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# ANN CONTROLLER MODELLING AND SIMULATION FOR RENEWABLE SOURCES BASED ELECTRIC VEHICLE CHARGING STATION CONTROLLING GRID

**Dr.V.Anil Kumar**[1], **Dr.G.Madhusudhana Rao**[2], **M. Malyadri**[3], **Y.V. Niranjan Kumar**[4] [1,2,3,4]
Dept of Electrical and Electronics Engineering, Sree Venkateswara College Of Engineering, Nellore (Dt), Andhra Pradesh, India.

## ABSTRACT

The charge-discharge management framework for electric vehicles (EVs) that is suggested in this study (GEMS) is depended on information interchange among a household energy management system (HEMS) and a grid energy management system. Based on knowledge of grid voltage limitations provided by the GEMS and predicted power identities, the HEMS in the system we created chooses an EV charge expelled approach to reduce PV and home operating costs with no disrupting about the utilization of EVs for public transportation. So as to decrease the negative impacts caused by faulty power profiles forecasts, the HEMS then regulates the EV charge-discharge in compliance therewith the established schedule and continually monitored data. The suggested structure was assessed using a computational model for the Japanese system of distribution. The simulation results show that our proposed framework is successful from the standpoint of minimizing the cost of household operation and decreasing PV.

**Keywords:** BESS, Circuit breaker, switch off time period, ESS.

## 1. INTRODUCTION

Reducing CO2 emissions to halt global warming is a global issue. About 25% of the world's energy consumption in 2040 will be accounted for by electricity [1], Therefore, the development of a decarbonized energy system must be led by the power sector. Essential strength autonomy is a significant problem in Japan, along with CO2 emissions. Since the Great East Japan earthquake and the Fukushima Daiichi occurrence in 2011, energy independence has remained at just 6%.. The government plans to increase it to roughly 25% by 2030 in order to resolve this issue [2]. On the other hand, it is intended to reduce the volume of CO2 emissions from the residential sector, which in 2013 reached 201 million, by 39.3% by 2030 [3]. The government is creating brand-new homes by zero common discharge meant for preparation by 2030. These is known as netzero energy homes (ZEHs), that has a yearly net energy ingestion of zero or less, are garnering a lot of attention [4]. Utilizing residential photovoltaic (PV) systems is crucial for achieving ZEHs; in addition, energy storage systems should be installed in homes for flexible use of PV system electricity. Home energy management systems (HEMS) could be installed in all (about 50 million) houses in Japan by 2030 and are anticipated to play a significant role in achieving ZEH [2]. EVs, although initially were utilized for mobility, may be used for storage of energy to make the most of solar power. Energy management could profit economically by linking EVs to the power grid using RESs [5], however the power flow is usually problematic because the power flow generated by EVs has significant and unanticipated temporal variability. Consequently, along with to the effective use of RES, the energy control over EVs must also consider the effect of EV charging and discharging on the grid. On EV charge-discharge management, numerous previous researches have been conducted. SMES will decrease the the backup voltage swings of the transformers brought on by an issue or changeable load on the grid while an EV is charged. As an outcome of the demand on the electrical system, more renewable energy sources, including solar power plants, are being used. The load curve, voltage change, power quality, and consistency can all be improved by SMES. SMES, a superior power compensation, will provide active and reactive power having extremely rapid reaction to control the voltage at charging stations for electric vehicles. Smart grids that use EVs must deal with a much more challenging issue since EVs add unpredictability into the charging or discharging state. Since many faults now frequently occur in urban areas, particularly during thunderstorms, transient stability is crucial. Therefore, the dynamic performance was examined for balanced faults like three-phase to ground faults.

## 2. RELATED STUDY

Initially designed as load levelling devices, SMES is used to smooth out the utility's daily peak demand as well as store energy in large quantities. SMES uses a superconducting coil to store electricity by passing current across it. Its efficiency is exceptionally great because there is no energy conversion into other forms. SMES may suck up or accept power by the grid or load very quickly. Since of its quick reaction, SMES be able to help a efficacy by improving power quality and transmission line stability in addition to serving as a load-leveling device. Consequently, SMES could beshown as a Flexible Transmission system (FACTs). Voltage/VAR support and transmission stability are two uses of SMES at transmission substations Balanced load. In the generation system, SMES applications such frequency control, spinning reserves, and dynamic response is a few examples. The fundamental tenet of SMES is that an electrical current that goes through a coil of wire can produce a magnetic field which may hold energy. While the coil is wrapped with regular wire, a magnetic field results, that generates heat. Since the coil is a DC gadget, an interface that includes a power conditioning system (PCS) is needed as the charge and discharge are typically accomplished via an AC utility grid. Utilising a common solid state DC/AC converter, PCS may alternately switch power to the superconducting coil and the load or grid. The superconducting magnet (DC) and utility grid (AC) are connected by the PCS. DC/AC conversion is performed by using an inverter/rectifier made up of a combination of SCR and GTO with a predetermined duty cycle.For the purpose of calculating plant effectiveness, PCS losses while converting and idling are crucial. The SMES system displays variations in size and duty cycle. The core of SMES is High Temperature Superconducting Coil (HTS). According to how large the purpose has to be, the coil may be a type of toroid or a solenoid. The cost-effectiveness of solenoid coils for large SMES systems is significantly greater. As a result, the battery may continue to encounter high-frequency power fluctuations that cause the battery to charge and drain suddenly. To distribute the power among the SMES and the battery, a modified fraction control mechanism is created. The new method connects the battery and SMES in series, with the SMES handling power disturbances first. The battery serves as an energy buffer to maintain a consistent SMES current. As a result, the battery charges and discharges in accordance with the SMES current rather than utilizing the immediate net power. Comparing the experiment to the previous fraction-based HESS regulation shows that the new control method can protect the battery from sudden power changes.

## 3. PROPOSED SYSTEM

Two energy management systems (EMSs), HEMS and GEMS, are taken into account. A upper side PV, an EV, and a HEMS controller make up HEMS. An OLTC plus a GEMS controller make up GEMS. Automated control allows each EMS controller to automatically alter a component's characteristics at predefined times. Normally, both of these EMSs are run separately to satisfy their unique needs. A key objective for the HEMS is to make sure that EVs are used for mobility while reducing home operating expenses. The HEMS controller is going to charge the EV whenever the PV fails to generate electricity and discharged it to meet the residential power demand whenever the PV generates electricity, while keeping the cost associated with domestic operations as minimal as possible. However, these actions improve opposite power flow, causing the DS to overvoltage, and this in turn causes the PV inverter to begin to decrease the solar energy generated and renders it impractical to earn the anticipated earnings from power sales. Additionally, the cost of residential operation will rise.The GEMS's responsibility is to preserve the superior of the power in the power grid. To keep the voltage within the allowed range in the DS, the OLTC is frequently used. It should be noted that increasing the amount of PV output available reduces the cost of the GEMS because PV will replace the power source with the high gasoline cost. As a result, the reduction in PV curtailment benefits both the GEMS and the HEMS, and by coordinating the two EMSs, there is potential to increase the mutual benefit. In this part, we outline our recommended coordinated design for the EV charge-discharge monitoring. We could reduce the cost of residential operations and PV curtailment by effectively migrating the predicted PV reduction to the EV. Our suggested structure, depicted in Fig. 1, operates in accordance with a comparable timetable suggested in [26], EV operation being its primary concern. It begins by predicting domestic power profiles, which are made up of anticipated residential electricity use and PV production intended by time phase as of 6:00 to 6:00 the subsequently day. The skillfulness among the HEMS and GEMS is then carried out by data sharing during the operational plan phase. Based on the projected PV yield and anticipated PV curtailment because of the voltage restraint, which is information from the GEMS, the HEMS develops an EV charge-discharge strategy to reduce the cost of act activity The anticipated charge-discharge amount would be more or lower than what is required to reach the goals if the predicted PV yield has a significant amount of error. As a result, the EV charge-discharge is controlled during the control phase to follow the given plan and the real-time observed data (referred to as "following control" below). In order to avoid making unnecessary power purchases and missing out on a chance to sell extra PV, the next control is to lower the shortfall and redundant of charge-discharge quantity origin by the mismatch among the predicted and real visibility. Once the HEMS have finished predicting the day's power profiles, the remainder of this section explains the specific steps.

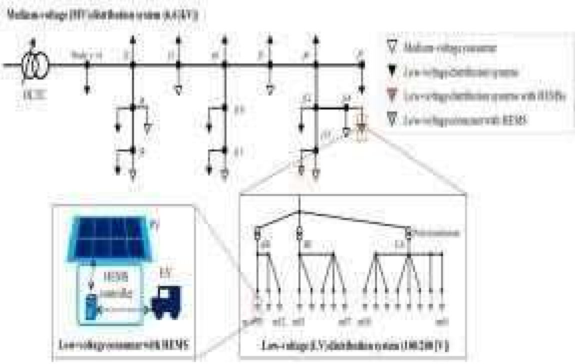

Fig.1.Proposedmodel

## 4. SIMULATION RESULTS

Let N be the indicator set of the homes without HEMS, and let n be the directory of the home with no one. The projected power profiles are used to define the proper voltage control parameter set for the OLTC, EV preliminary program conveyed from the HEMSs y are analyzed nether the voltage limitation, and the EV conditional plan xG = xPV m,xr m,ym ; m M ; m N. The GEMS, which consists of an OLTC and a GEMS controller, manages our grid. Line drop compensator (LDC) approach is used to control the tap ratio of OLTC. [27] in order to keep the DS's voltage stable. With this technique, the tap location is dynamically controlled by the OLTC, which keeps an eye on its secondary current and voltage. consent to it and vt represent the OLTC's resulting current and voltage, correspondingly.

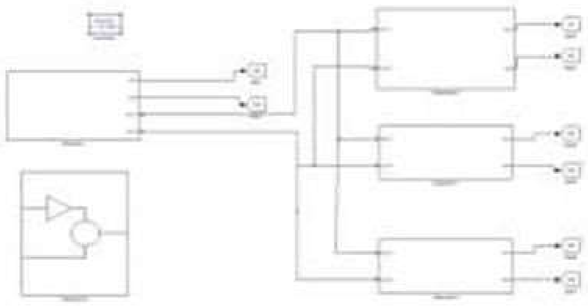

Fig.2.Technical Circuit.

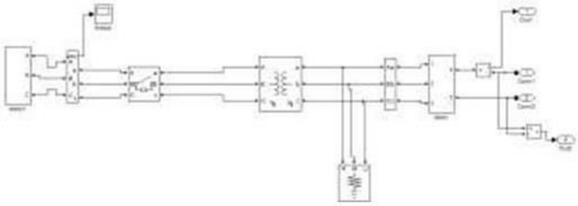

Fig.3. Creating station Simulation circuit.

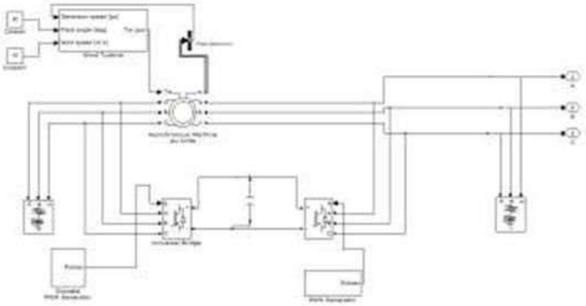

Fig.4. Wind power phase circuit.

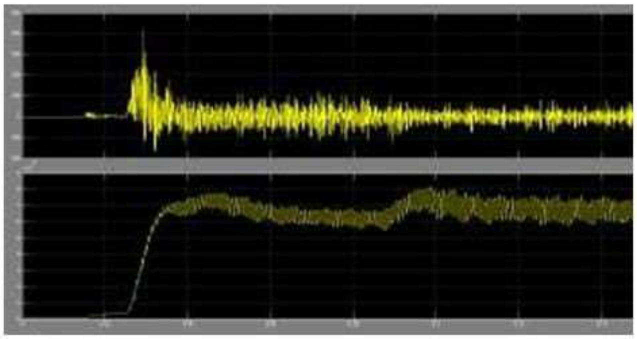

Fig.5.Voltage and current cross ways the Subsystem

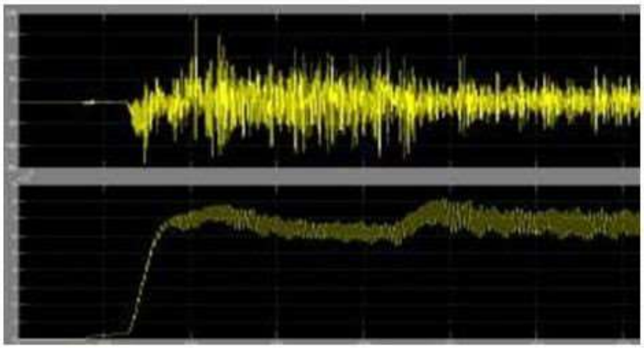

Fig.6. Output voltage across the subsystem 2.

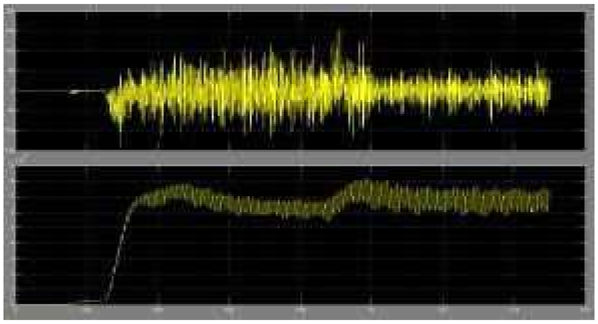

Fig.7. Output voltage across thesubsystem3.

## CONCLUSION

For the purpose of controlling EV charge discharge, we proposed a coordinated design. The collaboration is built on the exchange knowledge among HEMS and GEMS. a combination of the shared data and projected power profiles during the day ahead, the proposed framework generates a daily EV charge-discharge schedule to offer sufficient free energy for charging the constrained PV throughout the day and the fully charged capability for the expected EV drive. We additionally suggested the following preventive steps. The plan controls the EV charge-discharge quantity in line to the real-time monitoring data to minimize the shortfall and surplus of the charge-dis amounts caused by errors in forecasting. The efficiency of the suggested framework has been assessed using a DS simulation framework from the viewpoints of residential running costs and the amount of PV curtailment. Simulation findings showed that the suggested architecture proved effective in lowering the cost of domestic operation and PV reduction via sharing data and consequent regulation.

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