

ROM-PV

Reducing the photovoltaic operation and maintenance (O&M) costs through an advanced online platform

Project duration: from 12.2019 to 12.2022
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Publishable Summary

A challenge in the scope of facilitating further the uptake of photovoltaic (PV) technology is the reduction of levelised cost of energy (LCOE) by increasing the lifetime output, quality and sustainability as targeted by the SET-Plan. This can be achieved by improving the lifetime energy yield and operation and maintenance (O&M) costs through online data-driven and statistical algorithms that will enable the analysis of measurements collected from constant monitoring of PV plants. In this sense, a main challenge for ensuring quality of PV power plant operation is to safeguard reliability and optimum performance by detecting, classifying and accurately quantifying performance losses and failures.

The ROM-PV project has been initiated to overcome these challenges by developing and commercialising a product that will enable preventive and predictive maintenance and ensure optimal PV plant performance while also reducing the associated O&M costs. This will be achieved through the development of a cloud-based solution that will host innovative algorithms able to a) ensure data quality and b) allow failure and performance loss diagnosis (open- and short-circuit failures, inverter and bypass diode faults, shading, degradation, soiling, etc.) without disrupting the normal operation of the PV plant. The methodology will be primarily based on real-time analysis of measurement data, machine learning and statistical analysis and will be verified experimentally against field measurements from existing PV systems installed worldwide.

Currently, a complete methodology for ensuring data quality was developed and documented in a report [D3.1 Methods for ensuring data quality]. The report outlines the steps of the optimum methodology for ensuring data sanity by treating missing and erroneous data, performing data aggregation, imputation and filtering. In parallel, a data quality and management algorithm (routine) was developed for data sanity and validated against historical field measurement data obtained from PV systems installed in Cyprus, Greece and Spain. The proposed algorithm ensures high-quality data for the proposed monitoring solution. It is expected that the data management methodology will be also used for failure diagnosis purposes (i.e., detection of failures and provision of insights about possible failure causes).

A lot of work was also conducted in the field of failure and losses diagnosis. More specifically, algorithms for detection and classification of commonly occurred failures in grid-connected PV systems were developed. Similarly, algorithms for the quantification of soiling losses were also devised. It is expected that the failure and performance losses algorithms will be incorporated into the cloud-based monitoring solution for ensuring optimal PV performance, while also reducing the O&M costs.

The undertaken research work is expected to have significant impact on reducing the LCOE, by increasing the lifetime output, quality and sustainability of the technology as targeted by the SET-Plan. This will be achieved by predicting and accurately detecting faults and losses (i.e., soiling, shading, faulty inverter, etc.), performing preventive maintenance and cleaning maintenance strategies. Therefore, combining the preventive and predictive maintenance aspects of this project will impact positively the way O&M providers

perform their services, making them more efficient and cost effective, but it will also have a positive impact on plant lifetime performance.

Finally, this is an industry driven project which combines the research expertise of two well reputed research groups, the PV Technology Laboratory of the University of Cyprus (UCY) and the Centre for Advanced Studies in Energy and Environment (CEAEMA) of the University of Jaén (UJA) with the market experience of a global organization (Alectris Hellas IKE – industrial partner) that delivers assets care innovation for the global solar industry since 2012.

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
Cyprus	1	198'960	198'960
Spain	1	113'400	113'400
Greece	1	168'869	135'095
	3	481'299	447'455

Funding agencies involved and contracts

Funding Agency	Contract N° and Title
Cyprus Research Promotion Foundation (RPF)	P2P/SOLAR/0818/0009 – ROM-PV
Ministry of Economy, Industry and Competitiveness – State Research Agency (MINECO-AEI)	PCI2019-111852-2/ IOM-PV
General Secretariat for Research and Technology (GSRT)	T11EPA4-00023 GSRT System Contract Code: 5087186