2019 IEEE Texas Power and **Energy Conference (TPEC 2019)**

College Station, Texas, USA 7 – 8 February 2019



IEEE Catalog Number: CFP19J90-POD **ISBN**:

978-1-5386-9285-1

Copyright \odot 2019 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:
 CFP19J90-POD

 ISBN (Print-On-Demand):
 978-1-5386-9285-1

 ISBN (Online):
 978-1-5386-9284-4

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



Paper session 1: Power System Protection

Thursday, Feb. 7, 9:45 AM-10:45 AM, MSC 2404

- Half Cycle Negative Sequence Differential Protection for Synchronous Generator.....1
 - A. Doorwar, B. Bhalja
- Current-only Directional Overcurrent Protection Using Postfault Current.....6
 - I. Kiaei, S. Lotfifard, M. Ghanaatian
- Analytical Approach to Study the Impacts of Mutual Coupling on Transmission Lines Protection Systems.....11

A. Brahman, D. Novosad, M. Tabrizi, T. Cook, W. Lee

Paper session 2: Electrical Machines and Drives I

Thursday, Feb. 7, 9:45 AM-10:45 AM, MSC 2405

- High-Frequency Transformer Review and Design for Low-Power Solid-State Transformer Topology.....17
 - A. M. Elrajoubi, S. S. Ang
- A Chaos Based SVPWM technique for B4 Inverter fed Two-Phase Symmetric Induction Motor for THD & EMI improvement at Low Modulation Index....23
 - M. H. Arshad, M. Kassas
- A Review and Comparison of the DSP-Based Resolver to Digital Conversion Methods....29
 - B. Rahrovi

Paper Session 3: Power System Dynamics and Stability

Thursday, Feb. 7, 9:45 AM-10:45 AM, MSC 2406 A

- Power System Transient Stability Analysis Using High-Order Taylor Expansion Systems.....35
 - B. Wang, X. Xu, K. Sun
- Contraction Region Analysis for Power Systems.....40
 - M. Yilmaz, F. K. Bayat
- Quantifying the Effect of Air Conditioning Dynamics on Power System Transient Stability Limits.....46
 - B. Wiseman, L. Xie

Paper Session 4: Power Inverters and Converters I

Thursday, Feb. 7, 9:45 AM-10:45 AM, MSC 2406 B

- Efficiency and THD Optimization Based on an Interleaved PFC Converter Using Digital Controller with Integrated Valley Switching Control Feature.....52
 - C. Jiang, H. Nene, S. Choudhury
- Using a Z-Source Inverter as Rotor Side Converter in Doubly-Fed Induction Generator Wind Energy Conversion System.....57
 - K. Yousefpour, M. H. Imani, P. Niknejad, S. J. H. Molla,
 - M. T. Andani, S. Shahmiri
- Passivity-based Stabilization of DC-DC converters with Constant Power Loads.....63
 - J. C. Mayo-Maldonado, J. E. Valdez-Resendiz, J.C. Rosas-Caro,
 - O. F. Ruiz-Martinez, D. Guillen-Aparicio, G. Escobar-Valderrama

Paper Session 5: Renewable Generation: Economics, Control and Forecast

Thursday, Feb. 7, 11:00 AM-12:00 PM, MSC 2404

- Detection of Impending Ramp for Improved Wind Farm Power Forecasting.....69
 - J. Zhao, X. Chen, M. He
- Techno-Economic Analysis of Hybrid PV/Wind System Connected to Utility Grid.....75
 - Y. Alharthi, M. K. Siddiki, G. M. Chaudhry
- Non-Parametric Joint Chance Constraints for Economic Dispatch Problem with Solar Generation.....81

Paper Session 6: Demand Management

Thursday, Feb. 7, 11:00 AM-12:00 PM, MSC 2405

- Energetic Potential for Demand Response in Detached Single Family Homes in Austin, TX.....87
 - A. Bandyopadhyay, J. P. Conger, M. E. Webber
- Effect of Changes in Incentives and Penalties on Interruptible/
 Curtailable Demand Response Program in Microgrid Operation.....93
 - M. H. Imani, K. Yousefpour, M. T. Andani, M. J. Ghadi
- Imbalance Settlement Design with Demand Side Management and Combined Heat and Power.....99
 - S. S. O. Kermer

Paper Session 7: Load Analysis

Thursday, Feb. 7, 11:00 AM-12:00 PM, MSC 2406 A

• A Function-on-Function Linear Regression Approach for Short-Term Electric Load Forecasting.....105

H. M. Kiani, X. Zeng

• Study of Voltage-Dependent Harmonic Characteristics of Residential Appliances.....110

J. Roy, B. Mather

Paper Session 8: Application of Power Electronics in Power System

Thursday, Feb. 7, 11:00 AM-12:00 PM, MSC 2406 B

- Performance Analysis of Direct Power Control with Space Vector Modulation for Shunt Active Power Filter.....N/A
 - S. Ouchen, H. Steinhart, F. Blaabjerg, M. Benbouzid,

A. Betka, J. P. Gaubert

- FSIG-Based Wind Power Plant Transient Stability Margin Improvement, a STATCOM/SVC Comparison.....116
 - B. Khan, M. Kassas
- A Self-Commutated System for Combining Energy Sources to Improve Electric Power Service Reliability.....122

L. N. Estrada, M. P. González, M. S. Ramirez

Paper Session 9: Storage Units in Power System

Thursday, Feb. 7, 1:15 PM-2:15 PM, MSC 2404

- Chance-Constrained Microgrid Energy Management with Flexibility Constraints Provided by Battery Storage.....128
 - O. Ciftci, M. Mehrtash, F. Safdarian, A. Kargarian
- Future Electric Power Grid and Battery Storage.....134
 - A. Chen, Y. N. Velaga, P. K. Sen
- Solar PV and BESS based Home Energy System.....140
 - S. H. Metwally, X. Zhang, S. Ali, H. S. Krishnamoorthy

Paper Session 10: Electrical Machines and Drives II

Thursday, Feb. 7, 1:15 PM-2:15 PM, MSC 2406 A

- Ensemble Kalman Filter based Dynamic State Estimation of PMSGbased Wind Turbine....146
 - S. Afrasiabi, M. Afrasiabi, M. Rastegar, M. Mohammadi,
 - B. Parang, F. Ferdowsi
- PM BLDC Actuator with Helical Motion of the Rotor For Industrial Applications....150
 - O. Dobzhanskyi
- Enhancement the Frequency of a New Oscillating Thermomagnetic Generator.....156
 - A. Homadi, T. Hall

Paper Session 11: Power System Modeling I

Thursday, Feb. 7, 1:15 PM-2:15 PM, MSC 2406 B

- Voltage Droop Controls in Power Flow Simulation.....161
 - B. Allison, D. Wallison, T. J. Overbye, J. Weber
- Bio-Inspired Design for Robust Power Networks.....167
 - V.Panyam, H. Huang, B. Pinte, K. Davis, A. Layton
- MATLAB/Simulink-Based ElectromagneticTransient-Transient Stability Hybrid Simulation for Electric Power Systems with Converter Interfaced Generation.....173
 - D. Athaide, J. Qin, Y. Zou

Paper Session 12: Electrical Machines and Drives III

Thursday, Feb. 7, 2:30 PM-3:30 PM, MSC 2404

- Sensorless Field Oriented Control for Induction Motor Drives using Fuzzy-Logic Luenberger Observer: Experimental Investigation.....N/A
 - Y. Azzoug, S. Oochen, T. Ameid, A. Ammar, A. Menacer
- Modeling Study of the Series Arrangement of Thermomagnetic Generator.....179
 - A. Homadi, T. Hall, J. Post
- Fatigue Life Prediction of a Coaxial Multi-stage Magnetic Gear.....184
 - S. Modaresahmadi, A. Hosseinpour, W. Williams

Paper Session 13: Microgrid Design and Control

Thursday, Feb. 7, 2:30 PM-3:30 PM, MSC 2406 A

- A New Approach for Steady-State Analysis of a Hybrid ac-dc Microgrid.....190
 - M. M. Rezvani, S. Mehraeen
- A Real-time Simulation Testbed for Hierarchical Control of a Renewable Energy-based Microgrid.....195
 - R. S. Mongrain, Z. Yu, R. Ayyanar
- Modeling Single-Phase PQ Inverter for Unbalanced Power Dispatch in Islanded Microgrid.....201
 - O. Bassey, K. L. Butler-Purry

Paper Session 14: Special Topics

Thursday, Feb. 7, 2:30 PM-3:30 PM, MSC 2406 B

- Atmospheric Water Generation and Energy Consumption: An Empirical Analysis.....207
 - B. Asiabanpour, N. Ownby, M. Summers, F. Moghimi
- Evaluation of a Passive Optical Fiber Daylighting System for Plant Growth.....213
 - K. Ausanka, B. Asiabanpour
- Detection of Multiple Partial Discharge Faults in Switchgear and Power Cables.....219
 - G. A. Hussain, D. Hummes, M. Shafiq, M. Safdar

Paper Session 15: Distribution Systems I

Friday, Feb. 8, 9:15 AM-10:15 AM, MSC 2404

- Impact of Resistive Superconductive Fault Current Limiter's Location and its Resistance Value on the Stability of Micro Grid System....223
 - M. Mousa, S. Abdelwahed, J. Kluss
- A Communication-Based Protection Scheme for Smart Meshed Distribution Network....N/A
 - N. Shaker, K. Hassan, A. Megahed
- Investigation of Approaches for Incorporating Smart Meter Data in Load and PV Models in Medium Voltage Power System Studies.....229
 - S. A. Tijani, K. Butler-Purry

Paper Session 16: Electrical Machines and Drives IV

Friday, Feb. 8, 9:15 AM-10:15 AM, MSC 2405

 Nonlinear Dynamics in the Switched Reluctance Motor Drive with Time-delay Feedback Control.....234

S. Li, T. Chen

 An Improved Speed Controller for PMSM Drive with Unbalanced Load Using Load Torque Observer.....240

K. Yoldaş, A. Tekin, M. Boztepe

Paper Session 17: Power System Modeling II

Friday, Feb. 8, 9:15 AM-10:15 AM, MSC 2406 A

- An Interactive, Stand-Alone and Multi-User Power System Simulator for the PMU Time Frame.....246
 - T. J. Overbye, Z. Mao, A. Birchfield, J. Weber, M. Davis
- Large-Scale Synthetic Grids in Classroom Planning Studies.....252
 - A. Bornsheuer, B. Allison, K. Flaherty, T. J. Overbye, K, Davis
- MATGMD: A Tool for Enabling GMD Studies in MATLAB.....258
 - G. P. Juvekar, K. Davis

Paper Session 18: Multi-level Inverters and Converters

Friday, Feb. 8, 9:15 AM-10:15 AM, MSC 2406 B

- Active and Reactive Power Compensation using a PEV-Based Three
 -Level Capacitor Clamped Inverter.....264
 - M. Latifi, R. Sabzehgar, M. Rasouli, P. Fajri
- A Novel Application of Modular Multi-Level Converters for Partially Shaded PV Systems....270
 - J. Khazaei, G. Pavlak, B. Lee, M. Elsenbaty
- Experimental Challenges in Using a 1.2 kV GaN HEMT for High Power Density Converters.....276
 - F. Sadeque, A. Y. Fard, A. Adib, M. B. Shadmand, B. Mirafzal

Paper Session 19: Cyber-Physical Systems I

Friday, Feb. 8, 10:40 AM-12:00 PM, MSC 2404

- A Hybrid Attack Model for Cyber-Physical Security Assessment in Electricity Grid.....281
 - Y. Chen, T. Gieseking, D. Campbell, V. Mooney, S. Grijalva
- ISAAC: The Idaho CPS Smart Grid Cybersecurity Testbed.....287
 - I. A. Oyewumi, A. A. Jillepalli, P. Richardson, M. Ashrafuzzaman
 - B. K. Johnson, Y. Chakhchoukh, M. A. Haney, F. T. Sheldon, D. Conte de Leon
- Formalizing an Automated, Adversary-aware Risk Assessment Process for Critical Infrastructure.....293
 - A. A. Jillepalli, D. Conte de Leon, I. A. Oyewumi, J. Alves-Foss,
 - B. K. Johnson, C. L. Jeffery, Y. Chakhchoukh, M. A. Haney, F. T. Sheldon

Paper Session 20: Photovoltaics

Friday, Feb. 8, 10:40 AM-12:00 PM, MSC 2405

- Short Term Solar Irradiance Forecast based on Image Processing and Cloud Motion Detection.....299
 - S. Tiwari, R. Sabzehgar, M. Rasouli
- Energy Harvest Potential of Flexible Photovoltaics on Curved Surfaces.....305
 - L. Alpuerto, R. Balog

I

- PV Power Generation Credit Sharing towards Sustainable Community Solar.....311
 - X. Chen, J. Zhao, M. He

Paper Session 21: Power Flow Analysis

Friday, Feb. 8, 10:40 AM-12:00 PM, MSC 2406 A

- Optimal Power Flow with Disjoint Prohibited Zones: New Formulation and Solutions.....317
 - X. Liu, H. Davarikia
- Power Flow Consideration of Impedance Correction for Phase Shifting Transformers.....323
 - J. Yeo, P. Dehghanian, T. Overbye
- Determination of Power Transfer Capability by a Bisection-Like Algorithm via Power-Flow Solutions.....329
 - B. Bilir, M. Yilmaz

Paper Session 22: Power Inverters and Converters II

Friday, Feb. 8, 10:40 AM-12:00 PM, MSC 2406 B

- Implementation of an Advanced Modelica Library for Evaluation of Inverter Loss Modeling.....335
 - S. C. Lai, C. I. Hill, N. Suchato
- A Review of the More Electric Aircraft Power Electronics.....341
 - B. Rahrovi, M. Ehsani
- Distributed TABC based Bi-Directional Converter for Cell/Sub-Modular Level Battery Energy Storage System.....347
 - N. Pragallapati, J. Mueller

Paper Session 23: Distribution Systems II

Friday, Feb. 8, 1:15 PM-2:15 PM, MSC 2404

- A Secure Distributed Cloud-Fog Based Framework for Economic Operation of Microgrids.....352
 - S. Z. Tajalli, S. A. M. Tajalli, A. Kavousi-Fard, T. Niknam,
 - M. Dabbaghjamanesh, S. Mehraeen
- Equilibrium of integrated retail market by considering emission penalties: bi-level game modeling.....N/A
 - S. Khazeni, A. Sheikhi, M. Rayati, A. M. Ranjbar
- Distribution System Reconfiguration for Loss Reduction Incorporating Load and Renewable Generation Uncertainties.....358
 - A. Abbaskhani-Davanloo, M. Amini, M. S. Modarresi,
 - F. Iafarishiadeh.

Paper Session 24: Plug-in Electric Vehicles

Friday, Feb. 8, 1:15 PM-2:15 PM, MSC 2405

- Smart Grid Congestion Caused by Plug-in Electric Vehicle Charging....364
 - R. Jarvis, P. Moses
- Distributed Optimization-Based Hourly Coordination for V2G and G2V....369
 - F. Safdarian, L. Lamonte, A. Kargarian, M. Farasat
- Plug-in Electric Vehicle Optimization and Management Charging in a Smart Parking Lot.....375
 - S. H. Shamsdin, A. Seifi, M. R. Shahrbabaki, B. Rahrovi

Paper Session 25: Power System Operation and Planning

Friday, Feb. 8, 1:15 PM-2:15 PM, MSC 2406 A

- Optimal Load Frequency Control of Multi-Area Power System Considering Incremental Control Action.....381
 - A. B. Kunya, M. Argin, S. Kucuksari
- Budget Allocation for Power Networks Reliability Improvement: Game-Theoretic Approach.....387
 - H. Davarikia, M. Barati, Y. Chan, K. Igbal
- Self Regulation of Electrical Power Systems.....393
 - B. Porretta, S. Porretta

Paper Session 26: Cyber-Physical Systems II

Friday, Feb. 8, 1:15 PM-2:15 PM, MSC 2406 B

- Attack Scenario-based Validation of the Idaho CPS Smart Grid Cybersecurity Testbed (ISAAC).....399
 - I. A. Oyewumi, H. Challa, A. A. Jillepalli, P. Richardson, Y.
 - Chakhchoukh, B. K. Johnson, D. Conte de Leon, F. T. Sheldon, M. A. Haney
- Anomaly Detection in Cyber-Physical System using Logistic Regression Analysis.....405
 - S. S. Noureen, S. B Bayne, E. Shaffer, D. Porschet, M. Berman
- PMU Time Error Detection Using Second-Order Phase Angle Derivative Measurements.....411
 - I. Idehen, T. J. Overbye

Poster Session

Thursday Feb. 7 4:00 PM-6:30 PM, MSC 2401

Man-in-the-Middle Attack on Smart Grid Testbed Using a FPGA.....N/A

J. Fritz, K. Duncan, J. Sagisi, A. St. Leger

• Wide Area Control of a Photovoltaic Source....N/A

A. Patula, A. St. Leger

Removal of Black Powder from Natural Gas Transmission Pipeline.....N/A

F. K. Pinto, H. G. Darabkhani

• Wide Area Control of a Switched Capacitor Bank....N/A

S. Kelly, A. St. Leger

 Offshore Wind Farm Site Selection Based on Multi-Criteria Fuzzy Systems: A Case Study of Turkey.....N/A

M. Deveci, E. Özcan, R. John

• A Study on the Optimal Solar MPPT Voltage Controller Design.....N/A

K. Hwang, I. Kim

 A Pool Strategy of Microgrid in Power Distribution Electricity Market.....N/A

Y. Wu, G. Lim, J. Shi

Vermont National Guard Energy Storage Evaluation.....N/A

B. Anderson, M. Renard, A. St. Leger