Master thesis

Modelling of inverters to investigate the resonance behaviour of low-voltage grids

In the course of the energy transition, there is an increasing penetration of inverter-based systems in the distribution grids. Their harmonics can lead to undesirable voltage distortions, dangerous overvoltages and loss of stability of generation units. These changes thus have a considerable influence on voltage quality and are the focus of research in order to be able to guarantee grid stability and supply quality even with further expansion of renewable technologies.

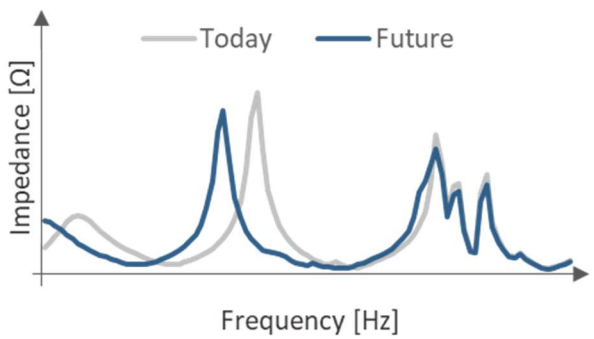

Figure 1: Impact of inverter-based systems on grid impedance

The grid impedance is a useful indicator for recognising potential risks and taking countermeasures at an early stage. The quality of the determination of the grid impedance is largely determined by the level of detail of the component models, such as the inverters of PV systems. For these, detailed models are required which, in addition to the filter elements, also take into account the influence of the control topology or the operating point.

In this work, therefore, models for calculating the impedance of inverters are to be created. Furthermore, a sensitivity analysis will be carried out to investigate the influence of different topologies or control parameters on the behaviour.

Core tasks and objectives of the thesis

- Literature research on frequency-dependent converter models and their parameterisation
- Implementation of relevant models into an existing tool for impedance calculation
- Analysis and comparison of different models and derivation of relevant parameters
- Sensitivity analysis of the provided models in synthetic LV networks
- Documentation and presentation of the results

Your profile

- Degree in computer science or engineering (electrical engineering, computer science, mechanical engineering, power engineering).
- Knowledge in C++ and/or Python is advantageous

Contact

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Focus

- Component modelling
- Impedance calculation
- Sensitivity analysis