# Re-examine of Electric Vehicle and its Components

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**Abstract**

*This Paper provides a brief summary of current studies in the field of electric vehicles. The primary function of electric vehicles is discussed in this paper. The battery, motor, charger, steering, and brakes are the main parts. The study finally demonstrates the fundamental ideas for working electric automobiles. The primary subject of this article is electric buses. This paper describes how the solar Power can be utilised to power electric buses.*

***Keywords*** *– Electric vehicle, motor, braking system, battery systems, hybrid system*

## I. INTRODUCTION

Based on an electromechanical mechanism, an electrical vehicle (EV). No, torque development uses any internal combustion engine. Electric power serves as the energy source for all power that is consumed. Electricity stored in the battery serves as the electric vehicle's primary power source. The benefit of having an electric motor with a highly efficient power conversion system. There are many circumstances in the world today where we cannot tolerate the environment, which is why we need to cut carbon emissions. Because so much petroleum is utilised in the automotive industry, there are significant environmental carbon emissions. Electric buses can run on solar panels in addition to electricity from the power grid. There is a battery present that may be utilised after being charged. To reduce their carbon footprint, every automaker must create at least one hybrid electric vehicle type. By 2030, only France and Japan will continue to produce gasoline-powered cars. This is a step forward in the direction of reducing pollution and advancing electrical vehicles for a clean environment. The several EV types are displayed in the table.

| Types of EVs | Hybrid EVs | Battery EVs | Fuel Cell EVs | Solar Cell |
|---|---|---|---|---|
| Energy System | Battery<br>Ultra-Capacitor<br>ICE Generator Unit | Battery<br>Ultra-Capacitor | Fuel Cell | Solar Cell |
| Propulsion | Electric motor drive<br>Internal combustion engines | Electric motor drives | Electric motor drives | Electric motor drives |
| Major issues | Managing multiple energy sources | Battery and battery management | Fuel cell cost<br>Fuel processor | Solar Cell cost |

**Table 1:Types of EV's**

A bus that runs on electricity is referred to as an electric vehicle. The electric bus can be run using a battery storage system or direct electricity from outside sources. Compared to buses that run on fuel, it has cheaper operational costs. Compared to diesel or petrol automobiles, it costs roughly two to three times less to power a vehicle. In comparison to the price of gas or liquid fuel, electricity is more stable. There are several possibilities for transportation, but buses are most frequently used, which has an immediate negative impact on the environment because they produce carbon. Electric buses allow us to cut back on both carbon emissions and the usage of finite energy sources like gasoline and diesel.

## II. MAIN COMPONENTS

Spark ignited, traction system, thermal cooling system, DC/DC converter, power electronics control, battery, motor, storage, braking system, and other major components are some of the ones found in electric cars. The

key elements of the electric buses are depicted in figure 1. The figure illustrates a variety of pieces with various functions.

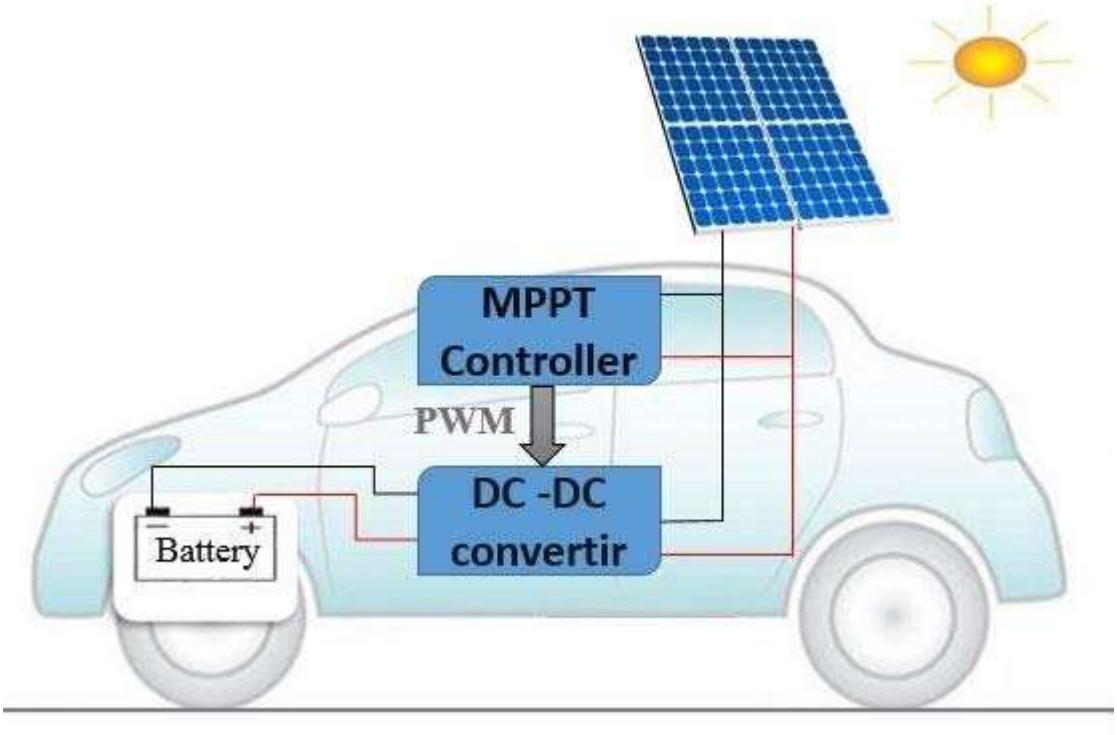



**Figure 1: displays the initial electric vehicle in 1943-35 (America)**

**DC to DC converter:** When electrical isolation is required, a full-bridge DC/DC converter is the converter that is usually used for fuel-cell power conditioning. Due to low switch voltage and current, full bridge DC to DC converters are excellent for high-power electrical transmission.

**Electric Motor Generator:** The integrated motor-generator set is an electric vehicle drive system used in plug-in hybrid vehicles that provides electric propulsion for the vehicle when acting as a motor. When acting as a generator, it transforms mechanical braking energy into electrical energy, creating a regenerative braking system.

**Regenerative Braking system:** Regenerative braking is the process of converting an electric vehicle's kinetic energy into chemical energy that is then stored in the electric battery system and can be utilised to power the vehicle.

**Recharge Station:** Buses can be charged in these stations using an electrical charging mechanism that transforms electrical supply power into battery storage power.

**Battery Packs:** These battery packs are set up in the area, and they will power the motor. The recharge station is capable of charging batteries. Battery capacity is for a 120 km journey, and charging takes around 1.5 hours.

**Solar Cell:** Solar cells can be used in an emergency for electric busses. When there is charging not available cell can work for small distances. It can be mounted on the top of the buses and it will charge through the solar system. There is a lot of space on the bus which can be utilized. The solar cell efficiency formula is shown below.

$$\text{Efficiency}\ (\%) = \frac{Pmax}{(Area * 1000\ W/m\text{^}2)} * 100 \qquad (1)$$

Pmax = Max cell power
Area = Cell area

**III. The Motor**

There are a number of motors available for electric vehicles: DC motors, Induction motors, DC brushless motors, Permanent magnetic synchronous motors and Switched reluctance motors.

1. **DC motors:** DC motor work on the DC supply and Fleming's left-hand rule is applicable for the rotation of that. It has been used in motor control for a long time. In this electromechanical conversion is transferred to the rotor through stationary brushes. However, it is suitable for electrical vehicle low power applications. It has found that applications in electric wheel-chair, transporter and micro-car, and buses. Today, various places and machines are using DC motors. The power level is less than 5kW. In the electric busses, we can use this motor and it gives good efficiency. Torque development in DC motor can be shown in the below equation.

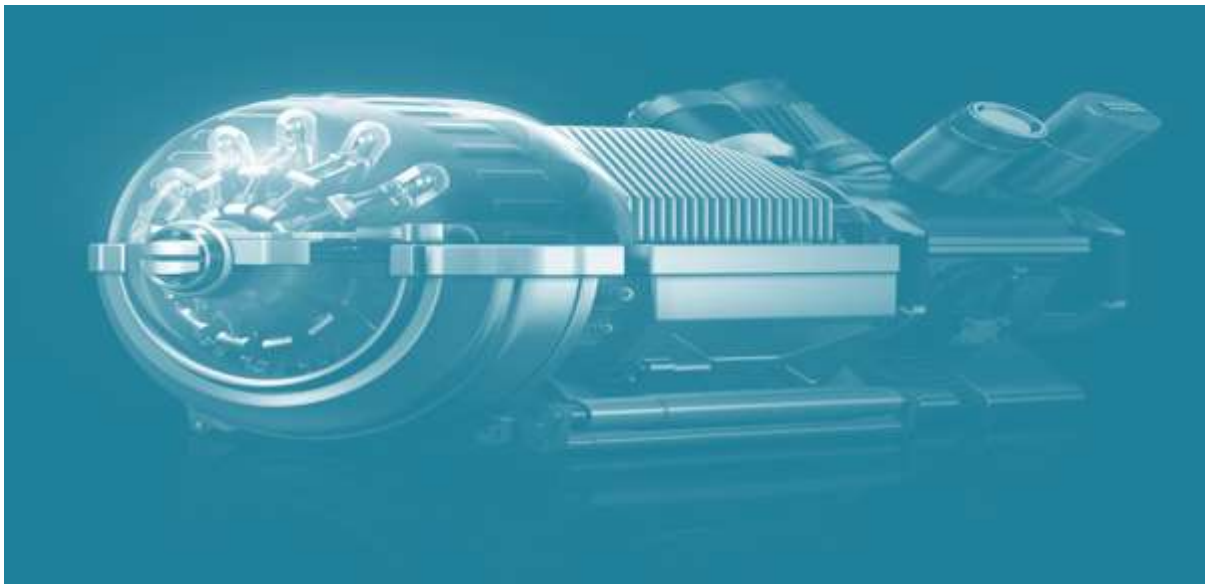
$$T = 9.55 * \frac{Output}{N} \text{ Nm} \qquad (2)$$

N = speed of motor in r.p.m.

2. **Induction motor:** It's a very popular Alternate Current motor. It also has a huge market share in controlled speed drive applications such as AC, elevator, or escalator. There are various higher power electric vehicles, for more than 10kW.

3. **DC brushless motor:** The conventional Direct Current motor is poor in construction because of the low power winding of the field is stationary while the main high-power copper winding rotates. The Direct Current brushless motor is turned inside out. The high-power copper winding is put on the stationary side of the motor and the field excitation is on the rotor using a permanent magnet rotor. The motor has a longer lifetime than the DC motor but is a few times more expensive.

4. **Permanent magnetic synchronous motor:** In this type of motor stator is similar to that of an induction type motor. The rotor is mounted with permanent electromagnets. It is similar to an induction type motor but the air-gap filed is produced by a permanent electromagnet which is placed in it. This motor is also suitable for electric and hybrid vehicles.



5. **Switched reluctance motor:** This motor specification is also good for the use of electric and hybrid vehicles.

**IV. Conclusion:**

This paper discusses the basics of electric vehicles and the development of electric vehicles, especially electric buses. The electric vehicle is very useful for the reduction of carbon emission and the change of climate. Consumption of petroleum is also reduced due to the use of that. The paper first describes the main components of electric vehicles, it then extends the description of the components with uses.

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