



4th PV Performance Modelling and Monitoring Workshop

Date: 22nd and 23rd October, 2015

Site: Rheinlandsaal, TÜV Rheinland Group, Am Grauen Stein, 51105 Cologne, Germany

Day one Thursday, 22. October 2015

09:00	00:10	Opening	Florian Reil	TÜV Rheinland, Solar Energy	Germany
09:10	00:10	Welcome & Introduction	Joshua Stein	Sandia National Laboratories	USA
Session 1		Solar Resource Data and Uncertainty	Clifford Hansen (Session Chair)	Sandia National Laboratories	USA
09:20	00:20	Satellite- and Camera-derived Irradiance Data for Applications in Low Voltage Grids with Large PV Shares	Marion Schroedter-Homscheidt	German Aerospace Center (DLR)	Germany
09:40	00:20	Evaluation of Satellite Irradiation Data at 200 Sites in Western Europe	Karel De Brabandere	3E	Belgium
10:00	00:20	Uncertainty of Satellite Based and Ground Based Solar Resource Assessment	Marcel Suri	GeoModel Solar s.r.o.	Slowakia
10:20	00:20	Accuracy of Meteornorm 7.1	Jan Remund	Meteotest	Switzerland
10:40	00:20	Next-Generation Satellite Modelling for NREL's National Solar Radiation Data Base (NSRDB)	Manajit Sengupta	National Renewable Energy Laboratory	USA
11:00	00:40	Coffee Break			

Session 1 Cont		Solar Resource Data and Uncertainty	Clifford Hansen (Session Chair)	Sandia National Laboratories	USA
11:40	00:20	Local and Regional PV Power Forecasting Based on PV Measurements, Satellite Data and Numerical Weather Predictions	Elke Lorenz	Carl von Ossietzky University Oldenburg	Germany
12:00	00:20	PV Performance Modeling as a Key to Predictive Control out of Solar Energy Forecast Applications	Kai Fieber	Pho2ris GmbH & Co. KG	Germany
12:20	00:20	Dynamic Uncertainty of Irradiance Measurements – Illustrations from a Study of 42 Radiometers	Anton Driesse	PV Performance Labs	Germany
12:40	00:20	Towards an Energy-based Parameter for Photovoltaic Classification	Stefan Winter	Physikalisch-Technische Bundesanstalt	Germany
13:00	00:20	Timeseries of Spectrally Resolved Solar Irradiance Data from Satellite Measurements	Jethro Betcke	Carl von Ossietzky University Oldenburg	Germany
13:20	00:10	Questions			

13:30	01:00	Lunch Break			
Session 2		Spectral Corrections for PV Performance Modelling	Alex Panchula (Session Chair)	First Solar	USA
14:30	00:20	Satellite-based Estimates of the Influence of Solar Spectrum Variations on PV Performance	Thomas Huld	Joint Research Centre of the European Commission	Italy
14:50	00:20	Combined Air Mass and Precipitable Water Spectral Correction for PV Modelling	Mitchell Lee	First Solar	USA
15:10	00:20	Sensitivity Analysis and Uncertainty Evaluation of Simulated Clear-Sky Solar Spectra Using Monte Carlo Approach	Giorgio Belluardo	EURAC research	Italy
15:30	00:20	Spectral Corrections for PV Performance Modelling	Fotis Mavromatakis	Technological Education Institute of Crete	Greece
15:50	00:20	Improved Prediction of Site Spectral Impact	Benjamin Duck	CSIRO Energy Flagship	Australia
16:10	00:20	Impact of Spectral Irradiance on Energy Yield of PV Modules Measured in Different Climates	Markus Schweiger	TÜV Rheinland, Solar Energy	Germany
16:30	00:30	Coffee Break			

Session 3	Soiling and Snow, and Other System Derates		Hassan A A Qasem (Session Chair)	Dubai Electricity & Water Authority	Dubai
17:00	00:20	Impact of Soiling on PV Module Performance for Various Climates	Werner Herrmann	TÜV Rheinland, Solar Energy	Germany
17:20	00:20	Overview of Sandia's Soiling Program: Description of Experimental Methods and Framework for a Quantitative Soiling Model	Bruce H. King	Sandia National Laboratories	USA
17:40	00:20	Validation of Models for Energy Losses due to Snowfall on PV Systems	Janine Freeman	National Renewable Energy Laboratory	USA
18:00	00:10	Day 1 Wrap Up			
18:10	Visiting PV Testing Lab of TÜV Rheinland				
18:30	Kölsch				
19:30	Dinner				

Day 2	Friday, 23 October 2015				
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Session 4	Bifacial PV Modeling Challenges		Teresa Zhang (Session Chair)	SunEdison	USA
09:00	00:10	Introduction to Bifacial Modeling Challenges	Teresa Zhang	SunEdison	USA
09:10	00:20	Simulation and Validation of Modelling of Bifacial Photovoltaic Modules	Gianluca Corbellini	SUPSI	Switzerland
09:30	00:20	Realistic Yield Expectations for Bifacial PV Systems - an Assessment of Announced, Predicted and Observed Benefits	Christian Reise	Fraunhofer-Institut für Solare Energiesysteme ISE	Germany
09:50	00:20	Modelling of the Expected Yearly Power Yield on Building Facades in Urban Regions by Means of Ray Tracing	Hendrik Holst	Institut für Solarenergieforschung GmbH	Germany
10:10	00:20	Multi-Year Study of Bifacial Energy Gains Under Various Field Conditions	Jose E. Castillo-Aguilella	Prism Solar Technologies, Inc.	USA
10:30	00:10	Poster Presentations - (1 min per poster)	Ulrike Jahn (Poster Chair)	TÜV Rheinland, Solar Energy	Germany
10:40	00:50	Coffee Break			
Session 5	PV Modelling Applications: Modelling Tool Updates		Jeffrey Newmiller (Session Chair)	DNV GL	USA
11:30	00:20	Latest Features of Pvsyst	Bruno Wittmer	Pvsyst	Switzerland
11:50	00:20	pvSpot - PV Simulation Tool for Operational PV Projects	Tomas Cebecauer	GeoModel Solar s.r.o.	Slowakia
12:10	00:20	Recent and Planned Improvements to the System Advisor Model (SAM)	Aron P. Dobos	National Renewable Energy Laboratory	USA
12:30	00:20	Helioscope	Paul Gibbs	Folsom Labs	USA
12:50	00:20	Performance Modelling of PV Systems in a Virtual Environment	Angele Reinders	University of Twente	Netherlands
13:10	00:10	Questions and Discussion			
13:20	01:00	Lunch Break			
Session 6	Field Monitoring and Validation of PV Performance Models		Werner Knaupp (Session Chair)	PV-plan	Germany
14:20	00:20	High-Speed Monitoring of Multiple Grid-Tied PV Array Configurations	Matthew Boyd	National Institute of Standards and Technology	USA
14:40	00:20	Field Data from Different Climates for the Validation of Module Performance Models	Gabi Friesen	SUPSI	Switzerland
15:00	00:20	Comparison and Validation of PV System and Irradiance Models	Benjamin Matthiss	Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg	Germany
15:20	00:20	The "best" PV Model Depends on the Reason for Modelling	Steve Ransome	SRCL UK	UK
15:40	00:20	Using Advanced PV and BoS Modelling and Algorithms to Optimize the Performance of Large Scale Utility Applications	Jürgen Sutterlueti	Gantner Instruments (GI)	Austria
16:00	00:20	System Performance and Degradation Analysis of Different PV Technologies	Yuzuru Ueda	Tokyo University of Science	Japan
16:20	00:10	Discussion and Wrap			
16:30	End of workshop				

Poster Session

P1	Investigating the Impact of Clouds on Solar Energy Production – Uncertainties for Yield Predictions by Using Satellite Data for Clouds	Ina Neher, Evandro Dresch, Khurshid Hasan, Bernd Evers-Dietze, Dieter Franke and Stefanie K. Meilinger	Hochschule Bonn-Rhein-Sieg	Germany
P2	Simulation of PV Power Output by Implementation of a Spectral Dependent Photocurrent in the Double Diode Model	Evandro Dresch	Hochschule Bonn-Rhein-Sieg	Germany
P3	Spectral Analysis of Various Thin Film Modules Using High Precision Spectral Response Data and Solar Spectral Irradiance Data	Markus Schweiger, Ulrike Jahn, Werner Herrmann	TÜV Rheinland, Solar Energy	Germany
P4	Numerical Modelling of c-Si PV Modules by Coupling the Semiconductor with the Thermal Conduction, Convection and Radiation Equations	Malte Vogt	Institut für Solarenergieforschung GmbH	Germany
P5	Soiling and Self-Cleaning of PV Modules in Different Climates	Werner Herrmann	TÜV Rheinland, Solar Energy	Germany
P6	Bifacial Performance Field Data Analysis	Mike Francis, Teresa Zhang, Brandon Tracey	SunEdison	USA
P7	A New Software for PV Plant Modelling	Gianluca Corbellini	SUPSI	Switzerland
P8	Progress and Challenges of CPV Modelling	Tobias Gerstmaier, T. Zech, M. Röttger, C. Braun, A. Gombert	Soitec Solar GmbH	Germany
P9	Uncertainty and Sensitivity Analysis for Photovoltaic System Models	Clifford Hansen, Curtis Martin	Sandia National Laboratories	USA
P10	Data Requirements for Calibration of Photovoltaic System Models	Clifford Hansen, Kathrine Klise	Sandia National Laboratories	USA
P11	Comparing Measured Performance Data of PV Installations to Simulation Results	Bruno Wittmer	Pvsyst	Switzerland
P12	Field Monitoring and Validation of PV Performance Models (tbc)	Frank Vignola, Fotis Mavromatakis	University of Oregon	USA
P13	Big-data Analytics of Real-world I-V, Pmp Time Series to Validate Models and Extract Mechanistic Insights to Lifetime Performance	Roger French, Tim Peshek	Case Western Reserve University	USA
P14	Effect of time-averaging on PV production estimates on systems with high DC to AC ratios	William Hobbs	Southern Company	USA