

The world's first-ever high-altitude floating solar farm - Copyright [Romande Energie](#)

This issue

- Welcome
- Introduction
- WG Updates
- Funding
- Publications
- Publication Policy
- Join us

Key dates

- 19 Jan '22: Workshop WG4: PV in the Built Environment
- 2 Feb: Workshop WG3: PV Simulation
- 15 Feb: Workshop WG5: PV in Grids
- 8-11 March: Training School
- 14-16 March: Final Conference

Welcome

Dear PEARL PV members,

2021 marks COST's 50th anniversary! While COST was founded on 22 November 1971, we are entering, this Winter, the final phase of our COST Action PEARL PV. Namely at the beginning of November 2021, the Work and Budget Plan of the 5th and very last Grant Period of our Action was approved by the COST Association. This means that funding of our research network will be available until 4th of April 2022. If you would like to learn more about 50 years of science without borders, then please visit the dedicated "[COST 50 years](#)" [website](#) which gathers an extensive overview of COST in the last half-century.

For the final phase of COST Action PEARL PV, the Core Group has updated the [Action's Workplan 2021-2022, which can be digitally accessed by this link and is available on PEARL PV's website](#). Please read it, so that you will be fully informed regarding the deliverables of your Working Group as well as about forthcoming

meetings and events. To stay connected in this covid-dominated period, we have held and will be holding **Online Workshops** in the winter of 2021-2022.

The first online [Workshop of WG1 on the topic of "PV Data Management and the PEARL Data Challenge"](#) took successfully place on Thursday 2 December 2021. At this event the [PEARL Data Challenge](#) was launched, which is open for participation to all PEARL PV members.

The Portuguese and Spanish teams that attended this meeting proposed to **nationally gather PV monitoring data sets** to be uploaded in this Action's shared **CKAN data server**. We would like to thank these colleagues for this great idea and would like to encourage all MC members of PEARL PV to respond to this call to upload PV monitoring data for your respective countries! Please contact dr. Atse Louwen (atse.louwen@eurac.edu) and dr. Eli Shirazi (e.shirazi@utwente.nl) for questions about the data challenge and as well as your data uploads.

Recently on 15 December, WG2 organized the [Early Career Forum on Photovoltaic Module and System Reliability](#) which showed the high-level research results of young talents in our COST Action. Next, and please **save the dates** in your dairies, on 19 January 2022 an online event will be held by WG4 on PV in the Built Environment; subsequently on 2 February 2022 WG3 on PV Simulation will gather and to end with, on 15 February 2022 the last online workshop will be organized by WG5 on PV in Grids.

Each Working Group is doing exceptionally well, as is evidenced by several joint manuscripts which are to be published in journals. Therefore **many thanks to all WG leaders!**

Also we like to warmly acknowledge the great exposure of WG3's Vice-Chair, **Prof. Joao Serra** (University of Lisbon) by his honourable position of **Conference Chair of EU PVSEC 2021 in Lisbon**, Portugal. Congratulations on a job well done and the tremendous honour!

Hereby we would like to announce that the **Country Reports 2020/2021** will be led again by Dr. Istvan Farkas (Hungary). In the next period, he will actively approach MC members for updates of their past country reports. Please be responsive to his emails, and please expect some deadlines for updated data in December 2021 and more specifically on 13 January 2022. Responsiveness will be essential, because the Country Reports should be ready for publication by the end of March 2022. If you feel curious about the final format of this publication, then please click on this link to [the download webpage for the 2018/2019 Country Reports](#).

Moreover, we also announce the **4th Training School on "Potential of monitoring tools and advanced operation and maintenance practice**

[for security and predictability of PV performance"](#), which will be held from 8 to 11 March 2022 at University of Twente, in Enschede, the Netherlands. Registration for the Training School has just opened (until January 15th). Please register or let interested candidates know about this wonderful training opportunity organised by our excellent Training School Manager, Prof. Aleksandra Krstić-Furundžić (University of Belgrade, Serbia).

To end with, please feel very welcome to attend the [Final Conference of COST Action PEARL PV](#) from 14 to 16 March 2022, at University of Twente, in Enschede, the Netherlands. In the forthcoming weeks the conference website will further unfold with the conference program and other relevant information. **Please save the date!!** This event will showcase all our PEARL PV hard work!!

Having said all this, we would like to thank you for all your continued support and involvement in COST Action PEARL PV and **wish you lovely holidays, a Merry Christmas and a very Happy New Year.**

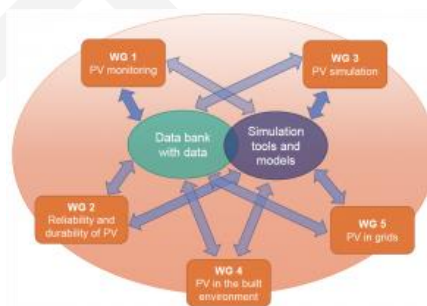
Chair Prof Angèle Reinders (University of Twente & Eindhoven University of Technology) & Vice Chair Dr David Moser (EURAC)

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.

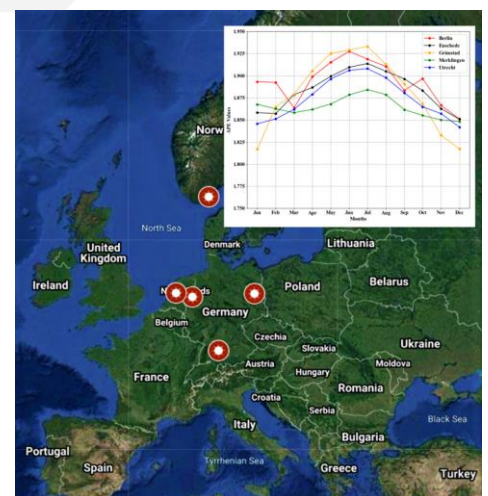
❖ WG1: PV Monitoring

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. A paper has been submitted by Basant Raj Paudyal to Solar Energy with Sakthi Guhan Somasundaram, Atse Louwen, Angele Reinders, Wilfried van Sark, Dirk Stellbogen, Carolin Ulbrich, and Anne Gerd Imenes as co-authors. The figure shows the locations of the collaborating institutes. A second paper on the effect of the early 2021 solar eclipse on APE is under preparation.

❖ 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.



While other research driven approached had been identified, no progress has been reported form the leads so far. We do encourage

all leads to realize a collaboration on their topics, which will fill up the CKAN databank faster for shared data analysis.

The topics are:

- 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 & 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)

Atse Louwen (EURAC) has organised a special side event at EUPVSEC 38 focussing on data exchange and research collaboration, by means of the PearlPV CKAN database. Various presentations by Ralph Gottschalg, Basant Raj Paudyal, Paolo Graniero and Christian Utama showed the increasing importance of (big) data analysis in PV research. A short presentation by the chair showed the attendees how to use the CKAN database. Finally, a first PearlPV data challenge was presented, aiming to foster collaboration in exchange of spectral irradiance data.

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

WG2: PV Reliability & Durability

WG2 has submitted two review articles in recent months; firstly on

“Review of degradation and failure phenomena in photovoltaic modules” involving 11 authors and 12 organizations and secondly, on “Review of technology-specific degradation and failure phenomena in photovoltaic modules” which includes 17 authors from 11 organizations. These are currently under review and highlight the research collaboration that has been undertaken by WG2 over the past 2 years.

In addition, WG2 organised an “Early Career forum on Photovoltaic module and system reliability” which focused on presentations from researchers who have 2-5 years experience in the field. This online workshop is focused on PV system and module durability and brought together leading early career researchers from around Europe. In this online event, we heard from speakers involved in failure analysis, reliability testing, non-destructive testing, and reliability challenges in new applications of PV. A very successful event and huge thank you to all involved.

Speakers are also being sought for the final conference and the Training school in Twente in March. Please email Jeff Kettle if you are interested in participating or speaking.

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

WG3: PV Simulation

As previewed in the last Newsletter, WG3 members led the development of the programme for the delayed third PEARL PV Training School, “Simulation tools and models for the analysis of PV system performance”, and several of them gave presentations at the event. The Training School was held in a hybrid format in July 2021. Due to the ongoing travel restrictions, only about a quarter of the trainees could attend on-site in Brasov, with the rest of the trainees and most of the trainers joining on-line. Nevertheless, the Training School provided an opportunity to discuss the range of modelling activities

relating to PV system design and performance analysis. A longer report on the Training School can be found elsewhere in this newsletter.

Research on the simulation of the effect of shading on PV systems and of bifacial energy gain was reported in several papers by WG3 member Jesús Robledo-Bueno and his co-authors (including Jonathan Leloux, leader of WG5) at the recent European Photovoltaic Solar Energy Conference (held on-line in September 2021). The work has considered PV applications including agrivoltaics and carports, as well as conventional ground-mounted system designs.

Following the series of PEARL PV on-line workshops held in late 2020/early 2021, we are intending to organise a further WG3 workshop in February 2022. Programme details will be published on the PEARL PV website early in the new year.

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

WG4: PV in the Built Environment

Since the last newsletter the WG4 members from Brasov, Romania were involved in organizing and preparation of the Seminar on “Designing with Photovoltaics”, held on July 5, 2021 and of the 3rd Training School on “Simulation tools and models for the analysis of PV system performance”, held on July 6-9, 2021.

Both events were successfully held in a hybrid format at the Transilvania University of Braşov in Braşov, Romania under the supervision of the Local Organizer, Assoc. Prof. dr. Bogdan-Gabriel Burduhos, of the Training School Managers: Prof. dr. Aleksandra Krstić-Furundžić and Prof. dr. Cedric Caruana, and of the Chair of PV Simulation Working Group (WG3): Prof. dr. Nicola Pearsall.

During November 2021, the coordinators of Work Group 4 were trying to organize on the

December 15, 2021 the online workshop called “PV in the built environment - Architects' and designers' points of view” which was postponed to March 2021. At the current date confirmations from the invited speakers are still expected.

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.pearlpv-cost.eu/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.pearlpv-cost.eu/event/online-workshop-wg5-data-analytics-for-better-pv-performance-and-grid-integration/>

WG5 will organize another workshop on PV system performance and monitoring. It will take place online the 15 of February 2022 from 9 AM to 12:30 AM CET.

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 fresh

funding for its fifth Grant Period. We thank the COST Association for its generosity and trust in our research network.

Publications

High impact journal *Frontiers* has launched a new *Research Topic* on *System Performance and Solar Integration*. The abstract registration deadline for this excellent opportunity will be 17 January 2022; subsequently manuscripts can be submitted before 31 March 2022.

For more information and abstract registration please visit this website and login: <https://www.frontiersin.org/research-topics/15823/system-performance-and-solar-integration-in-buildings-mobility-and-our-environment>

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.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](#):

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.pearlpv-cost.eu> Use this form to register your interest in participating <https://www.pearlpv-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, Vice Chair: Dr David Moser (EURAC), David.moser@eurac.edu, WG1 Leader: Prof Wilfried van Sark (Utrecht University), w.g.j.h.m.vansark@uu.nl, WG2 Leader: Dr. Jeffrey Kettle, (Glasgow University), jeff.kettle@glasgow.ac.uk, 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
Newsletter Editor: Dr Sarah McCormack (Trinity College Dublin), mccorms1@tcd.ie

next Newsletter please contact Sarah McCormack at mccorms1@tcd.ie.

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

▮ Contribute

Thanks for reading, and if you would like to contribute to the

▮ 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

▮ 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.