Determination of Appropriate Site Selection of Electrical Vehicles Charging Station

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***Abstract*— There is a pressing need to accelerate the development of advanced clean energy technologies in order to address the national challenges of climate change, pollution and effective energy utilization. Electric vehicles prove to be best solution to address pollution due to its lower emission, maintenance requirement. Solar Photovoltaic is a key technology option to realize the shift to decarbonize energy supply. The objective of this paper is the determination of optimal location for EV charge stations. This localization is highly related with the range of EV and traffic density on areas. The distribution of charging stations is a basically optimization problem. For this reason, estimation of optimum locations for EV charging stations in Kolkata, West Bengal, India. Based on the various factors contributing to the performance of solar panels such as radiation, temperature and other climatic conditions, inverter efficiency a solar power plant is also designed.**

Keywords*— *Electrical Vehicles, Charging Stations, Optimal Location, Grid Connectivity.

1. INTRODUCTION

In this paper, our aim is to determine the optimal location for EV charging stations. Charging station distribution of Electrical vehicles is basically a optimization problem. For the determination of suitable location of EV charging stations, we have chosen KOLKATA. We have chosen Kolkata because of its suitable location and the availability of DC Power in that location [1]. The aim of this paper is -

a. Realization of available transport system in Kolkata and to bring and increase the availability of Electric Vehicles instead of petrol and diesel-run vehicles. We have to the demand of electric vehicles by reducing the price of EV's.

b. Develop a PV power station which would purely supply the base loads during needs.

2. SURVEY OBSERVATIONS

. 2.1 SELECTION OF THE LOCATION FOR ESTABLISHING THE EV CHARGING STATION

This study is purely done on models specific to the existing ones in the Indian market. It has been further assumed that the vehicle would deliver 130 kilometers on single charge[2].

2.2 UTILIZATION OF EXISTING RESOURCES

We have to reduce the dependency of petrol-diesel run vehicles to reduce the environmental pollution. We have to increase the demand and the dependency of electrical vehicles. For establishing the charging stations of electrical vehicles, we have to select the best optimal locations in Kolkata.

2.3 DEMAND OF EV'S IN THE WORLD

Demand of EV's in the different countries among the world is increasing day by day. For example, sales in 2016 in the countries of United states, Canada, European union, India and China are 84,850, 4160, 155273, -1000, 2,66,000 respectively.

3. CHARGING OF EV GUIDELINES

THE charging system design A 5KW array of 6.6 KW level charging unit, a 10 KW bidirectional inverter. An intelligent control system consisting of an onsite controller and supervisory computer should be able to communicate with bidirectional inverter using modbus. The onsite controller monitors the solar PV power, the motor status, the EV charging pod, and the grid status. Weather information from a weather forecast site is extracted to estimate available PV energy.

4. OPTIMAL LOCATION ESTIMATION

For the determination of the best location of EV's charging station, Kolkata is here chosen. The road map of Kolkata with private bus routes shown in figure1 and figure 2 is representing here private bus route with optimal location. The following images are based on Mapbox software and it is a efficient software for creating and designing the desired maps of various locations. Red lines shown below indicate the roads covered by any private bus service provider. Figure 3 showing the zoom in results for the road layer. With the help of spectral clustering the minor errors on the road layers are eliminated by morphological image processing algorithms which are shown in figure 4. The yellow dots denote the optimal locations. Figure 5 representing CTC bus routes with optimal locations indicated using Mapbox software where the

estimated EVSE locations for CTC bus routes are also indicated with yellow dots. The following diagram is Fig.1.

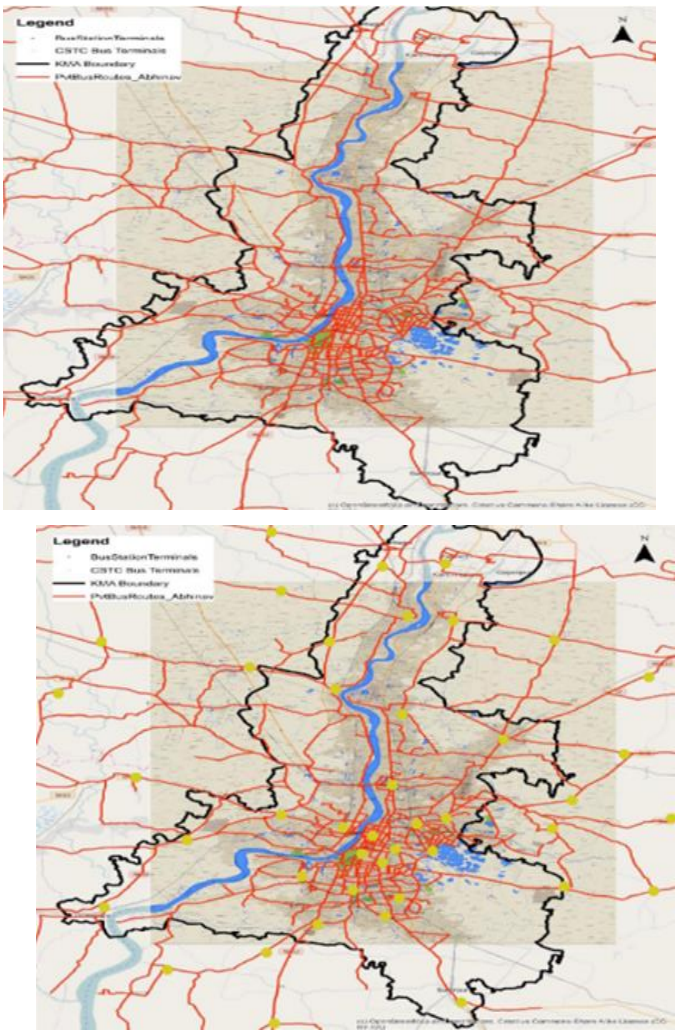

Fig.2. Private bus routes with optimal location

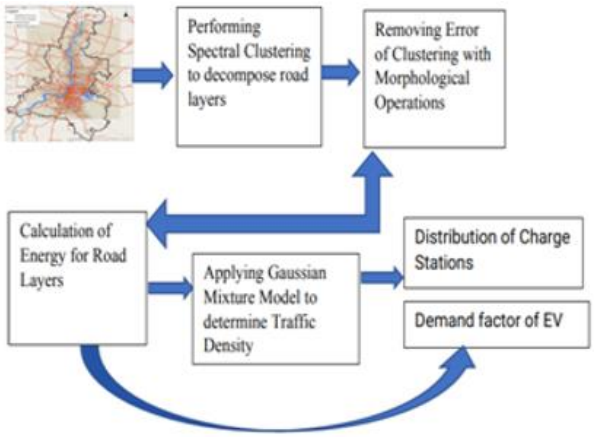

Fig.3. The Flow chart of EV charge locator (above) and the Zoom in results for the road layer (below).

Fig.4. The Morphological Image

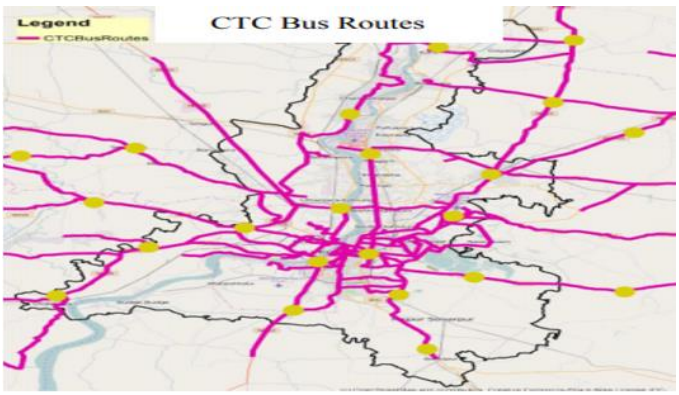

Fig.5. CTC bus routes with optimal locations indicated using Mapbox software. The estimated EVSE locations for CTC bus routes are also indicated with yellow dots.

5. GENERATION OF PROBLEMS

a. Load dependency of Grid and grid failure.

$$\alpha + \beta = \chi. \qquad (1) \qquad (1)$$

b. Increasing cost of grid development.

c. High cost of EV's of different companies.

6. PRODUCTION OF SOLAR POWER PLANT

By using efficient methods of design various losses in PV solar systems could be avoided such as soiling, reflection losses, Maximum power plant tracking (MPPT), and inverter efficiency. A detailed study was carried out to study the problems of solar PV model which is created because of solar isolation changes. Figure 6 representing the radiation at different tilt angle. The following diagram shows the radiation at different tilt angle.

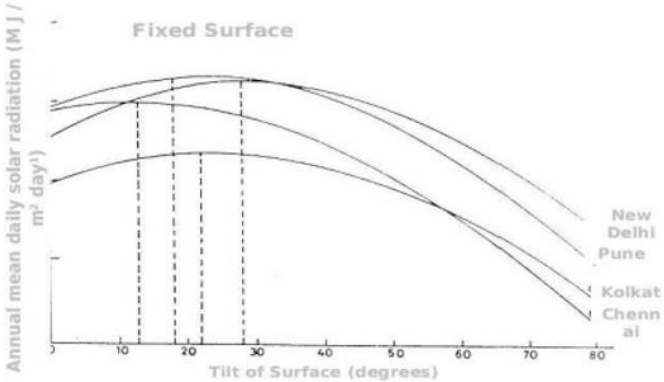

Fig.6. Radiation at different angle

7. SOLUTION OF PROBLEM

To work out the problem we have to consider several assumptions and some parameters. The parameters are vehicles battery life, charging period of battery, and the solar radiation in the area.

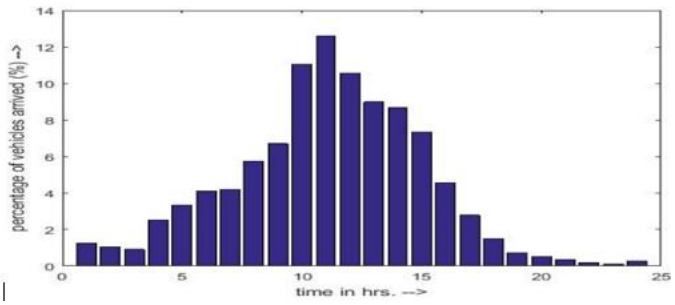

Fig.7. The vehicle arrival pattern at workplace.

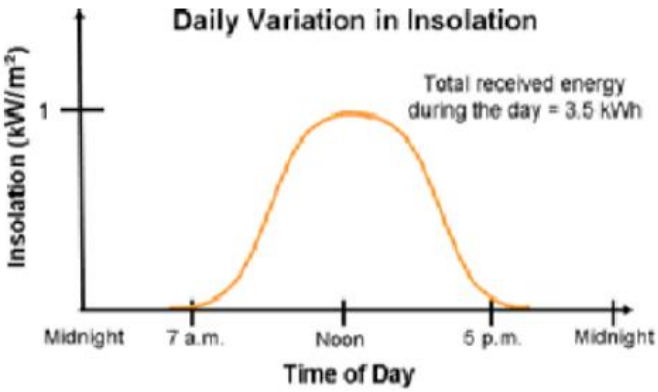

Fig.8. The approximate daily variation in the isolation system.

8. CHARGING SYSTEM DESIGN

The following diagram is the block diagram of Charging system block diagram.The charging system block diagram denotes the working principle of the model. This model can be used as a reference and could be implemented at any location.

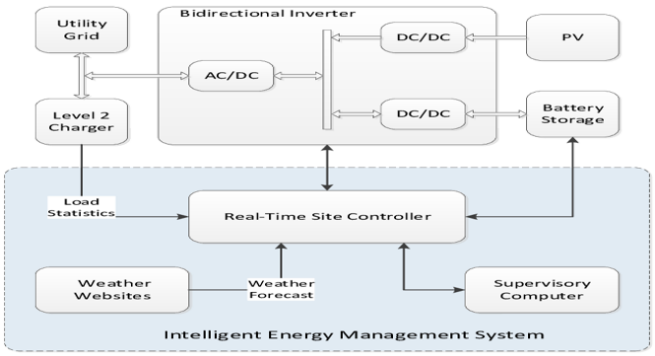

Fig.9. Charging system Block Diagram

9. CONCLUSION

We have proposed an innovative approach in this paper to determine the best fit locations for setting up Electrical Vehicles charging stations at specified regions. For the determination of optimal location of charging stations, kolkata has been chosen for it's best location and economic value. We have to reduce particulate matter concentration to provide its citizens a new pathway towards a healthy life.

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