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EV Charging By PV Panel Based on Energy Price and Vehicle to Grid

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ABSTRACT: Workplace charge of electric vehicles (EV) from photovoltaic (PV) panels installed on an office building can present several benefits. This includes the local production and utilize of PV energy for charging the EV and construction use of dynamic tariffs from the grid to plan the energy exchange with the grid. The long parking time at the workplace provide the ability for the EV to support the grid via vehicle-to-grid technology, the use of a single EV charger for charging several EVs by multiplexing and the offer of supplementary services to the grid for up and down regulation. Further, distribution network constraint can be considered to limit the power and prevent the overloading of the grid. A single mixed integer linear programming (MILP) formulation that considers all the on top of applications has been future in this paper for a charging a fleet of EVs from PV. The MILP is implement as a receding-horizon model analytical energy management system. Numerical simulation based on market and PV data in various country shown more then 500% in reduction the net cost of EV charging from PV when compared to immediate and average rate charge policies.

KEYWORDS: Electric vehicles ,PV panel ,PV MPPT converter.

I. INTRODUCTION

Electric vehicles (EVs) present a highly efficient mode of transportation with zero tail-pipe release. The current estimate for the USA is that present will be 1.2 million EVs by 2020 [1]. Electric vehicles are but, sustainable only if the electricity second-hand to charge them comes from sustainable source. Electricity generate from a fuel mix that is largely conquered by fossil fuels does not abolish the emissions but frequently moves it from the vehicle to the power plant. as this can have environmental advantages, complete elimination of emissions is dependent on utilizing non-emitting resources for power production. It is here that the phenomenal growth in the use of photovoltaic (PV) systems for dispersed generation and its falling cost over the years can have a direct collision. EVs used to travel to work are parked at the workplace for long hours throughout the day and it is generally the time when the sun is clean as well. Workplaces similar to industrial sites and office building harbor an admirable potential for PV panels with their large surfaces on flat roofs. This potential is largely unexploited today. Energy generated from PV array installed at the workplace and as solar carports can consequently be used for charging EVs this has several benefits:

1)EV battery double out of bed as an energy storage for the PV

2)The negative shock of large-scale PV and EV incorporation on distribution network is mutually reduced

3)Long parking time of EVs paves way for realization of vehicle-to-grid (V2G) expertise where the EV can offer energy and subsidiary services to the grid

II. PRELIMINARIES AND INPUTS

1)EV and user input

Each EV arrive at the car park by means of a state of charge at time and is parked at one of the several EV-PV chargers. The EV owners offer the information to the EMS about their probable departure time and charging energy command This means that the departure SOC of the vehicle is as of the EV or stored in a database inside the EMS for different EV model.

2) EV-PV charger

The 'EV-PV charger' as the expression is used here means an included power converter that consists of three ports to unite to the EVs, PV, and the AC grid,

Each EV-PV mount is associated to a PV array of rated power via a maximum power point track (MPPT) DC/DC converter. The output of the DC/DC PV converter is connected to an inside DC-link. The DC-link is connected to the grid via a DC/AC inverter of rated power, such that. There are number of isolated DC/DC converters for EV charging that are connected to the DC-link and each contain a rated power .

All power connections between any of the three ports namely PV, EV, and grid are via the DC-link .This incorporated converter provides more than a few benefits compare to using separate converters for PV and EV connected over the 50Hz AC grid. First, direct interconnection of the PV and EV over a DC-link is more proficient than an AC interconnection. Second, the integrated converter require one frequent inverter to the AC grid as a substitute of separate inverters for PV and EV. This reduces the part count and size of the converter. Third, by manufacture the isolated DC/DC converter for the EV bidirectional, the EV can now offer V2G services via the incorporated converter.

III. MILP FORMULATION

A) Acceptance criteria

When an EV arrive at the EV car park, it is linked to one of the *C* number of EV-PV chargers. As mention earlier, each EV-PV charger can have up to figure of EV connected to it. The user links to the EMS and the EMS instruct the user on which EV-PV charger he/she must connect to, based on two 'taking criteria'. The first criteria is that the energy command and parking time of all the EVs connected to one EV-PV charger must be within the power limits of the charger. The second criteria is that the arrival SOC of the vehicle have to be above the bare minimum SOC as set by the user. This is to make certain that constraint is satisfied.

B) Constraints: EV and user inputs

The maximum charging and discharging powers are also dependent on the SOC of the EV battery as shown in (16) and (17). For example, fast charging of EV battery cannot be done beyond 80% SOC of the battery [42]. Here, it is assumed that the maximum charging power linearly reduces from to zero when the battery is charged beyond 80% SOC till 100%

C) Constraints: EV–PV charger and car park

Under normal process the EMS extracts most power from the PV array using MPPT as shown in right side of equation. The PV power is needy on the scaling factor which scales the installation characteristics (e.g. azimuth, tilt, module parameters) of the PV array connected to the mare *c* with respect to the 1kWp location array used for the foretell data. The EMS implements PV restriction if it is illiterate to draw PV power or if there

The DC-link is used for power among the three ports of the converter and is the power balance equation for the EV-exchanges PV converter

IV. SIMULATION RESULTS

A) Simulation parameters

Settlement top prices (SPP) and price for reserve capacity (REGUP, REGDN) are obtain from the ERCOT day-ahead market (DAM) for Austin, Texas for 2014 for load zone LZ_AEN.These are extensive energy prices with a data decree of 1hr. Since divide values for was not existing, it is assumed that The PV generation data is obtain from the Pecan Street Project database for a house in the Mueller neighbourhood with a 11.1 kW PV system . The data promise is 1min. The power output is scale down for a 1kW system for use as with. It is unspoken that the PV system at the car park is owned by the workplace and hence =0.

B) Simulation results

Average speed, randomly belated and immediate charging The net costs of EV charging and PV sales for regular rate randomly delayed and urgent charging are estimated using. that the ESCo be paid by the ISO. It be obliged to be remembered that PV sales for both strategy is the same IMM charging be found to be better than AR in summer and associate versa in winter, with IMM charging net costs person cheaper than AR for 233 days. Third, the usual net cost per day for 2014 for AR and IMM be found

V. BLOCK DIAGRAM AND CIRCUIT DIAGRAM

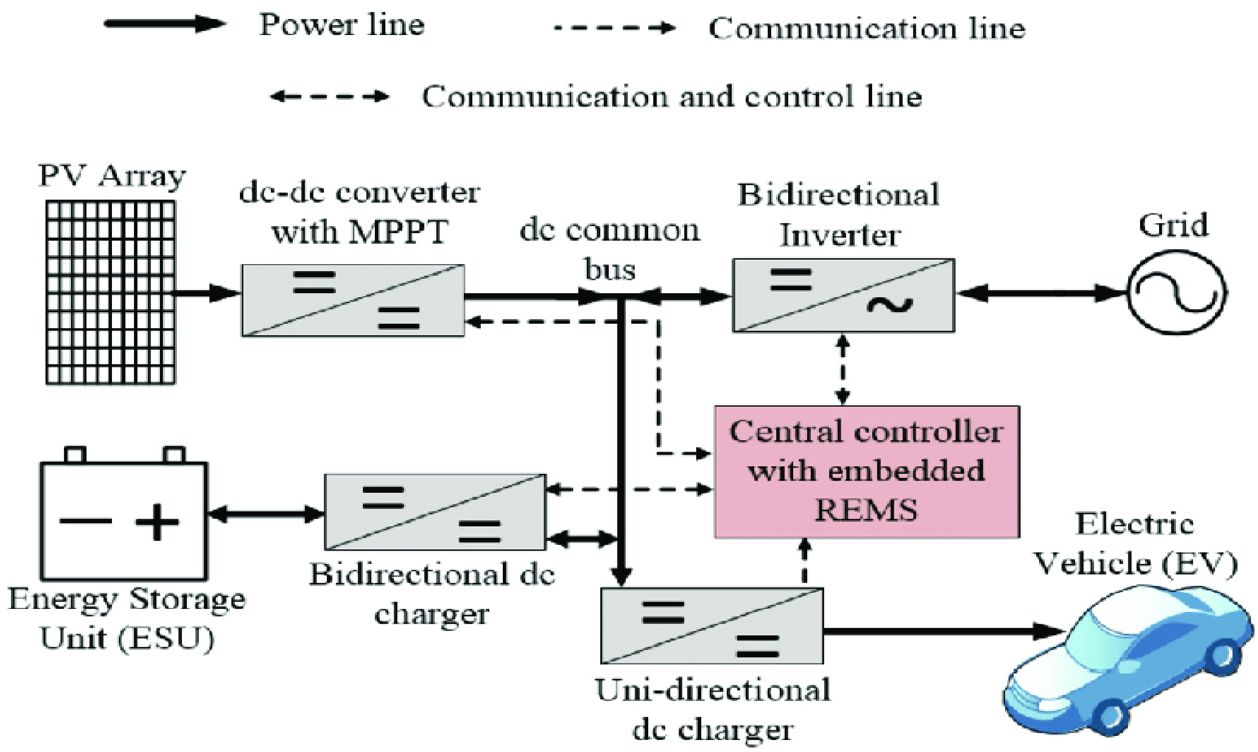

FIG.1.EV charging powered by solar panels on roof and carport

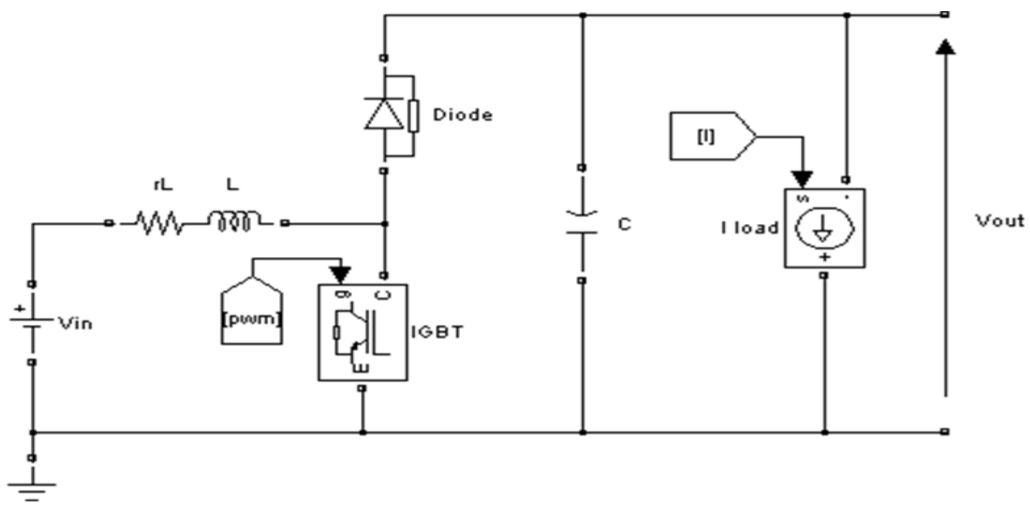

FIG.2.DC DC Converter

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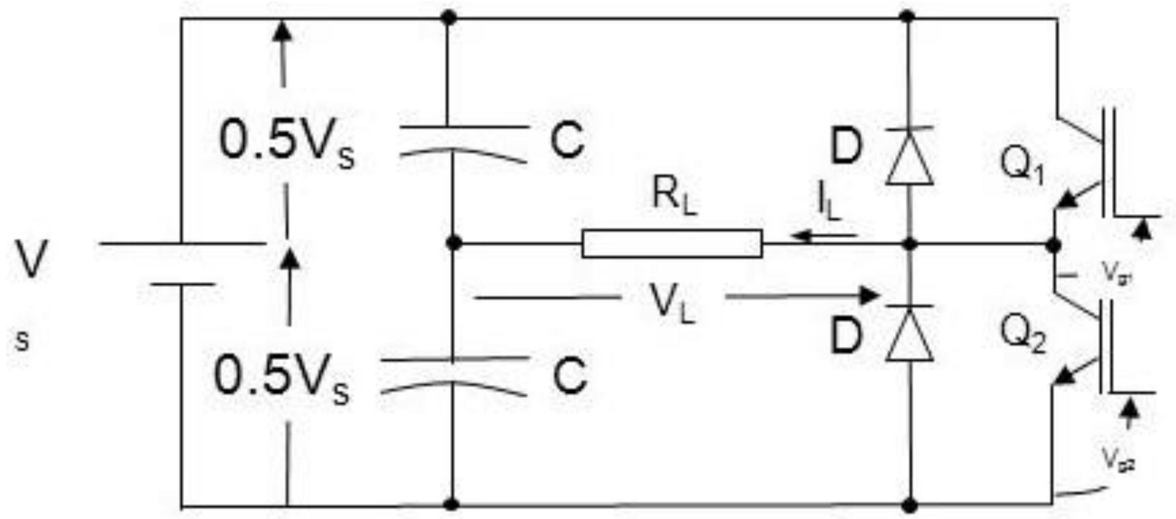

FIG.3.DC AC INVERTER

FIG.4.Modal Diagram

VI. CONCULITION

EV charging from PV can be prohibited to get several motives – to take advantage of time of use tariffs, supply ancillary services or follow the PV invention. However, the frequent approach is that each of these applications is solved as part optimization problems resulting in conflicting charging profiles. This is unreasonable, as a single EV cannot be forbidden at the same time with unlike charging profiles. Further, the trade and industry befits of this approach are too small to warrant mass taking on of smart charging. Hence it is vital to make a single problem formulation that bundles several applications collectively so that one optimal EV charging profile with cumulated remuneration is obtained.

In this paper, an MILP formulation has be proposed for charge of an EV fleet from PV that has several purpose built into one - charging of EV from PV, with time of use tariffs to sell PV power and charge EV from the grid, execution of V2G for grid prop up, using EV to offer ancillary army in the form of reserves and bearing in mind distribution network capacity constraints. The preparation of the connection of a single EVSE to several EV has be included in the formulation. This provides the ability to share the EVSE amongst many EVs resulting in substantial decrease in the cost of EV communications.

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