



This issue

Welcome

Introduction

WG Updates

Meeting Updates

Country Reports

STSM updates

ITC Conference Grants

STSM Interview

Publication Policy

Join us

Key dates

June 2019: delivery of PV data repository for PEARL PV research

14-18 October 2019: Seminar (14) and Training School (15-18) on 'Evaluation of performance degradation of PV systems', Malta

14 November 2019: Workshop on LSC PV Performance, Eindhoven

Welcome

Dear PEARL PV members,

We have exciting news for you! The PEARL PV's data bank for PV performance data will soon be released. This first trial version has been developed by University of Twente, ITC Department in collaboration with PEARL PV data bank team consisting of Anton Driesse (team leader), Wilfried van Sark, Christian Braun and Fjodor van Slooten. In the past 5 months these two teams have been intensively collaborating on a **new data storage system** in CKAN. The report of Working Group 1 in this Newsletter will explain in more detail about this new facility.

COST Action PEARL PV is growing and becoming an established research network throughout Europe and beyond. **New member countries** include Hungary, Montenegro, Moldova and Albania. Many of our members are participating in various Tasks of the International Energy Agency PVPS program and are making significant contributions to the forthcoming White Paper from SolarUnited (Global Solar Business Technology Association), and ETIP PV (European Technology and Innovation Platform for Photovoltaics) on quality, reliability and performance

for the European PV Industry. The first scientific papers have been published in journals which have been written in the context of joint research and/or STSMs for COST Action PEARL PV. Also **PEARL PV has been or will be presenting** at the PVPMC workshop (Albuquerque, USA), Intersolar (Munich, Germany), IEEE PVSC-46 (Chicago, USA), EU PVSEC (Marseille, France) and the Asian PVSEC in Xi'an in China.

In February of this year these PEARL PV events took place in Lisbon, Portugal: an MC3 meeting and five interesting research workshops, please visit the website for a summary of this very successful event: <https://www.pearlpv-cost.eu/news/>. The University of Lisbon under guidance of Prof João Manuel de Almeida Serra was an excellent host. **Warm hearted thanks** for this great experience!

Our next events, namely a Seminar and a Training School on the 'Evaluation of performance degradation of PV systems' will take place from **14 to 18 October 2019** at Malta College of Arts, Science and Technology (MCAST) in Paola, Malta. More information will be available on the website of our Action shortly, see here: <https://www.pearlpv-cost.eu/event/training-school/>. At this stage we kindly ask you to save these dates: 14 October for the Seminar and 15 to 18 October 2019 for the Training School.

In Grant Period 2 of our Action there was a budgetary excess which has been used by University of Belgrade to organize a dedicated Workshop for ITC countries in PEARL PV. This workshop aimed at better involvement of ITC colleagues in the ongoing research activities of this Action and understanding and promoting the PV research activities in ITC countries.

In this context all MC members, also those in non-ITCs, will be approached in the forthcoming months by Dr Istvan Farkas and Dr Ayda Esfandiyari with a kind request to contribute to a PV research report for PEARL PV which will capture all member countries research activities in the field of PV systems' performance and reliability. As such we would like to create a clear, timely and reliable overview of ongoing research activities in all PEARL PV member countries. This will also emphasize the important role of MC members in this Action, as the representatives of their national research networks in the international PEARL PV network.

Finally, to better inform non-members about the objectives, networking and research of PEARL PV we have created a PR Booklet which can be used for external communications.

We would like to sincerely thank you, all volunteering PV experts, for your energy, enthusiasm and efforts! PEARL PV's success story will be based on your contributions to the Action as a whole and to the programs of the Working Groups. Therefore we will be looking forward to meeting you all again in October 2019 in Malta.

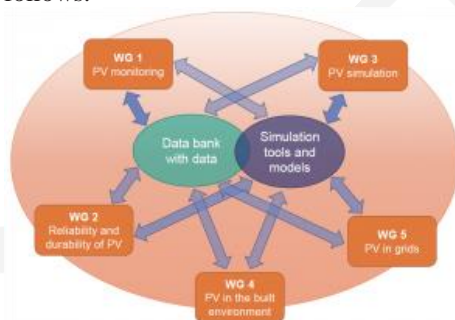
With sincere sunny regards,

Chair Prof Angèle Reinders
(University of Twente) & Vice Chair
Dr David Moser (EURAC)

Introduction

The aim of PEARL is to improve energy performance and reliability of PV systems in Europe leading to lower costs of electricity produced by PV systems by a higher energy yield, a longer life time eventually beyond the guaranteed 20 years as specified by manufacturers, and a reduction in the perceived risk in investments in PV projects.

This Action entails the formation of an inclusive network of PV system researchers, data resources that will be analysed by researchers, forming a very large agglomeration of PV systems performance data for Europe, and experts that can include more-nuanced evidence-based reliability in PV system, evaluation methods and simulation and design tools. Five Working Groups (WG) have been set up which will conduct research using a shared data bank and shared simulation tools and models. An update on each WG follows.



WG1: PV Monitoring

The Lisbon workshop of WG1 had as its theme 'Review of PV performance data and analysis'. WG1 participants had been asked to prepare 20-min presentations on their recent work, while identifying potential collaborations, which could materialize in Short Term Scientific Mission proposals. 14 presentations were given ranging from a review on PV performance data analysis by WG5 leader Jonathan Leloux to performance ratio evaluations and monitoring solutions, discerning normal to non-normal operation, meta-data analysis, degradation in tropical climates, autonomous monitoring using wireless systems and unmanned aerial vehicles, and

performance of hybrid systems. We had a very fruitful exchange of knowledge and some 25 participants actively engaged in the discussions that followed each talk.

In addition, we discussed the development of the data repository. The platform of choice is CKAN (see ckan.org), and a proof of concept database using CKAN has been developed by ICT experts at University of Twente. At present functional testing is ongoing. WG1 participants present at the Lisbon workshop have been given access to gain experience in uploading and downloading data files. Based on preliminary results so far, we can conclude that the CKAN platform is a good choice. As such the databank will be further professionalized in the forthcoming period by the installation of a server which will be delivered for broader use by participants of this Action in June of this year.

Chair Dr Wilfried van Sark (*Utrecht University*) & Vice Chair Dr Christian Braun (*FhG-ISE*)

WG2: PV Reliability & Durability

During the recent workshop in Lisbon, attending WG2 members gave interesting presentations where different aspects of reliability and durability of diverse technologies such as Si, organic PV, CIGS, Perovskites were clearly represented. It was fascinating to learn from each other and understand the different views on reliability and durability by fruitful discussions after each talk.

The WG2 workshop in Lisbon also focused on the progress of the white paper of this group (Deliverable 5 in Task 2.1). As an outcome of the workshop it was decided to split the long and ambitious paper in three consecutive papers with partially shifted focus. Coordinating authors, fields of responsibility and the structure of each paper were defined. Contributing authors were also found during the workshop. Furthermore, a timeframe for publication was set for each individual paper.

Chair Dr Bettina Ottersböck (*PCCL*)
& Vice Chair Hristina Spasevska
(*University of Skopje*)

WG3: PV Simulation

WG3 is investigating the simulation models that are being used by the PV community to determine best practices and to identify where development is required. Within the software survey conducted to find out what the PV community is currently using for PV system simulation, the respondents identified a number of topics that need more development. During the recent workshop in Lisbon, WG3 has selected the simulation of the performance of bifacial modules for the first topic to be addressed by a round-robin approach, i.e. where several researchers use different models with the same input data in order to compare the effectiveness of those models. We will be using data from bifacial installations where performance is being measured under different operating conditions. Anyone who is interested in the round-robin assessment, either in terms of data provision or simulation, are welcome to contact WG3 for further information.

Chair: Prof Nicola Pearsall
(*Northumbria University*) & Vice
Chair Prof João Serra (*Universidade de Lisboa*)

WG4: PV in the Built Environment

WG4 had a successful meeting in Lisbon during which the research program for PV in the Built Environment got directed towards several papers which will be written.

Chair: Dr Miriana Devetakovich
(*University of Belgrade*)

WG5: PV in Grids

WG5 is now organized along several lines of work that have been proposed by the participants. Typically, a line of work starts when several participants are interested in a collaboration on a specific topic that can lead to the joint publication of an article in a scientific journal, and it ends once the paper is published. Each line is coordinated by one of the participants who is willing to take upon this responsibility and who will usually be the first author of the paper.

Several lines of work have been proposed. Some of them are currently ongoing, and other potential lines have been discussed and will start if we can identify a team and a leader who are ready to develop it.

Ongoing activities: Power quality at the connection of PV to the LV and MV grids; Grazia Barchi, Sonia Pinto, Jovan Todorović, John Licari, Karl Knoebl
- Mapping annual and seasonal soiling in Western Europe; Leonardo Micheli, Joao Gabriel Bessa, Jonathan Leloux, Florencia Almonacid, Eduardo F. Fernandez
- Fault detection for PV system fleets using machine learning; Andreas Livera, Marios Theristis, Jonathan Leloux
- PV in the context of smart-grids and self-consumption; Cihan Gercek, Luis Fialho, Brian Azzopardi, Karl Knoebl

Potential: Spatio-temporal forecasting and PV monitoring; Rodrigo Amaro e Silva, Miguel Centeno Brito, Jonathan Leloux
- PV degradation vs stress factors (temp, RH%, UV, etc); Sascha Lindig, David Moser, Jonathan Leloux
- Monitoring data filtering and Quality Control (QC); Jonathan Leloux, Penka Georgieva, Zlatica Marinkovic, Sascha Lindig

Are you willing to join a task or create a new one? Ready to meet with the required high level of collaboration? Send an email with your proposal to Jonathan and Marios at jonathan.leloux@gmail.com.

Chair: Jonathan Leloux (*Polytechnic University of Madrid*) & Vice Chair Marios Theristis (*University of Cyprus*)

Meeting Updates

A series of interesting events took place in Lisbon in February 2019. More specifically, the Management Committee met for the third time since the beginning of the Action, at the University of Lisbon (at the Faculdade de Ciencias), where representatives from 24 countries were present. The Management Committee discussed the Action's progress and the next steps with regards to the short-term scientific missions, the work plan, valorization panel meetings, training schools, seminars and other important matters. In addition, Working Group leaders and participants discussed the results to date, the work plans and tasks of the Working Groups. Prior to the workshops that were organized on the 26th February, both a proposal writing workshop and a plenary meeting took place. Finally, on the last day of the Pearl PV events in sunny Lisbon, an interesting excursion to a CPV plant in Evora took place! See photo below:



Country Reports

At the recent meetings in Lisbon a working group was set up to collate national PV performance information into a PEARL PV Country Report. This report will comprise the performance evaluation issues of solar photovoltaic energy covering the PEARL PV countries since 2009 and will be updated annually. These reports will be made available on the PEARL PV website. In order to collate national data we need your help!

Currently a questionnaire is being compiled which will be sent to all members. This questionnaire will ask about
- general country information (area, population, GDP),

- climate data, (average Irradiation, temperature, wind speed),
- energy consumption and production quantities and
- PV installed capacity and PV electricity generation.

More specific PV data will also be requested such as annual installed capacity and number of PV systems installed for both stand alone and grid connected PV systems. Further to this, information on National PV policies and programs will be needed as well as descriptions of all national research groups in the PV systems sector.

We look forward to getting your valuable contributions and working together on these Country Reports!

Prof Istvan Farkas, (*Szent Istvan University*) Dr Ayda Esfandyari (*Technical University Dublin*), Prof Angèle Reinders (*University of Twente*) Dr David Moser (*EURAC*)

STSM Updates

STSMs are Short Term Scientific Missions which are institutional visits aimed at supporting individual mobility, fostering collaboration between individuals. They are primarily intended for PhD students and early career investigators (ECI) to visit other research groups, to acquire new expertise, contribute their expertise to projects and exchange ideas between participating institutions. STSM topics are linked with ongoing work in the PEARL PV Working Groups. We strongly encourage researchers and institutions from Inclusiveness Target Countries (ITC) to participate in STSMs.

During the second Grant Period GP2 (May 2018 to April 2019) seven STSMs were successfully completed. STSM applications for GP3 are most welcome! For detailed information on STSMs, please visit <https://www.pearlpv->

cost.eu/activities/stsm or contact STSM Manager Dr Markus Schubert (University of Stuttgart) markus.schubert@ipv.uni-stuttgart.de

ITC Conference Grants

ITC Conference grants allow us to support conference visits of PhD students and Early Career Investigators (ECIs) from ITC countries. ECIs include post-doc researchers up to 8 years after receiving their PhD. For the third grant period of our Action we can offer 3 ITC grants. Each grant is limited to a maximum of 1,500 EUR. We are looking forward to your applications! For details, requirements and applications, please visit <https://www.pearlpv-cost.eu/activities/itc-conference-grants> or contact STSM Manager Dr Markus Schubert (University of Stuttgart) markus.schubert@ipv.uni-stuttgart.de

STSM Interview



Mr Kun Kunaifi
PhD Student, University of Twente

It is a pleasure to share my three-week STSM experience at Eurac Research in Italy, which took place in March 2019. I went there not only because Eurac is located in the beautiful Alpine town of Bolzano and Italy is home to amazing food, but also due to Eurac's great reputation in solar energy research. Just like the University of Twente where I am doing my Ph.D., the work environment at Eurac is high. My supervisors and staff in the Renewable Energy Institutes and Welcome Office were friendly and helpful. At Eurac, it was easy to adapt and learn.

Under the supervision of Sascha Lindig and David Moser, my work involved learning and implementing the methods for analyzing the performance and degradation of PV systems in different climates. I also visited the research infrastructure, both indoor and outdoor, which was impressive. Using knowledge gained from my STSM back in the Netherlands, I wrote a conference paper regarding the performance and degradation of different technologies of PV systems in Indonesia and am preparing a research article using other PV systems in Europe, Southeast Asia, and Australia.

I want to close by thanking Cost Action Pearl PV and Eurac Research. I found my STSM to be a very beneficial program for young researchers like myself.

Publication Policy

With several deadlines for international PV conferences and many journal manuscripts of the 5 Working Groups in the pipeline, it is useful to be informed about the publication policy of PEARL PV. Authors of papers are allowed to acknowledge PEARL PV only if at least 2 PEARL PV countries are represented. Please make sure that you circulate the author list and an abstract of the manuscript to the relevant WG leader(s), chair and vice chair:

- 2 weeks before submission in case of submission to a peer-reviewed journal, and
- 1 week before submission in case of submission to a conference.

Once published please send a communication to the Action's Science Communication Manager (Eliza Loucaidou) for further dissemination of the publication through the PEARL PV publication list <https://www.pearlpv-cost.eu/dissemination/publications>. Please follow the dissemination guidelines and COST corporate identity which can be found here <http://www.cost.eu/media/dissemination-corporate-identity>. Also please include the following standard acknowledgment in any publication (poster, paper, book)

"This article/publication is based upon work from COST Action CA16235 PEARL PV supported by COST (European Cooperation in Science and Technology)"

This text is compulsory for any PEARL PV publication!

Further texts are shown on page 55 of the Action's Workplan which you can access by the website of PEARL PV:

<https://www.pearlpv-cost.eu/dissemination/reports/>

Please also include the addresses of the COST website as well as the PEARL PV website, the COST logo and EU logo in any publication. If space is limited then only the COST logo should be shown.

Join Us

For all the latest news check out PEARL PV's website at

<https://www.pearlpv-cost.eu>

You can register for participation by this registration form

<https://www.pearlpv-cost.eu/about/registration>. Please

feel welcome to share this registration form with interested colleagues.

PEARL PV is also visible in social media, namely you can follow PEARL PV by Twitter account

<https://twitter.com/CostPearl> and

by our LinkedIn group

<https://www.linkedin.com/groups/8655031>



Contact Us

For further info, please contact

Action Chair: Prof Angèle Reinders (University of Twente),

a.h.m.e.reinders@utwente.nl

Vice Chair: Dr David Moser

(EURAC), David.moser@eurac.edu

WG1 Leader: Dr Wilfried van Sark (Utrecht University),

w.g.j.h.m.vansark@uu.nl

WG2 Leader: Chair Dr Bettina Ottersböck (PCCL)

bettina.ottersboeck@pccl.at

WG3 Leader: Prof Nicola Pearsall

(Northumbria University),

nicola.pearsall@northumbria.ac.uk

WG4 Leader: Chair: Dr Miriana Devetakovich (Uni of Belgrade),

mirjana.devetakovic@gmail.com

WG5 Leader: Dr Jonathan Leloux (Polytechnic University of Madrid),

jonathan.leloux@upm.es

Science Communication Manager: Dr Eliza Loucaidou (Deloitte Cyprus),

eloucaidou@deloitte.com

Training School Managers:

Dr Gabriele Eder (OFI),

Gabriele.Eder@ofi.at and

Dr Aleksandra Krstic-Furundzic (University of Belgrade),

akrstic@arh.bg.ac.rs

STSM Manager: Dr Markus Schubert (University of Stuttgart),

markus.schubert@ipv.uni-stuttgart.de

Newsletter Editor: Dr Sarah McCormack (Trinity College Dublin),

mccorms1@tcd.ie

Vacancy

An interesting vacancy is offered for a PhD student on the topic of "Assessment of innovative solutions for the European electricity market", who will collaborate with JRC in Ispra, Italy, and University of Žilina in Prague, Slovakia.

More information including the vacancy description is available here:

<https://euraxess.ec.europa.eu/jobs/400644>

Contribute

Thanks for reading, and if you would like to contribute to the next Newsletter please contact Sarah McCormack at

mccorms1@tcd.ie before 1 Nov 2019.

Next issue will be published in Dec 2019.

Acknowledgement

This Newsletter is based upon work from COST Action CA16235 -

Performance and Reliability of Photovoltaic Systems: Evaluations of Large-Scale Monitoring Data – also called PEARL PV, supported by COST (European Cooperation in Science and Technology): www.cost.eu

PEARL PV Partners

UNIVERSITY OF TWENTE

eurac
research



Utrecht University



The University Of Sheffield



PCCL
Polymer Competence Center Leoben



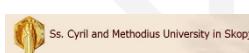
Deloitte

AUSTRIAN INSTITUTE OF TECHNOLOGY



ELEKTROPRIJENOS BIH
ЕЛЕКТРОПРИЄНОС БІХ

RTONE
IOT MAKERS



National Hellenic Research Foundation



Trinity College Dublin
The University of Dublin



Newsletter

April 2019



P  A R L P V



COST Description

COST (European Cooperation in Science and Technology) is a funding agency for research and innovation networks. COST Actions help connect research initiatives across Europe and enable scientists to grow their ideas by sharing them with their peers. This boosts their research, career and innovation.