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Current and Future Aspects of Wind Energy in India

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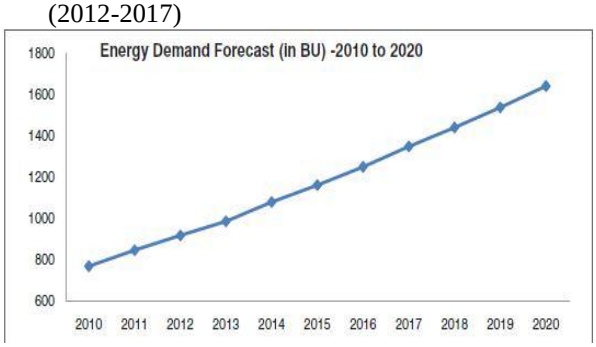
Abstract: There is an urgent need for transition from existing fossil fuel based energy systems to one based on renewable resources to decrease reliance on depleting reserves of fossil fuels with the objective to assess whether India can sustain its growth and its society with renewable resources. The International Energy Agency predicts that by 2030, more than 28% of the world's energy consumption will be in India and China. India occupies the fifth place in the world in wind energy generation after USA, Germany, Spain, and China and has an installed capacity of more than 9756 MW as of January 31, 2009. In this study, an attempt has been made to analyse and review the development and dissemination of wind energy in India.

Keywords: Wind energy, status, renewable energy, policies.

I. INTRODUCTION

There is a great challenge in meeting the needs in a sustainable manner. Electricity demand is growing at the rate of 8% annually. Capacity addition of about 1,20,000 MW is required in next ten years. The wind development progress so far is given below.

- Potential : 49,130 MW
- Achievement so far : 17,350 MW
- 11th Plan Target : 9,000 MW (2007-11)
- Achievement during 11th Plan : 10,250 MW
- Target for 2012-13 : 2,500 MW
- Target for 12th Plan : 15,000 MW (2012-2017)



Energy demand projection in India

II. PRESENT SCENARIO

Wind in India is influenced by the strong southwest summer monsoon, which starts in May–June, when cool, humid air moves toward the land and the weaker northeast winter monsoon, which starts in October, when cool, dry air moves toward the ocean. During the period fromMarch to August, the wind is uniformly strong over the whole Indian Peninsula, except the eastern peninsular coast. Wind speeds during the period from November to March are relatively weak, though higher winds are available during a part of the period on the Tamil Nadu coastline. In order to tap the potential of wind energy sources, there is a need to assess the availability of the resources spatially.

The use of wind power in India has been gaining importance with rapid installation in the last few years. Wind energy makes up the majority about 68 percent of the total renewable energy capacity installed in India. Initial estimates from Centre for Wind Energy Technology (C-WET) suggest that wind energy potential at 80 metres height (with 2 per cent land availability) would be over 100 GW. Some studies have estimated even higher potential ranges up to 300 GW [9]. By the end of October 2013, India had a total installed capacity of 19,933 megawatt (MW), with 1,699 MW installed in 2012-13. The total wind power generation in 2011-12 was 23,399.5 gigawatt hour (GWh), or about three and a half times the output of a new 1,000-MW nuclear reactor. The 12th Five Year Plan aims to install 15,000 MW between 2012 and 2017, which will almost double the total capacity of wind power in India.

States with high potential

- Andhra Pradesh
- Gujarat
- Karnataka
- Kerala
- M.P.
- Maharashtra
- Rajasthan
- Tamil Nadu

The technology status in India is :

- Capacity: 250 – 2500kW
- Hub heights: 41– 100 mt.
- Rotor Diameter: 28 – 110 mt.
- Gear and gearless type turbines

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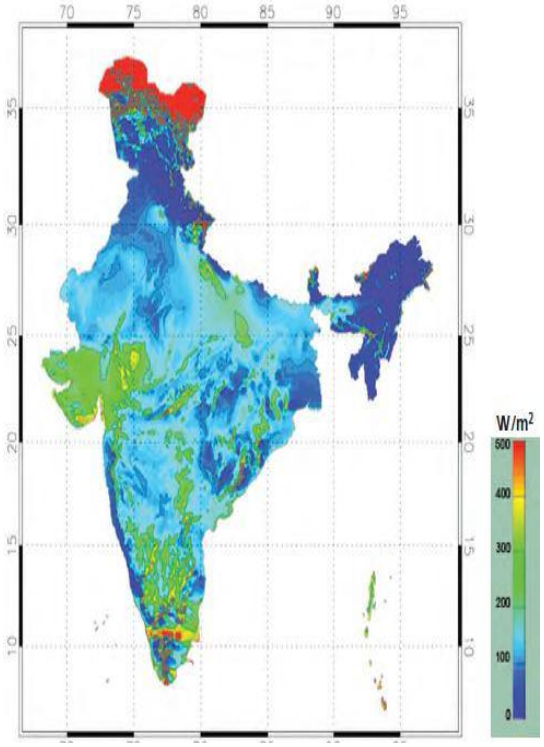
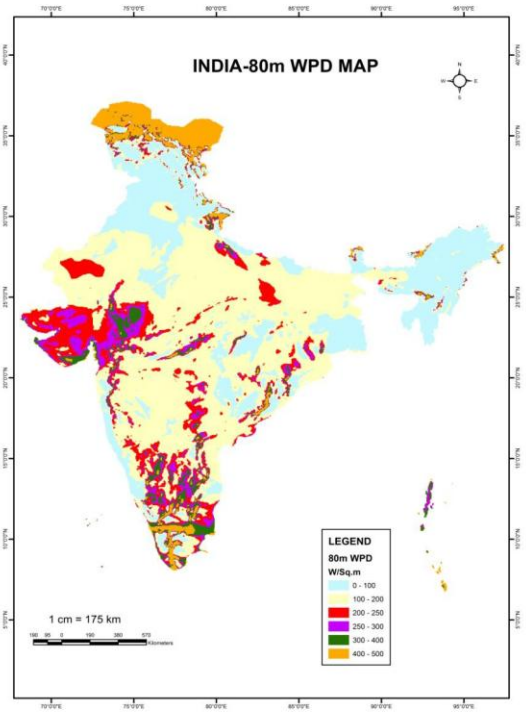
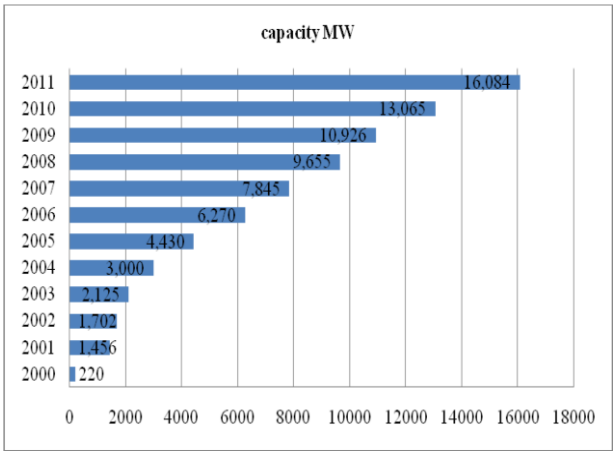
- State-of-the-art technology available in India
- 18 major companies with 44 models
- Indigenization – about 80 to 50%



Map: Wind power density (W/m2) at 80 m hub Height



State Name	Installable Potential MW	State Name	Installable Potential MW
Andaman &Nicobar Islands	365	Karnataka	13593
Andhra Pradesh	14497	Kerala	837
Arunachal Pradesh	236	Lakshadweep	16
Assam	112	Madhya Pradesh	2931
Bihar	144	Maharashtra	5961
Chhattisgarh	314	Manipur	56
Dieu Damn	4	Meghalaya	82
Gujarat	35071	Nagaland	16
Haryana	93	Orissa	1384
Himachal Pradesh	64	Pondicherry	120
Jharkhand	91	Rajasthan	5050
Jammu & Kashmir	5685	Sikkim	98
		Tamil Nadu	14152
		Uttarakhand	534
		Uttar Pradesh	1260
		West Bengal	22
		Total	102788



India's Cumulative Wind Installation (MW) (Source: GWEC, 2012)

III. WIND ENERGY PROGRAM IN INDIA

The original impetus to develop wind energy in India came in the early 1980s from the government, when the Commission for Additional Sources of Energy CASE had been set up in
1981 and upgraded to the Department of Non-Conventional Energy Sources DNES in 1982.34This was followed in 1992 by the establishment of a full-fledged Ministry of Non-ConventionalEnergy Sources MNES, renamed as Ministry of New and Renewable Energy MNRE in 2006.The Indian Renewable Energy Development Agency IREDA was established in 1987 as a financial arm of the Ministry to promote renewable energy

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technologies in the country. It provides finances to manufacturers, consultancy services to entrepreneurs, and also assists in the development and advancement of technologies. The original intent of these institutions was to encourage a diversification of fuel sources away from the growing demand for coal, oil, and gas required to meet the demand of the country's rapid economic growth.The wind energy program of MNRE was aimed at catalysing commercialization of wind power generation on a large scale in the country. A market-oriented strategy was adopted from inception, which has led to the successful commercial development of the technology. The broad based national program included windresource assessment; research and development support;implementation of demonstration projects to create awareness and opening up of new sites; involvement of utilities and industry; development of infrastructure capability and capacity for manufacture, installation, operation and maintenance of wind power plants; and policy support. An aggregate demonstration wind power capacity of 71 MW under the demonstration program of the Ministry has been established at 33 locations in nine states. MNRE provides support for research and development, survey and assessment of wind resources, demonstration of wind energy technologies, and has also taken fiscal and promotional measures for implementation of private sector projects.

IV. WIND ENERGY POLICIES

The three most important requirements for a high degree of grid penetration are

(1). A stable and compatible grid

(2). Appropriate wind assessment and micrositing

(3). Coherent and effective nationwide energy policy

The requirement of re-enforced coherent national policies that ensure sufficient expansion and penetration of wind energy is also important. Wind energy investments depend on stable policies, attractive tariffs and 'business case certainty'. The wind energy policy in India with regards to tax credit initiatives in the past has been based on installed capacity. However, recent legislations enacted describe that production based tax credit (PTC) and generation based incentives (GBI) have been implemented since 2009. This is an important decision made, which will drive towards sustainable electricity production from wind energy and not merely installations .Even with highly optimistic expansion, only about 18% of the total electricity demand is forecasted to come from wind energy. Therefore, the task of developing 20% electricity penetration by 2020 through wind energy requires clear planning and rapid implementation. The Electric Power Survey of India, published every few years, projects the demand for electricity for the next 10–12 years and also reflects the potential demand across different states. The wind energy policy must be coherent with this demand for energy across the various states in India, and this must also reflect on the grid power sharing between the states. The presence of a large grid across states is beneficial for wind power generation and the effective management of this grid structure is called for. This would also require harmonized grid codes that work for offshore wind turbine installations around the vast coastline of India needs to be fully explored. The efficiency with regard to the wind power supplied to the grid versus the potential wind power generation over one year should be greater than 20%. Currently, as mentioned, less than 1% of the overall electricity comes from wind power, whereas the installed capacity can produce 3–4% of the overall electricity needs. This implies poor efficiency of wind power penetration. Thus the key is improved efficiency of power penetration and not simply further installations; and where further installations are made, the appropriate turbine selections, location and specific wind farm controls must be made.

V. FUTURE ASPECTS

- Target for 12th Five Year Plan (2012-17) is 15000 MW
- Impact of withdrawal of Accelerated Depreciation
- Continuation of GBI scheme
- Repowering
- Large projects in IPP mode
- Forecasting models – has financial bearing
- Re-assessment of wind power potential
- REC mechanism and RPO
- Compete with conventional power

VI. CONCLUSION

At present, there are several financial and fiscal incentives provided to the wind power producers at the federal and state government level; however, unstable policies of the state governments as observed in the past and poor institutional framework increase the risk associated in the wind sector. A preliminary assessment of the status of wind power development in potential states of India indicates that there should be a stable and uniform national policy to make wind power projects financially attractive across the country. CWET has recently updated its estimates for wind energy potential in India as 48.5 GW as compared to the 45 GW before; however, the Indian Wind Turbine Manufacturers Association IWTMA estimates indicate that the potential for wind energy development in India is around 65–70 GW. Therefore, for the large-scale penetration of wind energy in India it is critically important to assess realistic potential estimates and identify niche areas to exploit the wind energy resource.

The assessment of the right regions in India for large wind turbine installations with technology to cater to lower wind speeds has also been discussed. Offshore wind energy has been untapped in India and this potential also needs to be actively explored. Finally, we have discussed the absolute necessity of coherent national policies that are production-based and enforce appropriate grid codes. Such a holistic approach to wind power generation and consumption in India, keeping in mind the quality and reliability of the wind farms and grid can enable the target of 20% wind power penetration by 2020 to be realistic and achievable.

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REFERENCES

1. International Journal of Advanced Research in Electrical,Electronics and Instrumentation Engineering(An ISO 3297: 2007 Certified Organization)Vol. 3, Issue 2, February 2014.
2. Energy Statistics 2013, central statistics office national statistical organisation ministry of statistics and programme implementation government of India, www.mospi.gov.in .
3. http://www.mnre.gov.in/mission-and-vision-/achievements.
4. Purohit, I. and Purohit, P., Wind energy in India: status and future prospects. J. Renew. Sustain. Energy, 2009, 1, 042701.
5. Wind Power India; http://www.windpowerindia.com/index.asp .
6. Indian wind energy outlook 2009. GWEC Report, September 2009.
7. Scheme for implementation of generation based incentives (GBI) for grid interactive wind power projects. File No. 53/1/2008-WE, Ministry of New and Renewable Energy, Government of India, December 2009.
8. The Energy and Resources Institute (TERI), IHC Complex, Lodhi Road, New Delhi 110003, India.
9. The Indian Wind Atlas, CWET, Chennai, 2010.
10. Centre for Wind Energy Technology, Chennai, http://www.cwet.tn.nic.in/html/information.html
11. Energy Statistics 2013, central statistics office national statistical organisation ministry of statistics and programme implementation government of India, www.mospi.gov.in