CALL FOR PAPERS

THE 50th IEEE PHOTOVOLTAIC SPECIALISTS CONFERENCE

June 11-16, 2023
San Juan, Puerto Rico, USA

Abstract Deadline: January 16, 2023

Call for Papers

On behalf of the Technical Program Committee, I would like to invite you to submit an abstract on your latest achievements in photovoltaic (PV) research, development, applications, and impact to the 50th IEEE Photovoltaic Specialists Conference (PVSC 50). The PVSC 50 marks a milestone in the conference's longstanding tradition of covering the full spectrum of PV knowledge and innovation, from the basic science and engineering of materials, devices, and systems, to the examination of policy and markets and critical issues of social impact. PVSC is a highly interactive and inclusive venue for everyone, from seasoned PV experts to entry-level professionals to students alike. The conference provides a unique opportunity to meet, share, and discuss PV-related developments in a timely and influential forum.

Based on the popular response from last year, publication of a conference proceeding will be optional. Full papers are encouraged but short abstracts will otherwise be used as the publication of record. Authors will have the option of submitting their evaluation abstract or a longer conference proceeding by the June 2, 2023, publication deadline. Exceptional submissions will be recommended for expedited review and publication in the IEEE Journal of Photovoltaics (JPV). You may also indicate that you would like your submission to be evaluated for JPV consideration.

New this year: Hybrid-tandem device technologies are collocated under Area 1.

To have your paper considered for presentation at PVSC 50, submit:

1. An evaluation abstract (3 pages maximum for technical committee review);
2. A short abstract of 300 words or less for display on the PVSC 50 website and default publication in the PVSC proceedings.

Abstract submission is via the PVSC 50 website where templates are provided. Please follow the template when preparing your submission. Technical evaluation abstracts will be thoroughly reviewed, used to decide acceptance and determination between oral and poster presentations. **The deadline for abstract submission is January 16, 2023,** at midnight Pacific Standard Time (UTC - 8 hours). Contributing authors will be notified of the acceptance status of their papers around March 15, 2023, after which they **must confirm** their ability to present their work at the conference. Invitation letters for visa applications are issued after registration to the conference upon request.

I look forward to welcoming you at the 50th IEEE Photovoltaic Specialists Conference in San Juan, Puerto Rico!

Jeremiah McNatt
Technical Program Chair
2023 50th IEEE PVSC

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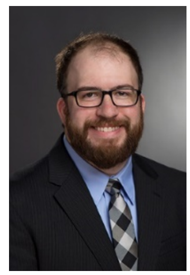

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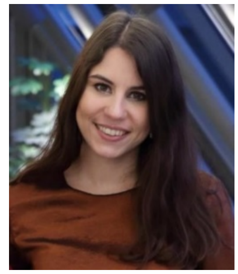

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USA

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Stephen Tay En Rong
National University of Singapore
Singapore

Area 1: Fundamentals and New Concepts for Future Technologies

Area Chair: Jacob Krich, University of Ottawa, Canada
Co-Chairs: Louise Hirst, University of Cambridge, United Kingdom
Takashi Kita, Kobe University, Japan

Sub-Area 1.1: Fundamental Conversion Mechanisms
Sub-Area 1.2: Nanostructures, 2D materials, Quantum Materials, and Unconventional Absorbers and Devices
Sub-Area 1.3: Advanced Light Management and Spectral Shaping
Sub-Area 1.4: Hybrid Tandem/Multijunction Solar Cells

Area Description

Paradigm shifts in solar cell technology are invariably preceded by breakthroughs arising from basic scientific research. Area 1 comprises fundamental research and novel device concepts that will provide a platform for the development of future photovoltaic technologies. Papers are sought describing research in basic physical, chemical, and optical phenomena, studies of new materials and innovative device designs, as well as photon management methods. Subjects of particular interest include, but are not limited to, new materials for all parts of the photovoltaic device, advances in the understanding of basic phenomena, nanostructures, advanced optical management approaches, new synthesis processes, and unconventional conversion mechanisms.

Sub-Area 1.1: Fundamental Conversion Mechanisms

Sub-Area Chair: Rune Strandberg, Universitetet i Agder, Norway

Sub-Area 1.1 captures both experimental and theoretical work exploring new paradigms for solar energy conversion. Papers submitted to this sub-area should explore fundamental physics, modeling, or initial experimental demonstrations of novel energy conversion mechanisms, including novel materials and novel device architectures. Areas of interest include, but are not limited to, non-conventional PV conversion processes based on hot-carrier effects, , intermediate band concepts, multiple exciton generation (MEG), transistor solar cells, and engineered band alignments. We particularly solicit papers on thermophotovoltaics, thermophotonics, or thermoradiative concepts. Also of interest are concepts and demonstrations of new materials and material science related to these concepts. Crosscutting scientific approaches involving novel physics, photovoltaics for solar fuel generation, alternative solar energy storage mechanisms, and innovative device structures are solicited.

Sub-Area 1.2: Nanostructures, 2D Materials, Quantum Materials, and Unconventional Absorbers and Devices

Sub-Area Chair: Andreas Pusch, University of New South Wales, Australia

Sub-Area 1.2 covers progress in the development of novel absorber and contact materials, novel device architectures as well as processing techniques for improving the performance, functionality, reliability, and scalability of PV devices. Topics of interest include theoretical and/or experimental development of nanostructures such as quantum dots and nanowires, 2D and layered materials such as graphene and transition metal dichalcogenides, quantum materials, Earth-abundant absorber materials, perovskite-inspired materials, new contact materials including carrier selective contacts, p-type transparent conducting materials, and transparent conducting oxides. Advances in growth, synthesis, thin film deposition, material printing, doping and passivation schemes as well as innovative strategies to reduce the cost of more established technologies, such as novel substrates and re-use processes are also welcome. Ideal submissions will range from studies of fundamental properties and materials to examples of working devices.

Sub-Area 1.3: Advanced Light Management and Spectral Shaping

Sub-Area Chair: Rebecca Saive, University of Twente, Netherlands

To achieve high power conversion efficiency, a solar cell must effectively utilize most of the incoming photons. This process involves the efficient coupling of the incident light into the solar cell with minimum loss and effective use of the energy imparted by each photon. This Sub-Area will focus on novel concepts, including advanced anti-reflection coatings, spectrum splitting, textured light trapping surfaces from front and/or rear surface, luminescent and fluorescent systems, micro- and nano-scale concentrator systems, and advanced photonic and plasmonic structures. With respect to plasmonics, both light trapping and hot carrier effects will be considered. It will also include photon recycling, angular restriction techniques for achieving improved open-circuit voltages and strategies to implement ultra-thin devices. In addition, ways to modify the spectrum of the incident sunlight using techniques such as up or down conversion either in planar layers or in waveguide structures will be considered. Papers submitted to this Sub-area should address one or more of these themes and may be theoretical or experimental in nature.

Sub-Area 1.4: Hybrid tandem/multijunction solar cells

Sub-Area Chair: TBD

Tandem and multijunction solar cells made with two or more classes of materials have demonstrated potential for exceptionally high conversion efficiency. This Sub-Area solicits papers regarding materials, structures, and devices based on combinations of different materials (e.g., III-Vs, silicon, perovskites, chalcogenides, organics, etc.) toward the production of hybrid multijunction solar cells. The full range of integration methodologies are of interest, including but not limited to monolithic epitaxy and deposition, wafer/layer bonding, and mechanical stacking, as well as the characterization of these materials, structures, and devices, from the atomic scale to the device level (and beyond), as related to their hybrid nature. Papers on the theory and modeling of such devices are welcome, as is work related to new module and system architectures optimized for such hybrid cells. Oral sessions in this topic may be organized with Areas 2, 3, 4, and 6, as appropriate, and may host another of the popular "Battle Royal" sessions of previous years.

Area 2: Chalcogenide Thin Film Solar Cells

Area Chair: Amit Munshi, Colorado State University/JPHB Cleantech LLC., USA
Co-Chairs: Shubhra Bansal, University of Las Vegas, USA
Christian A. Kaufmann, Helmholtz-Zentrum Berlin, Germany

Sub-Area 2.1: Absorber Preparation and Material Properties
Sub-Area 2.2: Contacts, Windows, Interfaces, and Substrates
Sub-Area 2.3: Cell and Module Characterization – Analysis, Theory, and Modeling
Sub-Area 2.4: Chalcogenides for Tomorrow and Beyond – Tandems, Recyclability, and Futuristic Innovations

Area Description
In recent years, thin film chalcogenide solar cells based on CIGSe and CdTe have achieved remarkable progress in terms of record conversion efficiencies and manufacturing at the multi gigawatts-per-year scale. Several gigawatts have demonstrated operating reliability in the field which has helped reducing the cost of installation as well as electricity from PV.

Area 2 brings this community together to present and discuss progress, challenges, and the future research avenues in evolution of CdTe-, CuZnSnS-, and CIGSe-based photovoltaic materials and devices. It provides a platform to present current research to improve the understanding as well as exploring new directions for materials and devices and narrowing the gap between record efficiency small area devices and commercial scale modules. The topics range from basic and applied material science, to computational/analytical results, to device characterization, as well as to potential future innovations.

Sub-Area 2.1: Absorber Preparation and Material Properties
Sub-Area Chair: Akira Nagaoka, Miyazaki University, Japan
Addresses progress in thin film fabrication, material properties, and their relationship with device performance. Topics include experimental and theoretical aspects of morphology, phase coexistence, microstructure, extended and point/bulk defects and their characterization, optoelectronic and transport properties, influence of substrates, compositional gradients and homogeneity, and interrelation of properties.

Sub-Area 2.2: Contacts, Windows, Interfaces, and Substrates
Sub-Area Chair(s): TBD
Focuses on the functions, effects and properties of substrates/superstrates, contacts, buffer and window layers, and interfaces. Submissions describing advances in understanding these aspects and their effects on performance are welcome. Progress in the cross-cutting areas of transparent conductors, moisture barriers, new or improved substrates, cell scribing and interconnection in modules, and novel topics not listed are also encouraged.

Sub-Area 2.3: Cell and Module Characterization – Analysis, Theory, and Modeling
Sub-Area Chairs: Theresa Magorian Friedlmeier, Zentrum für Sonnenenergie und Wasserstoff-Forschung Baden-Württemberg, Germany
This sub-area complements topics addressed in Sub-Area 2.1 and 2.2 through research discussion aimed at measurement, analysis, theory, and modelling of cells and modules. Contributions are

solicited in the areas of novel and established characterization methods, device analysis that yield insights into internal operation, 1D, 2D and 3D modelling of current devices and studies that guide progress, characterization of defects, degradation mechanisms and reliability, and novel related topics not listed.

Sub-Area 2.4: Chalcogenides for Tomorrow and Beyond – Tandems, Recyclability, and Futuristic Innovations

Sub-Area Chair: TBD

This Sub-Area is aimed at providing a rich launchpad for discussion on next generation chalcogenide-based photovoltaics. This area solicits contributions for research that bring existing or projected technologies together for chalcogenide tandem device applications, modules as well as material recyclability and other innovations beyond the traditional device architectures as well as materials. Abstracts concerning hybrid tandem/multijunctions of chalcogenides with other active photovoltaic materials should be submitted to Area 1.4. The scope of this topic area is significantly wider and includes new topics not covered by other traditional topic areas.

Area 3: III-V, Space, and Concentrator Photovoltaics

Area Chair: Stephen Polly, Rochester Institute of Technology, USA
Co-Chairs: Mitsuru Imaizumi, JAXA, Japan
TBD

Sub-Area 3.1: III-V Photovoltaic Cells
Sub-Area 3.2: III-V Cost Reduction Strategies & Terrestrial Applications
Sub-Area 3.3: Space Photovoltaic Modules, Systems, and Flight Experience
Sub-Area 3.4: Alternatives to III-V for Space Applications
Sub-Area 3.5: Photonic Power Converters

Area Description

III-V solar cells offer unparalleled photovoltaic conversion efficiency, an expansive palette of material properties, high absorption coefficients, resilience in extreme environments, as well as compatibility with a wide-range of growth and fabrication strategies. These attributes make III-V's well-suited for a multitude of both terrestrial and space power applications, including concentrator photovoltaics (CPV), along with a range of emerging technologies, such as autonomous vehicle power, commercial solar electric vehicles, laser power beaming receivers, dismounted soldier power, consumer electronics, and biomedical energy harvesters. Area 3 addresses all aspects of III-V photovoltaic device design, development, and systems, as well as all aspects of materials—including emerging material system alternatives to III-V's—devices, and systems for space power. Papers are encouraged on any of these subjects: methods to improve size, weight, power, and cost (SWaP-C) for any applications—land, sea, air, and space—as well as investigations of III-V system-level demonstrations.

Sub-Area 3.1: III-V Photovoltaic Cells

Sub-Area Chair(s): Phoebe Pearce, University of New South Wales (Tentative), Australia
This Sub-Area seeks to address all development up to the device-level for III-V photovoltaics, with the exception of low-cost strategies (see Area 3.2) and hybrid tandem/multijunctions of III-Vs with other active photovoltaic materials (see Area 1.4). Abstracts of interest include but are not limited to: epitaxial growth, materials design and development, device-level theoretical modeling, novel processing strategies, unique photovoltaic architectures, single and multijunction devices, device-level photon management, ultra-thin photovoltaics, III-V wafer bonding (excluding bonding with non-III-V active devices, see Area 1.4), materials/device-level characterization, III-V device reliability, and environmental effects testing at the materials-to-device level.

Sub-Area 3.2: III-V Cost Reduction Strategies & Terrestrial Applications

Sub-Area Chair(s): Jacob Boyer, National Renewable Energy Laboratory, USA
Topics of interest in this Sub-Area concern all aspects of cost reduction strategies for III-V photovoltaics at the materials, device, or module level. This includes (but is not limited to) direct monolithic growth of III-Vs on low-cost templates, so long as the template is not an active photovoltaic subcell (in which case, instead see Area 1.4); substrate re-use as well as other substrate cost mitigation strategies; high-throughput epitaxial growth; increased growth precursor utilization efficiency; low-cost device fabrication strategies; low-cost array- and module-level assembly; and automation of manufacturing steps. In addition, this Sub-area includes all module- and systems-level III-V photovoltaics for terrestrial applications. This includes conventional CPV and

(terrestrial) micro-CPV, but more broadly includes all terrestrial applications and systems that involve III-V photovoltaics. These emerging opportunities include, but are not limited to, photovoltaics for transportation applications; underwater photovoltaics; unmanned aerial vehicles.

Sub-Area 3.3 Space Photovoltaic Modules, Systems, and Flight Experience
Sub-Area Chair(s): Don Walker, Aerospace Corporation, USA
Sub-Area 3.3 includes all module- and systems-level III-V photovoltaic development for space applications, as well as on-orbit reliability and performance (for non-III-V materials, see Area 3.4). At the panel and array level, this includes the integration of space solar cells onto backplanes of interest—rigid or flexible blankets—as well as technologies required for electrostatic discharge control, stabilization against damage (e.g., UV, particles), and interactions with electric propulsion subsystems. Papers dealing with all aspects of micro-CPV module development for the space environment are encouraged. In addition, papers dealing with all aspects of flight experience and reliability are of high interest. This Sub-Area also seeks strategies to improve AM0 calibration of solar cells and panels. Space photovoltaic submissions—at all levels of development—related to alternative material systems to III-V's, including perovskites, should instead submit to Area 3.4.

Sub-Area 3.4: Alternatives to III-V for Space Applications
Sub-Area Chair: Stephanie Essig, University of Stuttgart, Germany
This Sub-Area solicits papers regarding all aspects of photovoltaic materials, structures, devices, or systems based on alternatives to III-Vs (e.g. perovskites, chalcogenides, etc.) for the space environment. This may include (but is not limited to) novel AM0 cell and module designs, materials design of interlayers and interfaces for enhanced stability, environmental effects, reliability, testing standards, and performance reports.

Sub-Area 3.5: Photonic Power Converters
Sub-Area Chair: Margaret Stevens, Naval Research Laboratory, USA
Sub-Area 3.5 seeks abstracts concerning all aspects of photonic energy conversion involving primary light sources other than the Sun. Topics include single and multijunction laser power converters including module- and system-level laser power beaming, ambient light harvesting, implantable and biomedical systems and applications, all aspects of thermophotovoltaics (TPV), and other operational energy demonstrations.

Area 4: Silicon Photovoltaic Materials and Devices

Area Chair: Ammar Nayfeh Khalifa University, Abu Dhabi United Arab Emirates
Co-Chairs: Kaining Ding, Forschungs Zentrum Jülich, Germany
André Augusto, Arizona State University, USA
Ziv Hameiri, University of New South Wales, Australia

Sub-Area 4.1: Silicon Feedstock & Wafering, Thin Silicon & Advanced Light Management
Sub-Area 4.2: Passivated, Carrier-Selective, and Heterojunction Contacts
Sub-Area 4.3: Emerging (2D) Materials Integration to Silicon PV
Sub-Area 4.4: Metallization, Interconnection, Module Integration, and Recycling/Sustainability and Novel PV Integrations
Sub-Area 4.5: Device Physics, Modelling, New/Enhanced Characterization Techniques

Area Description

Silicon has been the dominant photovoltaic technology for decades with market share exceeding 90% while technologically continuing to develop and scientifically entering the realm of innovative integrations. Commercial cell efficiencies exceeding 22%-23% are becoming routine as manufacturers transition to PERC structures and high-quality monocrystalline wafers. Module costs have fallen below $0.3/W and are now commonly a small fraction of an installed system's cost, and the emergence of, for example, bifacial and shingled cells has broadened the module flavors now available, while the advent of vehicle integrated photovoltaics is expected to bring unforeseen innovation, and the dawn of silicon based tandems and multi-junctions are anticipated to yield an era of 30% plus efficiencies as the new norm.

In this environment of rapid innovation, Area 4 invites contributions that define and shape the future of silicon photovoltaic science and technology in all its stand-alone and integrated permutations and combinations. Topics of interest span the breadth of the silicon solar photovoltaic field, ranging from silicon purity to thin-film deposition, from electronic transport through new contact structures to high-efficiency devices, from light management to loss analysis, and from interconnection to module field degradation caused by cell deterioration. In addition, new to area 4, we invite abstracts on topics related to emerging 2D materials integrated with Si for solar cells applications.

We also invite abstracts from industry addressing translation from lab to fab, challenges associated with manufacturing processes, recycling and sustainability, market trends and emergence of novel PV integrations, industry roadmaps, and challenges and opportunities the industry faces given the ever increasing focus on renewable energy.

Sub-Area 4.1: Silicon Feedstock & Wafering; Thin Silicon & Advanced Light Management

Sub-Area Chair: Dr Yan Zhu University of New South Wales, Australia, Dr. Valérie Depauw, imec, Belgium

This Sub-Area focuses on silicon and thin silicon with obvious overlaps. Silicon customarily includes silicon feedstock purification and production through crystallization and wafering, including high-performance multicrystalline and quasi momo silicon wafers, improved Czochralski growth, novel silicon growth techniques, and kerf-less technologies such as direct wafer or epitaxial wafer. Thin silicon—including those of amorphous silicon, microcrystalline silicon, epitaxial silicon, related alloys and thin flexible silicon wafers—pertain to thin silicon materials properties, deposition/growth methods including top-down and bottom-up approaches, flexible silicon handling, cell design and performance, and degradation. In particular for thin film silicon, advanced light management is essential. This encompasses surface engineering of silicon to increase photon absorption by classical, diffractive, Mie scattering, photonic techniques and plasmonic mechanisms, as well as approaches to reduce front-surface reflectance, reduce parasitic absorption, and reject sub-bandgap infrared light. Additionally, relevant areas include mechanical and electrical characteristics of the resulting wafers/foils and their impact on device performance; material changes during subsequent processing and defect engineering steps; and application opportunities and challenges ushered by the flexible form factor of thin silicon.

Sub-Area 4.2: Passivated, Carrier-Selective, and Heterojunction Contacts
Sub-Area Chairs: Dr Franz-Josef Haug, EPFL Switzerland and Dr Di Yan, University of Melbourne
This Sub-Area focuses on contacting methods simultaneously passivate the surface of crystalline silicon (maintain high quasi-Fermi-level splitting and thus high implied open-circuit voltage) and selectively extract charge carriers of one type (minimize the drop of the majority QFL across the contact). This also includes contacting strategies for patterned/textured surfaces and partial coverage such as the areas below the fingers of the metallization. We invite abstracts addressing fabrication, characterization and the underlying device physics of these contacts. The sub-area will also give a forum to discuss properties of alternative materials for passivating contacts and the performance of cells with contact layers such as amorphous silicon, tunnel oxides and polysilicon, and metal oxides.

Sub-Area 4.3: Emerging (2D) Materials Integration to Silicon PV
Sub-Area Chairs: Dr Aaesha Alnuaimi, DEWA United Arab Emirates and Dr Ammar Nayfeh Khalifa University
This sub area focuses on emerging 2D materials integration to Si PV. This can include graphene, hexagonal boron nitride, Transition Metal Dichalcogenides (TMDCs) such as MoS_2, WS_2, $MoSe_2$ and various Xenes. The focus is heterojunction solar cells fabrication on Si with emphasis on thinner, lightweight, and flexible solar cells. In addition, new methods for exfoliation, deposition, and optical characterization. Abstracts focusing on other novel ways to integrate 2D materials with silicon PV are welcome. In addition, simulation and modeling studies of 2D/silicon based solar cells are welcome. Abstracts concerning hybrid tandem/multijunctions of silicon with other active photovoltaic materials (beyond 2D materials) should be submitted to Area 1.4

Sub-Area 4.4: Metallization, Interconnection, Module Integration, and Recycling/Sustainability and Novel PV Integrations
Sub-Area Chair: Dr Antonin Faes, EPFL/CSEM Switzerland
This Sub-Area covers techniques for electrode formation, including printed metallization, plating, evaporation, dispensing or other transfer techniques, conductive adhesives, soldering, laser and thermal alloying of metals, transparent electrodes, selective doping, and contact opening for metallization. Electrodes also comprise the interface to subsequent module integration, and thus the Sub-Area also welcomes abstracts on mechanical adhesion, multi-wire technologies, and the interconnection of advanced cell structures like back-contact cells and silicon-based tandems. Abstracts area also welcome on sustainability, recycling and life-cycle assessment (LCA) topics for silicon solar cells and modules; novel module constructs for various applications (like agri-PV, floating-PV and others) and innovative PV integrations in buildings, vehicles or infrastructure.

Sub-Area 4.5: Device Physics, Modelling, New/Enhanced Characterization Techniques

Sub-Area Chair: Sabina Abdul Hadi, University of Dubai, United Arab Emirates, Dr Yan Zhu University of New South Wales, Australia

This Sub-Area focuses on understanding, quantifying, and modelling phenomena in silicon solar based cells, including new interpretations of device physics, multi-dimensional models, numerical analysis of novel cell concepts, power loss analysis and mitigation strategies, computational simulations, and associated means of validation. Abstracts are also welcome on the development of new device characterization techniques, which may be based on, e.g., photoluminescence, impedance, or capacitance measurements etc.

Area 5: Characterization Methods

Area-Chair: Jessica Yajie Jiang, University New South Wales, Australia
Co-Chairs: Behrang Hamadani, NIST, USA
Chris Fell, CSIRO, Australia
Jae Yun, University of Surrey, UK

Sub-Area 5.1: New Instruments, Methods and Data Analysis
Sub-Area 5.2: Advances in Optoelectronic Characterization Techniques
Sub-Area 5.3: Advanced Characterization of Photovoltaic Materials and Devices
Sub-Area 5.4: Photovoltaic modules and systems characterization, testing and standards

Area Description

The photovoltaic (PV) industry has grown exponentially in recent years. A sustainable development and expansion of the solar market, depends on both the development of new PV-relevant technologies and a better understanding of PV components and their properties from the materials level to the system level. In return, these rely on advanced characterization techniques that are necessary to ensure the bankability and reliability of PV modules and systems.

Sub-Area 5.1: New Instruments, Methods and Data Analysis

Sub-Area Chair: Dr Kwan Bum Choi, SERIS, Singapore
This sub-area focuses on the latest development of characterization tools, measurement techniques and analysis methods for photovoltaic applications. Papers should present technical novelty, describe the work done on the development of the tool or method, demonstrate its capabilities and limitations, and compare it to existing tools and methods in terms of the limitations. Papers should not advertise a commercially available equipment, but could refer to it.

Sub-Area 5.2: Advances in Optoelectronic Characterization Techniques

Sub-Area Chair: Behrang Hamadani, NIST, USA
This Sub-Area aims to focus on measurement techniques that should elucidate the optoelectronic properties of PV materials and devices (PV cells and modules). Topics of interest may include methods based on interferometry, spectroscopy, microscopy, imaging, luminescence, absorption, etc. For this Sub-Area, papers focusing on the technique rather than the material aspects are preferred.

Sub-Area 5.3: Advanced Characterization of Photovoltaic Materials and Devices

Sub-Area Chair: Gee Yeong Kim, Korea Institute of Science and Technology (KIST), Korea
This Sub-Area is on novel methods to study photovoltaic materials, their structure, properties, and how these relate to processing and performance, with a focus on both materials and devices (PV cells). For materials, examples of topics that would fit into this area include novel scanning probe techniques, such as variants of atomic force microscopy, scanning microwave microscopy, Kelvin probes, and advanced X-ray/synchrotron or photoemission methods, among others. For devices, papers should address the challenge of characterizing devices broadly. Examples include but are not limited to capacitance methods, study of device transients, methods to understand instability in device performance, degradation of device performance, ageing etc. Development of operando measurements are also welcome in this Sub-Area. Papers focusing on the characterizations of emerging PV materials and devices (single or multiple junction) are welcome in this Sub-Area.

Any paper related to optoelectronic characterizations should be submitted to Sub-area 5.2.

Sub-Area 5.4: Photovoltaic modules and systems characterization, testing and standards

Sub-Area Chair: Dr Christopher Fell, CSIRO, Australia

Papers focusing on characterization of complete modules and systems where the nature of the device is dominated by the ensemble of microscopic behaviors distributed throughout a large area rather than the understanding of individual microscopic behaviors should be submitted in this Sub-Area. For example, papers in this Sub-Area could focus on methods such as LBIC, photoluminescence or electroluminescence specifically as applied to understanding module performance rather than the same methods applied to small areas of device. Machine learning methods corelating those microscopic behaviors in materials and devices to PV module performance are also welcomed. Other examples of papers relevant to this area include adaptation of existing methods to characterize modules from emerging technologies such as perovskites. In addition, this Sub-Area is also intended for submissions related to standardization approaches to characterization. For example, standards for irradiance measurement, calibration methods for simulators, testing temperatures, and other fundamental parameters of characterization that also might potentially be incorporated into future standards can be submitted here.

Area 6: Perovskite and Organic Materials and Solar Cells

Area-Chair: Lyndsey McMillon-Brown, NASA Glenn Research Center, USA
Co-Chairs: Laura Schelhas, NREL, USA
Adrienne D. Stiff-Roberts, Duke University, USA

Sub-Area 6.1: Single Junction and Tandem Halide Perovskite Solar Cells
Sub-Area 6.2: Scale-Up, Scalable Processing, and Stability of Halide Perovskite Solar Cells and Modules
Sub-Area 6.3: Advances in Halide Perovskite Materials
Sub-Area 6.4: Alternative Halide Perovskite Materials, Organic, and Dye-Sensitized Solar Cells

Area Description

Halide perovskite materials are rising stars for solar cell and optoelectronic applications. Based on abundant materials and scalable coating technologies, these emerging PV technologies show potential for low-cost, lightweight, and flexible solar power generation. Perovskite solar cells have certified power conversion efficiency of 25.7% in single junction devices and 31.3% as tandem solar cells with silicon. Performance continues to improve as new device architectures arise and materials are improved, but these promising materials still must demonstrate viability in the market by combining performance, stability, and low toxicity at scale and in real world conditions. The current certified power conversion efficiency is 17.9% at the 'small module' size (800 – 6,500 cm^2). Beyond halide perovskites, continued promise exists in organic photovoltaics and quantum dot solar cells, which have both surpassed certified efficiencies of 18%, and dye-sensitized solar cells. Together, these alternative materials and device designs unlock new opportunities for the photovoltaics of the future.

Area 6 is an ideal forum for researchers in the field to present progress in halide perovskite and organic materials for photovoltaics. This Area highlights the rapid progress of these technologies and provides a platform to promote widespread commercialization. Topics range from device architectures, fabrication methods, outdoor performance, and reliability, to novel applications, fundamental materials insights, and the development of alternative materials. The rapid development of organic and halide perovskite materials and devices marks a strong foundation for this Area, and the Area facilitates a comprehensive discussion on the broad scope of these exciting solar cells.

Sub-Area 6.1: Single Junction and Tandem Halide Perovskite Solar Cells

Sub-Area Chair: TBD

Sub-Area 6.1 covers progress on the development of higher efficiency perovskite solar cells. Unlocking power conversion efficiencies beyond the detailed balance limit for single junction solar cells requires high efficiency single junction halide perovskite photovoltaics as well as tandem and multijunction architectures. The focus of this Sub-Area is on concepts relating to material design, solar cell fabrication, and module implementation that enable high efficiency. Contributions are welcome which feature experimental and theoretical work on proof-of-concepts, materials design for multijunction devices, device design and implementation, and the interplay between the various absorber films and interlayers in the cell layout. This may include (but is not limited to) novel AM0 perovskite cell and module designs, materials design of interlayers and interfaces for enhanced stability, environmental effects, reliability, testing standards, and performance reports. Abstracts concerning hybrid tandem/multijunctions of perovskites with other active photovoltaic materials should be submitted to Area 1.4

Sub-Area 6.2: Scale-Up, Scalable Processing, and Stability of Halide Perovskite Solar Cells and Modules

Sub-Area Chair: TBD

With the growing push for utility scale implementation of perovskite solar cell modules, sub-Area 6.2 focuses on developments related to scale-up, large-area fabrication and processing, high-throughput, and environmentally friendly manufacturing methods for perovskite solar cells. This sub-Area also includes perovskite module design, module testing, fabrication techniques, degradation mechanisms, efficiency loss, long-term durability testing, process chain evaluation, and life cycle assessment.

Sub-Area 6.3: Advances in Halide Perovskite Materials

Sub-Area Chair: TBD

Sub-Area 6.3 covers the latest developments in organic-inorganic hybrid and fully inorganic halide perovskite-based solar cells. The optoelectronic properties of the materials are highly tunable, making them attractive for a range of applications including building-integrated PV and tandem solar cells. This sub-Area focuses especially on the tunability offered by substitution of elemental and molecular components in the perovskite structure, which may enable better performance, new device architectures, design of interfaces in the layer stack, advances in fabrication routes, and novel processing steps. We invite contributions from the broad range of topics relating to halide perovskite-based PV.

Sub-Area 6.4: Alternative Halide Perovskite Materials, Organic, and Dye-Sensitized Solar Cells

Sub-Area Chair: TBD

Challenges faced by typical halide perovskite materials, combined with the performance of the class of materials, has led to a range of studies focused on related alternative materials. In Sub-Area 6.4 contributions are welcome on the development of lead-free perovskite solar cells, low-dimensional absorbers such as Ruddlesden-Popper and Dion-Jacobson phases, and other halide perovskite-inspired materials. Featured studies could include either theoretical or experimental work focused on this diverse group of absorber materials.

Additionally, this Sub-Area covers progress on the development of pure organic solar cells and dye-sensitized solar cells, including material optimization, the use of fullerene and non-fullerene based molecules, new charge transport materials and device designs. A broad range of submissions are welcome including first principles design and synthesis of new donor and acceptor materials, methods of controlling and characterizing microstructure in thin films, device optimization, stability, and scalability.

Area 7: PV Modules, Manufacturing, Systems and Applications

Area Chair: Natasha Hjerrild, GAF Energy, USA
Co-Chairs: Mengjie Li, University of Central Florida, USA
Nicholas Rolston, Arizona State University, USA

Sub-Area 7.1: Module Materials, Design, and Manufacturing
Sub-Area 7.2: System Design, Optimization and Performance
Sub-Area 7.3: Modelling and Predicting Energy Yield
Sub-Area 7.4: Strategies for Performance Monitoring and Rating
Sub-Area 7.5: Novel Applications and Integration of PV

Area Description

The PV module is the mechanical support and electrical connection of the cells. It offers both electrical protection and protection from the environment. It is the primary product around which a PV system is based, and it can be modified and optimized for locations, environments, and applications. As such, the PV module represents the cornerstone product of the PV industry. Recently, innovations in module construction have been largely responsible for significant increases in efficiency, annual yield, and the corresponding decreases in the levelized cost of energy (LCOE) for photovoltaic electricity generation. New materials, assembly technologies, module designs, and modes of PV integration are being developed to further reduce costs, increase performance, and accelerate deployment of PV. For example, in recent years, bifacial modules have become a widely accepted module design which reduces cost via increased energy yield. Additionally, customers and operators are seeking and utilizing energy yield prediction methods to reduce investment risk. Improved energy yield estimates will reduce some of the soft costs in financing, further reducing the LCOE. Furthermore, as manufacturing processes are streamlined and bottlenecks are shifted to deployment, there is demand for new, creative solutions for deploying PV modules (floating solar, agrivoltaics, Building-Integrated PV, Building-Applied PV, etc.) Area 7 is seeking papers describing significant advances in module technology, PV module design and manufacturing, methods for forecasting and modelling energy yield and performance, innovative PV deployment and new applications, as well as testing and system monitoring. Papers reporting completed work, accompanied by validation from the field, laboratory testing, or comprehensive modelling are encouraged and welcome.

Sub-Area 7.1: Module Materials, Design, and Manufacturing

Sub-Area Chair: Pravettoni Mauro, National University of Singapore, Singapore
In Sub-Area 7.1, abstracts are invited that describe new materials and methods for module production with particular interest on: new materials for backsheets, encapsulants, glass, or interconnects; new techniques for module assembly to reduce cost, increase efficiency or enhance reliability; new designs for bifacial applications; module adjustments and optimization for extreme environments; and novel module electrical configurations. In coordination with Area 8, we particularly welcome submissions describing state-of-art or new methods to improve module manufacturing quality, including quality assurance of module materials and subcomponents; statistical analysis tools for process control; automation of module assembly; and artificial intelligence methods for process monitoring and improvement.

Sub-Area 7.2: System Design, Optimization, and Performance
Sub-Area Chair: Mathilde Fievez, Stanford University, USA
In Sub-Area 7.2, abstracts are invited that describe new concepts for complete photovoltaic systems, methods of system optimization, field results, full life-cycle analysis of system components and system performance analysis. System optimization could be for energy yield, LCOE, self-consumption, LCA and end of life considerations or other aspects important for a specific application or environment. In particular, we welcome submissions describing system design and optimizations for bifacial modules, trackers in PV systems, floating PV, agrivoltaics, grid- connected or off-grid systems, and performance comparisons with the system performance models. Note that the papers related to forecasting and solar resource should be submitted under Area 10 and power electronics methods for optimization in Sub-Area 8.4 or Area 9.

Sub-Area 7.3: Modelling and Predicting Energy Yield
Sub-Area Chair: Liu Zhe, Northwestern Polytechnical University, China
Sub-Area 7.3 focuses on PV methods of module modelling and the prediction of produced energy. Abstracts relating to mechanical, thermal, and electrical modelling of PV modules and systems including methods for determining parameters for these models are also welcome. Abstracts of particular interest are those describing methods for determining model parameters from laboratory and/or outdoor characterization for different wafer sizes, cell interconnection, cell architectures, module designs, and installation types; models for the effect of solar spectrum on module output; and methods for estimating system losses, e.g., shading losses, or temperature variations, BOS related losses, etc. We also welcome the energy yield analysis for novel PV concepts, such as, tandem PV modules.

Sub-Area 7.4: Strategies for Performance Monitoring and Rating
Sub-Area Chair: Mengjie Li, University of Central Florida, USA
Sub-Area 7.4 welcomes abstracts reporting novel methods and technologies for system or individual module monitoring during operation, improved techniques for system performance testing, and research describing novel analysis strategies to extract the information on system or module health and performance from available monitored data. We welcome abstracts describing advances in or evaluations of methods for determination of plant performance metrics; procedures for conducting commissioning and acceptance tests. We particularly invite abstracts reporting efforts to compare and/or harmonize among the various standards for system testing and rating.

Sub-Area 7.5: Novel Applications and Integration of PV
Sub-Area Chair: Natasha Hjerrild, GAF Energy, USA
Sub-Area 7.5 welcomes abstracts describing recent advances in building integrated or applied PV systems (BIPV or BAPV), off-grid PV systems, hybrid systems, mini/micro-grids, DC end-use systems, mobility and transportation systems, infrastructure-integrated PV, agrivoltaics, floating solar, “wearable” PV, and other not-traditional PV applications. In particular, we welcome abstracts reporting new innovations, visions for future development, and advanced analyses of the cost reduction potential for building related PV applications, advances in building design tools with integrated PV modelling functionality, as well as reports of building power system performance. We are particularly interested in topics covering design and engineering advances, novel requirements, dual-use studies, and results from system simulations and field demonstration. In addition, we would like to emphasize papers that have a goal of leveraging the distributed nature of solar PV to enhance social equity.

Area 8: Module and System Reliability

Area Chair: Gernot Oreski, Polymer Competence Center Leoben, Austria
Co-Chairs: Max Köntopp, Hanwha Q CELLS, Germany
Laura Bruckman, Case Western Reserve University, USA

Sub-Area 8.1: PV Materials, Module and System Components Durability and Accelerated Testing Methods
Sub-Area 8.2: Field Experiences in PV Systems
Sub-Area 8.3: Performance, Reliability and Yield of Emerging Technologies (Tandem cells, Perovskites, OPV)
Sub-Area 8.4: Effects and Mitigation of Soiling on PV Systems

Area Description

Long-term durability and reliability of PV systems is critical for reliable, efficient, and sustainable energy production as the share of renewables – especially PV - increases in our energy mix. Moreover, systems delivering the expected return on investment for all players along the value chain provide the industrial driver for continued growth. PV system lifetimes are extending to 30-40 years and are often deployed in harsh weather conditions. The industry is both risk averse, requiring all new technologies (from cell through system elements) to prove their robustness in extensive testing before field deployment, and rapidly adopting new technologies faster than they can be field tested.

Within this context, Area 8 takes a holistic approach considering the reliability and resiliency of all types of PV systems, their components, and technologies as well as impact of materials, processing, installation, and operations throughout the value chain. Inverter and BOS failures are frequently reported in the field and are of special interest in this Area. Taking the growing market of storage systems into account, Area 8 is now also encouraging papers on the reliability solar + energy storage systems and related components.

Sub-Area 8.1: PV Materials, Module and System Components Durability and Accelerated Testing Methods

Sub-Area Chair: Stephanie Moffit, National Institute of Standards and Technology, USA
PV modules and system components are exposed to a wide range of stresses, such as high temperatures, temperature fluctuations, humidity, ultraviolet light, electrical or mechanical stresses and media loads. These can result in a variety of failure mechanisms such as glass corrosion, discoloration, backsheet cracking, bubbling and delamination, interconnect fatigue and corrosion, frame corrosion and fatigue, bypass diode failure, junction box failure, cable and connector failure, and failed inverter electronics. Additionally, the number of electrical storage systems connected to PV systems is increasing and the reliability of these systems becomes relevant.

Submissions are encouraged on experimental studies of the chemistry and physics of these or other failure mechanisms of PV materials, modules, or other system components, accelerated stress tests and method to extract acceleration factors, modelling of degradation and failure rates, and interfacial and multi-scale module simulations. Reports linking failure modes to material, module manufacturing, process parameters, and insights in critical controls are invited. Studies of degradation rates in recently developed high performance modules using high efficiency mono, bifacial and/or tandem cells (PERx, n-type, HIT, IBC, large wafers/cells), high density module designs (shingling, tiling, cut cells, close spacing, bifacial, large modules), and next generation module materials (AR-coatings, backsheets, encapsulants) are of interest, as are studies demonstrating field-relevant accelerated testing. Papers regarding detailed Failure Mode and Effect Analysis (FMEA) to assess the potential failure modes and development of adapted tests are also of interest as well as studies presenting reliability of modules and materials for novel applications and conditions (lightweight, floating, tracked), and integrated PV solutions (BIPV, VIPV, IIPV).

Sub-Area 8.2: Field Experiences in PV Systems
Sub-Area Chair: Max Köntopp, Hanwha Q CELLS, Germany
This Sub-Area focuses on statistics of types of failures, data analysis techniques for field data for large-scale and small-scale systems, analysis of mechanisms of observed degradation and failures, electrical and mechanical impacts of failures, safety and operational failures from large PV systems, expected vs. actual field performance, and long-term operation models of PV plants.

Submissions may include, but are not limited to, analysis of field observations from deployments of all PV technologies, methods of analysis of such data, experimental approach and energy yield predictions, best practices and technical/economic insights into operations and maintenance, and models or reviews. This Sub-Area also calls for papers presenting novel techniques, progress on deploying, as well as improved analysis and best practice, and acquisition and interpretation of inspection data/measurements from existing and emerging field characterization techniques. Papers studying innovations in the fields of inspection data analytics and diagnostic algorithms, remote failure detection and wide-area inspections for PV systems are also of interest. Also encouraged are papers studying PV system-level availability, in diverse climatic and site conditions, reliability related to extreme environmental events, mounting methods, and interactive effects. Innovations in the field of system data analytics and remote failure detection are also of interest. This area encourages submissions of field experiences with inverter or BOS failure, repowering, field repair, energy storage, varying DC/AC ratios, and bifacial field performance.

Sub Area 8.3: Performance, Reliability and Yield of Emerging Technologies (Tandem cells, Perovskites, OPV)
Sub-Area Chair: Ina Martin, Case Western Reserve University, USA
Reaching a high level of reliability and durability is key to deployment of perovskite, organic solar cells, and tandem cells at scale. Hence, this sub-Area is dedicated to the progress of stability in the context of individual devices and device components, as well as the wide range of efforts to determine reliability and yield in real-world settings. Discussed topics thus include intrinsic and extrinsic degradation mechanisms, efficiency loss issues in perovskite and organic photovoltaic modules, long-term durability testing, field performance, performance ratios, and novel applications, as well as deployment related issues that are not listed.

Sub-Area 8.4: Effects and Mitigation of Soiling on PV Systems
Sub-Area Chair: Leonardo Micheli, Sapienza University of Rome, Italy
Soiling can be a major factor affecting both the performance and profitability of PV. This Sub-Area focuses on studies related to various aspects of soiling: monitoring, estimation and both ground- and satellite-based forecasting of soiling losses and rates, cleaning solutions and cleaning frequency optimization, materials, and tests for anti-soiling coatings, both artificial soiling to test functionality and abrasion testing to test for durability. The Sub-Area welcomes as well technical

and/or economic studies on both corrective and preventive soiling mitigation measures, such as cleaning and anti-soiling retrofit solutions, as well as case studies presenting their implementation in operating PV plants. Also, methods to map the soiling losses for different climate conditions and site characteristics are of interest in this Sub-Area, along with studies on the fundamental physics of soiling deposition and removal mechanisms and their modelling.

Area 9: Power Electronics and Grid Integration

Area Chair: Dr. Aleksandra Lekić, Delft University of Technology, Netherlands
Co-Chairs: Dr. Haoran Zhao, Shandong University, China
Dr. Adriana Luna Hernandez, University of Puerto Rico-Mayaguez, USA

Sub-Area 9.1: Power Converter Design, Modelling, and Control
Sub-Area 9.2: Ancillary Services and Grid Support Functionalities
Sub-Area 9.3: Microgrids and Distribution System Operation and Control
Sub-Area 9.4: Reliability of Power Electronics and PV Effects on Grid Reliability

Area Description

As PV installations become more widespread, the demands on the power electronic converters designed to interface solar panels to the grid will continue to increase. Likewise, the rapid integration of massive levels of distributed PV penetrations motivates new challenges to managing grid operations. At the component level, advanced inverter functionality and energy storage will enhance grid stability to manage fast-changing phenomena by using rapid response to control and stabilize the grid. Furthermore, advanced topologies and controls will continue to improve power converter performance and reduce system costs. At the system level, the optimization and management of distributed PVs and other grid resources will continue to support the integration of large penetrations of renewables and enable more advanced grid services and support functionalities. The increasingly active nature of the power distribution systems will motivate new methods for microgrids and distribution grid operations requiring proactive management of the variable generation resources. The power electronics and power systems community are encouraged to submit contributions addressing the full range of scientific and technical contributions to the field of PV integration into the grid.

Sub-Area 9.1: Power Converter Design, Modelling, and Control

Sub-Area Chair: Dr. Bogdan Brković, University of Belgrade, Serbia

New converter designs for DC-DC and inverter applications for PV energy conversion promise higher efficiency, improved power density, increased switching frequencies, and higher voltage operational range. Emphasis is placed on novel circuit designs, magnetics, wide-bandgap semiconductor materials, and other innovations in component-level converter design. In addition, advanced power electronics control at the individual converter level, multi-converter-based microgrids, and large PV power plants are crucial to accommodate fast dynamics, nonlinearities, and complex system interactions. This Sub-Area invites contributions to any facet of design, modelling and control of power electronics for PV converters, microgrids, and power systems. Results that include circuit analysis, experimental validation, and field testing will be featured.

Sub-Area 9.2: Ancillary Services and Grid Support Functionalities

Sub-Area Chair: Dr. Kyriaki Nefeli Malamaki, Aristotle University of Thessaloniki, Greece

Wide integration of distributed PV generation and fast-acting inertia-less power converters introduce unprecedented variability and unpredictability on the system operators at both distribution and transmission system level. The PV power converter can have advanced control functionalities. However, these capabilities currently remain untapped since the PV system main function is to deliver the maximum power to the grid. In order to increase the PV integration and achieve 100% renewable energy penetration in electric power systems, a new control philosophy needs to be adopted for the PV converter control so that they mimic the behavior of conventional Synchronous Generators and provide Ancillary Services to support the grid. Such new Ancillary Services are: synthetic (virtual) inertia, voltage and frequency regulation, reactive power provision, provision of fault-current to maintain power system protection, ramp-rate limitation or power smoothing to prevent frequency events, harmonic mitigation and operation of PV converters as active power filters to improve power quality. In this manner, new paradigms need to be set and cost/benefits of such systems need to be identified, so that these ancillary services become tradable quantities into future electricity markets. This Sub-Area seeks papers that address the above-mentioned ancillary services that can be provided by the PV converters to support the grid and achieve higher PV penetration levels in the future electric power systems.

Sub-Area 9.3: Microgrids and Distribution System Operation and Control
Sub-Area Chair: Dr. Juan M. Rey, Universidad Industrial de Santander, Colombia
Microgrids offer an effective way of combining and controlling renewable energy sources, such as solar PVs, allowing operation in both islanded and grid-connected modes. However, the wide integration of distributed PV generation and fast-acting power converters introduces variability and unpredictability to the operation of the distribution systems. Because of this, adequate control techniques are required to extract the full advantages of integrating PV generators into these systems. This Sub-Area seeks papers that address problems arising from the integration of PV into microgrids and distribution systems, including voltage and frequency regulation, Volt-var optimization, power quality, stability, protection, PV sizing and placement, dispatching, and other pertinent issues.

Sub-Area 9.4: Reliability of Power Electronics and PV Effects on Grid Reliability
Sub-Area Chair: Dr. Özgür Can Sakinci, KU Leuven, Belgium
As the penetration level of PV systems in the power grid increases, correctly assessing the reliability of power converters and the effects of PV systems on the reliability of power grids for system-level analysis becomes crucial. At the equipment level, recent experiences show that converters are frequent failure sources in many applications such as wind and PV systems, as their reliability strongly depends on the operating and climate conditions. At the system level, given the increased share of PV systems, the availability of the PV system should be included in power system reliability models to obtain accurate results. This Sub-Area addresses reliability evaluation approaches and reliability metrics at the equipment level – dedicated to the PV power converters – and at the system level – devoted to the reliability of power systems including a significant amount of PV generation.

Area 10: Solar Resource Assessment for PV and Forecasting

Area Chair: Joshua S. Stein, Sandia National Laboratories, USA
Co-Chairs: Sophie Pelland, CanmetENERGY (Natural Resources Canada), Canada
Manajit Sengupta, National Renewable Energy Laboratory, USA

Sub-Area 10.1: Solar and Meteorological Measurement and Modeling
Sub-Area 10.2: Solar Resource and PV Power Forecasting

Area Description
Solar resource measurement, modeling and forecasting are essential for evaluating technical and financial performance in PV applications, and uncertainties related to the solar resource contribute directly to uncertainties in economic viability. This research area covers technologies and methods to quantify and model solar irradiance with a particular focus on applications in the PV sector.

Sub-Area 10.1: Solar and Meteorological Measurement and Modeling
Sub-Area Chair: TBD
Accurately measuring and modeling the available solar resource is essential for technical and economic planning of a PV system. This Sub-Area covers innovations in radiometer design, solar resource assessment methodologies, and variability and uncertainty quantifications. The chief objective is to reduce uncertainties in PV performance modeling and monitoring. Analyses of all relevant factors for PV modeling are included here, for example spectral irradiance, albedo, soiling, temperature, precipitation and snow, as well as their impacts on PV system performance.

Sub-Area 10.2: Solar Resource and PV Power Forecasting
Sub-Area Chair: TBD
As PV generation increases, the role of irradiance and power forecasting becomes ever more important to the successful integration of renewable energy on the grid. Highly accurate forecasting of the expected power output and its uncertainty is required for grid management and economic assessment. In this Sub-Area, all topics related to improvements in our ability to predict future PV power output and solar resource are invited.

Area 11: PV Deployment, Policy and Sustainability

Area Chair: Stephen Tay, National University of Singapore, Singapore
Co-Chairs: Arnulf Jaeger-Waldau, European Commission Joint Research Centre, Italy
Brittany Smith, National Renewable Energy Laboratory, USA

Sub-Area 11.1: Economics, Policy, and Energy Justice
Sub Area 11.2: Environmental Sustainability
Sub Area 11.3: User Behavior, Education in Institutes of Learning, and Workforce Development

Area Description

The PV Deployment, Policy and Sustainability area provides an opportunity to discuss aspects required to ensure the long-term success of the PV industry. This includes discussions on three themes focusing on 1) economics and policy, 2) environmental sustainability, and 3) social interventions. Recognizing the importance of student engagement for sustained growth in the industry, this area has a new topic for paper submissions focusing on outreach and education efforts in educational institutes due to the increased interest from past responses.

Sub-Area 11.1: Economics, Policy, and Energy Justice

Sub-Area Chair: TBD

This sub-area focuses on the economics and policy developments critical to expanding PV deployment and/or energy justice. Topics of interest include policy impacts, market drivers, and financial considerations that are paramount to overcoming barriers in PV deployment and providing equitable and affordable access to solar energy. Submissions discussing scenarios for an energy system with a very high share of photovoltaics are also welcomed. While we encourage researchers to present international efforts and discuss potential areas for expanded collaboration in this sub-area, unique case studies that would be of interest to conference participants are also welcomed.

Sub Area 11.2: Environmental Sustainability

Sub-Area Chair: TBD

This sub-area seeks submissions with a broad, systems-level perspective on the sustainability of PV throughout the life cycle. Topics of interest include discussions on current and future PV technologies through life-cycle assessment, material supply, manufacturing, and end-of-life management. Results from simulations, surveys, and focus group discussions on these topics are welcomed.

Sub Area 11.3: User Behavior, Education in Institutes of Learning, and Workforce Development

Sub-Area Chair: TBD

This sub-area focuses on increasing solar PV adoption through a two-pronged approach involving 1) user behavior, and 2) developing a skilled workforce for the solar PV industry through early engagement of students and workforce development. Topics of interest include studies on influencing user behavior, encouraging adoption, early engagement of students at all levels (e.g., high school and university), and workforce development. Innovative approaches to education, outreach, and workforce development are also invited. Abstracts with results are highly encouraged for submission.

Sub Area 11.4: Towards 100% Renewable Electricity

Sub-Area Chair: Ian Marius Peters, Forschungszentrum Jülich, Germany

PV installations are on the rise. The year 2022 saw us pass the 1TW mark. Regions across the world are experiencing the impact of significant penetration from PV and wind in their electrical networks and markets. In this Sub-Area, we want to address what technologies and concepts are most beneficial in addressing the challenges of the energy transition. In the upcoming conference we focus on all topics that show how a transition two 1TW photovoltaics will make the world a better place. We especially encourage contributions from students and aim to cover diverse regions and approaches.