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Energy Generation by Advanced Various Renewable Technology

Ashish R Kondekar[1], Sahil S Khawshi[2], Shubham P Wankhade[3], Prajwal R Jaiswal[4], Dushant S Satdive[5], Dnyaneshwar B Shelar[6]
Assistant Professor, Department of Civil Engineering[1]
Students, Department of Civil Engineering[2-6]
Sinhgad Institute of Technology and Science, Narhe, Pune, Maharashtra, India

Abstract: *Aim of this project is to production of electric energy using variable renewable technology, which is to be provided for the daily purpose. About 50% of the electricity used in India is generated by thermal power plants, which release a lot of toxic pollutants into the air and have a lot of negative environmental effects. Due to the high demand for electricity and the rising costs of coal and fuels, it has recently been noticed that there is an electricity crisis or shortage in India and other nations following the pandemic era. Since India is a nation that is constantly developing, there is a rising need for electricity. After all, coal is a type of fossil fuel whose supply will eventually run out, necessitating a shift to renewable technology.Over the road dividers, a vertical-axis wind turbine (VAWT) is being installed. As the car moves along the road, wind turbulence becomes trapped in the VAWT's blades, causing them to rotate and produce electricity. Additionally, we mount the solar panel over the VAWT, which generates electricity as well. When we apply this concept, a small hydroelectric power plant is built if there are nearby water bodies, such as ponds, rivers, dams, and water treatment facilities. A large amount of electricity can be generated by combining three renewable energy sources. It helps you reduce pollution in the atmosphere, earn carbon credits, and make energy generation economical. In our study, we found that about 0.5–1 KW of electricity can be generated in an hour, depending on the availability of wind turbulence and light intensity. This technology is capable of supplying electricity to one home.*

Keywords: Renewable Technology, Vertical Axis Turbine, Renewable Integration, Renewable Energy, Hydro-electricity, Solar Energy, Economical Energy, etc.

I. INTRODUCTION

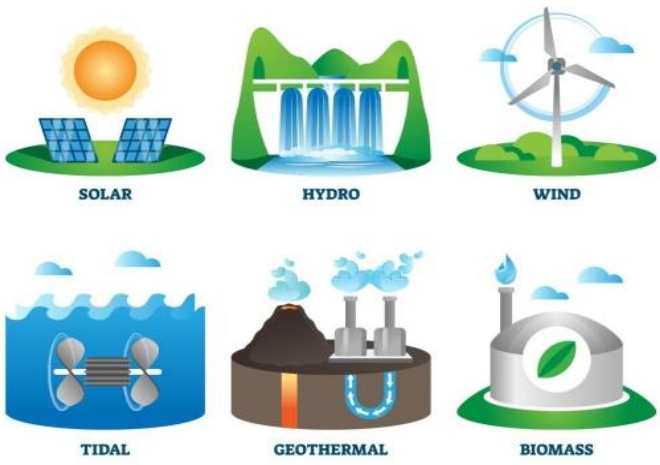

Image No. 1 Types of Renewable Energy (WB1)

Renewable energy is the form of energy that derives from natural resources in the form of solar, wind, tidal, hydro, and other energies. It is an endless form of energy, which is never-ending. The use of this type of energy can make a

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revolution in the world because there is no pollution emission for the use of renewable energy. Renewable energy sources are plentiful and all around us. Sources of energy such as Fossil fuel- coal, oil, and gases are all non-renewable sources that take millions of years for their formation. When fossil fuels are burned as sources of energy, it creates harmful greenhouse gases, which is after responsible for global warming and others. On other hand, there is no emission of greenhouse gases from renewable sources. So rather than using non-renewable sources, renewable sources have been used as good sources of energy that protect and maintain our environment.

Now, A days we are using now-renewable sources for different purposes, which leads to global warming. Ongoing studies and research's said that due continuous growth of the population in India traffic on Indian roads is also increased, which creates heavy wind turbulence on Indian roads. Wind turbulence can be effectively used for the generation of electric energy using a vertical axis wind turbine, which can rotate by wind turbulence and can convert mechanical energy into electrical energy. The amount of energy generation depends on the momentum of the vehicle, speedy winds are entrapped into the wings of the vertical axis wind turbine (VAWT) resulting in the rotation of wings which means the turbine is rotating. As the momentum of the vehicles is more then there is more energy generation, on either hand, if the momentum is less then there is low energy generation.

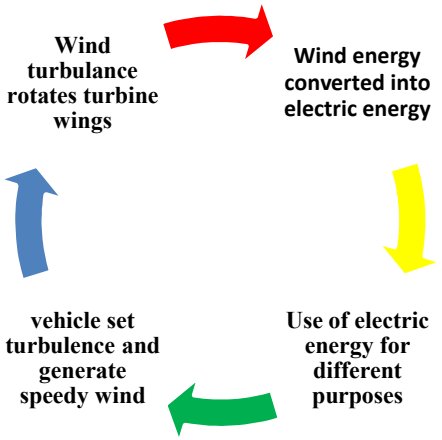

Image No. 2 Energy generation by VAWT (WB2)

Image No. 3 Wind turbulence generated by vehicles (WB3)

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A turbine, or a series of turbines, can produce a large quantity of electricity if they are positioned correctly. The amount that is generated may vary depending on the turbine's location, the speed of the vehicle, the volume that may be expanded, etc. This concept seems a little unusual since, up until now, we've heard that cars require energy in the form of fuel, compressed natural gas, and diesel, but in this case, we're talking about energy production rather than energy consumption. We are going to use different types of renewable energy for the generation of electric energy. The plan is that, to reduce the emission of pollutants from the coal-based electric power plant, variable renewable energy will be used as a source of energy.

II. METHODOLOGY

We select the site as we need sufficient amount of air flow rate for revolving of VAWT for generating electrical energy as well as it was ensured that there is a water body so, the hydroelectricity plant has been setted up.As a result, we consider the national highway (NH 753-A) close to the hamlet of Jalna in Chandanzira.Electricity generation by various renewable sources

2.1 Wind energy

On the highway divider, a vertical axis wind turbine (VAWT) was initially placed. When wind turbulence produced by a moving vehicle is confined in the VAWT's blades, it produces electricity. Wind turbulence is necessary for the production of electricity. In order to increase the ampere, we connected three turbines of two sets in series to the 12 volt DC motor that we utilised in our model. A 12 volt output can be produced by two turbine sets at a wind speed of 10 m/s.

Image No. 4 Wind turbulence generated by vehicles (WB4)

In previous studies it was found that wind energy can be harnessed by wind turbulence created by vehicles in the form of electricity given by:-

Available wind power (Pwind)

Electricity output = $0.5 \times \rho \times v^3 \times A$

Where,

A is the sweep area

ρis the density of air

V is the velocity of wind turbulence

P wind the available wind power

Area = D x H

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Where,
D is the diameter(0.6m)
H is the turbine height(1.5m)
Electricity output = 0.5 x 1.225 x 10^3 x 0.9 = 551.25 Watts
Efficiency of turbine (u)
= (1-Km) x (1-Ke) x (1-Ke,t) x (1-Kt) x (1-Kw) x Cp
= (1-35/100) x (1-1.5/100) x (1-7/100) x (1-2.5/100) x (1-8/100) x (35/100)
= 0.186
Electricity output = 0.186 x 551.25 = 102.53 ≈ 100 Watt

2.2 Solar energy

75-watt solar panels have been put on the top of the VAWT and are connected in series, just like the VAWT connections. Two sets of 70 × 70 miniature solar panels are used in our model, with a maximum output of 18 volts.

2.3 Hydro energy

In the place where we are implementing this idea, readily available water bodies such as rivers, dams, water treatment plants, and others are found, and a small hydroelectric power plant has been installed with a capacity of 200 watts. In our model we made the small water treatment plant and while treating water flow of water has been utilized at different points for electricity generation, for this purpose 12Volts DC motor has been used.
Electricity output of hydropower plant is given by:-

$$P = \eta \times \rho \times g \times h \times Q$$

Where,
η is efficiency factor
ρ is density of water
g is gravitational acceleration
Q is discharge
V is velocity
A is area of section
h is height of fall

2.4 Model Making

A model of size 1 m by 1.2 m has been made in which electricity has been generated by three types of renewable sources, which are wind, solar, and hydro. In this model, a small vertical-axis wind turbine (VAWT) has been made and installed on the divider of the road. Turbulence was created artificially, resulting in the generation of electricity. Additionally, a 70x70 solar panel that also produces power has been installed over the VAWT. In addition to this, a small water treatment facility is created that produces electricity while filtering water.

Photo No. 1 Prototype Model

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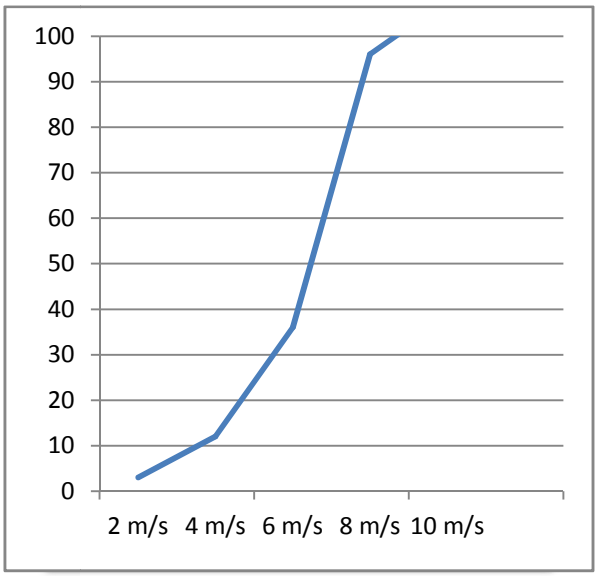
III. RESULTS AND DISCUSSION

3.1 Electricity Output (Wind) at different Wind Speed

Electricity output is depends on the wind speed as the wind speed is more the electricity generation is also more. The above table show that with increase in wind turbulence at road, electricity out is also increased.

Table No.1 Electricity output (Wind) at different wind speed

Sr. No.	Wind speed (m/s)	Electricity output(watts)
1	1	0
2	2	1-4
3	3	4-8
4	4	9-12
5	5	18-22
6	6	31-36
7	7	49-52
8	8	80-86
9	9	100-104
10	10	108-112



Graph No. 1 Line graph between the wind turbulence and electricity output

3.2 Electricity output by various renewable sources

Energy output by various renewable sources are different based on their design and renewable source factor. The amount of electricity produced by different types of renewable sources is mentioned above.

Table No. 2 Electricity output by various sources

Sr. No.	Type of renewable source	Electricity output by prototype model	Electricity output by original unit
1	VAWT	12V(1.5A)	12V (8A)
2	Solar	18V (2.5A)	12V (3.75A)
3	Hydro	4V(1.5A)	24V(8A)

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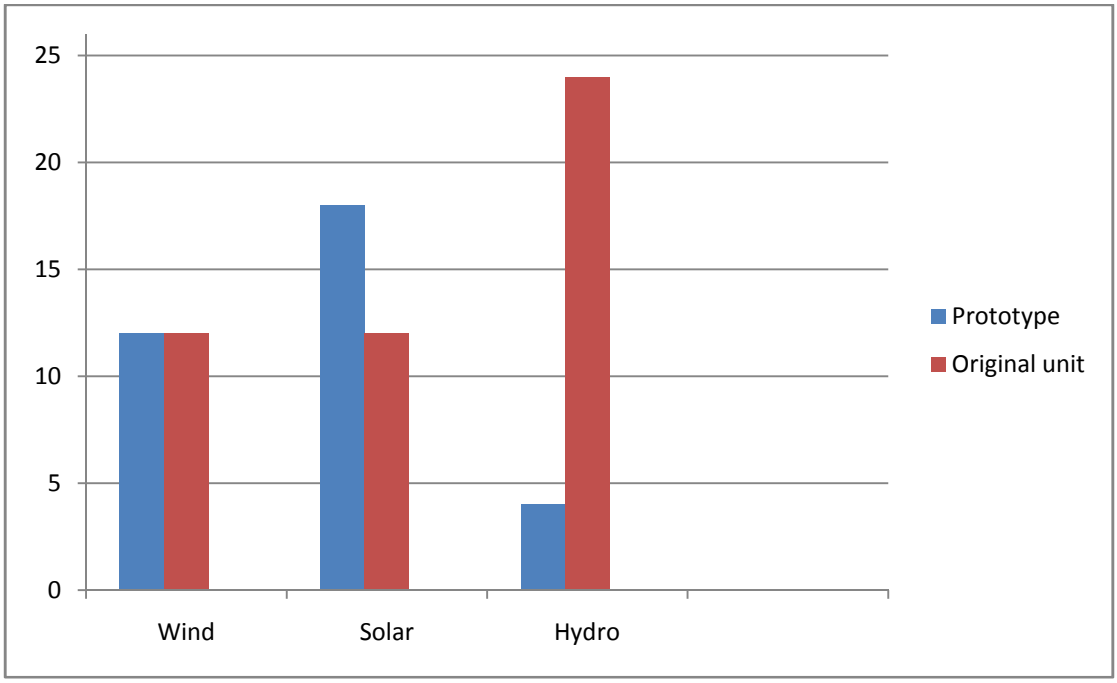

Graph No. 2 Electricity output by various renewable sources

IV. CONCLUSION

For their ability to provide electricity, three renewable sources have been developed, examined, and tested.

It was discovered that producing electricity from renewable sources is far more cost-effective than doing so with conventional power plants.

Firstly, we are proposing this plan to the small village of Jalna (Chandanzira), with a population of 9710, so the requirement for electricity in Chandanzira has been easily fulfilled by this ART technology

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