NEWSLETTER #1

April 2021

In a nutshell, POSYTYF is an H2020 project that aims to support the further integration of Renewable Energy Sources into the power system by developing the **Dynamic Virtual Power Plant** concept (**DVPP**).

The POSYTYF project was officially launched in June 2020. While all partners managed to reallocate some internal resources to kick-off the first tasks of the project, the pandemic situation and related boarder shutdown triggered significant delays in the recruitment of researchers on the project, and in the procurement of the experimental equipment required. Some positions are now filled-in, and others are still under recruitment process. A six-month extension of the project duration is considered in order to compensate this delay.

The next two pages will provide you with a brief status on the first tasks launched in each technical work package of the project, and an overview of the next steps.

Enjoy the reading!

The POSYTYF project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 883985.

WP1: Scenarios and models for the DVPP in present and future power systems

WP1 led by Universitat Politecnica De Catalunya, specifies scenarios of power systems -present and future- that will be used in the other work packages. The WP1 team has now formalized these different possible scenarios to be used for the analysis of realistic Dynamic Virtual Power Plants in Europe. They provide a wide range of options in terms of size, renewable generation technologies, and electrical network configuration. A review of existing electrical grids in several European countries allowed identify real scenarios in specific locations potentially suitable for DVPP operation. They serve as reference for the selection of a final set of scenarios, considering isolated (e.g., island) and interconnected (e.g., continental) cases. Those scenarios were then quantified through an optimization-based algorithm, using real data on the availability of different RES and demand in specific European locations. This quantification aims to provide a first approximation of the renewable plants sizing, considering present and future power system configurations. The scenarios will be used as a basis for further studies within other work packages of the Posytyf project, as well as other related works.

Deliverable D1.1 presenting these scenarios will soon be available for download on the project website.

WP2: Design of control at single RE generator level

WP2 deals with the design and modeling of controls at the single RE generator level and how they interface with controls of higher levels (farm, grid levels) as developed in WP3 and WP4.

The team led by Hochschule für Technik und Wirtschaft Berlin is currently developing the control models for non-dispatchable RE generators (wind turbine, photovoltaics). The controls shall enable to both optimize and/or limit the power of each RE plant according to the signals from higher-level controllers. In the next steps, those control models will be integrated into larger power system models and validated in the scenarios defined in WP1.

While models are presently developed under Matlab environment (Matpower/ MatDyn), they will be translated for commercial software such as PSS/E to ensure their industrial viability. In the following steps, the control models will be tested on the testbed of Hochschule für Technik und Wirtschaft Berlin. This testbed will be upgraded to integrate the programmable logic controller developer by the industrial partner Bachman for its Smart Power Plant Controller software.

WP3: Centralized controls at system levels for ancillary services

WP3, led by Ecole Centrale De Nantes, investigates how to coordinate the individual devices in a DVPP and several DVPPs at the transmission grid level so as to provide ancillary services at all temporal and spatial scales. The WP3 team started to investigate centralized control: the control design is based on the model of the entire DVPP system. It will provide concrete control solution but it is also intended as a benchmark for the maximum achievable performance. For the implementation, a decentralized scheme is also under study. Performances of both controls will be compared.

WP4: Decentralized controls at system levels for ancillary services

Led by Eidgenössische Technische Hochschule Zürich, WP4 treats, in conjunction with WP3, the decentralized control of a single or several DVPP(s) to provide ancillary services. It also considers future power systems with little synchronous, rotational, and bulk generation, in which controls have to be distributed among multiple, small-scale, and heterogeneous generators. The decentralized controls to be designed target dynamic ancillary services on the sub-second timescale, therefore no communication is considered between generation sources. Two control design approaches are investigated in parallel:

- A "central" approach to simultaneously design the decentralized controllers of all devices via a global optimization program. This innovative approach requires the development of entirely novel methods.
- A fully "decentralized" approach in which controls are designed according to local device specifications, using participation factors according to which control actions are allocated.

The first design approach is currently under development. The second one is in a testing phase on numerical case studies.

WP5 Competitiveness of the DVVP under uncertainty conditions

WP5 aims to evaluate the viability of the DVPP under different present and future scenarios, and to define how to operate it so that it can compete with battery energy storage systems. In other words: in which markets should the DVPP participate so as to justify its own investment? The early involvement of industrial partners CIEMAT and IBREDROLA in WP5 activities allows specifying techno-economic simulations that are adjusted to their industrial context and needs.

As a first step, the team led by Universidad Pontificia Comillas is working on the functional modeling of the DVPP itself, taking into account the uncertainties of some key parameters such as prices or generation/load flexibilities. The Spanish energy markets are firstly investigated for the DVPP participation (day ahead and intra-day markets, and deviation management). The challenge is to develop models that both precisely reflect the Spanish context and are generic enough to be usable in other national contexts. The first tests on those models are ongoing. Next, ancillary markets will be analyzed and modeled, in coherence with the choices made in WP3 and WP4. To that end, research will have to go beyond the Spanish context where, in its current structure, secondary reserve market is the only balancing market that could potentially be relevant for DVPPs.

While the models should be functional by the end of 2021 to enable the tool development and perform the targeted simulations, they will be constantly upgraded until the end of the project to integrate the DVPP participation to new potential markets.

Highlights of the coming months:

- Deliverable D1.1 *Definition and specification of Dynamic Virtual Power Plant scenarios* will be publicly released by August this year.
- A first webinar introducing the project and WP1 first results will be organized during summer 2021.

For more updates on the project:

www.posytyf-h2020.eu

www.linkedin.com/company/posytyf-project

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