ANN BASED GRID CHARGER FOR ELECTRICAL VEHICLE APPLICATIONS

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Abstract: This paper present to electrical vehicle charger by using ANN (Artificial Neural Network) controller is presented in this study. The charger configuration consists of an AC/DC rectifier up front and a DC/DC converter down back, with a DC link capacitor separating the two. And its power flow, the charger's design makes it possible to adjust the grid's voltage. To test the charger's efficacy, it was implemented in a MATLAB/Simulink environment. The simulation findings attest to the efficiency of an ANN based charger in controlling grid voltage when electric vehicles (EVs) are being charged and discharged in a different way.

1.INTRODUCTION

The 21st century's rapid technical advancement and population expansion led to a sharp increase in worldwide energy consumption. The rise in the world's energy usage is presently mostly attributable to the transportation sector. This situation raises concerns about carbon emissions and energy security because of the transportation market's heavy reliance on fossil fuels. The electrification of the transportation industry is a good way to address the environmental and energy issues in the long run. Numerous actions have been done by governments all around the world to encourage the use of electric vehicles (EVs). For instance, in order to address issues with national energy security, car emissions, and the expansion of local production capacity, India introduced the "National Electric Mobility Mission Plan 2020" in 2013. Affirming its dedication to the Paris Agreement, by 2030, the Indian government wants to see a big move toward electric cars. Provides an overview of the present state and anticipated developments in electric vehicle (EV) propulsion technology. A comparison between an electric vehicle (EV) and a diesel-powered car is provided in to highlight the advantages of electric transportation. However, effective control mechanisms must be put in place for their inclusion in accordance with the newest micro grid paradigms in order for EVs to be fully adopted. One of the main concerns that EV chargers must address is the time it takes to conduct the process of charging the battery, and many of these ways are related to power quality problems. Both strategies have benefits and drawbacks, as can be shown. The energy box is in charge.by using control signals, the G2V/V2G working modes may be regulated.

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Demand management is also possible, as well as solar and wind energy. Regulated distributed generation, functioning G2V/V2G phases has the ability to transform aneighborhood into a smart and workable standalone micro grid. Given the environmental and energy concerns, large- scale grid-linked EVs. The electrical system faces significant problems notwithstanding the economic benefits. However, the primary problems with the electrical system caused by EV charging are harmonics, grid overload, system instability, and voltage drop system losses, etc.]. Specifically, how EV charging affects the Numerous reports of a drop in power grid voltage have been found in the literature. The innovative ANN-based EV charger presented in this study is Comprised comprising a boost converter at the back and a front-end rectifier connected by a DC link capacitor. The ANN controller is responsible for regulating the rectifier and converter. The system's power flow may be controlled in both directions by the controller. Due to the fact that power can flow in both directions, an ANN controller is able to manage the grid voltage by compensating for reactive power through a rectifier and, while in converter mode, adopting a variety of charging and discharging states. The papers' Section II outlines a charger's precise construction and many operational modes. The development of an ANN structure for regulating rectifier and converter operation is covered in Section III. Section IV presents the charger's simulation findings in order to verify its efficacy in variousmodes of operations and its efficiency in regulating grid voltage. Finally, section concludes the essay.

2. Ev Charger from Grid

In order to fully monitor and analyses the active and reactive power flow between the power grid and the EV battery, the power grid operators employ dynamically reach EV charger. Therefore, a strong and dependable fromthe source to charger and is essential to the EV utility. Demonstrates the charger setup's power circuit schematic. With the aid of a universal bridge for AC/DC conversion and a buck-boost converter for DC/DC conversion, the charger can be shown operating in two separate conversionstates. Two separate controllers are used by the charger, principally to regulate the operations of the AC/DC converter and the DC/DC converter. Reactive power control for the management of grid voltage is implemented by the charger in the AC/DC converter using a voltage-controlled method. The DC-link capacitor provides the required reactive power supply. By controlling the amount of reactive power flowing, the charger can overcome the difficulties caused by grid voltage drops. The converter's second stage is a DC/DC stage. The converter has unique characteristics in each of its modes of operation.

3.ANN BASED CHARGER CONTROLLER

The ANN controller has two outputs: the first signal regulates the voltage level through a rectifier between the grid and the DC-link capacitor, and the second signal controls the current and is delivered to the Buck/Boost converter to maintain the charging current. Grid voltage regulation and DC-link voltage regulation are used to achieve the voltage-controlled scheme. In order to compute the essential inputs for the controller, several parameters are calculated. First, the difference between the computed and reference DC-link voltage is determined. The ANN controller receives the estimated error and produces a matching phase shift angle in response. Second, from the instantaneous grid voltage, the direct and quadrature voltages are derived. The desired direct voltage and the actual voltage are contrasted. The amplitude of thenecessary modulation signal is determined by the errorbetween the two inputs supplied to the ANN Controller. in order to regulate the DC/DC converter. For the buck and boost operation modes, the main operating equations may be determined using to for the buck mode and to for the boost operation, respectively.

https://doi.org/10.1051/e3sconf/202454002014

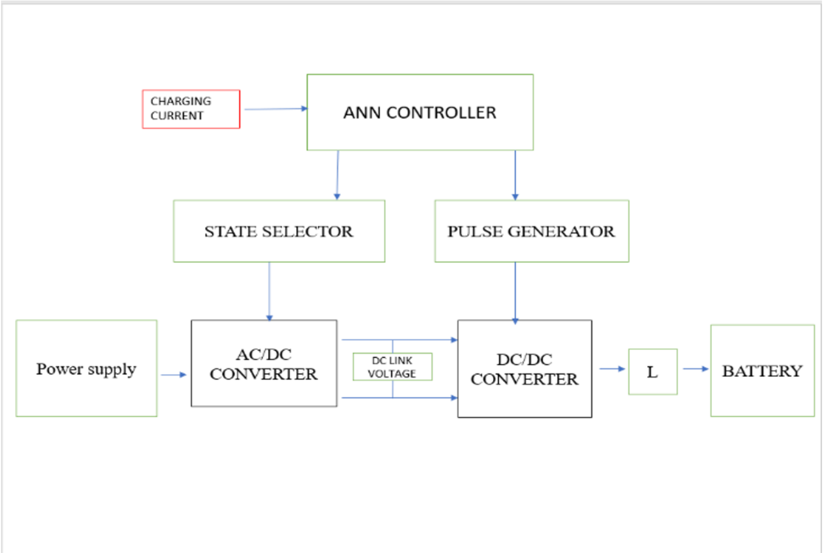

Fig. 1. Block diagram of Grid to EV charging by usingANN.

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4.STARTAGIY FOR ANN CONTROLLER

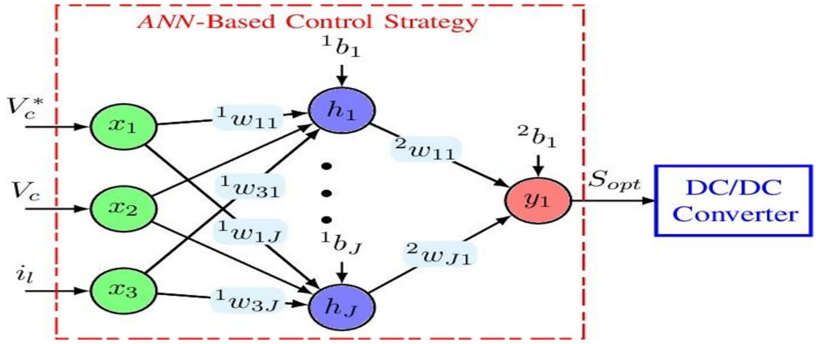

Fig.2. ANN System

A little amount of deviation from the goal outcome is necessary for ANN training. To carry out this training, a traditional LM-based approach is used in this work. The gadget we've created here has two inputs and two outputsto address this issue. voltage and charging current on the DC-link).

EV Charging applications by using ANN,

1. Home Chargers: Typically situated in a home's garage or driveway, these chargers are made for household usage. They provide a practical method for EV owners to charge their cars overnight.

2. Public Chargers: Public charging stations may be located in a variety of places, including parking lots, retail malls, and highways. These are necessary for extended trips and for people without access to a home charger.

3. Fast chargers: These chargers provide a greater power flow rate, enabling quicker charging. They may drastically shorten charging times and are frequently seenat public charging stations.

4. Smart Chargers: By communicating with the grid, smart chargers make charging more effective and affordable. They can be set up to charge at cheaper off- peak times when electricity is less expensive.
5. Wireless Chargers: Using inductive charging pads, certain EVs can be wirelessly charged. These provide the ease of not needing to physically connect a cable but are often slower than conventional plug-in chargers.
6. Fleet Chargers: Employed by companies with an electric car fleet, these chargers allow for the simultaneous charging of several vehicles, simplifying the management of numerous EVs.

Grid electrical car chargers are being used to encourage the rising use of electric vehicles and lessen our dependency on fossil fuels. They provide a more environmentally friendly transportation system and aid in lowering greenhouse gas emissions and car owner running expenses. Grid chargers, which may be powered by renewable energy sources like solar or wind, are also essential for enabling the integration of renewable energy into the transportation industry.

5. RESULTS AND DISCUSSIONS

The first step in EV charging is connecting the charging apparatus to the power grid. Owners or users of EVs connect the charging wire to the vehicle's charge in order to negotiate the charging parameters, such as the charging rate (kW), and to make sure that the car and the charger are compatible, the charging station talks with the vehicle.
The charging rate may be chosen by the user or the vehicle and may depend on a number of variables, including the need for charging immediately and the cost.
Here we give input voltage as 3 phase supply and this 3-phase supply it should be in 0,
-120, 120 phase shift. Supply frequency is 60HZ. This supply voltage is give the input as AC/DC converter using the universal bridge.

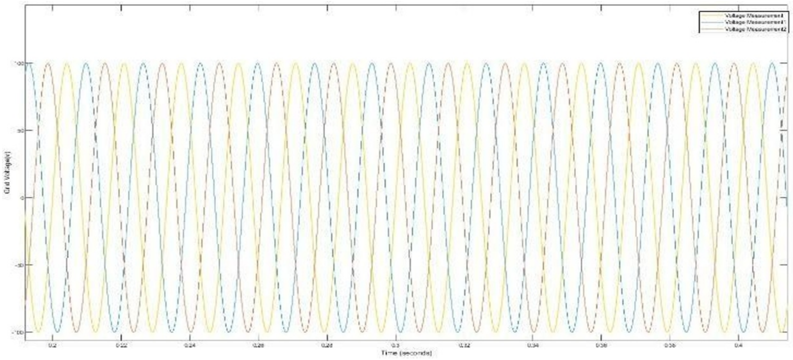

Fig.3. Grid voltage

Here DC Link capacitor provides Fig.4. the constant voltage to the direct current. It is used reduce the voltage deviations from the AC supply.

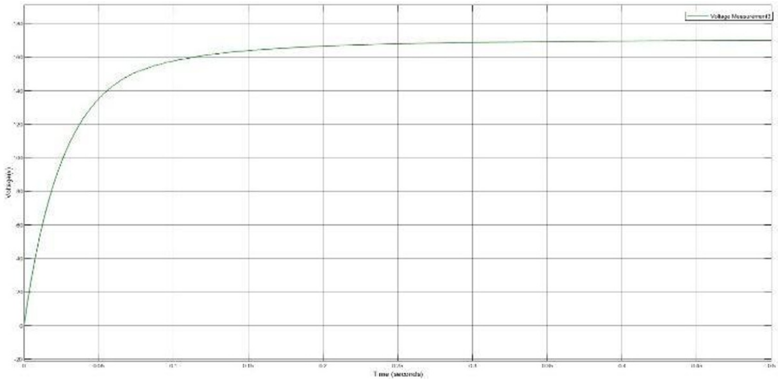

Fig.4. DC link Voltage

The battery current is taken from the DC/DC converter. Here using lithium ion Battery applying Fig.5 the voltage as 23volts. The voltage should be charged 23voltsit increased linearly.

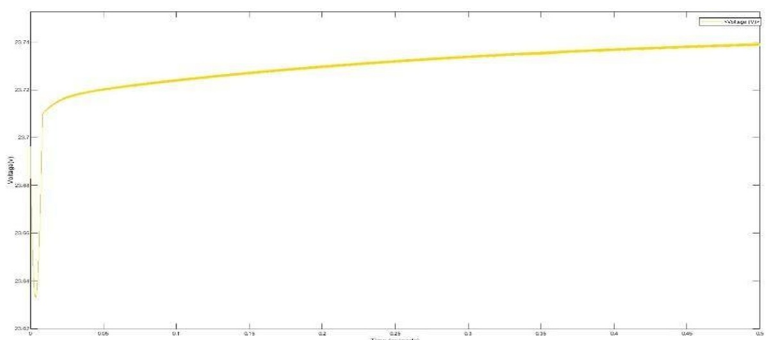

Fig.5. Battery Voltage

The battery current Fig.6 initial charged at 0AMPS increasing rapidly at 60amps and it will Start to discharged the desired current values.

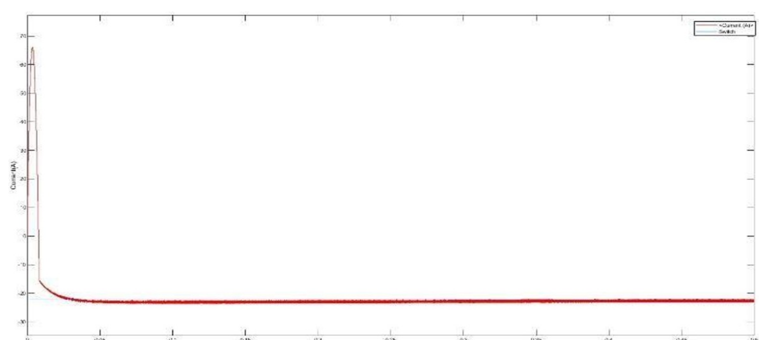

Fig.6. Battery Current

6.CONCLUSION

Plugging an electric vehicle (EV) into a charging station, determining the charging parameters, starting the charge, checking for safety and efficiency, and then concluding and unplugging the charging session are the simple steps involved in charging electric vehicles from the grid. Depending on the EV model and the charger being used, this procedure may alter, but it is often created to be secure, practical, and adaptable to many settings, including at home, at work, or when utilizing public charging stations. Electric car charging will become much more convenient and effective as EV infrastructure and technology develop.

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