Isolated Universal Bidirectional Converter for Low Power Applications

Summary

This research work will be devoted to the development of the power electronics facilities that have the ability to merge dc and ac grids by universal application. In particular, the main goal: of this work is to develop the isolated low power electronic converter suitable for dc and ac residential grid application with minimum redundancy.

Research field:	Electrical Power Engineering and Mechatronics
Supervisors:	Dmitri Vinnikov Oleksandr Husev
Availability:	This position is available.
Offered by:	School of Engineering Department of Electrical Power Engineering and Mechatronics
Application deadline:	Applications are accepted between November 15, 2021 00:00 and December 15, 2021 23:59 (Europe/Zurich)

Description

A dc grid becomes an obvious trend in the residential power system. Recent works show that even a high-voltage dc-current distribution system is more effective than a high-voltage ac system. Due to the latest research efforts in power electronics, the high-voltage dc-current system may replace an ac system in the coming decades. The dc low-voltage distributed system may become a reality even sooner. At the same time, it is evident that transient from ac to dc grid cannot be done immediately. In the nearest decade, we will observe a merge of dc and ac systems. As a result, the power electronics facilities that have the ability to merge dc and ac grids are required.

The main goal of this work is to develop the isolated low power electronic converter suitable for dc and ac residential grid application with minimum redundancy. There are several tasks that will be completed during the PhD study:

1. To propose the optimal power electronics topology which can be suitable for dc grid in a range from 300 V to 700 V.
2. To investigate the way of power density and cost optimization of the proposed solutions.
3. Implementation of the conventional control algorithms for grid-connection realization along with wide input voltage regulation.
4. Optimization guidelines for different applications: battery chargers, solar optimizers.
5. Development of the industrial prototype of universal converter with power up to 400 W.

Applicants should fulfil the following requirements:

- Practical experience in the design of electronic systems.
- Experience with programming of microcontrollers for power electronics application.
- Experience with electronic circuits modeling in (Matlab, PSIM or PSCAD).
- Experience with PCB design preferably using Altium Designer.
- Experience with closed-loop control systems featuring analog and digital sensors.

To get more information or to apply online, visit https://taltech.glowbase.com/positions/446 or scan the the code on the left with your smartphone.