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This issue

Welcome

Introduction

WG Updates

Funding

Upcoming events

Joint Publications

STSM & ITC conference grant

Update to Vademecum

Publication Policy

Join us

Key dates

5 July 2021 - Seminar on “Designing with Photovoltaics”, Transylvania University of Braşov, Romania

6-9 July 2021 - Training School on “Simulation tools and models for the analysis of PV system performance”, Transylvania University of Braşov, Romania

22 Sept -5th Management Committee Meeting & Workshop of 3 days location TBC



Welcome

Dear PEARL PV members,

We have very good news for all involved in COST Action PEARL PV and PV system research in Europe; our Action will be extended until April 2022 with financial support of the COST Association and the Horizon Europe programme. Furthermore, our Action received an additional budget for open access publishing. More information on these positive developments can be found in this Newsletter.

Recently, we have only been able to stimulate our network’s research activities and continue collaborations online through meetings and workshops, which were held by several Working Groups. From November 2020 until March 2021, monthly online workshops were held by WG1, WG2, WG3 & WG5, coordinated by the Action Chairs. These meetings were attended by 60 - 80 colleagues who are actively involved in PV system research. For each online workshop a report is

available on the PEARL PV website: (1) [Online Workshop WG1: Data sharing for trans-European PV performance analyses - PEARL PV \(pearl-pv-cost.eu\)](https://pearl-pv-cost.eu/online-workshop-wg1-data-sharing-for-trans-european-pv-performance-analyses-pearl-pv) (2) [Online Workshop WG2: New approaches for identifying and analysing failures in PV - PEARL PV \(pearl-pv-cost.eu\)](https://pearl-pv-cost.eu/online-workshop-wg2-new-approaches-for-identifying-and-analysing-failures-in-pv-pearl-pv) (3) [Online Workshop WG3: Modelling of PV Systems – Challenges and Comparisons - PEARL PV \(pearl-pv-cost.eu\)](https://pearl-pv-cost.eu/online-workshop-wg3-modelling-of-pv-systems-challenges-and-comparisons-pearl-pv) (4) [Online Workshop WG5: Data monitoring & analytics for better PV performance and grid integration - PEARL PV \(pearl-pv-cost.eu\)](https://pearl-pv-cost.eu/online-workshop-wg5-data-monitoring-and-analytics-for-better-pv-performance-and-grid-integration-pearl-pv)

Furthermore, we are delighted that we could welcome three new faces in our Core Group in the past few months. Each new Core Group position was approved by an e-vote by the full MC of COST Action PEARL PV.

Dr. Jeff Kettle of Glasgow University (Scotland, UK) became the leader of Working Group 2 on Reliability and Durability of PV. We wish him lots of success in this important position! Dr Reza Aghaei (Eindhoven University of Technology, The Netherlands) is warmly thanked for his prior WG2 leadership and his continued

support in his new role of Vice Chair of WG2.

Dr. Bogdan Gabriel Burdohos of University of Brasov (Romania) has accepted the leadership of Working Group 4 on PV in the built environment. He will replace Dr. Mirjana Devetakovic (University of Belgrade, Serbia) who will remain involved as a Vice of WG4. Both Dr. Bogdan Gabriel Burdohos and Dr. Mirjana Devetakovic are wished great success with their collaboration with all WG4 participants.

Dr. Sara Mirbagheri Golroodbari of Utrecht University (The Netherlands) has replaced Ms. Eliza Loucaidou Kassianidou (Deloitte Limited, Cyprus) in the position of Science Communication Manager. First of all we would like to gratefully thank Eliza for the wonderful communication activities that she conducted for COST Action PEARL PV since its start. And for the next year we wish Dr. Sara Mirbagheri Golroodbari lots of success with science communications for our Action.

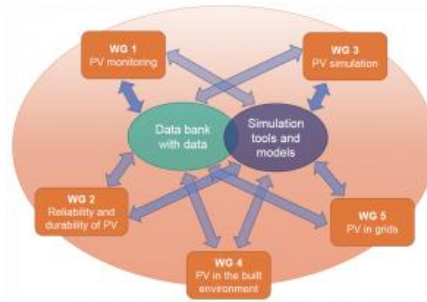
Due to the changes of the COVID situation in Europe, we have rescheduled the Seminar “Designing with Photovoltaics” and Training School on “Simulation tools and models for the analysis of PV system performance” from April 2021 to 6-9 July 2021. They will both be held at the Transylvania University of Braşov, Romania. Trainee registration will remain open until the end of May, see PEARL PV’s website for more details about the programs of the Seminar and Training School as well as registration procedures.

In general, we would like to thank you for all your continued support and involvement in COST Action PEARL PV in the past difficult year, but the future will be brighter and sunnier because of the extension of the COST Association.

With very best regards,
Chair Prof Angèle Reinders
(University of Twente & Eindhoven

University of Technology) & 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

As a follow up of the Utrecht workshop in February 2020 and the WG1 webinar on 3 November 2020 we have proposed to fill the databank using a research driven approach. As a first initiative, a group of researchers led by Anne Gerd Imenes (University of Agder, Norway) has been working to collect and upload data on solar spectra, with the purpose to cover spectral changes (in terms of average photon energy) across Europe. It has been successful in getting to the stage of a joint scientific contribution for the topic of spectral data analysis, which will be submitted soon.

Now, let’s continue! Please join our brains together in the effort for collaborative research and contact the responsible lead persons with your contributions in the research areas worked out in PEARL PV workshops:

- Climate dependent degradation of PV systems (Lead: Steve Ransome)
 - Uncertainties in determination of degradation, satellite base data and recorded data (Lead: Alessandro Virtuani)
 - Geographic locations of installations, factors to influence stability across Europe (Lead: Jeff Kettle)
 - PV data analysis for performance assessments of roof top PV systems in relation to losses due to system failures, soiling and maintenance schemes (Lead: Carolin Ulbrich)
 - Variation of floating PV performance across Europe (Lead: Wilfried van Sark)
 - Performance analysis in Agrivoltaics (Lead: Tareq Abu Hamed)
 - Effect of fast power fluctuation of PV systems on the grid? (Lead: Jovan Todorovic)
- Share your data with us! We need:
- labelled (faults/occurrences) time-series performance data (systems and powerplants)
 - millisecond PV power data
 - BIPV data with detailed metadata description
 - reliable performance and meta data for neighbouring PV systems, also residential
 - LCA and BIM (building information modelling) data
- Industry collaboration is welcome. Data is treated and analysed confidentially. Feel free to contact Wilfried van Sark and/or Carolin Ulbrich.

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

WG2: PV Reliability & Durability

WG2 aims to develop reliability and durability metrics for PV modules, components and systems, identify relevant data for reliability measurement of PV, develop the comprehensive methods for autonomous monitoring using the potential of big data bank

and apply machine learning techniques in order to detect the failures, predict the performance and service life.

The primary goal of WG2 is to share the knowledge via workshops, seminars and joint publications originating from WG2 with a wider community of PV experts and other stakeholders

WG2 has finalised an extensive review of the reliability of PV modules. The work covers silicon, thin film and emerging technologies and is to be submitted to a high impact journal. We thank the authors for their contributions and their patience in getting in this far, but we believe this will be a well cited paper for years to come.

Chair: Dr. Jeffrey Kettle, Glasgow University, Scotland, & Vice-chair: Dr. Mohammadreza Aghaei, Eindhoven University of Technology, The Netherlands

WG3: PV Simulation

In this update for WG3, we look back on the on-line workshop held in December 2020 and forward to the upcoming third PEARL PV Training School to be held in July 2021. In place of in-person workshops, each WG organised an on-line event, with that of WG3 being titled “Modelling of PV systems – challenges and comparisons”. The event included two presentations, covering advanced degradation modelling (Steve Ransome) and estimation of gain in bifacial systems (Nicholas Riedel-Lyngskær), which were followed by breakout room discussions on modelling challenges. Of particular interest in the discussions was the topic of data requirements, especially for the validation of modelling of new system types. We will be following up this workshop with more specific

collaboration between participants who expressed an interest in further activities.

As previously reported, WG3 has also prepared the programme for the third PEARL PV Training School, which was originally due to be held in Brasov in October 2020, and to cover a wide range of topics in modelling, including technical, economic and environmental aspects. Due to ongoing travel restrictions in Europe, the training school was again postponed from April 2021. It will now be held from 6-9 July 2021 and we are hoping that it will be possible to have a reasonable number of participants and trainers on site in Brasov, although it is clear that there will also be some virtual content. At the time of writing, it was still possible for young researchers to apply to attend the Training School (details on the PEARL PV web page).

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

WG4: PV in the Built Environment

Since the last newsletter there has been a change in the leadership of WG4. As such Dr Bogdan-Gabriel Burduhos holds now the chair position while Dr Mirjana Devetaković is vice chair.

Supervised by Dr Mirjana Devetaković the previously mentioned paper (Photovoltaics on Landmark Buildings with Distinctive Geometries) was published in Applied Sciences by members of WG4. The paper can be found at: <https://www.mdpi.com/2076-3417/10/19/6696>.

During the first months of 2021 Dr Devetaković worked on organizing an online workshop called “PV in the built environment - Architects' and designers' points of view”. This was to be held on 2nd of March 2021, but has been postponed due to administrative reasons to a later date.

In recent months, WG4 members from Brasov, Romania were involved in organizing and preparation of the Seminar on “Designing with Photovoltaics” and the 3rd Training School on “Simulation tools

and models for the analysis of PV system performance” which we hope will be possible to physically organize during 5-9 July 2021, in Brasov, Romania.

WG4 would like to promote the following special issues “Modeling and Forecasting for Energy Production of Photovoltaic (PV) Systems” and “Photovoltaic Systems in the Built Environment”. Their submission deadline can be extended on request. More information can be found at:

https://www.mdpi.com/journal/energies/special_issues/PV_Built_Environment and <https://www.hindawi.com/journals/ijp/si/430386/>

Chair: Dr Bogdan-Gabriel Burduhos (*Transilvania University of Brasov*) & Vice Chair Dr Mirjana Devetaković (*University of Belgrade*).

WG5: PV in Grids

The Covid-19 crisis has slowed down the progress at WG5. Nevertheless, our work since the previous newsletter has produced new journal articles. Among other things, WG5 has now produced 7 articles in high-level peer-reviewed scientific journals. There is an updated list of the contributions in our website: (<https://www.pearl-pv-cost.eu/wg/wg5/>)

We have also organized a successful webinar on “Data monitoring & analytics for better PV performance and grid integration”. The slides of the presentations are available here: <https://www.pearl-pv-cost.eu/event/online-workshop-wg5-data-analytics-for-better-pv-performance-and-grid-integration/>

Our WG5 Vice-Leader Sonia Pinto and other members of WG5 are promoting a Special Issue in the journal Energies "Impact of Interconnected PV Systems on Power Quality of Distribution Networks". Because of the Covid-19 crisis, the deadline for the submission of articles has been extended to the 31 October 2021. More information: https://www.mdpi.com/journal/energies/special_issues/PV_PQ

Chair: Jonathan Leloux (*Polytechnic University of Madrid*) & Vice Chair Sonia Pinto (*University of Lisbon*)

❖ Funding of COST Action PEARL PV

We have good news about financial support for Cost Action PEARL PV. Namely our Action received two forms of new additional funding in the past period: (1) an extension fund and (2) a top-up budget for open access publication. Below these financial mechanisms will be shortly described.

❖ Extension Fund

On 5 May 2021 an extension request for COST Action PEARL PV got granted with 107,000 euros by the COST Association. The extension will last until 4 April 2022, and will be dedicated to the organization of the 4th Training School of our Action, a Final Conference of 3 days, online meetings for each Working Group and the publication of a PEARL PV book.

❖ Open Access Publications

Our Action also received a top-up budget of 15,000 euro from the COST Association for open access publication fees, which should be spent in Grant Period 4, before the end of October 2021. Several WG and general PEARL papers have been identified as possible recipients of an open access publication fee, however since eligibility of this fee is based on (1) open access of the publication and (2) the ultimate date of the invoice for such a publication of 30 October 2021 latest, we will draft a line-up of further publications. If you are interested in receiving an open access publication fee, then please contact Mr. Peter Jansen (p.jansen@utwente.nl), who will register your interest and the advanced administration regarding this fee.

❖ Upcoming PEARL PV Events

There are several announcements of future events of COST Action PEARL PV.

(1) Training School on “Simulation tools and models for the analysis of PV system performance”

PEARL PV’s annual Training School on “Simulation tools and models for the analysis of PV system performance” will take place at the Transilvania University of Braşov in Braşov, Romania, from 6 to 9 July 2021. Naturally this year the event will be implemented in a hybrid format to not disadvantage groups/individuals who cannot travel. Trainees who register in time and fit to the eligibility criteria, will receive a reimbursement for participation. All information about this Training School, such as its programme, venue, travel information and instructions for applications is available on this webpage: Training School on Training School on "Simulation tools and models for the analysis of PV system performance" - PEARL PV (pearlpv-cost.eu). Please note that the deadline for applications by interested Trainees will be 31st of May, 2021.

In 3.5 days of expert lectures, modelling exercises and excursions, trainees will gain an understanding of modelling approaches for PV system analysis, including system optimization, performance prediction and fault and loss identification. The participants will learn about modelling principles and current software developments from PEARL PV Working Group members and external experts. So far, PEARL PV’s Training Schools have received very high ratings from their participants.

Interested in gaining and transferring knowledge on modelling photovoltaic systems to your institute and country? Learn from experts and the experiences of others engaged in best practice projects and share your own experiences! For questions about this Training School please feel welcome to contact: Training School Manager: prof.dr. Aleksandra Krstic-Furundzic at akrstic@arh.bg.ac.rs

Training School Manager: dr. Cedric Caruana at cedric.caruana@um.edu.mt
Chair of the PV Simulation Working Group: prof.dr. Nicola Pearsall at nicola.pearsall@northumbria.ac.uk

(2) Seminar on “Designing with Photovoltaics”

This one-day PEARL PV Seminar on the topic “Designing with Photovoltaics” will also be held at the Transilvania University of Braşov in Braşov, Romania, on 5 July 2021. The event will be implemented in a hybrid format so to not disadvantage groups/individuals who cannot travel. All information about this Seminar, such as its programme, venue, travel information is available on this webpage: Seminar on "Designing with Photovoltaics" - PEARL PV (pearlpv-cost.eu)

This Seminar will cover design, research and innovation in solar PV powered buildings, cities, vehicles, interior products, textile and fashion, to be explained and illustrated by actual design cases by world famous experts, top designers and innovative frontrunners working for Sono Motors, UNStudio, Studio Van Aubel, TNO, SUPSI, ENEA, University of Twente, Eindhoven University of Technology and Studio Van Dongen.

Don’t miss this interesting opportunity and remember to save the date!

For questions about attendance of this Seminar please contact:

Grant Manager: Mr. Peter Jansen at p.jansen@utwente.nl

Chair of this Action: prof.dr. Angèle Reinders at a.h.m.e.reinders@utwente.nl

Local Organizer of the Seminar and Training School: dr. Bogdan Gabriel Burduhos at Bogdan.BURDUHOS@unitbv.ro

(3) 5th Management Committee Meeting

Thanks to the extension of our Action we will hold the last MC meeting, MC5, of our network on 22 September 2021 in the morning (9h-12h) at a location which will be announced soon.

MC members please save the date and keep an eye on this webpage for information about this gathering: MC5 Meeting - PEARL PV (pearlpv-cost.eu)
For questions this MC5 please contact:

Chair of this Action: prof.dr. Angèle Reinders at
a.h.m.e.reinders@utwente.nl
Vice Chair: Dr. David Moser at
david.moser@eurac.edu

(4) Workshop

From Wednesday afternoon 22 September (13h–18h) to Friday afternoon 24 September (until 16:30h) a Workshop of 3 days will be held. At the moment we are preparing the call for papers, the program and the location of this event to be announced soon

This Workshop can be attended by anybody who already is or who can be registered as a PEARL PV participant.

More information about this event will be supplied in due course by the website of PEARL PV, Parallel Workshops PEARL PV - PEARL PV (pearlpv-cost.eu), and by means of separate mailings

Joint Publications

A Special Issue on "Performance Analysis of Photovoltaic Systems" Applied Sciences for PEARL PV got published. Thanks to all contributors and editors, in particular David Moser, Wilfried van Sark and Angèle Reinders. It covers 6 interesting, high-level research papers resulting from the Workshop in Utrecht in February 2020, among which performance assessments of PV systems in different climates by Kunaifi (UT) and Sascha Lindig (EURAC), simulations of bifacial PV systems with tracking by Nicholas Riedel-Lyngskær (DTU) and colleagues, and assessments of building integrated photovoltaics by Bogdan Burduhos (Transilvania University of Brasov), Mirjana Devetaković (University of Belgrade) and colleagues, see here for full content of this Special Issues: https://www.mdpi.com/journal/applsci/special_issues/performance_analysis_photovoltaic

It is also a pleasure that recently in December 2020, a major collaborative effort of all MC Members was published, namely the *PEARL PV Country Reports*, which has become a 270 pages full colour report on the status of PV systems and PV system research in Europe in 2018. The report can be downloaded here:

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

We aim at publishing an update of this report for the 2020/2021 PV systems situation in all PEARL PV Countries in Spring 2022.

Recently several PEARL PV members have published journal articles and will presented their research outcomes at the EU PVSEC, IEEE PVSC and PVSEC in Sydney based on their joint collaborations.

In WG2, a joint review article entitled "Reliability and degradation assessment of photovoltaic materials and modules: conventional and emerging technologies" has been prepared in two parts by 17 contributors from 11 COST countries and is under internal review before submission.

Also Reza Aghaei (TU/e) has presented a WG2 paper entitled "Reliability and Durability Research Activities of PV Modules, Components, and Systems in COST Action PEARL PV" on behalf of all WG2's participants at the 30th International Photovoltaic Science and Engineering Conference (PVSEC-30) & Global Photovoltaic Conference 2020 (GPVC 2020) and received the Best Paper Award, congratulations to all WG2's participants!

STSMs & ITC Conference grants

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. For detailed information on STSMs, please visit the [website](#).

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. We are looking forward to your applications! For details, requirements and applications, please visit the [website](#) or contact interim STSM Manager [Dr David Moser \(Eurac\)](#)

Update COST Vademecum

We would like to inform you that COST has updated the Vademecum that is now available on the COST website at www.cost.eu/vademecum. The most important update is in Section 5 – Eligible expenses. COST introduces new reimbursement rules, including the daily allowance. The daily allowance is a fixed amount of money a day that you can spend on local transport tickets (including parking, excluding the local transport to reach the main mode of long-distance transport), meals and accommodation. The maximum daily allowance rate for an eligible participant is calculated against the actual number of days the participant attends the approved activity (as confirmed against the signature on the official attendance list for each day of the event that you attend), plus 1. For each meal provided by the Local Organiser, the daily allowance is reduced with 10% of the daily allowance rate.

It will take some time before the next meeting will take place, but please read these new rules in the COST Vademecum carefully to prevent for any reimbursement issues or non-eligible expenses. If you have any questions about these new rules, please contact me. Best regards, Peter Jansen (p.jansen@utwente.nl), Grant Holder Manager

Publication Policy

With recurring 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 contact the Action's Science Communication Manager (Dr. Sara Mirbagheri Golroodbari) for further dissemination of the publication through the PEARL PV publication list

<https://www.pearl-pv-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](#):

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 <https://www.pearl-pv-cost.eu>
Use this form to register your interest in participating <https://www.pearl-pv-cost.eu/about/registration>
PEARL PV is also visible in social media. Follow us on Twitter [@CostPearl](#) and join us on LinkedIn <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
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WG3 Leader: Prof Nicola Pearsall (Northumbria University), nicola.pearsall@northumbria.ac.uk

WG4 Leader: Dr. Bogdan Gabriel Burduhos, University of Brasov, bogdan.burduhos@unitbv.ro

WG5 Leader: Dr Jonathan Leloux (Polytechnic University of Madrid), jonathan.leloux@upm.es

Science Communication Manager: Dr. Sara Mirbagheri Golroodbari

Training School Managers: Prof Aleksandra Krstic-Furundzic (University of Belgrade) akrstic@arh.bg.ac.rs and Dr Cedric Caruana, University of Malta
STSM Manager: David Moser (EURAC), David.moser@eurac.edu
Newsletter Editor: Dr Sarah McCormack (Trinity College Dublin), mccorms1@tcd.ie

Contribute

Thanks for reading, and if you would like to contribute to the next Newsletter please contact Sarah McCormack at mccorms1@tcd.ie.

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 (EU Cooperation in Science and Technology): www.cost.eu

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.