

## University of Stuttgart

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**Power  
Electronics**

**Master  
Thesis**

# Multidomain system-level model of one-phase bidirectional electric converter in the closed-loop regulation

### 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.

In this project, one of the prospective one-phase bidirectional schemes is considered, which is used in energy storage systems, charging stations, industrial sources, etc.

The project aim is to develop a multidomain system-level model of one-phase bidirectional electric converter in the closed-loop regulation by control system. Loss calculation will be done using Plecs.

### Tasks & Goals:

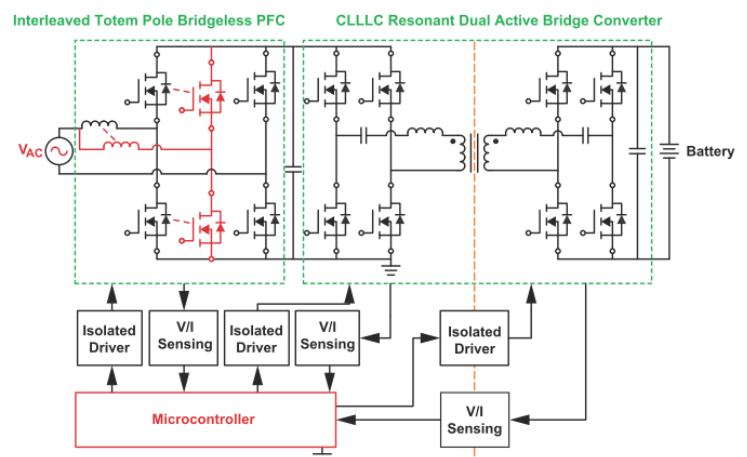
- Familiarization & literature search (10%)
- Calculations, design and components selection of power electronics (20%)
- Design and implementation the control system (15%)
- Simulation in different modes, discovering performance of the scheme (40%)
- Written thesis & presentation (15%)

### 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
- Familiarization with control systems of PFC and DC/DC conversion stages
- Improving Matlab skills

### Previous Knowledge:

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



Considered scheme of one-phase bidirectional electric converter  
(taken from Texas Instruments website)

