**PV Reliability Workshop – Online**

February 22 – 26, 2021

Chair: Matthew Muller

Program Committee Members:

Kevin ANDERSON

Rob ANDREWS

Teresa BARNES

Evelyn BUTLER

Yuepeng DENG

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Ingrid REPINS

Tony SAMPLE

Tim SILVERMAN

Josh STEIN

Itai SUEZ

Allan WARD

Karl-Anders WEISS

John WOHLGEMUTH

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| **AGENDA –** Monday, 22 February 2021 |
| **8:00 AM** | **Conference begins online with live Q&A at the end of each oral session** |
| **8:00 - 9:15**  | **Oral Session 1: Reliability and Field Failures***Session Chairs:* **8:00** – All-India survey of photovoltaic reliability -- Narendra Shiradkar (IIT-Bombay)**8:15** – Reliability overview of aging EU PV assets – Mark Rossetto (Silfab Solar)**8:30** – 35 years of photovoltaics: analysis of the TISO 10 kW solar plant – Eleonora Annigoni**8:45** – Non-module failures: primary causes of energy loss or safety hazards– Dean Solon (Shoals)**9:00** – Live Q&A with all speakers |
| **9:15 - 10:15**  | Poster Session A: Live parallel links for small group discussions (Posters viewed ahead as desired)  |
| **10:15 - 11:50** | **Oral Session 2: Catastrophic Weather and Insurance***Session Chairs:* **10:15** – Field EL on hundreds of thousands of modules post storm and wildfire to support insurance – Andrew Sundling (PVEL)**10:30** – Probability loss models for hail and tornados – Peter Bostock (VDE)**10:45** – Mature risk strategies for a maturing industry: mitigating the adverse impact of cat risk underwriting to accelerate PV solar development – Michael Kolodner (Marsh Insurance)**11:00** – Re insurance perspective – speaker to be confirmed**11:15** – Resiliency and mitigating hail risk – speaker to be confirmed**11**:**30** – Live Q&A and extended panel discussion (Overcoming the barrier of extreme premiums or projects that become uneconomical due to catastrophic weather risk) |
| **11:55 - 12:00**  | Poster Session A awards (Xiaohong Gu) |

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| **AGENDA –** Tuesday, 23 February 2021 |
| **8:00 AM** | **Conference begins online with live Q&A at the end of each oral session** |
| **8:00 - 9:15**  | **Oral Session 3: Field Degradation***Session Chairs:* **8:00** – Degradation analysis of crystalline silicon photovoltaic modules exposed over 30 years in hot-humid climate in China -- Huili Han**8:15** – A practical summary of PV module field degradation and failure – Kristine Sinclair (DNVGL)**8:30** – Update on PV fleets, degradation and other performance trends – Chris Deline (NREL)**8:45** – Long term stability and field degradation data for PERC-type modules – Max Köentopp (Qcells)**9:00** – Live Q&A with all speakers |
| **9:15 - 10:15**  | Poster Session B: Live parallel links for small group discussions (Posters viewed ahead as desired)  |
| **10:15 - 11:30** | **Oral Session 4: Inverters and Power Electronics***Session Chairs:* **10:15** – General trends on lab testing across different inverters – Michael Mills-Price (PVEL)**10:30** – Progress toward predictive maintenance of solar plants – Dana Olson (DNVGL)**10:45** – Inverter field failures – Jacob Marshall (Power Electronics)**11:00** – 62093 BOS and inverter qualification test – Peter Hacke (NREL)**11:15** – Live Q&A |
| **11:30 - 11:35**  | Poster Session B awards (Xiaohong Gu) |
| **AGENDA –** Wednesday, 24 February 2021 |
| **8:00 AM** | **Conference begins online with live Q&A at the end of each oral session** |
| **8:00 - 9:15**  | **Oral Session 5: Emerging Technologies** *Session Chairs:* **8:00** – Trina Vertex modules, and large modules on trackers – Pierre Verlinden (Amrock)**8:15** – Overview of DuraMAT tool development – (DuraMAT)**8:30**  – Reliability PERC modules using Ga-doped *p*-type mono wafers – Hongbin Fang (Longi Solar)**8:45**  – Live Q&A with all speakers**9:00** – Panel Discussion: Perovskites on the horizon, stability protocols and reliability – Tim Silverman, Matt Norton (others to be confirmed) |
| **9:15 - 10:15**  | Poster Session C: Live parallel links for small group discussions (Posters viewed ahead as desired)  |
| **10:15 - 11:50** | **Oral Session 6: Systems Field Data and Modeling***Session Chairs:* **10:15** – Endemic underperformance of PV projects, better P50 and downside energy production modeling – Bodo Littmann (VDE)**10:30** – Fielded module forensics for cell cracking – DuraMAT**10:45** – Lessons learned: large scale PV plus battery storage -- (speaker needed)**11**:**00** – Bifacial HALT testing – Cherif Kedir (RETC)**11:15** – Short bifacial field update – Cherif Kedir (RETC)**11:20** – Short bifacial field update – Silvana Ayala (NREL)**11**:**25** – Short bifacial field update – Tristan Erion-Lorico (PVEL)**11**:**30** – Live Q&A with all speakers  |
| **11:55 - 12:00**  | Poster Session C awards (Xiaohong Gu) |
| **AGENDA –** Thursday, 25 February 2021 |
| **8:00 AM** | **Conference begins online with live Q&A at the end of each oral session** |
| **8:00 - 9:15**  | **Oral Session 7: Standards and Accelerated Testing***Session Chairs:* **8:00** – PVQAT update – Tadanori Tanahashi (AIST)**8:15** – Materials characterization, accelerated testing, and constitutive modeling of electrically-conductive adhesives – Martin Springer (NREL)**8:30** – IEC-63209-2 Durability characterization of polymeric component materials – Nancy Phillips (DuPont) **8:45** – Sequential multi-factor stress testing for backsheet durability evaluation – Mike Kempe (NREL)**9:00** – Live Q&A with all speakers |
| **9:15 - 10:15**  | Poster Session D: Live parallel links for small group discussions (Posters viewed ahead as desired)  |
| **10:15 - 11:30** | **Oral Session 8: Quality, Reliability and Failures***Session Chairs:* **10:15** – Drone thermography and practical field failures – Rob Andrews (Heliolytics)**10:30** – General trends on lab testing across different technologies, different manufacturers, and different wafer sizes – Jenya Meydbray (PVEL)**10:45** – Navigating the warranty process for failed modules – Mike Loeser (Strata Solar)**11:00** – Quality management best practice guidelines – Ralph Gottschalg (Fraunhofer CSP)**11:15** – Live Q&A with all speakers |
| 11:30 - 11:35  | Poster Session D awards (Xiaohong Gu) |
| **AGENDA – Friday, 22 February 2021** |
| **8:00 AM** | **Conference begins online with live Q&A at the end of each oral session** |
| **8:00 - 9:15**  | **Oral Session 9: Emerging Technologies Session B***Session Chairs:* **8:00** – Reliability of the low temperature solder joints in multiwire/SmartWire -- Laura Spinella (NREL)**8:15** – Reliability of high-density ‘gapless’ module design – to be confirmed**8:30** – Glass/glass module durability – (DuraMAT)**8:45** – Combined accelerated stress testing and acceleration factor determination -- Peter Hacke (NREL)**9:00**  – Live Q&A with all speakers |
| **9:15 - 10:15**  | Poster Session E: Live parallel links for small group discussions (Posters viewed ahead as desired)  |
| **10:15 - 11:50** | **Oral Session 10: PV Useful Service Life Prediction***Session Chairs:* **10:15** – Durability and reliability perspective from outside the PV industry– Christopher White (NIST)**10:30** – Assessing material and module degradation through ionization damage – (DuraMAT)**10:45** – Assessing the useful life of PV modules – Henry Hieslmair (DNVGL)**11:00** – Experience with repowering – Kim Primerano (Longroad Energy)1**1:15** – Live Q&A all speakers**11**:**30** – Panel discussion – The challenges and possibilities for a 50-year module (Session speakers, Teresa Barnes and Charlie Gay) |
| **11:55 - 12:00**  | Poster Session E awards (Xiaohong Gu) |