Smart Management of Ev charging Station

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ABSTRACT:

In recent years, car companies like TATA and TESLA have introduced new electric cars to the market, along with setting up charging stations. However, these cars take at least 15 to 30 minutes to charge, and if all slots are filled, customers have to wait a long time.

Our solution aims to connect all electric car charging stations, allowing users to find stations of their choice, particularly beneficial for long-distance travelers with EVs, saving them time. Our system is user-friendly, allowing users to book available time slots. If a slot is unavailable, the system prompts for a new schedule. Users confirm bookings by paying a percentage online.

Additionally, our system provides the shortest route to reach the chosen station, facilitating easy navigation. Charging stations can manage available and booked slots via our interface. The system, developed for Android devices, utilizes time-slot allocation techniques and Google Maps API for navigation.

Our chatbot system allows control via voice commands, ensuring convenience. Online payment gateways enable quick transactions. By using our system, people save time, easily finding and booking appropriate charging stations.

KEYWORDS: Smart management, charging slot, EV Cars, Map.

INTRODUCTION :

In recent years, the global concern over climate change and the depletion of fossil fuels has intensified. To combat these issues, the adoption of renewable energy systems, such as photovoltaic (PV) systems, has become crucial. In Japan, the implementation of Feed-in tariffs (FIT) has spurred rapid growth in PV installations. However, the increasing output from these systems poses challenges to the stability of the power grid, affecting system frequency and voltage distribution. Consequently, there's a need to reassess the FIT system.

Additionally, the decreasing cost of PV installations suggests a significant drop in the price of PV power in the future. To address these issues, this study proposes the concept of EV charging stations that primarily rely on power from PV systems installed in smart houses. These stations act as aggregators, selling power to electric vehicles (EVs) and smart houses. To facilitate this, fixed batteries are utilized for electricity trading.

1. With EVs poised to become the future of transportation, the need for charging stations is paramount.
2. This project aims to provide a platform for booking charging slots at available stations, catering to the needs of customers.
3. The system offers various features, including an AI chatbot for booking stations via voice commands, Maps integration for navigation, digital payment options, and notifications via email and SMS for each activity.

RELATED WORK:

This paper [1] proposes the use of a coreless axial flux permanent magnet machine, which has the attributes of low stator mass, negligible core loss and virtually zero cogging torque, as the propulsion motor. A three-phase inverter with its dc bus fed from a three-port DC/DC converter, which accepts inputs from a solar panel and battery powers the propulsion motor. Galium nitride (GaN) devices are used in the three-port converter, allowing very high switching frequencies thereby reducing the size of the transformer which provides galvanic isolation between the two sources and output. The three-port converter ensures operation of the solar panel at its maximum power point and also allows bi-directional power flow between the propulsion motor and battery depending on operating conditions. Operation over a wide range of speeds, which is required by the solar race car application, is achieved by the new approach of current weakening. This method involves raising the dc bus voltage of the motor side inverter at speeds exceeding the rated.

As small-sized[2] superconducting magnetic energy storage (SMES) system is commercially available at present, the function and effect of a small-sized SMES in an EV charging station including photovoltaic (PV) generation system is studied in this paper, which provides a practical application of small-sized SMES. The comparison of three quick response energy storage systems including flywheel, capacitor (super-capacitor) and SMES is also presented to clarify the features of SMES. SMES, PV generation system, and EV battery are connected to a common dc bus with corresponding converters respectively. Voltage source converter (VSC) is used for grid-connection. With characteristic of quick power response, SMES is utilized to maintain the dc bus steady. During the long-term operation of EV charging station, an energy management strategy is designed to control the energy transfer among PV units, SMES, EV battery, and power grid. The EV charging station system is modeled in MATLAB/SIMULINK and simulation tests are carried out to verify the function and performance of SMES.

Having a network [3] of fast charging stations seems necessary in order to make EVs more attractive and to achieve larger uptake of them. Currently, 50 kW quick chargers that can charge a typical EV in about an hour are commercially available. However, a 240 kW fast charging level which can charge a typical EV in 10 minutes has been introduced in standards. It is expected that this high power fast chargers will be available in near future. A charging station must supply charging power in multi-megawatt levels when multiple EVs are being fast charged simultaneously. Here, charging station topology plays a crucial role in enabling future growth and providing fast charging with best quality of service, lowest cost and minimum grid impact. This paper presents a topological survey of charging stations available in the literature. Various charging station topologies are presented, compared and evaluated based on grid support, power density, modularity and other factors.

Electric vehicles (EVs)[4] are being introduced by different manufacturers as an environment-friendly alternative to vehicles with internal combustion engines, with several benefits. The number of EVs is expected to grow rapidly in the coming years. However, uncoordinated charging of these vehicles can put a severe stress on the power grid. The problem of charge scheduling of EVs is an important and challenging problem and has seen significant research activity in the last few years. This review covers the recent works done in the area of scheduling algorithms for charging EVs in smart grid. The works are first classified into two broad classes of unidirectional versus bidirectional charging, and then, each class is further classified based on whether the scheduling is centralized or distributed and whether any mobility aspects are considered or not. It then reviews the key results in this field following the classification proposed. Some interesting research challenges that can be addressed are also identified.

In order to interface one PV port[5], one bidirectional battery port and one load port of PV-Battery DC power system, a novel non-isolated three-port DC/DC converter named Boost Bidirectional Buck Converter (B3C) and its control method based on three domain control are proposed in this paper. The power flow and operating principles of the proposed B3C are analyzed in detail, and then the DC voltage relation between three ports is deduced. The proposed converter features high integration and single-stage power conversion from both photovoltaic (PV) and battery ports to the load port, thus leading to high efficiency. The current of all the three port is continuous, so the electromagnetic noise can be reduced. Furthermore, the control and modulation method for B3C has been proposed for realizing Maximum Power Point Tracking (MPPT), battery management and bus voltage regulation simultaneously. The operation can be transited between conductance mode and MPPT mode automatically according to the load power. Finally, experimental verifications are given to illustrate the feasibility and effectiveness of the proposed topology and control method.

III.PROPOSEDSYSTEM

This investigates the practical application of small-sized Superconducting Magnetic Energy Storage (SMES) systems in Electric Vehicle (EV) charging stations with photovoltaic (PV) generation systems. It compares SMES with other quick response energy storage systems such as flywheels and capacitors (super-capacitors) to elucidate their respective features. In this study, SMES, PV generation systems, and EV batteries are interconnected to a common DC bus through dedicated converters. A Voltage Source Converter (VSC) facilitates grid connection. SMES, known for its rapid power response, is deployed to stabilize the DC bus voltage. To manage energy transfer

effectively in the long-term operation of the EV charging station, an energy management strategy is devised. This strategy controls energy flow between PV units, SMES, EV batteries, and the power grid.
The EV charging station system is modelled using MATLAB/SIMULINK, and simulation tests are conducted to validate the functionality and performance of SMES in this setup.

IV. CONCLUSION

In this research work has provided valuable insights into optimizing reservation management and effectively allocating time slots for charging stations. We have successfully developed a Virtual Personal Assistant (VPA) to streamline user interactions and enhance user experience. Additionally, our study has introduced a novel approach to shortest route search systems by adapting the combination node algorithm to dynamic locations, inspired by popular online transportation services. Furthermore, we have gained valuable knowledge on integrating payment gateways into systems, thereby improving overall functionality.

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