The Futureflow project: Promoting TSO-TSO cooperation in operation of balancing systems

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Motivation

Load-frequency control operated by the TSOs is a crucial system to maintain the grid frequency within a stable bandwidth. According to European legislation, balancing reserve is procured by the European TSOs via market based approaches. The balancing markets are usually operated by the TSOs and proofed to be functional for provision of reserves in the last years. Nevertheless, the procurement of reserves causes considerable costs, which must be borne by the TSOs. E.g. Austrian Power Grid (APG) published costs for reserve provision of 92 Mio. EUR for the year 2016 [1].

It is the intention of the TSOs to reduce those costs by TSO-TSO cooperation in procurement and activation of reserves. Several regional cooperations have been established during the last years, e.g. between German TSOs and some interconnected TSOs as well as between Slovenia, Croatia and Bosnia [2]. The Future Flow project aims to investigate the cooperation in aFRR (automatic frequency restoration reserves) markets between Austria, Slovenia, Hungary and Romania. Main goals are to gather theoretical and practical experience in aFRR and netting cooperation to prepare the project members to assess later participation in upcoming European initiatives like PICASSO [3].

Approach, results and outlook

In the FutureFlow project [4], the system architecture is implementing the TSO-TSO-model, as described in the European guidelines for electricity balancing [5]. According to the TSO-TSO-model each TSO operates the national balancing markets and establishes the technical rules and guidelines for the connected balancing reserve providers. The balancing service provider provides balancing services to the connecting TSO, which then provides these balancing services to the requesting TSO. Each TSO procures the required amount or reserves in the own grid area, but the real-time-dispatch is performed within the whole grid area of all participating TSOs by means of a least-cost optimization taking into account limited transmission capacities between the control areas.

Historically, each TSO developed individual rules for connection of balancing reserve providers and evaluation of the provided services. In order to approach towards a level playing field for balancing reserve providers, some harmonization between the national rules should be considered. It is the aim of this paper to discuss and explain the proposals for harmonization of rules developed in the FutureFlow project. This includes: types of applicable generation units, baseline algorithms, level of online-data measurement, communication of online-data and evaluation of service provision.

In 2018, field tests and demonstration of the FutureFlow system will start. For this purpose, a demo site system (figure 1) has been developed in the past two years. The tests include the preparation of real flexibility providing units in all four control areas, pooling of flexibilities in four individual virtual power plants (VPP), and separate connection of all four VPPs to the TSO-hosted FutureFlow simulation platform, where the bidding within the control area is simulated. The TSO can connect to the Futureflow cloud platform where aFRR bids are forwarded and optimization and control is performed in real-time.

A further objective is the test of aFRR provision from renewable sources. To support the integration of renewable units, an aFRR product duration of 1 h and a gate closure time of ca. 30 min will be tested.

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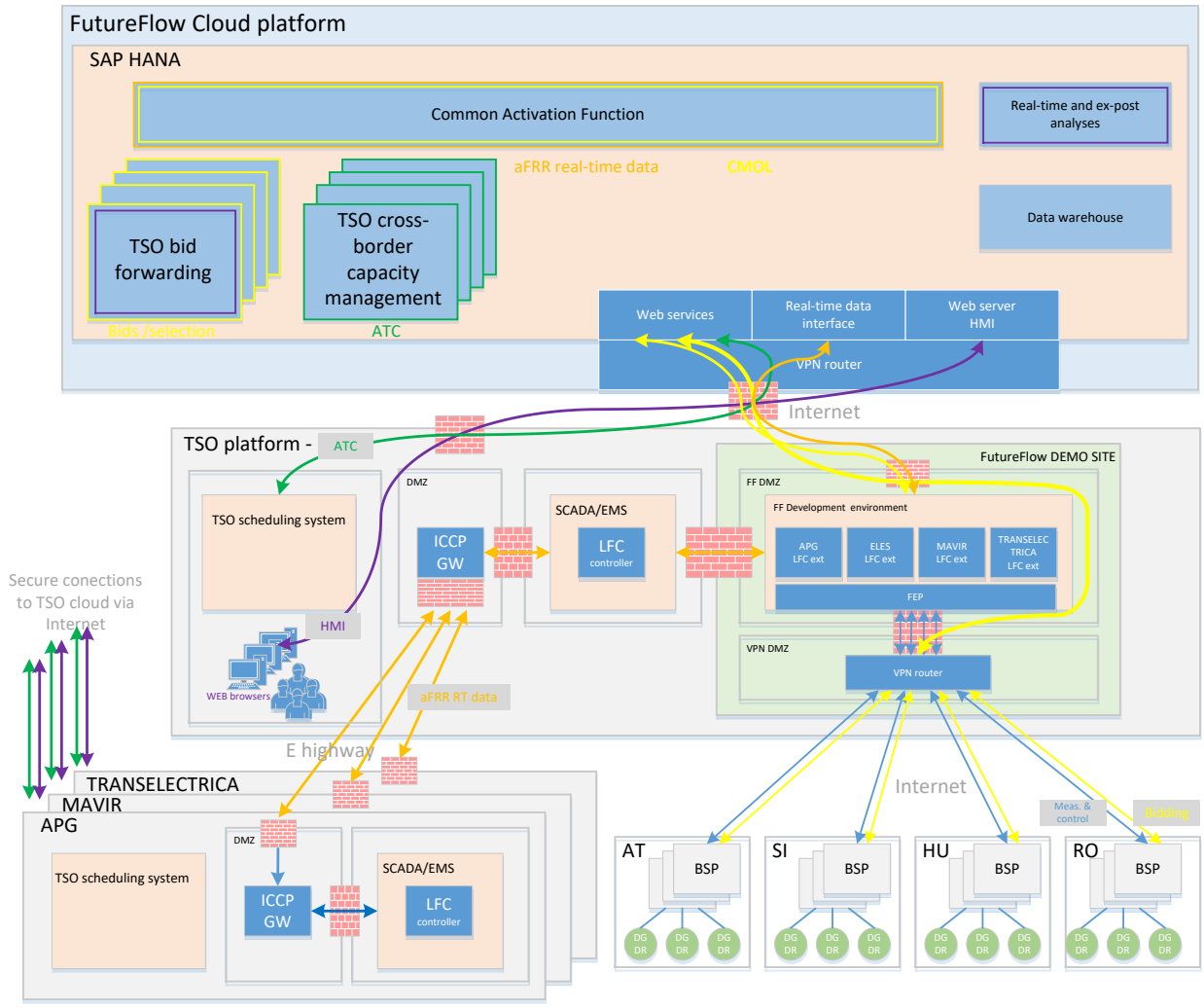

Figure 1: The FutureFlow DEMO Site System Architecture [6]

Literature

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