DEMONSTRATION IN POLAND

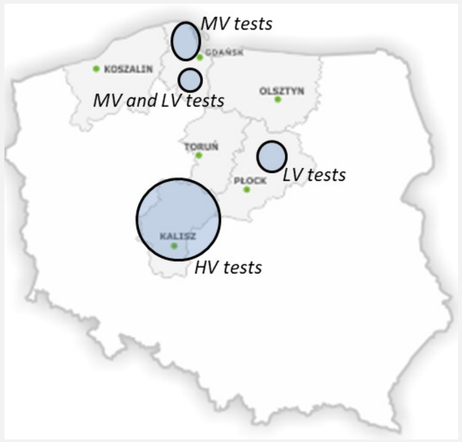
Problem Statement

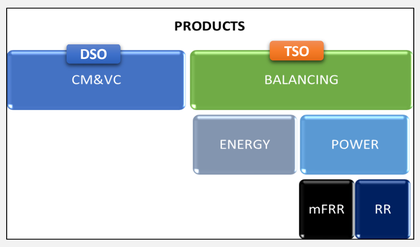
The primary objective of the Polish demonstration was to practically validate the feasibility of utilizing flexibility services to assist System Operators in managing the power system.

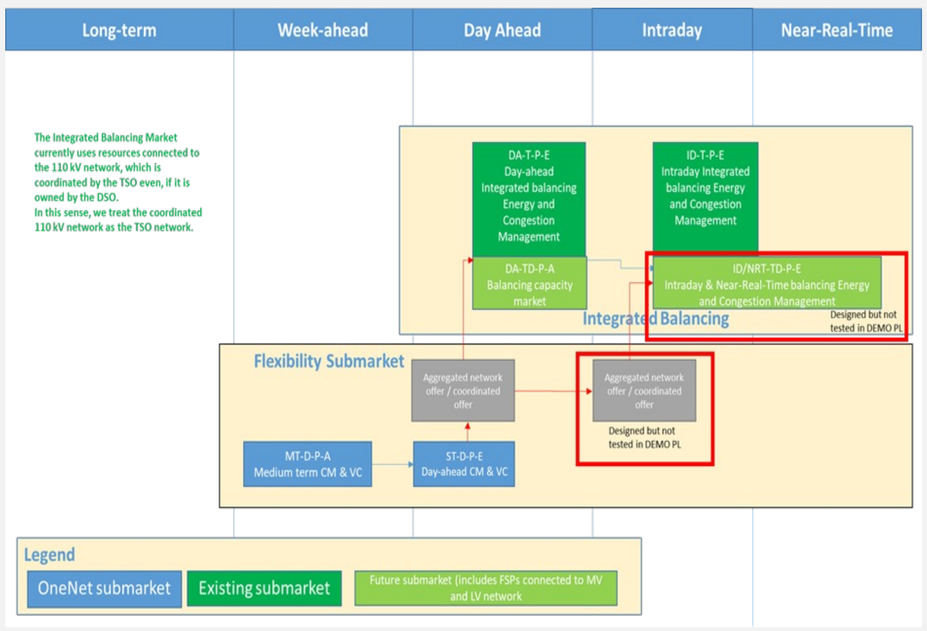
The project entailed the development of foundational assumptions and operational mechanisms for the flexibility market from scratch. This groundwork led to the formulation of business and system use cases, serving as the blueprint for constructing a prototype flexibility platform. The selection of services and products for testing was based on the defined needs of DSOs and TSOs.

Demonstration areas were chosen following network analyses, and promotional campaigns were conducted in these areas to enlist customers willing to participate as FSP in the tests. Additionally, mechanisms for coordinating activities between DSOs and TSOs were established, alongside algorithms designed to optimize the process of selecting offers for balancing services while maintaining the safe operation of the distribution network.

Demo's Innovation



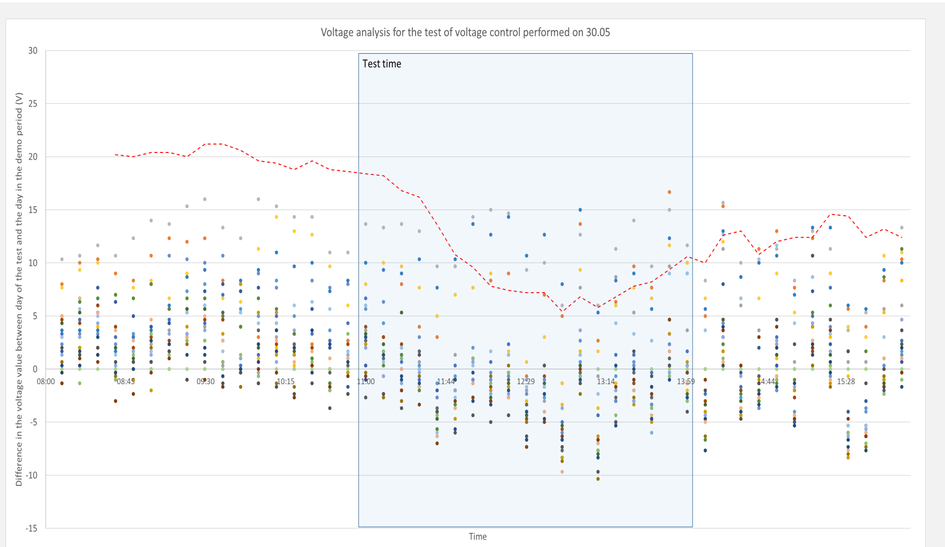




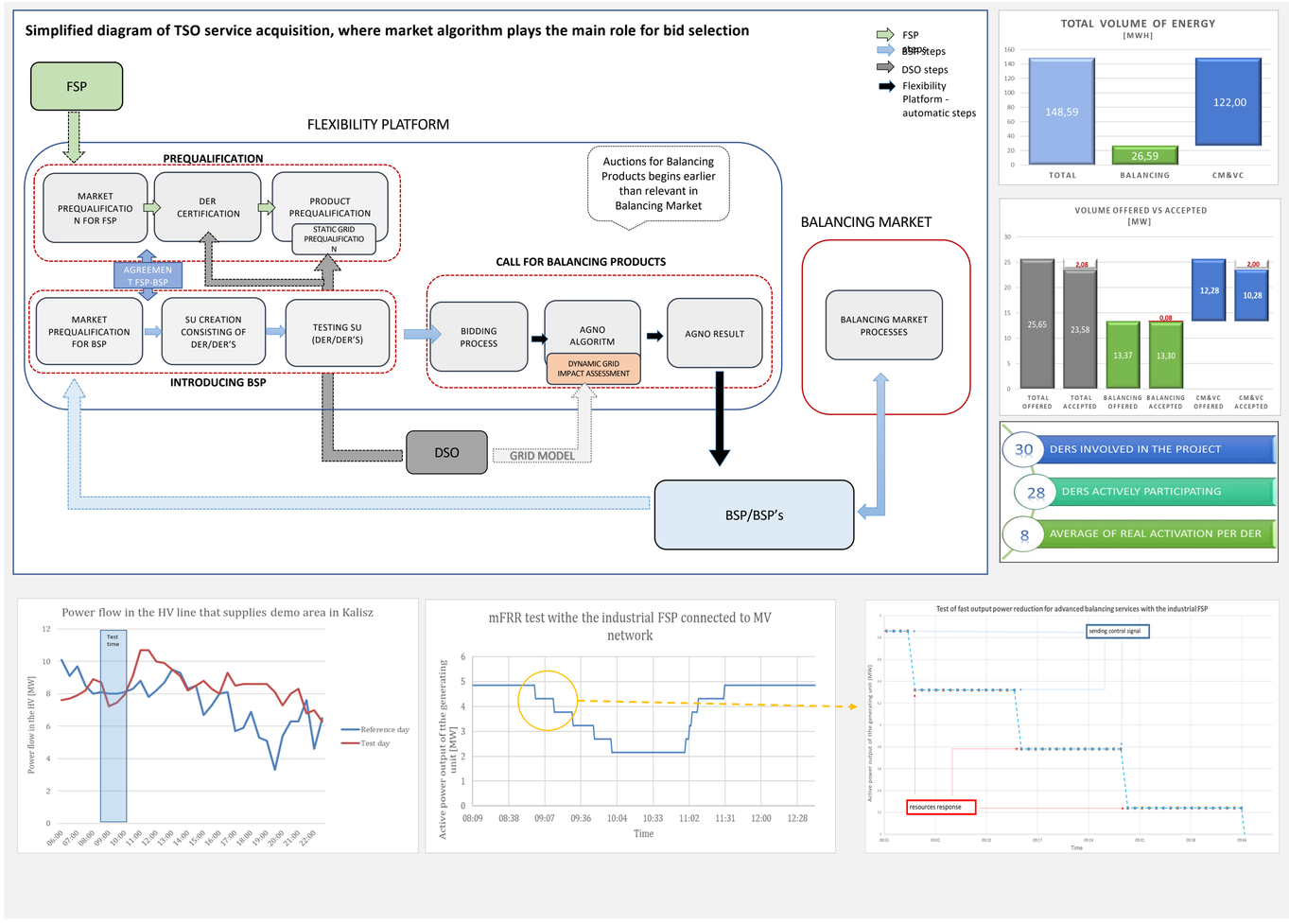
Services were procured from customers connected to both MV and LV distribution networks, with purchases made on the next day (DSO and TSO) and one week in advance (DSO).

Results and Lessons Learned

- Aggregators possessing the requisite skills and technical solutions play a pivotal role in shaping the flexibility market, especially concerning resources situated within the lower voltage network. Their role in providing services to the transmission network operator is especially critical.
- There is a certain threshold for the number of customers providing these services, which must be exceeded for the service to have a noticeable effect. Hence, the market's liquidity is of utmost importance.
- Algorithms designed to optimize and coordinate DSO and TSO activities, ensuring operational security in the distribution network while maximizing resource utilization, hold significant potential.
- While it is feasible to employ renewable sources connected to the low-voltage network to provide services, there is a susceptibility to errors due to unpredictable operating patterns.
- While limiting PV generation has proven effective for voltage regulation in the distribution grid, it's not always the optimal solution. This approach can also be beneficial for balancing purposes.
- However, establishing a dependable self-schedule for renewable resources, especially small prosumer PV installations, remains a challenging task.



The figure above shows the results of the DSO test for one of the days. The graph presents differences in the voltage values on the representative day on which the voltage control services tests took place and the other days in the analysed period. The data are presented for specific periods of the day.
Each dot represents the voltage level at a specific day and time during the day. The red dashed line shows the number of days when the voltage was lower than on the day of testing.
During the test period, there is a noticeable increase in the number of dots below the X axis and a decrease in the red line during peak PV generation hours - which means an improvement in the voltage value during the test hours.



Main Challenges

- Aggregators should be equipped with IT tools that enable effective control of customer resources, in a manner that aligns with the demands of the required service or product.
- The development of flexibility services in the distribution network faces a significant barrier due to the absence of smart meters with sufficient granularity and real-time data capabilities, along with the lack of network models, especially at the Low Voltage (LV) level.
- Limited knowledge of the distribution network's operational status by the DSO can lead to an overly conservative approach aimed at preventing network security violations in all conceivable, albeit improbable, scenarios. Especially, when the other System Operator would like to use those resources i.e. TSO for balancing purposes. To address this, DSOs should develop tools for dynamic flow analysis within their networks to determine permissible flow limits, especially when implementing complex flexibility resource offerings.
- Effective coordination between the flexibility market and the balancing market is essential for achieving an optimal and efficient energy market as a whole. This coordination between DSOs and TSOs is crucial in creating such a market, preventing duplicate service purchases, and mitigating system imbalances.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 957739