



MEETING UP INDIA'S ENERGY DEMAND THROUGH WIND POWER

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ABSTRACT

Electricity Act 2003 has been introduced and came into force in India from 15.06.2003. The purpose is to bring in competition, protect consumer's interests and provide power for all. The Act provides for National Electricity Policy, Rural Electrification, Open access in transmission, phased open access in distribution, mandatory SERCs, license free generation and distribution, power trading, mandatory metering and stringent penalties for theft of electricity. At the same time the Government wanted to push the sector onto a trajectory of sound commercial growth and to enable the States and the Centre to move in harmony and coordination. This policy of Government of India has helped the electricity generation target of conventional sources. India has generated 1185 Billion Unit by July 2018 and this achievement can lead to severe climatic disaster until and unless the option of harnessing renewable sources of power is explored. This paper examines the potentiality of India's Energy Demand through Wind Power.

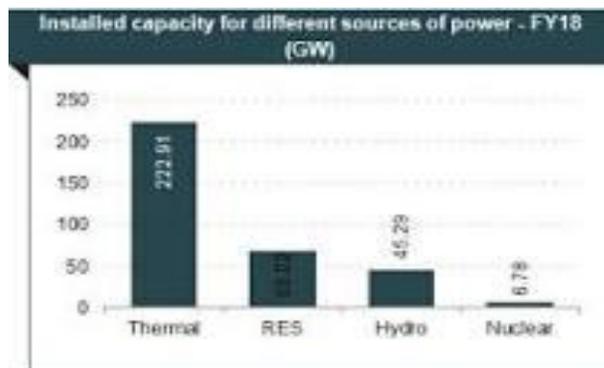
Key Word: Electricity Act, Energy Demand, Electricity Generation, Wind Power

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Introduction:

Climate change is recognized as a significant manmade global environmental challenge. It is also treated as a threat. India is experiencing unrelenting economic growth that has aroused concern for the country's current highly energy intensive resource stocks and their contribution towards the salient problem of climate change [1]. The energy-climate issue is challenging for India as it supports approximately 18% of the world's population which is equivalent to 1.2 billion people and is expected to rise to 1.5 billion by 2030 [1]. Despite India being ranked fourth in the world for total energy consumption, its per-capita emissions of 1.7 tonnes of carbon dioxide (CO₂) falls significantly short compared to the world average of 4.4 tonnes of CO₂. This trend is likely to persist up until 2031 as energy resources are becoming exhausted in spite of India being one of the largest producers of energy. Electricity is required for sustaining India's social and development growth of more than 8-10% of its gross domestic product (GDP), an increase experienced in the past 5 years, but overall important for industrialization, economic growth and improved quality of life.

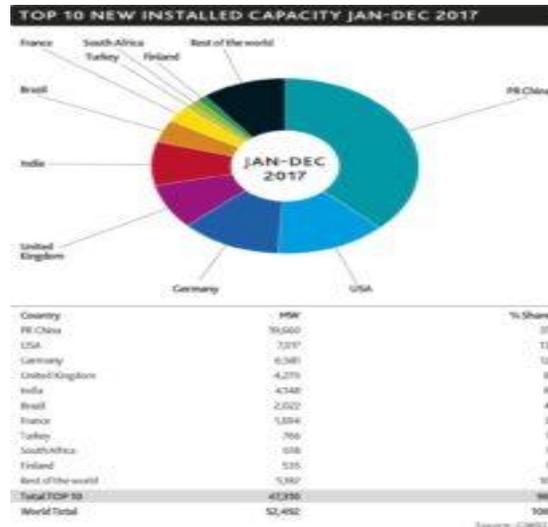


Source: Ministry of Power, Government of India

Global Wind Installation 2017 shows the installation of 539,581 MW globally and 32,848 MW nationally [2].

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Source: Global Wind Energy Council

Wind energy is clean, environmentally sustainable and renewable. It creates energy independence because the fuel is free. Thus, energy generated through wind has emerged as the fastest growing renewable energy source and it constitutes over 1/3rd of the total energy generated through renewable sources.

Wind Energy in India:

Recent developments in power generation technology have put wind energy generation on an almost equal footing with fossil fuel-dependent energy sources. For generating about 600 MW per year, a thermal power plant uses about 250 tonnes of coal. The same amount of energy can be generated through a 225 kW windmill installed in an area with high wind density [3]. In India, the cost of wind energy varies from Rs.2.7 to Rs.5.2 per kWh), compared to a coal energy cost of Rs.1.9–4.8 per kWh. On average, across the country, the generation cost of wind would be around Rs.3.5–Rs.3.6 per kWh, compared to Rs.3.5 from coal [3].

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State wise % of Wind Potential Utilized (As on 31.03.2017)

S. No	State	Cumulative Wind Power Installed Capacity operational at the end of FY 2017 (MW)	Total Wind power potential at 100 meter above ground level (MW)	Percentage of Wind Power potential utilized
1	Andhra Pradesh	1431.45	44229	3.24%
2	Gujarat	3948.61	84431	4.68%
3	Karnataka	2869.15	55857	5.14%
4	Kerala	43.5	1700	2.56%
5	Madhya Pradesh	2141.1	10484	20.42%
6	Maharashtra	4653.83	45394	10.25%
7	Rajasthan	3993.95	18770	21.28%

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8	Tamil Nadu	7613.86	35800	22.53%
9	Telangana	77.7	4244	1.83%
10	Others	4.3	3342	0.13%
	Total	26777.45	32848	8.86%

Table1: Source MNRE, Government of India

India is endowed with abundant wind sites suitable for generating wind energy. Table 1 shows the installed wind power capacity in India and also shows that the state of Tamil Nadu leads in installed capacity of wind energy. As seen from Table 1, as of 2017 the total installed capacity of wind power is 26,777 MW. There is still vast potential of wind Energy generation that can be exploited. This requires huge investments which need the active participation of private investments. The investment in wind energy by private parties rests exclusively on long-term security of income from wind energy investments and in the short-term on effective and efficient public policy. [4]

The researchers of National Institute of Wind Energy (NIWE) have conducted an economic analysis of wind farms situated at Muppandal, Tamil Nadu State, India. The study uses a capital budgeting framework to analyze the economic viability of investment in wind energy and profitability index to determine the financial profitability of the investments. Moreover the unit

cost of electricity of energy generated through wind energy is also estimated as this impacts the overall revenue earning capacity of the individual firms [5].

Largest ever Wind Power capacity addition of 5502.39 MW in 2016-17 exceeding target by 38%. During 2017-18, a total 467.11 MW capacity has been added till 30.11.2017, making cumulative achievement 32746.87 MW. Now, in terms of wind power installed capacity India is globally placed at 4th position after China, USA and Germany. [6]

India has a strong manufacturing base of wind power equipment in the country. Presently, there are 20 approved manufacturers with 53 models of wind turbines in the country up to a capacity of 3.00 MW single turbines. Wind turbines being manufactured in India are of international quality standards and cost-wise amongst the lowest in the world being exported to Europe, USA and other countries.

MNRE has issued the guidelines for the development of onshore wind power projects in Oct 2016 to facilitate the development of wind power projects in an efficient, cost effective and environmentally benign manner taking into account the requirements of project developers, State and national imperatives. The recently concluded first round of wind power auctions for 1000 MW saw the wind power price years falling to Rs 3.46 / kWhr. [7]

Recent Forecasting Models:

Various National & International Scientists have developed many Forecasting models in recent years. An attempt has been made to generate the wind and solar forecast over a selected location in Maharashtra. In this initiative, the high resolution (12 km) global model forecast has been particularly utilized along with cloud resolving forecast from a non-hydrostatic model. Initial results are promising. The model forecast along with systematic bias correction enhances the forecast skill with correlation higher than 0.9. [8]

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In addition to that For the Wind Forecasting methods like Persistence Method, Physical Method, Statistical Method, Artificial Intelligence Methods and Hybrid Methods are also used in India at the Renewable Energy Management Centers.

The concept of Renewable Energy Management Centre has been introduced to provide system operators with the forecasted VRE generation of its control area. The primary motivation for Renewable Energy Management Centre generation forecast is grid security. Residual load calculated with this forecast, can be used for scheduling balancing resources like conventional generating units. CERC has, in its regulation on Ancillary Services, mandated that all inter-state generators, whose tariff is determined by it, must provide Reserves Regulation Ancillary Services (RRAS) to the nodal agency [9].

Recommendations:

Given below are some specific recommendations for policymakers, academicians and energy experts:

1. Create electricity-production-based incentives so that the performance and reliability also receive more attention from the actual wind farm operators.
2. Secondly, lowering capital cost is one of the keys to ensuring the economic viability and profitability of private investments in wind firms.
3. Removing financial burden from the state utilities by subsidizing the higher cost of the Wind Energy.
4. The establishments of regional service stations, in proximity to a cluster of wind firms, in order to provide maintenance and upkeep of the equipment. This is another area that entrepreneurs may be able to tap into once more incentives are given to actual

performance of the turbines and investors want to ensure the smooth running and reliability of their machines.

5. A central governing body must be established responsible for certification, standardization of design and features, monitoring of wind farms and technological R & D.
6. Stop the unauthorized buy and sell of carbon credit certificates.
7. Issue new generation tariffs within proper time in order to promote renewable

Conclusion:

Thirty years ago private investments in wind energy were considered uneconomic. Private investors did not try to bother to think about the social benefits that society could get from this clean and renewable energy source. This is an example where public policy was needed to foster development for the good of the society. This was accomplished in many ways, including setting up a national ministry for renewable energy, setting up a research institute, setting up an institute for monitoring and assessment of wind potential sites, providing financial incentives and introduction of energy generation for captive consumption.

The Wind Energy experts of the Industry and Research Institutes have found that despite its strengths and the backing of the government, Indian wind power sector is unable to achieve its full potential. The reason lies in the faulty implementation of policy, inadequate infrastructure for evacuation, poor financial health of utilities and lack of investor education. The government should take these matters on priority basis if it is serious on achieving NAPCC target of fulfilling 15% of its energy needs from renewable sector by 2020.

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