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Wind Energy Development Strategies and Policies in India

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***Abstract*—** Wind energy is the rapidly increasing source of energy now-a-days. Energy is major factor for the country's economic progress as well as for refining the life standard of its citizen. Wind energy is a clean and eco-friendly energy source and recognized as compensation for the fossil fuels depleting with the passage of time. In India, the installed capacity of wind power was 27,441.15 MW, extending in south, north and west areas. India is fourth largest installed capacity of wind power in India. Generating energy through conventional sources such as coal, gas, etc. are leading to ecological concerns. Hence, the government switched to new and clean energy sources like wind, solar etc. which are gaining attention in world. The Indian government has made plans to use the resources to its full extent by the year 2022, MNRE has made target of producing capacity at 60000 MW. This paper go into detail information of Indian wind energy sector and discuss several developments which fast-tracked its growth. The paper presents current status, major achievements and future of wind energy in different states of India.

***Keywords*—** Wind Energy development; wind energy status; wind energy potential.

I. INTRODUCTION

Major reason of energy scarcity is the rapid increase in the pace in the rate of energy consumption as well as energy resources exhaustion across the world. It is very common to have electricity scarcity in country like India having a part of population (that is over 40 percent) deprived of electricity. From 1980s, energy is being produced by burning coal, hydrocarbon oil and natural gas in large amount causing huge carbon content in atmosphere.

Hence forth, environmental crisis has become alarm for the world today because increase in percentage of greenhouse gases, limited coal convenience, environment distortion, rising prices of fossil fuel.

In 2008, National Action Plan on Climate Change (NAPCC) was formed in India for control in climate change. It has also reflected role of renewable energy in total energy production. It has also made a target of achieving 15% improvement in energy production.

Now-a-days many strategies are operating in India for elevation of renewable energy. Large numbers of renewable energy equipment are commercially existing in the country. A Wind energy program which was presented in the second half of the 1980s has improved the setting up of wind energy greatly in the past few years.

A Ministry of New and Renewable Energy (MNRE) is responsible for forecasting and carrying out of the policy framework for renewable energy. In recent days, MNRE has presented generation based incentive scheme to deliver financial incentive for every unit of generation up to 10 years. It will invite huge venture from local autonomous power manufacturer and foreign investor like this has formed a level playing field among in land investor and far-off investor.

This energy can develop as an answer 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.

II. WIND ENERGY

Wind energy is being used for years, but only in the last 35 years it has linked itself into the modern energy supply on scale. About 2% of the sunlight that falls on the earth is transformed to wind energy. Still, the amount of energy that is actually extractable from the wind greatly exceeds the world's electricity use at the present time. Currently, wind provides around 1% of the world's electricity, and the amount of installed capacity is increasing day by day.

When the locality of wind farm is nominated on the basis of on the available wind data, second step is to improve the wind power output from the farm area using the available wind turbines from the manufactures. Higher rotor diameter growths the swept area of wind by cumulating the power of wind turbine. More hub height from the ground empowers the rotor to practice high velocity of air to most of the investor in the sector of wind energy. It must stay at the visibility of wind turbine technology available at higher promotion. Picking a superior rotor diameter and more hub height with latest transmission technology would exploit a wind farm power generation dimensions. There are vast quantities of characteristics of wind energy technology which are unique and which do mark the design of wind turbines and their use:

i. Low energy mass of the resource
ii. Changing nature of the resource
iii. Public recognition
iv. Non-dispatch capacity of wind generation
v. Material necessities

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vi. Costs

These features have been taken for justification in the latest progress of wind turbines, and should have been taken in the future to reduce the wind electricity generating cost and optimize the installation cost per MW capacity. As of 31 July 2016 the installed capacity of wind power in India was 27,441.15 MW with south, west and north area including the major part. India at this time is known as the world's fourth largest producer of wind power having surpassed Spain in 2015 and there are no wind power grid connections in East and North east regions as of March, 2015 end. No offshore wind farm consuming traditional fixed-bottom wind turbine technologies in shallow sea areas or floating wind turbine technologies in deep sea areas are under implementation. However, an Offshore Wind Policy was announced in 2015 and currently weather stations. [7]

III. Wind Energy Programs

National Institute of Wind Energy (NIWE), Chennai, is dedicated to achieve customer satisfaction, loyalty and confidence by providing reliable, quick and complete solutions of internationals quality to all the investor in the wind energy sector. It shall stay at the front of wind turbine technology application by constantly improving it.

Wind in India is result of strong monsoon in south-west, summer, which starts in May-June, and the fragile monsoon in north-east, winter monsoon, which starts in October. In period from March to August, there are strong winds over the whole Indian Peninsula, except that in eastern peninsular coast. In the period of November to March wind are quite weak, though higher wind are accessible during this duration. The wind power generation capacity in India is 49,130 MW as per the official estimations in the Indian Wind Atlas (2010) by NIWE. Technological advancement in wind energy sector is recognized and large wind speeds at higher hub heights have the potential of 49,130 MW at 50 meter level if height is increased to 80 meter , the expected wind potential using the same land availability will be of the order of 1,02,788 MW. As on March 31, 2015 a total of about 23439.26 MW of commercial projects have been customary until. [6]

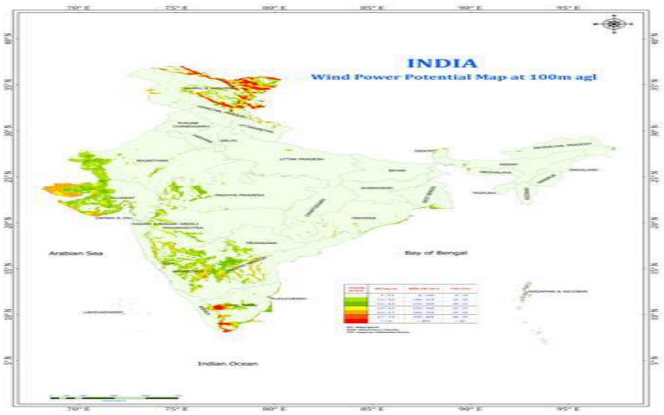

Fig. 1. Potential of Wind Energy at Onshore in India (source: [6]).

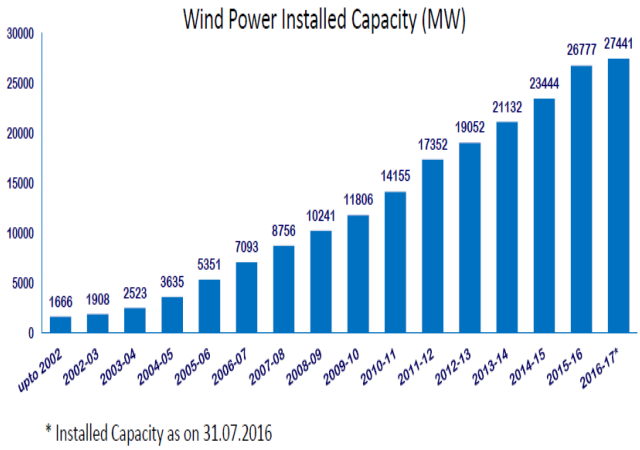

Fig. 2. Wind power growth (source: [6]).

IV. State Wise Wind Energy Scenario of India

NIWE provides state wise potential through the Indian territory.

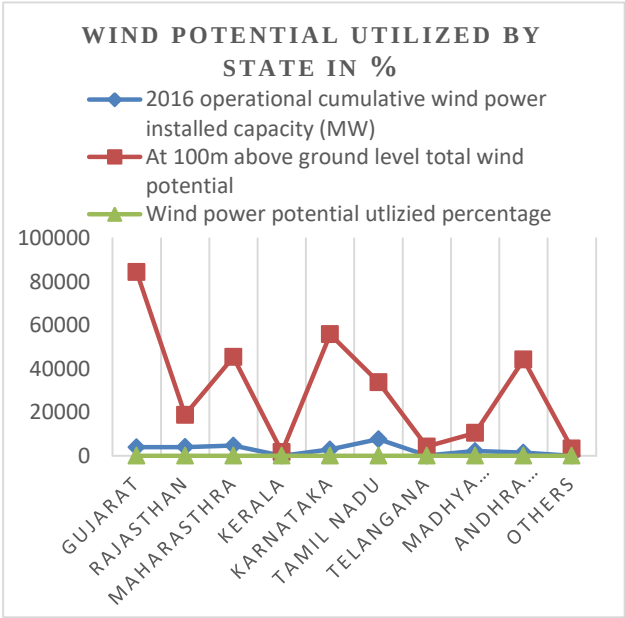

Fig.3. Wind Energy potential utilized (source: [7])

There are some sites in the country where estimated potential is being demonstrated as shown in the Fig. 4.

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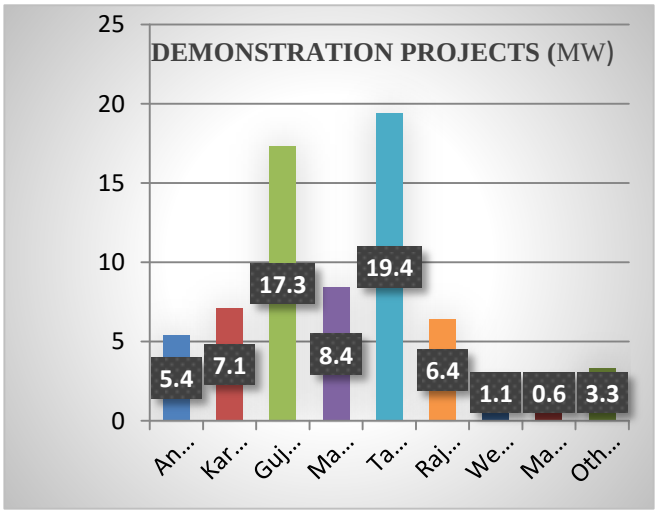

Fig. 4. Demonstration of state wise installed wind energy projects (source: [7]).

India has vast number of installed stations of wind energy which are monitored under required conditions and provide good amount of energy. The number of wind stations installed state wise is presented through pie-chart as shown in Fig. 5.

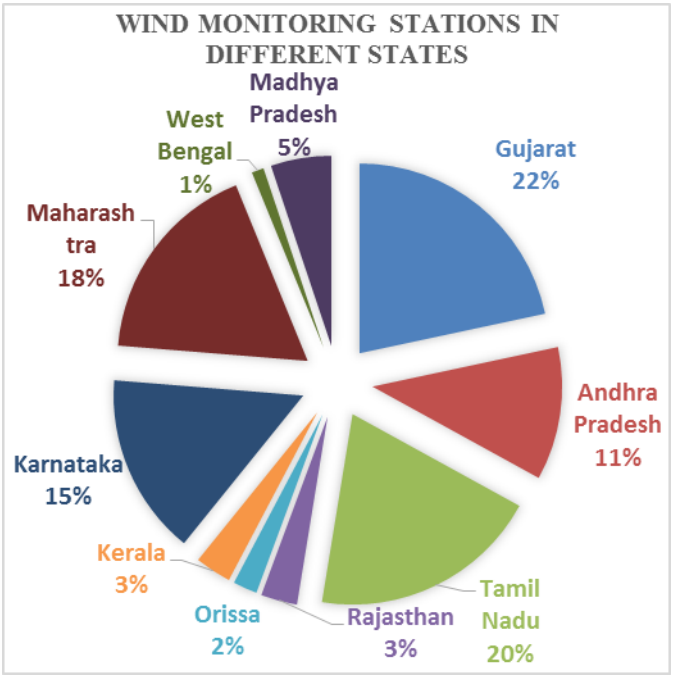

Fig. 5. Wind monitoring stations (source: [3]).

V. Offshore Wind Energy-Next Frontier

7600km Coastline is making India is blessed with offshore wind energy. United Nations Convention on Law of the Sea allots India a special right over its Exclusive Economic Zone (200 nautical miles from baseline) to progress offshore wind energy. The Offshore policy was notified on 6 October, 2015. There are restrictions for primary resource assessment. As measured by NIWE, there are 54 locations near shore wind beside coast.

Introductory studies by NIWE and Indian National Centre for Ocean Information Services (INCOIS) Hyderabad endorse potential sideways Tamil Nadu, Gujarat and Maharashtra coasts. [1][7]

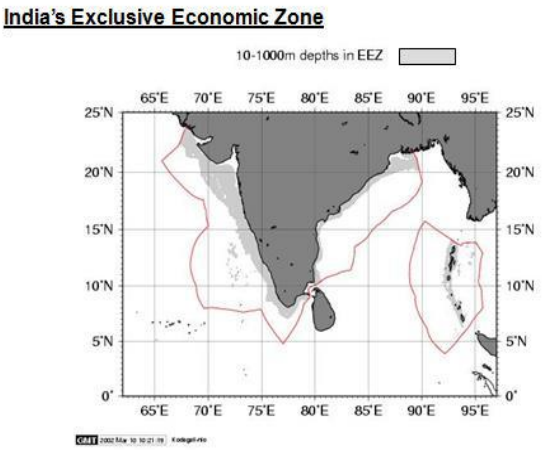

Fig. 6. Offshore potential (source: [6]).

Fig. 7. Prominent wind energy offshore potential in India (source: [6]).

VI. Future Policies

Now-a-days there are both Grid-tied and off-grid/battery charging small wind turbine existing worldwide. It is backed by the Solar Off-grid scheme & Solar Rooftop (grid-tied) scheme of the Ministry. Tamil Nadu Renewable Energy Development Academy (TEDA) has developed an integrated solar and wind energy as an example of grid system. A comprehensive parameter for installation of wind-solar hybrid systems under off-grid solar is in progression. [3]

- The Electricity Act 2003: Feed-in tariffs (FITs), obligatory quotas, delicensing.
- The National Action Plan on Climate Change (NAPCC) has national target of 15% renewable power by 2020.
- Allowance of 80% accelerated Depreciation (AD) will be granted for wind power projects.10 year tax day off.

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- Generation Based incentive of INR 0.5 /kWh for wind power. [17]
- The Projects not availing accelerated depreciation.
- The Creation of National Clean Energy Fund (NCEF) to support RE.
- The Central will assign financial fund allocation of $1100 million (INR 5000 crore) to states doing well in grid connected RE.
- The Concessions on import duty on certain wind turbine components.
- Grant of 100% will be provided as Foreign Direct Investment (FDI) in RE generation project.

VII. CONCLUSION

Energy demand across world, including developing countries like India, has led to depletion of fossil fuel which, although, provides energy in enormous quantity but effect the environment. Hence, to protect the environment from hazards, other sources including wind energy is used. It has proved to compensate for energy very well. The future looks bright for wind energy because technology is becoming more advanced and windmills are becoming more effective.

Wind energy is rapidly increasing with the passage of time. Government as well as world is putting effort to understand its importance and bringing best out of it. Government is implementing policies to harness it to recompense the hike in energy demand.

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