**Check proposal type:** **Typical Concurrent Paper** X

**Flow Based Market Coupling in Fundamental Electricity Market Models:**

**Methods and Parametrization for Renewable-Dominant Power Systems**

[Richard Weinhold, TU Berlin, riw@wip.tu-berlin.de]

[Robert Mieth, NYU, robert.mieth@nyu.edu]

## Keywords

Flow Based Market Coupling, Zonal Electricity Markets, Chance Cosntraints

## Overview

Europe's increase in electricity production from renewable energy resources (RES) in combination with a significant decline of conventional generation capacity has spawned political and academic interest in the transmission system's ability to accommodate this transition. Central to this discussion is the efficiency of capacity allocation and congestion management (CACM) policies between and within electricity market areas that are interconnected by shared and synchronized transmission infrastructure. To facilitate unrestricted cross-border electricity trading in the presence of finite physical transmission capacity, European system and electricity market operator inaugurated flow-based market coupling (FBMC).

## Methods

## FBMC is a coordinated multi-stage process that requires detailed forecasts and network models, which are typically not or only partially disclosed by the system operators. Academic publications that synthesize FBMC in model frameworks agree on a three step process – D-2 (base case), D-1 (day-ahead) and D-0 (redispatch) – but differ greatly in some core assumptions. Further, FBMC effectiveness for a future re-newable-dominant generation mix is typically overlooked in the current literature.

## Results

## Our work provides a comprehensive overview on existing FBMC approaches and assumptions, and explicitly discusses the impact of high-shares of intermittent generation. Theses discussions are complemented by a case-study on the European electricity system in the intermediate future using the open-source Power Market Tool (POMATO). Further, we present a risk- and uncertainty-aware extension of the FBMC framework using chance constraints. Here, look-ahead stages (D-2 and D-1) of the FBMC process internalize statistical information on load and RES uncertainty.

## Conclusions

Preliminary results show that a carefully parametrized FBMC process can remain effective even with high shares of intermittent generation and when it is robustified against forecast uncertainty. Comparative results show benefits in system costs over zonal market clearing utilizating static net transfer capacities and effects of zonal configurations.