PEARL PV

Welcome and Updates of PEARL PV

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Chair and Vice-Chair of COST Action PEARL PV

Presentation at Seminar, 14-10-2019, Malta

https://www.pearlpv-cost.eu

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EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

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The Malta Council for Science & Technology

L-Università ta' Malta

MCAST
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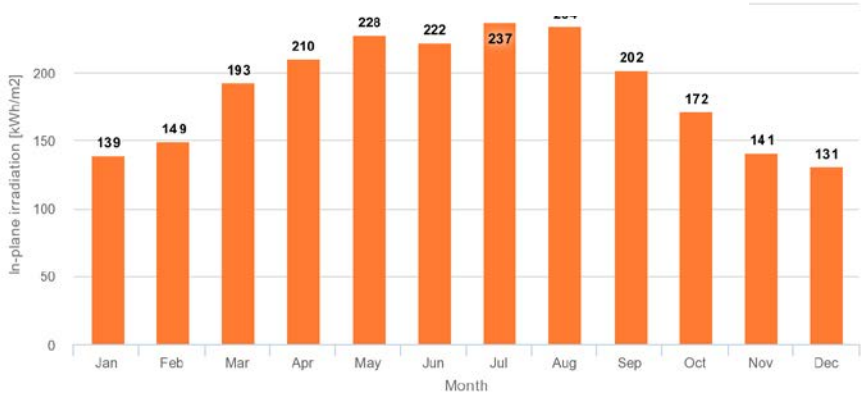
Welcome to this Seminar in Malta!

- High irradiation: $H_{Malta,\ horizontal}$=1960 kWh/m^2/year



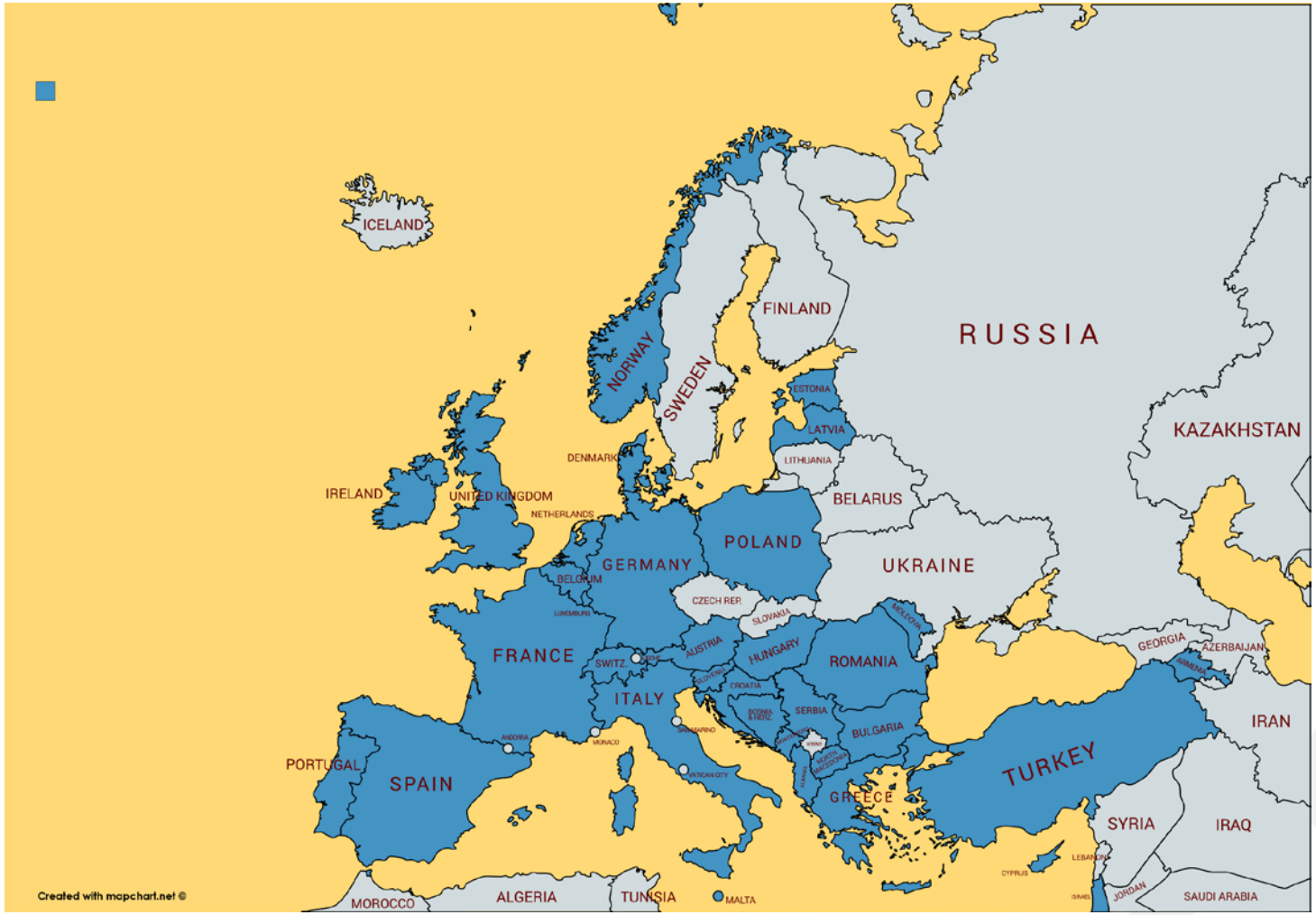
- Malta is THE island where the

Clean Energy for EU Islands initiative was launched in 2017, 14 countries, at present 26 islands identified

- reduced energy costs and greatly increased production by RETs
- better energy security for islands
- improved environmental impact on islands' natural environments
- the creation of new jobs and business

Malta' share of renewable energy in gross final energy consumption is 7.2% (Eurostat, 2017), 95% of RETs are PV systems, total installed PV capacity >110 MWp

The PEARL PV Network



At present
36 Countries
- 33 European Countries
- 2 IPCs: USA, Australia
- 1 NNC: Armenia

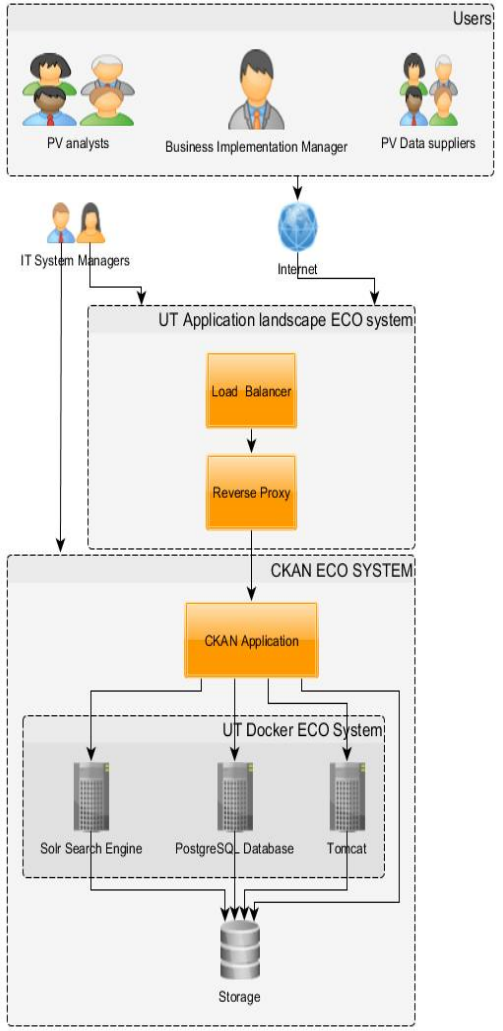
~ 250 members

Start of PEARL PV on 05/10/2017
Running until 4/10/2021

At present voting for admission of Luxembourg and Estonia.
Working on admission process for new IPC, namely Canada

Data server

- Update on CKAN data server of 4 terabytes
- Technically ready and installed by ICT team UT (June '19)
- Includes a dynamic NDA and check membership PEARL
- Several tests executed in the past 4 months
- Server access to PEARL PVers in Fall of this year
- Carolin Ulbrich and Judit Süveges (PVcomB, Helmholtz Centre, Berlin) will prepare the following:
  - Manual for uploads and downloads (1 November 2019)
  - Next, a manual for automated multiple files uploads (API and json files, used for transmitting data between a web application and a server.)



Other updates

Country reports

- Coordinated by Istvan Farkas **THANK YOU!!!**
- Started in summer with submission deadline of 30 September
- So far we received reports from Bosnia and Herzegovina, Denmark, Slovenia, Israel, Malta, Portugal and Spain

Website PEARL PV

- Fully updated in August, also with latest publications
- To be done: WG1- WG4 updates

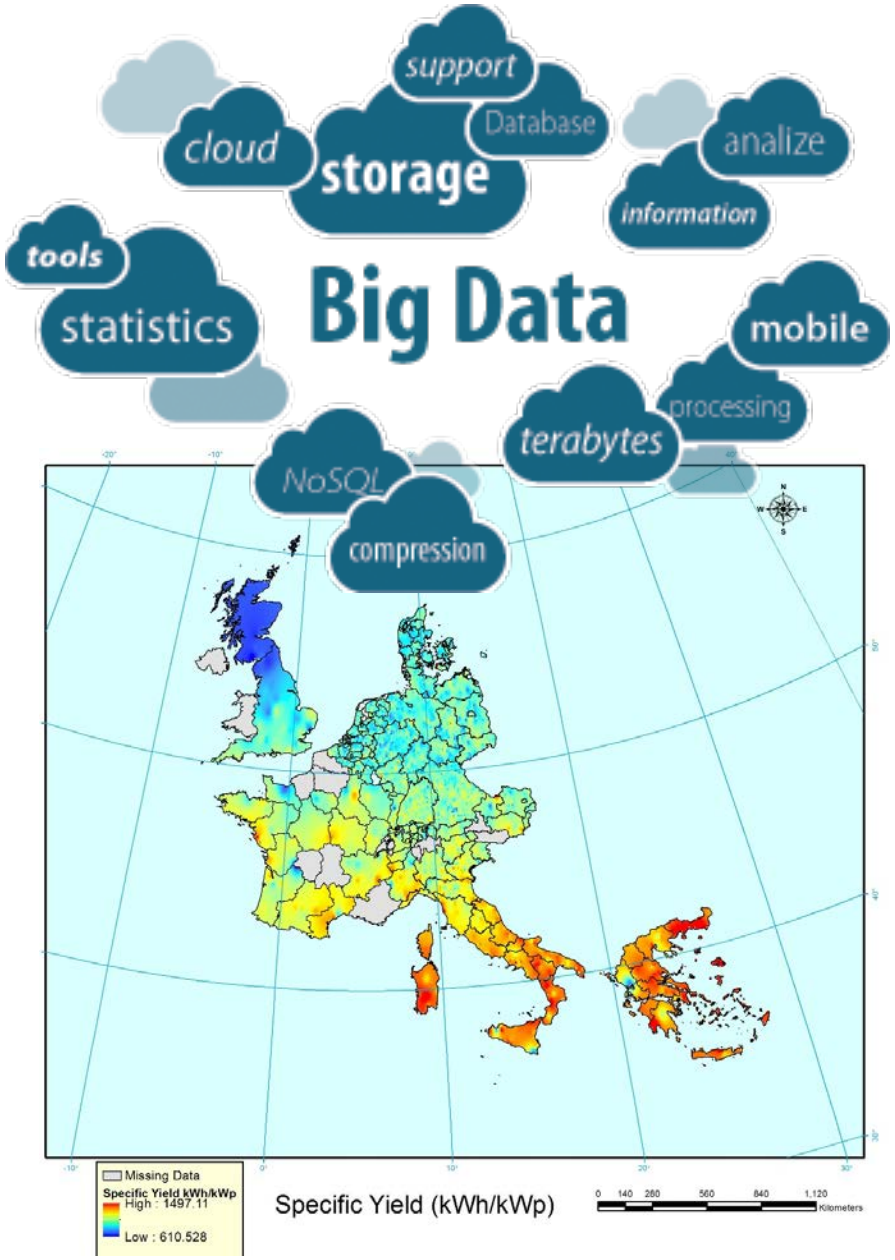
Publications

- Please report your publications by Dropbox of PEARL PV – Publications folder
- https://www.dropbox.com/home/COST%20CA16235%20-%20PEARL%20PV/Publications
- Great achievement: 28 Pearl related publications at EU PVSEC in Marseille

WG1: PV Monitoring

- Objectives (2018)
  - Identification of relevant data to be collected to properly assess PV *performance* of installed PV systems in the field and on rooftops
  - Design guidelines for data collection and analysis
  - Set-up a database and design guidelines for database access
- WG leader: Wilfried van Sark
  - 30 members

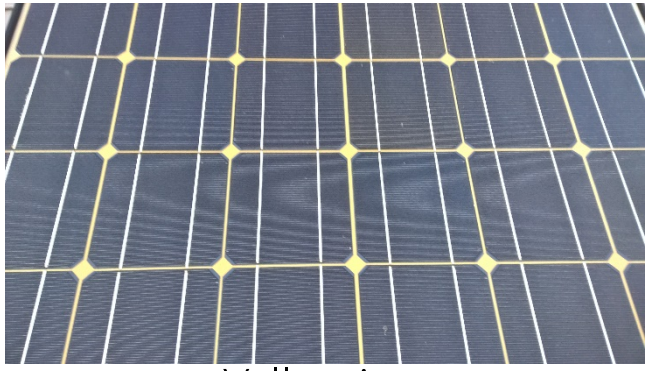
→ Database with open data running end Q4-2018: Please contribute with data



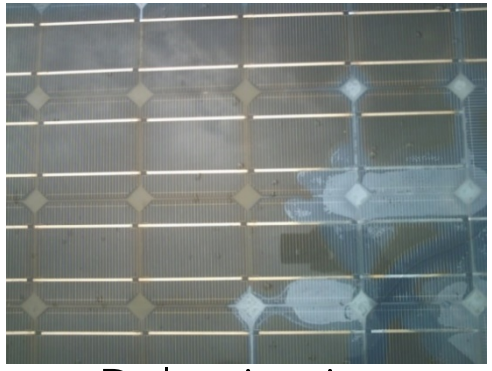
Annual yield map

WG2: Reliability and durability of PV

- Objectives (2018)
  - Definition of reliability and durability metrics for PV modules, components and systems
  - Identification of relevant data to be collected to measure reliability and durability
- WG leaders: Gernot Oreski, Bettina Ottersboeck 30 members



Yellowing



Delamination

- Problems/research questions that will be addressed:
  - Definition of reliability and end-of-life considering different views of PV stakeholders and different technologies
  - How to test reliability?
  - Can reliability, lifetime or end-of-life be modelled from short term testing?
  - Can available models for single effects or single materials be combined to an comprehensive PV module lifetime assessment method?

→ Extensive Review Paper until 2020. Contributions are welcome!!

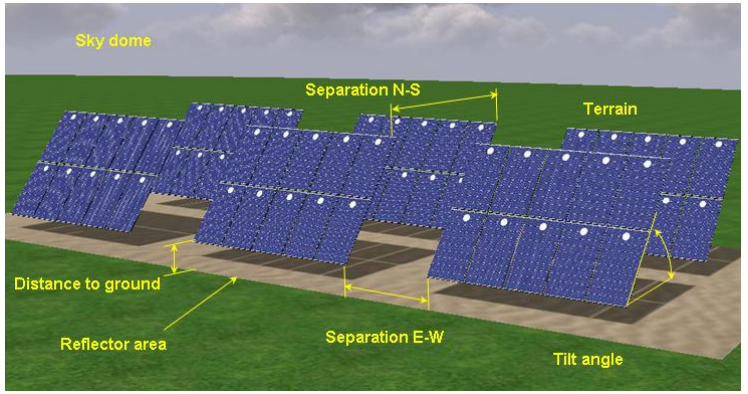
Update WG2: new WG leader

- Dr. Reza Aghaei, Postdoctoral researcher, Eindhoven university of technology (TU/e)
- Postdoctoral Scientist, Helmholtz-Zentrum Berlin (HZB), Competence Centre Thin Film and Nanotechnology for Photovoltaics Berlin (PVcomB), Germany, 2019.
- Postdoctoral Scientist, Project Manager, Fraunhofer ISE, Germany, 2017.
- Ph.D, Electrical Engineering, PV systems, Politecnico di Milano,Italy 2016.

WG3: PV Simulation

- Objectives (2019)
  - Identification and classification of simulation and modelling tools by scope and usage
  - Comparison of software tools to meet the needs of performance prediction and assessment
- WG3 leader: Nicola Pearsall, 15 members
  - A software survey was carried out among PEARL members to identify packages used, reasons for use, developments required, etc.
  - A poster on the survey was presented at the 12th PV Performance Modeling and Monitoring Workshop in May 2019

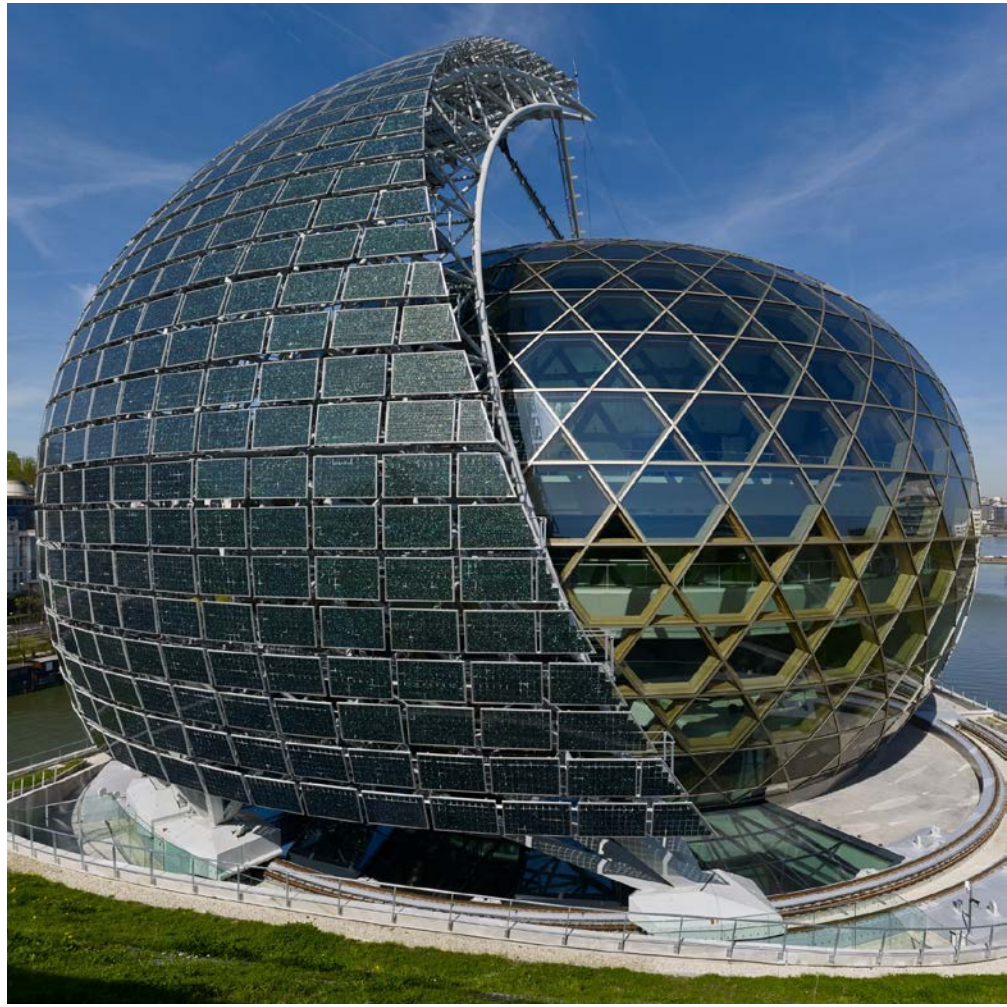
- The group decided that the first monitoring round robin will consider bifacial modules and systems, the use of which is becoming popular
- It will cover the ability to predict operating and performance parameters, including irradiance uniformity, cell temperature etc.
- Data collection and access permissions are currently in progress



WG4: PV in the built environment

- Objective (2019)
- Identification of required data and appropriate simulation models to be used in the framework of PV systems in the built environment

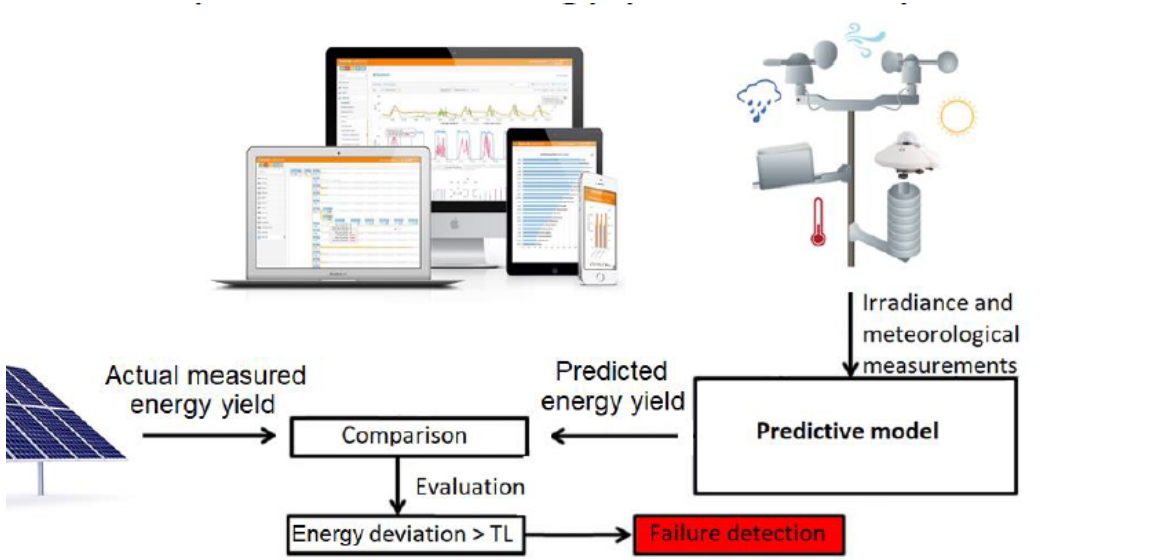
- WG leaders: Mirjana Devetaković, Bogdan Burduhos
  Alessandra Scognamiglio, Francesco Frontini
- 24 members



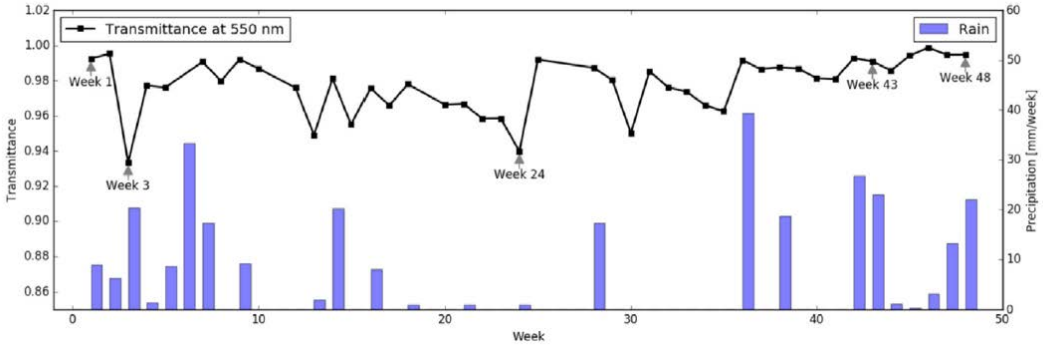
- An example of complex photovoltaic façade in the built environment.
- La Seine Musicale, by Shigeru Ban. Paris, 2017

WG5: PV in grids

- Objectives (2019)
  - Better grid-integration of PV systems
  - Increase and better understanding of PV systems performance
- Research topics
  - PV power forecasting
  - PV power fluctuations for grid operators
  - PV power quality in the grid
  - PV energy storage and management strategies
  - PV performance and fault detection
- Team
  - Leader: Jonathan Leloux
  - 27 members
- Latest results
  - Andreas Livera et al., Performance analysis of mechanistic and machine learning models for photovoltaic energy yield prediction, EU PVSEC, 2019
  - Leonard Micheli et al., Correlating photovoltaic soiling losses to waveband and single-value transmittance measurements, Energy, 2019



Livera 2019, Fault detection methodology



Micheli 2019, Weekly transmittance of PV module with soiling accumulation

Training School Program: 15-18 Oct, 2019

EVALUATION OF THE PERFORMANCE DEGRADATION OF PV-SYSTEMS

- Many Thanks to Training School Managers, Gabi Eder and Aleksandra Krstic-Furundzic!!!

Schedule of events

Tuesday 15 October 2019: State of the ART c-Si PV

Time	Topic	Lecturers
9.00 - 9.30	Registration Opening of the Training School	Angele Reinders / UTwente
9.30 - 10.45	**Keynote lecture:** **Reliability of Photovoltaic systems (c-Si)** and Activities in IEA PVPS Task13 Failure modes of c-Si-PV Systems, Modules and Components	Karl Berger / AIT Gabriele Eder / OFI

10.45 - 11.00	Coffeebreak	
11.00 - 12.30	Postersession I: Mutual introduction of all participants	Aleksandra Krstic-Furundzic / Univ.Belgrade
12.30 - 13.30	Lunch	
13.30 - 15.15	Expert lectures + Discussions: Degradation mechanisms of PV-cells and polymeric materials	Gernot Oreski / PCCL Abdülkerim Gök / Gebze TU
15.15 - 15.30	Coffee break	
15.30 - 17.00	Practical Course: Degradation modeling	Gernot Oreski / PCCL Abdülkerim Gök / Gebze TU

Wednesday 16 October 2019: Performance degradation / Bankability

Time	**Topic**	**Lecturers**
9.00 - 10.45	**Keynote lecture:** **Field performance measurements and the basics of data analytics** State-of-the-Art Performance Degradation Measurements Failure detection in the field	Jonathan Leloux / UPM Christian Braun / Fraunhofer ISE Gabriele Eder / OFI und Karl Berger / AIT
10.45 - 11.00	Coffee Break	
11.00 - 12.30	Bankability/calculations: effect of degradation and lifetime on economic viability	David Moser / EURAC

13.30 - 17.00	Excursion to PV-Installation at MCAST + Workshop: Evaluation and interpretation of electrical data I performance degradation, data treatment -> failure identification	Jonathan Leloux / UPM Karl Berger/ AIT Abdülkerim Gök / Gebze TU
Evening	Joined Dinner (invited)	Villa Bighi, Kalkara: https://villabighi.com/

Thursday 17 October 2019: Thin film Technologies / Characterization

Time	**Topic**	**Lecturers**
9.00 – 10.15	***Keynote lecture:* Performance degradation and failure modes of thin film PV**	Marcus Rennhofer / AIT
10.15 - 10.45	Coffee break	
10.45 - 12.00	Reliability engineering and modeling: root cause analysis and predictive ageing	Jeffrey Kettle / Bangor Univ.
12.00 - 13.00	Lunch	

13.00 -17:00	Visit to the University of Malta Solar Research Laboratory + Workshop: Measurement and interpretation of characterization data II Failure detection with EL, TG, UV-F…	Gabriele Eder / OFI Marcus Rennhofer / AIT Angele Reinders / UTwente Wolfgang Mühleisen /SAL
Evening	Social event	

Friday 18 October 2019: Emerging Technologies

Time	**Topic**	**Lecturers**
9.00 – 10.45	Reliability and challenges of emerging PV / Nanostructured PV Reliability of next generation PV-systems (OPV) Hybrid organic-inorganic Pb-free perovskite materials for PV applications	Shahzada Ahmad / BC materials Jeffrey Kettle / Bangor Univ. Anna Ioannou / National Hellenic Research Foundation
10.45 - 11.00	Coffee break	
11.00 - 12.30	Interactive poster session II	Aleksandra Krstic-Furundzic / Univ.Belgrade
12.30 - 13.30	Wrap up & closing / joined lunch	

Future events and plans

- Next events
  - Workshop on Luminescent Solar Concentrator PV, 14 November 2019, Eindhoven
  - MC Meeting and Workshops, February 2020, Utrecht
- Future plans
  - Progress Report 2 (research progress) to be submitted 4 November 2019
  - Data bank open for all PEARL PV members, 1 November 2019
  - Publications by Special Issues of Journals (first trial with LSC PV workshop)
  - Attendance PVSEC, Xi'an 4 to 9 November 2019
  - Valorization activity by an industry survey (Fall 2019)
  - Possibility to initiate a new WG on Socio-economics of PV (volunteer sought)
  - Establishment of PEARL PV award (scheduled in 2020)

Many thanks to Brian and Renate !!!

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Thanks to all and have a great stay in Malta

In particular thanks to all volunteers who execute PEARL PV with great enthusiasm!

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