Numerical Simulation Design of Improved Meta Heuristic Charging Scheduling for Electrical Vehicle Applications

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Abstract

The driving range of an electric car is restricted. There aren't many charging stations in India, so those that exist must be efficient. This study's purpose is to develop a set of criteria for selecting successful algorithms for scheduling EV charging in photovoltaic micro grids Due to the similarities between EV charging scheduling and timetabling scheduling, research works on other fields' scheduling were thoroughly analyzed. This involves scheduling issues. The paper also reviews scheduling constraints, particularly for solar-powered electric vehicles. Charging electric vehicles on smart micro grids using PV is encouraged. Electric automobiles (EVs) are gaining worldwide favour over conventional cars. However, the higher purchase price of an EV may still be the main market obstacle. Customers choose EVs for various reasons, including lower carbon emissions and higher performance. Consumers with environmental awareness and a renewable energy perspective are needed. A recent study found that a 1% increase in renewable energy sources increases EV demand by 2-6%. It is acknowledged that EVs provide new potential for control and consumption flexibility by adjusting the charging power at a given moment. Particle swarm optimization for grid charging electric vehicles Electric vehicles must be recharged after a distance. Because electric vehicles are a viable alternative to internal combustion engines, the technology has grown rapidly. Electric vehicles have fewer emissions, better energy efficiency, less noise pollution, and cheaper operating and maintenance expenses. We plan to use this research to identify efficient algorithms for charging electric vehicles (EVs) in photovoltaic microgrids. The similarities between scheduling timetabling and EV charging prompted a review of literature on scheduling in many domains, particularly timetabling.

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I. INTRODUCTION

Concerns about the effects of climate change have grown in recent years. When it comes to cutting down on greenhouse gas emissions, electric vehicles (EVs) are being considered as an alternative to traditional internal combustion engine (ICE) automobiles. By 2025, battery electric and plug-in hybrid electric vehicle sales are expected to account for 8 percent of total vehicle sales, according to an EIA analysis [3].

On the other side, as the use of electric vehicles grows, so does the burden they place on the power grid when charging. Energy usage in residential areas may rise as a result of the incorporation of electric vehicles into the power grid. There is an additional cost associated with generating and maintaining this additional power consumption. Because of the rapid adoption of electric vehicles, the power distribution infrastructure may become overloaded. With too many EVs charging at the same time, power distribution systems can no longer perform as they should, leading to equipment damage.

Power generation, transmission, and distribution [5] are the three primary components of the conventional power system, and each has a distinct purpose. [6]. Electricity is generated by the generation system in order to meet the needs of the entire system. The transmission system carries energy from the generation side to the distribution side of the power grid. This system distributes power to both commercial and residential buildings.

DERs like solar panels and wind turbines are not considered in this thesis because they are presumed to exist outside the power distribution system in the first place. Therefore, the power distribution system can be considered a load and modelled separately from the generation and transmission systems..

Table 1. Types of EV Charging
[Source-US Standards for EV Charging]

Level	Phase	Voltage (V)	Maximum Current (A)	Maximum Power (kW)	Charging Time (hours)
1	1	120 (AC)	20	1.9	$11-36$
2	1 or 3	208/240 (AC)	80	19.2	$2-3$
3	3	$208-600$ (AC/DC)	400	100	$0.2-1$

It is illustrated in Figure 1.1 that grid to vehicle (G2V), grid to home (V2H), and grid to grid (V2G) EV charging are the three options. Electric vehicles (EVs) can only draw power from a grid that doesn't have any power sources, according to this hypothesis. As a result, we're taking into account the G2V mode with 4 A distributed system

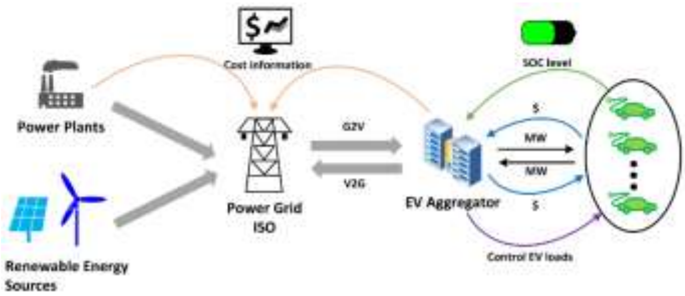


Figure. 1. Vehicle and Grid Interface for Smart Charging [Source- EVI-Australia]

Automobiles powered solely by electricity can be divided into three types: battery-electric cars; plug-in hybrid electric cars; and gasoline-electric hybrid cars (HEVs). A BEV is a vehicle whose entire power source is stored in its batteries. PHEVs and HEVs both have batteries and ICEs, however the HEV's battery is recharged by the braking system, whilst the PHEV's battery is recharged by an external source of energy. Electric vehicles (EVs) are gaining popularity around the world, outpacing traditional fossil-fuel vehicles. However, because batteries are far more expensive, the purchase price of an EV may remain the primary market barrier. For example, the IEEE 1547 standard, SAE-J2894, IEC 1000-3-2, and the U.S. National Electric Code 690 all set limits on the amount of harmonic and DC current that can be injected into a power system when an electric vehicle (EV) is being charged [6-8]. The specifications for an EV charger's connector are SAE J1772 and JARI/TEPCO. Table 1. shows the voltage and current requirements for the various types of EV charging.

II. RELATED WORKS

Gheorghe Badea et al. 2019 [1] Petrol consumption in the transportation sector has increased at a faster rate than in other sectors since mid-2010. The transportation sector accounts for 35% of overall CO2 emissions. In this framework, clean energy plans have been implemented, with electro mobility as the primary directive. The prospect of charging electric vehicle batteries with clean energy from solar autochthonous renewable resources is investigated in this research. A charging station for electric vehicles using photovoltaic panels and batteries as its main components was built, dimensioned, and simulated in operation using an isolated system. We simulated the functioning of the photovoltaic system's ideal configuration using improved Hybrid Optimization by Genetic Algorithms (iHOGA) software version 2.4. The solar energy system must be designed so that the charging station has enough electricity to feed numerous electric vehicles 24 hours a day, seven days a week. The key findings included the system's energy, environmental, and economic performance over the course of a year of operation.

M. Zeman et al. 2016 [2], This research looks into the feasibility of using solar energy to charge battery electric automobiles at work in the Netherlands. The ideal orientation of PV panels for maximum energy yield in the Netherlands is determined using data from the Dutch Meteorological Institute. The energy available for EV charging and the need for grid connection are determined by analysing the seasonal and diurnal changes in solar insolation. Due to the low solar insolation in the Netherlands, it has been established that the PV array's power rating can be enlarged by 30% in comparison to the converter's power rating. Various dynamic EV charging profiles are examined with the goal of reducing grid dependency and increasing the use of solar energy to directly charge the EV. Two situations are considered: one in which EVs must be charged exclusively on weekdays, and the other in which EVs must be charged seven days a week. A priority method is proposed to allow many EVs to be charged from a single EV–PV charger. The viability of connecting a local storage system with an EV–PV charger in order to make it grid independent is assessed. The ideal storage size for reducing grid dependency by 25% is determined.

Thenmozhi. G et al 2020 [3], Concerns about oil deliveries, international norms, and fuel prices are reshaping the locomotive industry. As a result, vehicle technology should be able to respond to these problems. The proposed article outlines a solar-powered electric vehicle that eliminates the major drawbacks of fuel and pollution. It is a global initiative to develop environmentally friendly transportation in order to create a green environment. In general, an electric vehicle's battery is charged from an external power source, however the proposed approach employs solar PV modules to charge a battery by absorbing solar radiation and converting it into electrical power (Photovoltaic Effect). Solar PV modules, which can be connected in series or parallel, and charge controllers provide electrical power to batteries. A Maximum Power Point Tracker (MPPT) controller is also utilised to reach the solar panel's ultimate power point. The DC voltage supplied by the solar PV panel is boosted by the Buck-Boost converter, which then feeds its output to a voltage source inverter. The voltage source inverter converts solar DC power to AC power and then follows the Brushless DC motor that controls the vehicle application. This model contains a Buck-Boost converter, which is used to control the batteries from the vehicle's primary power source, which is a solar PV system. In MATLAB/SIMULINK, the effectiveness of the suggested system was modelled and the results were confirmed.

K. Jamuna **et al. 2021 [4],** The charging method for electric automobiles in parking lots is described in this study. It enables us to assess a wide range of charging scenarios for Plug-in Hybrid Electric Vehicles (PHEVs) and Plug-in Electric Vehicles (PEVs), as well as the control techniques that go with them. Furthermore, this allows us to investigate various communication methods for a PHEV/PEV charging station. The Arduino board is used to monitor the charging strategy. Some vehicles are parked in office parking garages throughout the day and can be charged using solar energy using photovoltaic (PV) cell-based charging systems. Charging with solar energy reduces emissions from the power grid while also increasing charging costs. Furthermore, it provides greater flexibility in preparing for the introduction of new technologies (such as Vehicle-to-Grid, Vehicle-to-Building, and Smart Charging), which will become a reality in the near future. The simulation results show the impact of the suggested charging scenarios on voltage profiles, peak demand, and charging cost in general.

R. Seyezhaim et al. 2019 [5], Electric vehicle (EV) production relies on the use of a suitable DC-DC converter to charge the battery. To maximise battery life and performance, the DC-DC converter should be engineered. Chargers should employ a low ripple, high efficiency DC-DC converter. The Z-source converter (ZSC) and the Quasi Z-source converter are the most often utilised classical converters for charging (QZSC). As a result, the QZSC is recommended over the ZSC because it uses continuous input current, whereas the ZSC uses discontinuous input current, resulting in higher ripple content and lower converter and battery performance. Consequently, QZSC is the recommended battery charging converter, but it has the same duty ratio as a traditional buck converter. A comparison of all three converter types is made in this paper: classical buck converter, switched capacitor QZSC, and QZS buck converter (SC-QZSC). An analysis is performed on the performance characteristics, such as inductor and load ripple current and voltage, to see which one is the best fit for a certain application. The study shows that SC-QZSC is the best option because it meets the charger's specifications. In MATLAB/SIMULINK, simulations are run and results are checked.

Shambhavi Bade et al. 2020 [7] The major purpose of this endeavour is to effectively utilise solar energy. The output of a solar system is delivered to the sliding mode controlled SEPIC converter, to run PV panel at maximum power point. A second order SMC is also utilised to control pulses of single-phase inverter and the regulated 230V 50Hz AC signal is obtained which is supplied to a resistive load. The application of SMC at both ends permits efficient functioning for changes in weather and load conditions. Conventional MPPT methods i.e. incremental conductance, P&O techniques have low tracking efficiency and high oscillations, which may be efficiently handled utilising sliding mode control (SMC) (SMC). It is noticed from the analysis that SMC manages the voltage more efficiently with higher value and less fluctuations as compared to conventional approaches. The statistical analysis in terms of mean voltage, standard deviation of voltage and mean power also prove the superiority of presented scheme.

Qi Liu at al. 2016 [8], Electric Vehicle (EV) is a clean transportation technology that replaces traditional internal-combustion vehicles, according to Qi Liu and colleagues [8]. Photovoltaic power generating is a new energy power generation trend that is environmentally friendly and green. They will be the most effective solution to the current environmental protection and energy problems, as well as ensuring that the electric car charging station is really required. Electric vehicle charging stations that use photovoltaic (p-v) as a power source must not only add energy to electric vehicles, but also to electric cars and the electric grid interface. As a result, its development is critical to the current industrialization of electric vehicles. This study suggests two realistic design strategies for photovoltaic electric vehicle charging stations. Furthermore, the simulation of the charging station's operation provides solid support for the charging station's actual construction through simulation analysis.

Siddiq Khateeb et al. 2018 [9], Electric cars (EVs) are becoming increasingly popular in various nations around the world, according to Siddiq Khateeb et al. [9]. Electric vehicles have shown to be more energy efficient and environmentally benign than internal combustion engines. However, the absence of charging facilities limits the global adoption of electric vehicles. As the popularity of electric vehicles develops, more public locations are adding charging stations. If EVs are charged using the existing utility grid, which is fueled by fossil fuel-based generating, it will have an impact on the distribution system and may not be environmentally beneficial. Because solar has such a high potential for generating electricity from PV panels, charging electric vehicles using PV panels would be a terrific option and a good environmental move. This article provides a global overview of solar PV-EV charging systems and their deployment. Analytical approaches for obtaining information regarding EV charging behaviour, charging station operation modes, and charging station users' geolocation were proposed. The methods given here was both time and money efficient, as well as extremely beneficial to the researchers.

J.A Anderson et.al. 2015 [10] discussed 99.5% efficient all-silicon three-phase seven-level hybrid active neutral point clamped inverter. In this article, the author discusses a 3.4 kW/dm3 (55.9 W/in3) all-silicon 7-level 3-ϕ inverter with an efficiency of 99.35%, setting a novel standard for ultra-effective also power-intensive converters. For this reason, an other technique of the traditional FCC is adopted. The benefit is that the number of FC units is halved by using the DC-link midpoint connection. Since the capacitors need to be connected in series, it is easy to access in the hardware to endure the valued DC voltage, And has an ANPC-level front end, the front end usages a esteemed switch that is quasi of the DC bus voltage switch at the grid frequency.

III. PROPOSED METHODOLOGY

PHEVs serve primarily as a means of mobility for its owner A vehicle-to-grid situation could shorten the battery's lifespan, if it is allowed. Thus, it is necessary to reward clients who participate in the programme. Power transfer from a vehicle to a grid. Incentives that may be offered include return on investment for the service rendered As a result of receiving a financial benefit, offset the cost of a PHEV's purchase. As long as it's managed correctly, the impact battery degradation and vehicle life span could be reduced. However, with a high penetration of PHEVs, vehicle-to-grid makes more sense. The Incentives should be offered to encourage the use of PHEVs in the "idle" condition. Ancillary services are handled by CS. The impact of PHEV penetration in society is being studied. Modelling demand is essential. There are two parts to this problem. The first step is the installation of CS, which involves the configuration of CS. Deciding on the best spot to put the total operational costs for each of the CS's components are calculated. The distinction between their styles of Consumption of PHEV, daily mileage and PHEV quick charging a more in-depth look at the percentage of miles driven using only electric power is provided. In this case we rely on non-renewable resources for transportation. It has been observed that Plug-in Hybrid Electric Vehicles can alleviate the problem. Plug-in hybrid electric vehicles (PHEVs) are the focus of this chapter. The vehicle has been inspected. As the use of renewable energy sources expands, a variety of sources and dynamic electricity price schemes it's more convenient to charge a fleet of Plug-in Hybrid Electric Vehicles. The advantage optimising the charging schedule of PHEVs is critical to their integration. The automobiles Impact of car to grid is also discovered to be influenced by this potential. PHEVs are good for the economy. PHEV charge management must be integrated into study the patterns of V2G power transfers in both residential and business environments distribution is segmented into sections and incorporated into the system as a whole putting the algorithm through its paces.

In order to represent the vehicle's behaviour in the power distribution system, the cost function and limitations of the system are developed in this chapter. Using the cost function, we can estimate how much it will cost to run the house for 24 hours, as well as how much it would cost to run the car for 24 hours. Here, certain statistical data and state transition models are used to quantify the influence of these three uncertainties.

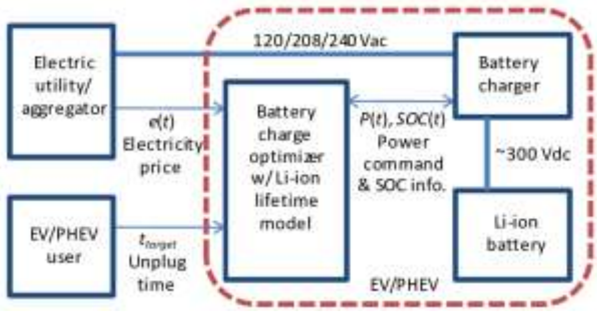


Fig. 2 Charging Management of Electric Vehicle

An important assumption is made in this research. This strategy is based on the premise that all homes' EV charging schedules are predetermined by controllers. The charging schedule dictates how often and at what power rate an EV must be recharged, thus anyone using an EV must adhere to that schedule.

It is projected that there will be a high demand for electric vehicles (EVs) based on recent travel patterns and the energy consumption per mile. In order to keep track of the EV demand, the average journey distance should be updated daily.

It is also possible to estimate how much electricity a house consumes over the course of 30 days by subtracting out the energy consumed by an electric vehicle (EV). A house's electricity use and its charging electric vehicle use are both included in the total energy consumption.

$P^{\text{total}} = P^{EV} + P^{\text{House}}$

Where P^{EV} is the energy consumption of the EV, and P^{House} is the energy consumption of the house, excluding the energy consumption of the EV.

In this section, we study about the vehicle availability model. Figure 3 depicts the state transition model used in this study to model vehicle availability. There are two levels of car availability: 0 indicates that the vehicle is not in the house and 1 indicates that the vehicle is in the house and ready to be charged. As a result of these probabilistic functions, the two statuses are linked. The transition function is a set of probabilistic functions.In order to get the controller's probabilistic functions, you can perform a statistical calculation. Each house's controller keeps track of the arrivals and departures at regular intervals. After a substantial amount of time has passed, the controller's probabilistic function can be easily discovered.

$$(s_{k+1} \mid s_k) = \begin{cases} 1 - p_{01}(t)\ s_k = 0 \text{ and } s_{k+1} = 0 \\ p_{01}(t) \\ p_{10}(t) \\ 1 - p_{10}(t)\ s_k = 1 \text{ and } s_{k+1} = 1 \text{ and } s_{k+1} = 1 \end{cases} \quad (1)$$

Where $0 \leq p_{01}(t), p_{10}(t) \leq 1$

There are a total of n arrivals and n departures per day in the interval " t." p 01 (t) is the number of arrivals divided by the total number of days. The probability of status s (k+1) relies on the preceding status s k, according to the definition. Recursion can be used to figure out how likely it is that a person will end up in a situation in which they are at or near status s (k+1). For each given time t k, the likelihood of a vehicle at home (s t=1) can be predicted from the status.

The market price is often reflected in the electricity system's demand. To put it another way, reducing the system's peak demand is a way to reduce its overall cost. It can then be described as a cost function.

For each 15-minute time interval, C (i) total represents total cost of the ith house, t is the time step defined as 15 minutes and C (t) total represents day-ahead market price for the 15-minute interval. P (i,t) total is the controllable variable indicating the scheduled total energy consumption of the i-th house during this time interval t. Furthermore, because the time step t is a constant, it can be omitted without affecting generality. Costs are transformed as a result of this.

$$\text{m} \ \sum_{i=1}^{N} \sum_{t=t0}^{kT+t_0} \left(C_{i,t}^{total}\right)^2 = \text{m} \ \sum_{i=1}^{N} \sum_{t=t_0}^{kT+t_0} \left(\Delta t^2 C_t^2 * \left(P_{i,t}^{\text{total}}\right)^2\right) \quad (2)$$

$$\text{m} \ \sum_{i=1}^{N} \sum_{t=t0}^{kT+t_0} \left(C_t^2 * \left(P_{i,t}^{\text{total}}\right)^2\right) \quad (3)$$

Using the estimated cost function has been reduced, the scheduled EV charging energy in the i^{th} residence can be determined as follows: When the notion of electric car fleets is further explored, electric vehicle charging can be further developed. It introduces itself. the concept of reducing energy imbalance between solar production and electricity consumption is a good one, On a local scale, demand is straightforward; however, when households group together, the problem of Taking into account more variables. As a result, a wide range of charging scenarios are considered. The thesis takes this into account. Individual charging, bottom-up control, and top-down control are the three main options control. In addition, current approaches are compared to uncontrolled charging as a benchmark.Individual charging, bottom-up control, and top-down control are the three main options. In addition, current approaches are compared to uncontrolled charging as a benchmark. Incorporation of electric vehicles. options.

This approach is swarmed by fish and birds and promotes other bio-education practices. PSO offers a population-based search service, which over time means the person, is partly changing his or her role. The particles that travel in the multi-dimensional search space inside the PSO system. During their flight, each particle changes its location in accordance with their own knowledge and experiences by using the best position of themselves and their neighbours. In multiple, you can find the best dimensional space for moving each particle in the setting point with optimum speed. Three factors inertia, cognition and culture influence particle speed. The inertial part simulates the bird inertia in the earlier way. The cognitive aspect imitates a bird's best place and a social memory that imitates the birds' memory that is the best place for some felines. Multi-dimensional space to search through the room, until the best solution is found. Each adjustment should use the current speed and the distance from the agent to P_{best} and G_{best} can be measured accordingly.

$$V_i^{k+1} = W \times V_i^k + C_1 \times r_1 \times \left(Pbest_i^k - X_i^k\right) + C_2 \times r_2 \times \left(Gbest^k - X_i^k\right) \quad (4)$$

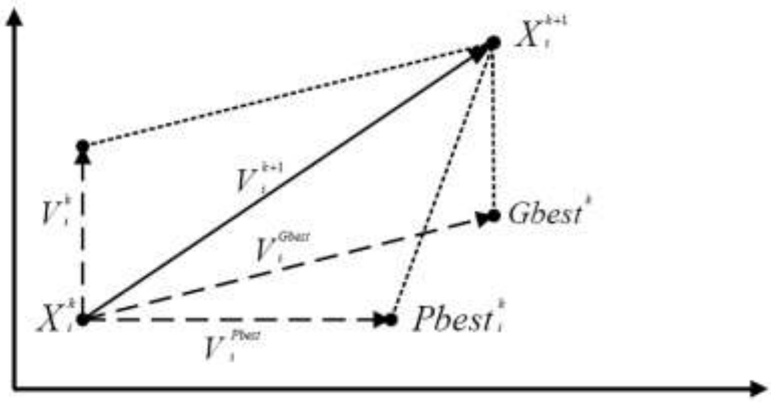


Fig 3: Particle Swarm Optimization Search Engine System

The implementation method of PSO is as follows:
Phase 1 Build an initial individual population to overcome a random location and speed.
Phase 2 Measure the fitness function value of each person.
Phase 3 In each P_{best}, it is ratio to the wellbeing of everyone. If the current solution is better than its P_{best}, substitute the current solution with its P_{best}.
Phase 4 Comparison of the state of health g_{best} of each person. If the well being of a person is better than g_{best}, substitute g_{best}.
Phase 5 All individuals are modified with pace and location.
Phase 6 Step 2-5 Continuous steps until the requirements have been met.
Coelho and Krohling suggested the use in a risky way of regenerating the PSO conditions of truncated Gaussian and Cauchy probability conveyances. In this paper, strategic diffusion is based on PSO Gaussian chances and Cauchy's probability techniques for circulation. In this modern approach, the irregular number of people who work in Gaussian probability is [0,1] years of age.
Gaussian distribution (G_d) The continuous probability distribution family also known as the normal distribution is essential. The location and size of each family can be calculated by two parameters. Therefore, in the local to central theorem the value of Gaussian distribution lies. Since the mean and variance is zero, local convergence helps to find quicker. Gaussian Standard Distribution The distribution C_d is used to produce this. Social area between [0,1] of the Gaussian distribution random number generated (G_d). Random number in between cognitive interval [0,1] area.
The modified velocity equation is given by

$$V_i^{K+1} = K.\left(W.V_i^k + C_1 G_d()\left(Pbest_i^k - X_i^k\right) + C_2 C_d()\left(Gbest^k - X_i^k\right)\right) \quad (5)$$

$$K = \frac{2}{\left|2-\varphi-\sqrt{\varphi^2 - 4\varphi}\right|} \quad (6)$$

Where $\varphi = C_1 + C_2, \varphi > 4$
The system will control system convergence. In order to guarantee the stability of the certificate, the receipt of shrinkage factor analysis (CFA) must surpass 4.0. However, the enhancement element K decreases the multi-like slower reaction. Used the normal element of retrenchment is set to 4.1; i.e. the constant K multiplier should be C1 and C2 0.729.
In particular, the issue variable, the number of particles, the speeding component, weighing down, neighboring estimate, number of cycles and the subjective appraisal of the commitment of the entire social segment perceptual and engagement are influencing many of the fundamental PSO control parameters. Furthermore, the most severe speed and withdrawal factor can affect the execution of the PSO when bracing or restricting speed is used. This segment addresses these criteria. The corresponding weight, speed edge, and pressure factor are exchanged.

IV. SIMULATION AND RESULTS

The charging power utilization and the characteristics of the grid load have a significant impact on the system's efficiency and profitability. The system has been analysed with respect to the load demand of the system and load demand of vehicle. We employed mathematical modelling for schedule assessment utilising particle swarm optimization in order to address the issue of linked network and independent requirement of electric vehicle and grid construction. Results of the proposed work can be classified into following broad categories.

- Modeling of charging parameters of electric vehicle.
- Analysis of load profile
- Schedule of charging and its optimization with help of particle swarm optimization.
- Performance assessment with respect to load demand and different penetration level.

Plots and graphs has been done at different penetration levels, The high penetration of Plug-in Hybrid Electric Vehicles (PHEVs) represent considerable loads that can cause potential overloads and excessive voltage drop and thus it is important to rebuild the distribution system. In this work, the challenge of placement of charging station (CS) and Distributed Generation (DG) with least power loss is taken into account for which Loss Reduction Index (LRI) is proposed. The scheduling of PHEVs considering different vehicle types, proportion of km travelled in entire electric range, and the client desire of charging makes the scheduling problem harder. Thus the Two layer Particle Swarm Optimization (TPSO) is designed in order to minimise the entire operational cost of scheduling.
The persistence model and the multiple analysis are outperformed by the PSO model. The performance is determined on

how well power demand is optimized for the vehicle charging. The model's performance isn't improved by normalising the input data, however deleting the night hours improves it marginally. Before developing the forecasting model, plotting the data, evaluating the correlation and sensitivity analysis between the variables, as well as data cleansing of outliers, are all necessary data preparation processes.

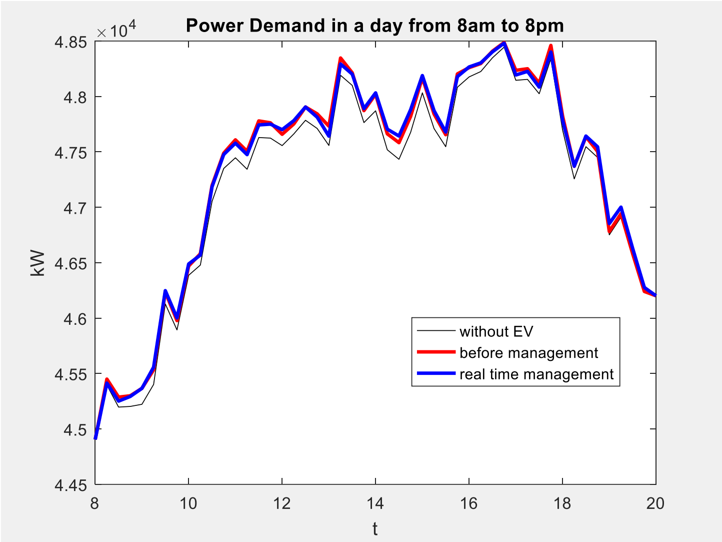


Fig. 4 Analysis of Power Management with Proposed Model at Low Penetration

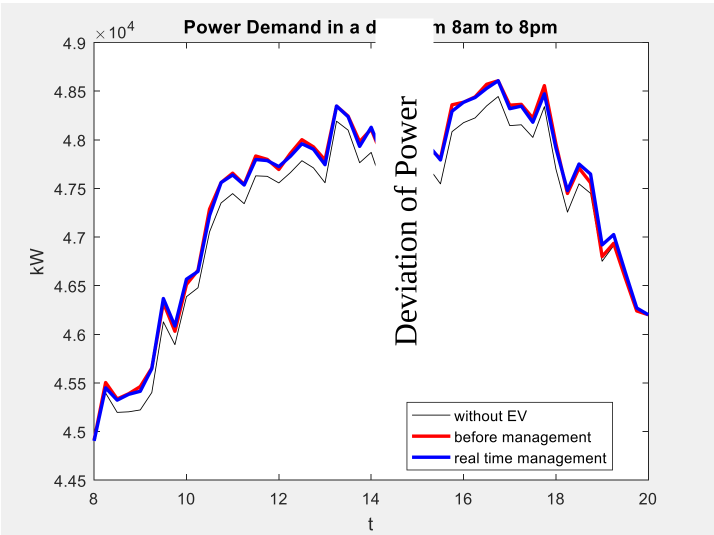


Fig. 5. Analysis of Power Management with Proposed Model at Medium Penetration

Charging Electric Vehicles in grids using particle swarm optimization has been proposed. Electric vehicles can only go so far before they need to be recharged. Because electric vehicles are a viable alternative to internal combustion engines, the technology has witnessed a significant growth spike. There are numerous advantages to using electric vehicles, including lower carbon footprint, greater energy efficiency, reduced noise pollution, and cost-effective operation and maintenance. A drawback of electric vehicles is that they have a restricted driving range from a single full charge, which can lead to range anxiety. – For electric vehicle drivers, range anxiety is the fear that they won't make it to their destination before their battery runs out. Reduced charge times can alleviate some of this worry. It used to take an hour or more to charge an electric vehicle from 0% to 100%, but that time has just been cut in half.

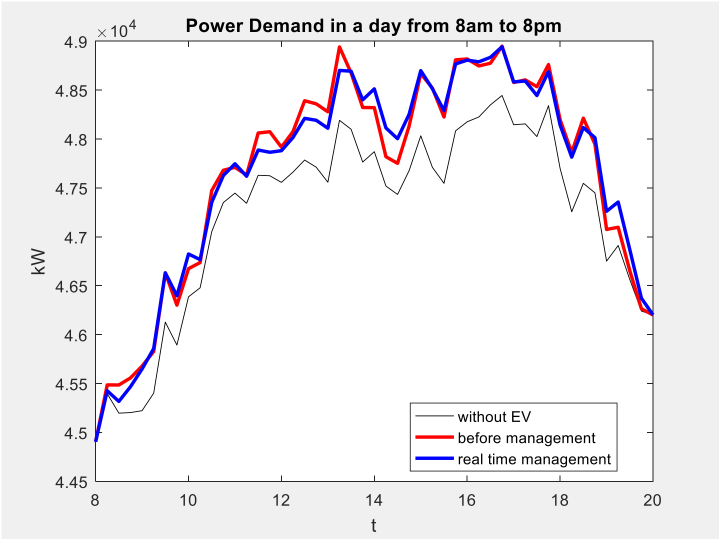
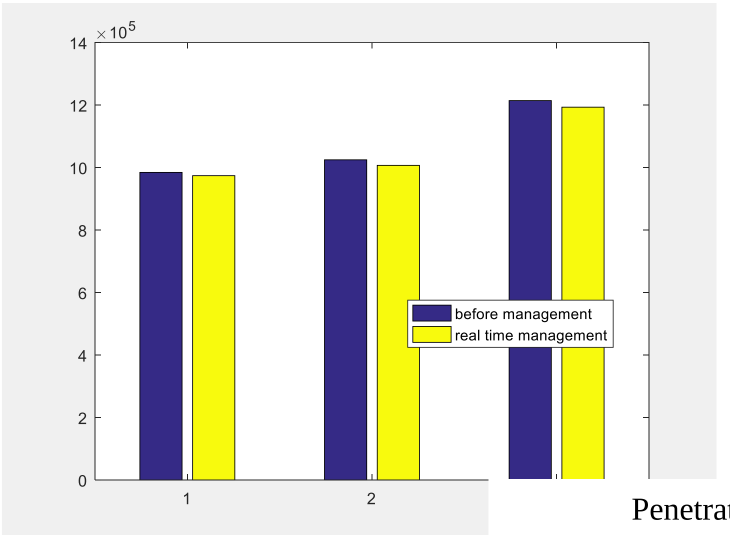


Fig. 6 Comparative Assessment with High Penetration Level of Charging



Penetration Level

Fig. 7 Deviation Analysis of Proposed Model and Conventional Model at Different Penetration Level

Range anxiety can be reduced by improving battery packs and providing public charging stations along significant routes. Some charging stations are not powered by renewable energy sources, which limits the advantages of utilizing electric vehicles. Charge stations powered by renewable energy sources like photovoltaic (PV)-powered smart micro grids (SMG) have been developed that would lessen the dependency on electricity from fossil-based fuels. Micro grids are smaller, more localized versions of the main grid that can function on their own when the main one is down. A reduction in greenhouse gas emissions and the associated costs of climate change and the detrimental impact on health can be achieved through the deployment of PV-powered charging stations. With the exception of some public charging stations, which allow drivers to charge their EVs at any time, the ports at these locations are allotted based on demand. As a result, drivers are unable to make proactive planning decisions, resulting in wasted time. This necessitates the development of algorithms that allow drivers to plan ahead and optimally charge their electric vehicles. Scheduling algorithms that have been employed in other situations may be able to help with this issue. Our country has a limited number of charging stations; as a result, the few outlets that are available must be efficiently controlled. For the purpose of selecting effective algorithms for scheduling the charging of electric vehicles (EVs) in photovoltaic micro grids, this study aims to provide criteria. Due to the parallels between the scheduling of timetabling and the scheduling of EV charging, research publications on how scheduling has been implemented in other areas, particularly timetabling challenges, were thoroughly investigated. Additionally, a discussion of the scheduling restrictions for charging EVs powered by solar panels is discussed in the research. Appropriate scheduling algorithms for EV charging in smart micro grids powered by PV are recommended based on the proposed criteria. This chapter explains the proposed simulation for analysis of several characteristics and figure of merits of the motor and the parametric evaluation with the datasheet for the validation of simulation as well as analysis of errors. The proposed simulation is useful for design and modeling of electric vehicle and to understand accurate mathematical model for the charging schedule of electric vehicles.

V. CONCLUSIONS

In this project, particle swarm optimization has been proposed for charging electric vehicles in grids. After a certain distance, electric vehicles must be recharged. As a result of electric vehicles being a viable alternative to internal combustion engines, the technology has experienced a large growth spurt. The use of electric vehicles has various advantages, including a decreased carbon footprint, improved energy efficiency, less noise pollution, and lower operating and maintenance costs. Electric vehicles. If you're worried about running out of juice, you may want to avoid electric vehicles altogether. Range anxiety is the dread that an electric car will not be able to reach its destination before its battery runs out. Charge times that are shorter can ease some of this anxiety. Charging an electric vehicle from 0% to 100% used to take an hour or more. That time has now been halved. Improved battery packs and public charging stations along major routes can help alleviate range anxiety. In some cases, the benefits of using electric vehicles are limited since charging facilities aren't fueled by renewable energy. In order to minimize our reliance on fossil fuel-based electricity, we've built charging stations powered by renewable energy sources like photovoltaic (PV)-powered smart micro grids (SMG). When the main grid goes down, smaller, more localized versions of it called "micro grids" step in to take its place. PV-powered charging stations can reduce greenhouse gas emissions and the associated costs of climate change and the harmful impact on health. The ports at these locations are allocated based on demand, with the exception of some public charging stations, which allow drivers to charge their EVs at any time. The outcome is wasted time for drivers, who are unable to make proactive planning decisions. As a result, drivers must be able to plan ahead and optimally charge their electric vehicles using algorithms. It is possible that scheduling techniques that have been used in other contexts could be of assistance here. Because the number of charging stations in the country is restricted, the few available outlets must be carefully monitored. Using this research, we hope to give criteria for selecting efficient algorithms for the scheduling of charging for electric vehicles (EVs) in photovoltaic micro grids. Scheduling of timetabling and EV charging have a lot in common, which led to a thorough review of research on scheduling in various fields, notably timetabling issues. In addition, the research discusses the scheduling limits for charging electric vehicles that are powered by solar panels. The presented criteria suggest appropriate scheduling algorithms for charging electric vehicles on smart micro grids powered by photovoltaic (PV). Using the datasheet as a reference, this chapter presents the suggested simulation for analyzing various attributes and figure of merits of the motor, as well as a parametric evaluation to validate and analyses the simulation as well as its mistakes. Using the suggested simulation, electric vehicle designers and modelers can better understand the charging schedule of electric vehicles using an accurate mathematical model.

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