Welcome to the 2025
Photovoltaic Reliability Workshop!

NREL hosts this annual workshop so that solar technology experts can discuss current and future issues in PV reliability. Longer-lasting PV systems make lower-cost solar electricity and have less impact on the environment, human health, and natural resources.

PVRW offers a combination of oral presentations, panel discussions with vigorous audience participation, and poster presentations. At our workshop, every attendee is a presenter or the sole guest of a presenter.

Chair:

Chris Deline

Committee:

Teresa Barnes
Ken Boyce
Jennifer Braid
Evelyn Butler
Kristopher Davis
Michael Deceglie
Tristan Erion-Lorico
Robert Flottemesch
Peter Hacke
Henry Hieslmair
Will Hobbs
Cara Libby
Danielle Merfeld
Christos Monokroussos
Colleen O'Brien
Gernot Oreski
Michael Owen-Bellini
Jon Previtali
Ingrid Repins
Laura Schelhas
Eric Schneller
Adam Shinn
Colin Sillerud
Nick de Vries
Allan Ward
Kent Whitfield

AGENDA – Tuesday, 4 March 2025

Check-In / Breakfast: 7:30 am

8:30 AM

Session 1: Opening session
Session Chairs: Ingrid Repins, George Kelly

- Workshop Opening Remarks —Chris Deline, NREL *(8:30-8:45)*
- Terabase Mechanized PV System Installation —Matt Campbell, Terabase *(8:45-9:15)*
- The American Solar Manufacturing Renaissance: Maintaining the Momentum —MJ Shiao, American Clean Power *(9:15-9:45)*
- PowerMark Prize Announcement —John Wohlgemuth, PowerMark *(9:45-9:55)*

Break: 9:55 AM

10:25 AM

Session 2: Field results - Extreme Weather
Session Chairs: Will Hobbs, Brooke Stanislawski

- Assessing the Impacts of Extreme Weather Events on Photovoltaic Installations Using Remote Sensing Imagery —Kirsten Perry, NREL *(10:25-10:45)*
- Duke Energy's Extreme Weather Perspectives —Matt Pickett, Duke Energy *(10:45-11:05)*
- Survivability of Island PV Following Hurricane Beryl —Frank Oudheusden, Azimuth Advisory Services *(11:05-11:25)*
- Panel Discussion *(11:25-11:45)*

Lunch: 11:45 AM

Poster Session A: 12:45 PM

2:15 PM

Session 3: Issues from the Field
Session Chairs: Robert Flottemesch, Sanjana Kartik

- Field Testing Methods and Results —Jim Rand, Core Energy Works *(2:15-2:35)*
- Typical Rates of Module Anomalies Found in IR Inspections —Nathan Brunner and Charlie Davies, DNV and Raptor Maps *(2:35-2:55)*
- Notes from the Trenches —Penny Ladner, DNV *(2:55-3:15)*
- Panel Discussion *(3:15-3:35)*

Break: 3:35 PM

4:00 PM

Session 4: Module Manufacturing
Session Chairs: Teresa Barnes, Tristan Erion-Lorico

- US Manufacturing Overview —Teresa Barnes, NREL *(4:00-4:05)*
- Sensitivity of Material Selection for Glass-Backsheet Modules —Suchi Mitra, Heliene *(4:05-4:20)*
- An Update on Qcells' US Manufacturing and Reliability Testing —Max Kontopp, QCells *(4:20-4:35)*
- US Module Manufacturing and Hail Resistant Module Development —Hongbin Fang, LONGi *(4:35-4:50)*
- Panel Discussion *(4:50-5:20)*
- Awards from Poster Session A *(5:20-5:30)*

PVRW Mixer Sponsored by RETC, TÜV Rheinland, and VDE: 5:30 PM

Poster Session A – Tuesday, 4 March 2025

Notes: **DuraMAT** posters are indicated with **red** titles. Presenters are indicated in **bold type**.

001. *Dynamic mechanical compatibility of trackers and PV modules (DuraMAT)*, **C. O'Brien**

004. *Steady-state and Sequenced Accelerated Aging to Reveal Degradation Pathways and Inform IEC Testing Standards*, **K. Liu**, D.C. Miller, N. Bosco, J.M. Newkirk, R.H. Dauskardt

007. *Leveling up for big format bifacials*, **S. Ovaitt**, C. Deline, B. McDanold, J. Park, B. Sekulic, T. Silverman, E. Palmiotti

010. *Progress Towards a Universal PV Plug and Socket*, **M. Kempe**

013. *Recommendations and Limitations for Winter PV Capacity Tests*, **A. Dionigi**

016. *Forecasting glass resilience of large format modules*, **M. Springer**, T. Silverman, J. Newkirk, N. Bosco

019. *Critical Role of Incoming Quality in Domestic Module Manufacturing*, **P. Bhatt**

022. *Simulating Wind-Driven Physics and Instabilities in Single-Axis Trackers*, **E. Young**

025. *Field connectors – observations from current construction projects*, **R. Chatelain**, T. Deer

028. *Mapping PV degradation mechanisms and field performance by leveraging large language models*, **B. Li**, M. Springer, D. Jordan, A. Jain

031. *IEC 61724 Standard Overview*, **M. Gostein**

034. *Predicting Degradation Kinetics Occurring During Encapsulant Lifetime*, H. Dedmon, S. Kruse, J. Kustas, J. Braid, M. Chandross, **M. Wilson**

037. *De-Risking EPE Encapsulants: Modeling Polymer-Polymer Interfaces*, **H. Dedmon**, M. Wilson, E. Palmiotti

040. *Applying Geospatial Workflows with "PVDeg"*, **T. Ford**, S. Ovaitt, M. Springer, M. Kempe

043. *New Cells, New Issues: Stress Tests for N-Type PV Module Designs*, **A. Sinha**, J.N. Jaubert, D.B. Kern, T. Karin

046. *Module breakage impacts on system availability*, **C. Helms**, N. de Vries

049. *Effect of Cell Cracks on Module Power Loss and Degradation: Modern Module Architectures*, **V. Parikh**

052. *Accelerated stress testing to deconvolute simultaneous-but-distinct degradation pathways under UV illumination*, **R. Wai**, X. Hanna, J. Newkirk, K. Terwilliger, S. Johnston, D. Miller, P. Hacke, D. Kern

055. *Root cause investigation of glass cracking in field-mounted solar modules*, **J. Karas**, R. Flottemesch, V. Parikh

058. *Investigation of inner layer cracking in PPE backsheets*, **S. Mitterhofer**, Z. Li, A. Aiello, K. Jensen, X. Gu, M.D. Kempe, W. Hobbs

061. *Reliability Evaluation of High-Efficiency Double-Glass PV Modules*, **J.M. Kuitche**

064. *Failure modes in modern cell interconnects for PV modules*, **P. Hacke**, N. Bosco, J. Hartley, S. Uličná

067. *Updates to the Variational Auto-encoder for crack parametrization*, **N. Jost**, O. Sanghi, B. Byford, E. Cooper, B. Pierce, I. Deane, J. Braid

070. *Let's Not R-EPE-at Our Mistakes*, **M. Mirzokarimov**, D. Roberts, L. Schelhas, H. Dedmon, M. Wilson, J. Munro, L. Madenjian, M. Issa, **E. Palmiotti**

073. *Emerging Technique for Detecting Damage On Various Module Layouts*, **R.M. Smith**, D.J. Colvin, B.A. Thompson, C.J. West, E.M. Langlois

076. *Gridline wear-out depends on the regime of crack opening*, **S. Rabade**, N. Bosco

079. *Measuring the stress factors for PV back sheet degradation*, **A. Wesley**, S. Oviatt, M. Prilliman, J. Newkirk, R. Arnold, M. Springer, M. Kempe

082. *DuraMAT Data Hub Chat*, **R. White**, S. Zisman, A. Nag, D. Rager

085. *Strengthening PV Thin Glasses Using Salt Pastes*, **J. Rimsza**, J. Nance, K. Strong

088. *Encapsulants for screen-printed copper contacts*, T. Druffel, **D. Williams**, K. Elmer, E. Yenney, A. Nambo, R. Dharmadasa, P.

Stradins, P. Hacke, W. Nemeth, S. Theingi, K. Kenney, J. Munro

091. *Steel module frames plus trackers equals cost savings*, **L.B. Ahsler**

094. *Development of version 1 of the National Climate Database (NCDB)*, **J. Yang**, M. Sengupta, A. Habte, Y. Xie, M. Bailey, D. Nychka, S. Bandyopadhyay

097. *Polysilicon issue of TOPCon bottom cells for perovskite/silicon tandem solar cell performance.*, **C. Lee**, J. Hyun, **H. Lee**, D. Kim

100. *Technoeconomic analysis (TEA) support*, **J. Zuboy**, B. Smith, M. Woodhouse

103. *Modeling Crystallization and Melting in EVA and Polyolefin Encapsulation to Augment Stress Predictions in Cracked PV Modules Over a 24-hour Period*, **K. Long**, K. Cundiff, J. Hartley

106. *Unscrambling combiner box SCADA tags using high frequency time series data*, **R. van Haaren**, M. Marosvari, H. Coleman, K. Rhee

109. *Comparative Dust Soiling Assessment for PV systems: Evaluating Multiple Methodologies*, **B. Pendleton**

112. *Distributed Strain Sensing of Solar PV Single-Axis Tracking System Under Dynamic Wind Loads*, **Y.J. Li**, H. Zhang, A. Chutani, P. Dice, G. Robinson, A.R. Dyreson, M.J. DeJong

115. *A Framework for the Multimodal Analysis of Photovoltaic (PV) Data*, **S.N. Venkat**, J. Raby, B. Thompson, D.J. Colvin, M. Liggett, K. Lu, M. Bolen, S. Johnston, D. Kern, G. Horner, K.O. Davis

118. *Outdoor Performance of n-type Modules With and Without Cell Cracks Over One Year*, **T. Karin**

121. *Silicon Module Recycling by High-Power Lasers*, P.K. Kanaujia, M. Owen-Bellini, H. Mirletz, D.L. Young, **M.C. Gupta**

124. *A computationally derived framework for predicting probability of PV module glass breakage by hail impact*, J. Hartley, **S.J. DiGregorio**

127. *Walkable Solar Panels*, **D. Meakin**

AGENDA – Wednesday, 5 March 2025

Check-In / Breakfast: 7:30 am

8:30 AM

Session 5: Module Reliability Science
Session Chairs: Ashley Gaulding, Colin Sillerud

- Breaking the Trend: Are Retro PV Module Designs a Cost-Effective Solution to Glass Reliability? —Jennifer Braid, SNL *(8:30-8:50)*
- Spontaneous Glass Breakage in Glass-Glass Modules —Ellie Palmiotti, NREL *(8:50-9:10)*
- Novel temperable glass for improved performance in solar applications —Alex Mitchell, Corning Incorporated *(9:10-9:30)*
- Panel Discussion *(9:30-9:50)*

Break: 9:50 AM

10:20 AM

Session 6: Module reliability - UVID
Session Chairs: Kaushik Roy Choudhury, Peter Hacke

- Accelerated UVID Testing and Comparison to Outdoor Testing —Archana Sinha, PVEL *(10:20-10:40)*
- UV + Damp Heat Induced Power Losses in Fielded Utility N-Type Si PV Modules —Ashley Gaulding, NREL *(10:40-11:00)*
- Performance and Degradation of PV Encapsulants for UV Induced Degradation Study —Dennice Roberts, NREL *(11:00-11:20)*
- Panel Discussion *(11:20-11:40)*

Lunch: 11:40 AM

Poster Session B: **12:40 PM**

2:10 PM

Session 7: PV System Insurance
Session Chairs: Nick de Vries, Leah Holton

- PV Risks and the Insurance Landscape —Mike Perron and Sandy Calvert, FM Global and Moore-McNeil *(2:10-2:30)*
- NatCat Modeling and Resiliency Considerations for Solar Property Insurance —Nicole Thompson, kWhAnalytics *(2:30-2:50)*
- Models, PMLs, and Insurance Sublimits —Lauren Carroll-Allan, CAC Specialty *(2:50-3:10)*
- Panel Discussion *(3:10-3:30)*

Break: **3:30 PM**

4:00 PM

Session 8: Inverters and BOS
Session Chairs: Colleen O'Brien, Michael Bolen

- More than One Side to the Story: a Forensics Dive into PV Connector Failures —Laurie Burnham, SNL *(4:00-4:20)*
- Uncapped Photovoltaic Connectors - A Combined Field and Chamber Study Verifies and Elucidates the Degradation —Dave Miller, NREL *(4:20-4:40)*
- Nominal Operating IGBT Temperature (NOIT), A Metric for Establishing Reliable Inverter Operations —Nick deVries, Silicon Ranch *(4:40-5:00)*
- Panel discussion *(5:00-5:20)*
- Awards from Poster Session B *(5:20-5:30)*

End of Wednesday Sessions

Poster Session B – Wednesday, 5 March 2025

Notes: Presenter names are in **bold type**.

002. *Lessons learned from solar PV energy yield assessment validation*, **E. Giacchino**, E. Soderlund, E. DeCristofaro, J. Silhavy, M. Sleiman

005. *Comparison of degradation due to outdoor exposure and accelerated stress testing in perovskite solar cells*, **T. Tayagaki**, S. Hirooka, H. Kobayashi, K. Yamamoto, T.N. Murakami, M. Yoshita

008. *IEC TC 82 Status*, **G. Kelly**

011. *A New Framework for Standardized Assessments of Risk Severity for Issues in Operating Assets*, **D. Penalva**

014. *2000V PV System LCOE Benefit Analysis*, **B. Frazier**

017. *Selecting bankable resource data for solar energy assessments*, **C. Bordonaro**, P. Metaut, A. Berlinsky, T. Romshek

020. *IEC Standard Aging Sequences for Adhesion in PV Modules*, **R. Arnold**, D. Miller, A. Jackson

023. *Going beyond stuck trackers: how well do your trackers work?*, **W. Hobbs**, K. Anderson

026. *Evaluation of front eave loads caused by snow accumulation on PV modules*, **T. Tanahashi**, T. Chiba, S. Adachi, H. Arakawa, Y. Tsuno, K. Ikeda, T. Oozeki

029. *Hail Damage - A Direct Comparison of Glass-Polymer and Glass-Glass Modules*, **A. Hendricks**

032. *Analyzing the Mechanical Resilience of PV Modules with Different Frame Designs*, **T. Billie**

035. *Field Testing of PID-p Susceptible Bifacial PERC Modules: Impact of Light, Voltage and Module History*, **C. Molto**, D.J. Colvin, R. Smith, P. Hacke, F. Li, G. TamizhMani, J. Oh, H. Seigneur

038. *Effect of Salt Mist and DH Preconditioning on PID for Mono and Bi-facial half cell PERC modules*, **C. Bainier**, J. Cano-Garcia, G. Kaur, E. Kam-Lum

041. *Encapsulation selection for TOPCon cells with LECO*, **J. Munro**, Y. Li, L. Madenjian, M. Issa, P. Brigandi

044. *Investigating Temperature Uniformity and Accuracy in PV Module Lamination: A Verification Study*, **A. Jackson**, R.L. Arnold

047. *Wind-Induced Dynamic Loading and PV Module Frame Fatigue Crack Initiation and Propagation*, **F. Oudheusden**, C. Needham, J. Ness

050. *Comparing Outdoor and Indoor I-V Curves on Bifacial PERC PV Modules Experiencing Polarization-Type Potential-Induced Degradation (PID-p)*, **D. Colvin**, C. Molto, R. Smith, M. Matam, P. Hacke, F. Li, G. TamizhMani, H. Seigneur

053. *Hail Kinetic Energy damage thresholds on large scale PV panels*, **J. Carl**

056. *Wind-Induced Dynamic Loading and PV Module Frame Fatigue Crack Initiation and Propagation*, F. Oudheusden, **C. Needham**, J. Ness

059. *Module Mounting Design Qualification Challenges*, **J. Sorensen**, S. Lokanath

062. *Incentivizing reliable PV through Revenue Put insurance premium reduction*, **H. Rasmussen**, A. Shinn

065. *Main factors contributing to the underperformance of solar modules in Colombia: high power tolerances and degradation due to inadequate cleaning procedures and improper handling of solar modules*, **R. Naranjo**, L.F.R. Chavez, J. Barrera, K. Visbal, J.S. Conejo

068. *Spectroscopic analysis of water in PV modules: from water detection to water mapping in polymers*, **C. Buerhop-Lutz**, O. Stroyuk, O. Mashkov, S. Vorstoffel, O. Ghaffari, I. Peters

071. *Filtering of Operational Data for Performance Issue Breakdowns*, **B. Pereyra**

074. *A New Vulnerability in Bypass Diodes Under High Temperature, Long Term Operation in Reverse Bias (HTRB)*, K. Rane, **N. Shiradkar**

077. *Pre-failure signatures of solar pv inverters: a pathway for improving inverter reliability*, **K. Buch**, R. Dhakal, W. Li

080. *Unraveling the Degradation of SHJ Solar Cells with 82% Less Silver*, **M.W. Martinez-Szewczyk**, O.J. Hildreth, M.I. Bertoni

083. *Classification of Defects in Thin film Silicon Modules for Hotspot Formation Using EL Imaging*, **S.K. Pullayikody**, P. Sluijs, N. Zeiher, V. Venkatesh, G. Mathiazhagan, R. Vasudevan, A. Smets

086. *Rapid Screening of SHJ and TOPCon Solar Cells for UV Degradation*, **J.D. Zubieta Sempertegui**, N. Moser-Mancewicz, J.G. Gezelter, S.R. Buffone, S. Cheng, M. Kamperai, N.G. Tshuma, G. Thomas, C. Biaou, J.L. Bryan, K.O. Davis, M.I. Bertoni, L.S. Bruckman, I.T. Martin

089. *PV Equipment Failures: Patterns and Predictions from O&M log data*, **C. Sotero**

092. *Best practices for pv project hail recovery*, **S. Ressler**

095. *An evaluation of operational PV project availability performance*, **K. Mullaney**, A. Chang, B. Grenko

098. *Evaluating the Degradation of Silicon Heterojunction Devices Through Chemical Analysis and Computational Simulation*, **N. Moser-Mancewicz**, J. Ochoa, M. Martinez-Szewczyk, T. Bantle, D. Kern, D. Jordan, S. Johnston, J. Medvedeva, M. Bertoni

101. *Reliable design: establishing a feedback loop between real world and design conditions*, **D. Herron**, A. Lindsay, M. Toro

104. *Module Due Diligence for Procurement by a Developer*, **S.K.L. Xu**

107. *Field Demo Sneak Peak: Side-by-Side Comparison of Hail Damage Mitigation*, **K. Reiter**, M. Bolen, D. Doerner

110. *Fluctuating PV module wind loads*, **Y. Fewless**

113. *Anomaly detection in PV fleet data via interpretable machine learning*, **B. Meyers**, A. Dufour, G. Ogut

116. *Comparative Dust Soiling Assessment for PV systems: Evaluating Multiple Methodologies*, **S. Li**, B. Pendleton, T. Müller

119. *MANTIS: from multiscale analysis to next generation thin film module inspection systems*, **G. Horner**

122. *Inline, Non-contact EL Scanner for Module Inspection and Quality Control*, **K. Lu**, E. Ignatovich, P. Miller, L. Vasilyev, A. Dirriwachter, J. Williams, T. Frank, E. Schneller

125. *Development of meaningful, low-cost Solar PV module and mounting fastener stack testing equipment and procedures*, **G. Robinson**

AGENDA – Thursday, 6 March 2025

Check-In / Breakfast: 7:30 am

8:30 AM **Session 9: Next-Gen PV Reliability**
Session Chairs: David Young, Silvana Ovaitt

- An Update on Perovskites Performance and Reliability Based on PACT's Testing —Michael Deceglie and Tim Silverman, NREL *(8:30-8:50)*
- Qualification Test Standards for Floating PV —Mauro Pravettoni, TII - Abu Dhabi *(8:50-9:10)*
- Reliability of TOPCon Solar Cells: Understanding Degradation and Recovery of Poly-Si/SiOx Passivating Contacts —Aditya Ratnapagol, NREL *(9:10-9:30)*
- UVID Initiates Metastability in the Dark: How to Properly Measure n-Type Modules —Todd Karin, PVEL *(9:30-9:50)*

Break: 9:50 AM

10:20 AM **Session 10: Trackers + hail**
Session Chairs: Michael Deceglie, Sumanth Lokanath

- Effectiveness of Hail Stow in Photovoltaic Systems —Jon Previtali, VDE *(10:20-10:40)*
- Full-scale High Speed Wind Testing of Trackers —David Kresse, NexTracker *(10:40-11:00)*
- Fatigue Loading of Purlins for Single Axis Solar Trackers —Nat Healy and Scott Van Pelt, GameChange Solar *(11:00-11:20)*
- Panel Discussion *(11:20-11:40)*

Lunch: 11:40 AM

Poster Session C: 12:40 PM

2:10 PM **Session 11: System Analysis & Modeling**
Session Chairs: Elsa Kam-Lum, Steven DiGregorio

- Repowering and Decommissioning Cost Model —Cara Libby, EPRI *(2:10-2:30)*
- Is Your Project Underperformance Caused by Unreliable Trackers? —Dan Chawla, Natural power *(2:30-2:50)*
- Energy at the End of the World: Renewable System Design for the South Pole —Amy Bender, ANL *(2:50-3:10)*

Break: 3:10 PM

3:40 PM **Session 12: Manufacturing and circularity**
Session Chairs: Michael Kempe, Gernot Oreski

- Glass and Silicon Recovery from Solar Modules Using Laser Processing —Mool Gupta, UVA *(3:40-4:00)*
- Uncovering Reliability Risks in Advanced PV Modules: A Data-Driven Approach for Industry Guidelines —Mahyar Nezhad, Kiwa *(4:00-4:20)*
- Module Warranty Backstop by Munich Re —Ron Sastrawan, Munich RE *(4:20-4:40)*
- Panel Discussion *(4:40-5:00)*
- Awards from Poster Session C *(5:00-5:10)*
- Workshop Closing Remarks —Chris Deline, NREL *(5:10-5:20)*

Workshop Closes

Poster Session C – Thursday, 6 March 2025

Notes: Presenter names are in **bold type**.

003. *Developing a UV Spot Test for Years of Equivalent Exposure*, **I. Repins**, T. Silverman, E. Palmiotti, M. Deceglie, A. Gaulding

006. *Residual Effects of Long-Term Vegetation Shading on a Ground Mount PV Array*, **R. Stromberg**

009. *GroundWork® Eyewitness™ Hail Monitoring and Event Reporting Service: A summary of hail data collected from a dense network of hail monitoring devices*, **T. Morrison**, J. Chard, A. Bryan, A. Will

012. *What is a polyolefin? A critical overview of ethylene copolymers as PV module encapsulants*, **G. Oreski**, C. Barretta, P. Christöfl, P. Gebhardt, K.A. Weiss, D. Miller, M. Kempe, S. Ulicna, A. Virtuani, H. Li, B. Habersberger, J. Munro, K. Proost, M. Kühne

015. *Analysis the Performance of PV Modules with Different Failures under Longtime Outdoor Condition*, **B. Wang**

018. *Low-cost daytime electroluminescence imaging*, **A.M. Gabor**, R. Landy, J.D. Friedl

021. *Screening early field failure in metal halide perovskite modules through stress testing*, **N.P. Irvin**, S. Uličná, J. Schall, D.B. Kern, T.J. Silverman, M. Deceglie, C. Fei, X. Shi, R.L. Arnold, B. McDanold, J. Parker, J. Huang, J.J. Berry, J.S. Stein, L.T. Schelhas

024. *A Tool to Create High-Fidelity and Adaptive Finite Element Model for PV Systems*, **X. He**, W. Arsalane, M.P. Shah

027. *From Hail to Hardware: A Comprehensive Risk Assessment for Solar Asset Resilience*, **R. Fagan**

030. *PV Standards Activities of IEC*, **J. Wohlgemuth**

033. *Soiling loss modeling in regions across the US*, **A. Berlinsky**, P. Metaut, C. Bordonaro, T. Romshek

036. *Adaptable Silicon Solar Cell Metrology in the Age of the Inflation Reduction Act*, **H. Wilterdink**, A.B. Karpen, N. Degenhart, L. Bruno, W. Dobson, R. Sinton

039. *X-Ray Imaging as a Tool for Understanding Photovoltaic Connector Failures*, **S. DiGregorio**, L. Burnham, B. King

042. *Performance evaluation of a Brazil research floating PV power plant*, D.A. Cassini, A.S.A. Diniz, V.C. Santana, D.S. Braga, **L.L. Kazmerski**

045. *Module Mounting Design Qualification Challenges*, **S. Lokanath**, J. Sorensen

048. *17 Years of Investigating Fires in PV Systems: A Synopsis of Experience*, **B. Brooks**

051. *Module and tracker deformation*, **G. Jago**

054. *Low-Cost Vibrational Sensors for in-situ High-wind Detection and Analysis*, **D.C. Jordan**, R. Smith, B. Sekulic, H. Seigneur

057. *Characterizing PV Modules using Paralleled MOSFET Loads with Active Feedback*, A. Mapes, **W. Sekulic**

060. *Updates on PV Bio-Soiling in the Southeast U.S.*, **M. Muller**, A. Rivera, M. Valerino

063. *A Comprehensive Test-to-Failure Protocol for PV Module Hail Damage: Integrating Weibull Analysis and Impact Mechanics*, **T. DeWolf-Moura**, S.A. Far, P. Bostock, R. Fritz, A. Hernandez, M. Kaur, C. Kedir, M. Pilliod, J. Previtali, J.R. Reynolds

066. *Evaluation of Durability and Cracking Propensity of Emerging PV Backsheets after Accelerated Laboratory Weathering*, **X. Gu**, S. Mitterhofer, Z. Li, A. Aiello, A. Aiello, K. Jensen, H.H. Hsien, A. Kadri, L. Ji

069. *The road to perovskite bankability*, **F. Dross**, T. Krajewski, L. Crowe

072. *Reliable Module Design Cost Reductions for Vertical Bifacial PV*, **J. McCabe**

075. *Assessing risk of glass failure during due diligence*, **B. Weinshenker**

078. *Climate Resilience for Inverter of Utility Scale PV Plant: Strategies and Risk Assessment*, **R. Dhakal**

081. *Watts the Hype? AI's Role in Powering Solar Reliability*, **M. Mousou**

084. *Investigating oxygen barrier properties of desiccated edge sealants for protection of perovskite solar modules*, **L. Postak**

087. *Edge sealed modules for improved perovskite stability in 1000 hours of damp heat testing*, **R. Ruhle**, D. Durney, D. McDougall, L. Laxmi, V. Chityala, D. Kabra, W. Sampath

090. *Edge sealed photovoltaic modules: matching thermal and optical properties of traditional encapsulation*, **D. Durney**, R. Ruhle, L. Maple, S. Johnston, D. Kern, W. Sampath

093. *Data-driven insights into solar production performance*, **P. Hwang**

096. *A review of modeled performance of PAN files in PVsyst®*, **E. Westphal**

099. *Recommendations for research-scale min-module vacuum laminations*, **M. Owen-Bellini**

102. *Diffuse Stow: Maximizing Potential in Photovoltaic Tracking*, **R.A. Borea**, S. Ovaitt, V. Cirimele, F. Melino, G. Maugeri, T. Ford

105. *Observation of High PV Durability Under Harsh Sequential Stress*, **D. Kern**

108. *Sustainable Solar Photovoltaics: Utilising operational characteristics for end-of-life management*, **A.P. Joshi**

111. *Heat and light: reliability testing of perovskite modules*, P. Pasmans, S. Roest, **J. Veloza**

114. *Enhancing performance of solar trackers through wind nowcasting and aerodynamic mitigations*, P. Fatehi, M. Elnahla, Y. Guo, T. Wu, **J. Elsworth**, S. Dana

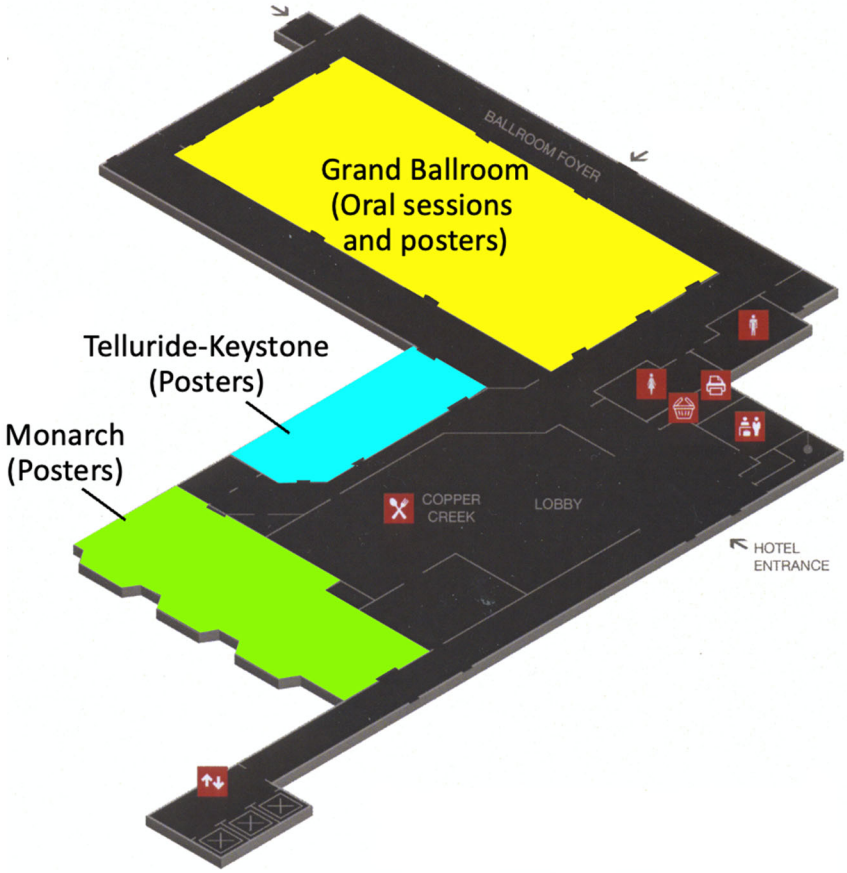
117. *Photovoltaic module backsheet burns attributed to misaligned busbar wires*, **S. Johnston**

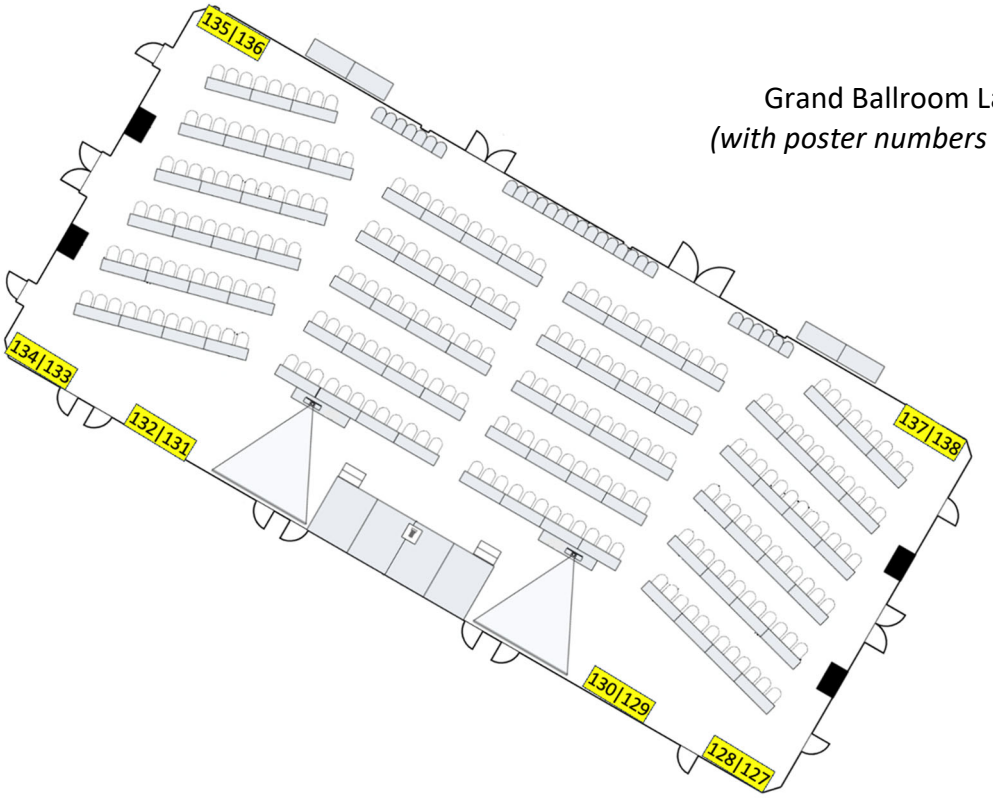
120. *Assessment of frame sealant property to module glass breakage via beam mechanics theory*, **Y. Lai**, G. Beaucarne, V. Hayez

123. *The Transferability of Silicon Photovoltaic Multiscale Diagnostics to Cadmium Telluride Technologies*, **M. Liggett**, D.J. Colvin, S.N. Venkat, G. Horner, M. Bolen, S. Johnston, D. Kern, K.O. Davis

126. *Off track: performance impacts of PV tracker mishaps*, **S. MacAlpine**

Map of Presentation Rooms





Grand Ballroom Layout
(with poster numbers in yellow)

Poster Room Layouts