ELECTRIC VEHICLE CHARGING STATION AUTOMATION

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Abstract - Electric vehicles (EVs) have the potential to increase energy efficiency in transportation, reduce greenhouse gas emission, and relieve reliance on fossil fuels. Basic infrastructure, such as electricity and services necessary for the charging infrastructure, are not available everywhere along a highway. Long charging times can potentially cause significant delays, not only because of the charging process itself, but also because of the potential waiting times resulting from busy charging stations (CS). For overcoming this problem we develop a mobile android application was developed with the facility to provide a list of positions of CSs in geographical manner nearest to the EV's position. Even though the application provides an estimation of driving range and a list of available CSs, it is not smart enough to find the realtime status (i.e. slot availability, price) of the CSs to reserve a slot. It would then select the most appropriate one based on offered prices, but other input parameters could be also taken into account, e.g. waiting times, estimated charging duration and alike. The results show that the time saved for waiting and automated the process of payment and searching of the charging stations.

Key Words: Electric Vehicle, Navigation, Efficiency, Automation, Charging.

INTRODUCTION

Over the few years ago, electric vehicles (EV) have gained significant attraction because of their appeal as a possible alternative to gas-powered vehicles. Since 2008, In US more than 4, 10,000 EVs have been sold till December 2015, it represent 33%of the global sales. The electric vehicle is expected as major sores of transportation in future. The main advantage of electric vehicle is pollution free. Electricity is used to charge there battery the power is taken from traditionally fossil flue power plants. It reduces their environment- friendly mode of transfer. Recently solar power base electric charging station is designed that provides clean electricity and improves efficiency of solar. While installation of power vehicle system can be on roof top of a building and solar canopies can also install on parking slot. It will make an excellent choice for solar power electric vehicle charging station. It will provide clean electricity as well as provide shade to vehicles.

The increasing exhaustion of fossil energy and depletion of global energy reserves in a major worldwide concern at economic, environmental and industrial levels. Potentially, the greenhouse gas emissions are changing the climate which would be major threat to human society. PHEV is considered as an option to reduce gas emissions and depletion of energy reserve. Considering that PEVs will play a major role in the future transport sector, governments ,power systems operators, and automakers ,have shown great interest in building an efficient charging network for parking place in residence ,downtown and industrial park.

From a distribution planning perspective, plug-in electric vehicles (PEVs) are an unknown quantity representing potential demand which varies both spatially and temporally across the system. In

order to accurately assess potential distribution systems impacts, these load diversity characteristic must be accounted in the system analyses.

In this system whenever the users car battery is low it will search for nearby station for charging his battery. After searching for the nearby station it will display map of nearby station. User will search for station which has minimum waiting time and will book his slot there .The User will get notified when his request will be accepted by the Head Operator of the Station. The Head Operator of the Station will see the entire request for the customers. He can accept or keep in waiting the request of the customer. After the confirmation by the station operator the customer will go to station at his time slot and the head operator will give command for customer charging.

MOTIVATION

Electric cars have recently been increasing in popularity and the demand for electric vehicles (EVs) could be an indicator for the future, due to the climate change and the need to reduce CO2 emissions. In addition to the environmental factor, that has been the main motivation for the introduction of electric vehicles, this type of transport reduces the dependence on fossil fuels and therefore contributes to greater energy independence, as well as provides an additional political impetus. Electric vehicle sales are steadily growing, and by 2030, it is expected that the share of electric vehicles will be almost 50% of new vehicles i.e. every second vehicle. One of the limiting factors for further deployment of electric vehicles is the underdeveloped charging infrastructure. Buyers find it more difficult to buy electric vehicles because of poor charging infrastructure, and investors, on the other hand, are not motivated to invest in infrastructure development because there are not enough users.

LITERATURE SURVEY

We have studied previous Researchers innovation to know more about the system which we are developing.

A. Aljanad et al [1] this paper presents the impact study of plugin electric vehicles (PHEVs) on a power distribution system and investigates how it would affect the distribution systems from different perspectives. PHEVs are modeled as storage energy systems in which its dispatch mode will follow the load shape patterns for chargingbehavior.

W. Deng et al [2] This paper provides a comprehensive study on using multi-terminal low voltage direct current (MT-LVDC) to connect multiple feeders or transformers, which can solve network constraints efficiently to improve the ability of the power supply for more PEV integration. This paper proposes an adaptive droop control for the MT-LVDC distribution system, and presents a probabilistic evaluation method to analyze the PEV integration capacity. To illustrate the potential of using MT-LVDC to improve PEV integration in an existing distribution network, a case study is performed, and the results show that MT-LVDC based on the proposed adaptive droop control can share the charging power demand during steady state and dynamic conditions between multiple feeders or transformers.

J. Stojkovic et al [3] —This paper analyses the optimal operation of a commercial PV charging station with 10 chargers for electric vehicles. The charging station is connected to the main distribution network and can buy and sell electricity to the grid. A multi-objective optimization algorithm that minimizes the operational costs of the charging station and costs related to the power losses in the distribution grid has been proposed. In the proposed method, the interests of the charging station owner and

distribution system operator were considered. Constraints related to user comfort in terms of the minimum level the state of charge when the vehicle leaves charging station and the technical limitations of the grid were also considered.

M. Tabari et al [4] This paper proposes a mathematical model for a stability-enhanced dc distribution system, for charging plug-in electric vehicles. The stability of the dc distribution system is enhanced through a nonlinear control strategy exercised locally by each battery charger. The proposed model is of the matrix form and can be used for small-signal analysis of a dc distribution system that hosts an arbitrarily large number of battery chargers. The paper also presents a set of computationally efficient equations for calculating system eigenvalues.

K. Peng et al [5] Firstly, a stability model of DC power distribution system integration of electric vehicles under different charging and discharging modes is established, and the stability of DC power distribution system is compared according to Nyquist stability criterion, when electric vehicles are charged and discharged in different ways. Finally, a DC power distribution system time domain example with electric vehicle is made in DIgSILENT simulation software, and simulation results verify the correctness of theoreticalanalysis.

Y. Li et al [6] Firstly, the impacts of on-board charging devices with different electrical characteristics on alternating current power supply were discussed. Additionally, the electrical effects of electric vehicle integration into three typical residential communities were demonstrated. By evaluating harmonic in residential distribution system, three-phase unbalance degree and voltage deviation, two suitable power supply mode for electric vehicle charging devices in residential community and possible entry approval standards of on-board charger were proposed.

G. Chunlin et al [7] The NSGA- II algorithm is used to solve the multi-objective problem, analyze the effects on generation cost, emission cost and wind power cost in different proportions and scales of electric vehicles by the Pareto front optimal solution set. Using the linear weighted method turn the multi-objective function to a single objective function, and obtain the dynamic economic dispatch results.

S. Yang et al [8] The proposed model aims to minimize the total distribution costs of the EV route while satisfying the constraints of battery capacity, charging time and delivery/pickup demands, and the impact of vehicle loading on the unit electricity consumption per mile. To solve the proposed model, they develop a learnable partheno-genetic algorithm with integration of expert knowledge about EV charging station and customer selection. A comprehensive numerical test is conducted on the 36-node and 112-node systems, and the results verify the feasibility and effectiveness of the proposed model and solution algorithm.

B. Zheng et al [9] In this paper, coordinated charging modes and charging time of different kinds of EVs are proposed. The Monte Carlo simulation is applied to determine the starting state of charge(SOC) and the initial charging time, etc. Taking the daily load curve in a certain day for example, the impacts of power demand of EVs in different scales on original load curve are calculated. The results show that the natural charging-discharging characteristic of EVs can be controlled to discharge during the peak load time and charge during the load valley.

R. Kumar et al [10] The research done on PEV charging impact shows that the secondary voltage is affected more significantly than the primary voltage which can affect the fault location process. Impacts on distribution system due to large scale integration of electric vehicle during fault condition

have been studied in this work. To investigate the impacts on fault condition in distribution system due to PEV integration, the IEEE 34 node system with PEV charging station coupled to one of its node is used under single line to ground fault condition.

PROBLEM STATEMENT

The need of the system is to avoid long queues for the charging of the car. If the user is struck somewhere and needs to charge his battery then in case of emergency he will find nearby station and can book his appointment. He can also get to know about the status of his booking.

OBJECTIVES

- To Provide smooth and efficient working of the Electrical car for the Consumers
- Consumer will be aware about the status of his booking.
- He will be avoiding long queues due to non-availability of the charging station.

SUMMARY

In this section we elaborated why the system is created. The aim of creating system is to provide user friendly and smooth services to the user. In case of emergency the user will book slot for charging. After confirmation for charging the user will go and charge his car. The user has 3 approaches for charging his car: Wind Supply, MainSupply and Solar Supply.

PROPOSED SYSTEM

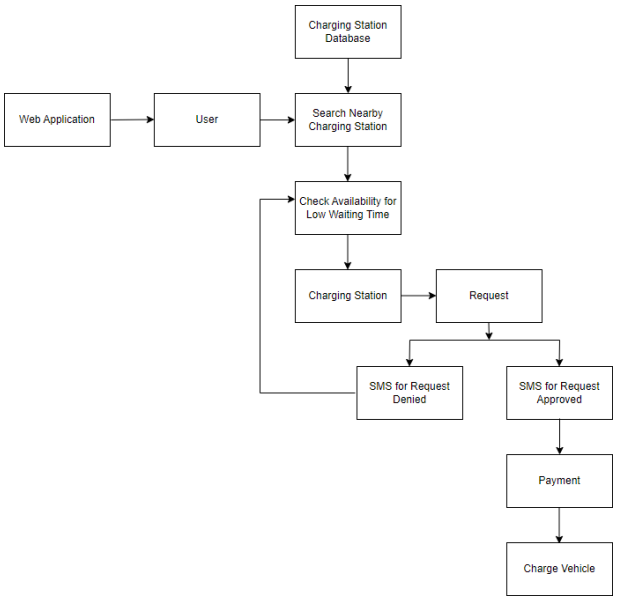

Fig -1: Block Diagram

In the system the user needs to charge his electric car at nearby station. Whenever the user needs to charge his car he will search the nearby stations where he can go and get charging for his electric car. After station search it will show the map of nearby available station to the user. The user will book the slot required by him at the charging station. After booking the slot of the charging user will be notified. The Head Operator of the station will operate form his mobile and will give confirmation to the user. Upon Arrival of the User the head operator will give command through his mobile and the charging slot will be allocated to the user and the charging of the Electric Car will be started.

SOFTWARE REQUIREMENTS

- JSP
- Java 8.1
- Netbeans 8.2
- MYSQL 5.6

HARDWARE REQUIREMENTS

Windows 11 PC i5 8 GB RAM 256 SSD

- Windows 11 PC
- i5 Processor
- 8 GB RAM
- 256 GB SSD

FLOWCHART AND EXPLANATION

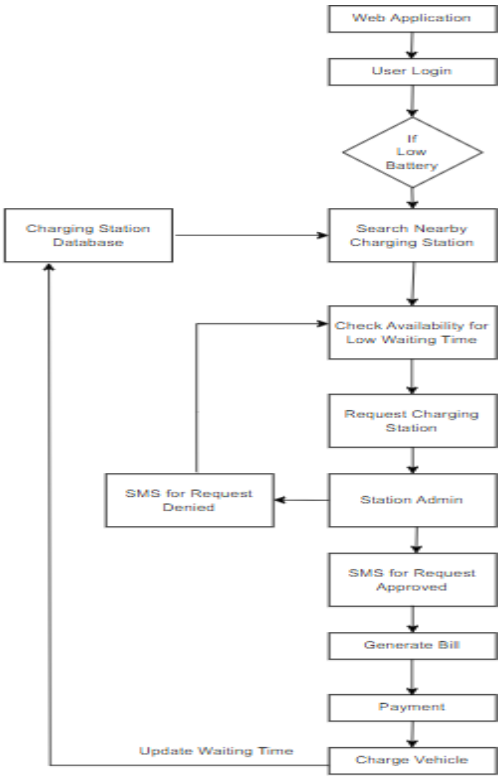

Fig -2: Flow Chart of the system

A web application needs user login. If battery is low, it will search the nearby charging stations and the map will be display nearby charging stations to the user. User can check minimum waiting time and send a request to book an appointment. Charging station admin will accept or reject the request and send SMS alert. If request is denied, user will search for next nearer charging station with low waiting time. After getting confirmation SMS for accepted request, the user will reserve his time slot and go to the station for charging. Bill will be generated and payment is proceed before service. Then charging of vehicle will be processed further. Finally the waiting time of charging station will be updated in database by adding user reaching time to the previous displayed time.

EXPECTED OUTCOMES

The system is intended for automated searching of the electric vehicle charging station. The system is proposed with a web application that identifies nearby charging stations. User can check waiting time for each available charging station and according to distance to travel, can choose the most significant station to book a time slot.

- Results are expected to be a quick reply from the charging station as the user sends the request.
- If the request is denied by the Station admin, the user can search for another one.
- After request approval, the time to reach the charging station is also updated in the database.
- An alert sent to the user through SMS will enhance the system's efficiency.
- The time for searching charging stations can be reduced significantly with database details accessibility online.
- A real-time system works on a web application and needs to register users.
- This helps to maintain a record of users, bills generated, and transactions of previous bills and improves the reliability of the system.
- A bill amount is generated and the user can reach the charging station at the respective time.

CONCLUSION

As India is a country with a vast road network, if the country wants to boost the popularity of EV's it need to install as many charging stations as possible. Installation of charging is much easier but lack of knowledge makes it difficult to handle. Proper knowledge will surely improve Current Situations. Charging of EV from solar energy provides a sustainable gateway for transportation in the future. It provides a direct utilization of the PV power during the day and exploits the solar potential rooftops of buildings. Our System will ease the problem depleting resources and increase in pollution caused by the non-electric cars. The system is cost efficient as the user can charge his car through 3 modes i.e. Wind, Solar and Power Supply. If user will book prior a slot for his car charging to the nearby station helping him to avoid long queue. The user can also find nearby stations by entering his current location and it will display all the convenient options feasible for users.

ADVANTAGES

- Great for reducing environmental crises
- Boost in producing of EV plants and increasing employment
- Helps in saving fuel resources
- In time of crisis the user will search nearby station and will charge his car by one of the given mode.

APPLICATIONS

- Helpful for people in affordable budget
- Renewable energy source
- Public Transportation
- Electricity Grid.

FUTURE SCOPE

- More electric cars will be into household and more approaches will be seen towards eco-friendly cars.
- The global imperative to cut carbon pollution and oil dependency
- Budget Friendly for consumers
- More Variations in the features of the car.

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