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Smart Highway Energy Generation

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ABSTRACT

Energy generation has seen significant development in recent years. This investigation describes a new technique for generating energy from the waste kinetic energy of the vehicles speed & the practical side we have been able to produce and store electrical energy using the vehicle minimum speed also without any extra cost for the land.If our concept is implementation throughout India, it not only increases the power generation to more than a few gig watts of electricity but also has other various fringe benefits including longer road life, employment generation, reduced CO2 emission in environment.

Keywords : Electrical Energy, Gig Watts, Global Wind Energy Council, MNRE, Capacity Utilization Factor

I. INTRODUCTION

In today's life the demand on electricity is much higher than that of its production. One of the biggest issues ever since men realized is that natural resources are going to be finished one day and a replacement is to be found. Apart from that fossil fuels play a major role in pollution, global warming and greenhouse gas. In order to overcome such problems incorporation of more renewable energy sources such as sunlight, wind and biomass is essential in the current century. Energy is very much essential for development of any nation. The global demand for energy is increasing in a rapid rate due to rapid rise in population and industrialization, while the energy sources are depleting in a very fast manner. Currently, more than 68 percent of electrical energy is produced by thermal power plants where fossil fuels such as coal, diesel etc. are used. As we realize that fossil fuels are going to be exhausted, we're trying to develop other means of power generation. Wind energy is the fastest growing source of clean energy Worldwide. This is partly due to the increase in price of fossil fuels. The employment of wind energy is expected to increase and increase over the next few years according to data from the Global Wind Energy Council. A major issue with the techniques is fluctuation in the source of wind. There is a near constant source of wind power on the highways due to rapidly moving vehicles. The motivation for this project is to contribute to the global trend towards clean energy in a feasible way. Most wind turbines in use today are conventional wind mills with three airfoil shaped blades arranged around a vertical axis. These turbines must be turned to face into the wind and in general require significant air velocities to operate. Another style of turbine is one where the blades are positioned vertically or transverse to the axis of rotation. These turbines will always rotate in the same direction regardless of the fluid flow.

II. CURRENT SCENARIO AND METHODS

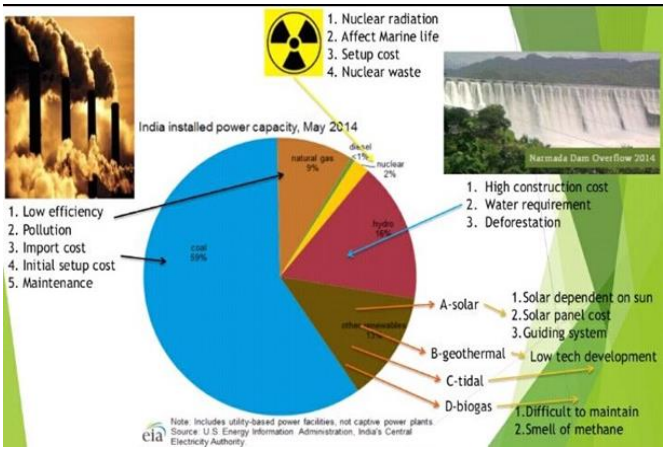
Phase I: WIND ENERGY SCENARIO IN INDIA

Wind energy program was started in India by the end of the 6th five yearly plans during 1984-85 and in the last few years it has increased significantly. The main objective of this program was the commercialization of wind energy generation, support research and development, deliver help to wind projects and to build awareness among people. Ministry of Non-Renewable Energy (MNRE) has done various amendment regarding incentives, schemes and policies for wind energy under this program.

India is relatively beginner to the wind energy sector as compared to Denmark or USA. But Indian policy support for wind energy has directed India and it ranked fourth with largest installed wind power capacity. The total installed power capacity is 26870 MW on April 30, 2016 and now India is just after China, USA and Germany. Global installed wind power capacity displays India better performance in wind energy sector. The five leading wind power countries are China, USA, Germany, Spain and India and they together represent a share of 73.5% of the global wind capacity.

As per MNRE, wind power accounts for the largest share of renewable power installed capacity i.e.70 percent (2012), other than the other renewable sources. The total installed wind power capacity in India reached 26.9 GW in April, 2016. A rapid growth in wind power installation has been measured in southern and western states in India. A need for about 350- 360 GW of total energy production capacity was reported by the Central Electricity Authority in its National Electricity Plan (2012), by the year 2022.

Only onshore wind potential has been utilized so far by India. Despite the fact that India is having long coast line over 7500 km, we have not yet appointed our offshore wind source for energy generation. The Capacity Utilization Factor (CUF) of offshore wind turbines is much higher other than the onshore turbines for the reason that of the high offshore wind speeds. Offshore Wind Steering Committee was formed by MNRE in August 2012, which passed a draft of the National Offshore Wind Energy Policy in May 2013. Energy generation using solar photovoltaic requires large area. As cost of the land is growing day by day, there is a strong requirement to use the available land as efficiently as possible. Here, we explored the potential of energy generation using the land above national road highways by constructing a roof structure. This space can contribute to the energy generation without extra cost for the land.



It also results in energy efficiency, for example, improved vehicle movement and minimum energy for air conditioning of vehicles. Additionally, it also helps in minimum road repairs and longer vehicle tire life due to the effect of sun shade.

Thus, the expenditure for wear and tear for road repairs is reduced considerably. From our modelling study, it is observed that the Ahmadabad-Rajkot highway can generate 104 MW of electricity (163 GWh of annual energy generation) and the Ahmedabad-Vadodara highway space can generate 61 MW of electricity (96 GWh of annual energy generation) for single-layer solar panels. If there are two layers of solar panels one over the other, the annual energy generation of the same highways,

Ahmadabad-Rajkot and Ahmedabad-Vadodara, can be increased to 229 GWh and 140 GWh.

Phase II: Wind Mill Dimension

Base Dimension

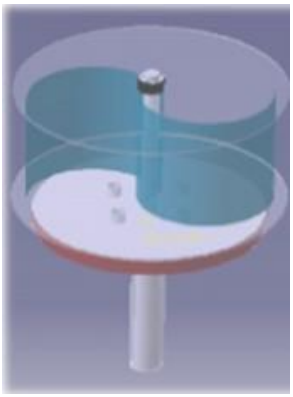
Height	:	14inches
Width	:	11inches

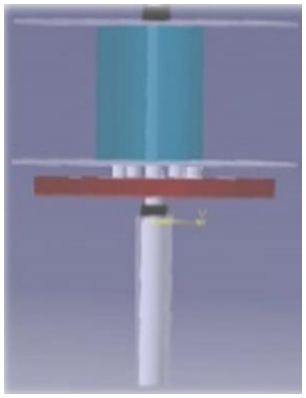
Blade Dimensions

Height	:	120cm
Diameter	:	60cm
Thickness	:	2mm
Angle b/w blades	:	180^0

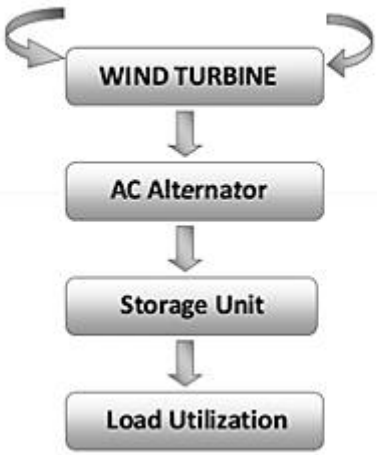
Shaft Dimensions

Diameter	:	2.54cm
Length	:	18inches





Block Diagram for Wind Power Generation



Phase III : Solar Panel Dimension

Size- 1.956m x 0.992m x 0.04m

Per Panel Energy Generate Capacity 250watt

Fig. 1 Solar panel on highway

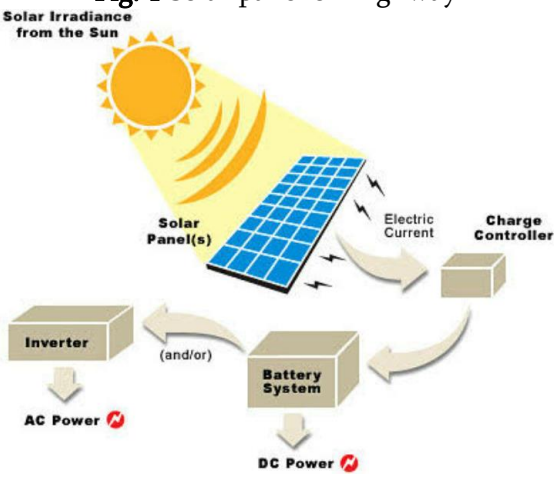


Fig 2. Diagram of solar panel

Phase IV: Calculation

Distance between two wind turbines = 3m

Distance between two solar panel pole = 3m

For 2 km study area require numbers of solar panels and wind turbines

For solar panel

Numbers of solar panels pole = 2000/ 3

= 666.66 ~667

Two panel in one pole

Number of solar panels are required for study area

= 667*4

= 2668 nos.

One solar panel generate electricity = 250w

Energy generate per day = 2668*250

= 667000

= 667kw

For wind turbine

Numbers of wind turbines = 2000/3
= 667
Two-line place wind turbine = 667*2
= 1334 nos.
One wind turbine generates electricity = 41.4w
Energy generate per day = 1334*41.4
= 55227.6
= 55kw

III. CONCLUSION

Thus, at minimum wind speed of 12.77 m/s i.e.,46 km/hr. the turbine is rotating at 342rpm which accounts for 102.4 watts according to the equation. Hence one can obtain an output of 500watts to 1kilowatts of power with an average wind speed of 20 to 30m/s. Our work and the results obtained so far are very encouraging and reinforce the conviction that wind energy conversion systems are practical and potentially very contributive to the production of clean renewable electricity from the wind even under less than ideal sitting conditions in most cities, highways are the faster routes, so this energy can be efficiently used for many purposes.

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