EU PVSEC

EU PVSEC 2023

40th European Photovoltaic Solar Energy Conference and Exhibition

18 — 22 September 2023

Lisbon — Portugal

CCL — Lisbon Congress Centre

Conference — **Call for Papers**

www.eupvsec.org

EU PVSEC 2023

40th European Photovoltaic Solar Energy Conference and Exhibition

CALL FOR PAPERS

AUTHORS WISHING TO CONTRIBUTE TO THE CONFERENCE PROGRAMME OF THE EU PVSEC 2023 SHOULD SUBMIT AN ABSTRACT AT THE LATEST BY

3 FEBRUARY 2023

Authors are invited to carefully read the topic descriptions and select the topic and subtopic which most closely matches the key novelty of their work. Please note that some topic areas have been renumbered and restructured. The subtopic descriptions are brief and non-exhaustive, while at the same time self-explanatory so that locating the correct area is straightforward.

MESSAGE FROM THE TECHNICAL PROGRAMME CHAIR

1TW AND COUNTING

I am pleased to announce the call for papers for the 40th European Photovoltaic Solar Energy Conference, which will take place in Lisbon, 18-22 September 2023.

2022 was the year of terawatt solar - with 1 TW installed globally, there are now ambitious targets to reach the next TW within as few as three years! European PV research is performing well and production technology is in higher demand than it has been for over a decade. The PV community is proposing innovative, affordable and sustainable solutions for the sector as PV manufacturing experiences a renaissance in Europe.

We are currently facing the first real global energy crisis and we need commitment and international cooperation to tackle it. Therefore, we cordially invite you to be part of the 40th edition of the EU PVSEC, the leading platform for knowledge transfer in PV.

We have arranged the programme in 5 topics as follows - Silicon Materials and Cells; Thin Films and New Concepts; Photovoltaic Modules and BoS Components; PV Systems Engineering, Integrated/Applied PV; PV in the Energy Transition. The technology topics will highlight new developments in silicon cells, perovskites and tandems, amongst others. The Module and Systems topics cover design, implementation, performance and operation - including the increasingly important role of digitalization and machine learning - as well as the multitude of applications in areas such as buildings (BIPV), agriculture (Agri-PV) and on water (Floating PV). The energy transition topic covers the wide range of multidisciplinary efforts required to ensure the rapid deployment of PV technologies on a massive and global scale as a key element of the ecological transition, including, technical, storage, economic, sustainability, and societal challenges.

As is clear from this extensive programme, the EU PVSEC offers a unique opportunity to share your work with others from across the entire field of photovoltaics, as well as an excellent opportunity for multidisciplinary learning. During the week, a broad range of parallel events will also be organized to complement the technical programme.

As an additional optional benefit for authors, we maintain our collaborations with Progress in Photovoltaics, Solar Rapid Research Letters and EPJ Photovoltaics who offer the opportunity to publish a selection of our best submissions. Through these different offerings we have a target of more than 100 high quality peer reviewed papers coming out of the conference, over a range of publication options, including Open Access.

It is worth highlighting the PV Academy that was successfully launched in 2022 at the 39th EU PVSEC/WCPEC-8. This offers new workers in the field an opportunity to increase their knowledge on a range of key photovoltaics areas with a set of live tutorials by recognized experts. The 2nd PV Academy will be held on the Sunday before the conference week.

It was clear that all participants greatly enjoyed the opportunity of meeting in person at the 39th EU PVSEC/WCPEC-8 in 2022. Sharing our knowledge and networking during this full immersion week is more efficient and rewarding in this format. I look forward to receiving your abstract for consideration for inclusion in our exciting programme also next year. After its postponement in 2020, I will be delighted to finally meet you in Lisbon in 2023.

Dr. Robert Kenny
European Commission Joint Research Centre
EU PVSEC Technical Programme Chair

CONFERENCE TOPICS & SUBTOPICS

This topic description for the EU PVSEC 2023, five topics this year, implements some changes which reflect the widening scope of the conference. In order to help and assist you in deciding to submit a contribution for this conference, we provide you with some explanations and clarifications, in particular in the new or re-arranged topics.

We appreciate that some level of overlap between different subtopics is unavoidable - if you have doubts about the appropriate subtopic to choose, please consider the one most appropriate to the main novelty of your work.

TOPIC 1
Silicon Materials and Cells

Topic 1 collects all abstracts which deal with crystalline silicon up to cell level. Amorphous and microcrystalline silicon is also covered in subtopic 1.3. The whole spectrum of Si technology is divided into 5 subtopics, which address typical issues and fields of technology development, many of them dealt with on a corporate R&D level.

An exception is tandem structures combining other materials with silicon which are grouped together in subtopics 2.1 (perovskite-based tandems) and 2.3 (which includes other tandems not employing perovskites). Contributions which focus on Si module encapsulation and reliability, or electrical performance measurement technologies are better placed in Topic 3.

1.1 Feedstock, Crystallisation, Wafering, Defect Engineering Novel and advanced production technologies for silicon, ingots and wafers, solar-grade silicon properties and specifications, testing, performance, costs.	*Influence of crystallisation parameters, impact of residual defects and impurities, and their mitigation.* *This subtopic focuses on all the steps required for the production of high-quality silicon up to wafer stage ready for subsequent cell fabrication.*
1.2 High Temperature Routes for Si Cells Solar cell architectures based on high temperature poly-Si and classical high temperature approaches (PERX, IBC, etc.). Subtopics 1.2 and 1.3 are where research work on crystalline Si cells is presented, divided into two main themes, which employ either high temperature or low temperature processing routes.	*This subtopic replaces a previous closely related one, which was titled 'Homojunction Solar Cells'. It includes technology development for these approaches.*
1.3 Low Temperature Routes for Si Cells Solar cell architectures based on classical a-Si junction formation and passivation schemes (e.g., HIT), as well as approaches relying on other low temperature passivation-based systems. Subtopics 1.2 and 1.3 are where research work on crystalline Si cells is presented, divided into two main themes, which employ either high temperature or low temperature processing routes. Amorphous and microcrystalline silicon, thin crystalline silicon, and silicon foils are also contained within this subtopic.	*This subtopic now contains a previous one which was titled 'Thin Film and Foil-Based Si Cells'.*
1.4 Characterisation & Modelling of Si Cells Measurement and modelling of innovative Si cell concepts.	*Characterisation and modelling of cells are of crucial importance in the development of innovative concepts and architectures. All such work should be submitted to this subtopic.*
1.5 Manufacturing of Si Cells Novel or improved manufacturing solutions and strategies, automated production processes and systems, quality assurance in production. Various contacts for Si solar cells - pastes, screen printing, plating, etc. Sustainability aspects of materials consumption at cell level, manufacturing processes and device architectures.	*Improvements in manufacturing solutions for mass production are crucial in order to continue the drive towards lower costs, while maintaining high quality and sustainability standards. New developments in production technologies should be submitted to this subtopic.*

TOPIC 2
Thin Films and New Concepts

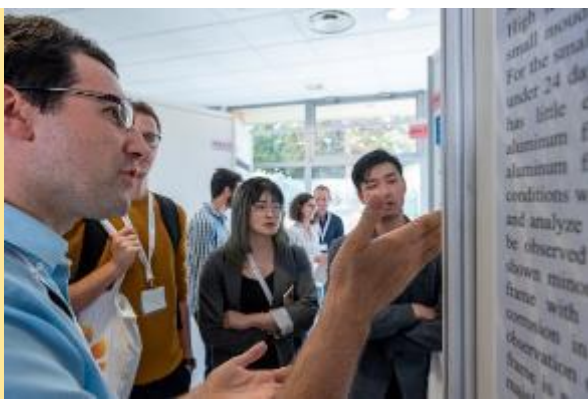
This Topic is subdivided amongst the different photovoltaic materials in use today or in the conceptual or demonstration phase that are not based on silicon. An exception are tandem structures combining other materials with silicon which are grouped together in subtopics 2.1 (perovskite-based tandems) and subtopic 2.3 (which includes other tandems not employing perovskites). The Topic comprises theoretical studies, innovations in processing and manufacturing technologies and upscaling, measurement and characterisation. If the paper describes the encapsulation on a module level, it is better to be presented under subtopic 3.1. For materials which don't fall under any of those listed in subtopics 2.1 to 2.3 you should consider subtopics 2.4 and 2.5, which present the ongoing high-end research with contributions to the understanding of photovoltaic conversion, including new materials and cross-fertilisation with other fields of optoelectronics.

2.1 Perovskite-based Tandems This subtopic focuses on perovskite-based tandem solar cells such as perovskite-silicon, all-perovskite or perovskite combined with other materials. For tandem structures not containing perovskite see subtopic 2.3.	*This subtopic brings together the increasing research into tandem structures employing perovskites. In the first instance this typically envisages structures on silicon, but all other combinations (such as all-thin-film tandems) are welcome. The subtopic comprises theoretical studies, innovations in processing and manufacturing technologies and upscaling, measurement and characterisation. N.B. For III-V multijunction devices and other tandems not employing perovskites, see subtopic 2.3.*
2.2 Perovskites Lead halide perovskites and their lead-free analogues, perovskite-based devices, manufacturing and up-scaling technologies and strategies.	*The subtopic comprises theoretical studies, innovations in processing and manufacturing technologies and upscaling, measurement and characterisation. Hybrid and other tandems employing perovskites are excluded from this subtopic (please refer to subtopic 2.1).*
2.3 Compound and Organic Semiconductors Compound semiconductor (e.g. II-VI and III-V) and organic devices, materials, surfaces/interfaces and contacts, processing and manufacturing technologies, measurement and characterisation, modelling. Novel cell architectures, materials, technologies and processing for single and multi-junction cells. Tandem devices that do not involve perovskite.	*The broad family of chalcogenide and kesterite thin film technologies, e.g. CI(G)S and CZTS, as well as CdTe, are contained in this subtopic; Polymer, organic and dye-sensitised cells and devices are also included. Devices, materials, surfaces / interfaces and contacts, modelling, processing and manufacturing technologies, up-scaling technologies and strategies, quality control, lifetime and reliability measurement and characterisation are all covered. III-V and related compound semiconductors. Tandem devices that are not covered under subtopic 2.1.*
2.4 New Materials, Devices and Conversion Concepts New cell materials and concepts, e.g., use of nanotechnologies and quantum effects. New module materials and concepts.	*Here we invite papers which describe experimental research realising new materials and device concepts, with emphasis on a rather fundamental or prototype (i.e., low TRL) level.*
2.5 New Modeling and Characterization Techniques Theoretical studies of materials, cells and modules; new measurement techniques, and new modelling and simulation approaches.	*This subtopic comprises all theoretical work on photovoltaic conversion as well as for instance measurement techniques to reveal e.g., atomic structures or electronic properties.*

TOPIC 3
Photovoltaic Modules and BoS Components

This Topic addresses all the components required to form a complete system. The PV module related aspects are divided into three subtopics, broadly dealing with manufacturing, reliability and performance, respectively. The remaining balance of system components are grouped together in subtopic 3.4. Papers presented under this topic regard research, development, design, measurement, modelling, testing and operational experience. Papers that deal substantially with aspects of sustainability, such as disposal, recycling and resource issues are dealt with in Topic 5 (Subtopic 5.2 Sustainability of PV).

3.1 PV Module Design and Manufacturing PV module design and materials, module manufacturing processes, techno-economic analysis.	*New module designs and hybrid technologies are also welcome here. For work relating to PV system performance, please refer to Topic 4.*
3.2 PV Module Durability and Reliability Type approval testing, degradation, ageing and lifetime, accelerated testing methods.	*This is the place for all work regarding making a PV device fit for prolonged outdoor exposure, including type approval testing, degradation, ageing and lifetime questions.*
3.3 PV Module Performance – Modelling, Testing, Standards Measurement and characterisation methods, field performance, energy yield, energy rating.	*This subtopic looks at new and improved measurement and characterisation methods, correlation between laboratory testing and field performance, energy yield, energy rating. It includes modelling and methods for characterisation and calibration, independently of the particular device active material. Work supporting development and validation of standards is also reported here.*
3.4 Power converters and other Balance of System Components Inverters, micro-inverters, power optimisers, monitoring systems, charge controllers, safety switches, mounting structures, trackers, cabling; measurements and testing of performance and reliability.	*This subtopic addresses these components mainly on the device level. The performance and reliability part includes operational performance, testing standards and measurement protocols. Electronic components, sensors and simulation tools that deal more generally with the grid interface, new services and functionalities, optimization, etc., are dealt with in subtopic 4.6. Regarding accumulators for stand-alone systems, please also see subtopic 5.1.*



TOPIC 4
PV Systems Engineering, Integrated/Applied PV

This Topic in general addresses single PV plants, where plant size may range from a few modules up to multi-MW. Consequently, this is the place for contributions on systems design, sizing, modelling, performance and operations.
This topic also deals with particular integration of PV, e.g., PV integrated into buildings (BIPV), Infrastructure Integrated PV (I2PV), Vehicle Integrated PV (VIPV), nature-inclusive PV ('Eco-PV'), and Agri-PV, as well as with floating PV, concentrating PV and PV for space applications. Advances in power electronics for advanced grid functionality are also covered (note that technical developments of power converters at system component level are dealt with in Topic 3.4). The subtopic on solar resources and forecasting is relevant to individual systems, but it covers scales ranging from the local to large geographical areas. The employment of batteries in stand-alone systems or for local use may form part of systems reported in this topic, but storage related to the wider energy system is dealt with in subtopic 5.1.

4.1 Solar Resource and Forecasting Solar resource assessment, measurements and monitoring, meteorological forecasting, now-casting, analysis of ground station and satellite data.	*Abstracts which deal with all PV relevant solar radiation science, models and tools are placed here.*
4.2 Engineering Design and Installation of PV Systems Planning, plant optimization tools, cost analyses, advanced installation criteria, construction and safety issues.	*This is the Topic for the design, engineering, realization and commissioning of entire PV systems. Work which focuses on how a system Interacts with the grid is dealt with in subtopics 4.6 (Electrical grid interface) and 5.1 (Energy system integration).*
4.3 Operation, Performance and Maintenance of PV Systems Monitoring, predictive and corrective maintenance, system failure analysis, system reliability, operational safety.	*Papers which describe the operational experience of systems in use are placed here. Of particular interest are maintenance related cost analyses as well as methods for system modelling and predicting technical lifetimes. Work which focuses on how a system Interacts with the grid is dealt with in subtopics 4.6 (Electrical grid interface) and 5.1 (Energy system integration).*
4.4 PV and Buildings Design, and architectural aspects of BIPV and BAPV; zero energy buildings; PV products for buildings; building, environment, safety and other regulatory aspects.	*This subtopic will collect all contributions describing how PV systems are placed on or are integrated into buildings, covering both functional and aesthetic aspects. All types of buildings are considered - residential, office, commercial, and industrial. Related ancillary equipment is also considered and how the whole system is integrated and performs, e.g., electric and thermal performance, heat pumps, integrated mounting structures, balcony PV, multi-functionality.*
4.5 Integrated PV Design solutions, implementation and performance of PV in infrastructures, on water (floating PV), in dual use agriculture (Agri-PV) and in nature ('Eco-PV'); Vehicle integrated PV (VIPV).	*This subtopic will collect all contributions describing how PV systems are placed on or are integrated into infrastructure, but also in nature and the environment which surrounds us. PV integrated into vehicles (VIPV) is also covered here, as well as indoor applications.*
4.6 Digital PV, Power Electronics and Electrical Grid Interface Power electronics for advanced grid functionality, measurement and control; simulation tools and testing methods; communication protocols, data driven methods, data ownership, data spaces, data models; grid management and optimization at high PV penetration.	*This subtopic covers recent developments in power electronics, measurement, modelling and control focusing on the interface between a PV plant and the electrical grid. The subtopic addresses relevant developments, including from digitalisation, for a reliable, secure and optimized grid operation at high PV penetration. This also covers concepts such as advanced inverter functionality, voltage and frequency regulation, power quality and stability, islanded operation, or micro-grids. ICT integration including (cyber) security is also included.*
4.7 Concentrators; Space Applications Design and measurement of concentrator solar cells, assemblies and CPV modules. Optical systems, mounting structures and trackers; Thermophotovoltaic energy conversion (TPV). Photovoltaic cells and systems for space photovoltaics, and their in-flight performance.	*Abstracts focusing on the device (cell) level may be more relevant to topic 1 or topic 2, in particular subtopic 2.4 for III-V based cells, however, if the cell design is specific to the application then it can be appropriate to be submitted here.*

TOPIC 5
PV in the Energy Transition

This Topic covers the wide range of multidisciplinary efforts required to ensure the rapid deployment of PV technologies on a massive and global scale as a key element of the energy and the broader ecological transition. As such it covers a range of aspects, ranging from integration of high amounts of PV generated electricity into the energy system, including storage; ensuring that PV is implemented sustainably and ecologically, through to financing, market development and policy making; and addressing and ensuring societal acceptance of the role of PV in a just energy transition.

5.1 Energy System Integration; Resilience and Security of Supply; Solar Fuels, Storage Energy management, resilience and security of supply with PV including modelling of integrated supply-demand systems, digital monitoring, control, forecast and dispatch involving various energy sources and users, including heat pumps, electromobility and others; Technology and engineering of storage systems and their integration; Direct applications of PV generated electricity, e.g., desalination, P2X (solar fuels and green Hydrogen)	*Integration of PV generated electricity into the wider energy system, including balancing supply and demand. Experience from other renewable sources and grid operators are welcome, including hybrid. The spectrum of storage systems covers: accumulators, supercapacitors, Redox flow, CAES, flywheels, storage in heat/cold, pumped hydro; seasonal storage including sizing, operation and performance; optimising the "dispatchability" and functionality of PV driven electricity systems. Scale may be local, to regional and continental, over time scales covering the full range from grid stabilisation to seasonal storage. Industrial applications in which PV generated electricity is converted directly into a useful product or service, including conversion of PV electricity into other energy carriers are also included here, e.g., PV-to-gas/fuels including hydrogen production (P2X); Water desalination, sterilization and upgrading; PV process heat/industrial processes.*
5.2 Sustainability of PV Safety and environmental issues; life-cycle analysis (LCA) of modules, systems, and applications, CO2 footprint, ecological effects of PV applications on land and water, sustainability of materials, customised products and sustainable design, product regulation concepts, reuse, recycling, disposal, and waste management, decommissioning, raw material availability, resource efficiency and material flows, PV in the circular economy, urban and spatial planning.	*As a renewable energy solution PV must also address concerns about its environmental impact. This is the subtopic for abstracts related to environmental science and engineering, health and safety, and also for socio-economists dealing with the circular economy and LCA.*
5.3 Scenarios for Renewables, Policy, Global Challenges Modelling and scenario analysis; interplay with other renewable energy systems; Policies for R&D, innovation, manufacturing, deployment, supply chain diversification and energy security; role of policy, trade barriers and taxation, regulatory frameworks for grid integration; education, training and job creation; Upscaling of PV and deployment at TW scale. PV roll-out in developing and emerging economies.	*This is the subtopic for policymakers, researchers, energy-law experts, media communicators, but also teachers and communicators. The more global aspects solicit papers from large, often collaborative efforts to analyse the role of PV in a larger context, often related to energy modelling or scenario analysis (including 100% renewables). Projecting PV towards 2030, 2050 and comparing the calculations are typical subjects in this subtopic, as well as the relation of PV to greater policy efforts in different regions of the world, or international agreements, including UN Sustainable Development Goals and IPPC.*

5.4 Costs, Economics, Finance and Markets Cost models and cost reduction, soft and area related costs; PV Levelised Cost of Electricity (PV LCOE) competitiveness, economics of, and business models for PV and storage/conversion (P2X); PPAs, financing and investment; market development and segmentation; market design for PV as dispatchable power and electricity market participation and integration; utility scale development, prosumer aspects and digitalisation. PV business models, finance and deployment in developing and emerging economies; implementation experiences at local and regional scale; energy access.	*In this subtopic we address market analysts, project developers and business experts from finance, and investment and utilities. It covers the more non-technical aspects of installing and dispatching PV electricity, new scenarios and the market conditions required to make them happen as well as analysis of present market development and trends.*
5.5 Societal Challenges; Citizens' Participation, Awareness PV impacts on society, awareness and social acceptance of the energy transition, barriers perceived by society, roles of citizens and examples addressing these, role of behaviour, cooperatives enabling PV deployment, trade-offs between different societal goals. Energy affordability and energy poverty.	*This subtopic addresses SSH scientists and looks at societal challenges around the ongoing energy and ecological transition, and how to ensure the implementation of climate change mitigation and adaptation policies in a rapid and fair manner. Citizen's participation is essential at the local and global scale and methods and studies to help achieve this are relevant here.*

ABSTRACT SUBMISSION

Authors wishing to contribute to the Conference Programme of the EU PVSEC, 18-22 September 2023, Lisbon, Portugal, should submit an abstract at the latest by **3 February 2023**.

Authors are invited to carefully read the topic descriptions and select the topic and subtopic which most closely matches the key novelty of their work. The subtopic descriptions are brief and non-exhaustive, while at the same time self-explanatory so that locating the correct area is straightforward.

A reference abstract template MS Word document can be downloaded in the EU PVSEC website.

Abstracts (in the format of 1 page for the Summary of the Abstract + up to 3 explanatory pages) shall be written in English and include short sections addressing:

- Aim and approach used
- Scientific innovation and relevance
- Results or preliminary results and conclusions

Authors also need to provide using the abstract submission platform:

Abstracts (in the format of 1 page + up to 3 explanatory pages) shall be written in English and include short sections addressing:

- Full paper title
- Full name, affiliation, address, e-mail and phone of one author for all correspondence
- For all other authors, full name, affiliation and e-mail
- Summary of the Abstract
- Applicable topic and subtopic number (e.g. 1.2) and a brief justification of the choice of subtopic to assist the evaluation process.
- Aim and approach used
- Scientific innovation and relevance
- Results or preliminary results and conclusion

“Aim and approach used”, “Scientific innovation and relevance” and “Results or preliminary results and conclusions” provide the basis for the review and programme selection process, so please make sure to address all three aspects.

The total length should not be more than four A4 pages. We recommend a minimum of 2 pages in total to ensure a comprehensive evaluation of your work. We encourage authors to provide enough information to be evaluated correctly. Kindly also note that in case you apply for “Journal Publication” in order to be evaluated correctly, only abstracts with a minimum of 3-4 pages are eligible. Please make sure that this requirement is respected.

Kindly also note that in case you apply for “Journal Publication” in order to ensure a sufficiently detailed evaluation, only abstracts with a minimum of 3-4 pages are eligible. Please ensure that this requirement is respected.

Detailed instructions on how to prepare and submit your abstract are given in the “Abstract Submission Guidelines” on the EU PVSEC website. Please read these instructions carefully.

For questions concerning abstracts, please contact:

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IMPORTANT KEYDATES

3 FEBRUARY 2023
DEADLINE FOR SUBMISSION OF ABSTRACTS

FEBRUARY – END-APRIL 2023
ABSTRACTS REVIEW AND EVALUATION BY THE SCIENTIFIC COMMITTEE

END APRIL 2023
NOTIFICATIONS OF AUTHORS

BEGINNING OF SEPTEMBER
SUBMISSION OF MANUSCRIPT FOR THE CONFERENCE PROCEEDINGS

The Author's Workstation contains more detailed information.

INSTITUTIONAL SUPPORT

European Commission

With the support of UNESCO's Natural Sciences Sector

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COORDINATION OF THE TECHNICAL PROGRAMME

European Commission
Joint Research Centre

INSTITUTIONAL PV INDUSTRY COOPERATION

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