I J C R M
International Journal of Contemporary Research In Multidisciplinary

Review Article

Wind Energy: A Ray of Hope in Rural Area

Dr. Hemantkumar B. Meshram[1*]
[1]Department of Physics, SDMv Nawargaon, Chandrapur, Maharashtra, India

Corresponding Author: *Dr. Hemantkumar B. Meshram

DOI: https://doi.org/10.5281/zenodo.14803378

Abstract

Present research paper is based on the smart use of wind-generated when vehicles run on the road. Newton's third law of motion states, "For every action, there is an equal and opposite reaction". According to this law when vehicles move with a certain definite velocity in a forward direction then from opposite directions equal and opposite amount of wind velocity will also travels. This freely available wind is usable to convert Wind energy into electrical energy. Of course, this energy will save in batteries and will be used to electrify rural areas by connecting it to the grid. This research paper explains how we can use this much amount of wind-generated indirectly, which is waste now and can be utilized for electricity generation by using a wind turbine. So that the lacuna of electricity, and dependency on fossil fuels like coal, petrol, diesel, and natural gas etc. for electricity generation will be reduced.

Manuscript Information

- **ISSN No:** 2583-7397
- **Received:** 13-12-2024
- **Accepted:** 22-01-2025
- **Published:** 04-02-2025
- **IJCRM:**4(1); 2025: 94-100

- **Plagiarism Checked:** Yes
- **Peer Review Process:** Yes

How to Cite this Article

Hemantkumar B. Meshram. Wind Energy: A Ray of Hope in Rural Area. International Journal of Contemporary Research in Multidisciplinary.2025;4(1): 94-100.

Access this Article Online

www.multiarticlesjournal.com

KEYWORDS: Mini Wind Turbine, Power, site, Rural India, Installation, Capacity, Power Plant

INTRODUCTION

India has ample renewable energy options that can perfectly compete with traditional sources. India has been ranked by Thapar et al. [1] as one of the promising countries for the production of wind power. The wind energy capacity is over 45000 MW, 2117.2 MW from which (until 31 Dec 2003) has been derived from this renewable energy source [2]. In terms of wind power, the country has tremendous potential. India is recognized as a new wind superpower by the World Watch Institute [3]. India is the fifth largest developer of wind power in the world. Though India has installed more than 100,000 MW, there is a shortfall of about 10,000 MW for the supply gap [4]. The growth of the Indian economy depends on increased electrical capacity. While capacity output in India is rising relatively rapidly, a persistent power shortage with no blackouts continues to exist for industry and households alike. India went from having an electricity surplus in the 50s and '60s to today's peak power conditions and energy shortages. Low supply quality and greater reliance on captive power have burdened the industry which accounts for the largest share in the consumption of power supplied by the utilities. Demand is also growing in agriculture

and the domestic market. In addition, over the next two decades, electricity consumption is expected to increase significantly. Wind energy is projected to play an enormously significant role in the future national energy scene [5-7], considering the gradual decline in connectivity and the growing cost of gas and fuel oil.

At the end of the Sixth Five-Year Plan, the wind power program in India was launched. In 1952 under the Council of Scientific and Industrial Research (CSIR), the first effort was made to use wind energy in agriculture in the world. A water-pumping model was designed for the windmill by the National Aeronautical Laboratory (NAL). In 1980-85 and 1986-89, the government of India launched a National Water Pumping Windmill Demonstration Program [8]. In 1985, through the Ministry of Non- Contractual Energy Sources (MNES) throughout the region, the Indian government implemented a wind monitoring and mapping programme. The Indian Institute of Tropical Meteorology carried out a comprehensive wind resource assessment in 1985 itself. With over 600 tracking stations [9, 10], it was the world's largest program. It was in 1986 that wind farm operation began in India with the construction of five wind farms, mainly imported 55 kW machinery from Denmark in Mandvi, Okha, Devgarh, Puri, and Tuticom. A comprehensive evaluation of Indian wind power potential for the construction of wind farms has also been launched based on science studies [11].

The MNES encouraged wind energy in the Seventh National Five-Year Plan to develop high-quality grids (1987-1992). The power installed was 50 MW until 1991-92. A strategy to foster expanded private-sector investment was formulated in 1991 to fill the gap between progressively increasing demand and supply and mobilize additional capacity-building capacity in electricity generation and distribution [12].

Although market-oriented incentives and strategies did exist in the late 1980s, private sector involvement only spurted in 1992, after private power policy was declared in 1991. Together with a booming economy and attractive fiscal stimulus, this gave an impetus for accelerated wind energy expansion. India's growth in 1992, the year in which the age of LPG (Liberalisation, Privatisation and Globalisation) was initiated, was unprecedented following the entry of private entrepreneurs in India. The construction of 247 generators at 13 sites in 7 countries added 32 MW in 1992 itself. The installed power in India was 192 MW in March 1994, and by March 1995 the capacity was increased to 370 MW. Higher capacity computer of 500 kW was launched in 1994. In 1 year, 178 MW were installed, while the installation took 8 years for the first 72 MW. In the mid-1990s this industry grew unprecedentedly and by 1998 the nation accomplished a phenomenal feat of 1,000 MW of wind power plants. This has enabled India to play a prominent role in the wind energy world map. The Indian wind industry became a major economic body in the country with Rs. 1500 crores annual turnover of 1997[13]. In the year 1997, the installed capacity of wind generation was about 750 MW and the locations were: Okha, Madhi, Mandri, Lamba and Tuna in Gujarat; Tuticorin, Kayathar and Muppandhal in Tamilnadu; Puri in Orissa, Deogarh in Maharashtra, Thirumala in Andhra Pradesh, Kheda in Madhya Pradesh, Tala Cauvery in Karnataka. BHEL had built two prototypes of WEGS (Wind Electric Generators), mounted and field tested, of the 5-kW grid. On that basis, a 500 KW wind farm project with machinery built indigenously was started by the Department of Non-Conventional Energy Sources (DNES). The BHEL project at Tuna was conceived and carried out entirely autochthonous. Furthermore, a prototype of a 200-kW machine with 50 % indigenous content was completed, installed and synchronized with the grid at Kayathar in Tamil Nadu and at Lamba in Gujarat. With wind energy worldwide that increased from 4900 MW in 1995 to more than10000 MW in 1998 but Indian annual capacity decreased from 382 MW in 1996 to 70 MW in 1998. The situation began in 1999 and the rise continues [14].

The wind resources evaluation programme today is carried out by the State Nodal Agencies (SNAS) of MNES, Field Research Unit of Indian Institute of Tropical Meteorology (IITM-FRU) and Centre for Wind Energy Technology (C-WET). In 17 States and 3 Union Territories, 476 wind monitoring stations have been built. A wind power density of more than 150 W/m^2 per annum at 30 m above the ground level is seen in 208 stations and is considered a benchmark for wind farm development. Seven stations [15] have wind power over 500 W/m^2, 3 stations over 400-500 W/m^2, and 25 have a wind power density of approximately 300 W/m^2 out of 208 appropriate stations. MNES wind resource evaluation programme is the largest wind resource evaluation programme in the world [16].

Scope for the future

The development of wind power in India began in the 1990s, and has significantly increased in the last few years. Although a relative newcomer to the wind industry compared with Denmark or the US, domestic policy support for wind power has led India to become the country with the fourth largest installed wind power capacity in the world. As of 30 June 2018 the installed capacity of wind power in India was 32,293 MW, mainly spread across Tamilnadu (7,269.50MW), Maharashtra (4,100.40MW), Gujarat (3,454.30M), Rajasthan (2,784.90MW), Karnataka (2,318.20MW), Andhra Pradesh (746.20MW) and Madhya Pradesh (423.40 MW) Wind power accounts for 10% of India's total installed power capacity. India has set an ambitious target to generate 60,000 MW of electricity from wind power by 2022. The Indian Government's Ministry of New and Renewable Energy announced a new wind-solar hybrid policy in May 2018. This means that the same piece of land will be used to house both wind farms and solar panels.

Expansion of wind power

Without waste or pollution, wind power may generate power. The overall amount of wind energy that can be generated in the long run, relative to for example petroleum or natural gas, is therefore not constrained. Yet a doubt remains as to future wind power quotas. Increased technology, lower unit cost, and an increased concern for environmental issues with rival technologies such as fossil fuels are at the centre of the enormous growth in wind power production. It is now interesting in the future to determine will limits are relevant for wind power

generation. As wind power is not available if wind is not present, during these cases consumers need to obtain power from other sources. The question, then, is the power structure that sets the boundaries or be it the environmental or economic consequences? A mixture of the above points would in the future restrict the amount of wind power available.

Probable restrictions

1. The site must have a reasonably high wind level

There is a continuous wind change in direction and speed and altitude, temperature, and landscape are also affected. The wind energy is commensurate with the wind speed cube. The doubling of the wind speed will provide the rotor with eight times more power. This, in turn, is not a technological cap, but a financial one, since wind power can be very costly if wind speeds are too poor at the wind turbine site.

2. Wind turbines need not be too near one another

Wind turbines use kinetic energy to reduce the wind speed and to transmit the kinetic energy in the wind to electric energy, thus the downwind speed of the turbine is lower, and thus a certain distance from the next turbine must still be established. The typical gap between the turbines is 5-10 turbine diameters. The wind turbine often creates turbulence and may limit a downwind turbine's lifetime, which is a major explanation for any distance needed. This cap is partly an affordable issue. If the wind-resourcing areas are not adequate, the units may be closer together which can lead to a decrease in output and a reduction in the lifetime. The other way is to use lower wind level regions (more expensive wind power). It is important to use the most economical option [17].

3. A plan is needed to balance wind power variance

The wind turbine's power generation varies steadily. The power grid is intended to provide electricity to customers when necessary. However, where there is no or little wind, the user still requires electricity. This implies: that other power-producing plants need to be available and/or storage needs to be made in the grid that is capable of storing the wind energy generated at high and low wind times. These two choices can be seen as one in fact. The first suggests that the fuel can be saved for later use in heavy wind conditions, rather than the use of fuel to provide users with energy. This ensures that wind power is "stored" in hydro tanks or fuel storage from high wind to low wind conditions.

4. Build additional power lines

The wind turbines are situated in high-wind areas. Transmission lines from these sites to customers need to be built. Furthermore, in cases of low wind rates, there have to be routes from customers to other power stations. This isn't a particular wind power challenge. The same is the case, even for hydropower plants. If a fuel is used for power generation, such as coal, gasoline, natural gas, or uranium, the transport of the fuel and energy is usually more economical. In particular, power lines must be viewed as one of the alternatives for transporting electricity from the source to customers. Mainly an economical problem is the number of power line requirements for the alternative wind power, as using very distant wind energy would cost the necessary electricity lines [18].

5. Effects on the environment

The adverse influence of wind energy on the atmosphere involves visual changes, bird life, pollution, and impacts on fish in the case of offshore wind energy. On the positive hand, wind power contributes significantly to the reduction of carbon, eco-friendly, green, and alternative energy sources [19].

6. Economy

Wind electricity is not free and wind power also pays more than typical power stations at the moment. The previously described boundaries are primarily economic and are not purely scientific, In general, the costs per kWh of wind energy generated would grow if the share of wind power is increased in all these issues. In the power grid, wind power would be 30 percent more costly (per kWh) than wind power 3 percent.

India's case study

Cheap and plentiful electricity, with minimal environmental and ecological risks, is a prime factor in economic development and enhancement of the quality of life of people living in developing countries like India. In the past, countries that have taken the lead in the right use of abundant fossil fuel sources were able not only to overcome the subsistence threshold but also to enter into the stage of mass energy consumption. In comparison, the natural climate has shown itself to be a massive waste and the detrimental consequences of fossil fuel production, conversion and usage of electricity have not been achieved. India began its infrastructure construction efforts very late in the day and was unable to take advantage of this process. For 20 years, green energy technologies in India have been successfully developed and disseminated, and policymakers and academics in India have calculated a significant utilization capacity for renewable energy. The fastest-growing source of renewable energy in the world is wind power with an annual growth rate of around 30%. It has been recognized as one of the green energy forms of energy production with most opportunities and commercially viable technology.

The following are the three key reasons contributing to the production of wind energy:

- **Need:** A new understanding of the finite nature and impact of the combustion of energy sources on the Earth's fossil fuel stocks.
- **Potential:** There is wind in the world and even with significant energy density.
- **Technology:** Developments in other areas could revolutionize the manner in which they could be used as they are used with wind turbines.

These conditions were important but not adequate to promote the re-emergence of wind power.

Two other factors are expected to achieve the current status of wind turbines:

- **Vision:** A new way of trapping the wind.
- **Political will:** To ensure that this happens political will is required.

There are also three additional considerations in the production of small wind turbines, which we have mentioned. The following are:

- **Losses:** The network losses are important since the irrigation charges are spread in nature.
- **Resources:** There are sluggish speed winds at most of the areas where irrigation loads occur, and mostly in a year.
- **Technology:** The sluggish wind turbine technology in the range of 1-10 kW is not available at reasonable prices.

Given the cost efficiency of conventional power sources, such as diesel and coal, as well as other favorable factors such as modularity, short project spread, non-polluting technology and the global energy and electricity shortage, demand for private wind power projects will probably grow quickly in the coming years. The rising cost of traditional electricity tariffs would also stimulate private enterprises to look at wind energy. An additional benefit in the form of 100 percent depreciation in the first year of operation of WEGS's capital investment would encourage more private interest in the output of wind power. If India takes the right steps now, it could well be a global pioneer in the generation of wind power in the coming years.

Installed wind power capacity and generation in India since 2007

Financial year	Installed capacity (MW)	Generation (GWh)
06-07	7,850	-
07-08	9,587	-
08-09	10,925	-
09-10	13,064	-
10-11	16,084	-
11-12	18,421	-
12-13	20,150	-
13-14	22,465	-
14-15	23,447	28,214
15-16	26,777	28,604
16-17	32,280	46,011
17-18	34,046	52,666
18-19	35,626	62,036
19-20	37,669	64,485
20-21	38,785	59,824

Source:https://en.wikipedia.org/wiki/Wind_power_in_India#Installed_capacity

India should strive for a high of 60,000 MW (India's wind potential), and steps to recapture the diminishing excitement should be taken. This industry will set a precedent to imitate others if a will exists to achieve the desired result. The world's wind power is predicted to rise enormously in the first 20 years of this millennium. India will reclaim its fourth-to-first place worldwide in the use of wind for power generation. Obviously, growth in the sector is going to be immense in the coming years. India will also see the emergence, in the not distant future, of offshore wind turbines. In the coming years, wind energy will undoubtedly be one of India and around the world's most promising renewable and non-polluting energy generation technologies.

Problem-Indian rural energy scenario

It has been mentioned that the famous English poet William Blake, "Energy is the only life. Energy is eternal delight." There was a mistake. Energy is not just a technology commodity. Nor is it a wise pillaging of the riches of god. Between the pictures of a technologically propelling society and an ever-material wealth, energy sometimes is deified or vilified as though it were an intent. If so, the entire focus of energy creation will either be on more energy production or on using less and less energy, without understanding the subjects and objects of energy systems as human beings. It can be used as an instrument of creation to gain energy to acquire a human face. The status of rural energy systems in India is a cause for concern at the constant misinterpretation of the rural aspects of energy. Political demand and their own needs for development drive electricity companies, who have not yet met an overwhelming majority of rural citizens, continue to hunt millions down in electricity programmes. Rural areas are marked by energy scarcity and continue to be degraded socially, politically, and environmentally. The inevitable inference is that rural energy demands have been severely underestimated in developing countries, after almost decades of exposure to energy problems in rural areas. Rural energy production was left in their consideration for economic growth to organizations who felt the value of offering large-scale technological solutions that are more appropriate for urban development at the detriment of limited, need-based, rural alternatives. It is increasingly difficult to settle the detrimental effects of this policy. Following the stresses, the need for a new solution for the production of rural energy has now become increasingly urgent. Recent technical advances and rising excitement about the private initiative opportunity on deregulated markets present additional prospects for expanding rural energy in another way.

Alternative suggestion for wind energy in rural India

Designs for windmill to minimize windmill construction costs and to define desirable matches between wind energy technology and applications from developed countries seem to have not been coordinated well, although a number of the WECS performance characteristics are very acceptable for many of the specific energy requirements in rural areas. Some of the following features are:

- **Renewability:** Wind energy is a natural resource which does not experience volatility in supply and demand.
- **Technological Complexity:** The wind machines are available in a wide variety of engineering designs and should therefore be easy to match the existing technical expertise and experience.
- **Scale:** Wind systems have multiple capacity and power ranges in rural areas that are well matched.

- **Distribution:** wind is a dispersed resource at the point of request such that electricity can be delivered to remote villages without using a distribution network.
- **Uses:** Wind energy systems are ideal for pumping water. Mechanical and electrical energy generation, both technologies of rural importance.
- **Environmental control:** Small scale wind power applications have relatively little adverse environmental effects on the atmosphere in the area.
- **Cost:** There is high costs for the construction of wind turbines, but small- scale light capital architecture (as discussed later) will provide an affordable power supply over life time for rural areas.

Wind power systems have substantial village-level adoption potential, as windmill efficiencies are well matched to many of the rural Indian basic energy needs. Low-capital, low-power wind machinery is particularly suitable for many low-lift water pumping applications, in small scales, simply built or run. The pumped agricultural needs and domestic water sources is one of the most critical energy needs in rural India. In certain ways, windmills can satisfy these requirements and can also potentially save cost, time and work in regions where other methods of water elevation are commonly used. They can also be used to provide mechanical strength for applications such as grain grinding or milling, cane crushing, olive oil pressing, air circulation for crop drying, cooling, wood sawing and aerating of water. In rural India, wind power generators can be ideal for home illumination, cooling systems, electric power communications, small-scale industrial uses, domestic supply, watering and irrigation pumps.

Need for further research

A detailed review of the different feasibility facets of the technology must be performed before it is distributed before efficient and continued use of new technology. Wind and evaluation of wind power, availability of facilities, building needs, precise production, financial and economic feasibility and energy quality, energetic viability, the initial cost of capital, simple initial service and maintenance, capacity to balance the power and demand profile, and enviro are all primary factors that will impact rural India's implementation. To be permanently included in a village's lifestyle, the windmill plant must also be consistent with the social and cultural context (socio-cultural acceptability). A considerable amount of work to build and execute designs is needed before windmills are widely used in rural areas. Individuals or organizations attempting to build windmills in rural India often do not have any of the necessary technological skills and expertise available. Style improvements and test efforts, however, could speed up the implementation of wind energy technologies in rural areas along with greater focus on distribution of knowledge to the windmill. In future, wind energy technologies will inevitably become more and more popular. However, the threat from traditional fossil- fuel energy supply schemes is currently serious. Wind power systems are marked by resource intermittence and large sizes to make matters worse. On the other hand, the rise in fossil fuels, the dwindling supplies and the environmental risks associated with their overproduction and use made the renewable energy market very interesting once again. It is thus important, by focusing on financially/economically the most rewarding applications that are socially appropriate, environmentally friendly, and to maximize the distribution of limited resources. By using various combinations of energy-resource technologies, the energy demand of an end-user can be met in more than one way. Decision making thus requires alternative actions that must be clearly identified and technology practicable prior to a fair assessment of the financial economic merits of competitive alternatives. The financial/economic research methods discuss disparities in economic output between the different alternatives.

Method of generation of wind

How to generate high wind speed in local area where no hilly region, no oceans? It is very big question but answer to this is very simple. You know in the world, every village, city Metro city vehicles runs over the roads like buses, tractors, trucks etc. By using these vehicles we can increase wind speed. But how? According to Newton's third law of motion “for every action there is equal and opposite reaction”. When vehicles travels on the road from one place to another place with some definite velocity. For example 20 km per hour or 40 km per hour or 60 km per hour in forward direction then from opposite direction wind also travels with the same velocity as 20 km per hour or 40 km per hour or 60 km per hour respectively. This is too much amount of wind energy generated which is not used by us. In the world crores of vehicles Run over the roads so lots of large wind produce indirectly which is not used for conversion of energy. As we know this wind produced which is indirectly totally free. A Person which has a vehicle fills the fuel in vehicle and go to work place from home place. Similarly, buses travels from one village/city to another village/city by filling fuel. They don't know indirectly lots of wind is produced/ generated during transport which is total wastage. As we can use it for conversion of it into useful energy. The main purpose of this research paper is the utilization of this much amount of wind power and conversion of it into electrical energy for household use in rural as well as in urban area. Now the question arises how can use this wind energy, for the conversion of it into electrical energy? As we know wind turbines are used for the conversion of wind energy into useful electrical energy. By installing mini wind turbine like bladeless wind turbines, and movable wind turbines in the bonnet of vehicles like Buses.

Why only mini wind turbine?

Medium and large wind turbines cannot be installed because in those wind turbines have a large blade from 1 meter diameter to 180 diameter and the poles having height 3 m to 150 meter. It is very difficult to install the wind turbine on the vehicle like bus. If installed then due to large wind speed, at the opposite side of the system of wind turbines will collapse. While bladeless mini wind turbine are very easy to install in bonnet of vehicles. Small wind turbine can sustain large amount of wind speed and will not collapse. After installation of small wind turbine on vehicles

converted electrical energy is stored in the battery and then we can use this stored energy to run household appliances.

How to apply a mini wind turbine?

Individuals' person who have vehicles can use this energy to light up his or her home appliances like light bulbs, charge their mobile, etc. After some time battery will discharge when the vehicle runs again on the road the battery will again charge. This is all about individual use. But can we use it in bulk or in groups so that a large amount of electrical energy can be utilized at a time from one place? i. e. the vehicles on which Mini wind turbines are installed come/gather in one place. Yes, it is possible. Mini wind turbines are installed on state government buses like red buses, green buses, etc. Near all state government buses at the evening about 6 p.m. to 9 p.m. gather at the bus depot and some of them are halting. In every Bus there will be a system converted wind energy wind energy utilized to lighten the bus depot. If through this mechanism large amount of energy got then this electrical energy can be connected to the grid and through using grid this electrical energy can be supplied to the nearby villages of bus stop or bus depot. In Maharashtra every district place, taluka place have bus stops where buses are halting. So supply of electrical energy is possible by connecting this electrical energy to grid and then to nearby villages. Through this mechanism if more than required amount of wind energy converted into electrical energy then each and every village that is in rural area will have a light! For all these purposes powerful small bladeless wind turbine which will be operate at 10 Km/h to 80 km/h wind speed is necessary. According to relation $P = A\boldsymbol{\sigma}V^3$ Power is a cubic function of wind speed. No other factor is more important to the amount of power available in the wind than the speed of the wind. 20% increase in wind speed means 73% more power and Doubling wind speed means 8 times more power. The swept area of a wind turbine is the second most important factor (after the wind resource itself) that determines energy production. The circle "swept" by the blades is the collector area. This will be a very large amount of wind energy converted into electrical energy. This much amount of power will fulfil required energy in the rural area as well as in urban area. One small bladeless wind turbine having size less than 1 meter can generate 1 KW of power, the cut in speed typically between 9 km/h to 15 km/h when the wind turbine starts rotating and generating power, as wind speeds increase no electricity is generated until it reaches any limit known as the rated speed this is the point that the turbine produces its maximum rated power. We can install one small bladeless wind turbine on one bus. In a bus stand or depot suppose approximately 60 buses are remain present at night it means that 60 kW of power will generate in 1 bus stop in a day. In India Monthly power consumption of an average household is 90 unit = 90 kWh. Therefor an average Indian house needs approximately 3 kW of power per day. Using above mechanism 1 bus stand can lighten 20 houses in one day. But Buses stop on bus depo for 8 to 10 hours. It means that this mechanism can enlighten near about 50 houses in one day. It is approximately one very small village. This is all about only one bus depot. In Maharashtra have 36 district, 358 talukas having 403 Bus stands. So every day near about 403 villages will lighten. All the Buses travel every day on roads means that the battery installed on the bus for converting wind energy into electrical energy will never discharge and will provide a continuous energy supply for households. If the company that makes bladeless wind turbines increases the power efficiency of wind turbines from 1 kW to 10 kW so that wind turbines will work on the 10 km/h to 80 km/h wind speed then about 4000 villages will lighten in one day. This is only for Maharashtra state if this mechanism applies to all over the states of India then guess how many villages lighten? Using this method lots of wind energy was waste now it will utilized. Also, dependency on Thermal Power, hydropower, geothermal power etc. will decrease. Also, we will get electricity in free! Only one time investment and servicing will needed.

Existing windmill concepts are often too costly and are not well suited to the traditional local circumstances in rural villages. Of course, the performance of such programmes is calculated more often as financial productivity than in any other manner as a direct result. However, if it is not indeed sufficiently prepared and assessed about its scientific, societal, energetic and environmental ramifications, a project would unlikely achieve optimum financial success.

CONCLUSION

The main aim of this research paper was to develop new techniques for increasing wind power and subsequently to increase wind power generation in rural as well as in urban areas by installing small bladeless wind turbine on bonnet of vehicles. How? State government buses everyday runs on the road and returned to bus stop. By installing mini wind turbine which generates minimum 1 KW of power on each Bus. As we know at evening nearly all Buses will back in the bus depot. In Bus depot will be an arrangement for conversion of saved electrical energy in the batteries will be connected to the Grid which will be in the bus stop. Through this Grid the converted wind energy will be supplied to the nearby rural area of the bus stand. It will also use to electrify the bus stop. By increasing Power capacity of mini wind turbine and improving some technical needs of wind turbine, can generate large amount of wind energy and will be independent on conventional energy sources. Also, the people will get electricity very cheap. Hope that in future this method will be applicable to power the rural and well as urban areas

REFERENCES

1. Thapar V, Agnihotri G, Sharma A. Wind farm development - government incentives. In: Proceedings of the National Conference on Wind Energy Commercialisation. Bhopal, India: Maulana Azad College of Technology; 1999 Mar. p. 152-5.
2. Ministry of Non-conventional Energy Sources. Wind power program [Internet]. New Delhi: Government of India; 2003 Oct 15 [cited 2023 Oct 15]. Available from: http://www.mnes.nic.in
3. Worldwatch Institute. Wind power sets new record in 1998 fastest growing energy source [Internet]. 2003 Oct 15 [cited 2023 Oct 15]. Available from: http://www.worldwatch.org

4. Ministry of Power. Indian electricity scenario [Internet]. New Delhi: Government of India; 2003 Oct 15 [cited 2023 Oct 15]. Available from: http://powermin.nic.in
5. Ezio S, Claudio C. Exploitation of wind as an energy source to meet the world's electricity demand. Wind Eng. 1998;74:375-87.
6. Fung KT, Scheffler RL, Stolpe J. Wind energy - a utility perspective. IEEE Trans Power Appar Syst. 1981;100:1176-82.
7. Gipe P. Wind power for home and business: renewable energy for the 1990s and beyond. Post Mills, Vermont; 1995.
8. Wind Power India. State-wise wind power installed capacity in India [Internet]. 2003 Oct 15 [cited 2023 Oct 15]. Available from: http://www.windpowerindia.com
9. Power Line. Wind power - Is it for real. 1996 Dec; p. 10-1.
10. Renewable Energy World. Wind is getting stronger and is on course for the next decade. United Kingdom: James and James (Science Publishers) Ltd.; 1999 May. p. 39-47.
11. Kumar S. Wind energy - India overview. Renew Energy. 1999 Jan;16(1-4):961-4.
12. Government of India. Seventh five year plan. New Delhi; 1991.
13. Sarkar SK. Indian wind energy scenario. IREDA News. 1997;8(3).
14. Rajsekhar B, Hulle FV, Hansen JC. Indian wind energy program: performance and future directions. Energy Policy. 1999;27:669-78.
15. Jagadeesh A. Whether wind energy? IREDA News. 1998;9(2):53-7.
16. Allied Publishers Ltd. Wind Energy Resource Survey in India I, II, III, IV, V. New Delhi; 1990.
17. Burton T, Sharpe D, Jenkins N, Bossanyi E. Wind energy handbook. Chichester: John Wiley & Sons; 2001. ISBN: 0-471-48997-2.
18. Sveca J, Söder L. Wind power integration in power systems with bottleneck problems. In: IEEE Bologna Power Tech Conference; 2002 Jun.
19. Söder L. On limits for wind power generation. Int J Glob Energy Issues. 2004;21(3).