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Implementation of Wind Power Generator on Cellular Base Station for Emergency Backup

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ABSTRACT: In this paper we propose a new concept of supplying an alternative power source for the mobile base station in order to supply enormous amount of diesel to the generators. Hence hereby we approach a project to replace the diesel generators by implementing the aerofoil power generators on the mobile base station. This consumes renewable energy of wind from nature and supplies necessary amount of power to operate the mobile base station, depending on the power need for the mobile base station during the emergency period. This project also helps in decreasing the effect of pollution such as carbon emission due to the usage of diesel fuels into the atmosphere. Hence this project helps in improving the profit by avoiding the expensive amount that are spend for the huge amount of diesel purchasing from the market. This paper will reduce the demand of fuel to the next generation.

KEYWORDS: Wind blades, dc generator, battery, boost converter.

I.INTRODUCTION

Nowadays mobile phones became a part of each and every people's life in the field of communication. The mobile base station operates mainly with the help of power supplied from electricity board and diesel generators. Hence, during any emergency period of power failure from electricity board, the base station is supplied with the help of diesel generators. The diesel generators consume more amount of fuel to operate during the period of emergency; it causes a heavy loss of money to the telecommunication companies for each and every year. Thereby installing the wind powered generators on all mobile base station the respected company can achieve a profit of nearly 50% of money. Here, we use vertical axis wind turbine for the purpose of continuous power generation. As there is a constant wind pressure above the level (150feet) of the tower rated amount of speed is achieved by the dc generator in an efficient manner. But in horizontal axis wind turbine the required amount of wind pressure is high and it is not achievable throughout the day.

II. BLOCK DIAGRAM

When the wind blows the turbine blades start to rotate. As the turbine and the generator is connected by the generator, the generator also starts the rotation with 100 revolution per minute. The generator will produce 12V, 3A. The power produce by the generator is stored in the battery bank. Then the power stored in the battery is given to the DC-DC Boost Converter in order to step-up the voltage and current to 220V, 6A. The output of the boost converter is given to the DC power distribution unit and to the load in the connecting towers.

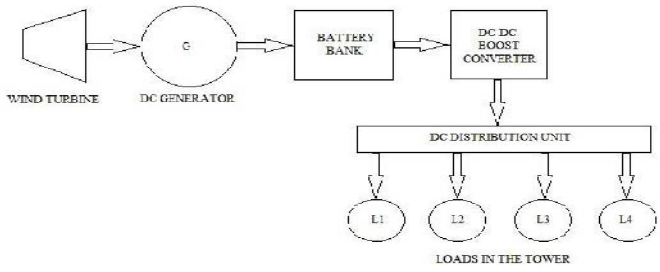

Fig.1 Block diagram of proposed method

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III. PROJECT DESCRIPTION

In this project we uses four number of blades for wind turbine and it is connected to the shaft of a large pulley wheel on the top of tower. A small sized pulley wheel is connected to the generator's shaft. These two pulleys are connected using a leather belt for free rotation. When a larger pulley rotates 1 revolution the smaller pulley will obtain 12 revolution per minute. Now the generator starts to rotate in its rated speed (100rpm) and the output power of (12v) is achieved and stored in battery bank. Through the power converters the required amount of power is supplied to the equipment's is by means of a dc distribution unit. A dc generator along with the prime mover of wind turbine is fixed on the top of the tower. The generator power of dc is transferred to the battery bank which is placed on the bottom of the tower which stores the power throughout the day. During the period of any emergency like power shut down of the EB supply to the tower equipments, the energy stored in the battery is discharged through the dc to dc boost converters to increase the level of the output voltage and output current for the required level to supply the various loads connected in the platform of the tower which are the major requirements for the successful operation of the telecommunication system by means of a dc power distribution unit.

IV. ECONOMICAL DRAWBACK OF EXISTING SYSTEM

The mobile base station operates mainly with the help of electrically supplied from electricity board and diesel generators. Hence during any emergency period of power supply failure from electricity board, the base station is supplied with the help of diesel generators. The diesel generators consume more amount of fuel to be operated during the period of emergency. It causes heavy loss of money for the Telecommunication companies for each and every year. The details of the diesel generated and cost spend by the mobile towers. Diesel consumed per day = 3 liters

Diesel consumed per month	= 10 liters
Diesel consumed per year	= 1200 liters
Cost of diesel per liter	= Rs.47
Cost of diesel per day	= Rs.141
Cost of diesel per month	= Rs.4, 230
Cost of diesel per year	= Rs.50, 760

So, these are the problems occur in existing system. In order to reduce the usage of diesel, reduce the carbon emission and the cost spend by the mobile towers we use renewable energy.

V. SAVING POTENTIAL FROM PROPOSED SYSTEM

For replacing the usage of diesel generators we operates with the help of renewable energy. This project also helps in decreasing the effect of pollution such as carbon emission due to the usage of diesel fuels into the atmosphere. Hence this project helps in improving the profit by avoiding the expensive amount that are spend for the huge amount of diesel purchasing from the market. The diesel generators are operated with the help of huge amount of fuel for supplying power to the base stations. Hence it causes a huge amount of financial losses for the telecommunication companies which leads to about 300 crores per year. And also the usage of liquid fuels in the market is rapidly increased, which reduces the demand of fuels to the next generations. We must reduce the usage of liquid fuels. The details of power consumed by the mobile towers and the cost is given below,

Power consumed in one hour	= 3 units
Power consumed in 3 hours per day	= 9 units
Power consumed per month	= 270 units
Power consumed per year	= 3240 units
Cost of one unit (from 0 to 100W)	= Rs.5
Cost of 1 unit (above 100)	= Rs.8.05

These are the power consumed in the mobile towers and the cost of the units. So, by using wind energy we can reduce carbon emission and also the cost spending for the diesel.

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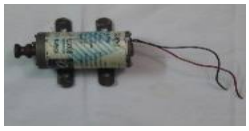
VI. HARDWARE COMPONENTS

Table 1: Components used in proposed system

S.NO.	Components	Ratings	Image
1.	Wind Turbine	L=540mm, W=160mm, T=0.4mm	
2.	Pulley	D=0.5mm	
3.	DC Generator	100rpm, 12V	
4.	Battery	12V, 3AH	
5.	DC-DC Boost converter	V_i=12V, I_i=3A, V_o=220V, I_o=7.5A	
6.	Load	1650W	

The above table shows the specifications of the mechanical and electrical components used in this project.

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VII. HARDWARE RESULTS

Table 2: Comparison of input and output voltage

Time(ms)	Vin(v)	Vout(v)
0	0	0
1	12	220
2	12	220
3	12	220
4	12	220
5	12	220
6	12	220
7	12	220
8	12	220
9	12	220
10	12	220

The above table shows the input and output voltage with respect to time. The input represented in table shows the amount of voltage generated by the DC Generator and the output of 220V is obtained from the boost converter to satisfy the load.

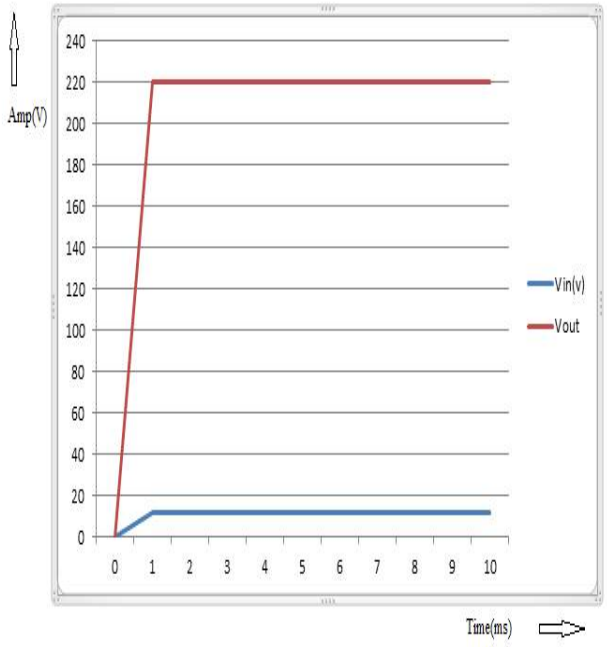

Fig. 2 Graphical representation of Vout and Vin

Fig 2 shows the graphical representation of input and output voltage with respect to time. The input to the boost converter is a constant 12V obtained from the generator as the rated capacity of it is 12V and the output obtained from the boost converter is 220V which supplies power to the load.

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Table 3: Comparison of input and output current

Time(ms)	I_{in}(A)	I_{out}(A)
0	0	0
1	3	7.5
2	3	7.5
3	3	7.5
4	3	7.5
5	3	7.5
6	3	7.5
7	3	7.5
8	3	7.5
9	3	7.5
10	3	7.5

The above table shows the input and output current with respect to time. As our boost converter is capable of withstanding 7.5A, the current may vary with respect to load connected to the circuit.

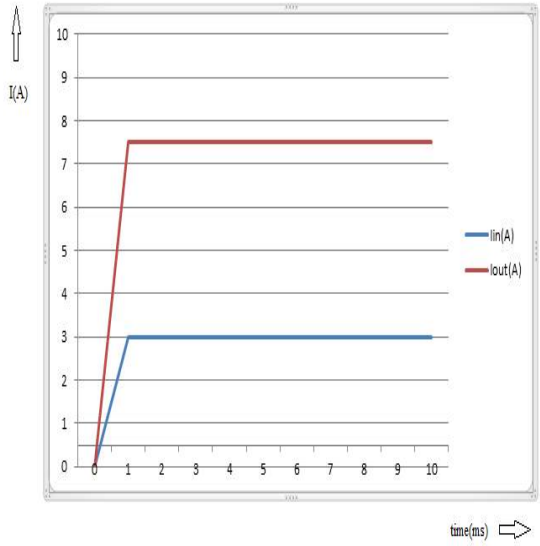

Fig. 3 Graphical representation of Iin and Iout

Fig.3 shows the graphical representation of input and output current with respect to time in milliseconds at no load condition we obtain a constant value, this may vary when the ratings of load changes output current also changes respectively.

VIII. CONCLUSION

Here we had implemented the new concept of aerofoil power generators on cellular base station for the purpose of reducing the demand of fuel in future and also to avoid the emission of carbon into atmosphere. From this project we have also introduced a new path to the usage of renewable energy in power generation for mobile towers.

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