

the range of the traction battery pack by either putting generated energy as a result of the vehicle motion back into the battery or using the generated energy to power other energy intensive devices in the vehicle thus shedding load from the traction battery pack and ultimately improving the range of the BEV.

The general equation for the calculation of the energy that can be generated by a wind turbine is given as:

$$\text{Wind Turbine Power} = \frac{1}{2} * A * V^3 * \rho * C_p(\lambda, \beta) \text{ [Watts]}$$

Where;

A is the turbine blade swept area

V is the wind velocity

ρ is the air density

λ is the tip speed ratio (TSR)

β is the pitch angle

C_p is the power coefficient of the turbine (a constant)

For the purpose of simplicity, assuming a unity power coefficient, this implies that the power generated will be only a function of the swept area of the turbine, the wind velocity which is also the vehicle speed, and the air density. Thus, for a vehicle traveling at the speed of 90km/hr., the following power can be potentially generated from the turbine.

$$V = 90\text{km/hr} \equiv 25\text{m/s at } R = 0.25\text{m}$$

$$\text{Power} = \frac{1}{2} * 0.2 * 25^3 * 1.225 = 1914 \text{ Watts}$$

This implies that for a period of 9hours the potential energy the vehicle will be able to generate is going to be about 45.94kWhr. while traveling at this speed.

V. CONCLUSIONS

The average daily commute is estimated to be around 66km/day. This put the average energy usage by the BEV at 13.86kWhr/day. From the estimated power output from the renewable energy source and the available energy for a 9hours period, it can be seen that the energy need of the BEV can easily be met from the renewable energy sources proposed in this paper.

However, a lot of research needs to be carried out on the potential of integrating these renewable energy sources into the BEVs for the alleviation of the range anxiety associated with the low adoption of electric vehicle technology due to the low energy density of the current lithium-ion battery technologies. The potentials in the integration of renewable energy sources in electric vehicle also helps in the reduction of energy cost that may be associated with the use of electric vehicle.

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