The VENTEEA 2 MW / 1.3 MWh battery system: an industrial pilot to demonstrate multi-service storage operations in distribution grids

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Introduction

The VENTEEA project is a 3.5-year field demonstration effort among the top initiatives of the French smartgrid R&D portfolio. Its goal is to facilitate the integration of Renewable Energy Sources (RES) in the MV distribution systems. For this purpose, a distribution grid with high penetration of RES was selected to test industrial pilots of new technologies and control approaches including primary substation digital management package, real-time network state estimation, Volt Var Control (VVC) schemes and a Distributed Energy Storage System (DESS), on which this paper focuses. The selected network comprises one 20-MVA primary substation and six 20-kV feeders. It powers 3200 customers and currently hosts two ~~a~~ wind farms (6 MW on non dedicated feeder and 12 MW on dedicated feeder). The VENTEEA project is carried out by a team of 10 (8 industrial and 2 academic partners) led by ERDF.

Approach

It is widely recognized that energy storage can facilitate the integration of RES in power systems. However, cost-benefit analysis often show that the revenues of a single service are not sufficient to cover the investment and operating costs, which hinders the development of this technology. The provision of multiple services to several stakeholders may help overcome this barrier thanks to the addition of revenue streams. However, the practical feasibility of this concept (multi-services, multi-players) needs to be proven: this is one of the key objectives of this storage field demonstration.

Main body of the abstract

The DESS system consists in a 1.3-MWh SAFT lithium-ion battery (2 Intensium Max IM20 containers) connected to the MV grid thanks to a 2-MVA Schneider Electric power conversion system, based on two Store Box containers with two 500kVA full 4-quadrant inverters each. To achieve multi-service operation, the remote supervision performs day-ahead scheduling of storage services to maximize profitability while satisfying requests from the stakeholders (Producers, TSO, DSO) and a set of constraints (e.g. DESS or grid capabilities). It also makes intraday adjustments of the schedule in order to limit the impact of the deviations that can occur due notably to RES forecast errors.

Then, the local supervision autonomously executes the optimized schedule and takes appropriate actions if a contingency occurs. The storage unit is grid-connected closely to wind farm connection points and a suitable switch allows connecting the DESS either to feeder 1 (dedicated feeder for WF1) or to feeder 2 (non-dedicated feeder with WF2). In addition to the necessary involvement of the stakeholders, this particularity strongly increases demonstration site potential in terms of DESS multi-service operation.

Conclusion

The proposed paper will 1/ present an overview of the VENTEEA project, 2/ present an innovative DESS

architecture and 3/ focus on multi-service storage operation: list and definition of individual VENTEEA DESS applications (frequency control, peak shaving, *etc*.), description of the proposed supervisory control and overview of the testing scenarios. After 6 months in operation, this paper will focus on the operational results and present recommendations on developing and installing storage systems for wind power generation.