

University of Stuttgart

Institute of Robust Power
Semiconductor Systems

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**Power
Electronics**

**Master
Thesis**

Comparison the performance and efficiency of three- phase bidirectional schemes of different topologies

Description of work:

Modern electrical energy conversion systems are becoming more intelligent, with the ability to exchange energy between energy storage, electrical grid, charging station and consumer – this project considers bidirectional power electronics, which allows us to control the flow of energy from source to consumer, as well as in the opposite direction.

The project aim is to compare the performance and efficiency of three-phase bidirectional schemes of different topologies. These schemes are prospective and are widely used in energy storage systems, charging stations, industrial sources, etc. The work should also analyze the schemes for the optimal application of GaN or SiC devices. Method of investigation – multidomain simulation using Matlab/Simulink and PLECS.

Tasks & Goals:

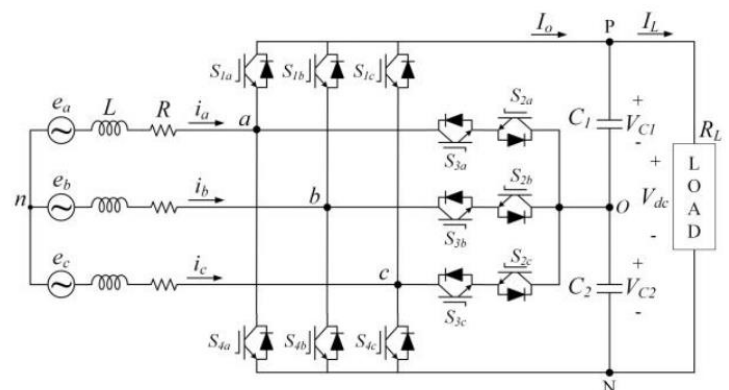
- Familiarization & literature search (10%)
- Calculations, design and components selection of power electronics (20%)
- Design and implementation the control system (15%)
- Simulation in different modes, discovering performance and efficiency of the schemes (40%)
- Written thesis & presentation (15%)

Benefits for student:

- Experience in simulation multidomain system-level models
- Familiarization with a performance of prospective bidirectional schemes, which used in energy storage systems, charging stations, industrial sources, etc
- Improving Matlab and PLECS skills

Previous Knowledge:

- Power Electronics
- Control System Theory
- Matlab/Simulink/Simscape



One of the considered scheme of three-phase bidirectional electric converter