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A Study on Latest trends in Automobile Industries with Reference to Electric Vehicles and Smart Grids

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Abstract
Automobile is trending now a day because every use personal vehicle for travelling and this paper reveals some of the aspects about the one of the personal vehicles i.e Electric Vehicle and further about Smart grids for that electric vehicle. This is about how Electrical Vehicles can contribute to grid stabilization, simulation-based research for smart charging, grid communication, block chain based technology for Electric Vehicles with the purpose of achieving the international environmental and sustainable goals. Smart grid and future electric vehicle is the most emerging issues that are integrating in the near future. With the increase numbers of EV's, new challenges are imposed to the grid, in terms of synergistic, continuous, dynamic, and stable integration of electric mobility problems. What was impossible to achieve back in history, eliminating Electrical Vehicles from the market due to its disadvantages is now possible via the Smart Grid integration. This paper presents a review of electrical vehicles and the novel proposals on how to smartly integrate it into the Smart Grid. Moving forward the future characteristic of a smart grid includes, flexibility being able to adapt to the changing needs that a system could require, clever and safe these are the values of the smart grid, efficient where minimizing new infrastructure for electrical grid is the aim, open to be integrated with renewable energies safely, and finally sustainable a key point to the future environment and sociable acceptance. Due to the world vision of smart grid, things are changing rapidly.
Keywords: *Recent Trends, Smart Charging, Smart Grids, Automobiles, Electric Vehicles, Block Chain and EV.*

1. Introduction
The Smart Grid is indeed the key towards smart Electrical Vehicle (EV) charging and is tasked with the responsibility of not only providing stability but also control that is needed in mitigating load impacts. In addition to that, the Smart Grid is also tasked with the responsibility of protecting components of distribution networks form ultimately being overloaded by the Electric Vehicles. A Smart Grid is defined as being an electricity network that enabled the flow of electricity on a two-way basis as well as data with the use of "digital Communications technology" thus enabling the detection, reaction and even the pro-act change in both usage and even multiple issues. It is prudent to note that smart grids usually have "self-healing capabilities" and therefore make it possible for electricity clients to become "active participants". Smart grid technology enables the matching of supply and demand at the local level. The ability to be flexible in the energy system is an essential component of a smart grid. The millions of Electric Vehicles (EVs) expected over the next few years offer flexible demand that might be optimised to deliver smarter outcomes for energy network operators and consumers.. It is prudent to note that smart grids usually have "self-healing capabilities" and therefore make it possible for electricity clients to become "active participants".

2. History of Electrical Vehicles
The electric automobile rose to prominence in the late 1900s as a viable alternative to steam cars, which can take up to 45 minutes to start in the morning, and gasoline cars, which require sophisticated gear shifting and must be cranked to start. Thomas Davenport developed the first electric motor in 1834. Thomas Parker, dubbed "Europe's Edison," produces the first commercially practical electric car. Unlike many of Parker's other inventions, such as electric trams, underground lights, and "Coalite," a smokeless fuel, the automobile receives little attention. As a result, electric automobiles are promoted as being

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particularly suited to women due to their lower physical demands. Moreover, a third of all cars on American roadways were electric by the turn of the century. However the electric car's prominence will be short- lived as technological development will soon overtake gasoline power. John Good enough and his colleagues at Oxford University devised the cobalt-oxide cathode, which is the heart of the lithium-ion battery, in 1980. Batteries made possible by this technology will power all kinds of consumer devices, as well as electric cars that can travel hundreds of kilometers on a single charge, in the decades ahead. Good enough and two other researchers were awarded the Nobel Prize in Physics in 2019 for their contributions to the development and improvement of lithium-ion batteries [1-4].

3. Electric Vehicles and Smart Grid

It was noted that with the most recent oil leak in the Gulf of Mexico, the use of EVS with their great potential for both emissions reductions and gasoline savings are indeed generating immense political and consumer interests. However, it is further noted that owing to huge amounts of electricity that is required in order to charge the EVs, they are also resulted in generation of significant concerns among the utilities that are tasked with the supply of electricity on the smart grid. It is worth noting that in Smart Grid, PHEVs have the potential of curbing emissions as well as reduction of the transportation costs. Another vital and unique advantage that is associated with the PHEVs is their capability in integration of the "onboard energy storage" with the "power grid" which can ultimately help in improvement of efficiency as well as increasing reliability of the "power grid". This is prone to result in serious impacts of "peak demand" on the power grid. This is because "home charging stations" are typically known to draw an "electricity load" of about 6.6 Kilowatts translating to 240 volts and 30 amps. Also comprises of electric vehicles and indeed, there are interesting possibilities that are attached to it. The smart grid involves the smart residential charging that implies to just plugging in one's car after commuting. Rather, it involves smart charging which enables the times of charging to be shifted based on the grid loads as well as on the needs of the owner which can be based on the utility's monetary incentives. That apart, the smart grid in electric vehicles also makes use of the Vehicle-to-Grid or the V2G which is a technology that helps in enabling connectivity of electric vehicles with the "distribution grid" thus helping in provision of demand services. The Vehicle-to-Home or the V2H involves provision of connection between a vehicle and the home of the owner thus ultimately helping in the provision of additional energy sources to such a home. The vision in this technology is that such a type of connection will help in provision of load shaving services especially during the peak hours and even as a major source of "back-up energies" in times of outages. The electric vehicles have an impact on the smart grid in that it also involves the renewable as well as storage integrations. This is true since if electric vehicles are part and parcel of the complex "new grid of distribution", then they will also effectively integrate with the storage and even renewable in such a grid.

3.1. Charge Point Management

The use of' smart' charge points that can broadcast and receive data as well as respond to external signals to adjust charging levels will be critical in regulating the impact on the power grid. Although most EV charging will take place at home or at work, spreading it out to other sites and at different times of day will help control the network's impact. Number of Charge Point management options exists each of which offers different amounts of flexibility integration of electric vehicles will risk being not only as bottlenecks but also will ultimately find

4. Electrical Vehicles and Environment

The growth of the EV market both in Europe and the rest of the World in last years, arose a relevant question: to what extent are electric vehicles eco-friendly and cost effective in comparison with internal combustion engine vehicles (ICEVs)? (C.M. Costa 2021) The economic payback is demonstrated to be quite variable in European countries. The economic payback can range from 2500 km (Portugal) and 335 000 km (other nations) (Czech Republic). When compared to the economic return, the environmental benefit is reached over relatively short distances of 30 000 km. It has been proved that in the event of a collision, fuel cell vehicles pose no greater risk than traditional autos, though further research is required to confirm this. When compared to electric vehicles, various restrictions exist, including the high cost of hydrogen production, the lack of adequate supporting infrastructure, and the link between battery capacity and vehicle mass. Thus, hydrogen FC has the potential to be a future clean energy source for vehicle applications, but its high cost (platinum catalysts), flammability, and storage problems prevent widespread use in the market. EVs, particularly BEVs and PHEVs, have been gaining appeal because of their capacity to provide many environmental, societal and health benefits. These include:

4.1. Energy Efficiency

BEVs consume three to five times less energy than traditional ICEVs. This unrivaled energy efficiency could lead to a significant increase in private transportation, benefiting both the economy and the environment (Norway) to 190 000 km (Poland). It is also demonstrated how economic and environmental benefits are influenced by mobility profile, with longer trip distance profiles providing greater benefits.

4.2. Environmental Benefits

Air pollution issues can be addressed, particularly in metropolitan areas, where a high number of people are exposed to dangerous pollutants emitted by transportation vehicles, by using BEVs with zero tailpipe emissions in conjunction with an energy mix mostly based on renewable sources.

4.3.Cost effective

With the reduction of the purchase prices between BEVs and ICEVs, BEVs promise potential transportation savings, as they can have much cheaper operating and maintenance expenses. Nonetheless, this is heavily reliant on the individual's mobility profile, geographic area, and BEV choice. Furthermore, numerous governments give purchasing and charging incentives, which help to anticipate the point at which BEVs become economically viable when compared to ICEVs.

4.4. Noise reduction

BEVs are quieter than ICEVs, which helps to reduce noise pollution and is better for the environment.

4.5. Grid stability

BEVs have the ability to operate not just as chargers by drawing electricity from the grid, but also as power sources in the event of a power outage. In this way, grid stability can be improved to the point where BEVs can act as energy buffers against the dynamic evolution of power system events. With this application, BEV can provide economic benefits by replacing traditional stabilisation devices such as power walls, hence eliminating the expense of their acquisition.

4.6.Energy security

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5. Novel Solutions to Grid Stabilization

The following is to demonstrate different research using simulation, suggestions, models on how to develop the integration of electric vehicles in smart grid taking into consideration different aspects of the system.

5.1. Solar Photovoltaic Based Electrical Vehicles for Grid Support

Using the MATLAB/Simscape environment, the suggested solar PV-based EV charging system was built. The results demonstrate that it can sustain the grid and charge the EV even in the face of fluctuating grid disturbances and irradiance. The charging system consists of a solar PV array with a bidirectional DC-DC converter for EV battery charging, a single-ended primary-inductor converter (SEPIC) DC-DC converter, a three-level inverter with an LCL filter for grid interface, and auxiliary controllers. The SEPIC converter is controlled with a maximum power point tracking algorithm via a bidirectional DC-DC converter and controller in order to maximise power extraction from the solar PV array and charge the EV battery. With the ability to continuously charge and sustain the grid, the controllers can enhance grid performance even in the face of disruptions and varying PV generation. Additionally, the charger can improve fault ride through capabilities for distribution networks using renewable energy sources and provides active and reactive power support through V2G power transfer [24]. Solar PV-based EV charging infrastructure offers high-efficiency and dependable EV performance through vehicle to grid (V2G) and grid to vehicle (G2V) operation. It also offers ancillary services to the power system, like voltage and frequency regulation, peak shaving, and bidirectional power flow to maintain utility grid balance.With the smart grid, V2G operation can also act as a controllable spinning reserve. A solar PV-based smart EV charging system is proposed to achieve the satisfactory functioning of multiple functions through the deployment of integrated control. The smart charger was designed to improve grid support through V2G operation and charge the EV battery using solar PV electricity. Single-ended primary-inductor converters (SEPICs) are preferred over other DC-DC converters for connecting PV arrays to DC-links due to their effective voltage regulation, low ripple current, and low electrical stress on system components. A DC-link connects the solar PV array, power grid, and EV battery through independent power converters with algorithmic designs for EV charging and grid feeding. An LCL filter reduces harmonics and increases power factor in order to enhance the system's power quality. The design and control of a SEPIC DC-DC converter with MPPT to extract the maximum power from solar PV is one of the study's main contributions. Another is the design and control of a SEPIC DC-DC converter with MPPT to extract the maximum power from solar PV. (ii) Designing and managing a bidirectional DC-DC converter with an intelligent charging/discharging strategy for V2G operation; and (iii) modelling and controlling an LCL filter and voltage source converter to enhance grid support [5-8].

5.2. Integrating Electric Vehicle Communication in Smart Grids

This essay explores how EVs' unpredictable charging can have a substantial impact on the electrical system and present difficulties for grid operators. In order to move forward, the authors of this journal are providing a research and analysis test system that has been designed in accordance with ISO/IEC 15118 standard, showcasing the performance of said system in an electrical network. In order to investigate the real-time functionality of the EV communication protocol with the network components, this research constructs a test system. Regarding universal applicability, a model-based approach is being sought for the realisation of technical communication. The entire test mechanism in RT-Lab is based on a real-time simulation. A server and a charging controller box (CCB) are in parallel communication with an automated battery model. Because of the system's inherent automation, EV charging may be modelled based on information exchange with the CS and, consequently, with charge management. The battery that is represented in the OPAL-RT real-time simulator functions like an EVCC. It exchanges energy-related data with the server and talks to the CCB to manage charging in real time. Both the test system and the smart grid's integration of this communication standard were examined. Ten homes, one electric vehicle (EV), four photovoltaic (PV) plants, and a single-phase low voltage grid make up the selected simulated power source. All of these units are connected to a specially designed charge management system. The results show how EV and CS bidirectional intelligent communication can support power balancing in the Smart Grid. By simulating electric vehicle charging with this test method, EV simulations in the future will become more accurate and compliant with ISO/IEC 15118. Furthermore, the automatic system will be incorporated into the simulation as part of the Fit2Load project, enabling the modelling of multiple EV charging in accordance with ISO/IEC 15118 standards.

5.3. Smart Charging

Through the coordination of multiple plug-in hybrid electric vehicles (PHEVs), this work presents a new Smart Charging Scheduling Algorithm (SCS-Algorithm) for charging solutions in a smart grid (SG) system. Utilities are concerned about voltage strains, overloads, and declines in smart grid performance that arise in distribution networks with

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a high volume of PHEV charging events. Random and disorganised PHEV charging on recently emerged SG can lead to major power outages, stability issues, and blackouts. Therefore, by implementing Grid to Vehicle (G2V) and Vehicle to Grid (V2G) technology in parking lots, controlled by various aggregators, a smart charging strategy is proposed and developed for charging coordination of PHEVs (e.g., every 30 minutes) to minimise total daily charging cost. Two test cases are used to validate the feasibility of the work and to determine the ideal charging cost when G2V and V2G technology are used simultaneously. In test case 1, 30 PHEVs are used with a 9:1 ratio of PHEV-30 to BEV, but in test case 2, 30 vehicles are used with a 5:4:1 ratio of PHEV-30, PHEV-40, and BEVs in the parking lot. In this research, a unique SCS-Algorithm is proposed, with stochastic initialization of various attributes and optimization techniques, to determine the optimal scheduling of numerous PHEVs while taking into account practical restrictions and determining the optimal overall daily cost. Both techniques are included in this algorithm, G2V and V2G. In this paper , they propose optimal charging architecture between a smart home and a plug-in electrical vehicle. This solution architecture is expected to optimize energy and power sharing between a plug-in electrical vehicle and a home with minimal costs with demand variability. It also reflects battery energy storage system's state of charge to make flat demand response schedule. A smart charging method and architecture for plug-in electric automobiles and smart houses is included. It is possible to create an optimal charging system for plug-in electric automobiles in the smart grid using this architecture. The proposed design is cost and energy efficient for a plug-in electric vehicle's optimal charging and energy-sharing algorithm. At the smart house or building, it can also take into account cost functions and restrictions like dynamic price, demand response, and battery state-of-charge. This architecture and technology can efficiently control the battery energy storage system. Enough energy transmitted by electricity and renewable energy sources can be stored in the smart home or building's battery energy storage system (BESS) for later use. Another published paper discusses the Progression of smart Metering infrastructure for electric vehicle charging stations. It Describes public charging point development with smart metering to guide the user, which can precisely monitor the transfer of electric energy when the problem occurs auto shutdowns, when charging is done to describe the level, stops the charging process which ensures saving of energy which can be further utilized to measure the electrical energy while charging process, kwh meter with accuracy up to 0.5 watts is used in the charging station. For data processing, a microprocessor is used which will show the data on the 15-inch screen for user information. Comprehensive Management Strategy for Plug-in Hybrid Electric Vehicles using National Smart Metering: In this work, a complete management strategy (CMS) for plug-in hybrid electric vehicles (PHEV) is developed, based on Iran's national smart metering program (FAHAM). The proposed plan also takes into account PHEV charging management and billing solutions. To shift the charging load of PHEVs and maximize load factor, an optimization method is used. AMI provides system operators and users with the knowledge they need to make informed decisions, as well as the power to carry out those decisions that they are currently unable to carry out. An optimization proposed model was solved using mixed integer linear programming (MILP) solver CPLEX under GAMS on a PENTIUM IV, 2.6 GHz processor with 4 GB of RAM. The charging load of PHEVs is shifted through optimization to achieve the following objective function: maximum load factor. In order to analyze the robustness of the CMS. The problem has been addressed in two scenarios: Scenario 1**:** There is no control on the charging procedure of the PHEVs. Scenario 2: The charging procedure of PHEVs is managed by the distribution system operator in order to maximize the load factor and flatten the load profile of the feeder. Results has shown that in scenario 1 the uncontrolled charging demand of PVEV's can cause difficult situations for distribution feeders by overloading it. Meanwhile scenario 2 controlled charging through FAHAM infrastructure and CMS strategy, the load profile of the feeder is flattened. Using controlled charging results in a

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higher load factor, which can be viewed as a major opportunity for the system operator to produce a far more efficient system using FAHAM infrastructure. A complete management approach for Iran is offered, based on the country's national smart metering scheme. The proposed technique aids the system operator in improving the overall efficiency of the system. The charging was carried out during the hours with lower loading, while the charging demand was reduced during the hours with higher loading. The adoption of FAHAM infrastructure for controlling PHEV charging has removed the risk of an increase in electricity demand during the network's peak load, according to simulation results.

5.4. Block Chain System in Electric Vehicle

Block chain technology is known for being used in the financial service, but little did we know it is also being used in Securely sharing medical information, Logistics, and supply chain tracking, data storage, etc. Blockchain is a technology integrated distributed data storage, peer-to-peer transmission, consensus mechanisms, encryption algorithms and other computer technologies, which collectively maintain a reliable database through a decentralized and trusted approach. It has built the mutual trust and resource sharing platform: "renewable energy tracing for EV charging" using the technical features and advantages of block-chain. By utilizing block-chain technology, the platform connected Beijing Power Trading, Qinghai Power Dispatch, Smart Internet of Vehicles Platform, local power operators, and EV charging users; introduced the tracking and matching mechanism of renewable energy products for EV charging orders; and established the infrastructure for the formation of EV renewable energy consumption certification by utilizing smart contracts, which formed the basis digital certification of EV renewable energy consumption. The method that has been considered, for renewable energy tracing is the following:

1. Using an architecture design of blockchain technology tracing renewable energy for electrical Vehicle charging platform. Connecting the power trading center and users charging app e-charging, which provides a technical foundation for EV users to engage in the dissipation of clean energy while also improving the charging experience and sense of participation.
2. The blockchain platform includes the charge operators, electricity trading centers, and dispatching centers formed a consortium chain with multiparty participation.
3. Data uplink and smart contract development, includes the design blockchain transmission services and interface standards to realize data uplink of power trading centers, dispatch curves, charge orders, and other related information, such as renewable power trading contracts, contract announcement numbers, originators, receivers, power types, and dispatch curves. Simultaneously, a smart contract program is being built to automatically generate Green Pass for each renewable energy charging request, and to realize the generation and circulation of Green Pass.
4. Renewable energy tracking management system developed on the basis of the Smart Vehicle Networking Platform. It can get renewable energy transaction data as well as dispatching curve data. The user order matching mechanism and the characteristic curve algorithm were created.
5. In addition, the system provides Green Pass with full life cycle maintenance. Green power contract management, green power dispatch management, green power inventory management, green power order matching management, Green Pass management, and other functions are among the primary responsibilities. Simultaneously, the app offers features such as displaying Green Pass on the blockchain and checking Green Pass on the blockchain.
6. An app is considered in this method that includes online renewable energy selection, Green Pass management, charging report, and other features are given for charging users on the basis of e-charge APP 3.0 in order to promote user engagement and experience.
7. To provide green power configuration and usage bias settings, develop a green power charge traceability module. The traceability of user

charging orders is realized through interaction with the underlying block-chain platform, green power tracing, and other systems, and at the same time, the blockchain link port provides users with Green Pass inquiries and regularly generates green power charging reports, enhancing the user's sense of participation and honor.

8. Visualization for the block chain information was created also that display interface based on the block-chain platform, which includes real-time displays of green power transactions, green power usage, Green Pass, and other related data.

Conclusion

The world is steadily moving forward with renewable energy, within a smart grid solution [9-11]. The evolution of the "smart grid" includes electric vehicles, and there are some intriguing possibilities associated with them. Smart residential charging, which entails simply plugging in one's automobile after commuting, is part of the smart grid system. Smart charging, on the other hand, allows charging times to be changed based on grid loads as well as the demands of the owner, which can be based on the utility's monetary incentives. Electrical vehicles might be the solution for many obstacles that the grid might face from renewable energy resources. The solutions that have been offered whether it's a solar photovoltaic based electrical vehicle for Grid Support, integrating EV's in smart grid system using ISO/IEC 15118 protocol, Smart Charging, or block-chain technology being used for grid and electric vehicle support these demonstrate how the EV's can contribute to the environment and Grid stabilization. And also, further Solar power is making rapid change to the power generation aspects and it is not harmful for the society and environment. BY Using electric vehicles, we can save environment from the Air pollution and we can gift healthy environment to our future generations.

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