ELCIA Hackathon Proposal Submission Template

1.Proposal Title

"SMART INTEGRATED WIRED/WIRELESS CHARGING SYSTEM FOR ELECTRIC VEHICLES USING SOLAR AND GRID ENERGY USING IOT".

2.Problem Statement

The government of India has launched "MISSION EV" to make all the vehicles electric as soon as possible. However, the major drawback faced by the Automobile manufacturers and government is the hurdle of battery life and setting up of charging stations. The battery range and the inability to setup charging stations at all the places is a major challenge faced by electric vehicles. Increasing in the number of travelling vehicles has increasing the problems such as air pollution and to the use of petroleum.

3. Proposed Solution

The proposed project deals providing solution to the human sensibility for the energetic and environmental problem that is encouraging the research in alternative solutions for the automotive field, as multiple fueling, hybridization and electrification. The electrically assisted vehicles are normally powered by rechargeable battery, and their driving performance is influenced by battery capacity, motor power, road types, operation weight, control, and, particularly, by the management of the assisted power. As solar energy is used to charge EVs this project is majorly dependent on renewable energy. A smart grid could be easily defined as the electricity delivery system, which transports, converts and distributes the power efficiently integrated with communications and information technology. In fact, plug-in hybrid electric vehicles (PHEVs) and electric vehicles (EVs) represent an important step in solving environmental problems and are being developed around the world.

4.Goals and Objectives

- Ecofriendly and user friendly interface.
- Reduces environment pollution.
- Compatibility.
- Sustainable energy utilization.
- Efficient charging.

5.Target Audience

This proposed system covers wide range of target audience both in private and public sector. The primary audience are individual electric vehicles (EV) owner.This can be even implemented in public transportation and can also be employed in automotive manufacturers, organizations and commercial enterprises.

6.Key Features

- Automated switchover between solar and grid without the need to manually toggle.
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- Automated payment system as well as easy option to track the charging stations in the city.
- Efficient and optimized charging.
- Stores energy.
- Solar energy utilization.
- Grid energy integration.
- Web applications.

7. Technical Approach

HARDWARE DESGIN:

a. **Voltage Sensor:** It consists of a voltage divider configuration to monitor the battery voltage.
b. **Battery:** The battery or power supply unit provides the required power to the entire system. The battery chosen for this project was 3.7V lipo battery.
c. **Buzzer:** We are using piezo buzzer in this project.
d. **I2C LCD display:** Used for visual or textual display.
e. **Relay Module:** Relays are electromechanical switches. We have used two common SPDT relays.
f. **Solar Panel**: It converts sunlight into electricity by using photovoltaic.
g. **Smart Grid**: It is an electrical grid with automation, communication and IT systems that can monitor power flows from point of generation to point of consumption.
h. **EV charging stations:** Wired and wireless charging stations can be used.
i. **Smart meters:** Energy meters to monitor and manage energy consumption and production.
j. **Antenna**: Structure that captures and/or transmits radio electromagnetic waves.

SOFTWARE DISCRIPTION:

Arduino IDE: The software used to program the microcontroller is the Arduino Ide. This systems provide sets of digital and analog I/O pins that can be interfaced to various extension boards and other circuits. For programming the microcontrollers, the Arduino platform provides an IDE based on the Processing project, which includes support for C and C++ programming languages. The Arduino board is connected to pc and the program is burnt onto the microcontroller board. This shows Arduino integrated development environment for compiling and uploading the programs to Arduino board.

Easy EDA: It is web based EDA (Electronic Design Automation) tool used for creating circuits, schematics, designing PCBs as well as for simulating electronic circuits.

Energy Management System (EMS): Software to manage energy flow between solar panels, batteries, grid and EVs.

Algorithm:

Auto Power selection:

Input- Solar and Grid Power.

Output- Selection of solar or grid for charging

Charging station location finder:

Input: GPS signals

Output: Locate charging station on map

Charging Billing:

Input: Wired/Wireless charging

Output: Charge amount

COMMUNICATION:

RFID module: Radio frequency Identification (RFID) is a wireless identification technology that uses radio waves to identify the presence of RFID tags. Just like Bar code reader, RFID technology is used for identification of people, object etc. presence.

- **RFID Tag:** RFID tag includes microchip with radio antenna mounted on substrate which carries 12 Byte unique Identification number.
- **RFID Reader:** Whenever RFID tags comes in range, RFID reader reads its unique ID and transmits it serially to the microcontroller or PC.
- **GSM Modem:** The module supports baud rate from 1200bps to 115200bps with Auto-Baud detection.
- **ESP32 Development Board :** It comes with dual core 32-bit processor, built-in WIFI and Bluetooth, more RAM and Flash memory, more GPIO, more ADC, and many other peripherals.
- Node MCU is famous for the ESP8266E module with LUA programming language. ESP32 is used for wake word of smart mirror.
- **LoRa modules:** For wireless communication.
- **Ethernet modules:** For wired communication.

INTERFACE:

Android App Development: Android Studio is the official Integrated Development Environment (IDE) for Android app development, based on IntelliJ IDEA. It also offers even more features that enhance the productivity while building Android app.

MQTT Protocol: MQTT (Message Queuing Telemetry Transport) is used to establish communication mainly between user and server or machine to machine communication.

8.Expected Outcomes:

This project solution largely make us less dependent on non-renewable energy consumption like petrol, diesel fuel and heating oil. Contributing to remarkable extent in reducing environment pollution. Also reduces carbon footprint. Brings awareness among people not to use unnecessarily vehicles as resources (like fossil fuels) cannot be replenished easily. Project aspires us to make ourselves more reliable on naturally available renewable sources. It also motivates users as it avoids fuel price hikes.

9.Block diagram and Circuit connections :

BLOCK DIAGRAMS:

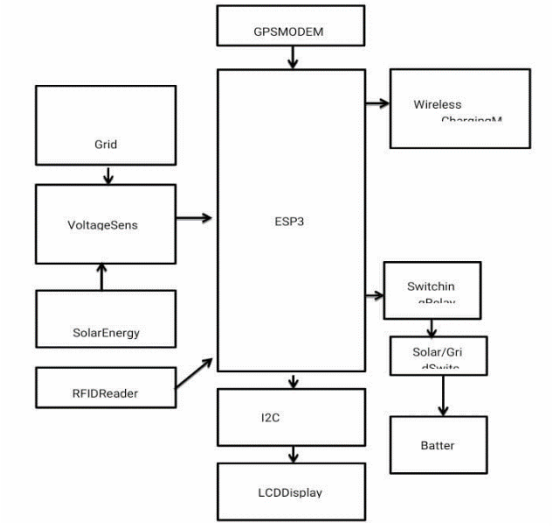

Fig: Block diagram of charging station

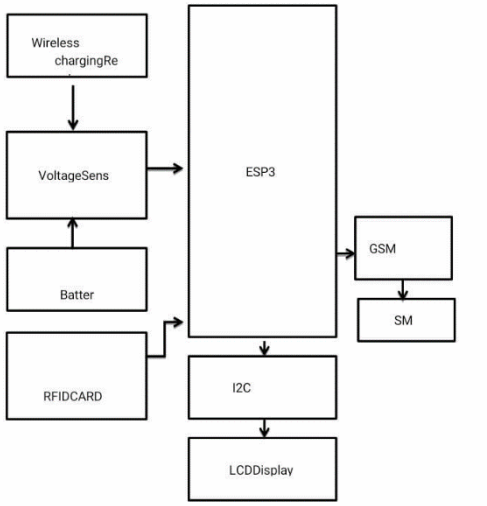

Fig: Block diagram of vehicle part

CIRCUIT DIAGRAM:

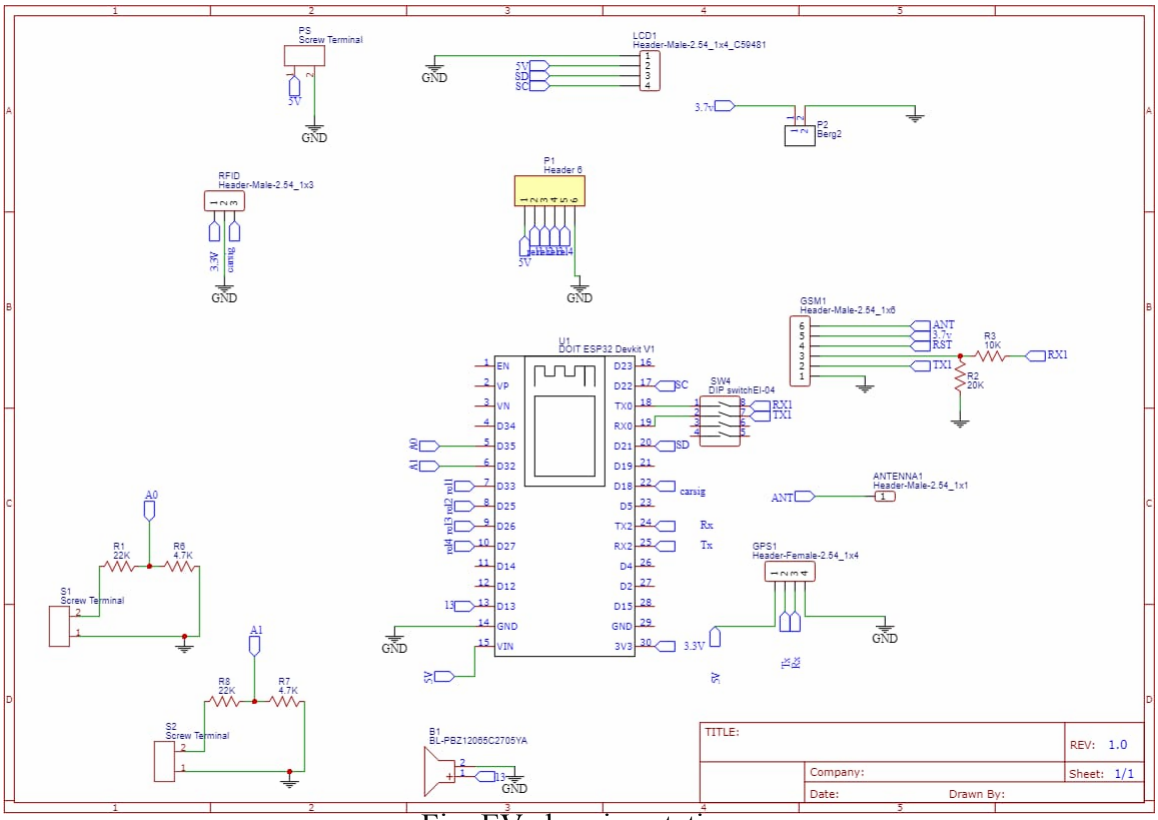

Fig: EV charging station

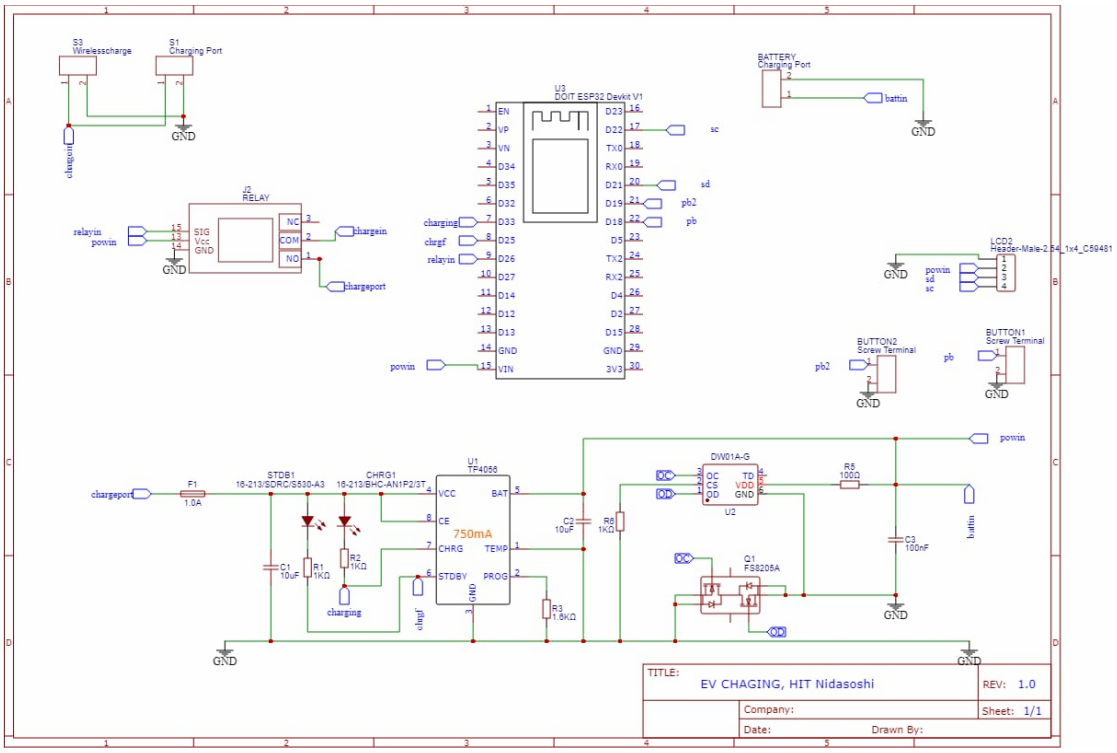

Fig: car part circuit diagram

PCB LAYOUT:

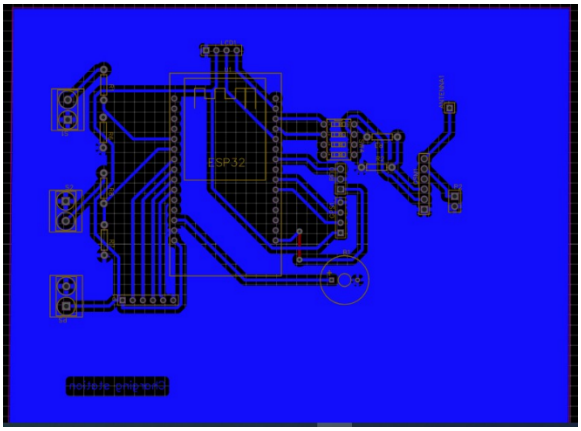

Fig: Charging station

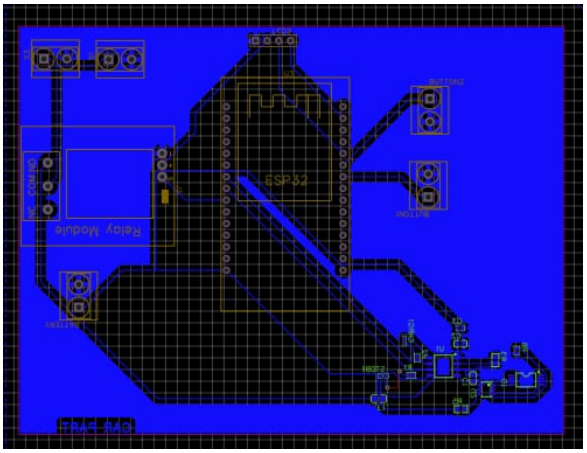

Fig: Car part

PIN CONNECTION:

CAR PART PIN CONNECTION:		
Components		
ESP32	Pin 16 Pin 17 Pin 19 Pin 21 Pin 22	Se Sc Sd Pb2 Pb
	Pin 30: GND	GND
	GPIO Pins (digital I/O)	Sensors, led, motor driver
	Pin 15 : VIN	PW in
DE01A-G Battery Protection IC (U2)	Pin 5: VDD	Power supply
	Pin 3,6: GND	GND
	Pin 1 Pin 2 Pin 4	OC (over current) CS (current sensing) TD (time delay)
Relay (J2)	Pin 13: GND	GND
	Pin 14: VCC	Power supply
	Pin 15: SIG	Signal from ESP32
	Pin 3: NC Pin 5: NO	

- Charging port (S1) and wireless charging (S3) -connected to relay input.
- Button1 (pb) and Button2(pb2) – connected to ESP32 for user inputs.
- LCD – connected to ESP32
- Charging and charging full indicator – connected to TP4056

EV charging station pin connection:		
Components		
ESP32 Devkit V1 (U1)	Pin : GND	GND
	Pin 19: VCC	5V power supply
	Pin 21: (D23)	SD
	Pin 22: (D22)	SC
	Pin 23: (RX0)	RX1 through DIP switch
	Pin 24: (TX0)	TX1 through DIP switch
	Pin 25: (D21) Pin 26: (D19) Pin 27: (D18)	Csig RX TX
GSM Module (GSM1)	Pin 1	Antenna
	Pin 2 Pin 6: (GND)	3.7V power input GND
	Pin 3: (Rst)	Reset
	Pin 4: (RX1) Pin 5: (TX1)	To RX1 via R3(10k ohm) To TX1 via R2(20k ohm)
LCS Display (LCD1)	Pin 1: VCC	5V power input

	Pin 2 : (GND)	GND

- RFID Header: 3.3V – power input and ground connection.
- Antenna: connected via header pin
- Screw Terminal (S1): connected through R1(22k ohm) and R7(4.7k ohm) to A1 (analog input1)

10.Budget and Resources:

- Voltage sensor- 30 /-
- Battery -1000 /-
- Buzzer – 200 /-
- I2C LCD Display -340 /-
- Relay -70 /-
- RFID -600 /-
- RFID tag- 200 /-
- RFID reader- 500 /-
- GSM modem- 900 /-
- Esp32 -600 /-
- GPS modem- 500 /-
- Solar panel -2000 /-
- Antenna- 100 /-

Total Cost = 12638 /-

11.Conclusion:

The project deals with the concept of smart integrated wireless charging and tracking system for elective vehicles using solar energy and IOT. From the project we can conclude that the proposed project can be useful to automatically switch over to the solar energy for the purpose of the charging. We can further conclude that the developed system can easily be scaled to the actual charging stations. The system will perform wireless charging of the electric vehicles and notify the owners the charge regarding the same. The proposed project can also help the users of the electric vehicles to track the location of charging stations nearby making it easier to find out the charging stations. The App is developed which will help the users of the electric vehicles to track the status of charging and the charge using IOT.
