

## PVTool

### Development of tools for effective control of large PV power plants

*Project duration: from 09.2018 to 10.2021*

*Report submitted: 11.2021*

#### **Publishable Summary**

The important proliferation of medium and large size PV power plants in Europe and worldwide is raising the attention to its important role in providing support to the electrical network. Large PV power plants need to ensure a smooth injection of the generated renewable power into the grid where they are connected, while providing the required ancillary services. Depending on the grid nature, such requirements can differ considerably, ranging from frequency or voltage support for PV power plants connected to power systems based on conventional synchronous generators, to grid-forming capability in systems or microgrids where PV is the main generation source.

The project aimed at developing relevant control architectures and control algorithms to ensure optimal performance in different kinds of systems. In relation to control architectures, alternative control architectures were analysed, including decentralized, distributed and hierarchical options. A methodology was presented to select the most appropriate control architecture for each service. As a result, the hierarchical control was highlighted as a relevant alternative to provide frequency support services. Regarding the interaction analysis and control algorithms, detailed small-signal models were developed to analyse the potential interactions derived from more demanding and faster grid support services. The application of different stability analysis methods confirmed the possibility of interactions, specially between the PV inverters and the Power Plant Controller. Also, a control tuning method was suggested to achieve fast grid support services. This method was validated in simulation and in an experimental platform.

In addition, the project aimed at strengthening the relations between the universities and industrial partners. In this direction, a follow-up of research ideas will be addressed by the universities and the industrial partner is planning to test the control tuning methods developed during the project in real-time simulators and eventually real power plants.

## Project consortium

Coordinator and all contact details:

|                                       |   |
|---------------------------------------|---|
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Participating countries and financing:

| Country      | Number of organisations involved | Project costs in EUR | Public funding in EUR |
|--------------|----------------------------------|----------------------|-----------------------|
| Spain        | 2                                | 711'613              | 449'807               |
| Sweden       | 1                                | 523'747              | 507'810               |
| <i>Total</i> | 3                                | 1'235'360            | 957'617               |

## Funding agencies involved and contracts

| Funding Agency    | Contract N° and Title          |
|-------------------|--------------------------------|
| AEI               | PCI2018-092882                 |
| CDTI              | EXP - 00108617 / SERA-20181007 |
| Energimyndigheten | 2017-008246 (44998-1)          |

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