

# POWER TRANSMISSION IN JHARKHAND AND POSSIBLE COST REDUCTION USING WIND ENERGY

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**Abstract:** The biggest thing is that till now there is no wind turbine of any kind in Jharkhand. In view of the increasing demand for electricity, it has been done in some different places in Jharkhand like RANCHI, JAMSHEDPUR, DEOGHAR, CHAIBASA and LOHARDAGA and from this it was understood that in Jharkhand, with the help of wind turbine, electricity can be used 24 hours.[1] According to the study, it has been found that electricity can be used on a large scale at a height of 10m-12m-15m at different places of Jharkhand. However, the height of the wind turbine depends on the area and the speed of the wind.

**Keywords:** Cost cutting, Average wind speed; fuel; Jharkhand; challenge, RET Screen; wind energy.

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## 1. INTRODUCTION

This is not a new technology to generate electricity from the wind. Thousands of years ago, people are using it in agriculture, household works etc. Until the last decade of the 19th century, it has been observed that wind energy has been used to pump water, grain and boats. Wind Turbine was used as a device to generate Electricity Developments of Mechanical Engineering, Electrical engineering, Aerodynamics, Control technology and electronics provide the technical basis for wind turbines commonly used today's Wind power is invented by professor James Blyth in 1887.[2]

Transfer of Thermal Electric power supply from one place to another place by the help of conductors it is very Easy. But service cost is too high Wind energy means renewable energy of Sources. Today date its attracted lots of attention due to technology development and friendliness to the Environment. From last previous year the use of renewable energy of source has raised Dramatically.[2] Ecofriendly and also promising renewable energy resource to help overcome global warming. Wind energy became a large contender for traditional fossil fuel energy. one time investment, maintenance free, low costs services, pollution free etc. but one major issue noise which can be improved.

## 2. METHODOLOGY

Five districts chosen to study are (1) RANCHI (2) JAMSHEDPUR (3) DEOGHAR (4) CHAIBASA and (5) LOHARDAGA. The study is done to get the energy capable of development to do the work in the right way for faster development for better studies. After studying the wind speed for 23 years {1983 January – 2014 Dec}, it has been measured.[3]

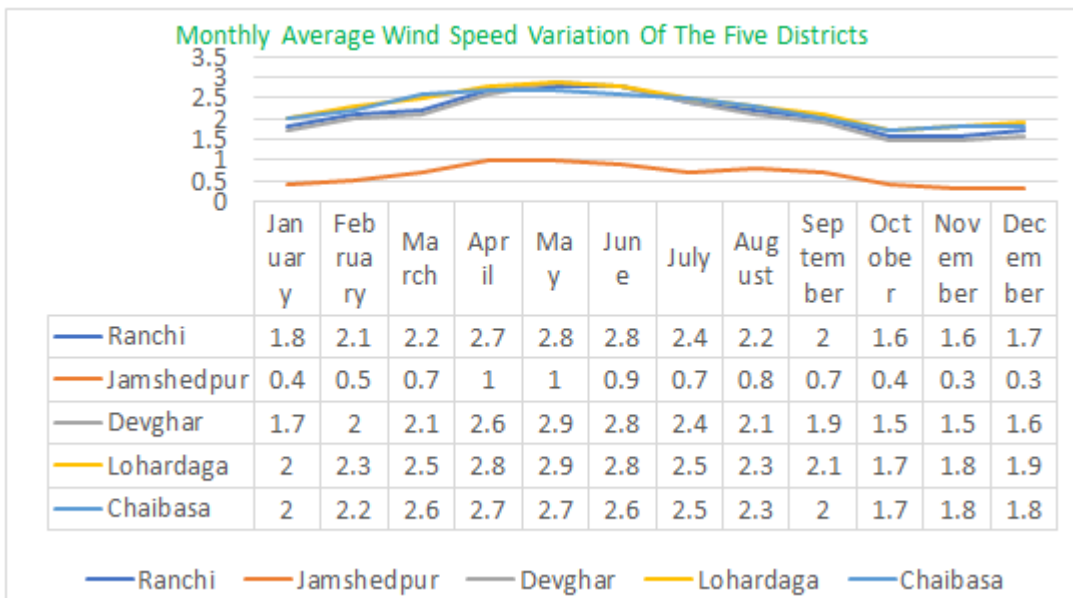


Chart graph (1) Monthly Average Wind Speed Variation of The Five Districts

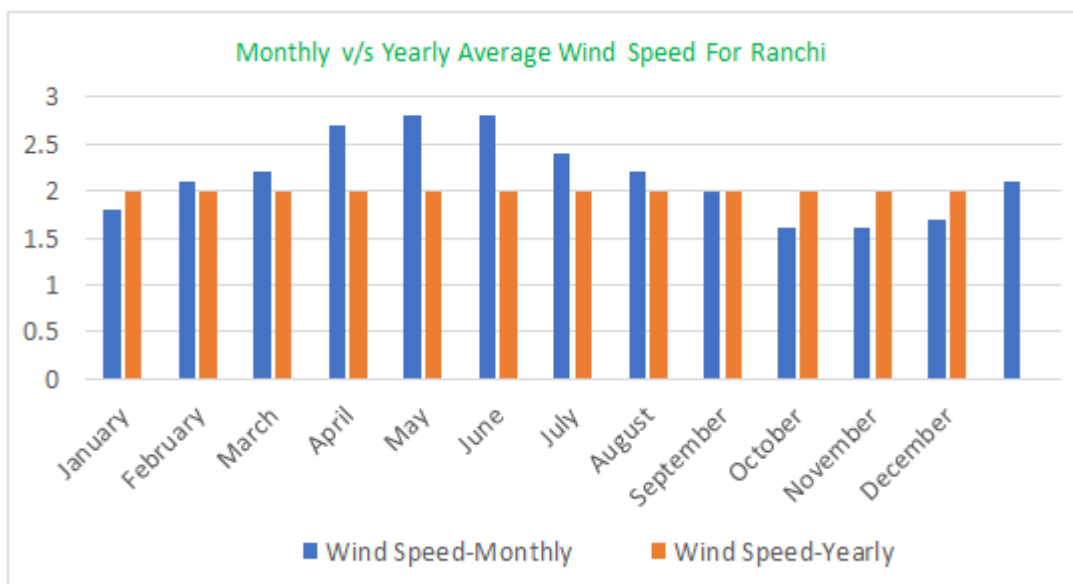


Chart (2) Monthly v/s Yearly Average Wind Speed for Ranchi

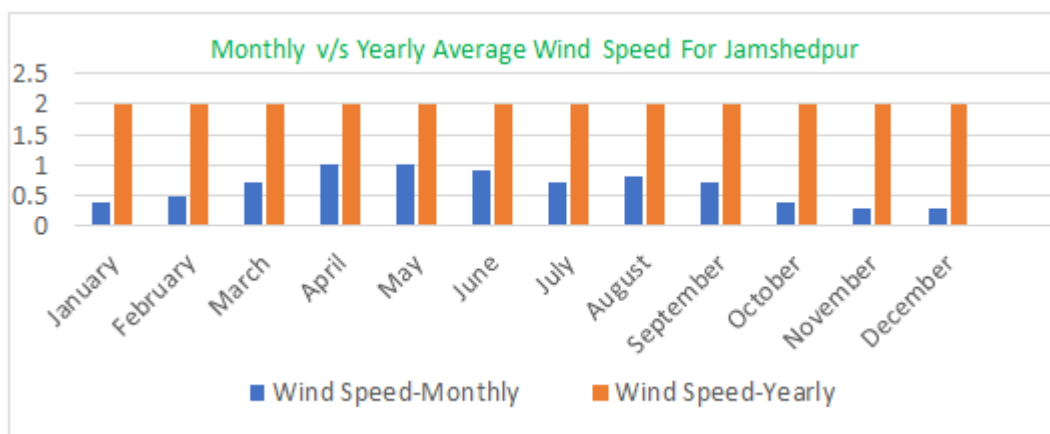


Chart (3) Monthly v/s Yearly Average Wind Speed for Jamshedpur

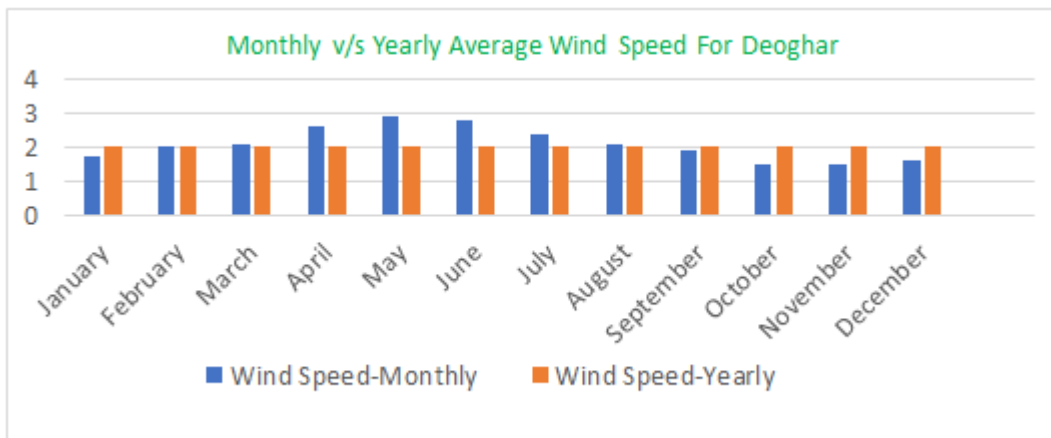


Chart (4) Monthly v/s Yearly Average Wind Speed for Deoghar

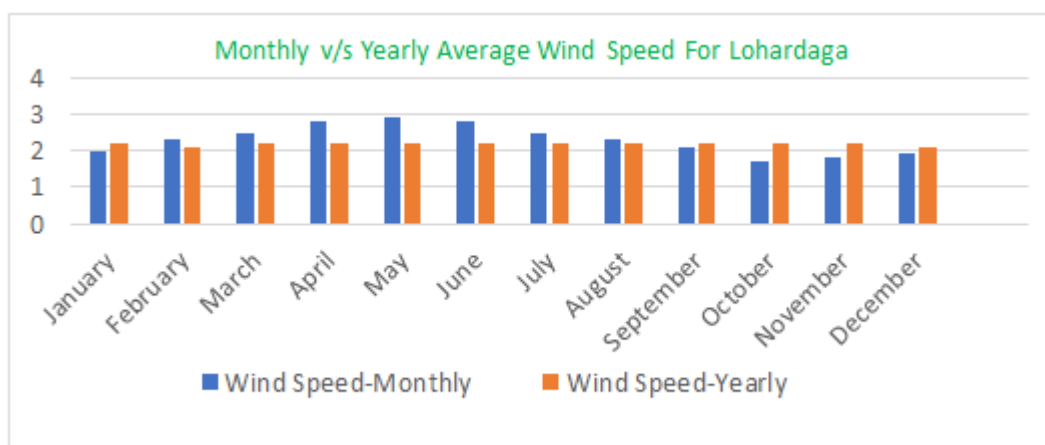


Chart (5) Monthly v/s Yearly Average Wind Speed for Lohardaga

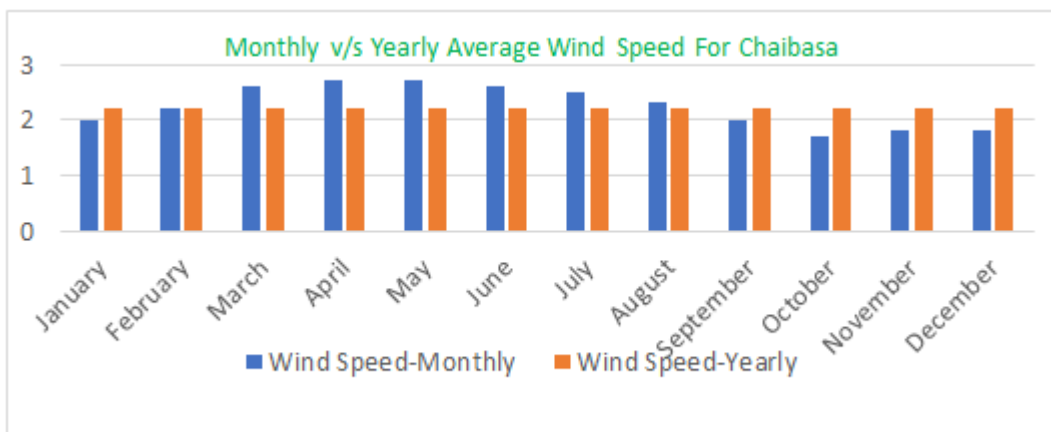


Chart (6) Monthly v/s Yearly Average Wind Speed for Chaibasa.

### 3. CONSTRUCTION AND WORKING OF WIND POWER PLANT

How a wind turbine is made. And how a wind turbine generates electricity. To make a wind turbine, a lot of instruments is required. First of all, its base foundation is what we call tower. We may sit this tower in several sections in pieces. So that it can be easily erected a couple of towers. This tower is hollow from inside So that the cable can be installed from inside it and also the stairs so that in case of any technical fault, it can be built from inside the tower without any problem or obstruction.[3] That is why the tower was not kept solid. if the tower was built in a solid form, then the tower would have become very heavy, it would have taken a lot of effort to install it, and also cost money. That's why we use hollow tower for wind turbines. Tower Hight depend upon areas. Weather area is urban, rural or hilly area etc.[4]

Wind turbines may have three blades and are very long blade sizes up to about 60 feet. Installing it is a challenging task. The length of the blade and the height of the tower are determined according to the area. These three blades are set in the rotor hub. And its rotation generates electricity. But there is a problem here that its blades spin very slowly. At the speed of 10-20rpm. Sometimes the wind speed is fast then the poet slows down and the poet changes the direction. Which is a challenging task.[4]

There are also many ways to set this blade. Either you first put the nickel part and then the rotor hub after that One blade can be installed with the help of a crane or by setting all three blades in the ground itself, at once, with the help of big crane, put it in the rotor hub. The most important part of this is its nickel.[5] On which the whole machine is set up, first the gearbox is placed, then the brakes and then the alternator. The rotor is connected to the shaft of the gear box. The function of the gearbox is to increase or decrease the rpm according to situation Its ratio is 1:90 to 1:100. This means that if the rotor rotates once the gearbox makes the rotor spin 100 times mores. Sometimes the wind speed is 11 less and sometimes 90 less. To balance the high wind speed, we use brakes so that there is no over speed of the blade. The shaft that is behind the gearbox can be called a generator or red. There is a magnet outside the alternator and one inside. And the shaft is connected to that small magnet when inner small magnet rotates its produces magnetic flux. With the help of anemometer, it is known in which direction the wind is blowing. [6]With the help of which the man turns the entire nickel part towards the direction of the wind. The electricity generated by the alternator is sent directly to the generator through the wire. Which increases the voltage. And then through the busbar, the electricity is sent to the sub-station from where the electricity is distributed to our daily purpose life. There are three types of wind turbine they are (a) onshore (b) near-shore and (c) offshore.

**TABLE 1: TOP 15 MOST TRUSTED BRAND MANUFACTURING WIND ENERGY IN WORLD.**

(1) VESTAS	(2) GOLD WIND	(3) SIEMENS GAMES
(4) GE RENEWABLE	(5) ENVISION	(6) ENERCON
(7) MINGYANG	(8) NORDEX GROUP	(9) UNITED POWER
(10) SEWIND	(11) SUZLON	(12) SENVIVO
(13) WINDEY	(14) CSIC HAIZHUANG	(15) XEMC

#### 4. WEIABULL DISTRIBUTION

Among the various statistical distributions available, the Weibull probability distribution is the most consistent distribution used to express the wind speed frequency and was employed for analyzing the wind energy potential of five selected districts of Jharkhand. The monthly average wind speed data were subjected to two-parameter Weibull distribution along with the additional statistical methods. [7]Table 2 shown the monthly and annual average wind speed data of the five districts for 22 years.

**Table 2: Five Districts Under Consideration of Jharkhand**

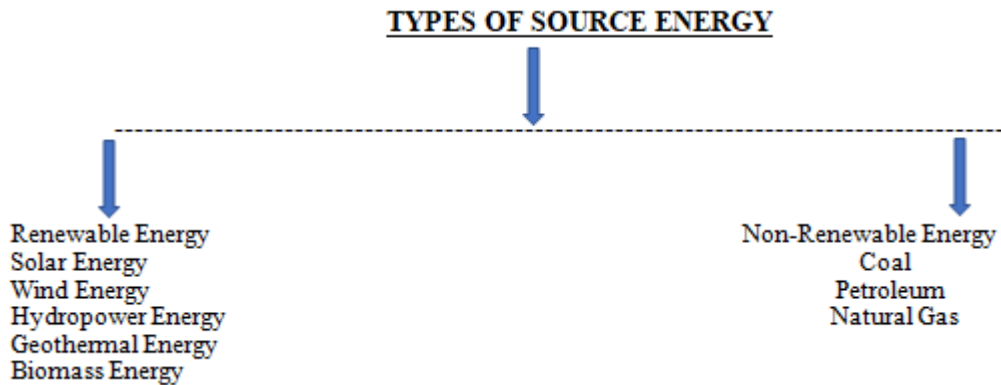
S/NO	CITY	LONGITUDE (N)	LATITUDE (E)	ELEVATION (M)	AIR DENSITY (Kgm <sup>2</sup> )
1	RANCHI	23.4	85.3	453	1.127
2	JAMSHEDPUR	22.8	86.2	142	1.135
3	DEOGHAR	24.5	86.7	224	1.146
4	LOHARDAGA	23.4	84.7	609	1.118
5	CHAIBASA	22.6	85.8	389	1.125

**Table 3: Average Wind Speed Data Throughout the Year for Five Districts of Jharkhand**

MONTHS	RANCHI	JAMSHEDPUR	DEOGHAR	LOHARDAGA	CHAIBASA
January	1.8	0.4	1.7	2.0	2.0
February	2.1	0.5	2.0	2.3	2.2
March	2.2	0.7	2.1	2.5	2.6
April	2.7	1.0	2.6	2.8	2.7
May	2.8	1.0	2.9	2.9	2.7
June	2.8	0.9	2.8	2.8	2.6
July	2.4	0.7	2.4	2.5	2.5
August	2.2	0.8	2.1	2.3	2.3
September	2.0	0.7	1.9	2.1	2.0

October	1.6	0.4	1.5	1.7	1.7
November	1.6	0.3	1.5	1.8	1.8
December	1.7	0.3	1.6	1.9	1.8

## 5. REASONS TO CHOOSE WIND MILL



**Solar Energy:** Solar energy which generates electricity from sunlight which is absolutely free. But the problem here is that it works only during the day and not at night. And it is not necessary that it should continue to work even during the day. It does not work even because of bad weather also.[8] Solar power plant also requires 2.5 acres of land to generate 1 MW Which encloses a large amount of land. Which shows a huge drawback. In the whole day, only 6-8 hours of sunlight can be used to generate electricity. The electricity generated by this is stored in the battery. and then it is sent to the distribution line.

**Hydropower Energy:** Hydropower plant makes the electricity by the help of water. its types are (1) run-of-river hydropower, (2) storage hydropower, (3) pumped-storage hydropower, and (4) offshore hydropower. Except for non-renewable sources, if we talk about renewable sources, then hydropower plant is the only power plant that can generate electricity for 24hour.Reasons to not choose hydropower because This technology is already in our Jharkhand and it is being used for centuries till date. Whereas in this new race, there is no wind power plant anywhere in our Jharkhand. In the coming time, the demand for wind power plant remained the most.[9]

**Geothermal Energy:** Heat is known as geothermal energy. heat from the deep inside the earth to generate steam to make electricity.

**Biomass Energy:** Biomass is a good source of renewable energy but it is not much efficient as compression to fossil fuel, solar and wind power plant. Biomass is the most commonly used wood for energy. From which a large amount of electricity is made. If such trees are cut, then it is a harm to our environment in future. Because of which the government also does not want to invest money on this project.

**Thermal Power Plant:** It is a good source to produce electricity Heat energy converted into electricity such as coal natural gas, heating oil. To generate 1mw of electricity, the thermal power plant takes about {300 to}600 kg of coal Per 1Mwh. However it is depending upon the quality of the coal. fossil fuel causes pollution it takes very large amount of water source required to convert water into Energy, Low efficiency and very high-cost maintenance.

Wind power plant like hydropower plant and thermal power plant has the capacity to generate electricity 24 hours a day. Whereas solar energy can generate electricity for only {6-8} hours in the whole day. [10]And if the weather is bad then there is no electricity generated. Thermal and Hydro Power Plant is a very old way of generating electricity. Thermal Power Plant which spreads a lot of pollution. Whereas in the same Hydro there is no such problem. As such, this problem is not special, but still there is a problem. There comes time when the river, pond and dam all start drying up. Then making electricity can cause a problem However, this problem is rarely seen. The wind will never run out which is absolutely free. It doesn't matter whether the weather is clear or bad, day or night. Wind power works 24 hours a day. A single wind turbine takes up a large amount of land. While the rest of the land can be easily cultivated, while solar power plants do not. The only problem here is that of investment. If this is solved, then there can be no better option than this to make electricity. In future wind power plant is going to bring a big revolution in the world of electricity. That is why the company and the government are also showing interest in setting up the plant.

## 6. JHARKHAND INFORMATION TABLE

The total population in Jharkhand is 3,29,88,134. Out of which there are 24 districts. According to the survey from the same 24 districts, these 5 districts have been selected for wind power plant there are total 62,54,781 houses in Jharkhand Out of which there are total 15,25,412 houses in urban, whereas in rural there are 47,29,369 houses in Jharkhand, Numbers of villages of each district and houses are shown given below. Through this table we get information about how much electricity we need.

**TABLE 4: JHARKHAND INFORMARTION TABLE**

SL.NO	DISTRICTS	POPULATION	VILLAGES	AREA (Km <sup>2</sup> )
1	RANCHI	3,322,248	1326	5,097
2	JAMSHEDPUR	1,630,000	452	224
3	DEOGHAR	1,700,963	2664	2,477
4	LOHARDAGA	5,26,441	354	1,502
5	CHAIBASA	22,93,919	75	7,224

**TABLE 5: JHARKHAND PHYSICAL INFORMATION**

FORMATION OF JHARKHAND	15 NOVEMBER 2000
CAPITAL	RANCHI
SUB-CAPITAL	DUMKA
LARGEST CITY	JAMSHEDPUR
DISTRICTS	24
BLOCKS	260
VILLAGES	32620
AREA	79,714 Km <sup>2</sup> (30,778 Sqm)
AREA RANK	15
DENSITY	414/Km <sup>2</sup> (1,070/Sqm)
POPULATION	3,29,88,134
HOUSEHOLD	62,54,781
RURAL HOUSEHOLD	47,29,369
URBAN HOUSEHOLD	15,25,412

## 7. ADVANTAGES

- There is a zero emission into the atmosphere when the energy obtained from the wind and it provides a clean air for fossil fuels.
- Wind turbine takes very little space as compare to a single power station due to this we can use the remaining land for agriculture industry.
- Renewable energy in nature the wind will not end and it can provide unlimited electricity to the world which is absolutely free.
- Generate energy from the biggest mountain, ocean, buildings or urban and rural areas, we can very easy use the electricity current for free 24 hours in ours works.
- This is a onetime investment. Only time to time maintenance is required, other than that there is no cost.
- Efficient use of land space.

## 8. DISADVANTAGES

- In nature the wind cannot be kept under control and neither does the same wind blow in the process where is a problem wind turbine cannot be installed everywhere because the wind is not flowing uniformly everywhere.
- Wind turbines are expensive to build with one turbine costing is up to 10lakh in Indian rupee for per 1 MW of name plate capacity installed.
- Wind power generates very little electricity as compared to fossil fuel. To generate the same electricity, we have to install wind turbine in more quantity. Wind turbines are also highly inefficiently in terms of output capacity.

➤ Due to the increasing demand for wind power, trees are being cut, animals are being harmed. Minority of land for windfarms may increase and also large numbers of birds are killed per years.

➤ A single wind turbine makes as much noise as that of a small jet engine. Due to this, the animals and the people of nearby places have to face trouble.

## 9. CHALLENGE IN WIND ENERGY GENERATION

(1) Wind power plants cannot be installed everywhere. Due to the non-uniform wind speed, it also raises the question of a challenge. To deal with these problems, the company made wind turbines of different sizes and capacities so that wind turbines can be installed in that area according to the speed of the wind. But still, this is the biggest choice question arises for the wind power plant.

(2) The fluctuations in voltage and grid frequencies are major challenges. This means that the wind energy that is being generated is not being efficiently delivered to the consumers and there is a lot of wastage. Development of the grid infrastructure becomes crucial to make this process more effective and efficient.

(3) The wind power plant turbine might cause noise and aesthetic pollution. As compare to conventional power plant wind power plant little impact on the environment. But the noise produced by the turbine blade and visual impact to the landscape.

(4) There should be land with alternative use for wind turbine installation. Which can be valuable in terms of electricity generation.

(5) The local wildlife is greatly disturbed by the wind power plant. Birds are becoming victims of spinning turbine blades on a large scale, due to which they are dying. Some solutions have been found for the birds to die less like choosing the right place for wind power plant, reducing through technology, painted on turbine blades or use radian. Due to this, the birds will not come close to the wind turbine blades after seeing the colors from a long distance. Due to which a lot of birds, bats life has been saved.



Fig (c)



fig (d)

## 10. APPLICATION

Wind mill is specially used for generating electricity. It is used for quite a number of purposes. Such as pumping water, saw-milling of timber, milling grains, drainage pumping, machining and oil extraction from seeds.

## 11. COST REDUCTION USING WIND TURBINE

The study conducted over the 5 districts of Jharkhand suggests that the speed of wind at the height of 10m is does not have sufficient energy to generate energy at a large scale hence large-scale integration of wind farms are not possible. So, the wind farms at small scale can be profitably set up in the areas of consumption where energy can be locally generated and locally produced. This can sufficiently reduce the transmission cost in far rural areas where the laying of transmission line is an expensive task.

## 12. RESULT AND CONCLUSION

According to the data in these 5 districts of Jharkhand, the monthly wind speed has been compared. Which you can see in the picture. According to the data the wind speed at these places varies from 0.3 m/s to 2.9 m/s. In these 5 districts, LOHARDAGA overtakes everyone in terms of monthly wind speed. In which the monthly seasonal wind speed of Ranchi

is 1.6 m/s to 2.8 m/s, Jamshedpur 0.3 to 1.0 m/s, DEOGHAR 5 to 2.9 m/s, LOHARDAGA 1.7 to 2.9 m/s, and CHAIBASA 1.7 to 2.7 m/s. According to the monthly fixed speed of the wind, Various studies show that the same wind does not blow in every direction at all times. Calculation of various statistical & Weibull shown in fig. The shape parameter (k) of Weibull distribution lies between 2.469k to 6.777 and scale parameter (c) of Weibull distribution lies between 0.676 to 2.470. the two Weibull parameters (k and c) calculated for the five districts of Jharkhand which is shown in fig. The most probable wind speed for Ranchi 2.193 m/s, Jamshedpur 0.548 m/s DEOGHAR 2.185 m/s, LOHARDAGA 2.408 m/s and CHAIBASA 2.301 m/s. while yearly value of wind speed carrying maximum energy were 2.419 m/s, 0.860 m/s, 2.461 m/s, 2.573 m/s and 2.447 m/s.

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