

Analysis on efficient flexibility cluster methods for aggregation service providers

The occurring changes, the energy sector and its participants have to face, bring difficult challenges with it, for example the change of the system from centralized to decentralized generation, most influenced by the rising contribution of Renewable Energy Sources. Since the bad predictability of photovoltaic and wind energy could lead to uncertainty of the stability of the system, it is sought for a solution.

Demand response is a possible solution to these problems, meaning that the load or generation of residential, commercial or industrial users or producers is shortened to meet stability in the system instead of the traditional adjustment of generation to demand. Clustering of consumers can bring benefits to a system operator, like the aggregator, that is participating in demand response. In this work different methods of clustering are compared and investigated in their usefulness for the providers of demand response service products.

For this objective different algorithms were implemented in a python framework namely: k-means, hierarchical clustering and a modified follow-the-leader algorithm. They were compared by their different approaches and results of clustering a set of more than 4000 residential customers. Furthermore different scenarios with different objectives - predictability of future consumption, insight in the general behaviour and detection of consumers able to participate in demand response - were evaluated, which led to the awareness of the superiority of the hierarchical clustering method.