Wind Power Developments in India: 75 Gw - Mission 2022

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Abstract- India has set up its target to commission 175 GW of power from renewable energy sources by 2022. This includes commissioning of 100 GW from solar and 60 GW from wind power projects. So far, India has achieved commissioning of 32 GW of wind power out of total 60 GW capacity targeted for wind power projects. India aspires to harness 40% of its energy needs through renewable power projects. Currently, it stands as fourth largest wind power generating country globally. Many renewable energy platforms are working together to achieve this mission.

Keywords— Forecasting, Scheduling, HOMER, Simulation, Optimization

I. INTRODUCTION

The power available in the wind flow over the earth surface is about 1.6* 10^7 MW which is more than the energy requirement of the world. Wind power is the most economical Non- conventional energy resource. The installation cost of wind power plant is about 4 crores/ MW i.e. equal to Thermal power plant. Wind power generation is the fastest growing energy resource today. In 2014, global wind power capacity expanded 16% to 369,553 MW, which is about 4% of the world's generation capacity. Denmark generates 40% of its electricity from wind. China is the world leader in wind power with an installed capacity of 163,670 MW in 2017.

II. LITERATURE REVIEW

Mr. S.S. Barpanda et al. [1] through this paper overlooks the existing legal and regulatory framework, challenges and ways for renewable energy integration into the grid system.

Ms. Jyoti B. Fulzele et al. [2] discusses the simulation and optimization of hybrid PV- Wind renewable energy system for rural electrification by using a research tool called Hybrid Optimization Model for Electric Renewable (HOMER).

Digambar Singh et al. [3] discusses the recent scenario of the wind energy and the growing opportunities in this sector in India.

Atul Shah et al. [4] presents several case studies in this paper which shows that wind energy can serve as a very reliable source and can assist the power system in periods of low frequency.

Ganesh Kumar et al. [5] studies wind power accessibility by a small wind turbine installed at high altitude snow-bound area at Banihal top in Jammu and Kashmir, India based on ten years' wind data between 1997 to 2007.

Yashwant Sawle et al. [6] provides a design of optimal hybrid energy-based power system for rural areas of Madhya Pradesh, India where utility supply cost is very high due to limited consumers and higher transportation cost.

R Majumder et al. [7] attempts to present a brief review of the wind energy potential of India, its challenges, and possible suggestions to improve its present capacity.

III. WHAT IS MISSION 2022?

India ranked fourth after China, U.S. and Germany in the global wind power installed capacity index with cumulative installed wind power generation capacity of 25,088 MW in 2015. The present wind power installed capacity in the country is around 32.5 GW, which is approximately 55% of the total renewable installed power generation capacity. To strengthen its renewable power producing capacity, it has set up a target to commission 175 GW of power from renewable energy sources by 2022. This includes commissioning of 100 GW from solar and 60 GW from wind power projects. So far, India has achieved commissioning of 32 GW of wind power out of total 60 GW capacity targeted for wind power projects.

India aspires to harness 40% of its energy needs through renewable power projects. Currently, it stands as fourth largest wind power generating country globally. Many renewable energy platforms are working together to achieve this mission.

IV. DEVELOPMENT OF OFFSHORE WIND ENERGY IN INDIA

Offshore wind is steadier and stronger than on land, and offshore farms have less visual impact, but construction and maintenance costs are considerably higher. In India, 6400 km-long coastal line offers a great potential for offshore generation. The government's plan to auction 5 GW offshore wind power capacities in this year is a progressive move toward achieving the mission 2022. According to some consultants who have published satellite data of 868 locations globally, Kundangulam and Rameswaram in India have even higher wind potential when compared to some European farms. India needs to look forward in this field and form a policy framework.

Fig. Suzlon's Met station in Arabian Sea

Suzlon group along with associates has commissioned their first operational Offshore LiDAR (Light Detection And Ranging) based wind measurement station in Arabian sea, south west of Jakhau port in Kutch, Gujarat under guidance from National Institute of Ocean Technology (NIOT) Chennai and approval from National Institute of Wind Energy (NIWE) Chennai. This met station is expected to collect data for a period of two years with coordination and help from Gujarat Maritime Board (GMB), which will provide the insights of sea properties during various seasons and navigation routes information apart from administrative permissions and facilities. Suzlon Energy attained a success rate of 1.23% to Rs. 14.79 at 11:00 IST on BSE after commissioning this offshore met station.

V. ONGOING WIND POWER PROJECTS IN INDIA

In a recently closed auction, Sprng Energy Private Limited has won 197.5 MW wind power project in Gujarat at a tariff of Rs. 2.43/kWh, which is the lowest unit tariff India, has seen in recent years. Suzlon pioneers the wind energy future by its huge investments and technologies by manufacturing wind equipments on Indian lands. It has bagged an order to install 120 units of 2.1 MW of wind equipments in Gujarat, which is estimated to be in the range of Rs. 1600-1700 crores as per existing cost. In 2016, Siemens wind power and Gamesa reached an agreement on a 59:41 mergers of their wind turbine businesses. Together, they are becoming a world leader in renewable energy industry. Since 2009, it has installed over 5 GW in India. This year it has gained multiple orders totaling 326 MW wind power capacities across India. During this project, it will install 135 units of its G114-2.0 MW wind turbines and 28 units of its G97-2.0 MW wind turbines across different sites in India. The duo has recently been awarded a contract to build its first hybrid optimal wind-solar project- a 28 MW solar facility will be connected to an existing 50 MW wind farm in India, which would have around 15 GW in India. Vestas design, manufacture, install and service wind turbines across 76 countries on the globe. It is a global leader with 87 GW wind turbines. It has recently won a contract for turbines totaling 250 MW from Ostro Kutch Power for a wind farm in Gujarat, India. The order comprises delivery, installation and commissioning of 125 V110-2.0 MW turbines, as well as project's civil and electrical works. Sembcorp Industries is a leading energy, water, marine and urban development group operating across five continents worldwide. The renewable energy business arm of the SembCorp has won a bid to set up a 250 MW wind power project in India.

VI. TECHNOLOGICAL DEVELOPMENTS AND MANUFACTURING BASE

The unit size of machines has gone up to 3.00 MW. More than 20 different companies in India are manufacturing over 50 different models of wind turbines. The current annual production capacity of domestic wind turbines is about 10000 MW. Wind turbines and wind turbine components are exported to US, Australia, Europe, Brazil and Asian countries.

Fig. Suzlon wind turbine

The cost of Indian wind turbines is one of the lowest in the world. Snow ramming and icing are the main problems in snow bound area. It reduces the efficiency of wind turbine and sometimes it blocks the running of the blade [5]. HRES (Hybrid Renewable Energy System) is the most viable answer for rural electrification [6]. Economic viability should be the top priority for rural electrification as end users are not always in a position to incur high costs of power due to their poor economic condition [2].

VII. REPOWERING POLICY

Most of the wind-turbines installed up to the year 2000 are of capacity below 500 kW and are at sites having high wind energy potential. It is estimated that over 3000 MW capacity installation are from wind turbines of 500 kW or below. In order to optimally utilize the wind energy resources repowering is required. Ministry issued repowering policy in August 2016.

VIII. PROS AND CONS OF THE SYSTEM

Like every system, electricity generation through wind also has several advantages and disadvantages. Pros include: 1) No fuel requirement as wind is free. 2) No waste or greenhouse gas production. Moreover, 3) It is Cheap, Efficient, Reliable and Renewable. 4) The land beneath can be utilized for farming. 5) It requires no waste storage [4]. Cons include: 1) Wind power can only be generated in windy areas. 2) It can kill migrating birds. 3) Wind turbines are noisy. 4) Initial capital cost is much higher compared to fossil fuel projects [7].

FUTURE SCOPE

India has enormous potential for power generation through wind. Long term vision and missions should be formulated to maximize the generation through this renewable source. Legal framework and work plans would definitely boost the offshore sector which holds huge potential. Proper planning for hybrid generation and integration to the transmission network is required by global experts and wind energy solution providers. Financial backing from various government ministries would generate more interest among investors and India will achieve its target by 2022 positively. Vortex generators can be seen as future of wind. These are bladeless turbines so they do not harm birds.

Fig. Vortex Generator

Vortex generators have very long life and production and maintenance costs are reduced to half [9].

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