technische universität dortmund

Fakultät für Elektrotechnik und Informationstechnik

Institut für Energiesysteme, Energieeffizienz und Energiewirtschaft

Master thesis

Research area: Electricity market modelling, transmission grid simulation

Development and implementation of a power flow decomposition method for the identification of loop and transit flows in meshed transmission grids

As a result of the liberalization of the electricity market and the increasing integration of variable renewable energy soruces (RES) into the European transmission system, electricity exchanges and the resulting physical power flows are increasing. Especially in large-scale meshed power grids, unscheduled power flows, so-called loop flows, can occur, i.e. active power flows circulating between several control zones. In addition, loop flows can reduce market efficiency by generating unscheduled power flows in adjacent market areas and causing congestion.

Since there is a fundamental discrepancy between the power flows scheduled by the market and the resulting physical power flows, the cross-border capacities available for electricity exchanges are reduced by various security margins in order to maintain reserves for grid operation. Nowadays situations in which several transmission grid operators have to act jointly -by means of coordinated multilateral remedial actions- on a disturbance during grid operations in order to resolve the overload occur more frequently. Therefore, new methods for the analysis and evaluation of grid and system security measures have to be developed, which enable a cause-fair distribution/decomposition of the power flow in order to be able to identify the causes of the disturbance exactly and to solve them in a targeted manner.

entsoe **Flow definition:**

Source	Sink	Line	Flow Type
A	A	A	Internal Flow
A	B	A or B	Import/Export Flow
A	A	B or C	Loop Flow
A	B	C	Transit Flow

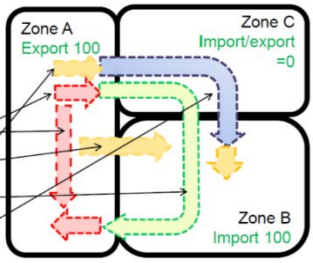

Figure 1: Definition of power flows according to ENTSO-E

The aim of this thesis is to implement a methodology power flow decomposition method in an existing market and transmission grid simulation framework. In particular, the identification of loop and transit flows in large-scale highly meshed transmission grid infrastructures is the main focus.

The following structure of the work is proposed:

- Familiarization with existing power flow decomposition methods
- Conception and development of a suitable power flow decomposition method
- Implementation of the method in an existing market and grid simulation framework
- Validation of the method by exemplary application with provided test data

Following this thesis, a short presentation will be given on the results of the work.

With immediate effect, this thesis is to be awarded to students of electrical/information technology and industrial engineering as master's thesis.

Contact: Björn Matthes, M.Sc., TU Dortmund, F&E-Building, Room 2.13
Bjoern.Matthes@tu-dortmund.de, +49 231 / 9700-981