

# ***WIND ENERGY IN INDIA***

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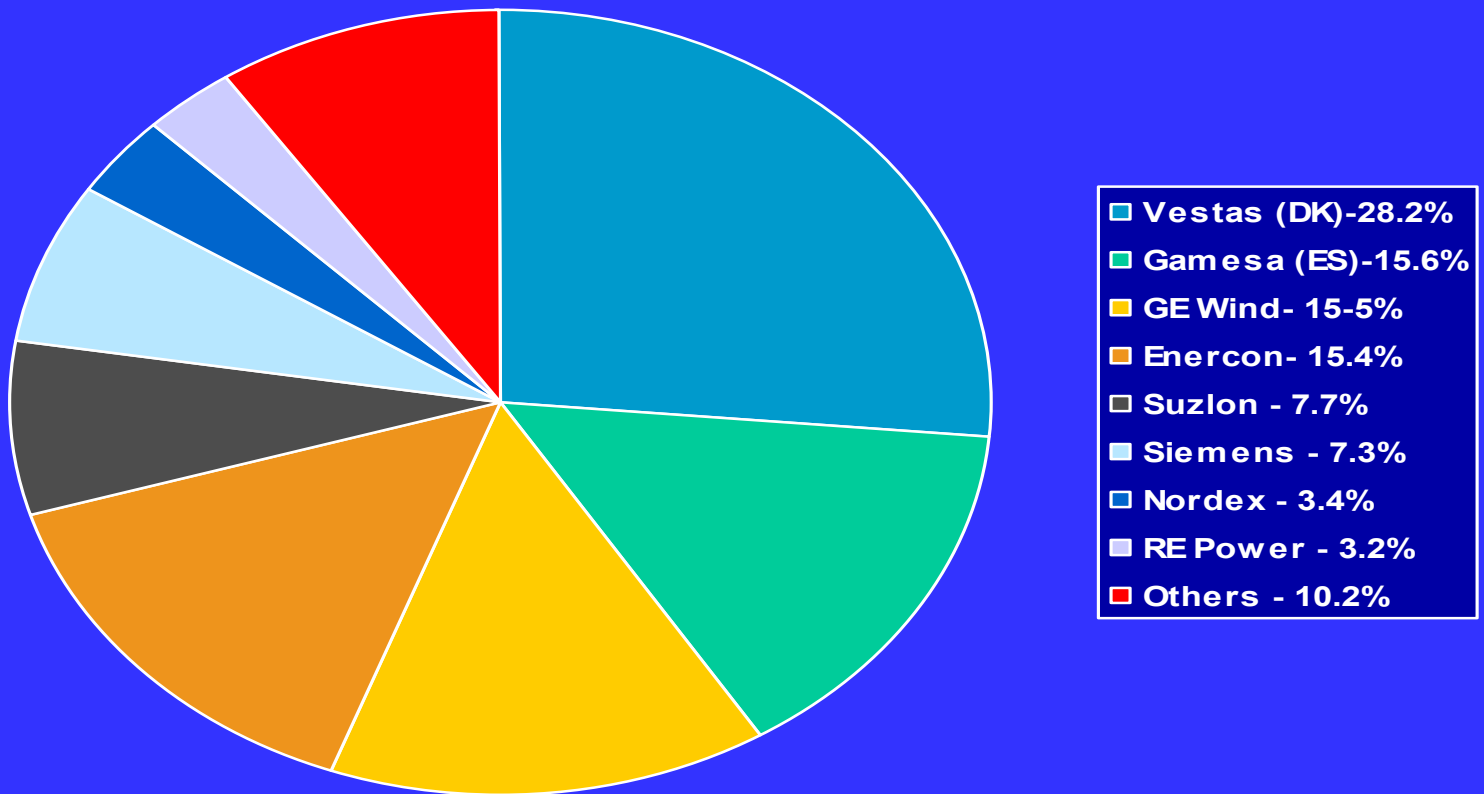
# WIND MARKET : GLOBAL SCENARIO

# Wind Energy - Fastest Growing Energy Sources

- Global renewable energy capacity increased by over 20,000 MW in 2006
- Wind energy added around 15,016 MW out of total renewable energy capacity in 2006.
- Wind industry has achieved an average growth of 17.1% over the past five years.
- Forecast up to 2011 indicates average growth in annual installation of 17.4% p.a.
- Growth Centres: USA, India and China with Europe maintaining high demand.
- Global drivers are stronger than ever: climate change and security of supply.
- The market value of the industry over the next five years would be around US\$186.4 billion.

# World Top 10 Suppliers In 2006

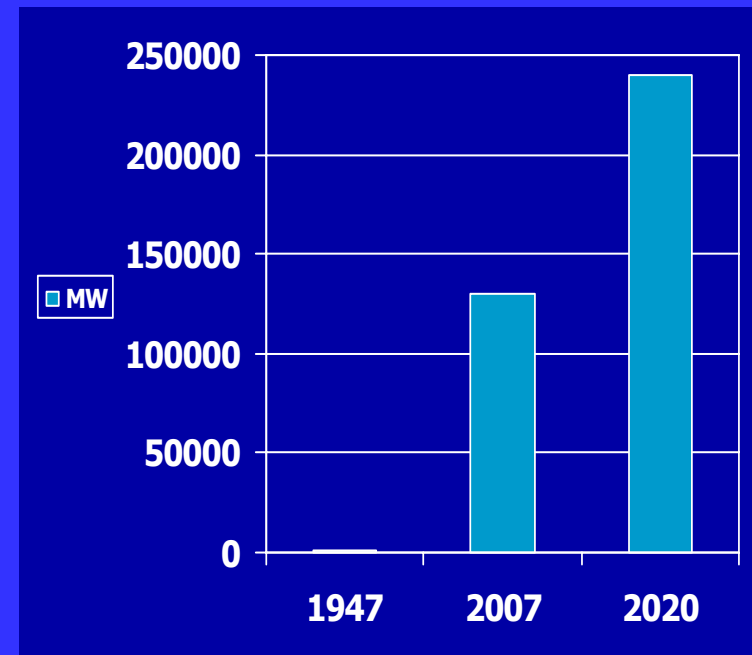
% of the total market 11,407 MW



# Power Scenario In India

## Electricity situation in India

- **Current Installed Capacity - Around 130000 MW**
- **Target Planned Capacity – 240000 MW by 2020**
- **India has been experiencing a large gap between demand and supply of electricity.**
- **Power shortfall between 10 – 12% despite annual growth in generating capacity of 8 to 10%. Peak level shortages exceed 35%.**
- **End consumers of electricity continue to experience shortages in terms of reliable access to electricity.**
- **The National Electricity Policy, 2005 expresses the need to use non-conventional energy sources such as wind, co-generation, small hydro, solar and biomass.**
- **Non-conventional Energy Sources including wind are also important to provide decentralised energy supply in agriculture industry and remote areas.**



# The Indian Economy.....



Witnessing an economic boom	GDP showing robust growth rate above 8%	Easy availability of credit in domestic and international markets	Industry in an upbeat mood. Power supply requirement growing rapidly	Considerable thrust towards infrastructure development
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# The Indian Economy.....



## CAUSE OF CONCERN

Demand for Power Growth Rate – 8 to 9%

Supply of Power Growth Rate – 4 to 5%

Depleting fossil fuels and their rising prices

# Estimated Potential And Cumulative Achievements As On 31.03.2007

Sl.No.	Sources/Systems	Estimated Potential	Cumulative Achievements (as on 31.03.2007)
<b>I.</b>	<b>Power From Renewables</b>		
<b>A.</b>	<b>Grid-interactive renewable power</b>		
1.	Bio Power (Agro residues & Plantations)	61,000	524.80 MW
2.	Wind Power	45,000	7092.00 MW
3.	Small Hydro Power (up to 25 MW)	15,000	1975.60 MW
4.	Cogeneration-bagasse	5,000	615.83 MW
5.	Waste to Energy	7,000	43.45 MW
	<b>Sub Total (in MW)</b>	<b>1,33,000</b>	<b>10,251.68 MW</b>

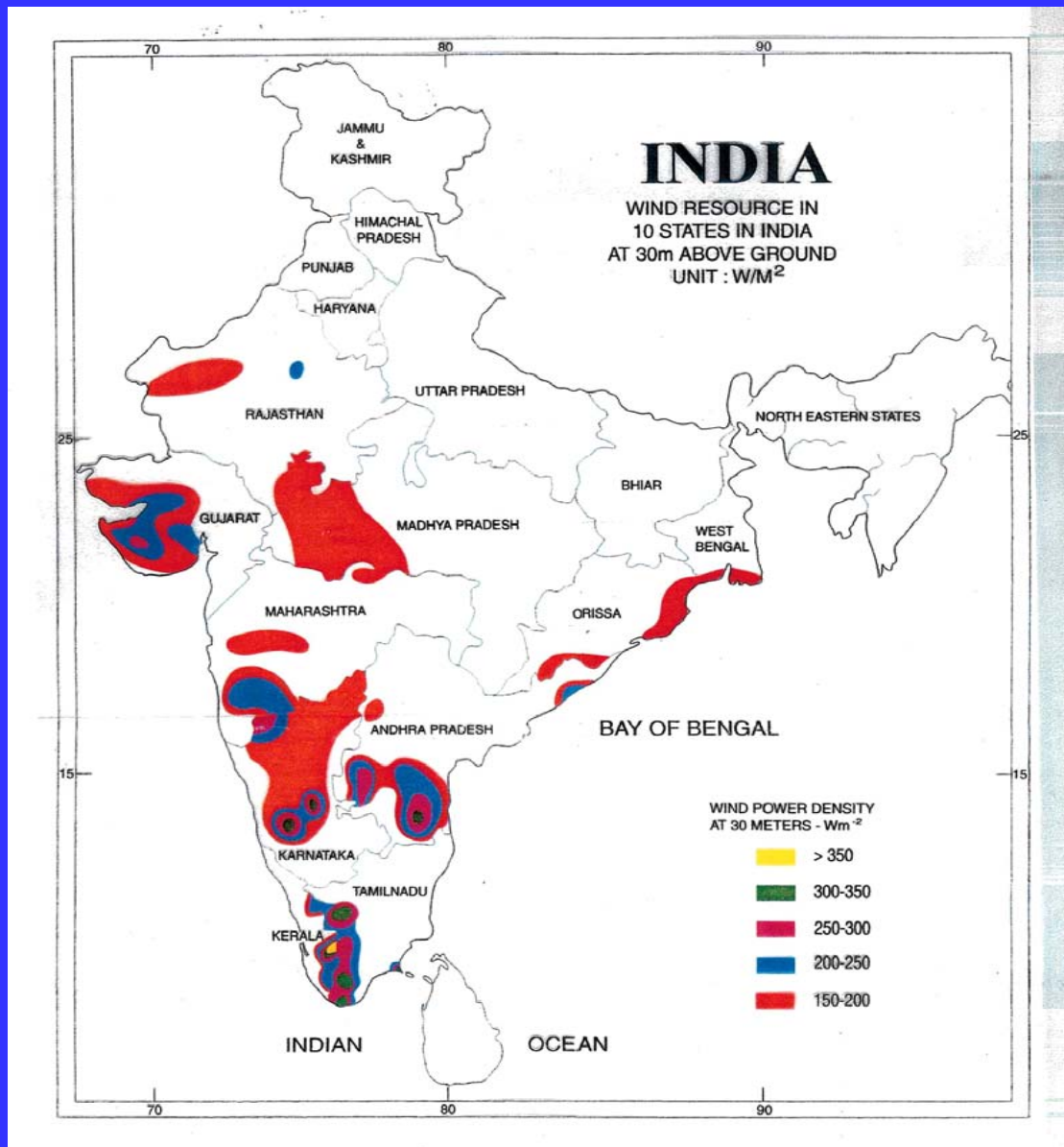
# WIND ENERGY

# Wind Energy Potential In India...

## HIGHLIGHTS

Potential	(MW)
Estimated by Ministry of New and Renewable Energy	45000
Achievement as on 31 March 2007	7090
Capacity Addition during the Financial Year 2006-07	1749

# Wind Resource In India



# Statewise Wind Energy Potential

Sl. No.	State	Gross Potential (MW)
1.	Andhra Pradesh	8275
2.	Gujarat	9675
3.	Karnataka	6620
4.	Kerala	875
5.	Madhya Pradesh	5500
6.	Maharashtra	3650
7.	Orissa	1700
8.	Rajasthan	5400
9.	Tamil Nadu	3050
10.	West Bengal	450
	<b>Total</b>	<b>45195</b>

# Statewise Installation Of Wind Energy Projects

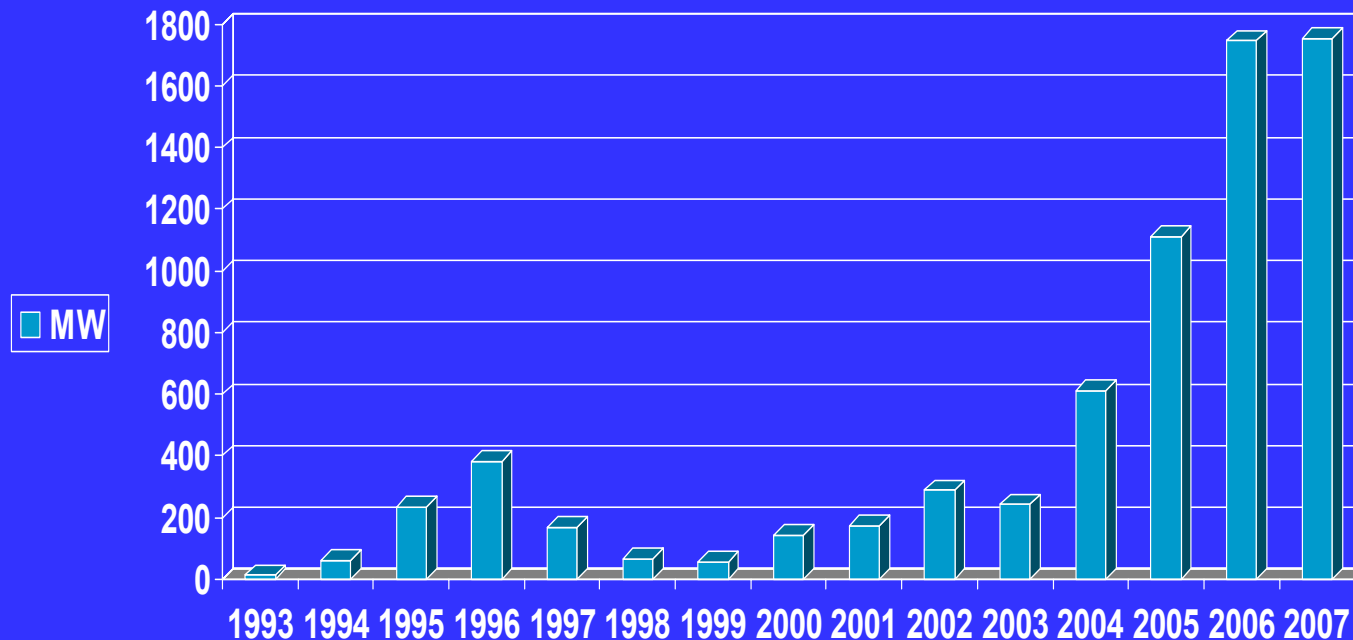
State	Mar-04	Mar-05	Mar-06	Mar-07
Tamilnadu	1361.6 MW	2037 MW	2894.6 MW	3492.7 MW
Karnataka	209.2 MW	410.7 MW	584.5 MW	821.1MW
Maharashtra	407.4 MW	456.2 MW	1001.3 MW	1487.7 MW
Rajasthan	178.5 MW	284.8 MW	358.1 MW	469.8 MW
Andhra Pradesh	98.8 MW	120.6 MW	121.1 MW	122.4 MW
Madhya Pradesh	22.6 MW	28.9 MW	40.3 MW	57.3 MW
Kerala	2 MW	2 MW	2 MW	2 MW
West Bengal	1.1 MW	1.1 MW	1.1 MW	1.1 MW
Gujarat	201.9 MW	253 MW	338 MW	636.6 MW
<b>Total</b>	<b>2483.6 MW</b>	<b>3594.3 MW</b>	<b>5341 MW</b>	<b>7090.3 MW</b>

# Cost Comparison With Other Renewable Sources

Sources	Cost per MW (Rs. Crore)	Levelised cost per Kwh (Rs/kwh)
Wind Power	4.5 – 5.25	2.5-3.7
Small Hydro Power	3.5-6.25	1.8-3.4
Biomass Power	3.5-4.0	2.2-3.2
Solar	10-12	8-10
Thermal Power Plant	4.0-4.8	2.5-3.0

# Wind Sector growth In India.....

## YEARLY INSTALLATION



# Investment Pattern

➤ Main types of investors investing in wind energy projects:

- \* To take advantage of tax benefits – 20% investors
- \* Need for power and also to avail the tax benefits including captive power – 70% investors
- \* Captive power for industrial use
- \* IPPs (Emerging trend)

➤ Generated power can be utilised through three main routes:

- a) Sale to utilities
- b) Own Consumption
- c) Sale to Third Party

# Why Investment In Wind Energy Attractive?

Private Sector have shown significant interest in wind sector. Factors generating such interest are as follows:

- Attractive buy-back rates of more than Rs.3.00/kwh (levelized for 10 years) and accelerated depreciation of 80% on wind investments offer a good margin to the investor investing for sale to grid.
- Inflation free source of power to meet captive needs of industry in an era of increasing prices of conventional fuels, demand supply gap and high industrial tariffs.
- With availability based tariff implementation at the state level, inflation free wind power offer considerable scope in trading, after debit repayment period.
- Declining cost due to improving technologies.
- CDM benefits and carbon trading offer a huge opportunity to improve payback period of investment.
- Low Gestation period.
- Wind energy quotas in some States.

# Key Drivers: Investment Incentives

- Oil prices touching the roof – driven by geopolitical uncertainty and fear of scarcity. Oil prices peaked to above 76/bbl
- Emerging financing options:
  - ✓ VCs funding the development of new clean technologies
  - ✓ Incubator organizations providing R&D support
  - ✓ Investment banking showing interest
  - ✓ Bond Market is starting to finance wind farms
- Attractive investment incentives – Generous feed in tariffs – Provides an inflation free investment
- Investment by energy intensive industries in wind energy to freeze future electricity costs given high industrial tariff
- Technological advancement thereby achieving PLF over 38%
- Cost reductions due to decrease in production and O&M Costs, and increased availability.

# Key Drivers: Carbon Finance

- Wind Energy is eligible for carbon credit benefits under the Kyoto Protocol for a decade from 2002.
- Estimate drawn up by the Infrastructure Development Finance Corporation (IDFC), each unit of electricity produced by wind power, could earn 15 paise worth of carbon credits.
- As per a rough calculation, if the CER price is 6 Euros, then a 600/750 KW turbine can earn its O&M cost per year.
- The 'Prototype carbon fund' of the World Bank encourages investor to fund renewable energy projects. Investors are given pro-rata share of the CERs produced from their investment.
- CDM Projects in India
  - ✓ CDM market in India reached new heights since the first registration in 2004
  - ✓ India tops the list in number CDM projects registered)
  - ✓ India contributes 11.5% to the volume of CER's from registered projects

Carbon trading is an important market driver; a recent alert spoke of India standing to gain \$5 billion from carbon credit in next 6-7 years

# Government Policies Incentives

## ➤ Central & State Government Policy Highlights:

- ✓ 80% accelerated depreciation
- ✓ Excise duty/import tariff concessions
- ✓ Tax holiday for power generation
- ✓ Feed-in tariffs
- ✓ Wind energy quota
- ✓ Provision of banking, wheeling and third party sale of power
- ✓ Other financial incentives/subsidies in certain states

## ➤ Foreign Investment Policy:

Automatic approval for foreign investors to enter into Joint Venture with an Indian partner for financial and/or technical collaboration/setting up of RE based power projects (100% equity permissible)

# Wind Energy Tariff - Statewise

States	Wheeling	Banking	Buy-back	Third party states
Andhra Pradesh	At par with conventional	Not Allowed	Rs.3.37 w.e.f. 1-4-2004 (Frozen for 5 years)	Allowed under Electricity Act, 2003 subject to regulation framed by respective SERCs
Tamilnadu	5% of energy	5% (12 months based on Financial Year – April to March)	Rs.2.90/kwh	Allowed under Electricity Act, 2003 subject to regulation framed by respective SERCs
Karnataka	5% of energy + 1.15/kwh as cross subsidy for 3 <sup>rd</sup> party sale	2% of energy input	Rs.3.40/kwh without any escalation for 10 years	Allowed under Electricity Act, 2003 subject to regulation framed by respective SERCs
Kerala	To be decided by SERC		To be decided by SERC	Allowed under Electricity Act, 2003 subject to regulation framed by respective SERCs
West Bengal	7% of energy + open access charges		Rs.4.00/kwh	Allowed under Electricity Act, 2003 subject to regulation framed by respective SERCs
Gujarat	4% of energy	Not Allowed	R.3.37/kwh without any escalation for 20 years	Allowed under Electricity Act, 2003 subject to regulation framed by respective SERCs
Madhya Pradesh	2% of energy + transmission charges as per ERC	Not Allowed	Yr 1 : Rs.3.37, Yr 2 : Rs.3.80, Yr 3: Rs.3.63, Yr 4: Rs.3.40 and Yr 5-20: Rs.3.30	Allowed under Electricity Act, 2003 subject to regulation framed by respective SERCs
Maharashtra	2% of energy as wheeling + 5% as T & D loss	12 months	Rs.3.50/kwh (escalation of 15 paise per year for 13 years)	Allowed under Electricity Act, 2003 subject to regulation framed by respective SERCs
Rajasthan	Below 132 KV, 50% of normal charges applicable	6 months	Yr 1: Rs.3.25/kwh (escalation 6 paise per year until 10 <sup>th</sup> year and then Rs.3.79/kwh from 11-20 years)	Allowed under Electricity Act, 2003 subject to regulation framed by respective SERCs

# Socio-Economic Benefits

- Creation of local employment opportunities.
- Improvement of power transmission networks.
- Reduction of transmission cost.
- Improvement in quality of power.
- Long term energy security.
- Overall development of the area.

# Major Manufacturers In India

- Vestas RRB
- Suzlon
- Enercon



# Future Projections

Cumulative Installed Capacity (MW) by end of March 2007	Installed capacity (MW) in 2006-07	Forecast 2008-2010			Total Installed capacity between 2008-2010	Cumulative installed capacity (MW) by end of 2010
		2008	2009	2010		
7092	1752	2000	2250	3000	7250	14342

# Vestas RRB India Ltd.

Vestas RRB India Provides a total Wind Energy Solutions to our Customer.

Our Turnkey offer/service includes:

- ✓ Identifying suitable sites based on wind resource data
- ✓ Site design and micrositing
- ✓ Land acquisition
- ✓ Supply of high quality Wind Electric Generators
- ✓ Site Development
- ✓ Civil foundation
- ✓ Electrical work
- ✓ Assisting obtaining approval from designated authority/ies
- ✓ Assisting execution of Power Purchase Agreement
- ✓ Erection and Commissioning
- ✓ Providing after sales service



Thank you