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DIGITAL PROCEEDINGS

10th Solar & Storage Integration Workshop

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

5 November 2020

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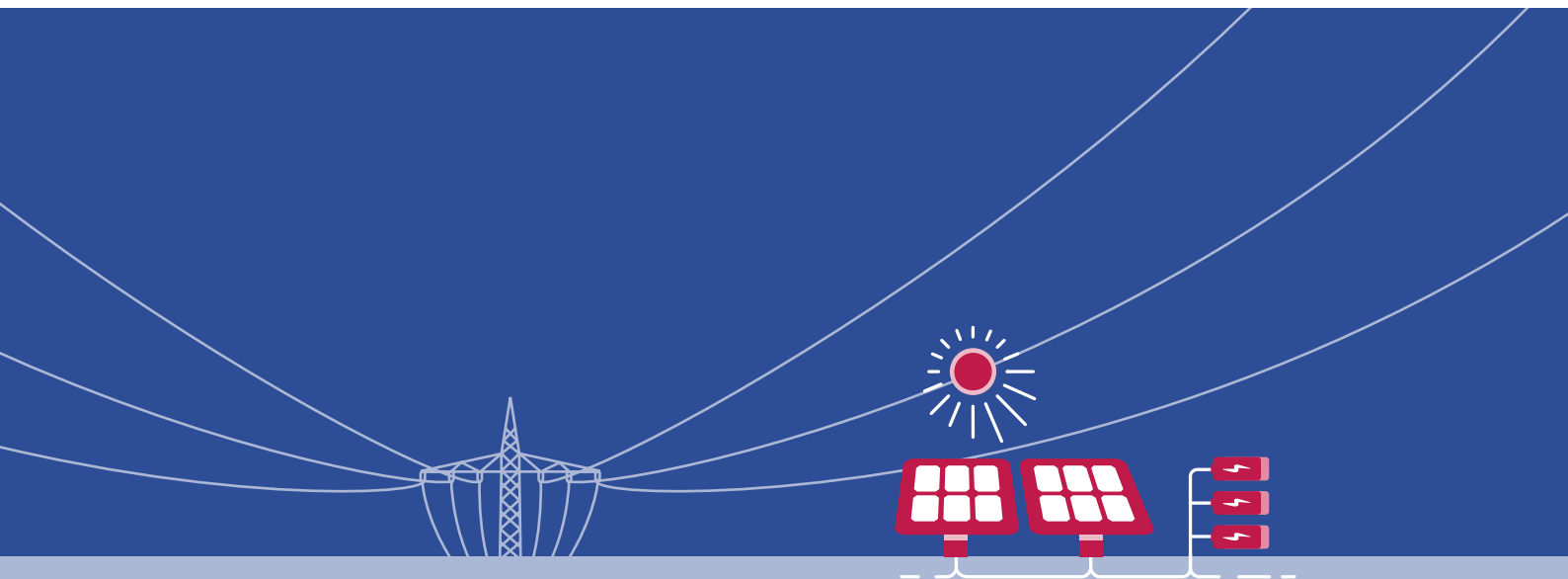solutions for sustainable development

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10th **Solar & Storage Integration Workshop**
International Workshop on Integration
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SESSION 1 – KEYNOTE SESSION
09:15 – 11:00 | 5 November 2020 | Session Chair: Thomas Ackermann (Energynautics, Germany)

09:15 – 10:35	**Presentations**

- **Emergency Island Mode for Distribution Grids**
  A. Falk, P. R. Stankat (SMA Solar Technology, Germany) (Submission-ID SIW20-101)
- **RE Integration Lessons in India and its International Context**
  S. Doczi (IEA, France)
- **Resilience of Power Systems with high RES Penetration**
  E. Tröster (Energynautics, Germany)

10:35 – 11:00	**Discussions**

07:15 Rio de Janeiro // 10:15 London // 12:15 Pretoria // 15:45 New Delhi // 17:15 Jakarta // 18:15 Peking // 19:15 Tokio // 21:15 Canberra

SESSION 2A: INTERNATIONAL EXPERIENCE
11:15 – 12:35 | 5 November 2020 | Session Chair: Peerapat Vithayasrichareon (IEA, France)

11:15 – 12:15	**Presentations (15 min. each)**

- **The End of 20 Years of Subsidization of PV Systems in Germany as a Driver for the Development of Digital Business Models**
  M.-R. Salzer (Aalen University, Germany), A. Ensinger (Altheim Netz AG, Germany), K. Bozem (bozem | consulting associates | munich, Germany), A. Nagl (Aalen University, Germany), S. Pelz (University of Applied Forest Sciences Rottenburg, Germany), D. K. Harrison, B. M. Wood (Glasgow Caledonian University, United Kingdom) (Submission-ID SIW20-156)
- **The Impact of Renewable Energy Expansion on Electricity Market Price in Japan**
  T. Wakeyama, K. Setoguchi (Kyushu University, Japan), R. Zissler (Tokyo Institute of Technology, Japan), K. Kimura (Renewable Energy Institute, Japan) (Submission-ID SIW20-61)
- **Integrating Small-Scale Embedded Generation into Distribution Networks in South Africa: Learnings from three (3) Case Studies in Metropolitan Environments**
  B. Molefyane, F. Oloo, M. Rampokanyo, J. Wright (Council for Scientific and Industrial Research (CSIR), South Africa) (Submission-ID SIW20-5)
- **Australia: the Global Leader in per capita PV/Wind Deployment**
  A. Blakers, M. Stocks, B. Lu, C. Cheng, D. Silalahi (Australian National University, Australia) (Submission-ID SIW20-50)

12:15– 12:35	**Discussions**

SESSION 2B: DISTRIBUTION GRID ISSUES
        11:15 – 12:35 | 5 November 2020 | Session Chair: Peter-Philipp Schierhorn (Energynautics, Germany)

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

- **Improving, Modelling and Simulation of Droop Controller for Grid-forming Inverter in DIgSILENT PowerFactory**
  P. N. Pham, **A. Salman**, R. Singer (Fraunhofer Institute for Solar Energy Systems ISE, Germany) (Submission-ID SIW20-19)

- **Development of a Fitting for Simulation Parameters to Apply and Derive a Cluster Analysis Regarding Grid Bottlenecks**
  T. Esterman, S. Köppl, N. Mader (FfE e.V., Germany) (Submission-ID SIW20-3)

- **Best-fit Machine Learning Classifier for Early-Stage Photovoltaic Hot-Spots Detection**
  M. Dhimish, N. Schofield (University of Huddersfield, United Kingdom) (Submission-ID SIW20-140)

- **Blockchain Technology as an Enabler for Decentralization in the Energy System**
  M. Hinterstocker, P. Dossow, A. Djamali (FfE GmbH, Germany), A. Bogensperger, A. Zeiselmair (FfE e.V., Germany),
  S. von Roon (FfE GmbH, Germany) (Submission-ID SIW20-90)

  5-MINUTES FLASH TALK
- **Contributions to DER Integration from the 3DMicroGrid Project**
  N. Martensen, D. Masendorf, S. Hempel (Energynautics, Germany)

12:20 – 12:35   Discussions

07:30 New York // 09:30 Rio de Janeiro // 12:30 London // 18:00 New Delhi // 19:30 Jakarta // 20:30 Peking // 21:30 Tokio // 23:30 Canberra

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SESSION 3A: HYBRID SYSTEMS
        13:30 – 15:15 | 5 November 2020 | Session Chair Julia Matevosyan (ERCOT, USA)

13:30 – 14:50   Presentations (20 min. each)

- **Renewable & Storage Hybrids in Resource Adequacy**
  E. Lannoye (EPRI Europe DAC, Ireland), A. Tuohy, E. Ela, J. Stekli, M. Pellow, D. Young (Electric Power Research Institute – EPRI, United States), K. Carden (Astrape Consulting, United States) (Submission-ID SIW20-120)

- **Hybrid Off-grid and Decentralized Renewable Electricity Systems Techno-Economic Model (HOTEM)**
  M. M. Elkadragy, M. Iqbal, M. L. Awad, M. Baumann (Karlsruhe Institute of Technology – KIT, Germany), A. Opal (University of Waterloo, Canada), M. Hiller (Karlsruhe Institute of Technology – KIT, Germany), J. Nathwani (University of Waterloo, Canada), J. Knebel (Karlsruhe Institute of Technology – KIT, Germany) (Submission-ID SIW20-48)

- **The Role of Grid Codes in Isolated Power Systems**
  P.-P. Schierhorn, N. Martensen (Energynautics GmbH, Germany) (Submission-ID SIW20-105)

- **Techno-Economic Aspects of Grid Forming Inverters in Small Power Systems**
  P.-P. Schierhorn, P. Gambín Belinchón (Energynautics, Germany), J. V. Magali Guilmineau (KTH Royal Institute of Technology, Sweden) (Submission-ID SIW20-104)

14:50 – 15:15   Discussions

SESSION 3B: POWER SYSTEM ASPECTS
13:30 – 15:15| 5 NOVEMBER 2020 | SESSION CHAIR: J. Charles Smith (ESIG, USA)

13:30 – 14:55   Presentations (17 min. each)

- **Investigation on Grid Integration of Large-Scale Photovoltaic Energy in Senegal**
  A. K. Usbeck (Hamburg University of Applied Science, Germany), M. Sarr, B. Niang, O. Ba, L. Thiaw (Cheikh Anta Diop University of Dakar (ESP), Senegal) (Submission-ID SIW20-37)

- **Power Hardware-in-the-Loop Simulation on Fast Frequency Response of Energy Storage System Equipped with Advanced Frequency Detection Algorithm**
  Y. Mitsugi, T. Terazono, H. Hashiguchi (Toshiba Mitsubushi-Electric Industrial Systems Corporation, Japan), J. Kato, K. Deguchi, Y. Ota, T. Nakajima (Tokyo City University, Japan) (Submission-ID SIW20-54)

- **Stronger Decentralization of the German Electricity-Heat-System**
  D. Masendorf, S. Hempel, E. Tröster (Energynautics, Germany), M. Koch, M. Vogel, C. Heinemann (Öko-Institut e.V., Germany) (Submission-ID SIW20-107)

- **ANN-based Photovoltaic Fault Detection Algorithm**
  M. Hussain, **M. Dhimish**, N. Schofield, S. Titarenko (University of Huddersfield, United Kingdom) (Submission-ID SIW20-139)

- **Curtailment of Generation in PV Installations – Comparison of the Effectiveness of Various Solutions**
  P. Kacejko, M. Wancerz (Lublin University of Technology, Poland) (Submission-ID SIW20-135)

14:55 – 15:15   Discussions

09:30 New York // 11:30 Rio de Janeiro // 14:30 London // 20:00 New Delhi // 21:30 Jakarta // 22:30 Peking // 23:30 Tokio

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SESSION 4A: BATTERY ASPECTS
15:30 – 17:00 | 5 NOVEMBER 2020 | SESSION CHAIR: Leonard Hülsmann (Energynautics, Germany)

15:30 – 16:35   Presentations (20 min. each)

- **An Economic Evaluation Tool for Solar Power Self-consumption System with Battery Energy Storage**
  C.-T. Lee, T. Yoshihara, K. Tomiyasu, H. Harada, Y. Nagayama, T. Oya, T. Nakamura (Hitachi, Japan) (Submission-ID SIW20-6)

- **BESS Optimal Sizing Methodology – Degree of Impact of Several Influencing Factors**
  B. Richard, X. Le Pivert, Y.-M. Bourien (University Grenoble Alpes, France) (Submission-ID SIW20-26)

- **Provision of Grid Services by PV Plants with Integrated Battery Energy Storage System**
  V. Gevorgian, P. Koralewicz, S. Shah, R. Wallen, E. Mendiola (NREL, United States), M. Morjaria (RE Plant Solutions / First Solar, United States) (Submission-ID SIW20-143)

FLASH TALK – 5MIN

- **Use Cases and Potential of Integrating Battery Energy Storage in Industrial Plants**
  Z. Wu, T. Blank, P. Zwickel, D. Sauer, M. Weber (Karlsruhe Institute of Technology – KIT, Germany) (Submission-ID SIW20-53)

16:35– 17:00   Discussions

15:30 – 16:38   **Presentations (17 min. each)**

- **UPS with Parallel Grid Forming Inverters**

  S. Scheurich, A. Falk (SMA Solar Technology, Germany) (Submission-ID SIW20-102)

- **Voltage Imbalance Resilience and Mitigation Using Grid Forming Inverters in Low-Voltage Distribution Grids**

  B. O. Winter, B. Engel (TU Braunschweig – elenia, Germany) (Submission-ID SIW20-106)

- **OSMOSE WP3: Factory Acceptance Test of the Grid Forming Demonstrator**

  C. Cardozo, G. Denis, T. Prevost (RTE R&D, France), M. Zubiaga, A. Sanchez-Ruiz, J. J. Valera (Ingeteam, Spain), Y. Vernay (RTE CNER, France) (Submission-ID SIW20-34)

- **Measured Impedance Characteristics of Solar Inverters up to 1MW**

  S. Rogalla, S. Kaiser, B. Burger (Fraunhofer ISE, Germany), B. Engel (TU Braunschweig, Germany) (Submission-ID WIW20-110)

16:38 – 17:00   **Discussions**

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17:05 – 18:00   **SESSION 5 – CLOSING SESSION**
> Session Chair   **Eckehard Tröster (Energynautics, Germany)**

17:20 – 17:55

To be Smart or not to be Smart, that's the Question

- Smart, smart, smart, everything needs to be smart: Smart Grid, Smart Inverter, Smart Meter.

- But how much smartness do we need?

- And how much does this depend on the PV penetration level and how distributed PV is?

- What are the smart solutions of the future everybody is talking about or should be talking about?

- How much can be solved autonomously at inverter level and how much communication and central coordination is needed?

In this panel we will discuss on the future power system and which role smartness will play.

Panelists:

- Enrique Gutierrez Tavarez (IEA, France)
- Andreas Falk (SMA, Germany)
- Vahan Gevorgian (NREL, USA)

17:55– 18:00   **Closure: Thomas Ackermann (Energynautics, Germany)**