

Master thesis

Design of an incremental meter placement strategy for the monitoring of distribution grids

Context

Electric distribution grids are undergoing an important transformation, due to the growing installation of renewable generation as well as the ongoing process of electrification of the mobility and heating sectors. To deal with the resulting challenges, Distribution System Operators (DSOs) will need real-time awareness about the operating conditions of the grid. This can be obtained via dedicated monitoring tools, for which a suitable meter placement is needed to achieve accurate results.

Today's distribution grids are mostly poorly instrumented grids and, for this reason, ad hoc meter placement approaches need to be devised to ensure a smart upgrade of the metering infrastructure. This thesis aims at designing an optimal meter placement strategy for the incremental deployment of meters. The proposed meter placement approach will need to guarantee the achievement of minimum accuracy targets for the grid monitoring while foreseeing the installation of a minimum number of meters in strategic positions of the grid in order to minimize the installation costs.

Your tasks

The thesis will be structured in two phases. In the first phase, you will become confident with the traditional approaches and tools adopted for the monitoring of distribution grids and you will review and analyze some proposals already existing for distribution grid meter placement. In the second phase of the thesis, you will implement a new approach for incremental meter placement. The validity and the performance of the proposed approach will be analyzed in a variety of scenarios using some benchmark distribution grids. Overall, the thesis will consist of the following steps:

1. Review of monitoring techniques and existing meter placement approaches:
 - review of WLS technique for distribution grid monitoring and accuracy performance;
 - review of approaches for distribution grid meter placement;
 - implementation of the most interesting approaches to be used as term of comparison;
2. Implementation and testing of an innovative meter placement algorithm:
 - design of the meter placement approach based on preliminary work in ACS;
 - implementation of a set of distribution system scenarios to be used as testbed for the validation of proposed approach;
 - analysis of the meter placement results in different test scenarios and in comparison to other benchmark methods;
 - final evaluation of strengths (and possible weaknesses) of the proposed meter placement

The thesis and its supervision will be in English.

For additional details or information, feel free to contact me.

Contact:

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