Callia - a design for a digitized flexibility trading platform and its operative and economic benefits for DSOs and TSOs

Democratization of the energy system also has the aspect that small scale units (e.g. PV on the roof top, owners of batteries etc.) are not only important as consumers and producers but also as providers of flexibility if aggregated; these flex owners, respectively their aggregator/market agent, operate primarily in the distribution grids. Further in addition to higher volatility, in energy systems with full or high penetration of renewable energy sources in general, a significant part of electricity generation is fed directly into the DSO grids and the TSOs have no direct control. In order for these democratized systems to operate reliably, distribution system operators have a greater responsibility for the operation of their grids. Apart from energy trading, operators need new markets to acquire flexibility products and it is crucial that the grid information be integrated (but remains private) and that all DSOs throughout the system have full access to the entire flexibility market. We design network integrated inter-DSO flexibility markets and automate the interactions between the agents in the whole system. We focus on the time up to 15 minutes before the implementation, but do not touch frr / fcr. We use mathematical programming and Lagrange decomposition to design a trading algorithm for flexibility trading.