

## IPERMON

### Innovative Performance Monitoring System for Improved Reliability and Optimized Levelized Cost of Electricity

*Project Duration: 04.2016 to 03.2019.*

*Initial report submitted: 09.2016*

#### **Publishable summary**

Photovoltaics (PV) continues to be a fast growing market, with an expected growth in global installations of up to 60 GW in 2015, according to the European Photovoltaic Industry Association (EPIA), and is on track to achieve the goal of 12 % of European electricity demand to be provided by PV by 2020. A key factor that will enable the further increase of the uptake of the technology is the reduction of PV electricity costs by increasing the lifetime output as highlighted by the Solar Europe Industry Initiative (SEII). This can be achieved by improving the reliability and service lifetime performance through constant, solid and traceable PV plant monitoring of installed systems, hence directly impacting positively investment cost, levelised cost of electricity (LCoE) and in general PV competitiveness. In this sense, a main challenge in the quest for ensuring quality of operation especially for grid-connected PV systems is to safeguard reliability and good performance by identifying and quantifying accurately the factors behind the various performance loss mechanisms, while also detecting and diagnosing potential failures at early stages or before occurrence, through robust performance monitoring, fault detection and preventive maintenance. The importance of the above is evident by the increasing number of recent international initiatives devoted to advanced condition monitoring and reliability such as the International Energy Agency (IEA) Photovoltaic Power Systems Programme (PVPS) Task 13, the PV Performance Modelling Collaborative (PVPMC) facilitated by Sandia National Laboratories, the National Renewable Energy Laboratory (NREL) workforce on reliability, degradation and performance monitoring, and the alignment with the main objectives of the SEII for quality assurance, long term reliability, active monitoring and accurate energy forecasting.

It is with this background that project IPERMON has been initiated in order to primarily monitor and assess PV system performance, through the formulation of a procedural protocol (starting from sensor installation, data acquisition and filtering, to time series analysis) for the development of algorithms to detect performance losses, failures and degradation mechanisms at an early stage. The developed algorithms will be integrated in an end-product which will be an innovative monitoring system with improved operations and maintenance (O&M) tools. The monitoring system will act as a high level watchdog by ensuring reliability and operational quality of PV power plants and eventually yielding increased lifetime output. In this respect, it is anticipated that the project will assist in providing a robust and accurate platform to detect losses, failures and estimate degradation at early stages and in real-time using data measurements and statistical tools. This is the first time such a system will be demonstrated with functionalities well beyond the current state-of-the-art. These types of tools are well anticipated in the fast growing PV market with continuously narrowing profit margins.

In addition, the advanced monitoring system can further act as the buffer between PV installations and the grid, contributing with the control algorithms to supportive functions for grid stability especially for the important task and requirement by many distribution/transmission system operators (DSO/TSO) for forecasting the day ahead energy yield. Therefore, the proposed system is of interest to a large stakeholder target group ranging from policy makers and utilities, plant operators, engineering procurement construction (EPC) contractors, module producers and investors.

Finally, the project is based on a transnational collaboration between a leading industrial partner, Gantner Instruments (GI), that will provide the platform for the development of the end-product and a research organisation, the University of Cyprus (UCY), with significant track record and award winning research work and innovations in the field. The skills, complementarity and balance of the consortium will greatly assist in materialising its objectives, thus contributing to the solar energy ambitions of the participating countries, as well as generating a commercial product that will enhance the competitiveness of a European industrial partner.

## Project consortium

Coordinator and all contact details:

Full name of organisation	Gantner Instruments Test & Measurement GmbH
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Participating countries and financing:

Country	Number of organisations involved	Project costs in EUR	Public funding in EUR
Austria	1	300'000	180'000
Cyprus	1	100'000	100'000
<i>Total</i>	<i>2</i>	<i>400'000</i>	<i>280'000</i>

## Funding agencies involved and contracts

Funding Agency	Contract N° and Title
FFG	853373, eCall: 6118666
Cyprus Research Promotion Foundation	KOINA/SOLAR-ERA.NET/1214/08 – IPERMON