

THE ALPGRID PROJECT

Advanced Linked Platform to enhance GRID performance (ALPGRID)

Background

In recent years, the Italian and Austrian electricity systems have been increasingly challenged by major trends impacting the regional performances of both electricity systems:

- An increasing share of electricity generation from non-dispatchable RES in the generation mix, this in order to meet the EU 2030 targets of the Energy Union, while mostly connected at distribution level;
- A lower electricity consumption due to the economic crisis;
- New load profiles coming from the electrification of the transport and housing value chains;
- Strong constraints on the single interconnector between Austria and Italy resulting from the price spread between the two adjacent control zones.

Consequently, the Italian and Austrian DSOs will likely observe in the years ahead growing network **voltage** and **power quality** issues as well as a lack of participation of market players to propose flexibility solutions.

If nothing is envisaged in the next five to ten years, the current state of play might lead to an unsustainable situation for the electricity systems on both side of the border: the connection of new non-dispatchable RES-based electricity generation will progressively become more difficult due to operational constraints resulting from a lack of flexibility solutions to be provided both by regulated and market players. Moreover, the quality of service for key industrial customers could also be declining.

In 2016, Italian and Austrian DSOs¹, in collaboration with their respective TSOs (TERNA and APG), **as well as aggregators and storage system operators**, started **separately** addressing such issues in their respective control zones: they studied primarily the implementation of voltage and power quality control techniques. Aggregators and storage operators could then concretely provide additional flexibility solutions to the electricity system, in line with the future regulations under debate at EU level.

A joint implementation of the envisaged solutions could **enable to solve the above problems in a more sustainable way**. In fact:

- Uncoordinated actions taken at distribution level in one of the two control zones may significantly impact the performances of the single interconnector and the electrical system beyond the border;
- A progressive deployment of the studied technological solutions at distribution level may not be efficient enough, since the same issues may resurface, leading to repeated investments to keep the electricity system working within an acceptable operational ranges.

The involved Austrian and Italian DSOs, together with aggregators as well as storage system operators², started therefore working together to avoid this scenario: they aimed at addressing the above pending issues by designing a joint cross-border **systemic approach** to bring stable solutions at once.

They end up with the **present investment project**: an innovative **system integration** of several **mature technology components** involving first regulated distribution network players, and next aggregators and storage operators, where the **synergies** between both types of technology solutions are searched to maximize the investment impacts onto both power systems at once. The project will deliver an increased operational efficiency for at least the next ten years, this with no need for repeated investments to host higher levels of RES in line with the trends foreseen to reach the 2030 targets safely.

¹ e-distribuzione (Italy), Wiener Netze and Kärnten Netz (Austria)

² Verbund (Austria), ENEL Green Power and ENEL Produzione (Italy)

Connecting Europe Facility Candidate proposal for Project of Common Interest (2017)

Note: The realization of the project relies on adequate level of financing, and on the confirmation, from each promoter, on the sustainability of the project.

The project aims at being labelled as a **smart grid project of common interest (PCI)** in 2017, thus being **mature enough** to apply for the 2017 CEF Energy Call 2 (to be opened in late 2017 or early 2018). It involves in Italy e-distribuzione together with Enel Green Power and Enel Produzione, and in Austria Verbund, Wiener Netze and Kärnten Netz.

The project: an innovative integration of synergetic, mature, technology-based solutions in order to simultaneously increase the operational efficiency of the Italian and Austrian regional electricity systems

Brief technical description of the project

The project integrates the coordinated deployment of **mature technology elements** with **an innovative, open, cross-border flexibility platform** operated jointly by aggregators in Austria and Italy:

1. First, DSOs enhance their ability to monitor and control their respective distribution grids, whereas market players provide additional flexibility from new and existing flexible assets including storage and increase their ability to forecast non-dispatchable RES generation;
2. Next, aggregators located both in Italy and Austria cooperate to jointly set up and operate a **cross-border flexibility platform** open to all market players.

While the participating **DSOs lead the project**, since most of the early challenges are met within the distribution network, the generation and storage operators provide flexibility, whereas aggregators market their cross-border aggregated flexibilities to TSOs and DSOs.

Resulting from the above investments:

- **DSOs will enhance the observability and controllability of their own distribution grids:** they benefit from advanced, yet mature, technologies allowing for improved operations and asset management;
- **Independent Storage System Operators** will install storage facilities of different sizes to provide services to the distribution and the transmission system as well as to local clients (depending on the localization of storage, e.g. power quality for industrial customers or synthetic inertia for the increased penetration of non-dispatchable RES generation);
- **Distributed non-dispatchable Renewable Plants Operators** will improve forecasting and control technologies to plan the power production and maximize revenues through the flexibility delivered to the aggregator;
- **Thermal Power Plant Operators** will make flexibility available from their auxiliary and storage equipment, which is connected at distribution level;
- **Aggregators in Austria and Italy** will invest in data communication and aggregation systems, connect the flexible assets and enter into contracts with TSOs and DSOs³ to deliver ancillary services;
 - **In Austria**, the added flexibility will increase the total flexibility available and lower the TSO costs needed to control energy;
 - **In Italy**, the project will kick-start for instance the demand-response market when the expected regulation allowing the aggregation of assets is in place;
- **Market Participants** from Italy and Austria will anticipate on upcoming regulations to create a joint entity open to all market participants in order to set up and operate a cross-border virtual flexibility

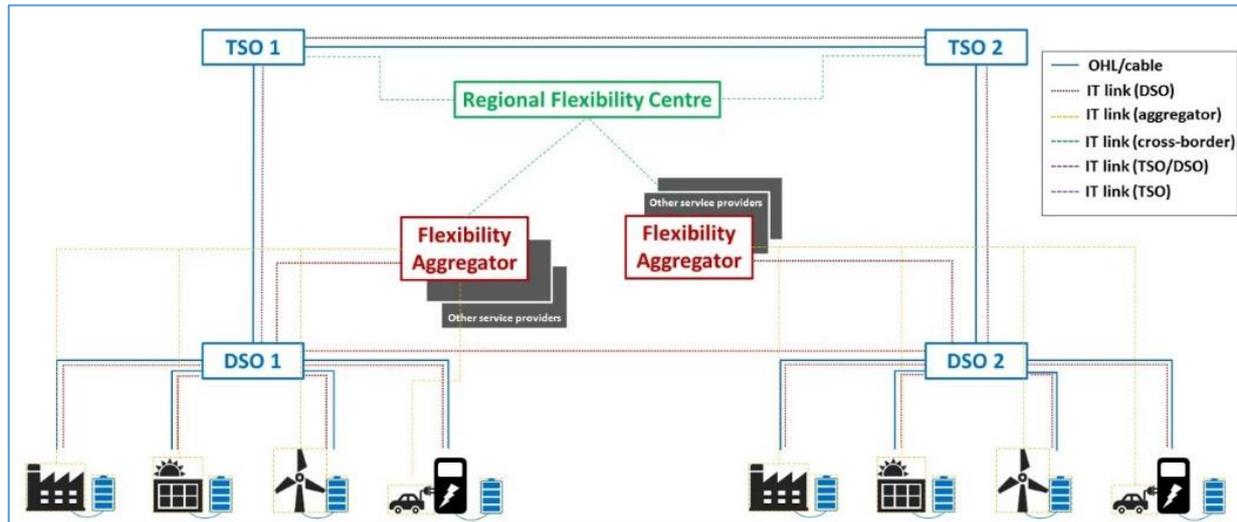
³ The possibility to enter into contract with the DSOs will be favored by the foreseeable evolution of the regulations in both Italy and Austria in line with the recast of the electricity directive (2009/72).

**Connecting Europe Facility
Candidate proposal for Project of Common Interest (2017)**

Note: The realization of the project relies on adequate level of financing, and on the confirmation, from each promoter, on the sustainability of the project.

platform leveraging on technologies developed in successful H2020 R&I projects⁴. The platform will be operated in a non-discriminatory fashion since welcoming any market participant (like for instance in the APCS⁵ organization in Austria - Austrian Power Clearing and Settlement-).

A schematic overview of the investment implementation is shown hereafter (cf. figure next page):



The project leans onto the following pillars:

1. **[DSOs] The deployment of power flow and power quality control devices in digitalized primary and secondary substations with e.g. FACTS and flywheel storage systems;**
2. **[DSOs] The deployment of real-time power monitoring and fault detection devices in digitalized primary and secondary substations, that support self-healing distribution grids thanks also to the use of a broadband telecom network,**
3. **[Storage operators] The deployment of storage solutions to provide flexibility available to the TSOs and DSOs;**
4. **[Aggregators/Storage operators] The deployment of solutions to enhance the flexibility of assets belonging to the aggregators portfolio in order to increase the resources and capabilities available to the TSOs and DSOs for the cross-border coordination (e.g. storage systems installed in conventional power plants and large customer's premises);**
5. **[Generators] The deployment of forecasting and control technologies for the non-dispatchable distributed renewable plants:** inflow forecasting in run-of-river hydro power resources is essential to keep control in an optimal way, to plan the power production and to maximize revenues for the aggregated plants. Inflow modeling and meteorological forecasting commercial tools will be applied to the aggregated plants in order to make sure that the resources and assets are utilized to their full potential in terms of production and revenues. In addition, integration of the forecasting tool with simulation and optimization tools able to support optimized dispatching of the plants will be pursued, in order to maximize the flexibility that can be reliably offered to the grid.
6. **[Aggregators] The deployment of a virtual cross-border coordination platform between Italian and Austrian aggregators:** it will consist in a dedicated IT infrastructure and software based on development efforts in EC-supported R&I projects, which can be considered as mature enough when

⁴ For example: <http://www.flexiciency-h2020.eu/>, <http://www.futureflow.eu/>, etc.

⁵ <http://www.apcs.at/en>

Connecting Europe Facility Candidate proposal for Project of Common Interest (2017)

Note: The realization of the project relies on adequate level of financing, and on the confirmation, from each promoter, on the sustainability of the project.

looking at the investment time line. The equipment and operation of the virtual center are distributed between the existing control systems of aggregators.

Synergies between project components

A key aspect of the project lies in the synergy brought by the simultaneous deployment of a portfolio of mature technology-based solutions: all together, they bring higher benefits and positive externalities than when a separate implementation is chosen which brings more limited impacts. Overall, the commonly operated flexibility platform is the corner stone of the whole portfolio of the network technology investments.

Alignment with the “Clean Energy for all Europeans” package

The present project is in line with the EC proposals issued in November 2016⁶.

In the recast of the electricity market directive (2009/72):

- Article 17.2 promotes the procurement of ancillary services through aggregators *Member States shall ensure that [...] distribution system operators when procuring **ancillary services**, treat **demand response providers**, including **independent aggregators**, in a non-discriminatory manner, on the basis of their technical capabilities. [...]*
- Article 31.5 dwells upon the role of aggregators as independent market players providing ancillary services to DSOs *[...] the procurement of non-frequency ancillary services by a distribution system operator shall be transparent, non-discriminatory and market-based ensuring effective participation of all market participants including **renewable energy sources, demand response, energy storage facilities and aggregators**, in particular by requiring regulatory authorities or distribution system operators in close cooperation with all market participants,[...]*

In the recast of the electricity market regulation (2009/714):

- Article 53.2 states that“*Transmission and distribution system operators shall cooperate in order to achieve coordinated access to resources such as distributed generation, energy storage or demand response that may support particular needs of both the distribution system and the transmission system”....*

⁶ Available at <https://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition>.