Charging of Electric Vehicles Using All-Green Energy

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1- Abstract

The purpose of this project is to charge the electric vehicles using all green energy. The main point in this project is to control the charging process based on the charging algorithm we designed. First of all, we implemented the project in software, and then moved to hardware. In software, the results will be for a 150-spot parking lot, 100 of them have a charger for EVs. In hardware, we applied the same but with using only 3 batteries (assuming every battery is a different car) with three different cases.

2- Why is the Electric Vehicle important?

✓ Using the electric vehicles is that they just produce one-half or one-third the CO-2 that produced from the internal combustion vehicles.

✓ The lower cost of the fuel for the electric vehicles, it can reduce the fuel cost by 20-40% compared to the internal combustion vehicles.

✓ Its efficiency is greater than internal combustion vehicles, car with an internal combustion engine get an average of 25% efficiency, whereas electric vehicle have an average of 80% efficiency.

3- Algorithm used

The aim of our project is to design an affective charging strategy for charging electric vehicles for the company staff using all green energy.
Factors that will affect our charging strategy
✓ Electric vehicles information: Nissan Leaf, Ford Focus, and Chevy volt
✓ Staff types : three hours or low staff, and more than three hours staff
✓ Charging amount at arriving: level 1(0-29%),level 2(30-59%),and level 3(60-89%)
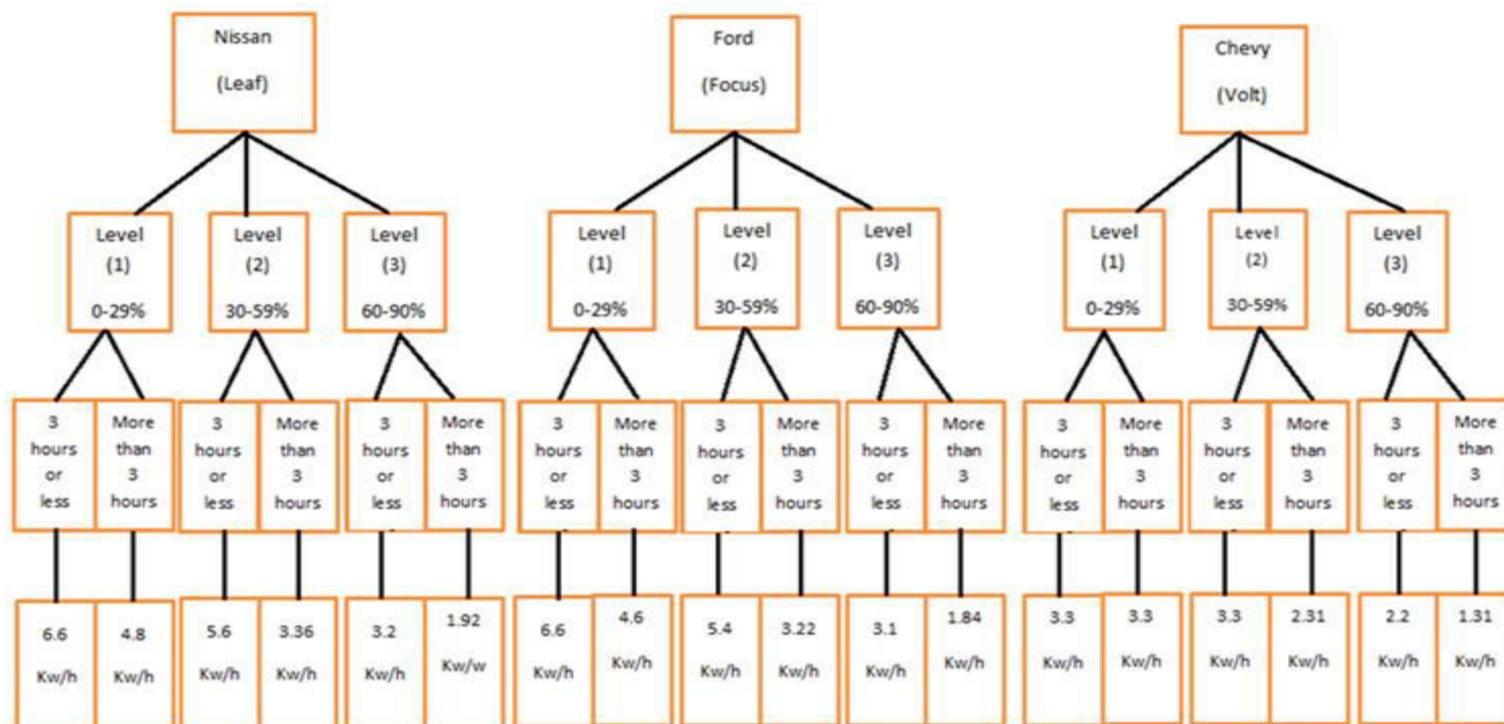
4- Connection in Hardware

In this part, we are charging three batteries with different charging amount using the solar panel, so we have to control the flow of charge by using a controller (Arduino and chargers) and switching devices (relays). The components in the figures are
1- One solar panel.   2- Relays.   3- Arduino Uno.   4-Chargers.   5-Batteries.
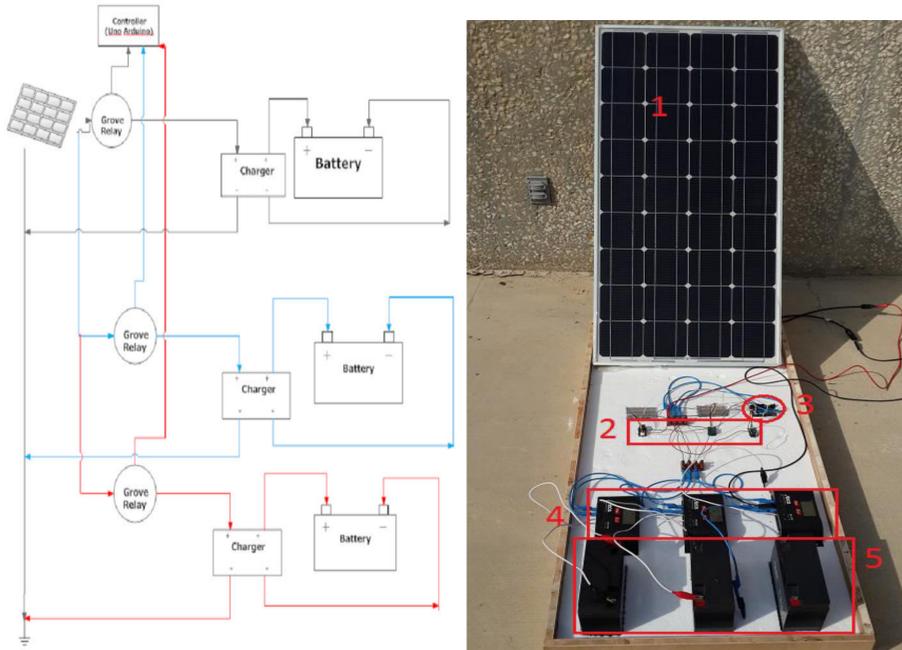
5- Simulation Results

State of charge is an important test that helps to study the rate of voltage and current change along time during the charging process. Next plots compare between voltage levels, current Amounts, power, and energy versus time for the three batteries.
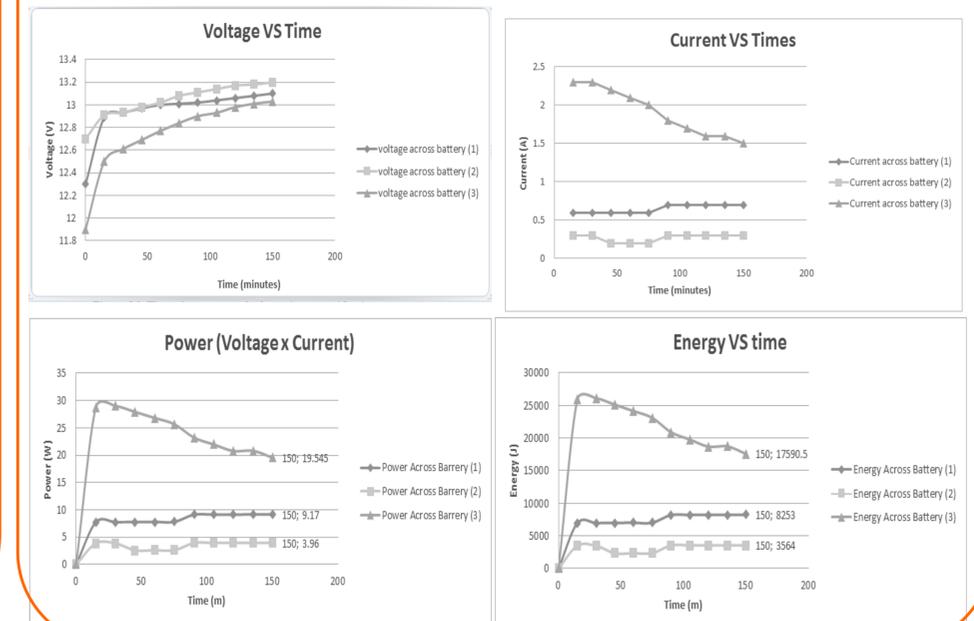
6- Conclusions

To come to the point, we have implemented Electric Vehicle charging using solar energy. The project was mainly divided into 2 parts: software simulation and hardware implementation. Both parts were based on the algorithm we designed. The hardware design was limited and small compared to the software design which is capable of charging up to 100 cars, while the hardware part just included 3 batteries as loads representing 3 car types. The results in the software were dependent on the starting time, the amount of power in the source per hour and the number of cars in the parking lot. In hardware, we checked the results to recognize the current distribution which dramatically relies on the battery voltage level.

7- Recommendations

If we are about to make some recommendations for any group of students whom will select the same senior project topic, we like to suggest the following:
1. An electric car toy to be used instead of the battery such that it can be more symbolic and further represent the project theme in case they wanted to use it in competitions so it can explain itself from sights either committees or ordinary people.
2. Since this project aims to encourage a clean-energy production either in utility or industry, we advise them instead to use another renewable & green source such as wind power or hydropower.
3. A smart-card technology to be implemented in the project design such that the type of the car plunged in the electric source can be identified and accordingly given specific charging rate.
4. Lastly, we would recommend if possible to use " remote control " technology for switching processes instead of programmed sequence of switching.