

SNOOPI

Smart Network Control with Coordinated PV Infeed

Project Duration: 10.2015 to 09.2018.

Initial report submitted: 11.2015

Summary

High penetration of PV in the distribution grid will significantly impact voltage control in the distribution network. It will cause high voltage rises and fast voltage changes over a very short time period when for example clouds are passing areas with large amounts of solar power. The objective of this study is to develop and test a voltage regulation tool that is scalable and portable so that it can be used for any distribution system with high PV penetration.

The project “Snoopi” consists of 4 partners: two in Germany, namely Energynautics GmbH, EWR Netz GmbH, one institution – KTH – in Sweden and one in Austria (Fronius International GmbH). It will last in total for three years.

The project will develop and test new control methods to maintain the voltage within set limits, even if the situation in the distribution network is changing very dynamically (e.g. if electric cars are frequently connected to the distribution network together with a high share of PV).

The main challenge is to coordinate the inverter control of many battery systems and at the same time minimize the communication and measuring requirements in the distribution network. As regulating the voltage in one node indirectly regulates the voltage in the adjacent node due to the inherited interactions in the voltage, a robust control scheme must be developed. Regulating the voltage in one node should not cause problems in another, and in addition the transformer tap changer control or other controllable devices need to be taken into account in the regulation, to ensure all node voltages are within the limits.

It is the intention of the project to test the newly developed control methods in a real distribution system with considerable amounts of PV. It is planned to implement and test the voltage control tool in field tests on the EWR Grid in Germany. The EWR Grid encompasses a large amount of PV. To measure the voltage in these networks, various measurement systems will be used, e.g. phasor measurement units.

The project will be executed in six phases. In the first phase field test areas in Germany will be identified and reconstructed in network models. The voltage control tool will be developed in phase two and tested by simulations on the network models in phase three. Phase four focuses on testing the tool in the laboratory. In phase five demonstration projects will be prepared. The main goal is the execution of demonstration projects in phase six, where the tool will be tested in field tests on the real distribution grids of EWR. During these field tests, several questions will be answered such as:

- What measurement quality is required from “Battery Inverter” and “Smart Meters”, e.g. what time delays are acceptable and what data sampling rates are needed?
- How much solar power can be installed in the distribution grid and what are the limiting factors?
- What is required to make the tool scalable and portable to other network areas?

The evaluation of the measured data as well as the delivery of the final report will also take place in phase six. The overall aim is to develop, test and validate the performance of the voltage control tool, so that it can be used as a network operating tool by distribution companies around the world.

Project consortium

Coordinator and all contact details:

Full name of organisation	Energynautics GmbH
First and family name of coordinator:	Thomas Ackermann
Full address:	Robert-Bosch-Str. 7, 64293 Darmstadt, Germany
E-mail:	t.ackermann@energynautics.com

Participating countries and financing:

Country	Number of organisations involved	Project costs in EUR	Public funding in EUR
Germany	2	769'962	428'469
Austria	1	0	0
Sweden	1	259'921*	259'921*
<i>Total</i>	<i>4</i>	<i>1'029'883</i>	<i>688'390</i>

**originally 2.469.250 SEK assuming 9,50 SEK / EUR*

Funding agencies involved and contracts

Funding Agency	Contract N° and Title
Projektträger Jülich, Germany	0325771A, 68302
Projektträger Jülich, Germany	0325771C, 68302
no funding	-
Energimyndigheten, Sweden	38400-1 Smart Network Control with Coordinated PV infeed - Snoopi