Why Electric Cars

- Electric cars create less pollution
- Most suitable option for hybrid vehicles.
- Most suitable to be used with fuel cells.
What is an Electric Car

• An electric car is a car powered by an electric motor.

• From the outside, looks nearly same.

• It’s silent.
Under the hood, there are a lot of differences between gasoline and electric cars:

- The gasoline engine is replaced by an electric motor.
- The electric motor is connected to a controller.
- The controller gets its power from an array of rechargeable batteries.
An Electric Car

- The gasoline engine, catalytic converter, tailpipe and gas tank, were all removed.
- The clutch assembly was removed.
- A new AC electric motor was bolted to the transmission with an adapter plate.
- An electric controller was added to control the AC motor.
Inside an Electric Car
The motor's controller

- A DC Controller can change the voltage available to the motor from 0-96 Volts depending upon the accelerator position.
AC motor for electric car
The motor's controller

- An AC controller hooks to an AC motor. Using six sets of power transistors, the controller takes in 300 volts DC and produces 240 volts AC, 3-phase. The controller additionally provides a charging system for the batteries, and a DC-to-DC converter to recharge the 12-volt accessory battery.
The motor's controller

- The controller reads the setting of the accelerator pedal from the potentiometers and regulates the power accordingly. If you have the accelerator pedal 25 percent of the way down, the controller pulses the power so it is on 25 percent of the time and off 75 percent of the time.

- Most controllers pulse the power (switching frequency) more than 15,000 times per second, in order to keep the pulsation outside the range of human hearing, the controller and motor are silent to human ears.
Electric-car Motors

- If the motor is a **DC motor**, then it may run on anything from 96 to 192 volts. Many of the DC motors used in electric cars come from the electric forklift industry.

- If it is an **AC motor**, then it probably is a three-phase AC motor running at 240 volts AC with a 300 volt battery pack.
DC Motor

- DC installations tend to be simpler and less expensive. A typical motor will be in the 20,000-watt to 30,000-watt range. A typical controller will be in the 40,000-watt to 60,000-watt range (for example, a 96-volt controller will deliver a maximum of 400 or 600 amps).
AC Motor

- AC installations allow the use of almost any industrial three-phase AC motor, and that can make finding a motor with a specific size, shape or power rating easier. AC motors and controllers often have a regenerative feature. During braking, the motor turns into a generator and delivers power back to the batteries.
Batteries problems

- Right now, the weak link in any electric car is the batteries.
- Problems with current lead-acid battery technology:
  - They are heavy (a typical lead-acid battery pack weighs 1,000 pounds or more).
  - They are bulky (the car we are examining here has 50 lead-acid batteries, each measuring roughly 6" x 8" by 6").
Battery problems

- They have a limited capacity (a typical lead-acid battery pack might hold 12 to 15 kilowatt-hours of electricity, giving a car a range of only 50 miles or so).
- They are slow to charge (typical recharge times for a lead-acid pack range between four to 10 hours for full charge, depending on the battery technology and the charger).
Battery problems

- They have a short life (three to four years, perhaps 200 full charge/discharge cycles).
- They are expensive.
Solution to Battery Problems

- You can replace lead-acid batteries with NiMH (Nickel-metal hydride) batteries.
- The range of the car will double and the batteries will last 10 years (thousands of charge/discharge cycles), but the cost of the batteries today is 10 to 15 times greater than lead-acid.
FUEL CELLS

It is very likely that the car of the future will be an electric car that gets its electricity from a fuel cell. There is still a lot of research and development that will have to occur, however, before inexpensive, reliable fuel cells can power automobiles.

Compared to batteries, fuel cells will be smaller, much lighter and instantly rechargeable and environmental friendly.
Charging an Electric Car

- Any electric car that uses batteries needs a **charging system** to recharge the batteries. The charging system has two goals:
  - To pump electricity into the batteries as quickly as the batteries will allow
  - To monitor the batteries and avoid damaging them during the charging process
In this car, the charger is built into the controller. In most electric cars, the charger is a separate box located under the hood, or could even be a free-standing unit that is separate from the car.
A charging station mounted to the wall of the house
A charging system in the trunk of the car
Coupling Alternatives for chargers

- Conductive coupling, which uses the common plug. With this connection, the vehicle is plugged into the appropriate outlet (i.e., 110 or 220 volts) to begin charging. The charger can be placed in the car (onboard) or out of the car (offboard).

- The second type of coupling is called inductive coupling. Power is transferred by induction, which is a magnetic coupling between the windings of two separate coils, one in the paddle, the other mounted in the vehicle.
ELECTRIC CAR
INDIAN EXPERIENCE
Mahindra Reva

- Revai is a pioneer of EV (electric vehicle) technologies and one of the first companies to introduce electric vehicles worldwide. Founded in 1994 as REVAi Electric Car Company, a joint venture between the Maini Group of Bangalore and AEV LLC of USA, the company was acquired in May 2010 by Mahindra Group of India.
Mahindra Reva

- The REVAi electric vehicle was launched in Bangalore in 2001 and in London in 2004. In September 2009 at the Frankfurt Auto Show the company unveiled two new cars, the 4 seat REVAi NXR and the 2 seat REVAi NXG.
- Today Reva has one of the largest deployed fleets of electric cars in the global market.
About REVAi

- The REVAi uses electricity as fuel. It doesn’t use petrol/diesel. The REVAi has a battery and a motor. On charging the car - power is stored in the battery. Subsequently the motor drives power from battery to run the car.
- The REVAi does 80 km when fully charged.
Charging the REVAi

- The car is as easy to charge as a mobile phone. It has an on-board charger along with a charge cable and can be charged anywhere, at home or at work, by simply plugging in to a 230 Volt, 15-Ampere socket. A full charge is completed in 8 hours and 80% charging takes place in two and a half hours.

http://www.revaindia.com/index.html
TATA Electric car

- Tata Motors, which plans to deliver its first electric car by the end of this fiscal, has turned to its tried and tested Indica platform for the vehicle. According to industry sources, the company is currently working on five prototypes of electric vehicles on the Indica platform.
• Tesla Roadster
THANK YOU