

Design of Intelligent Charger for Electric Vehicles

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Abstract - For providing power from Vehicle to grid, the role of intelligent charger comes in to the action. The intelligent charger for vehicle to grid power flow comprises of AC-DC PWM converter and bidirectional converter. During the on-peak load condition, intelligent charger transfers electrical energy from vehicle to grid and during off-peak load condition, the charger charges the vehicle-battery.

Key Words: Battery Charger; Solar Panel; Electric Vehicle; Vehicle to grid; energy storage systems, V2G Operation

1. INTRODUCTION

In recent years, the researches on effective use of battery energy have been increased according to the market expansion of electric vehicle (EV) using batteries as energy source. Due to the increasing needs for electric power in EVs, battery energy conditioning systems are required for charge and discharge control of the batteries [1]. The peak-load condition could be occurred in day-time from 10 a.m. to 12 p.m. or from 4 p.m. to 6 p.m. when is swamped with electric power demand in factories or buildings. Because of the quantity of power demand depends on the power consumption of loads, the utility grid has to secure a supply of electric energy is larger than the required power consumption under peak load-condition. It means that the waste of electric power could will be light at the other time than peak-load period.

In this paper, rapid-charger system which has a function of load compensation at the peak-load condition is proposed [1].

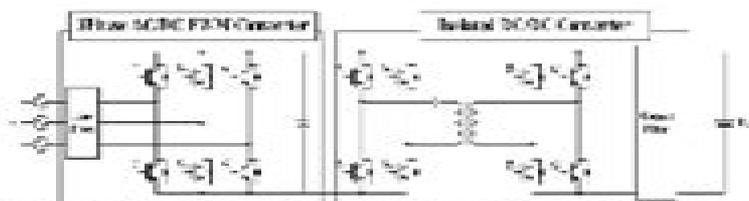


Fig - 1 : Intelligent-charger system schematic diagram.

At the peak-load condition, the intelligent charger passing charged energy in the battery of electric vehicle to the grid (V2G).

As shown in Fig. 1, propose rapid-charger system the well-known two-stage power converter which is composed of AC-DC PWM converter and an isolated bidirectional DC-DC converter [1].

2. CONFIGURATION OF SYSTEM

Fig. 2 shows a diagram of the grid-connected electric vehicles charger station system. The proposed system is composed of battery bank, bi-direction DC/DC converter, and bi-directional DC/AC inverter. The bi-directional DC/DC converter is able to transfer power between the battery bank and the bi-directional DC/AC inverter in both directions, either in battery charging mode or in battery discharging mode. The three phase's bi-directional DC/AC inverter is synchronized and connected to the grid. The inverter controls DC-link voltage desired level of 650V [2].



Fig - 2: Grid-connected electric vehicle charger station systems.

3. Source of Intelligent Charger

3.1 Battery

PROPOSED CHARGING-DISCHARGING SEQUENCE

Fig 3 shows the proposed power flow determination algorithm for 10kW rapid-charger system including V2G mode. At the peak-load condition, the system controller checks the rapid-charger operational state (i.e. charging or discharging). Fig 4 shows the each mode of operations [1].

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Design Of Intelligent Charger For Electric Vehicles:

Advanced Concepts and Technologies for Electric Vehicles Akshay Kumar Rathore, Arun Kumar Verma, 2023-08-30

This book explains the basic and advanced technology behind the Power Electronics Converters for EV charging and their significant developments and introduces the Grid Impact issues that underpin the grid integration of electric vehicles. **Advanced Concepts and Technologies for Electric Vehicles** reviews state of the art and new configurations and concepts of more electric vehicles and EV charging mitigating the impact of EV charging on the power grid and technical considerations of EV charging infrastructures. The book considers the environmental benefits and advantages of electric vehicles and their component devices. It includes case studies of different power electronic converters used for charging EVs. It offers a review of PFC based AC chargers, WBG based chargers and Wireless chargers. The authors also explore multistage charging systems and their possible implementations. The book also examines the challenges and opportunities posed by the progressive integration of electric drive vehicles on the power grid and reported solutions for their mitigation. The book is intended for professionals, researchers and engineers in the electric vehicle industry as well as advanced students in electrical engineering who benefit from this comprehensive coverage of electric vehicle technology. Readers can get an in depth insight into the technology deployment in EV transportation and utilize that knowledge to develop novel ideas in the EV area.

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