2020 IEEE Texas Power and Energy Conference (TPEC 2020)

College Station, Texas, USA
6 – 7 February 2020

IEEE Catalog Number: CFP20J90-POD
ISBN: 978-1-7281-4437-5

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: CFP20J90-POD
ISBN (Print-On-Demand): 978-1-7281-4437-5
ISBN (Online): 978-1-7281-4436-8

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

Applications of DC Power Flow Based Power System Dynamics Simulations 1
Hanyue Li, Wei Trinh, Jessica Wert, Megan Dawkins, Thomas Overbye and Jamie Weber

The Heuristic Dynamic Programming Approach in Boost Converters 7
Sepehr Saadatmand, Pourya Shamsi and Mehdi Ferdowsi

MetaMetric Approach in Performance Assessment of System Level Controllers for Different Operational Objectives 13
Payam Ramezani Badr, Behnaz Papari, Christopher Edrington, Gokhan Ozkan, Naireeta Deb and Phuong Hoang

Torsional Vibrations in Open Loop Volts Hertz Variable Frequency Drive Induction Motor Driven Mechanical Systems 19
Sahil Mishra, Alan Palazzolo, Xu Han, Yashu Li and Chris Kulhanek

Module-OT: A Hardware Security Module for Operational Technology 25
William Hupp, Adarsh Hasandka, Ricardo Siqueria de Carvalho and Danish Saleem

Energy Function based Approach for Online Inertia Estimation Utilizing Synchrophasor Measurements 31
Rakesh Kumar Panda, Abheejeet Mohapatra, Suresh Chandra Srivastava and Mladen Kezunovic

A Survey on Applications of Machine Learning for Optimal Power Flow 37
Fouad Hasan, Amin Kargarian and Ali Mohammadi

A Comprehensive Analysis of Single-Stage Wireless Power Transfer Compensation Topologies for Battery Chargers in Electric Vehicles 43
Kavita Kiran Prasad and Vivek Agarwal

A Novel High Gain Soft Switched Step-Up DC-DC Converter With Coupled Inductors 49
Kalahasthi Rajesh Babu, M.R Ramteke, H.M Suryawanshi and Koteswara Rao Kothapalli

Circuit-Averaged Modeling of Non-Ideal Low-Power DC-AC Inverters 55
Farouk Ghizzawi and Dani Tannir

State of Health Prediction of Lithium-ion Batteries Using Accelerated Degradation Test Data 61
Pasquale De Falco, Luigi Pio Di Noia and Renato Rizzo

Performance Evaluation of Photovoltaic Grid-connected Microgrid with Hybrid Energy Storage using Predictive Current Control 67
Bhaskara Rao Ravada and Narsa Reddy

Recovery-based Model Predictive Control for Cascade Mitigation under Cyber-Physical Attacks 73
Rui Ma, Sagnik Basumallik, Sara Eftekharnejad and Fanxin Kong

Selection of Conventional Generation Resources for Optimal Replacement by Wind Power Generations 79
Wolf Peter Jean Philippe, Emerson Iannone, Sara Eftekharnejad and Prasanta K. Ghosh

Smart Energy Routing For Rural Islanded Microgrid Clusters 85
Marjerie Suresh, Janani Jayaraman, Karthni Lakshmanan, Aswin Gopikanna and Vineeth Vijayaraghavan

Power Generation Frequency Response 91
Bracy Nesbit, John Dumas, Ravikanth Varanasi and Pradeep Tripathi

A Soft-Switching High Voltage Gain DC-DC Converter with Multiplier Cells - Analysis and Average Model 96
Abdulhakeem Alsaleem, Abdullah Bubshait and Marcelo Simoes

Equivalent Thermal Model of Stator Slots using FEA 102
Adolfo Dannier, Andrea Del Pizzo, Luigi Pio Di Noia and Renato Rizzo

Critical Component Identification under Load Uncertainty for Cascading Failure Analysis 108
Mirjavad Hashemi Gavgani and Sara Eftekharnejad

Distributed small loads as fast frequency reserves: Impact on System Performance 114
Lasse Peltonen, Tuomas Rauhala, Pertti Järventausta and Sami Repo

Hardware-in-the-Loop CPS Security Architecture for DER Monitoring and Control Applications 120
Ravikumar Gelli, Burhan Hyder and Manimaran Govindarasu

A Simplified DC Capacitor Active Voltage-Balance Algorithm with Common-Mode Voltage Reduction using Active-Zero SVPWM for Three-Level Photovoltaic Grid-Tie Inverter Application 125
Da Jiao, Yu Peter Liu and Mark Rayner

Techno-Economic Analysis and Optimization of a Microgrid Considering Demand-Side Management 131
Seyyed Danial Nazemi, Khashayar Mahani, Ali Ghofrani, Burcu E. Kose, Mahraz Amini and Mohsen A. Jafari

Data-Driven Solar Generation Forecast Considering Temporal Characteristics of Data 137
Guangyuan Shi and Sara Eftekharnejad

Do Energy Oscillations Degrade the Energy Transfer in Electrical Systems? 143
Leszek S Czarnecki

A Coupled Inductor based Single Phase Five Level Inverter with Capacitor Voltage Balancing 149
Sreekanth T., Jeyaram Durga Manian Deivanayagam, Siddharth Raju and Ned Mohan

A New Approach in Optimal Control of Step-Down Converters Based on a Switch-State Controller 154
Ali Parsa Sirat and Niloofar Zendehdel

Optimal Estimation of Capacity and Location of Wind, Solar and Fuel Cell Sources in Distribution Systems Considering Load Changes by Lightning Search Algorithm 160
Hassan Shokouhandeh, Mahmoodreza Ghaharpour, Hamid Ghobadi Lamouki, Yaser Rahmani Pashakolaei, Fatemeh Rahmani and Mahmood Hosseini Imani

Data-mining for Fault-Zone Detection of Distance Relay in FACTS-Based Transmission .. 166
Nima Salek Gilani, Mohammad Tavakoli Bina, Fatemeh Rahmani and Mahmood Hosseini Imani

Economic and Operational Evaluation of PV and CHP combined with Energy Storage Systems considering Energy and Regulation Markets 172
Khashayar Mahani, Maryam Arabzadeh Jamali, Seyyed Danial Nazemi and Mohsen A. Jafari

A novel location method for single-phase grounding fault in small current grounding distribution network based on difference of phase current fault component between fault and non-fault phases 178
Suyan Lu, Xiaohua Ding and Biaolong Su

Interaction of the Substation Load Tap Changer with the High Penetration of Distributed Energy Resources 184
Mohammad Mehdi Rezvani, Shahab Mehraeen, Jayanth Ramamurthy and Thomas Field

Aggregation and Bidding of Residential Demand Response into Wholesale Market 189
Mohammad Ostadijafari, Rahul Ranjan Jha and Anamika Dubey

Residential Energy Management System utilizing Fuzzy Based Decision-Making 195
Pantelis Dimitroulis and Miltiadis Alamaniotis

A Tractable Approximation Approach to Deal with the Binary Nature of Shiftable Loads in Multi-Period Optimal Power Flow 201
Iason-Iraklis Avramidis, Florin Capitanescu and Geert Deconinck

Methodologies for Customer Baseline Load Estimation and their Implications 207
Shubhasmita Pati, Satish Ranade and Olga Lavrova

A Sensitivity-based Approach to Adaptive Under-Frequency Load Shedding 212
Mukesh Gautam, Narayan Bhusal and Mohammed Benidris

A Stabilizer based Predictive Control Scheme for Smart Inverters in Weak Grid 217
Muhammad Farooq Umar, Ahmad Khan and Mohammad B. Shadmand

Integrated Coordination of Voltage Regulators with Distributed Cooperative Inverter Control in Systems with High Penetration of DGs 223
Shahrzad Mahdavi and Aleksandar Dimitrovski

An Efficient Mixed-Integer Linear Programming Model for Optimal Sizing of Battery Energy Storage in Smart Sustainable Buildings 229
Mahdi Mehrtash, Florin Capitanescu and Per Kvols Heiselberg

Microgrids: A Solution Towards Implementing Demand Response Programs 235
Azadeh Shadman, Fatemeh Tooryan, Mohammad Tasdighi, Yashar Kenarangui, Saeed Kamalinia and Edward R. Collins

Current Observer Based Predictive Decoupled Power Control Grid-Interactive Inverter ... 241
Zhen Zhang, Webster Adepoju, Mohsen Hosseinzadehtaher and Mohammad B. Shadmand

Transient stability assessment for generators and DER integration into the IEEE 9 Bus system ... 247
Sandesh Acharya and Malek Ramazeni

Blockchain-as-a-Service (BaaS) for Battery Energy Storage Systems ... 253
Justin Ochoa, Gomanth Bere, Indrasena Aenugu, Taesic Kim and Kim-Kwang Raymond Choo

Adaptive Balancing of Three-Phase Loads at Four-Wire Supply with Reactive Compensators and Nonsinusoidal Voltage ... 259
Motab Almousa and Leszek Czarnecki

Cooperative Model Predictive Control Scheme for Dispersed Smart Inverters at the Grid Edge ... 265
Amin Yousefzadeh Fard and Mohammad B. Shadmand

Partitioning Analysis in Temporal Decomposition for Security-Constrained Economic Dispatch ... 271
Farnaz Safdarian, Ali Mohammadi, Amin Kargarian and Bamdad Falahati

HIDES: Hybrid Intrusion Detector for Energy Systems ... 277
Vivek Kumar Singh, Evan Vaughan, Joshua Rivera and Adarsh Hasandka

A PWM Method for Single-Phase Current-Sourced High Frequency AC Link Inverter ... 283
Minjeong Kim, Ricky Lanclos and Robert Balog

Real-Time Detection of Critical Generators in Power Systems: A Deep Learning HCP Approach ... 289
Bhavesh Shinde, Shiyuan Wang, Payman Dehghanian and Mohammad Babakmehr

Dynamic Model Validation for Large-Scale Networks Using the Dominant Time Intervals ... 295
Mahsa Sajjadi, Hossein Seifi and Shahrzad Mahdavi

Anomaly Detection for Primary Distribution System Measurements using Principal Component Analysis ... 301
Arun Abhishek Imayakumar, Anamika Dubey and Anjan Bose

Risk-driven Planning for System Upgrades to Enhance Resilience of Distribution Systems ... 307
Monish Mukherjee, Shiva Poudel, Anamika Dubey and Anjan Bose

Constraint Clustering Based Anti-Islanding Scheme For Power Networks ... 313
Hamzeh Davarikia, Faycal Znidi and Masoud Barati

Coherency Detection and Network Partitioning based on Hierarchical DBSCAN ... 319
Faycal Znidi, Hamzeh Davarikia, Mohammad Arani and Masoud Barati

High-voltage Soil-Based Microbial Fuel Cells ... 324
Ahmad Alzahrani

Impacts of Experimentally Obtained Harmonic Spectrums of Residential Appliances on Distribution Feeder ... 330
Akshay Kumar Jain, Jinia Roy and Barry Mather

An Automated Cluster-Based Approach for Asset Rescheduling in Building Communities . 336
Seyyed Danial Nazemi and Mohsen A. Jafari

Comparing Connection Topologies of PV Integrated Curved Roof Tile for Improved Performance . . . 342
Lance Alpuerto and Robert Balog

Detection and Identification of Stator Inter-turn Faults and Demagnetization effects in Hybrid Analytical-Numerical model of a BLDC Motor using Electromagnetic Signatures . . 347
Adil Usman and Bharat Singh Rajpurohit

Computationally Efficient Identification of Power Flow Alternative Solutions with Application to Geomagnetic Disturbance Analysis . . . 354
Komal S Shetye, Thomas J Overbye, Adam B Birchfield, James Weber and Tracy Rolstad

Combined Learning and Analytical Model Based Early Warning Algorithm for Real-Time Congestion Management . . . 360
Fouad Hasan and Amin Kargarian

Load-Leveling Trainer for Demand Side Management on a 45kW Cyber-Physical Microgrid . . . 366
Jonathan Diller, Peter Idowu and Javad Khazaei

Renewable Energy Power Generation using Waste Energy in Water Pressure Reducing Valves . . . 372
Oveis Asgari Gashteroodkhani, Mehrdad Majidi and Mehdi Etezadi-Amoli

Accurate Modeling of Li-ion Cells Applied to LiFePO4 and NMC Chemistries . . . 378
Muhammad Usman Tahir, Taha Moaz, Hassan Khan, Nauman Zaffar and Irfan Khan

High Gain Soft Switched DC-DC Converter for Renewable Applications . . . 384
Kalahasthi Rajesh Babu, Manoj R Ramteke, H M Suryawanshi and Koteswara Rao Kothapalli

Intermediate Bus Converters for High Efficiency Power Conversion: A Review . . . 390
Sen Li

A Lab-oriented Testing Platform for Emulating a Wind Turbine in a DC Microgrid . . . 396
Loraine Navarro, Christian G. Quintero M. and Mauricio Pardo

Demand Response Based on the Power Factor Considering Polynomial and Induction Motor loads . . . 402
Jaber Valinejad, Mousa Marzband, Meisam Ansari and Antoine Labonne

Security Constrained Two-Stage Model for CO2 Emission Reduction . . . 408
Jaber Valinejad, Mousa Marzband, Meisam Ansari and Antoine Labonne

Experimental implementation of sliding mode controller for DC-link voltage regulation in three-phase bidirectional rectifier . . . 414
Mustapha Jamma, Abderrahim Bennassar and Mohammed Akherraz

Design and Simulation of Multi-phase Multi-stage Interleaved Boost Converters for Photovoltaic Application . . . 419
Badur M. Alharbi, Majid A. Alhomim and Roy A. McCann

Gaussian Process Regression based Fault Location in DC Microgrid 423
Sai Sowmya Nagam, Rakesh Kumar Panda, Abheejeet Mohapatra and Sandeep Anand

Implementation of Emulated Inertia using PV Generation with Energy Storage to Improve Integrated Grid Response 429
Mohamed Abuagreb, Babatunde Ajao and Brian Johnson

Dynamic phasor-based modeling and simulation of a reduced-order single-phase inverter in voltage-controlled and current-controlled modes 435
Udoka Nwaneto and Andrew Knight

Optimal Coordination of HVAC Scheduling for Commercial Buildings 441
Guanyu Tian, Samy Faddel, Qun Zhou, Zhihua Qu and Alex Parlato

An Electric Power System Energy Management Platform (EMP) Research Testbed 446
Ikponmwosa Idehen, Loren Klemesrud and Tom Overbye

Real-time Blackout Prevention in Response to Decentralized Cyberattacks on a Smart Grid 452
Arash Asrari, Meisam Ansari, Javad Khazaei and Valentina Cecchi

Semi-Seasonally Optimized Tilt Angles for Design of Utility-Scale Photovoltaic Generation Station 457
Faraj Alyami and Pablo Gomez

Frequency Control by Tariff Regulation (A comparison between the MPC and Tariff Modification) 462
Roghieh Abdollahi, Zoleikha Biron and Ramtin Hadidi

Large-Scale Battery Energy Storage System Dynamic Model for Power System Stability Analysis 468
Roghieh A. Biroon, Pierluigi Pisu and David Schoenwald

Offshore Wind Farms: A Fuzzy Approach to Site Selection in a Black Sea Region 473
Muhammet Deveci, Ender Özcan and Robert John

Induction Machines limits Identification During Abnormal Conditions Using an Optimization Algorithm 479
Mohammed Alqahtani, Zhixin Miao and Lingling Fan

Hardware Development of a Sinusoidal PWM on a Three-Phase 3.5 kW SiC Converter ... 485
Jonathan Diller, Brennan Trussell, Javad Khazaei and Peter Idowu

Optimal Daily Operation in Smart Grids Using Decentralized Bi-level Optimization Considering Unbalanced Optimal Power Flow 491
Meisam Ansari, Mostafa Ansari, Jaber Valinejad and Arash Asrari

Indian Grid Code Based Low Voltage Ride Through Control Development for Large Scale Solar PCS 497
Prashantkumar Patel, Yashpal Patel and Shimada Keizo

Optimal Restoration Strategy to Enhance the Resilience of Transmission System under Windstorms 503
Xue Gao and Zhi Chen

Nonlinear Control Design for Voltage Source Converters in Weak AC Grids 509
Javad Khazaei, Zhenghong Tu, Arash Asrari and Wenxin Liu

Cyber-Physical Observability for the Electric Grid 515
Nicholas Jacobs, Shamina Hossain-McKenzie, Adam Summers, C. Birk Jones, Brian Wright and Adrian Chavez

A Bayesian Attack Tree Based Approach to Assess Cyber-Physical Security of Power System 521
Rounak Meyur

Steady-State Scenario Development for Synthetic Transmission Systems 527
Hanyue Li, Ju Hee Yeo, Jessica Wert and Thomas Overbye

Microgrid Control Strategies for Seamless Transition Between Grid-connected and Islanded Modes 533
Silvanus D'Silva, Mohammad B. Shadmand and Haitham Abu-Rub

The Voltage Regulation of a Buck Converter Using a Neural Network Predictive Controller 539
Sepehr Saadatmand, Pourya Shamsi and Mehdi Ferdowsi