VOL. 11, NO. 6, MARCH 2016 ISSN 1819-6608
ARPN Journal of Engineering and Applied Sciences

www.arpnjournals.com

POWER SHARING ANALYSIS OF A NEW MODIFIED MULTI-INPUT INTERLEAVED BOOST CONVERTER BASED ON H-BRIDGE CELLS

W. M. Utomo, Y. M. Buswig, Z. A. Haron and A. Bakar
Electrical Power Department, Faculty of Electrical and Electronic Engineering, Universiti Tun Hussein Onn Malaysia, Parit Raja, Batu Pahat, Johor, Malaysia
E-Mail: ans_cold84@yahoo.com

ABSTRACT

In this paper, a new modified multi-input boost converter is proposed using H-bridge cells as building blocks and uncoupled inductors in parallel using interleaved technique as ripple reduction method. The objectives of this paper are to design a high ripple reduction and a high-performance multi-input boost converter. Different operating modes and the switch realization of the new converter are obtained. The modes of operation based on the status of the four switches. The proposed multi-input boost converter is composed of two inputs source that accommodated with some extra semiconductors, inductances and diodes to form the interleaving technique as proposed method. The proposed concept has been investigated through simulation using the MATLAB/Simulink environment. The simulation results confirm the validity of the proposed method, which can be seen as a promising new topology that ensure multi-input converter suitable for renewable energy applications.

Keywords: multi-input converter, interleaving technique, H-bridge cells.

INTRODUCTION

Nowadays, Multiple-input DC-DC converters are playing a significant role in interfacing and diversification of different energy sources. The single DC-DC converters are connected to electric sources like battery, fuel cell, wind power and other renewable energy with (V-I) features and the outputs can be combined with dc bus in both parallel or series (Valenciaga and Puleston, 2005), (Kumar and Ikkurti, 2011), (Wang and Nehrir, 2008), (Jiang and Fahimi, 2011), (Dobbs and Chapman, 2003).

Therefore, several energy sources can be consolidated either in parallel (Tao *et al*, 2006)(Gummi and Ferdowsi 2010)(Chen *et al*. 2006) or in series(Ahmadi and Ferdowsi, 2012), (Kumar and Jain, 2012), (Nami *et al*. 2010)(Shen and Yang, 2013) with the electric connected multiple-input converter topologies. However, the main restrictions of the input source topologies connected in parallel are the compulsory of the input voltage source to be asymmetrical and at one time, only one input source can provide energy to the load to obviate energy from the conjugation effect.

Series connecting the input sources are necessary to provide energy simultaneously. Therefore, in series configurations, by using an individual diode, each input source can avoid the other input source to form a parallel connection, which increases numbers of components (Ahmadi *et al*. 2013) (Li *et al*. 2010) (Kwasinski, 2009).

Nevertheless, these configurations have weaknesses such as expensive, huge and complicated in design. It also minimizes the efficiency and accuracy of the whole system. Consequently, a single converter with multiple inputs has been introduced, replacing the multiple single input converters.

Multiple-input converters offer uncomplicated and more consolidated styling as well as reducing cost and the systems complexity. Moreover, the efficiency of power distribution reinforces reliability at the regulated output voltage (Dobbs and Chapman 2003) (Tao *et al*. 2006).

Various isolated and non-isolated topologies on multiple-input converters have been presented (Tao *et al*. 2006) (Chen *et al*. 2002) (Patra *et al*. 2012) (Liu and Chen 2009). Electric-connected circuits belong to the non-isolated topologies while the magnetic-connected circuit belongs to those isolated topologies.

In the magnetic-connected circuit, the energy conversion transformation from sources to load is executed using flux technique and the time domain multiplexing (Matsuo *et al*. 1993). Thence, the necessity of the extra Peripheral circuitry and the transformer requirement make the magnetic-connected circuit complicated, huge, and expensive as well as increasing the circuit parameters dependency (Dobbs and Chapman, 2003) (Zhao *et a*l. 2008) (Khaligh *et al*. 2009) while electric-connected circuit has a modular structure, reduces cost and is not using transformer, thus making this non-isolated circuit more attractive and greatly reduces the matter associated with magnetic-connected circuit..

PROPOSED MODIFICATION FOR MULTI-INPUT BOOST DC-DC CONVERTER

The operation principle of multi-input DC-DC converter is based on the essential of DC-DC converter. The essential operation of the basic DC-DC converter is to charge the passive elements of the converter during a specific period of time and then discharge the stored energy of the passive element through load during the