Scientific Journal of Impact Factor (SJIF): 5.71

e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 8, Issue 03, March -2021

SMART ELECTRIC VEHICLE CHARGING SYSTEM

Mrs. Pranjal Jog[1], Mrs. Suwarna Shete[2], Mrs. Ashwini Deshpande[3], Mrs. Puja Pohakar [4]

College Applied Sciences and Humanities Department, PCCOE, Savitribai Phule Pune University

Abstract — *The aim of this study is to establish a system for intelligent electric vehicle production and management (EVs). A mobile framework was also developed to facilitate the exchange of information and consumer versatility. This proposed electric car charging device users of Vehicle-to-Grid technologies, with a view to linking electric vehicles (ESV), and even renewable energy sources to smart grids (V2 G). It also addresses the new electricity market model in order to achieve the best possible conditions for the sale of power by legalising electricity production and usage. This paper uses a precise technological model for an electric car and diesel engine of the same category to build a techno economic model. These technological models are tested using actual motorcycles by experimental measurements. The models are then related to economic models for a French case study for TCO estimation. The average cost of ownership of the electric car being researched is around 1000 for a five-year period lower than for the comparable diesel car. The model prioritizes the issue of stress violations of the prosumer community on feeders. The open capacity of the distribution network is measured along with the model of the mobile energy storage road.*

Keywords*-electric vehicles (EVs), Electro-Vehicles (ESV), Smart Grids (SG), Vehicle-to-Grid technology(V2G), Simulink, TCO estimation.*

I. INTRODUCTION

EW paradigms are emerging, like the Electric Vehicle (EV), the Smart Grids (SG), the Vehicle-to-Grid (V2G), and the Electrical Markets (EM). EM is the consequence of the deregulation of electricity production and use, and in this reality, power suppliers and consumers are free to negotiate the terms of their contracts. Also EVs integration on current electrical distribution network, without violating the system's technical restrictions, requires electrical data consumption analysis and smart charging approaches, where EV batteries charging or discharging processes need to be coordinated among the several users.

This topic already catches lot of attention of the scientific community under the topic of EM [1, 2, 3], and in this paper it is proposed a similar approach for the charging or discharging process of the batteries in an EV. This new reality brings additional problems, such as: (1) overload of electrical energy distribution network, if there is a considerable amount of EVs charging at the same time; (2) home consumption and contractual power limitation; (3) buying electricity at lower prices when renewable energy is produced in excess, and selling electricity at higher prices when the demand for energy is superior to the offer in the electrical network.

II. LITERATURE SURVEY

Paper Name: Open Capacity Enhancement Model Of Medium Voltage Distribution Network With Mobile Energy Storage System

Author: Wei He Daoshan Huang1, Bojian Chen1, Ting Huang1, Xiaoling Fang1, Huiyu Zhang1 And Junjie Cao2

Abstract: In order to meet the demand of prosumer for power quality and new load in distribution network, an open capacity expansion model of distribution network with mobile energy storage system (MESS) is proposed in this paper. The model gives priority to the problem of voltage violation of prosumer group on feeders. Combined with the mobile energy storage path model, the open capacity of distribution network is calculated. Firstly, the actual distribution network geographic information and traffic routes are combined to establish the distribution network model based on mesh generation. Secondly, the traffic route model of the mobile energy storage system is established on the distribution network model based on mesh generation. Then, the optimal power flow of distribution network is calculated with the optimal network loss, and the mobile energy storage system is scheduled according to the situation of voltage violation. And the specific vehicle model and its scheduling are determined, which can better deal with the problem of distributed energy consumption and make prosumer operate safely and economically. Finally, according to the proposed N-1 security check constraint of distribution network with mobile energy storage system, the maximum open capacity of distribution network is calculated after the voltage regulation is completed. The example shows the practicability and correctness of the model in this paper. This paper formulates a mobile energy storage operation strategy to improve the open capacity of distribution network. The strategy not only fully meets users' needs, but also better guides the operation of power grid. It is conducive to releasing more potential power supply space of distribution network and improving asset utilization.

Paper Name: Techno-Economic Comparison of Total Cost of Ownership of Electric and Diesel Vehicles

Author: ANATOLE DESREVEAUX1, ERIC HITTINGER1,2, ALAIN BOUSCAYROL 1, (Member, IEEE), ELODIE CASTEX 3, AND GABRIEL MIHAI SIRBU4

Abstract: Despite their low environmental impact, electrical vehicles have low penetration in the automotive market. Consumers are reluctant for technical reasons (limited driving range and long charging time) but also for an economic reason (high investment costs). Electric vehicle total cost of ownership (TCO) is often perceived as higher than for a thermal car, especially in Europe where diesel cars have a lower TCO than gasoline cars. Accurate TCO estimations are critical, but most of the techno-economic studies of electrified vehicles are based on very simplified energy models. In this paper, a techno-economic model is developed using an accurate technical model of an electric vehicle and a diesel car of the same segment. These technical models are validated by experimental measurements on real cars using real driving cycles. These models are then coupled to economic models to calculate TCO for a French case study. The total cost of ownership of the studied electric car is lower than for the equivalent diesel car by about 1000 for a 5-year ownership period. Of particular importance is the finding that using real driving cycles instead of standard driving cycles decreases the TCO of electric cars while simultaneously increasing the TCO of diesel vehicles. This has implications for techno-economic models, suggesting that the typical TCO approach that uses manufacturer-reported standard cycle data may be systemically biased towards thermal vehicles. In order to understand how TCO may change in different locations, a sensitivity analysis varies different technical and economic factors. Government subsidy, ownership duration, and vehicle depreciation are the most important factors for the TCO of electric vehicles. However, TCO of the electric cars can be lower than the TCO of equivalent diesel cars under a wide range of reasonable inputs.

III. PROPOSED SYSTEM

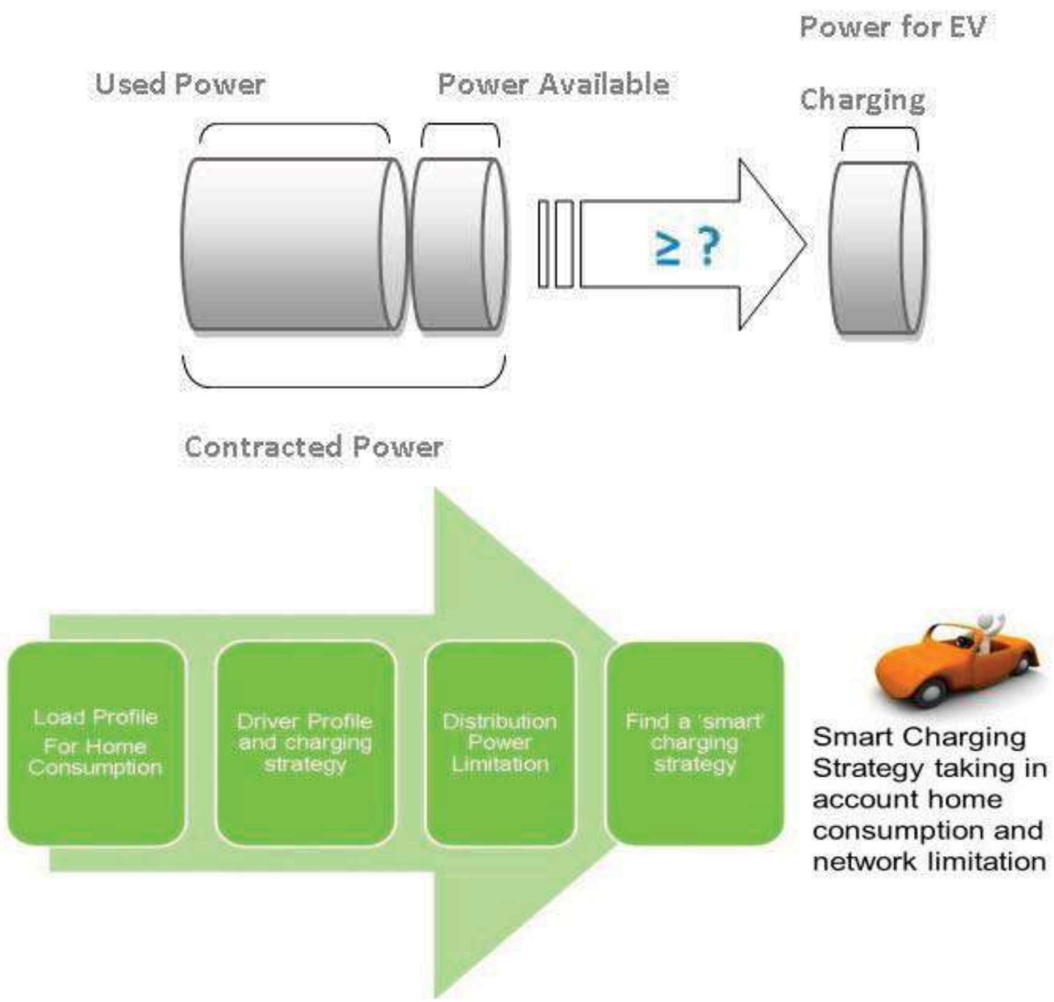

Figure 1. Block Diagram

In this paper is proposed a smart charging system to achieve the goals identified in Fig 1, i.e. taking in account home consumption, distribution network limitations identify a smart charging strategy. This system is based on a central information repository can store and manage historical data on electricity consumption and production. From this central repository it is possible the development of tools to extract knowledge from past electricity exchange log files, EM prices, renewable energy availability, home energy consumption (if EV is connected at home) and electrical distribution network constraints. Also, the weather information can be used for the forecast of energy production from renewable energy sources, and the EV users arrival and departure times from home (obtained from a tracking device) can be used for consumption timing optimization (e.g., users can change their behaviour, and thus historical data needs to be fitted). This central repository will be later, in a Smart Grid environment, a fundamental module to store all kind of SG data and to solve the problems of different data format diversity.

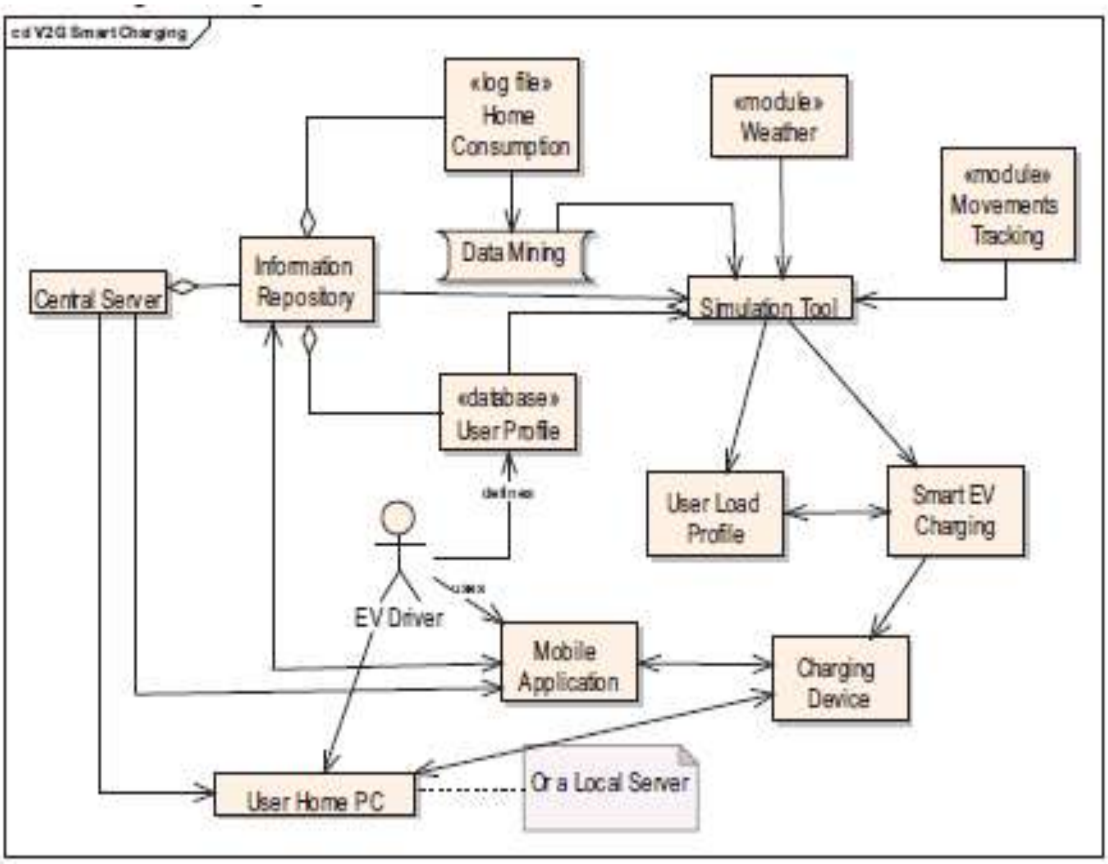

Figure 2. Main modules of the Smart EV Charging System

3.1 Modules:

A. Central Repository, with information about user energy consumption (amount and time), energy production with available information of power, energy supplier and source (e.g., hydropower, wind power, photovoltaic, etc), energy prices and weather information (temperature, wind direction and speed, rain amount, solar radiation, etc), user profile information;
B. Weather module, based on a web robot to pick weather information from pre-defined sites;
C. Movements Tracking application, developed for a mobile device with GPS functionality;
D. Simulation Tool, based on Netlog;
E. Charging Device; responsible for charging or discharging the EV batteries; and
F. Mobile Application, an application to run on a mobile device (like PDA or IPphone) to receive and send control information for charging the EV batteries.

Table 1. Characteristics of the system

CHARACTERISTICS OF THE COMMUNICATION SYSTEM BETWEEN CHARGING SYSTEM AND PC OR SERVER

	Frequency	Transmission Rate	Distance
ZigBee	868 MHz (Europe) 915 MHz (North America)	20 kbps 40 kbps	10 – 100 m
Bluetooth	2.4 GHz	1 - 3 MHz	100 m (class 1)
IEEE 802.11p (G5)	5.85-5.925 GHz	10MHz	500m – 1000m
WiMAX	2 - 6 GHz	15 MHz	2 – 5 km

3.2 Mobile Application:

The main functionalities of the Mobile application are:

A. Registration: registration page for new users;
B. Password Recover: form for password recovery;
C. Login: home page of the application - the user is redirected to this page after login;
D. Profile Creation: page created for user profile by entering information on the EV;
E. Personalized Charge Profile: page load profiling, through the introduction of information regarding the date / time of travel, number of Km you intend to accomplish, and minimum SOC (State of Charge) allowed for the EV batteries;
F. Statistics: home energy consumptions, weekly, monthly and annual energy expenses, price variation of electricity, charging periods, among others.

IV. PROTOTYPE SETUP

Figure 3. Main application functionalities menu: (1) Tracking of electricity charging and discharging process; (2) Creation of a profile (pre-defined information, like EV type, helps the user on this process; (3) User profile with the identification of travel periods and electricity prices to sell and buy; (4) Report with all user profile information.

V. CONCLUSION

In the proposed Smart EV Charging System, the introduction of mobile applications will facilitate connectivity user's interaction. The Central Information Repository, with Data Mining approaches, can be used to program and assist smart EV charging, taking into account the electrical network distribution limitation. A simulation tool helps on this smart charging process, and can be used to identify overloaded electrical distribution lines, and also to simulate behavior and operating conditions under different assumptions. Electrical energy producers can also benefit from this data collection and manipulation, because they can tune their production according to users' consumption needs.

REFERENCES

[1] C. Farmer , P. Hines , J. Dowds and S. Blumsack, 2010. Modeling the Impact of Increasing PHEV Loads on the Distribution Infrastructure. 43rd Hawaii International Conference on System Sciences 2010.

[2] Zhou, Z.; Chan, W.; and Chow, J. 2007. Agent-based simulation of electricity markets: a survey of tools. Artificial Intelligence Review 28(4):305–342.

[3] A. Ugedo and E. Lobato, 2007. Generator Load Profiles Estimation Using Artificial Intelligence. Intelligent Systems Applications to Power Systems, 2007. ISAP 2007. International Conference on, vol., no., pp.1-6, 5-8 Nov. 2007.

[4] Federal Energy Regulatory Commission. Form 714, California Independent System Operator, Washington, DC: Federal Energy Regulatory Commission, 2004. See also: http://www.ferc.gov/docsfiling/eforms/form-14/data/2004/WECC.zip

[5] C. Crowley and F. Joutz, 2003. Hourly electricity loads: Temperature elasticities and climate change. In 23rd U.S. Association of Energy Economics North American Conference.

[6] G. Franco and A. Sanstad, 2008. "Climate change and electricity demand in California." Climatic Change 87:139–151.

[7] P. Sousa. Visualização de Percursos em Dispositivos Móveis, Master Project of ISEL, Available at: www.deetc.isel.ipl.pt\matematica\jf\psousa.pdf

[8] V. Figueiredo, F. Rodrigues, Z. Vale, J.B. Gouveia. 2010. An Electric Energy Consumer Characterization Framework based on Data Mining Techniques; IEEE Transactions on Power Systems; Vol. 20, n.2, pp. 596-602.

[9] J.H.Zhao, Z.Y.Dong, X.Li, and K.P.Wong, 2007. A framework for electricity price spike analysis with advanced data mining methods, Power Systems, IEEE Transactions on Issue Date, vol 22, Issue 1, Feb. 2007, pp: 376 – 385.

[10] B. D. Pitt and D. S. Kitschen, 1999. Application of data mining techniques to load profiling. IEEE International Conference on Power Industry Computer Applications, pp. 131-136, May 1999. [11] Rita Gonçalves Ramada. "V2G - Modelo de simulação". End Year Project at ISEL, 2010.