

Current scenario of wind power in India & government Policies

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Abstract:

Purpose – This paper aims to review the role of government initiatives for the development of wind power industries in India, to provide better and benevolent policies in the production of wind energy density and to maximize the use of the renewable source of energy which permits to reduce carbon emission from the coal-based power plant and to curtail tackle need of society and mitigate poverty. **Design/methodology/approach** – The present study is carried out on the current position of wind power generation in India. Government policies for promoting clean energy and associated problems are also analysed herein detail. However, secondary approaches are opted in terms of alertness of caring for the environment hazardous and reduced the major economies aspects by fulfilling the schema of Kyoto Protocol and Paris Agreement, United Nations Framework Convention on Climate Change. **Findings** – The prospective of wind energy generation is huge, as an ancient source of energy, wind can be

Keywords CO2 emission, Energy balance, Environmental damages, Energy sector, Renewable energies, Scenario analysis, Correlation analysis, Resource management, Wind, Renewable energy, Wind energy, Wind farm, National measures, Policies,

1. INTRODUCTION

Advancement of civilisation solely depends on the usage of technology. The vast usage of technology on the other hand depends on supply of energy. Economical development of the developing countries like India needs continuous and steady supply of electricity. Power supply in India is typically based on fossil energy contributing more than 79% of India's total energy supply. Fossil fuel can be categorised as coal, natural gas, crude oil etc. Usage of fossil fuel generally causes tremendous degradation of environment. Carbon dioxide the highest contributor to Green House Gases (GHGs) is released due to burning of fossil fuel. Such GHGs are absorbed in the atmosphere and emits radiation lying in the range of thermal infrared region. India holds third position among all the countries when the ranking is made on the basis of release of GHGs. Although, the primary inconveniences of conventional fossil fuel are environmental pollution, its increasing cost and limited supply have made Indian Government to implement policies for use of renewable and green energy resources. According to Paris agreement (COP21), India's commitment to follow cleaner path for energy production has led this country towards renewable and non-hazardous energy sources. India

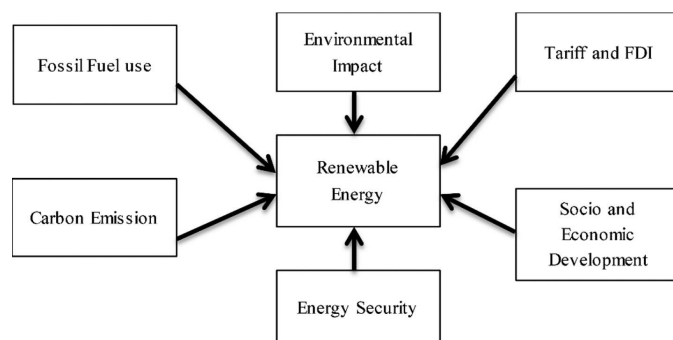
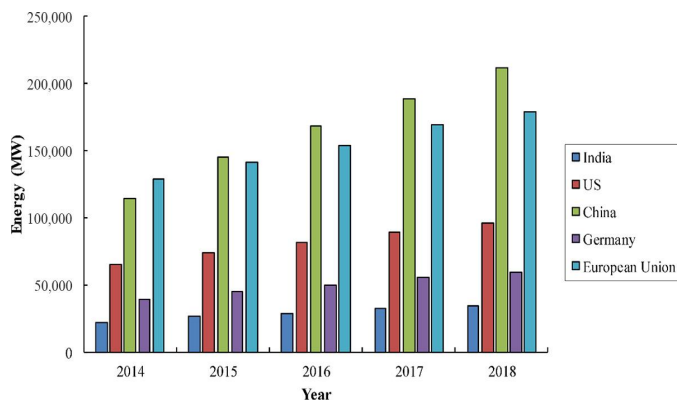


Figure 1. Factors driving the progress of RE more than 21% of total electricity used in India. As on Paris agreement this percentage should have been 40% by 2030

2. International measures

The carbon emission reduction and its effect on climate change, the IEA have recognized the progress of renewable energy ([India energy outlook, 2020](#); [Nazir et al., 2019](#)). Simultaneously it has anticipated India to evolve as second biggest contributor to the worldwide energy demand within 2035 ([India energy outlook, 2020](#)). The worldwide energy map is changing, with conceivably extensive ramifications for energy markets and exchange. Withdrawing the revival of the oil and gas sector in

the US and reshaping the treaty of nuclear use in power generation can boost fast development in the utilization of wind and solar-based advances and by the worldwide acceptance of unconventional gas production. The scenario of global oil markets entirely depends upon Iraq's achievement in renewing its oil part. If the new activities are broadened and actualized in a purposeful exertion to improve worldwide energy efficiency, this could in like manner be a distinctive benefit. Based on global Situations and various contextual investigations, this world energy outlook evaluates how these new improvements may influence global energy and atmosphere inclines over the Wind power in Coming decades (Nazir et al., 2019). Regardless of progress in 2018, about 1.3 billion individuals stay without access to power and 2.6 billion do not approach clean cooking offices. 10 nations, 4 in Asia and 6 in Africa represent 66% of those without power and only three nations India, China and Bangladesh represent the greater part of those without having clean cooking facilities. EDI for 80 nations, to aid policymakers tracks advancement towards wind energy technological development. The EDI is a composite list that quantifies a nation's energy improvement at the lowest and highest level. It uncovers a wide improvement as of late, with China, Netherland, Brazil, Poland and South Korea indicating the best advancement (India energy outlook, 2020; van Aalderen and Horlings, 2020). Figure 2 shows the progress of renewable energy (RE) linearly with every passing year. Even the developing country such as India is competing with developed countries like China and Germany in RE generation (InternationalGEWC, 2020).



Source: Sharma et al. (2012)

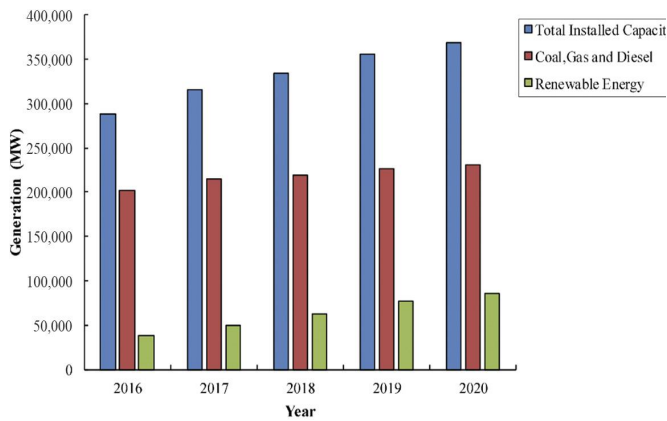
Figure 2. Year-wise RE generation of India compared with developed nations

2.2 National Measures

Enactment preceding the EA 2003 had no particular arrangements that would promote inexhaustible or non conventional energy sources. Although with this weakness, the MNRE has progressed in the direction of supporting by way of policy rules since 1994, with blended outcomes. In any case, the EA 2003 changed the lawful and administrative structure for the sustainable power source area in India. The EA 2003 mandates policy formulation to promote renewable sources of energy by the federal government, the State governments and the respective agencies within their jurisdictions. CERC and SERCs are responsible for fixing the tariff of renewable energy projects across the country and among the States. It ensures grid connectivity of all renewable projects to state which is remotely located and away from load centres (Chaurasiya et al., 2019; Sholapurkar and Mahajan, 2015)

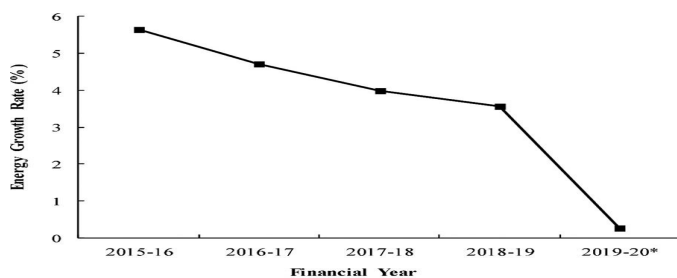
3. Indian initiatives

India is the first nation across the globe who has established an independent ministry exclusively dedicated to the awareness and execution of clean and green energy technology in the nation from the year 1990 onwards. It has established MNRE for the same (Hayashi, 2018; Eren et al., 2019). Figure 3 shows India's energy progress along with the increasing power share of the renewable energy sector for the last five years. Figure 4, it clearly gives an idea of the efforts and initiatives taken by the government to reduce its conventional energy growth rate. NITI Ayog in its working paper regarding India's Energy and Emission Outlook clearly states that the government of India had set a target of 45% power generation from non-fossil fuel sources by 2030 (NITI Aayog, 2020a). Ayog had indicated in its goals under the mission to take urgent action to combat climate change and its impacts (NITI Aayog, 2020b).



Sources: (*till 31st January 2020); Eren *et al.* (2019); NITI Aayog (2020a); NITI Aayog (2020b); Central Electrical Authority (2020b); Central Electrical Authority (2020c)

Figure 3. Generation status of the last five years



Sources: (*till 31st January 2020); Eren *et al.* (2019); NITI Aayog (2020a); NITI Aayog (2020b); Central Electrical Authority (2020b); Central Electrical Authority (2020c); Peinke *et al.* (2004)

Figure 4. Conventional energy generation growth

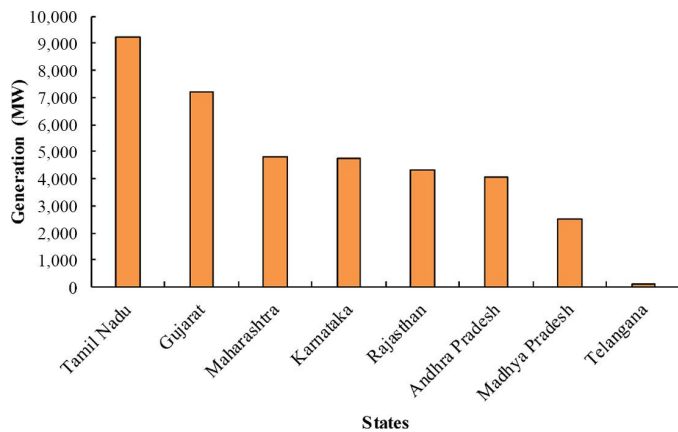
4. Wind energy status in India

In 2012, even though a slowdown global economy, India’s electricity demand continued to rise (Central Electricity Authority, 2020a; REN21, 2020). Electricity shortfalls are common, and under DDUGJY one of the most anticipated programs, India aims to electrify all villages. Electricity demand is estimated to more than triple between 2005 and 2029. CEA projected the need for 345–355GW of total generation capacity by 2022 in the freshly published national electricity plan (Bhargava and Chand, 1999). Regardless of large capacity additions over the decades, power demand

goes on increasing and generation struggles to meet it. As compared to a mere 2% in 1995 to 12.2% in year 2012 total installed capacity, wind energy generation is increased continuously. Almost 50% of renewable power is generated by wind (Central Electrical Authority, 2020f). Wind energy installation capacity must grow at a CAGR of 5.9% to reach 779GW in 2035, or over 20GW per year from 2009 through 2035. The fiscal year 2015–2016 saw the addition of nearly 26GW power to the grid (Central Electrical Authority, 2020b; Central Electrical Authority, 2020c; Central Electrical Authority, 2020d; Central Electrical Authority, 2020e; Central Electrical Authority, 2020f). Table 1 explains the progress of wind energy in the country through the five-year strategic plan adopted by the government. This scale of expansion could pose a challenge for the government without a significant role for renewable energy. During the fiscal year 2018–2019 wind energy alone delivered over 37GW to India’s new installed capacity, accounting for over 43% of total renewable energy power generated (Central Electrical Authority, 2020e). An increase in wind farm installation from 2006–07 to 2018–19 is shown in Figure 5.

5. Major wind farm issues

India’s transmission network has a two-tier structure: interstate grids that are governed by the PGCIL and the local grids, which are controlled by the state transmission companies. Integration of all grids i.e. national, regional and local is the main problem faced by India (Panse and Kathuria., 2018). Poor and weak integration grids act as a blockade to a smoother flow of power generation from renewable. India’s transmission system is distributed into five regional grids: north-eastern, northern, eastern, western and southern regions (Irfan *et al.*, 2019; Gupta *et al.*, 2019). The change in wind power generation can create problems for the grids in maintaining a constant demand and supply balance. Maximum wind turbine farms in India are located in hilly and remote areas that are quite far away from load centres. The key constraint for the future of wind power development in the country is the poor transmission and distribution network.



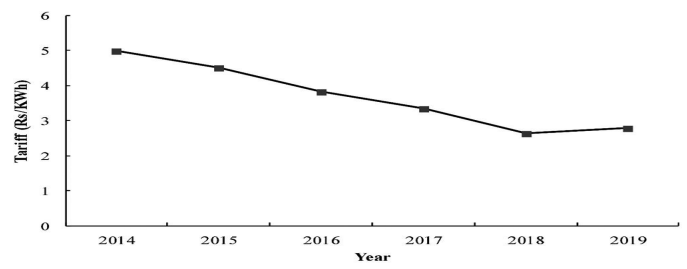
Source: Central Electrical Authority (2020f)

Figure 6. State-wise wind generation capacity

5.2 Wind turbine accidents

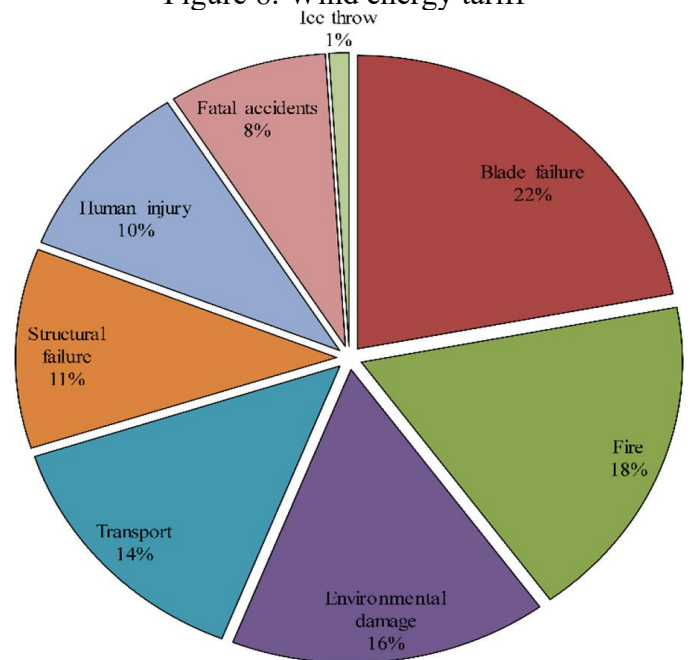
Broken wind turbine blades and its accidents with birds are major problem during the last decade (Centre for sustainable energy, 2020). Besides these environmental issues such as forest fire and deforestation are also causing a major problem for the operators (Nazir et al., 2019). With the wind being a clean and green source of renewable energy, a new study had found that its blades are posing a threat to birds in their locality. Birds are dying because of the collision with the turbine blades (Nazir et al., 2019). Wind turbines and the number of incidents related to are is shown in statistical data in Figure 9. As the number of cases birds dying with the collision is reported including migratory birds and raptors, India’s environment ministry setup a panel of forest experts and it has

suggested several measures to be implemented by all wind power owner companies across India for ensuring the protection of birds. Giving orange colour to the wind turbine blades to prevent birds from flying into the turbines is one of the suggestions given by the forest experts (Lakhanpal, 2019). Identifying areas and locations where the installation of wind farms is not going to



Sources: Chou et al. (2019); The Economic Times (2017); Chawla et al. (2020)

Figure 8. Wind energy tariff



Source: Cao et al. (2018)

Figure 9. Wind turbine accidents

6. Carbon emissions

Carbon emission is the biggest problem faced by developing countries like India. It is followed by China in CO2 emission (Wang et al., 2020). The majority of India’s power demand is met by fossil-based coal-fired power plants. India’s fossil fuel carbon emission has risen to 305%in the year 2017 as compared to 1990 as shown in Figure 10 (Carbonbrief, 2020). To reduce its over-dependence on fossil-based power, India has committed to the Paris climate agreement, UNFCCC that it will take steps to increase its renewable energy to minimize its percentage share of power from fossil and by promoting solar and wind power

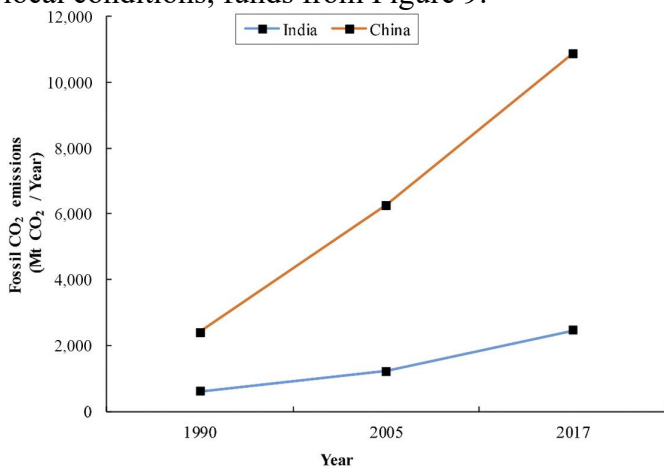
thereby reducing carbon footprint (Wang et al., 2018; Kelly, 2005; Marilena et al., 2020). The plant

load factor for the last six years has been on decreasing side. It was 64% in 2014–15

and now it has fallen to 56% as shown in Figure 11 (National power portal, 2020; Shrimali, 2020). On the other side in Figure 12, the share of renewable energy is going on increasing year by year which shows the government efforts for green energy and its commitment towards carbon emission and climate (Central Electrical Authority, 2020b; Central Electrical Authority, 2020c; Central Electrical Authority, 2020d; Central Electrical Authority, 2020e; Central Electrical Authority, 2020f).

7. Discussions

Wind power market is evolving very fast in India with rapid growth in Industry. However, wind market depends on several other conditions such as, local conditions, funds from Figure 9.



Sources: Carbonbrief (2020); Wang *et al.* (2018); Kelly (2005); Marilena *et al.* (2020)

Figure 10. Carbon emission

8. Conclusions

The prospective of wind energy generation is huge, an ancient source of energy, wind can be utilized both as a source of electricity and for agricultural, irrigation uses. The study of wind turbine blades and its features showed how it can be properly fabricated and used to extract the maximum power, even at variable and low wind speeds. The expansion of offshore wind farms, which have both a better energy density and lesser disturbance with the local systems, is a positive step forward in the realization of the wind potential. Understandings of

technical faults provide a blueprint for the wind farm operators to extend stable performance in power delivery systems. The integration of remotely located wind farms with regional load centres can lower its dependability on fossil power. With more wind generation coming up and tariff

going down is a difficult situation for investors. Identifying areas and locations where the installation of wind farms is not going to disturb the bird's movement and its integration with the grid is a major issue which the government needs to address. The special advantages of wind energy over solar is that it is available 24/7. It means that generation is not affected by day and night cycles. If wind turbulence is ignored,

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