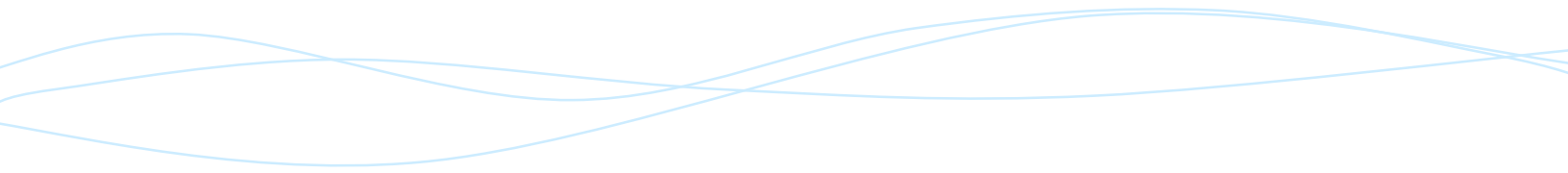


Motor ind

Bringing wind power to the masses




About

This document introduces Motorwind micro-wind power solution to prospective investors. Motorwind Power Private Limited is Indian subsidiary of Hong Kong based Motorwave Company Limited. We are seeking investment for the launch and expansion of Motorwind products in India.

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Wind power industry and Motorwind

Wind power is among the fastest growing renewable energy technologies around the world witnessing annual growth rates of around 30%. The total installed capacity worldwide by the end of 2008 stood at 121 GW.

India has witnessed rapid growth in the wind sector over the last few years as it met its 2010 target two years in advance. The growth in India has largely been result of a favourable policy environment and rise of Suzlon, the private wind power behemoth that has become one the world's largest wind turbine manufacturer.

Wind Power

- **Fastest growing renewable energy technology worldwide and in India.**
- **Also the least-expensive one in terms of generation cost.**
- **Cheaper than coal at today's costs if coal externalities are removed.**

Wind power is widely recognised as the least cost renewable energy technology with an average generation cost of \$0.05- \$0.06 / kWh. Analysis show that the levelized annual cost of wind power is less than that of a new coal thermal power station. While the cost of energy from a thermal power station is initially low, it continues to increase with increases in the cost of fuel. On the other hand, the cost of wind energy is initially high and reduces as loans are repaid, as no variable cost is involved.

If the cost of externalities of coal-based power generation and the hidden subsidies are factored in, wind power is actually less expensive than coal. Therefore, it's not surprising that the wind power industry has demonstrated sufficiently low risk to gain the attention of the financial community and independent power developers for near-term projects.

Motorwind micro-wind turbine technology is based on the same high efficiency Horizontal Axis Wind Turbine (HAWT) technology but it exists in a space distinct from large wind turbines as it is aimed at distributed generation due to its unique ability to be installed virtually anywhere there is wind. Centralised wind farm applications are also possible with Motorwind especially at sites that are inaccessible for large wind turbines.

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Technology

Motorwind is a unique, modular, micro-wind turbine technology with an ability to be installed anywhere and scaled to any size. Its lightweight construction ensures that it can work at low wind speeds and therefore require less wind to operate than large wind turbines, in turn ensuring a much higher capacity factor.

In its most simple form, a single Motorwind set is arranged much the same way as a Solar PV panel that has several small units (cells) connected together to generate a total of, say 70W. Several of these panels, say ten, can then be connected together to make one module of 700W. Any number of these modules can in turn be installed in a system to generate as much energy as required -- sometimes in MW scale -- limited only by the space available. For example, one would require around 1428 modules of 700W each to make a 1 MW solar farm.

Motorwind

- **Modular and scalable, much like solar PV modules.**
- **Capacity factor up to 3 times more than large turbines due to the ability to utilise weak winds.**
- **No fear of damage in high winds. Low maintenance.**



Similarly, a Motorwind set is made up of several small polymer turbines -- each only 25 cm across -- held together on a stainless steel frame,

connected with each other and with a generator attached at one end. Power generated from the set is the sum of power captured by each turbine. A 20-turbine set, for example, generates 166W rated at 10m/s. A module of six such sets would be rated at 1 kW (see photograph below of a Motorwind installation in South Africa). Scaling the capacity to 1 MW would require 1000 such modules.



The light weight turbines start operating at wind speed as low as 2 m/s as opposed to 4 to 5 m/s for traditional large turbines. They continue operating at even 1 m/s. While traditional large turbines operate only 20-40% of the time at a typical site -- Motorwind will continue to work up to 95% of the time

since weak wind speeds are more frequent than high winds. Therefore, there's an obvious benefit to be able to operate in high as well as low wind speeds even though the energy content is less at lower speeds.

Motorwind turbines do not require to be shut down in wind speeds beyond 13-14 m/s, unlike large wind turbines, for fear of damage. Operating range of Motorwind turbines extend much further beyond that threshold. Installations in Hong Kong have survived category 4 hurricanes on more than one occasion with absolutely no damage to the modules. The use of simple components ensures they can be maintained quite easily unlike traditional large turbines which need to be serviced by expert technicians each time there is a problem.

Innovation

- Unlike any other wind technology – patented.
- Install in any size according to requirement.
- As efficient as large turbines, significantly more than other small turbines.

Motorwind power generation turbines can be installed either as:

- a) stand-alone system comprising of Motorwind module, battery bank, and inverter;
- b) grid-connected system comprising of Motorwind module, grid-interfaced inverter; or,
- c) hybrid of the two with grid-interface as well as some battery backup.

Insofar as impacts on the grid-connected power systems are concerned, it is an established fact that addition of wind power results in reduction in technical losses and strengthening of voltage levels.

Technology Innovation

Three aspects of innovation are inherent in the Motorwind solution:


Design and IP

The unique design of Motorwind turbines – several interconnected gears facing the wind -- hasn't been seen in Horizontal Axis Wind Turbines before. It's a Motorwave Co. invention that is completely patented. No competition exists in this space and any knock-off could be easily demonstrated to be one since nothing like this existed in the past.

Modularity and scalability

Motorwind has brought the same flexibility and modularity that exists in solar PV to wind power industry for the first time. Until now, developers of captive wind power plants were limited by available turbine capacities but now they can opt for any size based on their requirement. This modular nature also allows the turbines to be installed in sizes so small they weren't seen in wind power before. Motorwind turbine capacities can range from a few watts to several Megawatts.

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Efficiency

Small wind turbines have existed for a long time. However, they have always been much less efficient than large turbines. Tests have shown Motorwind turbines to be 40% efficient -- this is almost double the efficiency of some small wind turbines and close to the efficiency of large turbines.



Technology Validation

Motorwind has been developed in collaboration with Mechanical Engineering department at Hong Kong University that has provided all the support in testing different designs and collecting the data.



Product line-up

Motorwind turbines are available in several different configurations and sizes depending upon wind resource availability, siting conditions and special requirements. The complete product line-up of Motorwind products include:

- Motorwind Fixed-profile power generation turbines;
- Motorwind Air/Water Pump;
- Motorwind-Solar PV Hybrid Streetlights;
- Motorwind Large-sized turbines for buildings & wind farms;
- Motorwind Aero (directional) turbines;
- Motorwind Directional Panels;
- Motorwind Portable directional turbines;
- Motorwind Underwater turbines;
- Motorwind Submersible pumps; and,
- Motorwind Educational kits for schools, colleges and engineering institutions.



Other products include change-over grid electrical box - a device that allows for a seamless transition from battery bank to the grid whenever the battery gets exhausted and then switching back to the battery after it's charged up; and a hand-held anemometer.



More information about these can be obtained from Motorwave Group website: www.motorwavegroup.com

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Value proposition

Power generation

This is the most obvious benefit of Motorwind turbines. It allows electricity to be generated from the wind. As with other wind technologies, greater the wind speed, higher is the power output. Typically, with doubling of speed, output increases eight times. Motorwind systems can therefore quite easily offset entire energy demand at some households most economically. At others places, Motorwind can fulfill part of the energy requirement or can be used to create backup energy supply during power outages.

Emission reduction

Motorwind allows households and other building owners to reduce their CO2 emissions by offering a clean source of energy. The energy embedded in the polymer turbines can be generated within a few months at the rated capacity. This is substantially less compared to solar photovoltaic which has energy payback in the range of 3 to 7 years.

Building-integrated

Motorwind is the world's first and only truly building-integrated wind turbine solution. Traditional small wind turbines are rarely installed on rooftops as they generate too much load at one particular point and because they require the roof to be dug up, which most build owners refuse to allow. Motorwind turbines are ideal for flat roofs as they can be installed along the parapet thereby distributing the load across the wall. No digging is required. There are several other ways in which Motorwind can be integrated with a building if considered at the design stage itself.

Wind for the masses

By allowing people to generate electricity on rooftops, Motorwind brings wind power from wind developers to ordinary people. It also makes wind power affordable -- substantial savings can be made by installing Motorwind in a high wind resource site.

Net-metering

To enable expansion of distributed renewable energy in India, government has expressed its willingness to begin net-metering. Motorwind installations will therefore allow individual households to get even faster returns on their investment by eliminating the battery bank and feeding electricity

Benefits

- Generates clean fossil-fuel free power economically.
- The only building-integrated wind power solution.
- Brings wind power to the masses for the first time.
- High green novelty value for environmentally conscious.
- Interesting advertising applications.

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directly into the grid at an attractive feed-in tariff. ToD (Time of Day) tariff structure, when introduced across the nation, will also suit wind power as studies in Maharashtra region of India show 70% generation during peak demand slot.

Green branding


Motorwind is also attractive for corporates who wish to project their company as environmentally responsible. Motorwind turbines can be a very visible tool in this regard as it can help project company's efforts to reduce its carbon footprint. Green-building industry too can benefit from Motorwind. In the LEED green building rating system for example, building owners gets extra points for on-site electricity generation.

Advertising

A fantastic value addition of Motorwind installation is its ability to double as a sign-board or a platform for advertising when different coloured turbines are used to create alphabets or shapes. Motorwave Co. HK, does not charge extra for sign-board applications but retains all advertising rights. For advertising applications, the advertising revenue is shared with the client. It also retains all rights to carbon credits and renewable energy certificates.



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Opportunity and Market Size

Power demand

India is said to be currently suffering a power deficit of over 20% set to increase over time. The present electricity generation base at around 140 GW is expected to rise to around 220 GW by 2017 as per current estimates. However, experts predict that it will fall far short of the demand at that time. According to McKinseys' "Powering India: The Road to 2017" report, actual demand could be as high as 335 GW. McKinsey estimates that India's pace of capacity addition must increase five to tenfold if we are to fulfill the demand.

Rural electrification

The government of India has committed itself to provide electricity to all rural households by 2012. Over 125,000 villages remain unelectrified. There is a tremendous shortage of power in even the rural areas which are electrified. It is not uncommon for residents of these areas to experience 15-20 hours of blackouts and brownouts every day.

Environment

Despite this humongous demand for electricity, worsening climate change requires that the world must transition from fossil fuel based sources of energy to renewable energy within a span of few decades. India's stand at UN negotiations on climate change framework has been to push for developed countries to accept greater cuts to allow developing nations to grow. This is facing stiff resistance from the developed world but regardless of what India is able to garner in the final deal at Copenhagen in December 2009, the country remains committed to renewable energy in its National Action Plan on Climate Change.

Energy independence

Less than one third of India's oil demand is fulfilled from sources within the country, rest all is imported largely from gulf nations. This is widely regarded as a threat to our national security as the nation can be held to ransom or brought to a standstill by countries that control oil production. Apart from environmental concerns, security implications demand that India moves to non-fossil fuel based energy sources such as solar and wind power.

Opportunity

- Huge power deficit set to grow manifold.
- Rural demand could be a big driver of growth.
- Climate change and energy security issues demand adoption of renewables.
- 90 GW of wind power in India remains untapped, as per estimates.
- Remote Area Power Supply demand can jump-start the growth today.

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Wind power potential

The country's wind power potential is estimated to be 48,000 MW according to government's Wind Resource Assessment Programme. However, this estimate was made in early 1990's in only ten states and is based on the wind power technology prevalent at that time. States that did not have policies and mechanisms were not covered and even states that were included were not entirely covered under the programme.

Industry experts estimate India's wind power potential to be above 100,000 MW. Out of this, only about 9600 MW has been realised so far, leaving over 90 GW of wind capacity that is yet to be exploited.


It's also worthy of mention that Motorwind has a distinct advantage to traditional large turbines in terms of ease of installation in remote areas. Motorwind's large turbine with diameter from 2 - 5 metre can be disassembled and taken to any location including those inaccessible by a motor able road.

Remote Area Power Supply (RAPS)

Motorwind systems are therefore ideal for remote locations that cannot be fitted with electricity distribution systems such as the Sundarban Islands. Another application could be to power energy requirements of the Indian Army and allied forces' remote stations such as those in the desert.

Currently this demand is met by expensive diesel generated electricity which must be first carried to these locations. Similarly, grid-independent power requirements like cell phone towers can be powered by Motorwind in high wind resource areas. Over 100,000 such towers are in existence all over the country.

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Company & management

Motorwind turbine technology was invented by Mr. Lucien Gambarota, CEO of Motorwave Co. Ltd in the year 2007 at Hong Kong where it's currently manufactured. Since then distribution and manufacturing tie-ups have been forged across several countries. There are several installations currently operating in Hong Kong and in many other countries.

Motorwind Power Private Limited was registered as Indian subsidiary of Motorwave Co. Ltd in December 2007 at New Delhi. Its operating address is B-985, Palam Vihar Gurgaon, 122017.

Equity Status

Motorwind Power Private Limited is 99% owned by Motorwave Co. Ltd, Hong Kong. One percent of the stake belongs to the Indian partner, Manu Sharma.

Lucien Gambarota, CEO, Motorwave Co. Ltd., Hong Kong

Born in 1957 in Italy, Lucien studied physics and chemistry in a French university. He worked as an international buyer for 4 years for the World's second largest retailer. He moved to Hong Kong in 1987 and opened a watch factory at that time. Has been doing private research in many fields for more than 15 years, and has designed or discovered many consumer products. He invented and developed Motorwave technology and Motorwind technology. He also developed the California Fitness concept of harvesting human energy during workouts. Lucien has strong business and engineering skill combined with extreme curiosity. He became interested in renewable energy late 2004, and has since registered several patents.


Manu Sharma, Director, Motorwind Power (P) Ltd., India

Manu Sharma, 32, is a climate change activist and renewable energy expert based in Gurgaon. He is founder of Green-India, a group of energy professionals, academia, architects, environmentalists and ordinary citizens pursuing solutions that can help address climate change and the energy crisis. He works as an independent renewable energy consultant with home owners and architects and recently worked with an international NGO engaged in the area of climate change. Manu has delivered talks on climate change and renewable energy at conferences and has authored articles on the same. In June 2008 he was interviewed by the BBC on India's climate change policy and in July 2009 he featured on a national TV news programme as a climate change expert. He holds a strong interest in business innovation and organisational change.

Company

- Motorwind was invented in Hong Kong by serial inventor, Lucien Gambarota.
- Currently being made and sold out of Hong Kong. Has also been launched in several other countries.
- Indian venture 99% owned by Hong Kong firm.

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