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Power Quality Improvement Using Hybrid Solar/Wind Generation for EV Charging System

Surender Kumar Sharma*
Department of EEE,
Poornima University, Jaipur, Rajasthan

*Author to whom correspondence should be addressed:
E-mail: surendra.sharma@poornima.edu.in

Abstract: This manuscript presents a novel control strategy for photovoltaic (PV) power, wind power generation in to a DC micro grid centered electrical vehicle charging station. The PV array exhibits different current- voltage- (I-V) and power-current (P-V) characteristics under changing conditions. The main aim aimed at the integration of solar and wind near deliver as ample as likely charging energy for the charging stations. Various maximum power point tracking (MPPT) techniques are available in the literatures. This amenity will be grid associated so that alleging can happen throughout hazy and wind less days. The grid connected to provide the advantage to transfer the excessive power when generation exceeds the demand. The proposed system of Solar and wind integration a for electrical vehicle charging is simulated and analyze in PSIM 9.0 software and simulated results are presented.

Keywords: Hybrid, Solar Generation, Wind Generation, Electrical vehicle

1. Introduction

In the current situation the main challenge for electrical vehicles establishment in India is charging infrastructure and availability of power in remote locations. For many causes containing ecological worries and vitality prices- it is desirable to ward usage non-conventional energy source toward scare electrical vehicles. Due to concerns about the atmosphere, power generation based on hybrid renewable energy has become popular. In order to eradicate transmission forfeiture and grid connectivity difficulties, Renewable energy centered power group is performed in Renewable energy. Compared with fossil fuels, wind power systems are less harmful.

As alternating resources include a cumulative proportion of organization generation volume associated to old hydro and updraft integrated generation, novel provocation to the dependability, constancy of the value grid arise. Uniting storage of energy by non-conventional energy sources can decrease adversative effects arranged service grids by sinking probability distribution.

The projected method in this manuscript is combination of wind and solar power, for energy storing keen on a DC micro grid–centered for electric vehicles charging station. It is suitable for car parks or business sites with networks to municipal conveyance. Electric vehicles will be parked at the competence when integrated hybrid sources will normally be capable to supply energy. Organization design is offered in the Subdivision 2. Modeling of renewable energy system is offered in subdivision 3. Simulation outcomes of the EV charging posting are deliberated in Subdivision 4. Subdivision Vinclines the Closes.

2. System Architecture

The projected integrated Solar / wind DC mico-grid topology presented in figure 1. A solar PV array and wind turbine joined system deliver energy aimed at EV charging. The complete system is grid linked to allow the transport of vigor as initiated by the regulator scheme. The key aim is delivering the EV charging competence, storing excess energy through accusing the storage batteries. The regulator impartial is to detention the maximal existing power commencing the daylight and gust though keeping energy output to the network as steady as conceivable. In the figure 1 wind power converted in to AC to DC, and solar PV converted in to DC-DC. Then after integrated DC again converted in to AC.

3. Modeling of Wind / Solar integrated System

(A) Wind Power Modeling

PSIM simulations designed for the wind generation system contains the wind turbine &generator, AC-DC Convertor modules, the wind mill turbine demonstrated form electromechanically point of view. The exemplary offers the smooth characteristics of the wind rotor, control system of counting pitch and MPP characteristics. The curve of this wind turbine is that there is no gearbox, but there is a back-to-back converter, whose size is suitable aimed at the entire power, as displayed in the figure. Fig. 2. The PMSM is directly coupled with the wind turbine.

The PMSM is connected to three phase rectifiers.

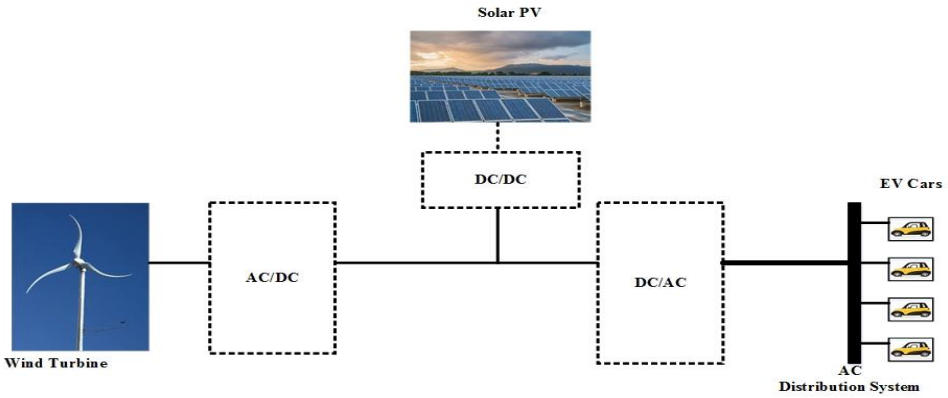

Figure 1. Block diagram of integrated Wind / Solar system for electric vehicles charging station

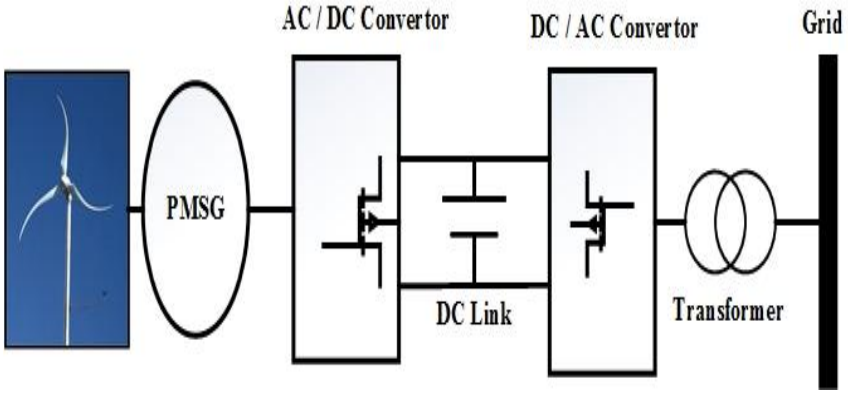

Figure 2. Schematic diagram of a wind power system connected to grid.

(B) PV solar power module

An electrical archetypal proficient of corresponding the Voltage vs. Current (V-I) and Voltage vs. Power (P–V) performance of the PV cell below changed irradiances has stayed employed in the PSIM software. In this archetypal, temperature is taken as persistent at standard ambient temperature in edict to decrease the performance period of the complete archetypal. (It is known that temperature has an important result on the I–V and P–V output characteristic curves of the cell, but examination of the possible influence is out of possibility for this scheme.) The archetypal permits simulating dissimilar collection techniques by changing the series/parallel PV cell influences PV.

A PV array with 36 parallel strings of 29 units in series is demonstrated. The arrangement is valued to make around 1.8 kW power below full sun circumstances. Figure 3 demonstrations the typical V-I and P–V characteristics of a photovoltaic unit. The MPPT algorithm is practical to safeguard that the PV array operates at maximum power output based on irradiance (under the supposition of continuous working temperature). This research work uses a perturbation and observation (P&O) method-in which the output voltage is regularly changed to notice the best arrangement voltage. This is the MPPT algorithm commonly used in many photovoltaic systems, easy to appliance, and mechanisms well when the irradiance prepares not alteration rapidly with time.

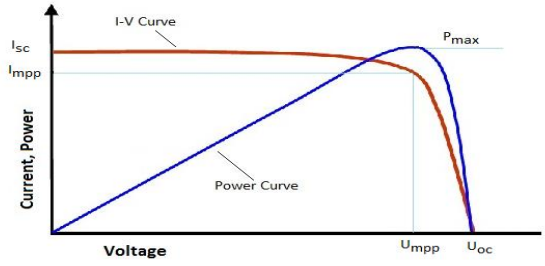

Figure 3. I–V and P–V curve of a typical Photo Voltaic cell.

The boost convertor is used for transmission power form PV arrangement to DC bus. The converter output is set

to equal the amplitude of the DC bus voltage, while the contribution pathways the voltage that produces maximum power. Application of the perturbation and observation (P&O) MPPT procedure in PSIM environment.

4. Simulation and Results

The proposed integrated wind / solar system for EV charging station is simulated in PSIM 9.0 software. Is shown in figure 4.

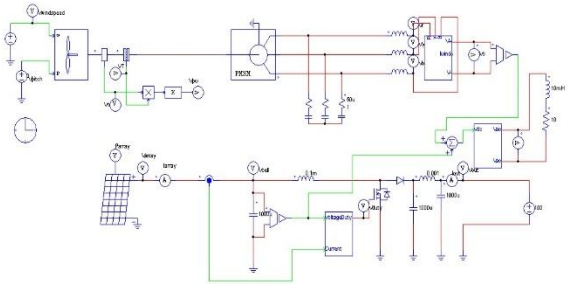

Figure 4. PSIM Model of integrated for Wind / Solar (PV) for electrical vehicle charging station

Implemented the simulations to display the performance of apiece subsystem. The active reaction of the wind generator, wind turbine, PV subsystem is verified. Comprehensive demonstrating is achieved on system levels and the module and the outcomes are showing in Figure. 5-8.

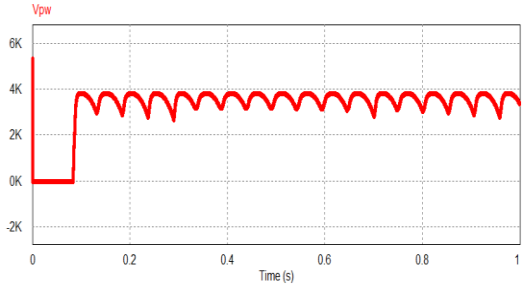

Figure 5. Wind Power

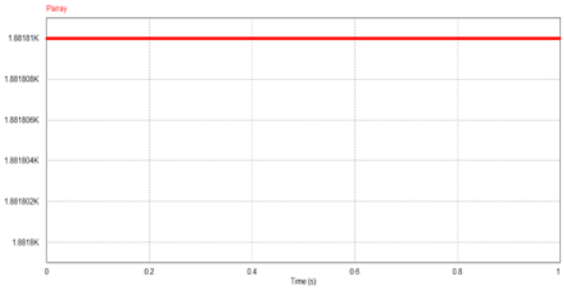

Figure 6. PV Power

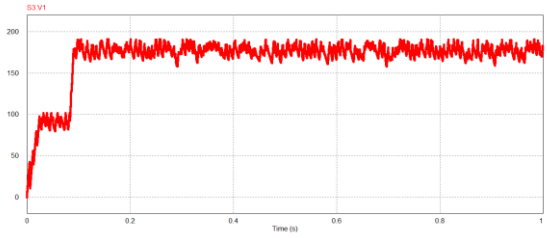

Figure 7. DC Bus Voltage

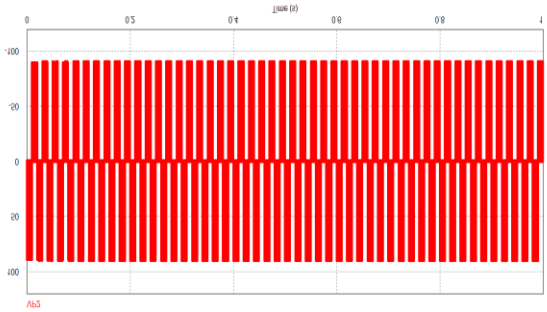

Figure 8. AC grid Voltage

5. Conclusion

In this paper an integrated wind / solar system for EV charging station has been offered. Complete model of solar PV and wind has been developed, as well as applied constrictions and MPPT control algorithms. Control rationality has been active to engross maximum power from the non-conventional bases and charge the EVs.

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