

WIND ENERGY AND ITS DEVELOPMENTS IN INDIA

Report by :
M.VARUN SANKAR
EE18BTECH11030

Contents

1. What and Why?
2. Wind power in India
3. Onshore and Offshore wind power
4. Government Strategies and plans
5. Programs and projects in India
6. Statistics
7. Recent news articles
8. Conclusion
9. References

What and Why

Energy is one of the essential parts of the economy for any country. Energy demand has been increased drastically all over the world. Due to this increase in energy demand, the conventional sources (coal, petroleum, etc.) are reducing so fast. As a byproduct, it causes harm to the environment and public health. These ill effects and demands forced us to move from conventional sources to renewable energy sources (Wind, Solar, Hydropower, etc.).

The wind is used to generate electricity by using the kinetic energy of air to run the turbine. It is connected to a generator, thereby producing electric power. In this way, the kinetic energy of air molecules is converted into electrical energy.

Wind Power or Wind Energy is one of the fast-growing technologies. The usage of wind power has drastically increased. The wind power generation capacity has been raised over the past decades. International energy agency statistics show that wind energy provides more power than any other newer sources.

Wind power in India

India has a target of 175 Gigawatt of renewable power by 2022, In which 33 % (60 Gigawatt)power is through wind power and 450 Gigawatt by 2030, of which 140 Gigawatt from wind energy. India stands fourth globally in the usage of wind power of producing around 37.7 Gigawatt as of 2020 and has a 7% share globally. India has a target of 5 Gigawatt of offshore installation by 2022 and 30 gigawatt by 2030.

Onshore and Offshore wind power

Onshore wind power means the turbines are located on land. Conventionally onshore wind power was used during initial times, infrastructure costs for onshore are less worth than offshore ones, and sometimes good land is used to

install onshore wind turbines. Changing wind direction makes onshore turbines less operative(functional) than offshore ones.

Offshore wind power means turbines are located in water. These turbines are installed depending on the geolocation and wind speed conditions. Hence, it makes the turbines to be more operative(functional) and efficient. There is no land use by offshore wind turbines, so it makes offshore better than onshore turbines.

Government Strategies and plans

The government of India (GOI) is focusing on policies to bring investors into the wind energy sector. The national institute of wind energy(NIWE) and GOI gave a policy on offshore wind development in India. NIWE, along with GOI, has installed around 800 wind monitoring stations in India and made a wind potential places map.

Policy for Repowering wind power projects aims to use the wind energy resources by creating a new framework by providing infrastructure and capital support to achieve more recent power generation targets.

Wind data sharing policy (WDSP) is the policy that focuses on sharing of information, reports, and assessments done by NIWE and other research units in India to the corporate vendors about potential sites and resource assessment information.

As per the report of NIWE, the total wind energy potential is 302 gigawatt at 100 meters in height. out which more than 95% of wind resources are located in seven states (Southern states, Madhya Pradesh, Gujarat, Rajasthan)

Programs and projects in India

FOWIND(Facilitating offshore wind energy in India) is an organization led by GWEC(global wind energy council) to help India offshore projects and help India towards green technologies. This project concentrated on the Gujarat and Tamilnadu(T.N) states first to identify potential wind sites and make preliminary resource assessments.

The offshore wind resource assessment program aims to estimate wind energy potential. It was measured using LiDARs to identify zones on the coast of Gujarat and T.N.

The first offshore wind energy project for a capacity of 1 Gigawatt was built in Gujarat. There are several wind parks in the country located in various locations. Some are Muppandal wind farm (T.N), Jaisalmer Wind park(Rajasthan), Brahmanvel Windfarm, Vankusawade wind park, Dhalgaon wind farm(Maharashtra)

Statistics

Python codes: Github link (in refernces)

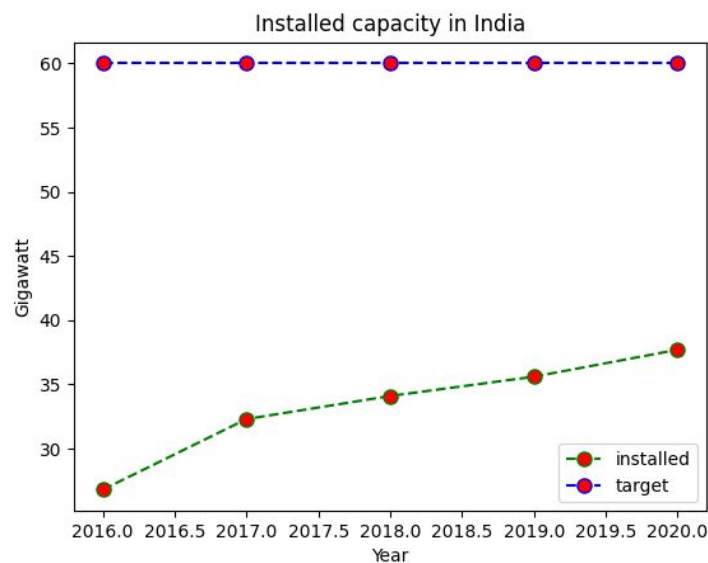


Figure - 1 (Data set from MnRE site)

As the graph shows that India is moving towards its renewable target of 60 gigawatts in wind energy by 2022, as lockdown slowed the movement towards reaching our target, but for the Fiscal year 2021-22, capital of 1000 cr is provided to Solar energy corporation of India(SECI) and 1500 cr capital for renewable energy development agency.

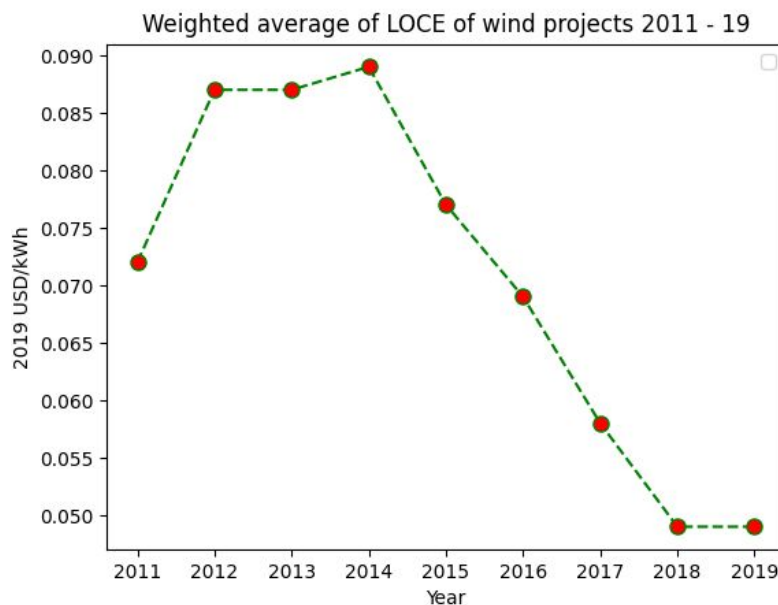


Figure - 2 (Data set from IRENA site)

Levelized cost of energy (LOCE) gives the present total cost of a project over assured time. The weighted average shows that the price decreased, which increases the small corporate's investment in wind energy. As a result, many wind parks or farms will develop over time, helping to reach renewable targets.

Recent news articles

Generally, low-speed wind breezes cannot push turbine blades, so china recently developed a nanogenerator using the phenomenon of triboelectric effect. A small swing produced by the human arm generates power, so a slight breeze of 1.6m/s is enough for the nanogenerator to harness the power.

Onshore wind turbines generally harm the wildlife ecosystem, mainly bird families. There are several collisions of birds with blades of turbines. A recent study in Europe shows that pipistrelle bats are attracted to the wind turbines and resulting in a crash, so good monitoring systems are required to minimize the damage to the ecosystem and wind turbines.

Conclusion

Wind energy is eco-friendly when compared to fossil fuels. It becomes an excellent source for developing countries and stands as one of the most viable solutions for their rising energy demand. Generally, a Wind turbine lasts for 20–25 years, and as long as the wind blows, the wind turbine can harness the wind to create power.

India has a vast potential for renewable energy sources. Due to government intervention, there is growth in the renewable energy sector. The strategies for achieving new renewable energy goals depend on NGOs, Corporates, R&D institutions, and entrepreneurs' participation.

There is a need to focus on the technological system, accurate measuring techniques, manufacturing, and logistics, which requires better policies and good governance.

References

MNRE site, NITIAYOG

Irena site

Wikipedia pages

ScienceDaily News, Press information Bureau(PIB)

The Hindu, Econoictimes site

OPED views in THE HINDU

Codes for plots: <https://github.com/Elonian/Renewable>