E.ON Energy Research Center

Lehrstuhl für
Automation of Complex Power Systems
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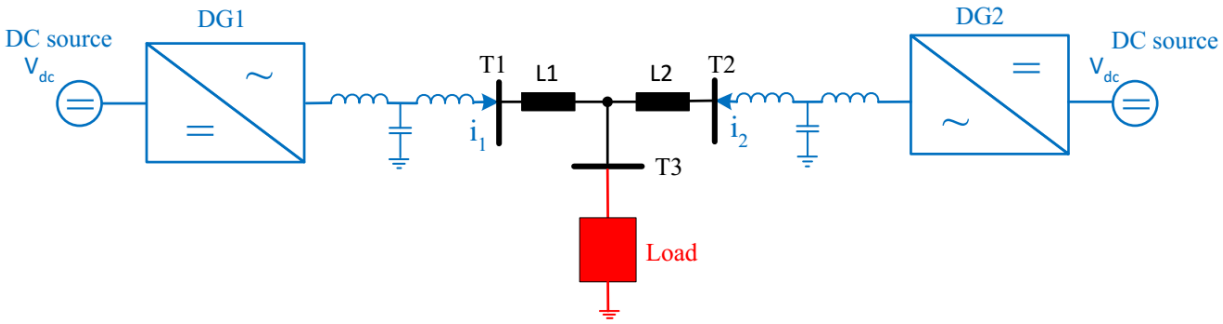
Automation of Complex Power System
Final Project

Title of the project: Simulation and test of micro-grid dynamics

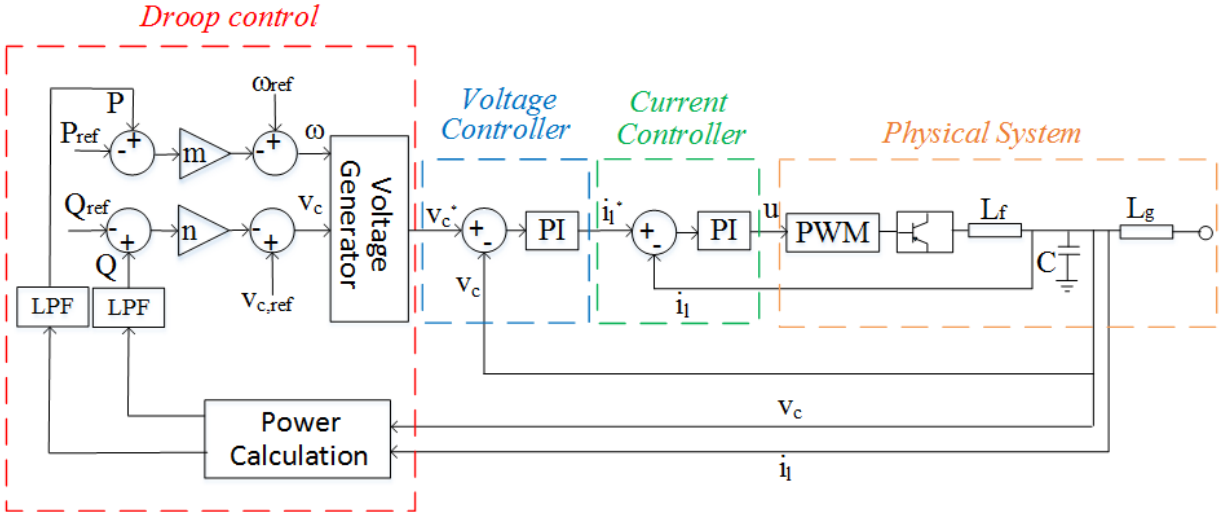
Goal of this project is to learn about the dynamics of a micro-grid operating in islanding mode. Specific focus is placed on the role of the local controller based on a droop principle.



The proposed microgrid is composed by:

- two local energy sources. The energy sources can be represented by a constant DC voltage of 750 V
- one variable resistive load
- the nominal characteristics of the grid are:
    - rated voltage: 220 V (phase voltage)
    - rated frequency 50 Hz

The two sources are connected to the main bus by means of a three-phase inverter operating at 10 kHz switching frequency. The converter is controlled by means of nested loop architecture.



The inverters present on the output an LCL filter with the following parameters:

- inductance on inverter side: 3 mH
- capacitance: 10 µF
- inductance grid side: 1.5 mH
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Each of the two local energy sources is connected to the load by means of a three-phase line with the following parameters:

- R = 1 Ohm
- L = 10 mH

The load is a simple three phase resistive load. Nominal value is 50 Ohm.

Assignment:

- build a simulation model in Simulink of the proposed set-up
- design the PI controllers for the two inverters (use rotating Park frame approach)
- implement a droop logic for frequency and voltage (assume perfect decoupling)
- perform a step change of the load from 50 to 40 Ohm
- analyze the results
- write a report in which you explain any design decision taken