

# Bachelor Thesis

## Development of a Process to Investigate Grid Expansion Measures in Smart Grids

The electricity system of the future faces several challenging developments. These include the increasing penetration of renewable energies based on wind, solar and biomass as well as the associated decentralized generation and storage of energy. In addition, we see an increasing demand for electrical energy due to the electrification of the heating, transportation and industrial sectors. To meet these growing requirements, grid operators must carefully plan the expansion needs of their grids. The short, medium and long-term expansion requirements are determined in the grid planning process.

As many research questions in the field of electrical grids are concerned with the future development of our electricity system, it is essential to be able to estimate the future expansion requirements of the grids under investigation. The grid expansion information from the grid operators is often recorded in text form (as a PDF), which makes automated investigations more difficult. In addition, synthetically generated networks are often used in research, for which no network expansion information is available. The aim of this work is therefore to develop a procedure for determining, implementing and evaluating grid expansion measures in the distribution grid.

The procedure is to be used to estimate the need for expansion in smart grids and to evaluate the use of certain measures. For this purpose, the monetary requirements of individual scenarios can be determined and compared. The basic question is: What influence does the smartification of low-voltage distribution grids have on their expansion requirements?

### Aim of this Thesis:

- Fundamental research on grid expansion planning
- Development of a grid expansion procedure
- Implementation in Python
- Exemplary Investigation of distribution grids

### Your Profile:

- Degree in engineering or industrial engineering (electrical engineering, mechanical engineering, energy technology) or computer science
- You are interested in current research topics relating to the energy supply of the future

First basic knowledge of Python is advantageous

### We Provide:

- Intensive and reliable support during your thesis
- Flexible time management and your own air-conditioned workplace with good IT equipment
- A great atmosphere with lots of activities for students and assistants
- Many industry contacts and help with finding internships
- The possibility of a subsequent doctorate or employment if you perform very well

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### Contact Person

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### Focus

- Programming in Python
- **Grid expansion planning**
- Smart Grids