

# Wind matters

Making the case for wind in India

Tulsi R. Tanti



**SUZLON**  
POWERING A GREENER TOMORROW



<b>SECTION I</b>	<b>The age of wind .....</b>	<b>1</b>
<b>SECTION II</b>	<b>India's game changer .....</b>	<b>3</b>
	Meeting growing electricity needs .....	4
	Ensuring India's energy security .....	5
	Energizing India.....	6
	Mitigating climate change .....	7
	Enhancing India's competitiveness.....	8
<b>SECTION III</b>	<b>Catalysts for wind .....</b>	<b>9</b>
	Government: Enablers par extraordinaire .....	10
	OEMs: Exemplary entrepreneurship.....	11
<b>SECTION IV</b>	<b>Horizons unbound.....</b>	<b>12</b>
	Spurring further growth.....	13
	What is in it for India?.....	14



## **Foreword**

The extraordinary success and growth of wind in India - and the economic contribution that has, in turn, delivered to the country - is largely an untold story.

As we all know, the world faces three critical shortages: food, water and energy. By addressing the energy shortage we actually make significant in-roads to managing the food and water crisis.

If a country like India can achieve so much through wind: closing the power deficit, contributing to energy security for the country, mitigating climate change and creating thousands of green jobs, then aspects of the recipe of our success to-date might be of interest to other sectors and, indeed, other parts of the world. Additionally, making inclusive growth a reality is essential as we journey from being a developing to a developed nation.

I believe the story of wind in India is one where we all can be justifiably proud. But this is only the beginning. The next decade is surely our opportunity to expand the sector further and, by 2020, to be generating 7 per cent of the country's power requirements. I should like to thank all our investors, customers and employees for supporting us on this journey. It is also appropriate to acknowledge the politicians who have stood up, been counted and done the right thing.

Recent global events have prompted an advent of new energy. The facts speak for themselves. We can power a greener tomorrow. Let us continue doing what is right for our country - and humankind.

**Tulsi R. Tanti**

Pune, June 2011

SECTION I  
The age of wind



Suzlon wind farm in Dhule, India

This is a tale of two revolutions.

Their stories are remarkably similar; both had their inception in the early 1990s, and both found real momentum at the turn of the millennium. **We speak of course of the Indian economy on the one hand, and the wind industry in India on the other; the one is powering the other.**

India's remarkable growth over the last two decades is well documented. But there is another, lesser known, growth story that has created a silent revolution of sorts in India's energy and climate space. During this time, the Indian wind industry grew from a purely nascent state to the third largest annual market in the world, contributing nearly 8.2 per cent of India's power generating capacity. In so doing, the Indian wind industry has powered India ahead of the curve in terms of climate change mitigation as well as in terms of meeting India's peak energy deficit.

An economy that is growing at nearly 10 per cent will need to double in a single decade the total electricity capacity additions of the last

60 years – which stands at 174 GW today. There is only one viable, scalable and clean answer to India's electricity conundrum. Wind based power generation is, of course, free of fuel cost, scalable at remarkably quick rates, and is also a clean source. In such a scenario, wind becomes a critical, irreplaceable answer to India's electricity needs and climate concerns..

This paper aims to uncover how the wind industry has made a substantial, though sometimes unseen contribution. India's growth story. It also examines what the wind industry can do for the Indian economy in the future, in terms of employment and inclusive growth, electricity generation, and efforts to mitigate climate change.

***India's growth potential over the next two decades is limited only by our infrastructure. Wind will be one of the most important pillars of the next chapter in this exciting growth story.***

SECTION II  
India's game changer



Suzlon wind farm in Kutch, India

Of the many growth stories that the Indian economy has been witness to over the last decade, few have been as impressive, and as rapid, as that of the Indian wind industry.

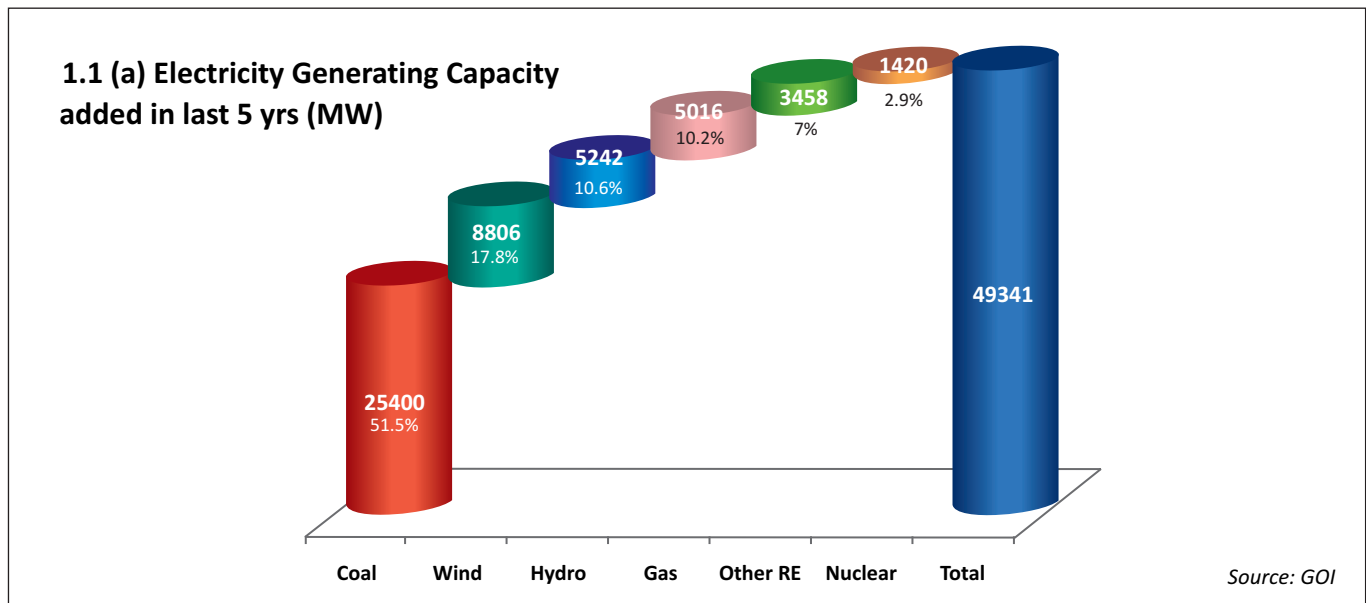
At the onset of the decade recently past, India's wind industry stood at what now seems to be a paltry 1.7 GW. From these humble beginnings, India has soared to a total installed capacity of 14.1 GW, which translates into a Compound Annual Growth Rate (CAGR) put in full for first mention of 26 per cent. Another statistic that makes for equally impressive reading: the annual market size at the beginning of the decade was 200 to 300 MW; that number has jumped to 2351 MW in FY 2011.

These numbers impressive though they are don't tell the entire story. The benefits of the wind industry in India have been multi-faceted the

sector has made substantial contributions to growth in employment, community development and related growth linkages/multipliers which are of great intrinsic value but seldom counted.

### Meeting growing electricity needs

The Indian elephant of the 1980s has metamorphosed into the sleek Indian tiger of the 2000s. A moribund economy that would consider a growth rate of four per cent as an exceptional achievement now looks askance at growth rates of 'only' eight to nine per cent. However, a growth rate in excess of 8 per cent or near eight per cent over the last decade warrants a commensurate rise in demand for electricity, which is likely to grow at 5-6 per cent over the next decade. And there lies the nub of the problem.



Despite 68 GW of total power generating capacity being added over the last 10 years, peak demand deficit continues to remain worryingly high, at nearly 12-13 per cent. Those of us living in urban areas are aware of this problem, of course, especially during India's long and hot summer. Rural India paints a more desolate and desperate picture when it comes to electricity supply: 35 per cent of India's population does not have regular access to electricity. This implies nearly 60,000 villages cannot expect any improvements in their standard of living any time soon.

That India has tremendous latent demand is therefore extremely clear. Wind has played its part in overcoming this challenge. Of the total capacity additions of 49 GW in electricity in the last five years, wind alone was responsible for nearly 18 per cent (8.8 GW) (*please refer exhibit 1.1 a & b*) and had the highest share, barring only coal.

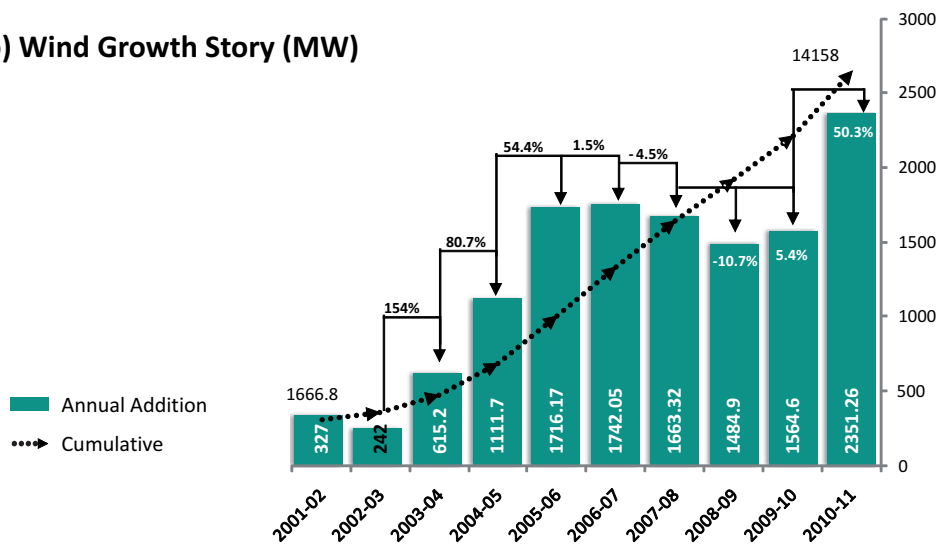
In cumulative terms, wind has the capacity to generate around 3.5 per cent of the total electricity generation mix at 23 per cent capacity factor.

The wind industry alone has thus far contributed over 100 TWh to help satisfy India's ever increasing need for power as we journey from a developing to a developed economy

### Ensuring India's energy security

About 80 per cent of India's oil needs are fulfilled by imports. And while India is undoubtedly a coal rich nation, 12-15 per cent of India's electricity is generated by coal that is imported from other nations. There are two ways in which wind provides energy security. **First**, wind has helped the nation reduce its dependency on expensive and polluting diesel-based power generating capacity.

1.1 (b) Wind Growth Story (MW)



Source: GOI

**The second**, and actually more important advantage conferred by wind, is that, thus far wind has saved India over 54 million tons of coal imports, or upwards of 4.8 billion USD over the last 10 years.

## Energizing India

An often overlooked aspect of the wind industry is the tremendous benefits that it confers in terms of socio-economic development, especially in the rural parts of the country along with huge forward and backward linkages.

India is well on its way to becoming a regional hub for the renewables industry in general, and the wind industry specifically, especially with the added benefit of its long value chain, resulting a massive boost to exports.

In terms of employment, every megawatt of new wind capacity creates 15 jobs on a direct and indirect basis. In addition, one extra job is also created on a cumulative basis for every three megawatts installed for operation and maintenance. ***In total, 219,000 Job-years (one job for year) have been created due to the wind industry thus far. Annually, the wind industry is creating 38,000-40,000 jobs year on year.***

The most important socio-economic development that is happening is the inclusive growth of communities in and around wind installations, all of which are situated in rural areas. In parallel, a lot of rural infrastructure is being developed around these farms, actively aided by the wind manufacturing companies. Also, local communities are encouraged to continue farming on the leased lands; companies like Suzlon actively promote local developmental services such as health, sanitation and education in and near the villages which have wind installations.

### Exhibit 1.2



#### Investment

Over Rs. 75,000 (US\$ 17 Bn) crores have been invested in wind industry thus far



#### Energy Security

Indian wind industry has saved over 54 million tonnes of coal imports to date; net savings of around US\$ 4.8 Bn



#### Employment

Over 2.2 lakh job years have been generated via the wind industry until date



#### Abatement

Over 88 million tonnes of cumulative CO2 have been abated due to date

Source: SAT - Office of the Chief Economist

*Wind installations aren't just generating electricity; they are also creating opportunities and wealth creator for those at the very bottom of the pyramid (Please refer exhibit 1.2).*

## Combating climate change

Although growth is the top most priority, given the current urbanization rate of 30 per cent, India's Governments have understood the nuances of climate change, and the need for acting as a responsible nation. This is especially important, as well as timely, because India already has become the third largest emitter, with rapidly growing per capita Green House Gasses (GHG) **In full pl emissions.**

A related challenge for India was in terms of meeting its burgeoning electricity demand in a sustainable way. In this regard, India has already done far more than could be reasonably expected of her. *It is wind that has given India the lead in mitigating climate change.*

More to the point, a recent report of the Ministry of Environment and Forests has rightly pointed out that no large country in the world is as vulnerable, on so many dimensions, to climate change as India. With over 7,000 kilometers of coastline threatened by sea level rise, and rapidly melting glaciers in the erstwhile pristine Himalayas, India's biodiversity and ecology is under a very serious threat (*See exhibit 1.3*).

### Exhibit 1.3



#### Rising Temperatures

Indian annual mean temperature showed a warming trend of 0.51° C per 100 years. Temperatures across the country are forecast to rise by a minimum of 1° C to 4° C towards 2030.



#### Declining Yields

Projected yields of major crops, such as rice, maize, sorghum are likely to decline by 20 per cent on average by 2030.



#### Sea Level Rise

The sea level has been rising at 1.3mm/year in the last two decades, could increase to 2 mm by 2030 .



#### Epidemics Likely

Incidence of diseases is likely to sharply increase by 2030 due to rising temperatures, increasing salinity and higher precipitation.

Source: Ministry of Environment & Forest, CLIMATE CHANGE AND INDIA : A 4 X 4 ASSESSMENT A SECTORAL AND REGIONAL ANALYSIS FOR 2030s

*Wind installations in India have resulted in reducing CO2 emissions cumulatively by as much as 91 million tons. Last year alone (FY '11) the wind industry abated emissions to the tune of 22.8 million tons.* Wind is considered to be the least emitter of Green House Gases (GHGs), even in comparison to other renewables, when it comes to manufacturing processes.

### Increasing India's competitiveness

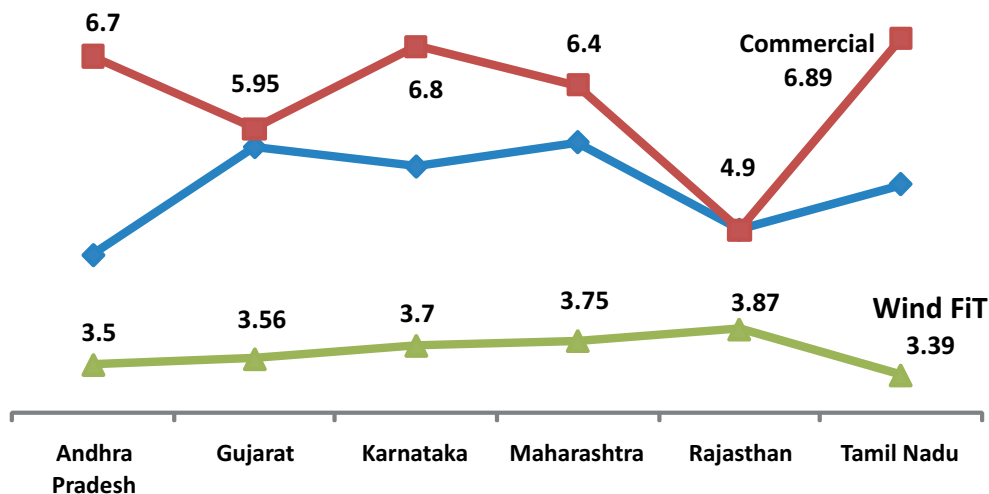
Contrary to a very popular perception, wind is actually not an expensive technology. It offers a dual advantage to the user of electricity. On the one hand, it is perhaps the most competitive source of electricity today with absolutely no fuel costs. On the other hand, when contrasted with wildly fluctuating prices of fossil

fuels, wind becomes the fuel of choice with a stable pricing visibility of over 20 years.

The cost of generating a kilowatt-hour of energy from wind has gone down over the years. This is because technology is bringing costs down sharply, and also because of larger MW machines being installed. **The feed-in tariff for wind per unit of Kilowatt-hour (KWh) among major wind states ranges from Rs 3.4 to Rs 5.3, whereas the commercial and industrial tariff prevailing in these states are substantially higher, going up by multiples of 1.3 to 1.7** (Please refer to exhibit 1.4). Wind has already achieved parity at the sub-grid level, even though fossil fuels costs still do not factor in the environmental costs.

Wind is, without any doubt, a game changer for India.

**1.4 Wind vs Commercial Tariff (Rs./KWh)**



Source: SERC



SECTION III  
Catalysts for  
wind



Suzlon wind farm in Jaisalmer, India

Wind's growth story would not have been possible without the exemplary synchronicity displayed by both industry and Government over the last 15 years.

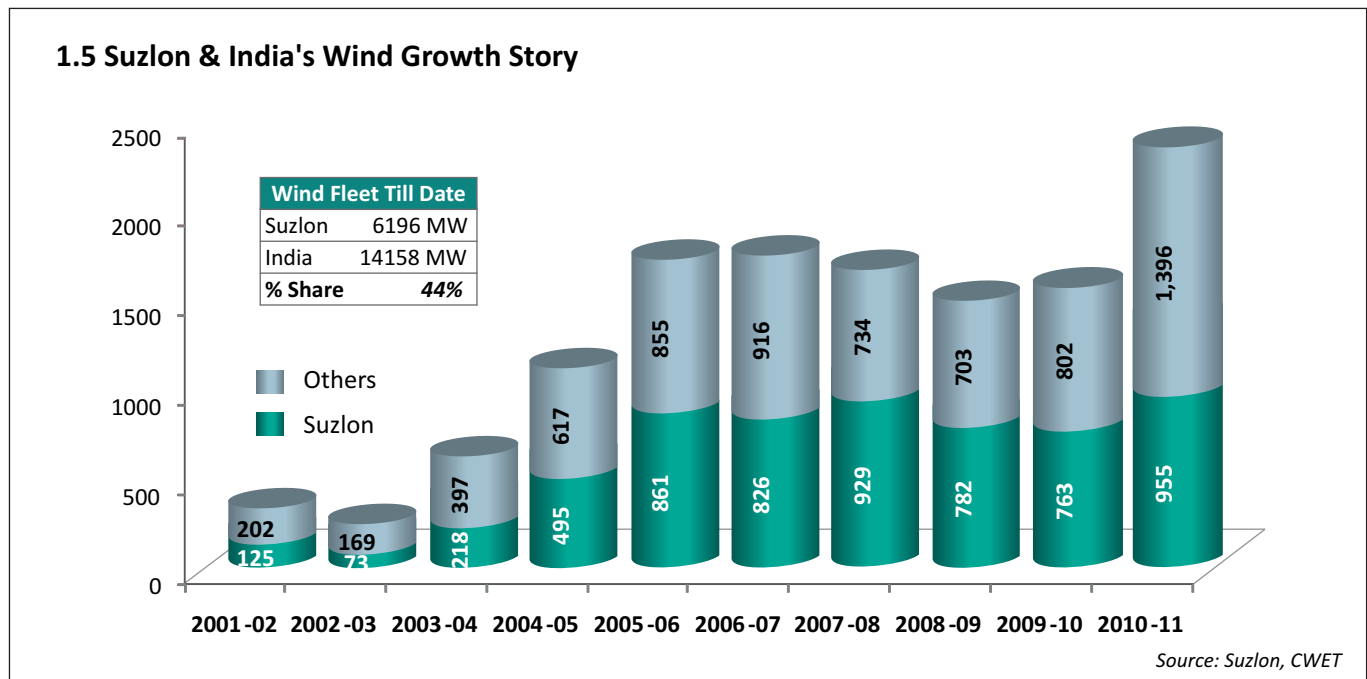
### Government: Enablers par extraordinaire

India is fortunate to have a very supportive and action-oriented Government at both the centre and the state level for facilitating and steering India's wind industry's growth story, especially so in the context of the wind industry. The regulatory bodies, CERC and SERC and other institutions such as CWET, IREDA, have played a

stellar role in setting the necessary foundations and supports required for the greater penetration of wind.

It is due to these strong policy enablers that India today stands at par with the EU, in terms of a policy and regulatory environment and in supporting frameworks within which wind can experience self-sustained growth.

***The public policy regime and regulatory environment in India is an exemplary benchmark for emerging markets.***



### OEMs: Exemplary entrepreneurship

There is an old phrase that is particularly apt in this context: it takes two to tango. While the Government did much more than could be reasonably expected of them in terms of laying the ground work, the kind of revolution that we have seen would not have been possible without the entrepreneurial spirit displayed by the early pioneers in the wind industry.

Wind was a relatively nascent industry as late as the early 2000s across the globe, but particularly so in India. Every aspect of the wind industry value chain, right from wind measurement up until operations and maintenance of wind installations, was a complex, costly and technically challenging problem. In order to scale this industry, and derive advantages therein, the country needed both advanced technologies, as well as advanced solutions providers.

While India played host to almost all the world's leading wind energy companies in the early 90s, the industry had sunk to its

When we began our journey, we realized India is a unique market that needed customized solutions. From here, we led the field in introducing innovative and advanced technology at affordable costs, integrated value chain to offer reliable technology and a comprehensive, customized product portfolio, and most importantly - an end-to-end solution offering giving customers ease of access for investment into the sector. With a fleet of more than 5,500 MW installed across over 40 sites and 45 per cent of the total market share Suzlon's growth story is a bell weather of India's wind power sector. (please refer exhibit 1.5).

The market has gradually transformed over the last three years or so into a relatively developed market. The entry of international heavyweights such as Vestas and Siemens is proof of the fact that India is now an attractive destination for both investment and manufacturing.

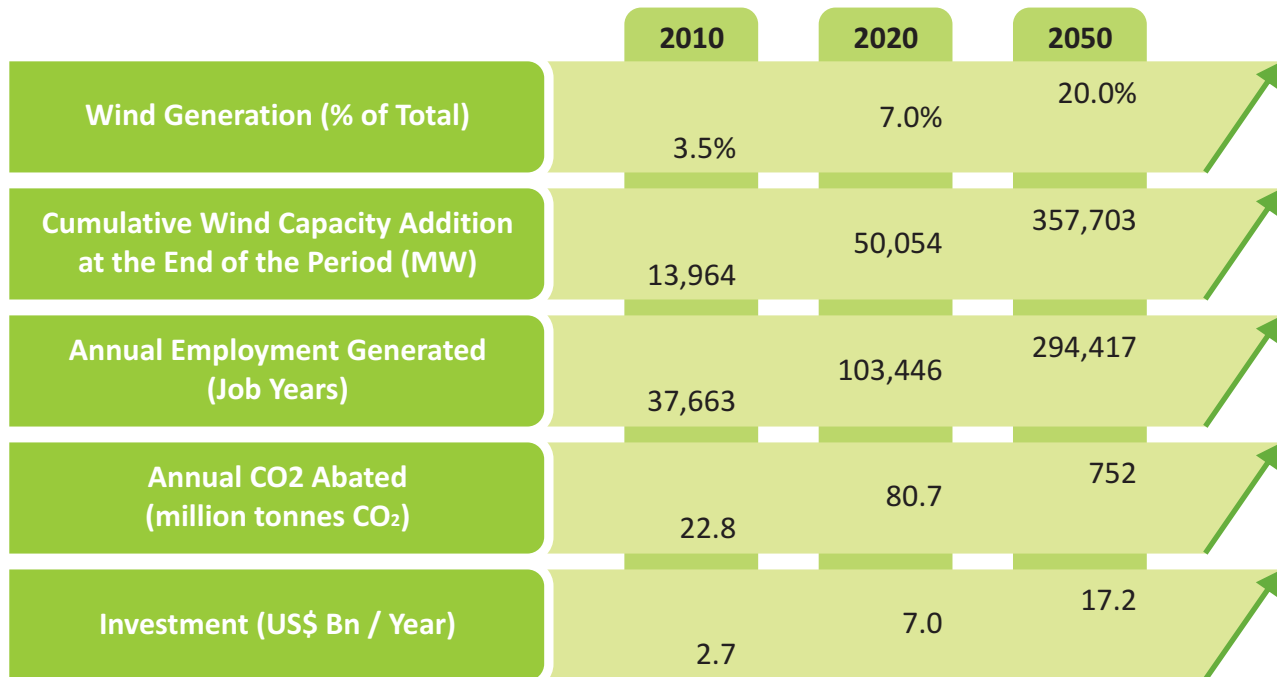
***The wind growth story is testimony to what is possible when entrepreneurial spirit combines with an exemplary public policy framework.***



SECTION IV

Horizons Unbound:  
7% by 2020, 20% by 2050

Suzlon wind farm in Dhule, India



Source: SAT - Office of the Chief Economist

That we have achieved much over the recent past is without doubt; that we have a long, long way to go is also truth. Investors, manufacturers and policy makers have all reached a stage of maturity from which a simply stratospheric growth trajectory is really possible.

It is our firm belief that anything less than a doubling of wind's contribution to India's potential generation to 7 per cent by 2020, and tripling this figure by 2050, would be doing ourselves a grave disservice. NAPCC's target of 15 per cent of renewable energy in the electricity generation mix by 2020 is a good step in this direction, and it is to be hoped that SERC will follow through in terms of implementation.

### Spurring further growth

The loftiest of ambitions must be rooted in the realms of reality. In what follows, we break down these admittedly ambitious aims into more concrete targets.

- (1) 50 GW of wind installations by 2020; 350 GW by 2050:** While it is a known fact that India is not an expressly wind-rich nation, technical advancements have made it possible to harness wind from both low wind sites as well as from altitudes of more than 80 metres.

The wind potential at current estimates stands at 49 GW at an altitude of 50 metres. Tamil Nadu is an example of a state that has already exceeded its estimated potential and is still growing rapidly. It is therefore clear that much of the wind potential has not as yet been assessed. We believe that CWET is currently undertaking a study along these lines and that India's potential could increase significantly. This excludes the vast off-shore potential that lies dormant along India's gargantuan 7,000 kilometre coastline.

- (2) **US\$ 50 Bn** will need to be pumped into the wind industry over the next decade if we are to realize our targets. This represents an exciting and largely untapped opportunity for the financial sector in India.
- (3) **OEMs have a huge and critical responsibility** in scaling up their R&D in order to usher in technological advancements that will enable effective deployment of machines in both low wind sites as well sites that have winds at appreciable higher altitudes, at an affordable price. A breakthrough in storage capacities and grid compatibility of machines would be a truly revolutionary step for the wind industry. Indeed, it could allow for wind to be a base load source, rather than the peak load source.

## What is in it for India?

If India is able to tap into all the potential that wind has to offer, we stand to reap tremendous benefits along multiple dimensions.

- (1) **Energy Poverty Alleviation and Securitization:** Based on the assumption that 50 GW is the installed capacity by 2020, wind could by itself generate as much as 650 TWh in the next 10 years, satisfying the needs of people who are currently

deprived of any access to electricity at all. In addition, wind power will secure India to the tune of US\$ 23 Bn by reducing the dependency on imported coal and fossil fuels. It is to be hoped that, if targets for 2050 are met, we can remove in totality coal imports altogether and will significantly reduce our dependency on fossil fuels.

- (2) **Creating Green Jobs:** In 2010 alone, the wind industry created 37,600 job-years. **This number is expected to exceed 100,000 by 2020 in terms of incremental annual jobs year.** These jobs, of course, are not only the ones created in the wind industry per se. The enormous potential created by the backward and forward linkages with other, related economic sectors will result in many more employment opportunities being created.
- (3) **A Cleaner, Greener India:** India's fossil fuel dependency for electricity generation is currently around 80 per cent, which can be easily brought down if wind and other renewable energy sources gain ascendancy. Wind generation can save India around 500 million tons of CO<sub>2</sub> cumulatively in the current decade. Wind therefore has the potential to ramp up, to a significant extent, India's climate change mitigation efforts, along with improving India's standing in the international community when it comes to climate change issues.

**The growth of the wind industry has been a success story with few parallels over the last two decades. With clear policy supports, a clear appetite for investments, and an accelerating appetite for power, there is nod doubt that wind can play a key role in not only contributing to India's energy security, but also as a catalyst to rural development, creating decent, meaningful employment, and significantly reducing India's carbon footprint. Truly a game changer for an emergent India.**

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