RWTH AACHEN UNIVERSITY

E.ON Energy Research Center
ACS | Institute for Automation of Complex Power Systems

Master Thesis:

Optimal Power Flow Algorithm for Voltage Control in Distribution Systems

Context:
The increasingly interconnected character of power grids and the high penetration of distributed Renewable Energy Sources (RES) pose additional challenges for voltage control and stability compared with conventional power generation.

Voltage control in power systems aims to maintain a stable voltage profile during rapid fluctuations of generation and demand. This can be achieved by solving and Optimal Power Flow (OPF) problem, which is a non-linear optimization problem with continuous and discrete variables (e.g. reactive power compensation elements, line power flow limits, bus voltage limits, etc.).

In addition, the voltage control algorithm requires high sampling rate data from the power system states (mainly bus voltage magnitudes and phase angles) and in some cases state estimation when the power system states are not directly observable.

In this context, the goal to is to develop an OPF algorithm for voltage control, which achieves an execution time below 1 minute and a seamless integration with the measurement and state estimation algorithms developed at ACS.

Tasks for a Master Thesis include:

- State-of-the-Art literature review
- Implementation of an OPF algorithm for voltage control in distribution systems in Python
- Integration of the OPF algorithm with the measurement and state estimation algorithm (already implemented in Python)
- Testing and evaluation of the complete voltage control structure

Your Profile:
For this thesis, you require a very good knowledge of Python and a basic understanding of optimization techniques. Moreover, you will have to invest some time understanding the OPF concepts that have been developed at ACS until now. Fundamental knowledge about operation of distribution power systems is required.

Contact:

Lisette Cupelli, M. Sc.,
Edoardo De Din, M.Sc.
Tel. +49 24180 49747 / 49615
{lcupelli},{ededin}
@eonerc.rwth-aachen.de

ACS |Institute for Automation of Complex Power Systems
ERC |E.ON Energy Research Center
RWTH Aachen University
Mathieustr. 30 Room 02.27 / Mathieustr. 10 Room 00.10
52074 Aachen, Germany