FUTURE AND SCOPE OF WIND ENERGY IN INDIA

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ABSTRACT: In the present paper we have studied the present scenario of power sector of India and need for application of renewable sources for future shortage in power demands. Wind turbines do not need any type of fuel, so there are no environmental risks or degradation from the exploration, extraction, transport, shipment, processing or disposal of fuel. of all the renewables, wind energy dominates as an immediate viable, cost effective option which promotes energy conservation and avoids equivalent utilization of fossil fuels and avoid million ton of Greenhouse gas emission causing ozone depletion and other environmental impacts like Global Warming. Carbon di-oxide emissions can be reduced on an average 3.3million tons in a year by adding 1 GW energy of renewable origin like wind energy and production of clean energy only by help of renewable energy sources, so it will help to minimize the adverse effects of climate change in India.as we as globally.

Keywords: Energy Conservation, Externalities, Green House Gas, Clean Energy

INTRODUCTION

The exponential growth in the rate of energy consumption is the main cause of energy shortage, as well as energy resources depletion worldwide. Electricity shortage is very common in country like India where most of the population (i.e. over 40 percent) has no access to modern energy services. On an average, electricity demand is expected to raise 7.4percent annually for next 25 years. According to International Energy Agency, more than 28 percent share of the world's total energy will be consumed in India and China by the year 2030. Therefore a significant amount of energy must come from renewable sources. National Action Plan on Climate Change (NAPCC) was formed in 2008 for climate change control, has also considered role of renewable energy in total energy production of India. NAPCC has also set a target to increase the renewable energy share in total energy production up to 15 percent till year 2020, which clearly shows India's commitment towards a sustainable development. The huge gap between demand and supply requires more energy resources. The basic challenge is to fulfill the energy requirements in a sustainable way and one of the best available options in current scenario is renewable energy sources, so it is required to intensify Renewable energy and energy efficiency program. By moving towards renewable energy production, which must be indigenous in nature and must have low generation cost, we can enhance energy security condition, reduce our import dependency, solve problem of fuel price instability etc. Carbon di oxide emissions can be reduced on an average 3.3million tons in a year by adding 1 GW energy of renewable origin so it will help to minimize the adverse effects of climate change in India. Wind energy can emerge as a solution of most of the problems because it is cost-effective in nature, clean energy resource, reduce fossil fuel demand and more over could be a fighting tool against climate change. Wind power has been using since ancient eras for various purposes. Before the development of the steam engine, conventionally wind power was primarily used for various applications such assailing ships etc.

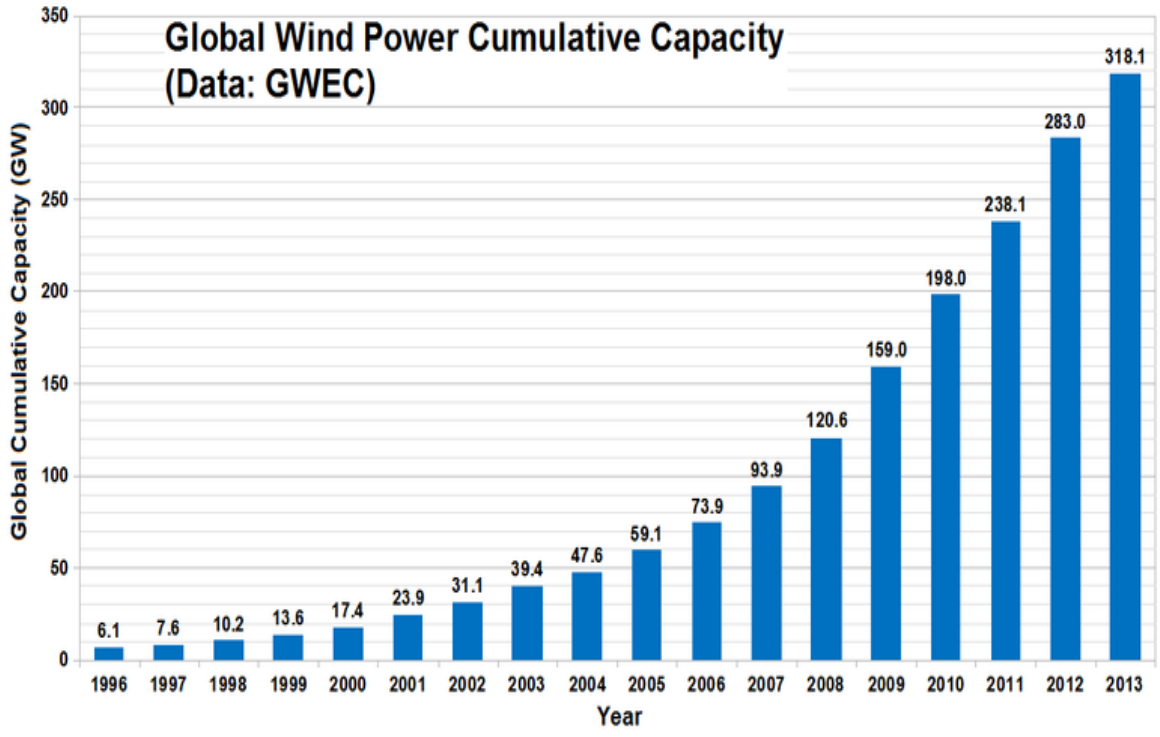
HISTORY OF WIND ENERGY TECHNOLOGY – A TECHNICAL OVERVIEW

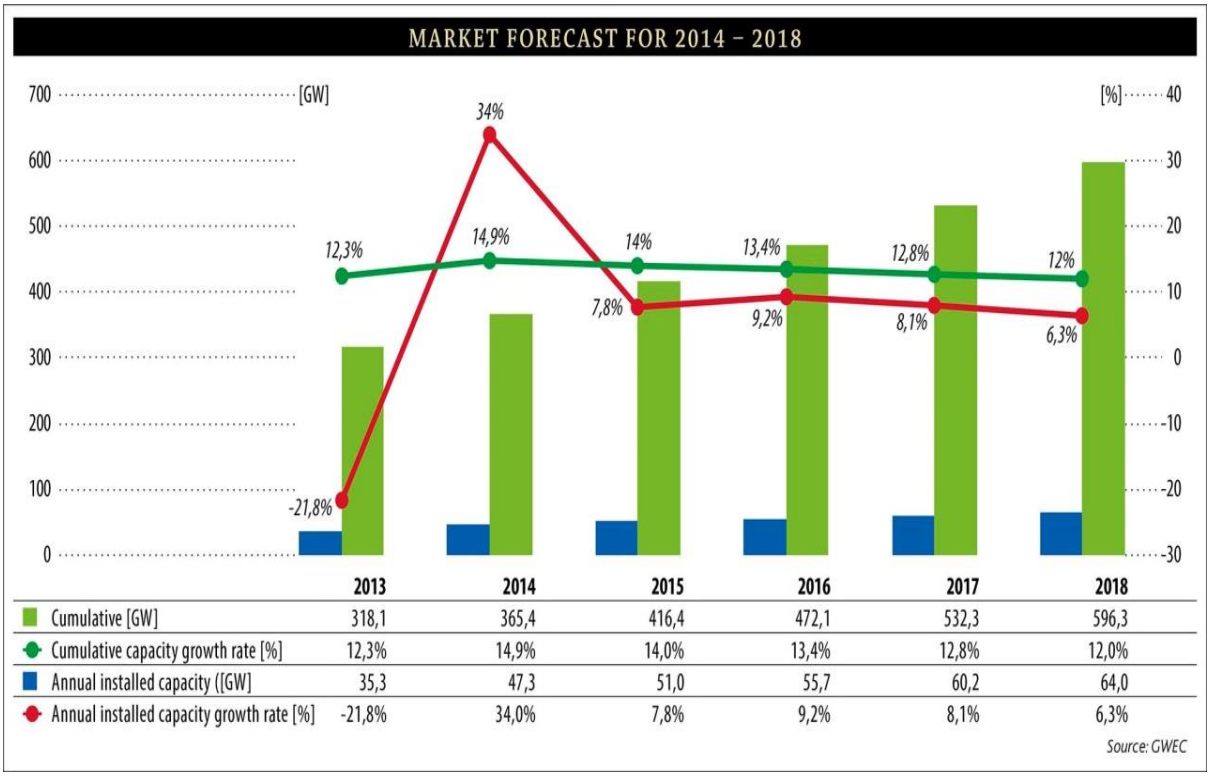
Background In 1891, a Dane by the name of Poul LaCour built the first electricity-generating wind turbine. It was improved by Danish engineers and used to supply energy during energy shortages in World War I and World War II. The wind turbines built by the Danish company F.L Schmidt (now a cement machinery maker) in 1941-1942 can be considered the forerunners of modern wind turbines, and other companies, such as the American Palmer Putnam began building turbines as well, modifying the number of blades and tower height. The actual technology has also improved in large spurts. By the end of 1989, a 300 kW wind turbine with a 30-m rotor diameter was state-of-the-art. Ten years later, 1500 kW turbines with a diameter of around 70m are available from many manufacturers. Though 4-5 MW are expected within the next 2 years, the 1.5 MW turbines remain state of-the-art. In India, a typical wind turbine is of the 200 kW type.

GLOBALLY WIND ENERGY PRODUCTION

The worldwide installed capacity of wind power reached 283 GW by the end of 2012. China (75,564 MW), US (60,007 MW), Germany (31,332 MW) and Spain (22,796 MW) are ahead of India in fifth position. The short gestation periods for installing wind turbines, and the increasing reliability and performance of wind energy machines has made wind power a favoured choice for capacity addition in India. Suzlon, an Indian-owned company, emerged on the global scene in the past decade, and by 2006 had captured almost 7.7 present of market share in global wind turbine sales. Suzlon is currently the leading manufacturer of wind turbines for the Indian market, holding some 43 present of market share in India. Suzlon's success has made India the developing country leader in advanced wind turbine technology.

Top 10 wind power countries Country Total capacity end 2013 (MW) China 91,424 United States 61,091 Germany 34,250 Spain 22,959 India 20,150 United Kingdom 10,531 Italy 8,552 France 8,254 Canada 7,803 Denmark 4,772 **Rest of world** 48,351 **Total 318,137**





Source –GWEC

WIND ENARGY IN INDIA

Wind energy program was commenced in India by the end of the 6thfive yearly plan during 1983-84 and in the last few years it has increased considerably. The main objective of the program was the commercialization of wind energy production, support research and development, provide help to wind projects and to create awareness among people. Under this program Ministry of Non Renewable Energy (MNRE) has done various modification regarding incentives, schemes and policies for wind energy. India is relatively newcomer to the wind energy sector as compared to Denmark or USA. But Indian policy support for wind energy has led India and it ranked fifth with largest installed wind power capacity5. The total installed power capacity was 19,565 MW on June 30, 20136and now India is just behind USA, China, Spain and Germany. Global installed wind power capacity shows India's better performance in wind energy sector (table-1). The five main windrower countries are China, USA, Germany, Spain and India and they together represent a share of 73 present of the global wind capacity. As per MNRE (figure- 1), wind power accounts for the largest share of renewable power installed capacityi.e.70 present (2012), as compared to the other renewable sources. The total installed wind power capacity in India had reached 17.9GW in August 2012. The total capacity added during financial year 2012-2013 was around 1,700 MW7. India's cumulative installed capacity up to year 2011 is shown in figure -2. A rapid growth in wind power installation has been measured in southern and western states in India. A need for about 350- 360 GW of total energy generation capacity was reported by the Central Electricity Authority in its National Electricity Plan (2012), by the year 20228. Only onshore wind potential has been utilised so far by India. In spite of the fact that India has long coast line over 7500 km, we have not yet tapped our offshore wind resource for energy generation. The Capacity Utilization Factor (CUF) of offshore wind turbines is much higher as compared to the onshore turbines because of the high offshore wind speed7. Offshore Wind Steering Committee was established by MNRE in August 2012, which released a draft of the National Offshore Wind Energy Policy in May 2013. The development of **wind power in India** began in the 1990s, and has significantly increased in the last few years.

Although a relative newcomer to the wind industry compared with Denmark or the United States, India has the fifth largest installed wind power capacity in the world. In 2009-10 India's growth rate was highest among the other top four countries.

As of 31 March 2014 the installed capacity of wind power in India was 21136.3 MW, mainly spreadacross TamilNadu(7154MW), Gujarat (3, 093MW), Maharashtra (2976MW), Karnataka (2 113MW), Rajasthan (2355MW), MadhyaPradesh (386MW), AndhraPradesh (435MW), Kerala (35. 1 MW), Orissa (2MW), West Bengal (1.1 MW) and other states (3.20 MW). It is estimated that 6,000 MW of additional wind power capacity will be installed in India by 2014. Wind power accounts for 8.5% of India's total installed power capacity, and it generates 1.6% of the country's power.

STATE-LEVEL CAPACITY OF WIND ENARGY POWER

There are a growing number of wind energy installations in states across India. By the end of January 2014, the states of India had a cumulative installed capacity of 20298.83 MW.

State	Capacity as on 31.03.2013(MW)
Tamil Nadu	7162.18
Gujarat	3174.58
Maharashtra	3021.85
Rajasthan	2684.65
Karnataka	2135.50
Andhra Pradesh	447.65
Madhya Pradesh	386.00
Kerala	35.10
Others	4.30
Total	19051.46

Wind energy production state wise in India (Source -MNRE)

TAMIL NADU (7158 MW)

With peak wind power generation at close to 7000 MW, Tamil Nadu is one of the wind power hubs of South Asia. Tamil Nadu generates 40% of India's wind power. Major districts with wind farms are Tuticorin, Coimbatore, Kanyakumari, Thirunelveli and Tiruppur.

GUJARAT (3,187 MW)

Gujarat government's focus on tapping renewable energy has led to sharp rise in the capacity to generate power using wind energy in the last few years. According to official data, wind power generations capacity in the state has increased a staggering ten times in just six years. As per C-WET data, the total installed capacity in Gujarat stood at 3093 MW.

MAHARASHTRA (2976 MW)

Maharashtra is third only to Tamil Nadu and Gujarat in terms of generating in India. In Satara a Company named **Suzlon Energy Ltd**. has its wind power plant.

RAJASTHAN (2355 MW)

2356 MW as per the news reported by Times of India, Dated 31.3.2012

MADHYA PRADESH (386 MW)

In consideration of unique concept, Govt. of Madhya Pradesh has sanctioned another 15 MW project to Madhya Pradesh Wind farms Ltd. MPWL, Bhopal at Nagda Hills near Dewas under consultation from **Consolidated Energy Consultants Ltd. CECL Bhopal**. All the 25 WEGs have been commissioned on 31.03.2008 and under successful operation.

KERALA

The first wind farm of the state was set up at Kanjikode in Palakkad district. They generate a total of 600 MW of power. The agency has identified 16 sites for setting up wind farms through private developers.

ODISHA (2.0MW)

Odisha a coastal state has higher potential for wind energy. Current installation capacity stands at 2.0 MW. Odisha has a windpower potential of 1700MW. The Govt of Odisha is actively pursuing to boost Wind power generation in the state. However it has not progressed like other states primarily because Odisha having a huge coal reserve and number of existing and upcoming thermal power plants is a power surplus state.

WEST BENGAL (2.10MW)

The total installation in West Bengal is 2.10 MW till Dec 2009 at Fraserganj, Distt- South 24 Paraganas. More 0.5 MW (approx) at Ganga Sagar, Kakdwip, Distt - South 24 Paraganas. Both the project owned by West Bengal Renewable Energy Development Agency (WBREDA), Govt. of WB and project was executed on turnkey basis by Utility Powertech Limited (UPL).

PROJECT

Power plant	Producer	Location	State	Total capacity (MWe)
Muppandal wind farm	Muppandal Wind	Kanyakumari	Tamil Nadu	1500
Jaisalmer Wind Park	Suzlon Energy	Jaisalmer	Rajasthan	127
Brahmanvel windfarm	Parakh Agro Industries	Dhule	Maharashtra	528
Dhalgaon windfarm	Gadre Marine Exports	Sangli	Maharashtra	278
Vankusawade Wind Park	Suzlon Energy Ltd.	Satara District.	Maharashtra	259
Cape Comorin	Aban Loyd Chiles Offshore Ltd.	Kanyakumari	Tamil Nadu	33
Kayathar Subhash	Subhash Ltd.	Kayathar	Tamil Nadu	30
Ramakkalmedu	Subhash Ltd.	Ramakkalmedu	Kerala	25
Gudimangalam	Gudimangalam Wind Farm	Gudimangalam	Tamil Nadu	21
Puthlur RCI	Wescare (India) Ltd.	Puthlur	Andhra Pradesh	20
Lamda Danida	Danida India Ltd.	Lamba	Gujarat	15
Chennai Mohan	Mohan Breweries & Distilleries Ltd.	Chennai	Tamil Nadu	15
Jamgudrani MP	MP Windfarms Ltd.	Dewas	Madhya Pradesh	14
Jogmatti BSES	BSES Ltd.	Chitradurga	Karnataka	14

Power plant	Producer	Location	State	Total capacity (MWe)
		District		
Perungudi Newam	Newam Power Company Ltd.	Perungudi	Tamil Nadu	12
Kethanur Wind Farm	Kethanur Wind Farm	Kethanur	Tamil Nadu	11
Hyderabad APSRTC	Andhra Pradesh State Road Transport Corporation	Hyderabad	Andhra Pradesh	10
Muppandal Madras	Madras Cements Ltd.	Muppandal	Tamil Nadu	10
Shah Gajendragarh	MMTCL	Gadag	Karnataka	15
Shah Gajendragarh	Sanjay D. Ghodawat	Gadag	Karnataka	10.8
Acciona Tuppadahalli	Tuppadahalli Energy India Private Limited	Chitradurga District	Karnataka	56.1
Poolavadi Chettinad	Chettinad Cement Corp. Ltd.	Poolavadi	Tamil Nadu	10
Shalivahana Wind	Shalivahana Green Energy. Ltd.	Tirupur	Tamil Nadu	20.4
Dangiri Wind Farm	Oil India Ltd.	Jaiselmer	Rajasthan	54

Proposed and running project in India

MAIN BARRIERS -CHALLENGES IN WIND ENERGY AND MAJOR ISSUES

Initial cost for installations a wind turbine is greater than that of conventional fossil fuel generators per MW installed. Noise is produced by the rotor blades. and the energy production is fully depends on flow of wind, This is not normally an issue in the locations chosen for most wind farms. (Geographical structure of India) There are some factors which may provide serious barriers to a scheme and a barrier study is to address these and to inform the client of the development potential that is available.

1. Examine average wind speed
2. Review planning issues and land availability
3. Assess external electrical system strength
4. Assess aircraft and radar interference potential
5. Report observations and conclusions

FUTURE AND SCOPE

Wind power is an affordable, efficient and abundant source of domestic electricity. It's pollution-free and cost-competitive with energy from new coal- and gas-fired power plants in many regions. The wind industry has been growing rapidly in recent years. The **Ministry of New and Renewable Energy** (MNRE) has fixed a target of 10,500 MW between 2007–12, but an additional generation capacity of only about 6,000 MW might be available for commercial use by 2012.The MNRE has announced a revised estimation of the potential wind resource in India from 49,130 MW assessed at 50m Hub heights to 102,788 MW assessed at 80m Hub height. The wind resource at higher Hub heights that are now prevailing is possibly even more. India has set a target of achieving overall wind energy installed capacity of 27,300 MW by 2017 and 38,500 MW by 2022. As per NOVONOUS estimates, this creates an **US$ 31.25 billion** opportunity in the wind energy market in India till 2022. The wind energy market in India has been growing since the last many years. The total installed capacity of the Indian Wind Energy market is 21136.20 MW. India stands at the 5th Rank in terms of the total installed wind power capacity just behind China, USA, Germany and Spain. But the potential is far from being utilized. It is estimated by the Indian Wind Energy Association that the Wind power potential for all the states of India put together would be in the order of 1.5 GW. It can sustain the growing needs of electricity of the Indian consumers in a sustainable way. The report aims at providing the reader a detailed view of the industry with the use of analysis frameworks which help in identifying the political, economical, social and technical factors that determine the scenario of the market and the market forces prevailing in the industry. The Key challenges faced by existing players and the barriers for a new player entering into the market, are also covered. The report also identifies the role played by the central and the state governments by analyzing the incentives and subsidies offered by central and state governments. This report also provides details about risks associated with credit, policy and technical factors in Indian wind energy market. The report also has detailed company profiles including their position in wind energy value chain, financial performance analysis, product and service wise business strategy, SWOT analysis and key customer details for eleven companies namely Suzlon Energy Limited, Gamesa Wind Turbines Private Limited, Vestas Wind Technology India Private Limited, Wind World India Limited, Global Wind Power Limited, Inox Wind Limited, Kenersys India Private Limited, Regen Powertech Private Limited, GE India Industrial Private Limited, RRB Energy Limited and LM Wind Power Technologies (India) Pvt. Ltd.

CONCLUSION

In the present paper we have studied the present scenario of power sector of India and need for application of renewable sources for future shortage in power demands. Wind energy today plays a significant role in reducing greenhouse gas emissions and can be rapidly deployed in the future. Each wind-produced

kilowatt hour (kWh) avoids a kWh created by power stations burning coal, gas and oil - on average 696 gCO_2/kWh.Carbon di oxide emissions can be reduced on an average 3.3million tons in a year by adding 1 GW energy of renewable origin like wind energy, so it will help to minimize the adverse effects of climate change in India and also minimize the effect of global warming. The proposed target for 12th five yearly plans (year 2012 to 2017) is 15,000 MW. Here in India, it is necessary to introduce long-term comprehensive stable policies to support and boost the necessary investments in renewable energy.

Some facts:-

- In 2011, wind power in the EU avoided the emission of 140 million tons (Mt) of CO_2, equivalent to taking 71 million vehicles off the road.
- In 2020, the 213 GW of installed wind power as planned in Member States' National Renewable Energy Action Plans could avoid the emission of 316 Mt of CO_2. This is equivalent to around three quarters of today's EU car fleet's emissions and 28% of the EU's greenhouse gas reduction effort for 2020 (20% reduction)

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