

Master's thesis

for Ms./Mr.

Topic: Application of PMUs in Hybrid State Estimation

Task:

Power system state estimation is a crucial function in modern power systems, which involves estimating the values of system state variables on measurements obtained from various sensors placed across the network. The accurate monitoring of power system state variables is essential for ensuring the reliable and secure operation of the grid. Traditional state estimation methods rely on measurements from SCADA systems. However, the increasing complexity and dynamics of modern power systems make it challenging to capture the fast-changing dynamics of the system using only SCADA measurements. Phasor measurement units (PMUs) have emerged as a promising technology for dynamic state estimation (DSE) due to their high measurement accuracy and real-time data acquisition capabilities. However, because the PMU is a relatively new and expensive device, its widespread adoption is not economically viable. But despite this, even a small number of them result in significant improvements in network monitoring.

The purpose of this work is to investigate the application of PMU devices in State Estimation to create a so-called Hybrid State Estimation. During the work, the effects of PMUs on the observability of the network, on the performance of existing and new algorithms will be investigated. Key problems and limitations of this interaction are to be identified. All research should be accompanied by modelling and analysis in the Matlab environment.

The study has to cover the following points:

- Literature research on State Estimation and PMUs
- Research and development of an algorithm in Matlab Experimental test of the circuit
- Modelling and simulation of a test network in Matlab
- Comparative analysis of results, identifying research gaps
- Documentation of the results

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