

Environmental Impacts and Pollution Related Challenges of Wind Energy

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ABSTRACT

As we all know the fact that with the increasing of awareness about the threat on our nature and people are now more familiar about the risk Or danger to our nature and it's poor condition, there are many social and economic awareness parties as well as all the authorities as well as environmentalists are in worry and Considering all the pollution related challenges and all the parameters that are responsible for this threat and for that purpose they are concerning about the nature and our earth across the globe. This is the reason that now we are looking for some environmental friendly sources and therefore, we are now more depends on renewable energy sources like wind energy, solar energy and hydro energy for the purpose to generate electricity. Now after looking all the possible sources we think that the option for wind energy is safest and best option in terms of balanced development for our Nation and our nature as well as concerning about the mother earth and in the criterion of commercial development. This source is better option than other sources because of its two reasons first are renewability and the second is availability. We need high potential for development as the world's need for energy is far more than the world's total consumption of energy. According to the reports across the whole Worldwide, a total need of about 60 000 MW have been installed, which produces about 100 TWH yearly. The biggest and most important challenges for further usage of energy and development and modification are connected to economy, land usage, environment and grid capacity. As we all know that the cost of installations of wind power plants are low that ultimately reduced installation costs, however there is no fuel used and hence no fuel cost and the construction is not very complicated and time consuming and need construction time less than one year, it is said to be the most economic new power plant technology. Man has used the energy in wind for many years for different purposes whether it is, used for sailing the boats or running power generation mills at land. With all the available energy sources we can say that wind energy source is the most mature and is the best option that we are looking forward to for the production of energy in our future. The total effects of wind energy on the environment and our nature it often is positive, because of the production of renewable energy and due to the fact that it has the power of replacing the mining activities that are going around our own world. An overall view, about how that energy source will displace the harm caused by other activities can be understood by more complete understanding of the environmental and economic reactions. So after checking all the criterion of the positive as well as negative sides we may choose wind energy for the generation of energy and other beneficial purposes as it is the safest one option. This research paper provides analyses and discusses all the aspects to understand those environmental effects, both positive and negative. We consider both the effects on our nature and our environment.

Keywords: Pollution; Wind energy; Environment

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INTRODUCTION

In past years, we found that the wind energy has become one of the most economical renewable energy technology and source of producing energy. Nowadays we are now more focused on renewable resources of energy which will not harm our environment much because of its poor quality that we degrade our nature quality now [1]. Today, electricity generating wind turbines employ proven and tested technology with concerning all the aspects and provide a secure, safe and a sustainable energy source which is a very good criterion to consider the wind source of energy as a good source of energy. At good, windy sites where the amount of wind is sufficient to rotate the turbines, wind energy is now proofed itself already a successfully in a competition with other conventional energy production sources. So basically what happens in the wind energy source is that wind energy makes the use of wind which is present in that area to provide the mechanical power so as rotate wind turbines which turn electric generators which are attached to it and traditionally made to do other works, like milling or pumping. Basically the main mechanism of the wind turbine is that it is converting the kinetic energy which is being change into electrical energy by wind turbines and this conversion of mechanical to electric energy is the result of the generation of energy. After this the wind turbines produced electricity or we can say by wind conversion systems. Wind power is a sustainable and renewable energy, and has a much smaller and less harmful impact on the environment compared to burning fossil fuels and other harmful activities that will harm our nature in a very drastic way [2]. By using the kinetic energy created by air in motion, we are producing the electricity. Using wind energy conversion systems this is transformed into electrical energy. The whole mechanism is consist of following steps so, firstly the wind hits a turbine's blades which causes them to rotate and turn the turbine connected to them which is attached to it. This changes the energy from kinetic energy to rotational energy, by moving a shaft which is connected to a generator, and thereby producing the electrical energy through the principle of the electromagnetism. So this is the simple logic behind the working model of the wind turbines which will help to produce the electrical energy from the wind. Wind energy is that energy which uses the wind in the most beneficial form which will produce the energy which is renewable as well as not harmful for our nature as well as not add to the global warming by not producing any greenhouse gases. So, wind energy is basically depends on the principle of the conversion of kinetic energy to rotational energy, mechanical energy for the production of electricity.

ENVIRONMENTAL IMPACTS OF WIND ENERGY

Wind energy is the most preferable energy because:

It is the safest form of energy.

It has small impact on environment as compared to burning fossil fuels.

It is feasible.

And, at this stage when the population as well as pollution level has increased very much we are looking for different sources of energy which will cause less harm to our nature [3].

Environmental benefits/advantages

Wind energy being the safest energy that can be used does not cause any type of water or air emissions, and it also does not produce any kind of hazardous waste. As there is no need of resource transportation and extraction, because wind power does not make use of natural resources like oil, gas therefore it will not cause any damage to the environment. There is no need of considerable amounts of water during operation or working. Wind power not only reduces harmful emissions like CO₂ or SO₂ but it also decreases the amounts of external costs of fuel-based electricity generation. In this era, where the problem of global warming is increasing, it can be prevented by using more and more wind energy. As wind energy plants has only minor impacts on the Environment they are considered a green power Technology. And, most importantly they do not produce any air pollutants or greenhouse gases [4]. There are some points which will prove that wind energy is an ideal renewable energy because:

It does not cause any pollution as; it is a pollution-free, infinitely sustainable form of energy.

There is no requirement of any kind of fuel.

There is no requirement of any kind of fuel our environment It will not produce any kind of harmful or bad, waste.

Disadvantages or cons

The wind fluctuates: Like other renewable sources of energy such as solar energy wind energy is also not constant as it depends on other factors. Although the wind is sustainable and will never run out, wind speed is different at different places. This can cause some serious problems for the working efficiency of a wind turbine because an adequate amount of wind is needed for wind turbine to be work more efficiently as well as with more power. In the power generation cost, how fast, how often and when the wind blows plays the significant role. The power output from the wind turbine is directly proportional to the cube of the wind speed (Figure 1). Hence for wind turbines to work more efficiently a sustainable wind must be there, as it fluctuates it will affect our production of electricity. That's why fluctuations in wind speeds will make a greater impact on wind turbines (Figure 2).

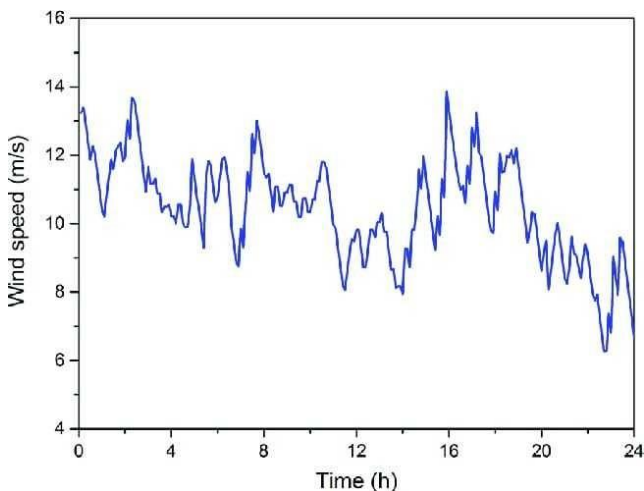


Figure 1: The variation of wind speed in Dongchi island of Penghu

Wind turbines are expensive: Even after the reduction of costs, wind turbines are still very expensive. For wind power plants an engineer must carry a site survey. In addition to which a wind tester is also used to check the speed of wind. Considering all of these processes contributes to the high cost of buying and installing wind turbines and hence the costs of turbines are high.

Wind turbines pose a threat to wildlife: Although wind energy is safe for the environment, it is often heard that wind turbines pose a threat to wildlife-primarily birds and bats. Birds die when they collide with the turbine blades. However, according to researchers, they believe that they pose less of a threat to wildlife than other man-made structures do just like in the installations of cell phone masts and radio towers harm more birds than wind turbines (Figure 3). Wind farms located off shores also affect the lives of fish and other marine wildlife. Nevertheless, the contribution to death rates among bird and bat populations due to wind power plant is still there and poses a threat to wildlife.



Figure 2: Indian map showing different speed of wind at different places

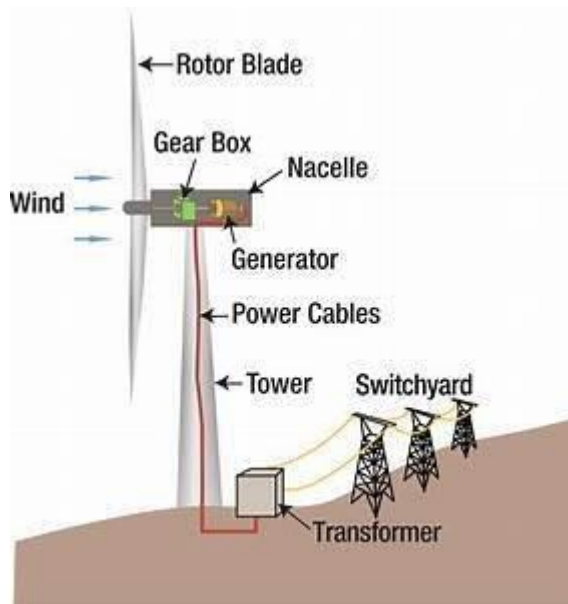


Figure 3: Labelled diagram of wind turbine

Wind turbines are noisy: Noise pollution generated by wind turbine is one of their main disadvantages. The noise is created by the blades of the wind turbines. Noise emitted is relatively weak but characteristics. They can even be sometimes heard from hundreds of meters away depending on the wind direction. Multiple wind turbines and right wind direction can cause much more noise pollution. Noise pollution created by wind turbines is one of the biggest impacts of wind energy.

Wind turbines create visual pollution: Counting the number of disadvantages, the drawback of wind turbines is the visual pollution they create. Although lots of people like the look of wind turbines, others don't, they did not find them pleased with many seeing them as a blot on the landscape. This, however, tends to depend solely on personal opinion. With increase in wind farms public acceptance is also becoming more.

WIND POWER IN INDIA

As we know we are now more dependent on renewable sources and that is why the wind power generation capacity in India has increased so faster. So, mainly the contribution in wind energy comes from northern and western sides. India can also provide the guidelines for the same to be applicable in wind down energy power plants and it is the best way you keep our balance in terms of free end safe environment conditions. Now we all need more sources of generating power which will full fill the need of the humans. According to the data of 2018; the interesting part is that India needed a lot of energy sources in which mainly is-solar power. 2018 had become the greenest year. Last year solar power will contribute the most in generation.

Thus, solar power had a huge share if about 50 percent while on the other hand wind energy had a share if 12 percent, in the

total capacity addition. New capacity added in the fossil fuel sector shrunk to 24 percent, this was, and however, marginally higher from the 21 percent witnessed (Figure 4 and Figure 5). Hence all the renewable energy sources will contribute in large capacity additions in energy production.

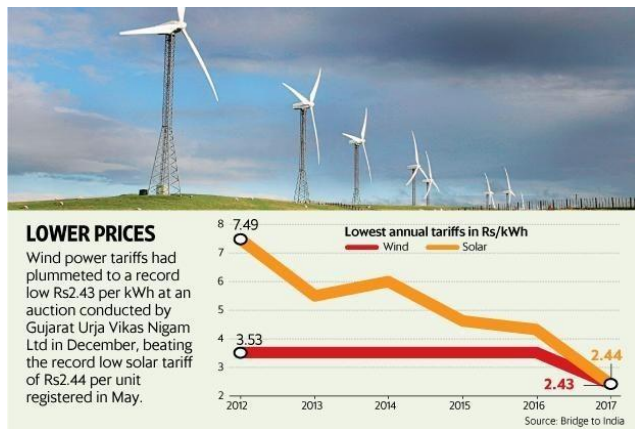


Figure 4: Graph showing decrease in prices of wind power.

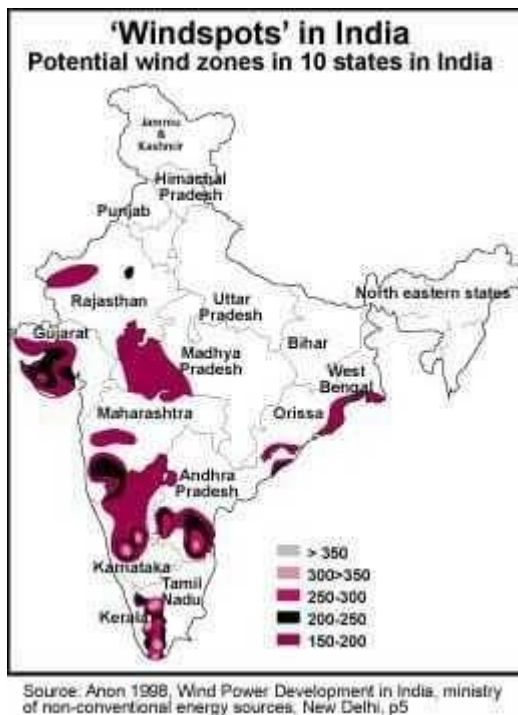


Figure 5: Wind spots in India

Barriers to renewable resource

According to the facts from the previous year, Wind energy increased to mainly contributing in all the aspects of providing the good and safe energy and its production is also increasing so fast. And as compared to other countries all over the world China was by far the largest mainly total 17.1 percent of energy is generated from renewable energy sources including hydro, wind energy and biomass energy. We are expecting the rise in the percent of generating electricity by the year 2030. Most of the participation in increasing the percentage is from the wind and solar energy because these two are the primary sources right now present. Although now the percentage is not high but it's impact

is major and achieve many things as compared to coal and natural gases. But now, also renewable energy sources still face major and big obstacles. Some of them are same as with all new technologies; other problems are the result of a bad regulatory framework and marketplace. This page explores the barriers to renewable energy in detail, with a focus on wind energy as well as other renewable energy sources.

Capital cost: Capital cost is the most obvious and big trouble while installations of the wind, and solar power, plants. Many installations are costly and require some kind of a particular land as well as particular infrastructure to implement that work.

Sitting and transmission: As we know nuclear, coal and natural gases are the centralized, sources because they are depend upon relatively very few and less high output power plants. But on the different note the wind power and solar power are the decentralized sources because in this smaller generating stations spread all over the large area and they work with unity to generate electricity. **Sitting-** Sitting is mainly refers to the need to locate the important things related to the power plants in different areas or different pieces of land. Doing this requires negotiations, permits, and contracts which will kill or finish the power plant projects and increase the costs also.

Transmission: As the word suggest transmission is the act of transmit the thing from one place to another. In this transmission refers to the wanted or the needed infrastructure and the transmission line system to transfer or transmit the electricity from the point of the generation to the consumer end where it is consumed. To abruptly, fastly take the advantage of these resources, new and modified transmission infrastructure is much needed and transmission costs money, and needs to be sited. Both the financing and the siting can be significant and major barriers for developers and customers, even when they're eager for more renewables though, again, clean energy momentum is making this calculation easier. **Market Entry-**From the past years the contribution from the renewable energy sources is less as compared to the other source like coal, nuclear and natural gas. They contribute a lot. Countries invested a lot in these projects in terms of finding the clean sources, which also hold huge market values. New technologies and start-ups face a number of problems they have to compete with all the other, sources which are in a major role and have a big participation in production of electricity and other kind of energy. With the increasing of government interest as well as the investment in all these projects will be major help.

DISCUSSION

Facts about wind energy

There are numbers of wonderful facts about wind energy that we are using nowadays as a renewable source of energy. Explaining you about the wind is used to produce electricity for different purposes [5,6].

1. Wind energy include, the turning of the wind power to produce useful electricity.
2. Although we, are, using wind energy as a renewable sources and we have found about this from now. But the fact is that windmills are, used in Persia in 2000B.C.
3. Wind energy is the safest option as it is a clean and a renewable source of energy.
4. Where, there, are, large numbers of wind turbines then the group of turbines are, called wind farms.
5. Wind energy is harnessed by using the wind turbines which are very high as high as 20 story building. And the blades are also very big like 60m long. They are resembled by the fans of a giant aero plane sticking on the stick.
6. The most amazing fact regarding wind energy is that no water is used in this energy and hence we can save a lot of water. According to data, we save 30 trillions of water by 2020.
7. Setting the wind turbines and implementing it is a very big task setting of the wind turbines at off shore location is the best option because there the speed of wind is steady but the fact is that the cost of infrastructure increase.
8. Most of the wind mills have blades and they are rotating at a very high speed at the speed of 320kph from the tip.
9. Wind energy is used more frequently now. The largest wind power, plant is located in USA in Hawaii whose; blades are as 20 story building.
10. According to the recent report given by NREL, 1 MW of wind energy can offset approximately 2,600 tons of carbon dioxide (CO₂) and hence can replace the CO₂ from environment.

Solution

Although we are accepting the fact that wind energy power plant installations are much lower and simpler as compared to the wind energy negative environmental impacts and effects on nature that are produced by conventional energy sources. Wind energy still has to be assessed and mitigated when necessary. There are some major conditions that must be kept in mind before choosing an area that can be suitable for a wind farm development. These conditions are depending on many things include factors such as: wind climatic conditions of those area topographical conditions. There is another term called strategic environmental assessment (SEA) is the procedure by using which we can evaluate the adverse impacts of any plans and programs on the environment. To solve the problem of noise pollution caused by the wind turbines, new wind-power

technology employs sound-dampening systems. Compared to the first built models, latest wind turbines are considerably quieter. Noise that is coming from gears and generators has been reduced, and modern wind turbine's housing is insulated. To further decrease the sound produced by noise blades have also been designed. The ecological effects of wind-energy facilities are not easy .More over above all these aspects will influence our environment in great way .So we are trying to minimize all the disaster that will produces from wind blades and we are providing safest way to produce energy without harming the nature.

CONCLUSION

After all the discussion we found that at last we are conclude that, we must decide that to produce electricity for our needs we must find some ways or sources which will harm the environment very less and has the smallest possible impact on the environment. Above all as we can see From a technical and economic approach and view, the most preferable and safest form of renewable and "clean "energy is wind energy. It can effectively contribute and crediting to fight climate changes that occurs in our nature nowadays; at the same time providing various environmental, social and economic benefits. If we notice on the other way, it is necessary to reduce the bad effects of wind energy on our nature and environment. As you can know that wind energy may produce some bad effects on nature while producing noise, and visual impact. We are looking forward for that energy sources which will not harm our environment or have very less impact on our nature. Wind energy is that energy which has great importance of being the renewable energy source as well as not affecting our environment, our nature in a major way. So the wind energy is that renewable source of energy which will not harm our nature and it is economically beneficial also.

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