

H2020 Project GRECO: Open Science for innovative products in photovoltaics.

Insolight participates together other 10 international partners in GRECO, in a pilot of the European Commission that aims to put into action the concepts of open science and responsible research and innovation for the development of socially responsible photovoltaic products.

To demonstrate that the application of Open Science practices (and more broadly, Responsible Research and Innovation methodologies -RRI-) are the basis for obtaining research products aligned with the current society challenges and become a basic reference of how these materialize in all phases of an R&D project, are the two main objectives of GRECO (H2020-787289). This project is financed with € 3m and will last until May 31st, 2021.

The Solar Energy Institute of the Universidad Politécnica de Madrid (UPM), coordinates this multidisciplinary research project where different parties of the quadruple helix of innovation -civil society organizations, industry, government and academia- are committed to work together and share knowledge and data among each other and interested third parties to come up with six innovative PV products. The project will operationalize tools that enable effectively this collaboration in different locations of Europe, Africa and Brazil through **public engagement** mechanisms. In this way, processes such as user-centered Open Innovation, Citizen Science or Mobilization and Mutual Learning (MML) actions will be especially relevant for the development of our products.

Also, through **Open Science** tools such as *Open Access, Open Data, Open Education, Open Notebooks, Open Software y Open Peer-Reviewed* GRECO aims to generate a research process more accessible to the rest of world. *“This will undoubtedly allow that the developed scientific concepts can be quickly reused by third parties, science can advance in a more transversal way and there is no double financing of the same researches in different parts of the world”* comment Ana B. Cristóbal and Carlos del Cañizo, coordinators of this Project.

Right here, when the implementation of these mechanisms seems to have undeniable advantages, there is the big question that the project itself will try to determine, evaluate and manage: *how far can open science be used without losing competitiveness?*

Finally, GRECO will conscientiously regulate the **ethical, gender and governance principles**, the remaining aspects of the RRI, which will guide the execution of the project in its search for socially responsible products.

Six products that will make a difference

Throughout the project, researchers participating in GRECO will design six products.

The first one is an *in-situ* repairing methodology that can save the cost of replacing defective modules in a PV installation while supporting the idea of Circular Economy. Through a collaborative process where we will identify and collect defective modules from the civil society and researchers from different Organizations will develop a methodology that will

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be tested and analyzed by installers from three countries. A video-tutorial will be published to give free access to anyone interested in the procedure.

The second one is an ageing model for PV modules to improve the estimation of energy production of PV plants and reduce the uncertainty on the estimations that are made by financial agencies when considering investments on this type of projects. To that extent, the project will call to the collaboration of European installations' owners to access and measure their plants. Researchers will analyze these data and compare them with that obtained in the last decade, to produce the most precise model possible.

A third product targets to develop a more sustainable solution for irrigation, pursuing a reduction of costs and a major use of renewable energy in agriculture. The major innovation of GRECO is that the solution is not already agreed. During the project, both Governments and Irrigators from the Euro-Mediterranean area in a user-centered Open Innovation process will define the current needs of the irrigators and Governments and together the researchers of GRECO will co-design a product that meets their demands.

The three remaining products are devoted to improving the penetration of photovoltaic energy into the electric system, taking advantage of its decentralized character. GRECO will develop cheaper and more efficient solar cells, a novel system of modules able to provide energy to buildings up to 8 stores, and improved PV heat-pump systems as enablers of a major use of renewable sources in the daily-life. To carry out these investigations the Consortium will carry out consultations through mobilization and Mutual Learning processes with different relevant players in six different countries: Spain, Portugal, Bulgaria, Germany, United Kingdom and Brazil to define barriers and facilitators to the use of those products and consequently, define proper roadmaps for a better alignment of the technology with the society. Moreover, the project is expected to co-design with third parties a Citizen Science Initiative that allow people from around the world to contribute with their data to foster the studies and investigations of the photovoltaic community.

But perhaps the product with the greatest impact expected from the project will be the **guide for researchers** that the project will publish in the summer of 2020, where we explain to the scientific community how to implement the concepts of RRI and Open Science in research projects.

All products of GRECO will follow Open Science practices and several actions have been designed to contribute to the openness of our results. Researchers will adopt not only Open Access and Open Data policies, but also will explore the implementation of Open Notebooks in research institutions or the use of video-tutorials as a double resource: educational and metadata.

An international partnership to get the major impact of the Open Science pilot

The research consortium, coordinated by Ana Belén Cristóbal and Carlos del Cañizo, both from the Universidad Politécnica de Madrid, will have the participation of the Pompeu Fabra University, the University of Evora, the Central Solar Energy Laboratory of the Bulgarian Academy of Science, the Helmholtz Zentrum Berlin, the Reiner-Lemoine Institute and the University of São Paulo. Likewise, the Government of Andalucía, the Swiss company INSOLIGHT and the Euro-Mediterranean Irrigators Association are partners in the Consortium.

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