DIGITAL PROCEEDINGS

8th Solar Integration Workshop

International Workshop on Integration of Solar Power into Power Systems

16 - 17 October 2018 | Stockholm, Sweden

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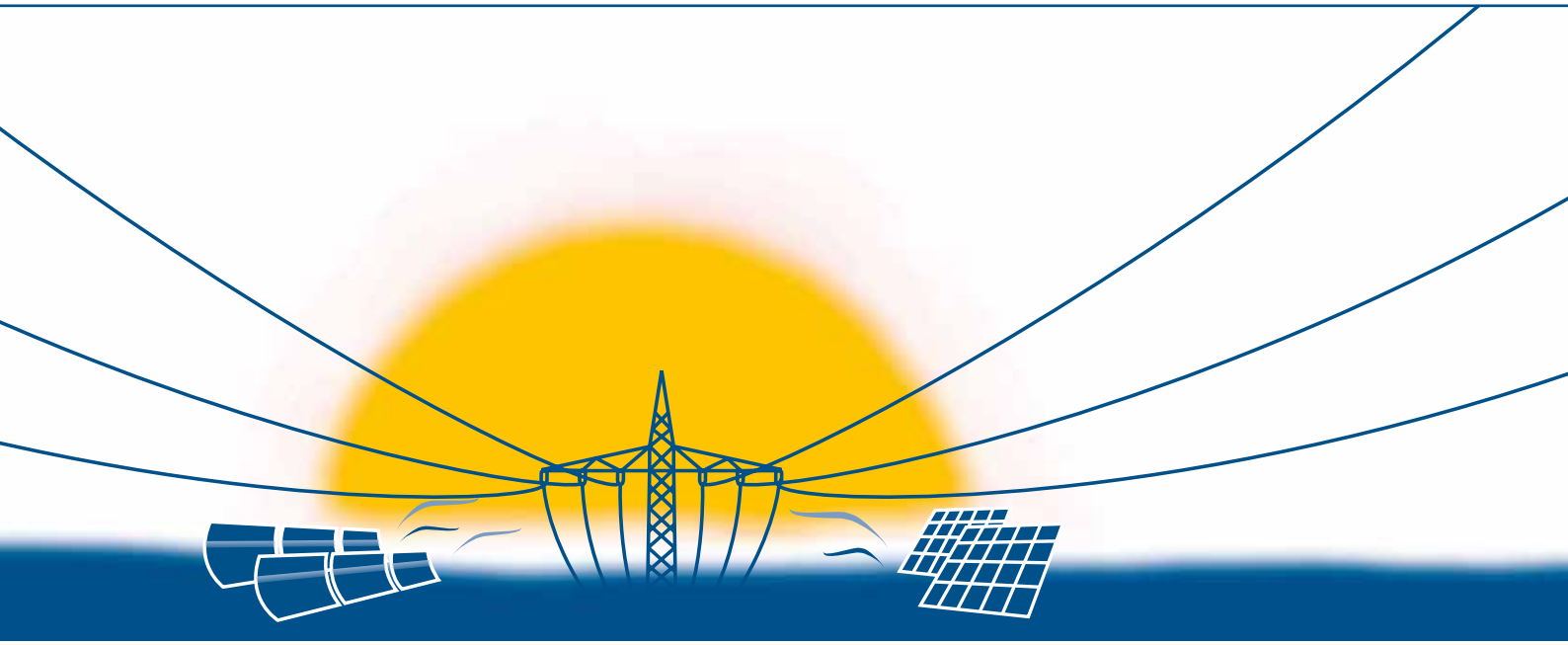

www.solarintegrationworkshop.org

Edited by Uta Betancourt / Thomas Ackermann

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8th Solar Integration Workshop

International Workshop on Integration of Solar Power into Power Systems

with Special Topic **STORAGE**

16 - 17 October 2018

Stockholm, Sweden

Welcome to Stockholm!

It is my great pleasure to welcome you to the **8th International Workshop on Integration of Solar Power into Power Systems** in Stockholm, Sweden.

The share of solar power in power systems is increasing at a remarkable speed in many countries worldwide. This results in the increasing need to discuss the technical and economic issues of the integration of solar power into power systems. The primary objective of this Workshop is to stimulate interdisciplinary thinking between industry and research by providing a platform for discussion and for sharing ideas and knowledge regarding the key issues in the field of large-scale integration of solar power.

I would like to thank you all for making this workshop to what it has become over the years: a great communion of like-minded PV/CSP/storage system developers and project developers, power systems operators and other professionals. With your commitment, your ideas and your papers and presentations, you fill the frame we set with life. The number of submitted abstracts has by far exceeded our expectations and enables us to offer you a great workshop program with more than 65 presentations in 17 sessions.

As conference planning and consulting company in RE grid integration, Energynautics is well aware that in our line of work it is crucial to keep pace with the times. That is why the Energynautics workshops have always succeeded in reflecting the shifting focuses in the area of RE grid integration. Last year, we took the next step towards a comprehensive yet diverse RE conference experience and commemorated the first edition of the E-Mobility Power System Integration Symposium as we feel it necessary to discuss the impact of a larger share of EVs in transportation on the grid.

Nowadays, it is more important than ever to pool our research and combine our forces to make change happen and give our planet a fair chance. That is why we maintain last year's Workshop setup and again offer three conferences in one week that go hand in hand. **The Grid Integration Week 2018** that also features the **2nd E-Mobility Symposium** and the **17th Wind Integration Workshop** offers many combination opportunities for its participants to account for the inherent synergies of the conference topics.

We work hard at these Workshops, but it is very important to me personally to give our participants the time to mingle and network in a more casual setting as well. On Tuesday, the spotlight will be on our poster presenters. Researchers and practitioners present their projects in poster sessions during the Workshop and at the especially dedicated Poster Reception on 16 October 2018. This Networking Event is a platform for poster presenters to showcase their findings and discuss them with workshop participants in a casual get-together. This year, we offer our poster presenters the opportunity to present their research in flash talks during the evening reception. For the second year in a row, we also offer a combined Solar and Wind Dinner (17 October 2018) that will take place at the spectacular Vasa Museum. It is the perfect opportunity to mingle with both solar and wind experts. I encourage you to make good use of these unique educational and networking opportunities!

The most interesting papers from the Solar and Wind Workshops will again be published in a Special Edition of the *IET Renewable Power Generation (due Jan/Feb 2020)*[1]. Because of the high interest in the workshop proceedings, we will again submit this year's proceedings to international libraries and organizations who operate citation index systems such as the (i) FIZ – Fach Informations Zentrum Karlsruhe, (ii) Elsevier, (iii) ETDE, (iV) Reuters, (V) Compendex, (Vi) Thomson Citation Index, (Vii) EBSCO Information Services so that the proceedings are more easily available for academia and industry worldwide.

[1] The first special edition based on the 2013 Workshop was published in January 2015 (Volume 9, Issue 1), the special edition from the 2014 Berlin Workshop was published in January 2016 (Volume 10, Issue 1), the special edition from the 2015 Brussels Workshop was published in February 2017 (Volume 11, Issue 3), the special edition from the 2017 Berlin Workshop will be published in March 2019, see http://digital-library.theiet.org/content/journals/iet-rpg

I would like to seize this opportunity and thank our local partners Lars Nordström and Lennart Söder of the Co-Organizer **KTH – Royal Institute of Technology** and Jonas Persson of Vattenfall for their great support! Special Thanks also go to our Giga Sponsor **DIgSILENT** (Germany). In addition, the workshop is supported by ENTSO-E (Belgium), ESIG – Energy Systems Integration Group (USA), the IET Digital Library (United Kingdom), Power Circle (Sweden), Renewables Grid Initiative (Germany) and Solar Power Europe (Belgium) as well as the media partner WindTech International (Netherlands).

I would also like to thank all those who supported the organizers of this workshop: all the members of the International Advisory Committee as well as Uta Betancourt, Ines Drewianka, Katharina Fischer and Anke Ost (all Energynautics, Germany).

Let me seize this opportunity to announce that next year's Solar Integration Workshop will take place in October/ November 2019 in Dublin, Ireland!

Enjoy some inspiring days in Stockholm and seize the numerous networking opportunities!

Thomas Ackermann
Energynautics

PS: Comments are always welcome, feel free to contact me at: t.ackermann@energynautics.com

TIMETABLE 8th SOLAR INTEGRATION WORKSHOP

TUESDAY, 16 OCTOBER 2018			
Solar Workshop Day 1			
08:00 – 09:00	FOYER		
	CHECK-IN & ON-SITE REGISTRATION		
09:00 – 09:10	M1		
	OPENING: WELCOME & INTRODUCTION		
09:10 – 10:50	M1		
	SESSION 1: KEYNOTE SESSION		
	10:50 – 11:20 Coffee Break		
11:20 – 13:00	M1	M2	M3
	SESSION 2A: POWER SYSTEM STUDIES I	**SESSION 2B: ANCILLARY SERVICE ASPECTS**	**SESSION 2C: PROJECT EXPERIENCE**
	13:00 – 13:15 Group Photo		
	13:15 – 14:00 Lunch		
14:00 – 15:40	M1	M2	M3
	SESSION 3A: POWER SYSTEM STUDIES II	**SESSION 3B: INNOVATIVE SOLUTIONS**	**SESSION 3C: CESEPS**
	15:40 – 16:05 Coffee Break		
16:05 – 18:15	M1	M2	M3
	SESSION 4A: DISTRIBUTION GRID ASPECTS	**SESSION 4B: GRID CODE ASPECTS**	**SESSION 4C: FORECASTING I**
18:15	**POSTER RECEPTION & NETWORKING**		

WEDNESDAY, 17 OCTOBER 2018			
Solar Workshop Day 2			
08:30 – 10:15	M1	M2	M3
	SESSION 5A: FREQUENCY CONTROL ASPECTS	**SESSION 5B: DECARBONIZATION OF ENERGY SECTOR**	**SESSION 5C: FORECASTING II**
	10:15 – 10:40 Coffee Break		
10:40 – 12:05	M1	M2	M3
	SESSION 6A: POWER QUALITY ISSUES	**SESSION 6B: MARKET AND REGULATORY ISSUES**	**SESSION 6C: HYBRID POWER SYSTEMS & STORAGE**
	12:05 – 12:15 Short Break		
12:15 – 13:15	M1		
	CLOSING SESSION – PANEL DISCUSSION: AUTONOMOUS GRID		
	13:15 – 14:00 Lunch		
14:00	M1		
	OPENING SESSION 17th WIND INTEGRATION WORKSHOP		

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TUESDAY, 16 OCTOBER 2018

09:10 – 10:50 SESSION 1 – KEYNOTE SESSION
> Session Chair Thomas Ackermann (Energynautics, Germany)

- **Can the Nordic Countries become CO_2 Negative by 2040?** Kenneth Karlsson (ETSAP / DTU, Denmark)
- **Status of Power System Transformation: Towards Growing Share of Wind and Solar Power**
  Peerapat Vithayasarichareon (IEA, France)
- **Overview: Grid Integration of Renewables in Australia** Jennifer Crisp (DIgSILENT Pacific, Australia)
- **TBA**
  TBA

The contributions and discussions of this session are not part of the proceedings.

11:20 – 13:00 SESSION 2A – POWER SYSTEM STUDIES I
> Session Chair TBA

- **Grid integration of Variable Renewables: The Role of Power System Flexibility**
  C. Hart, P. Vithayasrichareon (IEA, France)
- **Renewables Integration Grid Study for the 2030 Japanese Power System**
  R. Kuwahata, P. Merk (Elia Grid International, Germany), T. Wakeyama (Kyushu University, Japan), D. Pescia (Agora Energiewende, Germany), S. Rabe (GridLab, Gemany), S. Ichimura (Japan Renewable Energy Institute, Japan) (Submission-ID SIW18-17)
- **Interaction Analysis of Large-Scale PV Power Plants Considering the AC Network**
  J. Montero-Casinello, E. Prieto-Araujo, R. Ferrer-San-José, O. Gomis-Bellmunt (CITCEA-UPC, Spain) (Submission-ID SIW18-55)
- **Resource Adequacy at Continental Scale: Methodological Insights from Joint Assessments of Interconnected North American Power Systems**
  G. Stephen (NREL, USA) (Submission-ID SIW18-299)

11:20 – 13:00 SESSION 2B – ANCILLARY SERVICE ASPECTS
> Session Chair Julia Matvosyan (ERCOT, USA)

- **Highly Accurate Method for Real-Time Active Power Reserve Estimation for Utility-Scale PV Power Plants**
  V. Gevorgian (NREL, USA) (Submission-ID SIW18-31)
- **The Potential of Using Residential PV-Battery Systems to Provide Primary Frequency Control on a National Level**
  R. Luthander, S. Forsberg (Uppsala University, Sweden) (Submission-ID SIW18-110)
- **Impact of Inverters with Virtual Synchronous Machine Control in Low Voltage Grids**
  F. Rauscher, E. Rebak, B. Engel (TU Braunschweig – elenia, Germany) (Submission-ID SIW18-277)
- **Practical Implementation of the SNOOPI-Box for a Smart Voltage Control in the Distribution Grid**
  S. Hempel, J.-D. Schmidt, E. Tröster (Energynautics, Germany), M. Koch, U. Ohl (EWR Netze, Germany) (Submission-ID SIW18-325)

11:20 – 13:00 SESSION 2C – PROJECT EXPERIENCE
> Session Chair J. Charles Smith (ESIG, USA)

- **PV Integration with Flexible Generation and Consumption Units – Evaluation of a Quota-Based Grid Traffic Light Approach in a Field Test**
  K. Geschermann, K. Volk, C. Lakenbrink, M. Konermann (Netze BW, Germany) (Submission-ID SIW18-69)
- **Enhanced Feed-in Management in Low and Medium Voltage Distribution Grids for PV Integration and Ancillary Service Provision – Experience from a Field Test**
  L. Rupp, K. Volk, M. Konermann (Netze BW, Germany), J. Imfeld (Landis+Gyr, Switzerland) (Submission-ID SIW18-162)
- **Self-consumption and Self-sufficiency Level in an Energy Cell with a High Penetration of PV and a Hybrid Battery Storage System**
  L. Held, G. Weber, M. Zimmerlin, M. R. Suriyah, T. Leibfried (Karlsruhe Institute of Technology – KIT, Germany), M. Armbruster, R. Höche (Stadtwerke Bühl, Germany) (Submission-ID SIW18-171)
- **Comparative Study of Three Methods of Increasing the Solar PV Hosting Capacity of an LV Grid**
  A.Kitimbo, U. Morild (Vattenfall R&D, Sweden) (Submission-ID SIW18-94)

14:00 – 15:40 SESSION 3A – POWER SYSTEM STUDIES II
> Session Chair Michael Nørtoft Frydensbjerg (Vattenfall, Denmark)

- **High Penetration of Photovoltaic Energy and Supply-Demand Balance in the Western Japan Grid, with Utilizing Interzone Transmission and Demand Response**
  A. Takehama (Ritsumeikan University, Japan), M. Utagawa (National Institute of Advanced Industrial Science and Technology – AIST, Japan) (Submission-ID SIW18-274)
- **Impacts of Distributed Solar Advanced Inverters on Transmission Voltage and Reactive Power**
  B. Palmintier, I. Krad, D. Krishnamurthy (NREL, USA) (Submission-ID SIW18-227)
- **Japanese Power System Operation with Large Amounts of PV using Day-ahead and Intraday Unit Commitment**
  Y. Udagawa, Y. Nishitsuji, K. Ogimoto, J. Gari da Silva Fonseca Junior (The University of Tokyo, Japan), K. Ukegawa (Kozo Keikaku Engineering, Japan), S. Fukutome, (JP Business Service Corporation, Japan) (Submission-ID SIW18-59)
- **Investigation of Balancing Power Demand in the Roll-out Scenario of Solar Energy in Senegal**
  B. Koeppen, A. K. Usbeck (Hamburg University of Applied Sciences – HAW, Germany), M. L. Ndiaye, A. Ndiaye (Cheikh Anta Diop University –UCAD, Senegal) (Submission-ID SIW-53)

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> Session Chair TBA

- **Secure Energy Information Network in Germany – Demonstration of Solar-, Storage- and E-Mobility Applications**
  G. Heilscher, S. Chen, F. Ebe, H. Lorenz (Ulm University of Applied Sciences, Germany), S. Hess, T. Kaufmann (Zenner Hessware, J. Wening (Meteocontrol, Germany) (Submission-ID SIW18-317)
- **Coordinated Power System Services from Distributed Batteries**
  P. Nørgaard (Technical University of Denmark – DTU, Denmark), M. Florides (University of Cyprus, Cyprus) (Submission-ID SIW18-268)
- **Evaluation of Datasets and Methods to Derive 3D Building Models and their Influence on PV Power Integration Studies**
  D. Lingfors, J. Widén (Uppsala University, Sweden) (Submission-ID SIW18-193)

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> Session Chair Cihan Gercek (University of Twente, Netherlands)

- **Capabilities of Strict Power Limits at Prosumer Households for Solving Network Load Issues at LV grids: An Austrian Case Study**
  D. Reihs, S. Übermasser, S. Henein (AIT Austrian Institute of Technology, Austria) (Submission-ID SIW18-313)
- **Evaluation of Heat Pumps for Balancing Grids in Combination with Solar Energy Production: A Dutch Case Study**
  C. Gercek, A. Reinders (University of Twente, Netherlands) (Submission-ID SIW18-260)
- **Stability of Grid-connected Photovoltaic Inverters During and After Low Voltage Ride Through**
  Z. Zhang, R. Schürhuber, L. Fickert (Graz University of Technology, Austria), Y. Zhang (Shanghai DianJi University, China) (Submission-ID SIW18-248)

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> Session Chair TBA

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  A. Scheidler, J. Ulffers, J. Dasenbrock, D. Horst, C. Pape (Fraunhofer IEE Kassel, Germany), M. Braun (Fraunhofer IEE Kassel | University of Kassel, Germany) (Submission-ID SIW18-297)
- **Calculating the Hosting Capacity of Electrical Network with High Penetration of Solar PV**
  N. Etherden, J. Ahlberg (Vattenfall R&D, Sweden), D. Lingfors (Uppsala University, Sweden), K. Kvamme (Powel A/S, Norway) (Submission-ID SIW18-234)
- **Integration of PV+Storage – Technical and Economic Evaluation at Distribution Grids**
  G. Yang, P. Hou (Techincal University of Denmark – DTU, Denmark), D. Sera, J. P. Rodrigues Martins (Aalborg University, Denmark), P. Douglass, S. Martens (Danish Energy, Denmark), P. M. Johansen, D. K. Svendsen (Integrate, Denmark), K. Moth (LivingPower Aps, Denmark) (Submission-ID SIW18-72)
- **Coordinated Reactive Power Control of Solar PV for Thermal and Voltage Constraint Management in Distribution Network**
  N. Hieu Xuan (Yokohama National University, Japan | Vietnam National University of Agriculture, Vietnam), T. Tsuji (Yokohama National University, Japan) (Submission-ID SIW18-233)
- **Identification of a Dynamic Equivalent of an Active Distribution Network from Monte-Carlo Simulations**
  G. Chaspierre (University of Liège, Belgium), G. Denis, P. Panciatici (RTE R&D, France), T. Van Cutsem (University of Liège, Belgium) (Submission-ID SIW18-86)
- **Evaluation of Power Flow Prognosis Methods for Congestion Management in Low Voltage Grids**
  K. Volk, C. Lakenbrink, N. Hatje (Netze BW, Germany), F. Sivorotka (Seven2one Informationssysteme, Germany),P. Stolle (Fichtner IT Consulting, Germany), K. Förderer (FZI Research Center for Information Technology, Germany) (Submission-ID SIW18-85)

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> Session Chair TBA

- **Solar Inverter Interactions with DC Side – Some Regulatory Challenges**
  J. Crisp, R. Sharma, T. George, S. Hagaman (DIgSILENT Pacific, Australia), H. Nguyen (Leeson Group, Australia) (Submission-ID SIW18-270)
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  L. Guise (Schneider-Electric, France), F. Cleveland (Xanthus Consulting, USA) (Submission-ID SIW18-254)
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  R. Bründlinger (AIT Austrian Institute of Technology, Austria), G. Arnold, N. Schäfer (Fraunhofer IEE, Germany, Germany), T. Schaupp (KACO New Energy, Germany),G. Graditi, G. Adinolfi (ENEA, Italy) (Submission-ID SIW18-82)
- **Generator Technical Performance Standards in the Australian National Electricity Market**
  J. Eggleston (Australian Energy Market Commission – AEMC , Australia) (Submission-ID SIW18-41)
- **Pre-Certification of Grid Code Compliance for Solar Inverters with an Automated Controller-Hardware-in-the-Loop Test Environment**
  R. Bruendlinger, J. Stöckl, Z. Miletic, R. Ablinger, F. Leimgruber (AIT Austrian Institute of Technology, Austria), J. Johnson (Sandia National Laboratories, USA), J. Shi (EPRI, USA) (Submission-ID SIW18-169)

16:00 – 18:00 SESSION 4C: FORECASTING I
> Session Chair TBA

- **Evaluation of the Impact of Intra-Day Distributed PV and Wind Generation Forecasts on Decision-making in the Operations of an Island Grid System**
  J. Zack (UL, USA) (Submission-ID SIW18-165)
- **System Imbalance from Solar Energy Trading**
  T. Landelius, S. Andersson (Swedish Meteorological and Hydrological Institute – SMHI, Sweden), R. Abrahamsson (Tekniska Verken Linköping Nät AB, Sweden) (Submission-ID SIW18-185)
- **Very Short-Term Solar Power Forecasting Using Ground-based Sky Images**
  D. M. Lasanthika H.Dissawa, A. P.Agalgaonkar, D. A. Robinson, S. Perera, (University of Wollongong, Australia), R. I. Godaliyadda, P. B. Ekanayake, J. Ekanayake (University of Peradeniya, Sri Lanka) (Submission-ID SIW18-271)
- **On the Improvement of Day-ahead Forecasts of Solar Irradiation with Simple Ensembles and Training Data Selection in Japan: A Countrywide Assessment**
  J. Gari da Silva Fonseca Júnior, K. Ogimoto (The University of Tokyo, Japan), F. Uno, T. Oozeki (National Institute of Advanced Industrial Science and Technology – AIST, Japan) (Submission-ID SIW18-273)
- **Development of Nowcasting Method of Irradiance Distribution based on Kriging and All-sky Image Information**
  T. Kato, M.Imanaka, M. Kurimoto, S. Sugimoto (Nagoya University, Japan) (Submission-ID SIW18-239)

WEDNESDAY, 17 OCTOBER 2018

08:30 – 10:15 SESSION 5A – FREQUENCY CONTROL ASPECTS
> Session Chair Math Bollen (Luleå University of Technology, Sweden)

- **The Provision of Primary Frequency Control in the Australian National Electricity Market**
  J. Eggleston, B. Hiron (Australian Energy Market Commission – AEMC, Australia) (Submission-ID SIW18-42)
- **Managing Frequency in Low Inertia Grids**
  S. Hagaman, T. George, J. Crisp (DIgSILENT Pacific, Australia) (Submission-ID SIW18-57)
- **Contribution of Photovoltaic Power Systems to Frequency Control**
  J. Seidel, B. Engel (TU Braunschweig , Germany) (Submission-ID SIW18-38)
- **Experiences with large Grid Forming Inverters on the Island St. Eustatius, Portability to Public Power Grids**
  O. Schömann, T. Bülo, C. Hardt, A. Falk, P. R. Stankat, (SMA Solar Technology, Germany) (Submission-ID SIW18-252)

08:30 – 10:15 SESSION 5B – DECARBONIZATION OF ENERGY SECTOR
> Session Chair

- **The Role of Climate Variability in the Assessment of Roadmaps for Power Systems with High Renewable Penetration**
  R. Figueiredo, P. Nunes, M. C. Brito (University of Lisbon, Portugal) (Submission-ID SIW18-194)
- **Effects on Greenhouse Gas Emissions of Introducing Lithium-ion Batteries for Stationary Power System Applications**
  S. Davidsson (Chalmers University of Technology, Sweden) (Submission-ID SIW18-283)
- **Demand-side Management and Energy Storage Options for Building's Photovoltaic Integration.**
  Z. Hoyos, P. S. Moura (University of Coimbra, Portugal) (Submission-ID SIW18-120)
- **Climate Change Mitigation Potentials of Vertical Building Integrated Photovoltaic**
  T. Blanke, B. Dring (FH Aachen, Germany), M. Vontein, M. Kuhnhenne (RWTH Aachen University, Germany) (Submission-ID SIW18-77)
- **Simplification Methods for Optimal Dimensioning of Energy Storage Systems and Heating Devices using Time Series Load and Infeed Data**
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08:30 – 10:15 SESSION 5C – FORECASTING II
> Session Chair John Zack (UL AWS Truepower, USA)

- **Improvements for Online Feed-in Estimations Based on PV Power Output Measurements**
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- **Using Solar and Load Predictions in Battery Scheduling at the Residential Level**
  R. Bean (Redback Technologies, Australia), H. Khan (University of Queensland, Australia) (Submission-ID SIW18-137)
- **Integration of Short-term PV Forecasts in Control Strategies of PV-Diesel Systems**
  P. Besson (SteadySun, France), T.-P. Do, G. A. Koucoi, F. Bourry (National Institute of Solar Energy – INES, France) (Submission-ID SIW18-315)
- **Solar Ensemble Forecasting for Distribution Power System Volt and Var Control**
  B. Uzunoglu (Uppsala University, Sweden), M. Blaschek, C. Kusmitsch (UBIMET, Austria), A. Terciyanli (ENDOKS, Turkey) (Submission-ID SIW18-310)

10:40 – 12:05 SESSION 6A -POWER QUALITAY ISSUES
> Session Chair Bernd Engel (TU Braunschweig, Germany)

- **Hosting Capacity of the Grid for Photovoltaic Installations – a Stochastic Approach Applied to Single-phase Connections**
  M. H. J. Bollen, E. Mulenga, S. K. Rönnberg (Luleå University of Technology, Sweden), N. Etherden (Vattenfall R&D, Sweden) (Submission-ID SIW18-46)
- **Should Waveform Distortion (Harmonics) be Considered when Connecting Large Amounts of Solar PV?**
  S. K. Rönnberg, T. Busatto, M. H. J. Bollen (Luleå University of Technology, Sweden) (Submission-ID SIW18-99)
- **Power Quality Measurement Campaign at a Jordan LV Grid and Determination of the Influence of a Large PV Plant**
  D. Masendorf, E. Tröster (Energynautics, Germany), S. Jankovic (International Energy Consultants, Germany) (Submission-ID SIW18-250)

10:40 – 12:05 SESSION 6B – MARKET AND REGULATORY ISSUES
> Session Chair Julian Eggleston (Australian Energy Market Commission – AEMC , Australia)

- **How to Create Value through Aggregation: A Business Model Review for Multiple Regulatory Environments in Europe**
  S. De Clercq (3E, Belgium), D. Schwabeneder, C. Corinaldesi (TU Vienna, Austria), O. Bertetti, A. Woyte (3E, Belgium) (Submission-ID SIW18-44)
- **A Comparative Analysis of PV Markets in Brazil and Sweden**
  S. Silveira (KTH Royal Institute of Technology, Sweden), W. Uturbey, H. Batista da Silva, L. S. Marques (UFMG Federal University of Minas Gerais, Brazil) (Submission-ID SIW-294)
- **Transmission, Distribution and Markets: Coordination needs in the European Power System**
  E. Lannoye, A. O'Connell (EPRI International, Ireland), M. Doering (Navigant, Germany) (Submission-ID SIW18-170)
- **A Comparative Assessment of the Small-Scale Distributed Generation Policies in the EU and Latvia**
  L. Zemite, L. Petricenko, A. Sauhats, O. Linkevics,G. Bockarjova (Riga Technical University – RTU, Latvia) (Submission-ID SIW18-117)

10:40 – 12:05 SESSION 6C – HYBRID POWER SYSTEMS AND STORAGE SOLUTIONS
> Session Chair TBA

- **Summary of Tenerife Hybrid Power Stems Workshop**
  T. Ackermann (Energynautics, Germany)
- **Sensitivities in Hybrid Energy Systems**
  M. A. Lagler, E. Schmautzer, R. Schürhuber (Graz University of Technology, Austria) (Submission-ID SIW18-9)
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- **Decentralized Secondary Frequency Control in an Optimized Diesel PV Hybrid System**
  A. V. Turnell, P.-P. Schierhorn, D. Masendorf (Energynautics, Germany), K. Morozovska (KTH Royal Institute of Technology, Sweden) (Submission-ID SIW18-326)

12:15 – 13:15 SESSION 7 – PANEL DISCUSSION: AUTONOMOUS GRID
> Session Chair Adrian Timbus (ABB, Switzerland)

- **Panelists**
  - Adrian Timbus (ABB, Switzerland)
  - Fredrick Carlsson (Vattenfall, Sweden)
  - Math Bollen (Luleå University of Technology, Sweden)

  more TBA

The contributions and discussions of this session are not part of the proceedings.

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