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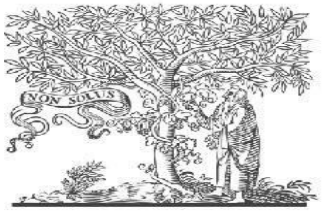

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IJIEMR Transactions, online available on 26th Dec 2022. Link :http://www.ijiemr.org/downloads.php?vol=Volume-11&issue=Issue 12

10.48047/IJIEMR/V11/ISSUE 12/87

Title A CRITICAL STUDY ON ENERGY MANAGEMENT FRAMEWORK
Volume 11, ISSUE 12, Pages: 680-684

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A CRITICAL STUDY ON ENERGY MANAGEMENT FRAMEWORK

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ABSTRACT

Blackouts and load shedding are frequent occurrences in a poorly maintained electric power grid. Load shedding occurs often for hours in many developing and underdeveloped nations. Millions of homes often employ a low power backup source for emergency loads in such circumstances. Lead-acid batteries are often used to store energy, although their capacity is quite low (a few kWh at most, depending on the number and size of the batteries). In a typical Indian house, a battery with a capacity of 12 V and 180 AH is utilized. Since the lead-acid battery's real capacity is only approximately 70%. Because only 1.512 kWh of useful energy may be recovered, the backup time is quite short. An electric vehicle (EV) has a huge amount of energy storage capacity, often exceeding 10 kWh. The middle-sized electric cars, with the exception of the Toyota Prius PHEV, feature a 22-32kWh battery package. A lengthy driving range is provided by the premium car, such the Tesla S, which has a range of 60 to 90 kWh. As a result, the energy storage capability of any kind of EV may be simply used to provide a standby power source for the residence when the vehicle is at rest.

Keywords: - Energy, Electric, PEVs, Batteries, Power.

I. INTRODUCTION

The usage of electric cars (EV) and plug-in hybrid electric vehicles (PHEV) may cut emissions from private sector vehicles (2 and 4 wheels). Due to rising worries about the energy crisis, environmental pollution, and climate change, EVs, PEVs, and PHEVs (sometimes known as xEVs) have attracted a lot of interest in recent years. Essentially, xEVs are automobiles with a large battery pack that helps with propulsion using electricity, cutting down on the usage of fossil fuels significantly. PEVs and PHEVs also have superior fuel conversion efficiency than regular cars [3]. As a result, the cost per unit (Rs/km) and mileage increase, increasing the penetration of PEVs in recent years. By 2020, it is predicted that 3.8 million PEVs would have been sold globally.

These cars use HV batteries to power them, which lessens their need on fossil fuels. Given the quantity of private automobiles, the utility grid is undoubtedly impacted by the energy usage while charging. This might need the construction of new power facilities, such as hydro, nuclear, and coal power plants, which would present additional economic and political difficulties in addition to existing ones. Otherwise, it may decide not to utilize x EVs.

II. RENEWABLE ENERGY PLANTS

Over the last ten years, renewable energy plants (REPs), such as solar photovoltaic (PV), wind, and others, have gained

significant popularity and are being used as internal generating facilities to satisfy consumer demand worldwide [1]. Through incentives, subsidies, and other means, governments, businesses, and utilities are encouraging the installation of REPs with modest capacity (in the W to kW range) in residential and commercial buildings [2,3]. In terms of kilowatts, solar PV is one of the potential renewable energy sources used as a roof-top power production system by residential customers. Due to numerous programs promoting renewable energy, the number of such rooftop solar PV systems may dramatically rise in the next years.

The local loads are powered by a solar PV system, which is often utilized as a standalone energy producing system [4]. Handling the intermittent nature of output electricity resulting from changing weather conditions is the key problem in standalone solar PV systems. Therefore, it is usually advised to combine an appropriate energy storage system (ESS) with a solar PV system, creating a hybrid energy system (HES) [5,6]. The capacity of the ESS grows in relation to the days of autonomy when HES is built as an independent system to handle the demand of the residential load [7]. As a result, HES's total cost rises as well.

An alternative to enhancing the ESS's capacity is to install a solar PV system that is linked to the grid. Here, surplus solar PV system energy is exported into the utility grid. Due to the construction of solar PV capacity that is not optimized, lower demand during the day, the lack of ESS, and other factors, the extra energy produced by solar PV systems that are linked to the grid tends to rise [8–11]. As a result, the utility grid receives the most energy possible, which results in a high penetration of solar PV. Because of this energy transaction, the utility business often has serious technological problems [12]. Unbalanced loading of distribution lines, anomalous functioning of protective systems, reliability concerns, etc., particularly on the low voltage weak distribution systems, are a few of the significant technical challenges. The user may benefit from ESS of the electric vehicle (EV) rather than exporting the most energy possible into the utility grid [13].

III. ELECTRIC VEHICLES

The use of electric vehicles (EVs) in environmentally friendly transportation networks has revolutionized the way society across the globe gets about [14,15]. Vehicle businesses are vying with one another to develop the greatest EV technology as an environmentally friendly choice in order to get the most market share via societal acceptability. Incentives, subsidies, and other initiatives have already been launched by several government agencies to hasten the adoption of EVs. This assistance lessens the financial strain of the first EV purchase for regular people. Therefore, the society chooses to use electric cars (EVs) rather than traditional fossil fuel-based vehicles for their everyday commuting needs.

Battery electric vehicles (BEV), hybrid electric vehicles (HEV), plug-in electric vehicles (PEV), and plug-in hybrid electric vehicles (PHEV) are the four categories under which EVs fall [16]. New to this

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category are renewable powered plug-in hybrid electric cars (R-PHEVs), which employ energy sources like solar PV, fuel cells, etc. to power the EV [17,18]. A appropriate ESS is also included in the EV to increase dependability. Rechargeable batteries are often utilized as ESS in EVs. The user must rely more on their own internal generating capacity or the utility provider to charge the EV battery [19, 20]. Therefore, the customer-installed solar PV/battery-based HES would be a tremendous assistance to advertise EV technology.

IV. RESIDENTIAL CONSUMER WITH EV AND SOLAR PV PLANT

The installation of solar PV systems and the use of EVs are both rising daily as a result of the alluring incentives and plans. In Fig. 1.1, a typical home customer from Introduction 3 is shown with an EV and a solar PV-based REP. It is necessary to divide the various loads in the residential system into critical and suitable or controllable loads. Both the utility grid and internal generating resources may be used to power these demands [21].

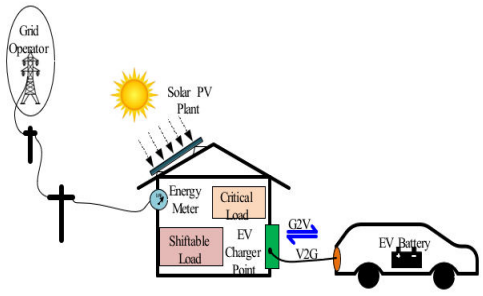

Fig. 1 General schematic diagram of a residential consumer with EV and solar PV

The residential load scheduling is an intriguing research challenge that may be resolved by taking into account the in-home solar PV system and the EV readily accessible in the domestic sector [11]. As a result, the solution produced by load scheduling aids in limiting the penetration of renewable energy [22]. Here, the charging and discharging order of the EV battery may be efficiently changed, allowing the utility grid and solar PV systems to balance the demand [23–26]. Effective DSM methods [27–29] may help reduce the uncertainties brought on by the large penetration of renewable energy sources and electric vehicles while also benefiting the utility business and the customer.

The V2G and G2V methods, as was previously said, entice EVs to join the DSM energy management program. The EV needs a specialized power electronic converter to carry out V2G and G2V operations. The battery of the EV and other on-board energy sources exchange power with the external electrical network via this power converter [30, 31]. The utility grid, a micro grid, or any other local electricity network might be the external power network. The power converter system is often included with the electric vehicle [32]. In order to deploy an energy management solution for residential clients who have both an EV and an in-home solar PV system, it is crucial that the EV has an on-board power converter system.

V. CONCLUSION

The usage of PEV as a backup power source for home loads in emerging and

undeveloped nations is emphasized in this paper. The suggested technology operates as a home Nano grid without interfering with PEV's performance as an electric car. A V2H system has been used for this purpose. The use of solar PV-based car charging is also made in order for the whole system to function as a Nano grid. The PEV is regarded as a home load and is charged by both solar PV and the grid. To lessen reliance on the grid, solar PV panels are recommended to charge the car. In order to capture and use more solar energy throughout the day, both slow DC charging and rapid DC charging are used with constant voltage and constant current charging modes.

In chapter 2, a thorough analysis of renewable energy sources, energy storage systems, the choice of ESS, the charging method for energy storage, electric vehicles (EVs), the impact of EVs as an ESS in micro grids, energy consumption optimization, EV charging at home issues, and solutions to those issues have been done.

The needs of a typical Indian home have been used to design six modes of operation for the V2H system in chapter 3. The proposed V2H system has been modeled and simulate on the basis of these types of operation. To verify these six V2H system operating modes, an experimental setup is created. Here, PEV serves as the home's power supply during load shedding or blackouts and as a residential load when it is charged by solar PV or the grid. The utility and dependability of the power supply are increased by the addition of solar PV panels to the utility grid for charging vehicles. This qualifies it for use in power and distribution networks that aren't well-maintained and often load-shed. Solar PV charging lowers household bills and grid load stress, particularly during peak daytime demand periods. As a result, it functions as an H2G system and peak power plant. Three PEV driving patterns are taken into consideration based on the PEVs' availability at home: "weekdays," "weekends holiday," and "weekends traveling." It is determined that the "weekend holiday" driving pattern is most suited for the suggested V2H system. For the V2H and H2V based backup power supply, the suggested technique has been implemented effectively. This qualifies it for use in emerging and undeveloped nations' shoddy electricity distribution infrastructures.

REFERENCES

[1] M. Wang *et al.*, "A preventive control strategy for static voltage stability based on an efficient power plant model of electric vehicles," *J. Mod. Power Syst. Clean Energy*, vol. 3, no. 1, pp. 103–113, Mar. 2015.

[2] M. Liu, P. McNamara, R. Shorten, and S. McLoone, "Residential electrical vehicle charging strategies: the good, the bad and the ugly," *J. Mod. Power Syst. Clean Energy*, vol. 3, no. 2, pp. 190–202, Jun. 2015.

[3] T. Ha, Y. Zhang, V. V. Thang, and J. Huang, "Energy hub

modeling to minimize residential energy costs considering solar energy and BESS," *J. Mod. Power Syst. Clean Energy*, vol. 5, no. 3, pp. 389–399, May 2017.

[4] M. Bahloul, L. Chrifi-Alaoui, M. Souissi, M. Chaabane, and S. Drid, "Effective fuzzy logic control of a stand-alone photovoltaic pumping system," *Int. J. Renew. Energy Res.*, vol. 5, no. 3, pp. 677–685, 2015.

[5] A. A. Eajal, M. F. Shaaban, E. F. El-Saadany, and K. Ponnambalam, "Fuzzy logic-based charging strategy for Electric Vehicles plugged into a smart grid," in *2015 IEEE International Conference on Smart Energy Grid Engineering (SEGE)*, 2015, pp. 1–6.

[6] L. Zhu, J. Han, D. Peng, T. Wang, T. Tang, and J.-F. Charpentier, "Fuzzy logic based energy management strategy for a fuel cell/battery/ultra-capacitor hybrid ship," in *2014 First International Conference on Green Energy ICGE 2014*, 2014, pp. 107–112.

[7] N. L. Diaz, T. Dragičević, J. C. Vasquez, and J. M. Guerrero, "Fuzzy-logic-based gain-scheduling control for state-of-charge balance of distributed energy storage systems for DC microgrids," in *IEEE Applied Power Electronics Conference and Exposition - APEC*, 2014, pp. 2171–2176.

[8] W. Zhou, M. Li, H. Yin, and C. Ma, "An adaptive fuzzy logic based energy management strategy for electric vehicles," in *IEEE International Symposium on Industrial Electronics*, 2014, pp. 1778–1783.