

6th Solar Integration Workshop

14 - 15 November 2016

International Workshop on Integration
of Solar Power into Power Systems

with Special Topic STORAGE


Vienna, Austria



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MONDAY, 14 NOVEMBER 2016

TUESDAY, 15 NOVEMBER 2016

Solar Workshop Day 1

Solar Workshop Day 2

08:00 – 09:00	Grand Waterfront Foyer			08:30 – 09:55	Grand Waterfront 1	Grand Waterfront 2	Grand Waterfront 3
	Registration				SESSION 5A: IRENA & Grid Codes	SESSION 5B: Forecasting	SESSION 5C: Storage Systems
09:00 – 09:10	Grand Waterfront 1+2+3			COFFEE BREAK (20MIN)			
	OPENING: Welcome & Introduction						
09:10 – 10:50	Grand Waterfront 1+2+3			10:15 – 11:15	Grand Waterfront 1	Grand Waterfront 2	Grand Waterfront 3
	SESSION 1: Keynote Session – Solar Power in Power Systems, Special Focus: Austria				SESSION 6A: Grid Codes	-	SESSION 6C: Regulation & Electricity Markets
COFFEE BREAK (25 MIN) & POSTER SESSION				SHORT BREAK			
11:15 – 13:00	Grand Waterfront 1	Grand Waterfront 2	Grand Waterfront 3	11:15 – 12:15	Grand Waterfront 1+2		
	SESSION 2A: Grid Integration Studies & Experience	SESSION 2B: PV & Smart Grid Concepts	SESSION 2C: IEA PVPS Task 14		SESSION 7: Closing Session – Podium Discussion: Future Role of Storage for PV Integration		
LUNCH (1H)				LUNCH			
14:00 – 15:45	Grand Waterfront 1	Grand Waterfront 2	Grand Waterfront 3	13:00	Grand Waterfront 1+2+3		
	SESSION 3A: PV & Storage in Distribution Systems	SESSION 3B: System Study Modelling	SESSION 3C: System Studies		OPENING SESSION 15 th Wind Integration Workshop		
COFFEE BREAK (20MIN) & POSTER SESSION							
16:05 – 18:15	Grand Waterfront 1	Grand Waterfront 2	Grand Waterfront 3				
	SESSION 4A: Frequency & Reserve Issues	SESSION 4B: Economics & Storage	SESSION 4C: PV & Distribution Network				
19:30 – 23:00	SOLAR DINNER RESTAURANT "PFARRWIRT"						

MONDAY, 14 NOVEMBER 2016

08:00 – 09:00 Registration

09:00 – 09:10 Welcome

09:10 – 10:50 SESSION 1 – KEYNOTE SESSION: SOLAR POWER IN POWER SYSTEMS, SPECIAL FOCUS: AUSTRIA

> Session Chair Thomas Ackermann (Energynautics, Germany)

09:10 – 10:30 Presentations (17 min. each)

- **The Speed of PV Development World-Wide - A New Dimension for Power Systems**
T. Ackermann (Energynautics, Germany) (Submission-ID SIW16-254)
- **PV and Distribution Grids in Austria: an Overview**
C. Raunig (Oesterreichs Energie, Austria)
- **The Impact of Renewables and Strategies for Integration in Wiener Netze Distribution Grid**
T. Schuster (Wiener Netze, Austria)
- **Optimization of the Balancing Market in Austria**
Ch. Todem (APG, Austria) (Submission-ID SIW16-200)
- **Communication in the Tension Between Renewables and Power Grid Development**
F. Wöber (APG, Austria) (Submission-ID SIW16-201)

10:30 – 10:50 Discussions

10:50 – 11:15 Coffee Break & Poster Session

11:15 – 13:00 SESSION 2A – GRID INTEGRATION STUDIES AND EXPERIENCE

> Session Chair J. Charles Smith (UVIG, USA)

11:15 – 12:35 Presentations (20 min. each)

- **The Eastern Renewable Generation Integration Study: Insights on System Stress**
A. Bloom, J. Novacheck (NREL, USA) (Submission-ID SIW16-178)
- **Linking Technical Grid Integration Studies with Long Term Techno-Economic Planning Studies for Isolated Power Grids**
E. Taibi, F. Gafaro, P. Journeay-Kaler, I. Portugal (International Renewable Energy Agency [IRENA], Germany), J. Gómez, F. Fernandez (DlG SILENT, Germany) (Submission-ID SIW16-86)
- **Demonstration of Active Power Controls by Utility-Scale PV Power Plant in an Island Grid**
V. Gevorgian, B. O'Neill (NREL, USA) (Submission-ID SIW16-5)
- **Maximizing the Penetration of Inverter-Based Generation on Large Transmission Systems: the MIGRATE Project**
M.-S. Debry, G. Denis, T. Prevost, F. Xavier (RTE, France), A. Menze (TenneT Offshore, Germany) (Submission-ID SIW16-100)

12:35 – 13:00 Discussions

11:15 – 13:00	SESSION 2B – PV AND SMART GRID CONCEPTS
> Session Chair	Bernd Engel (TU Braunschweig, Germany)
11:15 – 12:35	Presentations (20 min. each)
	<ul style="list-style-type: none"> • Capacity Management of Low Voltage Grids Under the Energy Transition E. J. Coster, M. Broekmans, J. P. Hodemaekers, H. A. Fidler (Stedin, Netherlands) (Submission-ID SIW16-112) • Decentralized Battery Energy Storage System – Application and impact in a Distribution System with Cloud Connection A. Berthold, M. Hausladen (ABB, Germany), D. Speiser (EWE NETZ, Germany) (Submission-ID SIW16-9) • Automatic Integration of Photovoltaic Inverters in a Smart Grid System to establish Additional Power Grid Beneficial Functions P. Steinbusch, R. Uhlig, S. Fischer, M. Stötzel, M. Zdrallek (University of Wuppertal, Germany), T. Bülo (SMA Solar Technology, Germany), W. Friedrich, U. Schlüter (Mauell, Germany) (Submission-ID SIW16-74) • Modular PLC-Based Control Concepts for Integration of PV Plants to Power Distribution Grids T. Oesselke (Phoenix Contact Electronics, Germany) (Submission-ID SIW16-16)
12:35 – 13:00	Discussions

11:15 – 13:00	SESSION 2C – IEA PVPS TASK 14
> Session Chair	Christoph Mayr (AIT Austrian Institute of Technology, Austria)
11:15 – 12:45	Presentations (15 min. each)
	<ul style="list-style-type: none"> • Survey and Case Studies of Transmission Level PV Integration Assessments Utilizing Generation Forecasts and Innovative Flexibility Resources K. Ogimoto (University of Tokyo, Japan), A. Marinopoulos (ABB, Sweden), K. Clark, B. Mather (NREL, USA), K. Asano, K. Ohbayashi, (NEDO, Japan), K. Frederiksen (Kenergy, Denmark), I. McGill (University of New South Wales, Australia), A. Iaria (RSE, Italy), M. Kraczy (Fraunhofer IWES, Germany), P. Vingerhoets (KU Leuven, Belgium), C. Mayr, R. Bründlinger (AIT – Austrian Institute of Technology, Austria) (Submission-ID WIW16-246) • A Comprehensive Study on the Actual Potential of Grid Support Functions to Enhance the Hosting Capacity of Distribution Networks with a High PV Penetration S.Kadam, B. Bletterie (AIT – Austrian Institute of Technology, Austria) (Submission-ID SIW16-273) • Review and Assessment of Latest Grid Code Developments in Europe and Selected International Markets with Respect to High Penetration PV R. Bründlinger (AIT – Austrian Institute of Technology, Austria) (Submission-ID SIW16-274) • Automated Grid Planning for Distribution Grids with Increasing PV Penetration A. Scheidler (Fraunhofer IWES, Germany), L. Thurner (University of Kassel, Germany), M. Kraczy (Fraunhofer IWES, Germany), M. Braun (Fraunhofer IWES University of Kassel, Germany) (Submission-ID SIW16-270) • Progress and Future of Japan’s PV Deployment K. Ogimoto (University of Tokyo, Japan), K. Ohbayashi, K. Asano (NEDO, Japan) (Submission-ID SIW16-272) • Managing Integration of Distributed PV in North America T. Key (EPRI, USA) (Submission-ID SIW16-271)
12:45 – 13:00	Discussions

13:00 – 14:00 Lunch

14:00 – 15:45	SESSION 3A – PV AND STORAGE IN DISTRIBUTION SYSTEMS
> Session Chair	Tom Key (EPRI, USA)
14:00 – 15:20	Presentations (20 min. each)
	<ul style="list-style-type: none"> • Testing and Validation of Simultaneous Multiple Use of Photovoltaic Storage Systems F. Lobas-Funck, F. Soyck, B. Engel (Technical University Braunschweig, Germany) (Submission-ID SIW16-77) • Preventing Overvoltage in a Distribution Grid with Large Penetration of Photovoltaic Power R. Luthander, D. Lingfors, J. Widén (Uppsala University, Sweden) (Submission-ID SIW16-49) • System Supporting Storage Deployment for the Compensation of Grid Effects Caused by PV in a Distribution Grid T. Nacht, M. Tragner (4ward Energy Research, Austria) (Submission-ID SIW16-196) • Dynamic Battery Storage Models for Investigation of Dynamic Grid Voltage Stabilization W. Shan, M. Shan (Fraunhofer IWES, Germany) (Submission-ID SIW16-123)
15:20 – 15:45	Discussions

14:00 – 15:45	SESSION 3B – SYSTEM STUDY MODELLING
> Session Chair	Julia Matevosjan (ERCOT, USA)
14:00 – 15:30	Presentations (18 min. each)
	<ul style="list-style-type: none"> • Determination of WECC Distributed PV System Model Parameters for Partial Loss of Generation Due to Bulk System Voltage Sags J. C. Boemer, E. Vittal, M. Rylander (EPRI, USA), B. Mather (NREL, USA) (Submission-ID SIW16-237) • Characterization of Harmonic Emission of Individual Wind Turbines and PV inverters based on measurements – Part I – Photovoltaic Inverters F. Ackermann, H. Moghadam (Fraunhofer-ISE, Germany), J. Meyer, S. Mueller, M. Domagk (Technical University Dresden, Germany), F. Santjer (UL International/DEWI, Germany), I. Athamna (FGW – Federation of German Windpower and other Renewable Energies, Germany), R. Klosse, K. Küch (WindGuard Certification, Germany) (Submission-ID SIW16-99) • A Novel Control Algorithm for Grid-Connected Inverters improving Power Quality using Voltage Control and Virtual Impedance S. Reichert, B. Stickan (Fraunhofer ISE, Germany) (Submission-ID SIW16-163) • Power System Model Reduction with Grid-Connected Photovoltaic Systems Based on Hankel Norm Approximation I. Maqbool (Fraunhofer IWES, Germany), G. Lammert (University of Kassel, Germany), A. Ishchenko, (Phase to Phase BV, Netherlands), M. Braun (Fraunhofer IWES University of Kassel, Germany) (Submission-ID SIW16-57) • A Transient Stability Improvement by Decentralized Non-Linear Control of Active and Reactive Power of PV K. Furubayashi, T. Tsuji, T. Oyama (Yokohama National University, Japan), K. Uchida (Waseda University, Japan) (Submission-ID SIW16-214)
15:30 – 15:45	Discussions

14:00 – 15:45	SESSION 3C – SYSTEM STUDIES
> Session Chair	Debra Lew (GE, USA)
14:00 – 15:20	Presentations (20 min. each)
	<ul style="list-style-type: none"> • Methods to Ensure Deliverability of System Flexibility E. Ela, E. Lannoye, A. Tuohy (EPRI, USA) (Submission-ID SIW16-187) • Synthetic Natural Gas Production and Utilization in the North European Power System in 2050 J. Ikäheimo, J. Kiviluoma (VTT, Finland) (Submission-ID SIW16-219) • A Study on Power System Reliability Evaluation with Massive Penetration of Solar Power Generations S. Yamashita, T. Tsuji, T. Oyama (Yokohama National University, Japan), Y. Nakachi, S. C. Verma (Chubu Electric Power, Japan) (Submission-ID SIW16-89) • Hybrid Industrial Power Systems Mixing Photovoltaic & Diesel Power Generation: How to Optimize PV Penetration Rate while Maintaining Power System Stability D. Goulielmakis, G. Scaringella, J. Philippe (Schneider Electric, France) (Submission-ID SIW16-19)
15:20 – 15:45	Discussions

15:45 – 16:05 Coffee Break & Poster Session

16:05 – 18:15	SESSION 4A – FREQUENCY AND RESERVE ISSUES
> Session Chair	Eckehard Tröster (Energynautics, Germany)
16:05 – 17:45	Presentations (20 min. each)
	<ul style="list-style-type: none"> • Frequency Control in Distributed Inverter-Dominated Electrical Power Systems S. Laudahn, J. Seidel, B. Engel (Technical University Braunschweig, Germany), T. Bülo, D. Premm (SMA Solar Technology, Germany) (Submission-ID SIW16-257) • Primary Operating Reserves from Concentrated Solar Power Plants (CSP) S. Ott (University of Applied Forest Sciences Rottenburg, Germany), P. Lilje (M.P.E., Germany), M. Brunotte (University of Applied Forest Sciences Rottenburg, Germany) (Submission-ID SIW16-182) • A Study on Influence of Ramp Event of Aggregated Power Output of Photovoltaic Power Generation on Electric Power System Frequency T. Kato, Y. Manabe, T. Funabashi, M. Kurimoto (Nagoya University, Japan) (Submission-ID SIW16-25) • Modelling of Small-Scale Photovoltaic Systems with Active and Reactive Power Control for Dynamic Studies D. Fetzer, G. Lammert, K. Fischbach, M. Nuhn, J. Weide, D. Lafferte, T. Paschedag (University of Kassel, Germany), M. Braun (Fraunhofer IWES, Germany) (Submission-ID SIW16-114) • Integration of PV-Units in the Tertiary Control Ancillary Services Market in Switzerland A. Chacko (Swissgrid, Switzerland), V. Wyss, M. Koller, S. Poelzig (Electricity company of canton Zurich (EKZ), Switzerland), F. Carigiet, F. Baumgartner (Zurich University of Applied Science (ZHAW), Switzerland) (Submission-ID SIW16-15)
17:45 – 18:15	Discussions

16:05 – 18:15	SESSION 4B – ECONOMICS AND STORAGE
> Session Chair	Paul Gardner (DNV GL - Energy, United Kingdom)
16:05 – 17:45	Presentations (20 min. each)
	<ul style="list-style-type: none"> • Energy Storage: Is There a Business Case? D. Lew (GE Energy, USA) (Submission-ID SIW16-63) • Through the Valley: The Impact of PV Penetration Levels on Price Volatility and Resulting Revenues for Storage Plants M. Hartner (Vienna University of Technology, Austria) (Submission-ID SIW16-43) • Quantifying the Storage Requirements Needed To Achieve High PV Penetration in the U.S. P. Denholm, R. Margolis (NREL, USA) (Submission-ID SIW16-87) • Merit Order Effect of Flexibility Options M. Hinterstocker, B. Eberl, S. von Roon (Forschungsgesellschaft für Energiewirtschaft, Germany) (Submission-ID SIW16-122) • PV Generation Share in the Energy System and Battery Utilisation Correlation in a Net Zero Emission World D. Bogdanov, A. Gulagi, C. Breyer (Lappeenranta University of Technology, Finland) (Submission-ID SIW16-186)
17:45 – 18:15	Discussions

16:05 – 18:15	SESSION 4C – PV AND DISTRIBUTION NETWORK
> Session Chair	Nicklas Johansson (ABB, Sweden)
16:05 – 17:53	Presentations (18 min. each)
	<ul style="list-style-type: none"> • Stability Assessment for Automated Voltage Controlling Equipment in Distribution Grids M. Schoeneberger, S. Patzack, H. Vennegeerts (FGH / RWTH Aachen University, Germany) (Submission-ID SIW16-162) • Spatio-temporal Analysis of Regional PV Generation E. Nuño, N. Cutululis (DTU, Denmark) (Submission-ID SIW16-102) • Identification and Reconstruction of Photovoltaic Measurement Gaps based on Temporal Correlation and Spatial Distance P. Zehetbauer, S. Kloibhofer, M. Stifter, B.-V. Mysore-Vasudevarao, F. Leimgruber (AIT - Austrian Institute of Technology, Austria) (Submission-ID SIW16-259) • Advancing Distribution Planning Tools for DER Impact Assessments: Streamlining DER Hosting Capacity Analysis M. Rylander, J. Smith (EPRI, USA) (Submission-ID SIW16-157) • Optimised Control of 10 MW Photovoltaic (PV) Plant with 1MW / 1MWh Battery P. Nørgaard, H. Bindner, A. Thavlov (DTU, Denmark), M. Florides, V. Venizelou, M. Patsalides, C. Anastassiou, G. Makrides, V. Efthymiou, G. E. Georghiou (University of Cyprus, Cyprus) (Submission-ID SIW16-189) • Study on Optimization Methods for Active Distribution Network with a Large Penetration of PV Y. Shiratori, T. Tsuji, T. Oyama (Yokohama National University, Japan), Y. Nishida (Tokyo Electric Power Company Holdings, Japan) (Submission-ID SIW16-81)
17:53 – 18:15	Discussions

19:30 – 23:00 SOLAR DINNER (Bus departure 19:00)

08:30 – 09:55	SESSION 5A – IRENA & GRID CODES
> Session Chair	Thomas Ackermann (Energynautics, Germany)
08:30 – 9:35	Presentations
	<ul style="list-style-type: none">• Scaling up Variable Renewable Power: The Role of Grid Codes (10 min) F. Boshell (IRENA, Germany) (Submission-ID SIW16-240)• The Role of Grid Codes for VRE Integration into Power Systems (15 min) P. Schierhorn, N. Martensen, T. Ackermann (Energynautics, Germany) (Submission-ID SIW16-241)• Status of Revision of the VDE-AR-N 4105 Application Guide for the Connection of Distributed Generation to Low Voltage Networks (20 min) J. Suckow (VDE/FNN, Germany), J. C. Boemer (EPRI, USA), (Submission-ID SIW16-239)• Status of Revision of IEEE Std 1547 and 1547.1 (20 min) J. C. Boemer, A. Huque, B. Seal, T. Key, D. Brooks (EPRI, USA), C. Vartanian (Mitsubishi Electric Power Products, USA) (Submission-ID SIW16-238)
09:35 – 09:55	Discussions

08:30 – 09:55	SESSION 5B – FORECASTING
> Session Chair	Bernhard Ernst (Fraunhofer IWES, Germany)
08:30 – 09:38	Presentations (17 min. each)
	<ul style="list-style-type: none">• Validation of Solar Irradiance Forecasts Using High-Resolution Numerical Prediction Models H. Ohtake, F. Uno (National Institute of Advanced Industrial Science and Technology (AIST), Y. Yamada (Meteorological Research Institute of the Japan Meteorological Agency, Japan) (Submission-ID SIW16-170)• Development of Solar Forecasting in India: The Introduction of REMCs M. Kaur, I. Mitra, M. Wypior, S. Kumar Sharma, A. Ramanan (GIZ, India) (Submission-ID SIW16-261)• A Combined Pyramidal Image Matcher and Analog Ensemble Method to Improve Satellite-Based Short-Term Solar Power Prediction in the Hawaiian Islands S. Young, J. Zack (AWS Truepower, USA) (Submission-ID SIW16-206)• Short-Term PV Power Prediction Analysis of Different Latitudes in the Condition of PV Power Curtailment Y. Cui, Z. Chen, P. Sun (Hubei Meteorological Service Center Meteorological Energy Development Center of Hubei Province, Wuhan, China) (Submission-ID SIW16-002)
09:38 – 09:55	Discussions

08:30 – 09:55	SESSION 5C – STORAGE SYSTEMS
> Session Chair	Name (Company, Country)
08:30 – 09:38	Presentations (17 min. each)
•	Solving the Community Storage Dilemma – Higher Utilization by Multiple Usage C. Stegner, A. Blockinger, J. Bogenrieder, P. Luchscheider (ZAE Bayern, Germany) (Submission-ID SIW16-148)
•	Limitations of Integrating Photovoltaic Energy into Municipal Grids Excluding and Including Storage Systems B. Böckl, J. Vopava, L. Kriechbaum, T. Kienberger (Montanuniversitaet Leoben, Austria) (Submission-ID SIW16-121)
•	Field Assessment of PV-Home Storage Systems C. Messner, J. Kathan, C. Seitzl, S. Hofmüller (AIT – Austrian Institute of Technology, Austria), J. Wolfahrt (Fronius International, Austria) (Submission-ID SIW16-221)
•	Integration of Storage into a Renewables Portfolio to Optimise Revenue & Grid Connection Utilisation S. Weatherhead, G. McFadzean, C. Cleary, L. Russell (TNEI Services, United Kingdom) (Submission-ID SIW16-59)
09:38 – 09:55	Discussions

09:55 – 10:15 Coffee Break

10:15 – 11:15	SESSION 6A – GRID CODES
> Session Chair	Roland Bründlinger (AIT – Austrian Institute of Technology, Austria)
10:15 – 11:00	Presentations (15 min. each)
•	The Barbados Grid Code as a Template for a Caribbean Grid Code – Following the Ideas of the ENTSO-E Grid Codes N. Martensen, T. Ackermann (Energynautics, Germany) (Submission-ID SIW16-242)
•	New Zealand Guideline for the Connection of PV Solar Power and Determining Hosting Capacity for PV Solar Power R. Strahan, S. McNab, S. Pandey, S. Lemon, A. Miller, N. Watson, A. Wood (University of Canterbury, New Zealand), T. Crownshaw (Transpower NZ, New Zealand) (Submission-ID SIW16-263)
•	State of the National Implementation of the NC RfG in Germany J. Möller, K. Genzmer (M.O.E. Moeller Operating Engineering, Germany) (Submission-ID SIW16-11)
11:00 – 11:15	Discussions

10:15 – 11:15	SESSION 6C – REGULATION AND ELECTRICITY MARKETS
> Session Chair	Paul Denholm (NREL, USA)
10:15 – 11:00	Presentations (15 min. each)
•	Merit Order of Grid Optimizing Measures for a Sustainable Grid Planning and Efficient Solar Integration S. Köppl, A. Zeiselmaier, A. Bogensperger, M. Müller, M. Hinterstocker, F. Samweber (Research Center for Energy Economics – FfE e.V., Germany) (Submission-ID SIW16-94)
•	Policies of PV Self-Consumption: Disruptive Potential on Balancing Systems M. Döring, M. Bons, S. Tiedemann (Ecofys Germany, Germany) (Submission-ID SIW16-232)
•	Constructing Offering Curves for a CSP Producer in Day-ahead Electricity Markets I. Dimoulkas, D. Khastieva, M. Amelin (KTH Royal Institute of Technology, Sweden) (Submission-ID SIW16-55)
11:00 – 11:15	Discussions

Short Break

11:15 – 12:15	SESSION 7 – CLOSING SESSION: FUTURE ROLE OF STORAGE FOR PV INTEGRATION
> Session Chair	Paul Gardner (DNV GL – Energy, United Kingdom)
11:15 – 11:45	
• Introduction: The landscape	P. Gardner (DNV GL – Energy, United Kingdom) (5 mins)
• Panelists	J. Charles Smith (UVIG, USA) Allan Miller (University of Canterbury, New Zealand) Francisco Boshell (IRENA, Germany)
11:45 – 12:15	Discussions

12:15 Lunch

POSTER PRESENTATIONS:

- **Symbiotic Operation of Large PV and Wind Power Plants**
R. Grab, F. Ackermann, S. Rogalla (Fraunhofer ISE, Germany) ([Submission-ID SIW16-24](#))
- **Techno-economic Optimum Control of Grid-connected Residential Battery Energy Storage Units**
I. Ranaweera, O.-M. Midtgård (Norwegian University of Science and Technology, Norway) ([Submission-ID SIW16-48](#))
- **East Asian Super Grid: Can Australia Become an Electricity Source for Asia?**
A. Gulagi, D. Bogdanov, C. Breyer (Lappeenranta University of Technology, Finland) ([Submission-ID SIW16-92](#))
- **Feeder Analyses of a Medium Voltage Grid with the Utilization of a Solar-Roof-Potential-Analyses**
F. Ebe, J. Morris, H. Ruf, G. Heilscher (Ulm University of Applied Sciences, Germany), F. Meier (Stadtwerke Ulm/Neu-Ulm Netze, Germany) ([Submission-ID SIW16-131](#))
- **Optimal Scheduling of Plug-in Electric Vehicles in Distribution Systems Including PV, Wind and Hydropower Generation**
S. Zaferanlouei, I. Ranaweera, M. Korpås, H. Farahmand (Norwegian University of Science and Technology, Norway) ([Submission-ID SIW16-166](#))
- **Copula Correlation Modeling of Aggregate Solar Irradiance in Spatial Networks**
J. Munkhammar, J. Widén (Uppsala University, Sweden) ([Submission-ID SIW16-169](#))
- **The Impact of Large-Scale Renewable Energy Integration on the Utilization of Pumped Hydro Storage in Spain**
E. Rye, A. Lie, H. G. Svendsen (SINTEF Energy Research, Norway), M. Korpås, H. Farahmand (Norwegian University of Science and Technology, Norway), ([Submission-ID 192](#))
- **Case Studies Analysis of Renewable Energy Implementation into the Mining Industry**
K. Zharan, J. Bongaerts (TU Bergakademie Freiberg, Germany) ([Submission-ID SIW16-213](#))
- **A Transient Stability Assessment Method of Power Systems by using Dynamical Systems Theory in Japanese 60Hz Power System with Photovoltaics**
A. Hatano, T. Tsuji, T. Oyama (Yokohama National University, Japan) ([Submission-ID SIW16-215](#))
- **Assessment of Probabilistic PV Production Forecasts Performance in an Operational Context**
A. Bocquet, A. Michiorri, A. Bossavy, R. Girard, G. Kariniotakis (MINES ParisTech, France) ([Submission-ID SIW16-230](#))
- **Development of a RDS-PP Guideline for Photovoltaic Power Plants**
C. Bertsch-Engel (CEE Operations, Germany), A. Böser (VGB PowerTech, Germany) ([Submission-ID SIW16-262](#))
- **Experimental Research on the Optimal Tilted Angle for PV Modules in Wuhan, China**
Z. Chen, P. Sun, C. Cheng (Hubei Meteorological Service Center | Meteorological Energy Development Center of Hubei Province, China), G.-G Yan (Wuhan Rixin Technology, China) ([Submission-ID SIW16-002x1](#))
- **Application and Effect Test of A Method of Gradually Approaching Error for the Solar Radiation Prediction**
Z. Chen, P. Sun, (Hubei Meteorological Service Center | Meteorological Energy Development Center of Hubei Province, China), R. Zhang (Hubei Provincial Meteorological Administration Training Center, China) ([Submission-ID SIW16-002x2](#))