experts in their respective fields, headed by CEO, Geoff Henderson. The engineering, procurement, production, quality, marketing, administration, and wind farm development teams are based in Christchurch, and growing numbers of Windflow operational and maintenance staff are deployed to wind farm sites as they are developed. The company is governed by a long-standing Board of Directors with a range of power industry, environmental, business growth and public governance expertise.

Windflow is primarily a wind turbine design and assembly company, and as such its main capabilities are in:

- engineering design, research and development, where its team of 14 professional engineers is becoming recognized as a centre of excellence in wind turbine engineering and related fields.
- production engineering, where its team of 12 professional engineers, procurement staff and qualified tradesmen works closely with its numerous, predominantly New Zealand based, component suppliers to ensure the quality of each and every part that makes up the turbine, and then assembles the turbine in accordance with established quality procedures.
- wind farm development, operations and maintenance, where its team of 11 professional engineers, analysts and windsmiths works closely with our marketing team to take wind farm projects all the way from inception to installation to operation.

Windflow offers a range of services to wind farm developers:

- **Site Assessments**

Windflow offers an initial free desktop review of a potential site, in terms of its broad suitability for wind energy. Windflow can also be contracted to perform an on-site assessment to determine aspects such as: suitability of the site for building a wind farm; ease of establishing a suitable road access to the site; proximity to a distribution line of appropriate voltage and capacity; any significant resource consent issues; likely wind resource given land, ground cover and surrounding topography; and possible wind monitoring and turbine locations.

- **Wind Monitoring**

On-site measurement of actual wind speed, direction and distribution is important to determine the potential output of a wind farm. Windflow offers a wind monitoring service consisting of 10 metre high prospecting mast and anemometry for an initial three month period. The data is collected at 10 minute intervals, and can typically be downloaded remotely. If a reference site with historical data is available nearby, data from this reference site can be correlated with the on-site measurements to give an indication of long term performance. The service includes equipment hire, installation, monitoring, analysis and removal.

Windflow also offers monitoring and analysis of wind data at other heights as required, including a 30 metre mast to measure wind data at the hub height of the Windflow 500 turbine.

- **Turbine Supply**

The Windflow 500 can be supplied ex-factory from its New Zealand manufacturing base, with several variants available depending on the developer's needs. Windflow typically arranges transport, oversees foundation design and erection and undertakes commissioning of the turbines and SCADA system, and works with the customer to provide advice, support services or project management as needed.

- **Project Management (Turn Key projects)**

Windflow has the capability to undertake the entire wind farm project, or selected parts of it on behalf of the customers. As well as managing the complete installation of the turbine Windflow can also project manage site works such as roads, foundations, SCADA, and electrical connection. For single turbine or small installations, Windflow may also be able to assist with the resource consent application if required.

- **Operation and Maintenance**

During the warranty period, Windflow undertakes the operation and maintenance (O&M) of the wind turbines. Windflow's remote monitoring or on-site staff will ensure that the turbines are operating efficiently, and respond quickly to any issues that arise. Preventive maintenance is typically performed every six months. After the warranty period, Windflow can continue providing O&M services, or can train the customer's staff if preferred.



THE WINDFLOW 500 TURBINE

The company's primary technology is the medium sized Windflow 500 wind turbine which incorporates advanced mechanical and electrical features, and is cost-effective to transport, install and operate. Its patented torque limiting gearbox is lightweight yet robust and uniquely allows the use of a synchronous generator directly on line. This generator is standard within the energy sector but an advancement for wind turbine technology and improves cost efficiency and grid integration. Its two-bladed teetering rotor is also an improvement over other two-bladed designs.

Competitive Advantages

The Windflow 500 is ideally suited for small to medium sized wind farms which many developers will find easier and more cost-effective to consent and build. The turbine has fundamental cost and technical advantages which make it equally attractive for large wind farms in New Zealand and elsewhere. Short lead-times, excellent transportability and general cost-effectiveness represent only some of the competitive advantages.

The Windflow 500 also includes several technological, economic and environmental competitive advantages which are summarised below:

- **Robust and Cost Effective Torque Limiting Gearbox**

Gusty, turbulent winds mean that the torque (twisting force) applied to a conventional gearbox is erratic and causes considerable overloads.

Windflow Technology's patented Torque Limiting Gearbox uses a hydraulic system to limit torque fluctuations. This allows the generator shaft to rotate at a constant speed independent of the two bladed rotor which has a variable speed in response to the ever-changing wind speeds.

The Torque Limiting Gearbox system therefore significantly reduces the torque on the turbine shaft and gearbox and results in a gearbox that is more robust, compact and cost effective than other gearbox designs.

- **Exceptional Electrical Integration with Synchronous Generator**

A constant speed generator shaft allows Windflow to use an off-the-shelf synchronous generator. This avoids the need for complex and expensive power connection equipment and voltage support equipment, and allows the electricity generated to be fed directly into the electricity network. In addition, the synchronous generator can be used to provide voltage support for the local network. This facility does not depend on wind availability. This advantage is particularly important in countries with weak electrical grids and where windpower has become a significant proportion of electricity generation.

This gives the Windflow 500 turbine significant grid integration advantages compared with other turbines which generally use induction or non-synchronous generators. These advantages are becoming recognized and two other turbine manufacturers have now started to incorporate the use of these generators in their turbine designs.

- **Two-Bladed Teetering Rotor Design**

The Windflow 500's two-bladed teetering rotor design is significantly lighter and results in cost savings throughout the turbine manufacture. Three bladed turbines do not teeter, and are comparatively heavier and more expensive.

Teetering (a see-sawing motion which is enabled by having only two blades) is important because it significantly reduces the bending forces on the turbine shaft, gearbox, tower and foundations. The Windflow 500 turbine's rotor is designed to teeter up to 6 degrees on either side of the normal plane of rotation in response to varying wind forces. Pitch-teeter coupling is an important feature of the Windflow 500 design which, unlike many other two-bladed designs, stabilises teetering during operation.

- **Reduced Environmental Impacts**

The environmental impacts of wind turbines vary depending on the size of the turbine. The Windflow 500 is a medium-sized wind turbine and stands at 47 m from tower base to blade tip. In comparison, large multi-megawatt turbines (for example a 3.6 MW turbine) can stand over three times this height, at 160 m from tower base to tip.

Smaller turbines have less visual impact (even though more of them are required for a given output) because the human eye is particularly sensitive to vertical scale. This is especially so when wind turbines are sited on ridge-tops, which will be the usual case in New Zealand. Furthermore aviation lighting is not required and lightning risks are reduced when the height is lower than 60 m.

Earthworks to install multi-megawatt turbines are comparatively more than for the Windflow 500, due to the large foundations and wider roads required.

The Windflow 500 components can be transported on five metre wide roads using standard sized trucks and can be installed using a readily available 80 tonne crane. In comparison, multi-megawatt sized turbines require large 400 tonne cranes for installation that need 10 metre wide roads often built on highly visible ridges. The transport of oversize turbine components can require road and bridge strengthening and temporary closures, and the oversize trucks usually require pilot vehicles, leading to higher traffic movement.



Windflow 500

The Next Generation Wind Turbine



3.6 MW turbine (160 m high) superimposed over a photograph of Dunedin's Octagon with further 3.6 MW turbines on the ridge in background



Windflow 500 (47 m high) superimposed over a photograph of Dunedin's Octagon with further Windflow 500 turbines on the ridge in background

MARKET FOR WIND POWER

The wind energy market is international and growing significantly.

- Forecasts covering the period up to 2013 indicate average growth in annual installations over that period of 15.7 % p.a (see Figure 1).
- Growth centres: The centres showing the fastest growth are expected to be USA and China, with Europe maintaining steady demand.
- 2008 recorded the highest installation of wind power ever - 28,190 MW of new capacity, 42% above 2007.
- Global drivers are stronger than ever: climate change and security of supply were top of the political agenda during 2008 and remain so into 2009.
- The market value of the industry over the next five years will total some US\$ 300 billion.

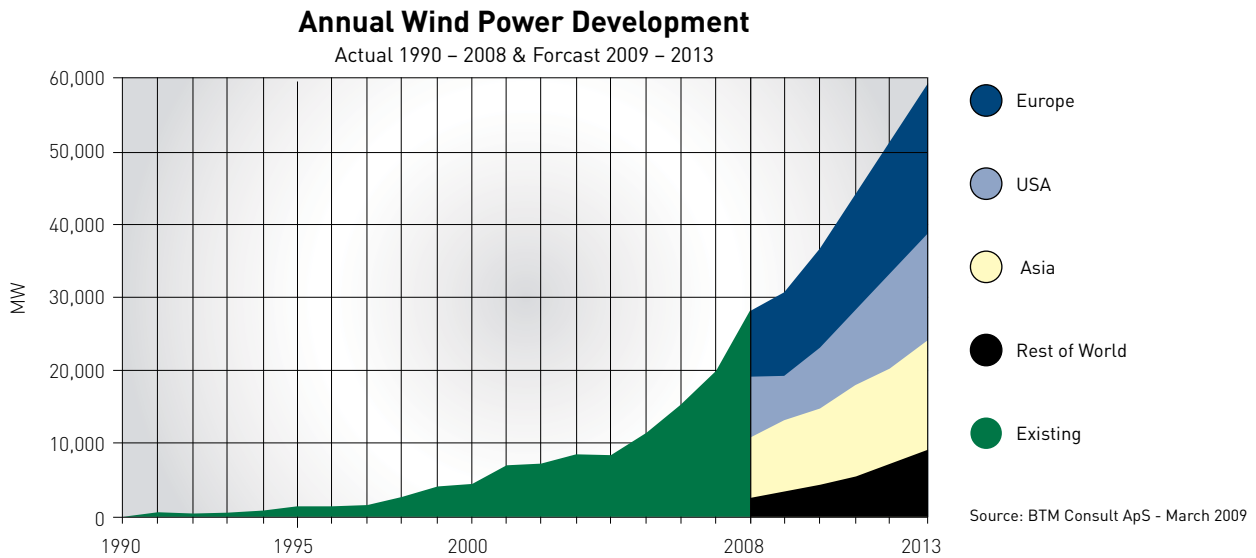


Figure 1: Annual Wind Power Installations (Actual to 2008 – Forecast to 2013)



RESEARCH AND DEVELOPMENT

Windflow Technology drives its business to be a global leader in wind turbine technology innovation. This is both a commercial and technological imperative. All research and development activity is therefore linked to known market opportunities.

Current research and development includes:

Development of a 60 Hz variant of the Windflow 500

Adapting the Windflow 500 from a 50 Hz to 60 Hz frequency in line with the electricity system of the growing North American market in particular.

Development of a wind-diesel variant of the Windflow 500

Islands and other isolated electrical grids that rely on diesel for electricity generation represent an increasing market for renewable wind or solar power when it is available with diesel on hand as a backup.

This wind-diesel market is one for which the Windflow 500 is particularly well suited because:

- its size makes it easier and more cost efficient to transport
- its use of a synchronous generator to provide voltage control enables it to offset a higher proportion of diesel fuel than most other turbines.
- it is designed to withstand very strong winds that are common during the cyclone season throughout South Pacific Islands and certain isolated areas in Asia.



**‘To be a global leader
in wind turbine technology innovation’**





HISTORY

Windflow Technology was founded in 2001. It was an engineering business significantly ahead of its time.

Founder Geoff Henderson had returned to New Zealand in the 1990s equipped with extensive international wind energy experience including early wind ventures in the United States. He also worked for a leading wind power organization, the Wind Energy Group, in the United Kingdom where he was part of a team designing wind turbines.

His decision to bring this level of innovative wind energy thinking back to New Zealand and its deregulated energy sector was one that required almost immediate buy-in to get a project off the ground. Such a significant shift in thinking and the vision to comprehend the size of the opportunity was not forthcoming from within New Zealand's energy sector at that time. It was this reality that led to the decision that it was necessary for Windflow Technology to go it alone.

Although trained as a professional engineer with no formal business qualifications, Geoff undertook the challenge of preparing the highly detailed engineering focused business plan and prospectus that could build confidence in the vision and the opportunity.

A loyal and confident investor base has since contributed to several share market capital raisings over the years which has enabled the company to achieve its growth plans.

In 2001, Windflow Technology raised \$2.6 million satisfying the investing public that the concept of a two-blade turbine invention was commercially viable.

The company first had to complete aspects of the engineering design and identify the partners that would be capable of eventually manufacturing the component parts.

The manufacture of the first Windflow 500 prototype with its revolutionary torque-limiting gearbox was an engineering feat that secured enormous interest from investors and engineers both locally and globally.

Windflow's success and innovation has also been recently recognised within the energy and sustainability industry in New Zealand through several notable awards. Some of the largest wind farm developer companies in the world are recognizing the Windflow advantage as the company's track record opens up more commercial opportunities.

The following business milestones highlight the company's growth and success.



MILESTONES

- **September 2001:** Initial public offering raises \$2.6m. This provides the funds to commence developing the prototype and seek a Resource Consent for the first site at Gebbies Pass on Banks Peninsula, near Christchurch.
- **July 2003:** Installation and start up of the prototype turbine at Gebbies Pass.
- **September 2003:** A 1 for 2 Rights Issue raises just under \$5m. This provides funds to continue development of the turbine and the Te Rere Hau wind farm site.
- **November 2003:** Windflow Technology is one of “the first fifteen” companies listed on the NZAX market when it opens.
- **December 2003:** Granting of 519,000 tonnes of carbon credits to NZ Windfarms, then a wholly owned subsidiary of Windflow Technology, for the development of the Te Rere Hau wind farm near Palmerston North.
- **February 2005:** Granting of a Resource Consent to NZ Windfarms to develop the 97 turbine Te Rere Hau wind farm.
- **June 2005:** Windflow Technology raises \$3.3m by way of a further Rights issue.
- **December 2005:** An initial public offering by NZ Windfarms raises \$4m followed by listing on the NZAX. Windflow Technology’s stake is accordingly reduced from full ownership to a 43% shareholding.
- **August 2006:** A consortium of Babcock & Brown and NP Power enter into a 50-50 joint venture arrangement with NZ Windfarms for the development of Te Rere Hau wind farm plus possible other sites.
- **September 2006:** Installation and start up of the first five turbines (of 97 in total) on the Te Rere Hau wind farm. The farm is opened by the Prime Minister, Rt. Hon. Helen Clark.
- **October 2006:** Exercise of options by NZ Windfarms shareholders raises a further \$4 million, diluting Windflow Technology’s shareholding in NZ Windfarms to 27%.
- **May 2007:** A subsequent public offering by NZ Windfarms raises \$75m including Vector Limited taking a cornerstone stake of 19.9%. Windflow Technology’s shareholding in NZ Windfarms dilutes to 3%.
- **September 2007:** Windflow Technology establishes its own nacelle assembly factory in Riccarton, Christchurch and moves its whole team to adjoining offices.
- **January 2007 - October 2008:** The Te Rere Hau joint venture orders further 92 Windflow 500 turbines to be installed at Te Rere Hau.
- **October 2007:** Windflow Technology wins the Sustainable Business Network’s Sustainable Design and Innovation Award and the Energy Efficiency and Conservation Authority’s Product Innovation Award for its Windflow 500 turbine.
- **November 2007:** Windflow Technology raises \$5 million in a fully-subscribed Rights issue.
- **December 2007:** Windflow Technology acquires remaining 50% of Wind Blades Ltd (its blade manufacturing operation in Pakuranga, Auckland).
- **April 2008:** Windflow Technology staff numbers 50, a major increase from 15 in April 2007.
- **June 2008:** Windflow Technology forms a Joint Venture with AH Gears (its gearbox manufacturer in Auckland), called Wind Gears Ltd.
- **June 2008:** Windflow Technology gains ISO 9001:2008 certification.
- **June/October 2008:** The company announced on 30 June 2008 an agreement with State Owned Enterprise electricity generator and retailer Mighty River Power under which Windflow Technology will construct a wind farm for Mighty River Power using Windflow 500 turbines. State Owned Enterprise electricity generator and retailer Mighty River Power buys a 19.95% cornerstone shareholding in Windflow Technology.
- **September/October 2008:** Windflow Technology raised \$10.3 million through the September options exercise, private placements, and the Mighty River Power share purchase.





Windflow Technology Ltd

44 Mandeville St, Riccarton, Christchurch
PO Box 42-125, Christchurch 8149, New Zealand
Telephone +64 3 365 8960
Fax +64 3 365 1402
www.windflow.co.nz