

# 9<sup>th</sup> Solar & Storage Integration Workshop

International Workshop on Integration  
of Solar Power and Storage into Power Systems

15 - 16 Oct 2019

Dublin, Ireland

SPECIAL SESSION BY:



## PRELIMINARY PROGRAM AS OF 14 OCTOBER 2019

Important: This preliminary program is subject to changes. It is strongly recommended to check back regularly.

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# TIMETABLE 9<sup>th</sup> SOLAR & STORAGE INTEGRATION WORKSHOP

TUESDAY, 15 OCTOBER 2019				WEDNESDAY, 16 OCTOBER 2019	
Solar Workshop Day 1				Solar Workshop Day 2	
08:00 – 09:00	FOYER				
	REGISTRATION				
09:00 – 09:15	REDWOOD B/C			REDWOOD A	REDWOOD B
	OPENING: WELCOME AND INTRODUCTION			09:00 – 10:40	SESSION 5A: <i>SPECIAL SESSION BY IRENA:</i> EXPERIENCES AND BEST PRACTICES FROM FRONT-RUNNER COUNTRIES FOR SOLAR AND WIND INTEGRATION
09:15 – 11:00	REDWOOD B/C				
	SESSION 1: KEYNOTE SESSION				
GROUP PHOTO & COFFEE BREAK (40 MIN)				COFFEE BREAK (30 MIN)	
11:40 – 13:00	REDWOOD A	REDWOOD B	REDWOOD C	11:10 – 12:10	REDWOOD B/C
	SESSION 2A: FORECASTING	SESSION 2B: BALANCING AND ANCILLARY SERVICE	SESSION 2C: DISTRIBUTION GRID ASPECTS I		SESSION 6: CLOSING SESSION – PANEL DISCUSSION
LUNCH (60 MIN)				LUNCH (2 H)	
14:00 – 15:40	REDWOOD A	REDWOOD B	REDWOOD C	14:00	REDWOOD A/B/C
	SESSION 3A: POWER SYSTEM STUDIES I	SESSION 3B: STORAGE ASPECTS	SESSION 3C: MARKET ASPECTS		OPENING SESSION 18 <sup>TH</sup> WIND INTEGRATION WORKSHOP
COFFEE BREAK (30MIN)					
16:10 – 18:00	REDWOOD A	REDWOOD B	REDWOOD C		
	SESSION 4A: POWER SYSTEM STUDIES II	SESSION 4B: HYBRID POWER PLANTS / SYSTEMS	SESSION 4C: DISTRIBUTION GRID ASPECTS II		
18:00	NETWORKING & POSTER RECEPTION				

## TUESDAY, 15 OCTOBER 2019

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**08:00 – 09:00** Registration

**09:00 – 09:15** Welcome Thomas Ackermann (Energynautics, Germany)

**09:15 – 11:00** SESSION 1 – KEYNOTE SESSION

> Session Chair Thomas Ackermann (Energynautics, Germany)

**09:15 – 10:45** Presentations (18 min each)

- **Accommodation of Solar Rooftop Photovoltaic on ESB Networks**  
S. Pukhrem, A. Walsh (ESB Networks, Ireland) (Submission-ID SIW19-67)
- **Innovative System Services for Facilitating Integration of High Levels of Wind Generation**  
N. Delaney (EirGrid Plc., Ireland) (Submission-ID SIW19-105)
- **System Services – An Investors Perspective**  
P. Harte (Ireland)
- **Status of Power System Transformation: The Energy Transition to Boost System Flexibility**  
P. Vithayasrichareon (IEA, France)
- **The Evolving Role of Northern Ireland's Distribution Network**  
Roger Henderson (Northern Ireland Electricity (NIE) Networks, Northern Ireland)

**10:45 – 11:00** Discussions

### **11:00– 11:40** GROUP PHOTO / COFFEE BREAK

**11:40 – 13:00** SESSION 2A: FORECASTING

> Session Chair Jonathon Dyson (Greenview Strategic Consulting, Australia)

**11:40 – 12:40** Presentations (20 min. each)

- **Probabilistic Semi-Dynamical Nowcasts of Solar Radiation Globally via Freemium Web API Distribution**  
H. Jack, N. Engerer, J. Luffman (Solcast, Australia) (Submission-ID SIW19-244)
- **PV Power Forecast Comparison of Physical and Machine Learning Models**  
K. Winter, D. Beinert, S. Vogt, R. Fritz (Fraunhofer IEE, Germany) (Submission-ID SIW19-123)
- **Optimized Regional Photovoltaic Forecast Model: Forecasting Actual Feed-In Considering Self-Consumption**  
R. Fritz, G. Good, S. Vogt, K. Winter (Fraunhofer IEE, Germany) (Submission-ID SIW19-243)

**12:40– 13:00** Discussions

<b>11:40 – 13:00</b>	<b>SESSION 2B: BALANCING AND ANCILLARY SERVICE</b>
> Session Chair	J. Charles Smith (ESIG, USA)
<b>11:40 – 12:40</b>	<b>Presentations (20 min. each)</b>
	<ul style="list-style-type: none"> <li>• <b>Electricity Balancing Capacity, Emissions, and Cost Comparison of Three Storage-Based Local Energy Systems for Variable Power Generation</b> S. W. Monie, A. M. Nilsson, M. Åberg (Uppsala University, Sweden) (Submission-ID SIW19-219)</li> <li>• <b>Integration of Flexibility into an Energy System with High Shares of Solar PV – Contributions from the Project C/sells</b> M. Hinterstocker, K. Ganz, T. Kern, P. Dossow, S. von Roon (FfE, Germany) (Submission-ID SIW19-30)</li> <li>• <b>The Value of a New East-West Facing Single Axis PV Tracker Setup</b> P. Nørgaard, P. Behrendorff Poulsen, N. Riedel (Technical University of Denmark, Denmark), J. Vedde (European Energy, Denmark) (Submission-ID SIW19-61)</li> </ul>
<b>12:40– 13:00</b>	<b>Discussions</b>

<b>11:40 – 13:00</b>	<b>SESSION 2C: DISTRIBUTION GRID ASPECTS I</b>
> Session Chair	Eckehard Tröster (Energynautics, Germany)
<b>11:40 – 12:40</b>	<b>Presentations (20 min. each)</b>
	<ul style="list-style-type: none"> <li>• <b>Centralised vs Autonomous Control of Distribution Systems to Increase PV Hosting Capacity</b> A. O'Connell (Electric Power Research Institute, Ireland), J. Smith (Electric Power Research Institute, United States) (Submission-ID SIW19-118)</li> <li>• <b>Shading Losses for Different Types of Residential PV Inverter Systems and its City-Wide Impact on PV Potential</b> N. Etherden, M. Aboukrat, V. Cebollada (Vattenfall R&amp;D, Sweden), D. Lingfors (Uppsala University, Sweden), B. O. Karlsson (University of Gävle, Sweden) (Submission-ID SIW19-185)</li> <li>• <b>Estimating the Impacts of Single Phase Electric Vehicle Charging and Photovoltaic Installations on an Unbalanced 3-Phase Distribution Grid</b> M. Shepero, U. Ramadhani, J. Munkhammar, J. Widén (Uppsala University, Sweden) (Submission-ID SIW19-68)</li> </ul>
<b>12:40– 13:00</b>	<b>Discussions</b>

## 13:00 – 14:00 LUNCH BREAK

<b>14:00 – 15:40</b>	<b>SESSION 3A POWER SYSTEM STUDIES I</b>
> Session Chair	Babak Badrzadeh (AEMO, Australia)
<b>14:00 – 15:20</b>	<b>Presentations (20 min. each)</b>
	<ul style="list-style-type: none"> <li>• <b>Interaction Analysis of Large-Scale PV Power Plants Considering Communication Delays and Operational Points</b> J. Montero-Cassinello, M. Cheah-Mané, E. Prieto-Araujo, O. Gomis-Bellmunt (CITCEA-UPC, Spain) (Submission-ID SIW19-104)</li> <li>• <b>Solar Power Plant Harmonic Emission – Design and Commissioning Case Study</b> J. Leung, D. Chong, T. George (DgSILENT Pacific, Australia) (Submission-ID SIW19-182)</li> <li>• <b>Evaluating Fast Frequency Control Strategies for Solar PV and Battery Storage within an Inverter-Dominated Power System</b> A. U. N. Ibn Saif, R. Li, D. Flynn (University College Dublin, Ireland) (Submission-ID SIW19-144)</li> <li>• <b>Provision of Frequency Control by Multi-Inverter Photovoltaic Power Plants based on Real-Time Estimation of Maximum Available Power</b> A. Rossé, G. Delille (Électricité de France (EDF), France), C. Shu (EDF Renewables, France), L. Arnaud (EDF Store &amp; Forecast, France) (Submission-ID SIW19-52)</li> </ul>
<b>15:20 – 15:40</b>	<b>Discussions</b>

<b>14:00 – 15:40</b>	<b>SESSION 3B: STORAGE ASPECTS</b>
<b>&gt; Session Chair</b>	<b>Paul Gardner (Paul Gardner Energy Consulting, United Kingdom)</b>
<b>14:00 – 15:20</b>	<b>Presentations (20 min. each)</b>
	<ul style="list-style-type: none"> <li> <b>Upgrade of a Grid-Connected Storage Solution with Grid-Forming Function.</b>  <b>C. Cardozo</b>, G. Denis, T. Prevost, (RTE R&amp;D, France), M. Zubiaga, J. J. Valera (Ingeteam, Spain), Y. Vernay (RTE CNER, France) (<a href="#">Submission-ID SIW19-205</a>) </li> <li> <b>Optimized Positioning for Storage Systems in an LVDC Traction Grid with Non-Receptive Power Sources and Photovoltaic Systems</b>  M. Salih, <b>D. Baumeister</b>, M. Wazifehdust, M. Koch, P. Steinbusch, M. Zdrallek (University of Wuppertal, Germany), S. Mour (SWS Netze Solingen, Germany), C. Troullier (Stadtwerke Solingen, Germany) (<a href="#">Submission-ID SIW19-159</a>) </li> <li> <b>A Study on Sizing of Substation for PV Generators with Optimized Operation of BESS</b>  <b>Y. Yoo</b> (Korea University, Republic of South Korea), S. Jung (National Hanbat University, Republic of South Korea), H. Moon, G. Jang (Korea University, Republic of South Korea) (<a href="#">Submission-ID SIW19-176</a>) </li> <li> <b>Enabling Rising Penetration and Added Value of Photovoltaic Generation by Implementation of Advanced Storage Systems (Erigenaia)</b>  <b>M. Florides</b>, K. Oureilidis, V. Efthymiou, G. E. Georghiou (University of Cyprus (UCY), Cyprus), B. Kubicek, J. Kathan, S. Ubermasser (Austrian Institute of Technology (AIT), Austria), I. Ilicic (Cybrotech, United Kingdom), P. Rechberger, H. Heigel (Fronius International, Austria), A. Violaris, I. Papageorgiou (Electricity Authority of Cyprus (EAC), Cyprus), K. C. Bayindir (Ankara Yildirim Beyazit University, Turkey), A. Kilic, G. Batar, A. Bayramoglu (ADM Elektrik Dagitim, Turkey), S. Baykal, A. Terciyarli (T4E Technology for Efficiency, Turkey) (<a href="#">Submission-ID SIW19-179</a>) </li> </ul>
<b>15:20 – 15:40</b>	<b>Discussions</b>

<b>14:00 – 15:40</b>	<b>SESSION 3C: MARKET ASPECTS</b>
<b>&gt; Session Chair</b>	<b>Peerapat Vithayasrichareon (IEA, France)</b>
<b>14:00 – 15:20</b>	<b>Presentations (20 min. each)</b>
	<ul style="list-style-type: none"> <li> <b>Field Test to Demonstrate a Smart Market Platform via Smart Meter Infrastructure</b>  <b>T. Estermann</b>, S. Köppl, A. Bruckmeier, D. Wohlschlager (Forschungsstelle für Energiewirtschaft / Research Center for Energy Economics (FfE), Germany) (<a href="#">Submission-ID SIW19-80</a>) </li> <li> <b>Solving the Challenges of Successfully Delivering BESS Projects in Competitive Electricity Markets</b>  <b>H. Mackenzie</b> (HARD software, Australia) (<a href="#">Submission-ID SIW19-164</a>) </li> <li> <b>Rooftop PV Business Models in India and Brazil - A Comparative Analysis</b>  J. Thakur (KTH Royal Institute of Technology, Sweden), H. Batista (UFMG Federal University de Minas Gerais, Brazil), S. Silveira (KTH Royal Institute of Technology, Stockholm, Sweden), <b>W. Uturbey</b> (UFMG Federal University de Minas Gerais, Brazil) (<a href="#">Submission-ID SIW19-111</a>) </li> <li> <b>Investment in Solar and Wind Generation in Australia – Lessons Learned</b>  <b>J. Eggleston</b>, T. Nelson, T. Walker, G. Williams (Australian Energy Market Commission (AEMC), Australia) (<a href="#">Submission-ID SIW19-18</a>) </li> </ul>
<b>15:20 – 15:40</b>	<b>Discussions</b>

**15:40 – 16:10 COFFEE BREAK**

<b>16:10 – 18:00</b>	<b>SESSION 4A: POWER SYSTEM STUDIES II</b>
<b>&gt; Session Chair</b>	<b>Carmen Cardozo (RTE, France)</b>
<b>16:10 – 17:30</b>	<b>Presentations (20 min. each)</b>
	<ul style="list-style-type: none"> <li>• <b>Validation of Solar Power Plant Dynamic Model Using Commissioning Test Measurements</b> D. Chong, J. Leung, T. Bertes, L. Mardira (DigSILENT Pacific, Australia) (Submission-ID SIW19-181)</li> <li>• <b>General Flexibility Model Analysis for Mass PV Deployment</b> K. Ogimoto, J. Gari daSilva Fonseca Junior, K. Kataoka (The University of Tokyo, Japan), H. Azuma, A. Isonaga (JP Business Service, Japan) (Submission-ID SIW19-253)</li> <li>• <b>Modelling of 100% Renewable Energy in Australia</b> B. Lu, A. Blakers, M. Stocks, C. Cheng, A. Nadolny (Australian National University, Australia) (Submission-ID SIW19-245)</li> <li>• <b>Next Generation Utility Scale PV- and Storage Systems: New Steps towards a 100% Renewable Generation</b> T. Bülo, A. Knobloch, C. Hardt, A. Falk, O. Schömann, L. Grebe (SMA Solar Technology, Germany) (Submission-ID SIW19-261)</li> </ul>
<b>17:30 – 18:00</b>	<b>Discussions</b>

<b>16:10 – 18:00</b>	<b>SESSION 4B: HYBRID POWER PLANTS/SYSTEMS</b>
<b>&gt; Session Chair</b>	<b>Julian Eggleston (Australian Energy Market Commission (AEMC), Australia)</b>
<b>16:10 – 17:30</b>	<b>Presentations (20 min. each)</b>
	<ul style="list-style-type: none"> <li>• <b>Status of Hybrid Power Systems – Summary of Hybrid Power System Workshop</b> T. Ackermann (Energynautics, Germany)</li> <li>• <b>Implementation of Utility Scale Hybrids – Experience in the Australian NEM</b> J. Dyson (Greenview Strategic Consulting, Australia) (Submission-ID SIW19-264)</li> <li>• <b>Aspects of System Sizing for Complete Autonomy of Islands Grids, Discussed by Using the Example of PV-Integration into the Faroe Islands</b> H. G. Beyer (University of the Faroe Islands, Faeroe Islands) (Submission-ID SIW19-147)</li> <li>• <b>High Penetration of PV in Tropical Island Systems: Experiences from Indonesia</b> P.-P. Schierhorn, A. Vieira Turnell, D. Masendorf, T. Ackermann (Energynautics, Germany)</li> </ul>
<b>17:30 – 18:00</b>	<b>Discussions</b>

<b>16:10 – 17:35</b>	<b>SESSION 4C: DISTRIBUTION GRID ASPECTS II</b>
<b>&gt; Session Chair</b>	<b>Alison O'Connell (EPRI, Ireland)</b>
<b>16:10 – 17:15</b>	<b>Presentations (20 min. each)</b>
	<ul style="list-style-type: none"> <li>• <b>Empirical Analysis of Voltage Variations in Low Voltage Distribution Grids from Photovoltaic</b> M. Alhamwi, N. Etherden (Vattenfall R&amp;D, Sweden), E. Mulenga, M. H. J. Bollen (Luleå University of Technology, Sweden) (Submission-ID SIW19-216)</li> <li>• <b>Navigating IEEE 1547: Grid Readiness for Distributed Energy Resources</b> A. Tuohy (EPRI, USA) (Submission-ID SIW19-78)</li> <li>• <b>Impact Assessment of High Penetration of Photovoltaic Power Generations on Residual Load Profile of Various Distribution Networks based on Statistical Data</b> T. Kato, M. Imanaka, M. Kurimoto, S. Sugimoto (Nagoya University, Japan) (Submission-ID SIW19-150)</li> </ul> <p><b>Poster Flash Talk (5 min.):</b></p> <ul style="list-style-type: none"> <li>• <b>Tapping Flexibility Potential of Decentralized Controllable Loads for Smart Markets through Aggregation</b> M. Müller, A. Zeiselmaier, J. L. Pedraza Gómez (Forschungsstelle für Energiewirtschaft / Research Center for Energy Economics (FfE), Germany) (Submission-ID SIW19-33)</li> </ul>
<b>17:15 – 17:35</b>	<b>Discussions</b>

## **18:00          Networking & Poster Reception**

## WEDNESDAY, 16 OCTOBER 2019

<b>09:00 – 10:40</b>	<b>SESSION 5A: EXPERIENCES AND BEST PRACTICES FROM FRONT-RUNNER COUNTRIES FOR SOLAR AND WIND INTEGRATION</b>	 International Renewable Energy Agency
> Session Chair	Emanuele Taibi (IRENA)	
<b>09:00 – 10:20</b>	<b>Presentations</b>	
	<ul style="list-style-type: none"><li>• <b>The Knowledge Framework for Power Sector Transformation</b> Raul Miranda (IRENA, Germany)</li><li>• <b>Secrets of Successful Integration</b> Debbie Lew (Debra Lew LLC, United States)</li><li>• <b>Experience from Wind and Solar Integration: IEAWind Task 25</b> Hannele Holttinen (IEA Wind Task 25   Recognis, Finland)</li><li>• <b>Wind and Solar Integration at ERCOT: Experiences and Best Practices</b> Julia Matevosyan (ERCOT, United States)</li></ul>	
<b>10:20 – 10:40</b>	<b>DISCUSSIONS</b>	

<b>09:00 – 10:40</b>	<b>SESSION 5B: DISTRIBUTION GRID ASPECTS III</b>	
> Session Chair	TBA	
<b>09:00 – 10:25</b>	<b>Presentations (20 min. each)</b>	
	<ul style="list-style-type: none"><li>• <b>Managing Grid Phase Loss with PV Plants</b> S. McGuinness (EPRI, Europe) (<a href="#">Submission-ID SIW19-34</a>)</li><li>• <b>A Methodology for the Assessment of PV Induced Flicker</b> J. Doms (Tractebel, Belgium), J. Wynants (Siemens, Belgium), S. Cole (Tractebel, Belgium) (<a href="#">Submission-ID SIW19-215</a>)</li><li>• <b>PV Forecasting in Distribution System Operation – Requirements and Applications</b> M. Krafczy, B. Mey, H. Becker, S. Drauz, R. Fritz (Fraunhofer IEE, Germany), S. Wende v. Berg, M. Braun (Fraunhofer IEE, Germany   University of Kassel, Germany), P. Hofbauer, B. Rindt (egrid application &amp; consulting, Germany) (<a href="#">Submission-ID SIW19-64</a>)</li><li>• <b>Smart Meter as a Cornerstone for Grid Integration of Renewable Energies</b> S. Azad, M. Ludwig, M. Zdrallek (University of Wuppertal, Germany), B. Brandherm, A. Ndiaye, M. Deru (German Research Center for Artificial Intelligence (DFKI), Germany), J. Zimpel, M. Hörhammer (Voltaris, Germany), A. Schalk (VSE AG, Germany), C. Breuer (STEAG Technischer Service, Germany), N. Neusel-Lange (SPIE SAG, Germany), (<a href="#">Submission-ID SIW19-129</a>) <b>Poster Flash Talk (5 min.):</b></li><li>• <b>On the Utilization of Cross-Regional Interconnector and Pumped Hydro Energy Storage for the Further Introduction of Solar PV in Japan</b> S. Ichimura (Renewable Energy Institute, Japan) (<a href="#">Submission-ID SIW19-230</a>)</li></ul>	
<b>10:25 – 10:40</b>	<b>Discussions</b>	

## 10:40 – 11:10 COFFEE BREAK



11:10 – 12:10 SESSION 6– CLOSING SESSION –PANEL DISCUSSION

> Moderator Eckehard Tröster (Energynautics, Germany)

11:10 – 12:00

**How much storage do we need? / Silver bullet or economic disaster?**

**Panelists:**

- Thorsten Buelo (SMA, Germany)
- Harley Mackenzie (HARD software, Australia)
- Debra Lew (Debra Lew LLC, USA)
- Paul Gardner (Paul Gardner Energy Consulting Ltd, UK)

12:00– 12:10 Closure

**12:00 – 14:00 LUNCH**

## POSTER PRESENTATIONS

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- **Tapping Flexibility Potential of Decentralized Controllable Loads for Smart Markets through Aggregation**  
M. Müller, A. Zeiselmaier, J. L. Pedraza Gómez (Forschungsstelle für Energiewirtschaft / Research Center for Energy Economics (FfE), Germany) ([Submission-ID SIW19-33](#))
- **Realtime Simulation Studies on Power System Stabilizing Effect of Virtual Synchronous Generator for Grid-Connected Inverter**  
J. Kato, T. Masaya, Y. Ota, T. Nakajima (Tokyo City University, Japan), Y. Mitsugi, H. Hashiguchi (Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan) ([Submission-ID SIW19-226](#))
- **On the Utilization of Cross-Regional Interconnector and Pumped Hydro Energy Storage for the Further Introduction of Solar PV in Japan**  
S. Ichimura (Renewable Energy Institute, Japan) ([Submission-ID SIW19-230](#))
- **Tertiary Based Cooperative Decentralized Control of DC Microgrid**  
H. Aboelsoud, T. Tsuji (Yokohama National University, Japan) ([Submission-ID SIW19-238](#))
- **Collaborative Control Method for Distribution System Equipment and PCS for PV - Voltage Rise Suppression Function Revising Waiting Time –**  
A. Moriwaki, S. Uemura (Central Research Institute of Electric Power Industry, Japan) ([Submission-ID SIW19-268](#))