

Master/ Bachelor thesis

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## **Implementation of an Algorithm for the automated recognition of topology changes in Distribution Grids**

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Due to the ongoing Energiewende, large power plants such as nuclear and carbon power plants will be turned off and exchanged by decentralized generation units as photovoltaic or wind power plants. Thus, the generation of electrical power is shifting from the transmission grids to the distribution grids. This leads to bidirectional power flows. To detect bidirectional power flows and possible anomalies in Distribution Grids, algorithms for the state identification of the grid are used. These algorithms usually base upon on an assumingly known topology of the grid, which does not consider the possibility of changing status of switches. As grid state calculations are supposed to occur autonomously and without reoccurring manual adjustment of the topology data, algorithms that detect and update the changing status of switches are necessary.

At the beginning of this master thesis, extensive research with regard to existing methods for automated topology recognition takes place. During this step, the author can take existing methods – developed at the ie<sup>3</sup> – into consideration. The methods for the automated topology recognition are to be evaluated regarding their complexity, robustness and realization in the operation of the grid operator. Afterwards, an appropriate method to detect the current topology of the grid is to be chosen. Based on this method, further grid calculations functions have to be able to use updated topology of the grid. The algorithm is to be implemented in a suited environment in the programming language C++. For this, a research environment developed at the ie3 can be used. At the end of the thesis, an evaluation of the developed method based on exemplary use cases takes place.

The following structure is suggested:

- Introduction and research of literature to topology recognition in distribution grids
- Listing and evaluation of methods for the automated topology recognition in distribution grids
- Familiarization with the C++ environment
- Implementation of the suitable method
- Generation of use-cases for testing of the developed method
- Testing of the algorithm by using generated use-cases

Following this work, the results are to be reported in a presentation.

This thesis is now available as a master thesis for students of electrical/information technology and industrial engineering. Parts of the thesis can also be assigned as bachelor thesis.

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