Automated Network Planning Including an Asset Management Strategy

Daniel Büchner, M.Sc. ¹
Leon Thurner, M.Sc. ²
Dr. rer. nat. Tanja Manuela Kneiske ¹
Prof. Dr.-Ing. Martin Braun ¹, ²

Contact:
daniel.buechner@iee.fraunhofer.de
Phone: +49 561 7294-134
Fraunhofer IEE
Königstor 59
34119 Kassel
Germany
www.iee.fraunhofer.de/en
www.uni-kassel.de/go/pandapower

¹ Fraunhofer IEE
² University of Kassel

Automated Expansion Planning and Asset Management

Fraunhofer IEE and University of Kassel developed an automated expansion planning tool based on the open source software pandapower. This tool finds an optimal set of reinforcement measures based on various load and generation scenarios (Figure 1).

Besides the grid expansion, an important planning task is the maintenance and renewal of electrical equipment. For this task asset value and reliability are important parameters. To account for these objectives in the automated expansion planning tool, the cost term is extended by a residual value for replacement measures (Figure 1).

Tests on a Medium Voltage Grid

This integrated approach was tested on a real MV grid (Figure 2a) and compared to the normal reinforcement approach (solutions in Figure 2b). The results in Figure 3 show that the integrated approach

- Finds solutions with only slightly increased investment cost;
- Leads to a larger increase of the asset value;
- Replaces older rather than new lines, thus reducing the failure rate more than the reinforcement approach.

With the integrated cost model the automated expansion planning can consider aspects of asset management at only slightly increased investment cost.

Outlook

Currently a more sophisticated model is developed at Fraunhofer IEE that considers

- Condition and importance of electrical equipment using a realistic ageing model and a reliability analysis;
- Both OPEX and CAPEX for different maintenance and renewal strategies.

The aim is to create an integrated planning tool that can identify an optimized investment strategy for a large time scale.