2020 Clemson University Power Systems Conference (PSC 2020)

Clemson, South Carolina, USA 10 – 13 March 2020



IEEE Catalog Number: CFP2037X-POD **ISBN:**

978-1-7281-9385-4

Copyright © 2020 by the Institute of Electrical and Electronics Engineers, Inc. All Rights Reserved

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

*** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.

IEEE Catalog Number:	CFP2037X-POD
ISBN (Print-On-Demand):	978-1-7281-9385-4
ISBN (Online):	978-1-7281-9384-7

Additional Copies of This Publication Are Available From:

Curran Associates, Inc 57 Morehouse Lane Red Hook, NY 12571 USA Phone: (845) 758-0400 Fax: (845) 758-2633 E-mail: curran@proceedings.com Web: www.proceedings.com



Table of Contents

1. A Blockchain-based Flexibility Market Platform for EV fleets Strategy for Wind Integration.....1

Gonzalo Munilla Garrido, Andre Luckow, Daniel Miehle, Florian Matthes

- 2. A Graph Theory-Based Clustering Method for Power System Networks.....9 Iroshani Jayawardene, Pramod Uthpala Herath, Ganesh Venayagamoorthy
- 3. A Review of Long-Distance UHVDC Technology A future Energy Disrupter.....17 Innocent Davidson
- 4. Accelerating Artificial Intelligence on the Grid.....22 Sean Murphy, Mohini Bariya, Theo Laughner, Kevin Jones, Alexandra von Meier
- AGC Asynchronous Tuning for Improving PV Consumption in the Energy Imbalance Market.....29 Yawei Wei, Lv Ying, Zhihong Yu, Jinxiu Hou, Kumar Venayagamoorthy
- An Innovative Deep Learning Approach Applied to Transient Stability Assessment of Power Systems.....34 Hannah Wooten, Stephen Harris, Bhuvaneswari Ramachandran
- 7. An Intelligent Load Shedding Scheme for the Micro-grid in Shipboard Power System Using Probabilistic Methods.....40 Naireeta Deb, Gokhan Ozkan, Phuong Hoang, Christopher Edrington, BEHNAZ PAPARI, Payam Ramezani Badr
- An LC Filter Design Based on the Maximum Ripple Current for Two-Level Inverters Controlled with a Bipolar Switching Scheme.....46 Saleh Farzamkia, Ketan Lakhera, Arash Khoshkbar-Sadigh, Vahid Dargahi, Poria Fajri
- Assessing the Impact of Smart Inverter's Functions on Power Quality in Rooftop PV Applications.....52 Fatemeh Tooryan, Edward R. Collins, Azadeh Shadman
- Decentralized Operation of Resource Constrained Microgrids Multi-agent Demandbased Approach.....58
 Sanaz Paran, Rohit Jinsiwale, Deepak Divan
- 11. Device-Specific Signature Generation Technique for Smart Grid Device.....63 Azadeh Famili, Chirath Pathiravasam, Yingjie Lao, Ganesh Venayagamoorthy
- 12. Distributed Constrained Optimization Over Networked Systems Via A Singular Perturbation Method and Application to Economic Dispatch.....68 Phuong Hoang, Christopher Edrington, BEHNAZ PAPARI, Gokhan Ozkan, Hyo-Sung Ahn
- 13. Distributed Demand Response Management.....74 Pramod Uthpala Herath, Kumar Venayagamoorthy
- 14. Dynamic Voltage Restorer Controlled with Energy Minimized Compensation Method Based on Double Flying Capacitor Multicell Inverter.....81 Arash Khoshkbar Sadigh, Saleh Farzamkia, Vahid Dargahi
- Electric Transmission Fault Location Techniques Using Traveling Wave Method and Discrete Wavelet Transform.....86 Wesley Fluty, Yuan Liao

- Electric Transmission System Fault Identification Using Modular Artificial Neural Networks for Single Transmission Lines.....94 Christopher Asbery, Yuan Liao
- 17. Enhancing Distribution System Resilience Against Extreme Events: A Review.....101 Sibabalo Noludwe, Komla Folly
- Experiments of Power-Frequency Constant Estimation of Load-Frequency Control Using Reinforcement Learning.....110 Shota Nishimura, Nobuyuki Yamaguchi
- **19. Grid Cyber-Security Strategy in an Attacker-Defender Model.....117** Yu-Cheng Chen, Vincent Mooney, Santiago Grijalva
- 20. Grid Following Inverters and Synchronous Condensers: a Grid Forming Pair?.....125 Richard Kenyon, Anderson Hoke, Jin Tan, Bri Mathias Hodge
- 21. Intelligent Power Converter Controllers for Photovoltaic Systems.....132 Ali Arzani, Kumar Venayagamoorthy
- 22. LVQ Neural Network for Online Identification of Power System Network Branch Events.....140 Dulip Madurasinghe, Kumar Venayagamoorthy
- 23. Mesogrids for Regional Power Delivery and Reliability.....147 Roger Faulkner, Richard Wenzel, Clayborn Taylor
- 24. Modelling and Assessment of the Fault Ride-Through Capabilities of Grid Supporting Inverter-Based Microgrids.....153 Elutunji Buraimoh, Innocent Davidson
- 25. Multiple Zero-Sequence Harmonic Injection Method using Optimized Coefficients..160 Saleh Farzamkia, Arash Khoshkbar-Sadigh, Mahshid Khoshlessan, Vahid Dargahi
- 26. Nearly Free Sustainable Electric and Thermal Power for Desalination.....165 Vishwas Powar, Rajendra Singh, Prahaladh Paniyil
- 27. Online Voltage Optimization of the Power Distribution System.....173 Hasala Dharmawardena, Ganesh Venayagamoorthy
- Plug-n-Play Alternating Projection Algorithm for Large-scale Security Constraint Optimal Power Flow.....180 Tuyen Vu
- 29. Power System Protection response under Geomagnetically Induced Currents.....185 Moazzam Nazir, Johan Enslin, Mohammad Babakmehr
- **30.** Powering Africa by Photovoltaics.....191 Omolola Adeniran, Rajendra Singh, Prahaladh Paniyil
- Real-Time Analysis of a Multi-Agent-Based Distributed Control Strategy for Islanded AC Microgrids.....199 Ali Jafarian Abianeh, Farzad Ferdowsi
- 32. Reinforcement Learning Approaches to Power Management in Grid-tied Microgrids: A Review.....205 Erick Arwa, Komla Folly

- **33. Remote hardware-in-the-loop approach for microgrid controller evaluation.....211** Kumaraguru Prabakar, Amir Valibeygi, Sai Akhil Reddy Konakalla, Brian Miller, Raymond De Callafon, Annabelle Pratt, Martha Symko-Davies, Thomas Bialek
- 34. Residential peak power demand shaving by Using Single-Phase Residential Static VAR Compensators.....219 Muhammad Kamran Latif, Andrés Valdepeña Delgado, Said Ahmed-zaid, Randy Gnaedinger
- 35. Secondary Control of Microgrids via discrete-time neural distributed cooperative control.....227 Carlos Vega, Larbi Djilali, Edgar Sanchez
- **36. Short-term Wind Variability Analysis of Afe Babalola University.....233** Oladimeji Ayamolowo, Elutunji Buraimoh, Innocent Davidson, Omo-irabor Benedict
- **37.** Sparse Representation-based Classification of Geomagnetically Induced Currents.....240 Mohammad Babakmehr, Farnaz Harirchi, Moazzam Nazir, Johan Enslin, Payman Dehghanian, Shiyuan Wang
- 38. Supervisory Energy Management in Hybrid AC-DC Microgrids Based on a Hybrid Distributed Algorithm.....247 BEHNAZ PAPARI, Robert Cox, Nicolas Sockeel, Phuong Hoang, Gokhan Ozkan
- **39. Sustainable Power for Electrification of Transportation.....253** Prahaladh Paniyil, Rajendra Singh, Vishwas Powar, Ganesh Venayagamoorthy
- **40. Techno-Economic Analysis and Power Management for Remote Area Microgrid....260** Fatemeh Tooryan, Azadeh Shadman, Saeed Kamalinia, Edward R. Collins
- The Impact of Load Patterns on Power Loss: A case of V2G in the Distribution Network.....266 Uwakwe Chukwu
- 42. The Impact of Q-Factor on Optimal Energy Loss: A Case of V2G in the Distribution System.....270 Uwakwe Chukwu
- 43. The Impact of V2G Location on Energy Loss Reduction.....274 Uwakwe Chukwu
- 44. The Impact of V2G on Power Factors.....278 Uwakwe Chukwu
- 45. The Paradigm Shifting Role of Solar Powered DC Nano-Grids in New Electrification and Replacement for Traditional Grid Distribution.....282 Amir Ahmed Asif, Rajendra Singh, AKM Jahangir Majumder
- 46. Toward Developing Metrics for Power System Resilience.....288 Aaron Snyder, Sean Morash