This paper presents a new zero-voltage-switching (ZVS) isolated dc-dc converter which combines a boost half-bridge (BHB) cell and a full-bridge (FB) cell, so that two different type of power sources, i.e. both current-fed and voltage-fed, can be coupled effectively by the proposed converter for various applications, such as fuel cell and super-capacitor hybrid energy system. By fully using two high frequency transformers and a shared leg of switches, number of the power devices and associated gate driver circuits can be reduced. With phase-shift control, the converter can achieve ZVS turn-on of active switches and zero-current switching (ZCS) turn-off of diodes. In this paper, derivation, analysis and design of the proposed converter are presented. Finally, a 25~50 V input, 300~400 V output prototype with a 600 W nominal power rating is built up and tested to demonstrate the effectiveness of the proposed converter topology.