

**2020 IEEE 14th International
Conference on Compatibility,
Power Electronics and Power
Engineering
(CPE-POWERENG 2020)**

**Setubal, Portugal
8 – 10 July 2020**



**IEEE Catalog Number: CFP20851-POD
ISBN: 978-1-7281-4219-7**

**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:	CFP20851-POD
ISBN (Print-On-Demand):	978-1-7281-4219-7
ISBN (Online):	978-1-7281-4218-0
ISSN:	2166-9538

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

CURRAN ASSOCIATES INC.
proceedings
.com

TABLE OF CONTENTS

POWER GENERATION, TRANSMISSION AND DISTRIBUTION

ANALYSIS OF CONVERTERS WITH BIPOLAR OUTPUT FOR DC MICROGRID	13
<i>S. P. Litrán, E. Durán, R. S. Barroso, J. Semião, M. B. Ferrera</i>	
ANALYSIS OF SKIN EFFECT IN SINGLE WIRE RESISTANCE BY FINITE ELEMENT METHODS.....	19
<i>Jorge Rafael González-Teodoro, Vladimir Kindl, Enrique Romero-Cadaval, Rafael Asensi</i>	
CHARGING/DISCHARGING STRATEGY FOR ELECTRIC VEHICLES BASED ON BI-LEVEL PROGRAMMING PROBLEM: SAN FRANCISCO CASE STUDY.....	24
<i>M. Bagheri Tookanlou, M. Marzband, J. Kyyrä, A. Al Sumaiti, K. Al. Hosani</i>	
EFFECTS OF BROKEN SKIRTS AND POLLUTION ON VOLTAGE DISTRIBUTION FOR CAP AND PIN GLASS INSULATORS.....	30
<i>C. Mateus, F. A. Barata, R. Luís</i>	
IMPACTS OF AUTOMATED NATURAL VENTILATION IN THE TEMPERATURE AND HUMIDITY OF A DISTRIBUTION TRANSFORMER ROOM.....	36
<i>Alexandre Correia, Luis Ferreira, Paulo Coimbra, Aníbal De Almeida</i>	
OPTIMIZING NODAL CAPACITY ALLOCATION USING RISK ASSESSMENT OF ELEMENT FAILURE RATE	44
<i>Nuno Amaro, Francisco Carrola, Francisco Reis</i>	
THE IMPORTANCE OF DAILY LOAD FORECASTING FOR MAIN ELECTRIC SUBSTATION IN A SPOT MARKET CONTEXT	50
<i>P. J. Santos, S. R. Chemetova, A. J. Pires, M. V. Neves</i>	
VIRTUAL INERTIA AND DROOP CONTROL USING DC-LINK IN A TWO-STAGE PV INVERTER	55
<i>João Graça Ramos, Rui Esteves Araújo</i>	

POWER ELECTRONICS AND APPLICATIONS

AN 8/6 SRM DRIVE WITH A MULTILEVEL TOPOLOGY BASED ON A CROSS-SWITCHED CONFIGURATION	63
<i>V. Fernão Pires, Daniel Foito, A. J. Pires, Armando Cordeiro, J. F. Martins</i>	
ANALYSIS OF THE STATCOM/BALANCER ROBUSTNESS IN RAILWAY APPLICATIONS	69
<i>António P. Martins, Vítor A. Morais, Carlos J. Ramos</i>	
ANALYTICAL MODELLING AND OPTIMIZATION OF DAB CONVERTERS CONSIDERING THE STEADY-STATE BEHAVIOR AND ALL DEGREES OF FREEDOM	76
<i>Muhammad Faisal Fiaz, Sandro Calligaro, Roberto Petrella</i>	
COMPACT ELECTROTHERMAL MODEL OF AN IMPULSE TRANSFORMER FOR SPICE.....	82
<i>Krzysztof Górecki, Krzysztof Górski, Zakład Łączności</i>	

COMPARATIVE ANALYSIS OF VEHICLE-TO-VEHICLE (V2V) POWER TRANSFER CONFIGURATIONS WITHOUT ADDITIONAL POWER CONVERTERS	88
<i>Tiago J. C. Sousa, Luis Machado, Delfim Pedrosa, Carlos Martins, Vítor Monteiro, Joao L. Afonso</i>	
DC CAPACITOR TESTING CAPABILITY INTRINSIC TO MULTI-LEG CONVERTERS	94
<i>Mitja Nemeč, Vanja Ambrožič, Andraž Rihar, Peter Zajec</i>	
DISCRETE POLYNOMIAL RESONANT CURRENT CONTROLLER FOR A SINGLE-PHASE VSC CONNECTED TO THE GRID USING AN LCL FILTER.....	100
<i>Carlos Ramos, António Martins</i>	
FAULT TOLERANT OPERATION OF THREE-PHASE 3 LEVEL T-TYPE QZS INVERTERS USING SLIDING MODE CURRENT CONTROLLERS	107
<i>V. Fernão Pires, Daniel Foito, Natália Santos, Armando Cordeiro, C. Roncero-Clemente, J. F. Silva</i>	
GRID-CONNECTED THREE-PHASE 3L-T-TYPE QZS INVERTER FOR RENEWABLE ENERGY.....	114
<i>Carlos Roncero-Clemente, Oleksandr Husev, Fermín Barrero-González, Eva González-Romera, María Isabel Milanés-Montero, Enrique Romero-Cadaval</i>	
IMPROVED METHOD OF POWER INDUCTOR DESIGN WITH DC CURRENT IMPACT.....	120
<i>Wai Keung Mo, Kasper M. Paasch, Thomas Ebel</i>	
INFLUENCE OF PARAMETERS OF CURRENT FEEDING POWER LEDS ON THEIR ELECTRIC, OPTICAL AND THERMAL PROPERTIES	127
<i>Krzysztof Górecki, Przemysław Ptak</i>	
MODELLING INFLUENCE OF SELECTED FACTORS ON PROPERTIES OF INDUCTORS OPERATING IN THE BUCK CONVERTER.....	132
<i>Krzysztof Górecki, Kalina Detka</i>	
MODULAR MULTILEVEL CONVERTERS FOR BATTERY ELECTRIC VEHICLES: VARIABLE DC VOLTAGE CONTROL TO OPTIMIZE BATTERY LIFETIME.....	137
<i>Davide De Simone, Luigi Piegari</i>	
MULTIPLE-OUTPUT SWITCHED-CAPACITOR DC-DC COMBINATION CONVERTERS FOR IOT APPLICATIONS	143
<i>J. Semião, E. Durán, S. P. Litrán, M. B. Ferrera</i>	
NON-INVERTING MAGNETICALLY COUPLED BUCK-BOOST BIDIRECTIONAL DC-DC CONVERTER.....	149
<i>A. Rodriguez-Lorente, A. Barrado, A. Lázaro, P. Zumel, M. Sanz</i>	
STUDY OF DISTURBING FACTORS IN CURRENT SENSORLESS CONTROL APPLIED TO NPC MLC	156
<i>Alexander Suzdalenko, Janis Zakis</i>	
SWITCHING FREQUENCY REDUCTION FOR EFFICIENCY OPTIMIZATION IN TWO PARALLELED UPS SYSTEMS	161
<i>Tiago J. L. Oliveira, Luís M. A. Caseiro, André M. S. Mendes, Sérgio M. A. Cruz, Marina S. Perdigão</i>	

SMART GRID TECHNOLOGIES AND APPLICATIONS

A HYBRID PROBABILISTIC ALGORITHM FOR COMPUTATIONALLY EFFICIENT ESTIMATION OF POWER GENERATION IN AC OPTIMAL POWER FLOW.....	169
<i>Mohamed Lotfi, Shaden Fikry, Gerardo J. Osório, Mohammad Javadi, Sérgio F. Santos, João P. S. Catalão</i>	
A MULTI-OBJECTIVE MODEL FOR HOME ENERGY MANAGEMENT SYSTEM SELF-SCHEDULING USING THE EPSILON-CONSTRAINT METHOD.....	175
<i>Mohammad Javadi, Mohamed Lotfi, Gerardo J. Osório, Abdelrahman Ashraf, Ali Esmaeel Nezhad, Matthew Gough, João P. S. Catalão</i>	
A NOVEL PEER-TO-PEER NEGAWATT TRADING TRANSACTIVE ENERGY SYSTEM FOR PROSUMERS	181
<i>D. Syptayev, H. S. V. S. Kumar Nunna, Almas Shintemirov</i>	
ADAPTIVE STATE OF CHARGE CONTROL FOR DROOP-CONTROLLED INDUSTRIAL DC-MICROGRIDS	187
<i>Raoul Laribi, Darian Andreas Schaab, Alexander Sauer</i>	
AN OPTIMAL CHARGING OF PLUG-IN ELECTRIC VEHICLES IN UNBALANCED THREE-PHASE DISTRIBUTION NETWORK.....	194
<i>Pegah Bahrevar, Seyed Mehdi Hakimi, Arezoo Hasankhani, Miadreza Shafie-Khah, Gerardo J. Osório, João P. S. Catalão</i>	
CONSENSUS BASED IDEAL CURRENT SHARING CONTROLLER FOR DC MICROGRID	200
<i>Shirazul Islam, Souradip De, Sandeep Anand, Soumya Ranjan Sahoo</i>	
IMPLEMENTATION OF FINITE CONTROL STATE MODEL PREDICTIVE CONTROL WITH MULTIPLE DISTRIBUTED GENERATORS IN AC MICROGRIDS	206
<i>Iresha Poonahela, Sertac Bayhan, Haitham Abu-Rub, Miroslav Begovic</i>	
INCIDENT AND FAILURE QUANTIFICATION METHODOLOGY IN A CRITICAL INFRASTRUTURE	212
<i>Nuno Martins, Pedro Pereira, David Salgueiro</i>	
INFLUENCE OF WEATHER CONDITIONS IN POWER QUALITY EVENTS	219
<i>Nuno M. Rodrigues, Fernando M. Janeiro, Pedro M. Ramos</i>	
INTELLIGENT SYSTEMS APPLIED TO BUILDINGS' MANAGEMENT.....	224
<i>R. Pereira, F. A. Barata, C. Viveiros</i>	
INVESTIGATION OF DISTRIBUTION TRANSFORMER LOSS OF LIFE IN ELECTRIC VEHICLES PARKING LOT INTEGRATED SYSTEM	230
<i>S. Muhammad Bagher Sadati, Mohammad Yazdani-Asrami, Miadreza Shafie-Khah, Gerardo J. Osório, João P. S. Catalão</i>	
LOW-COST EMBEDDED MEASUREMENT SYSTEM FOR POWER QUALITY FREQUENCY MONITORING	236
<i>Nuno M. Rodrigues, Fernando M. Janeiro, Pedro M. Ramos</i>	
WIRELESS MONITORING SYSTEM OF ENERGY PARAMETER FOR CONSUMERS WITHOUT ACCESS TO THE LOW VOLTAGE LINE.....	240
<i>Mircea Dobricianu, Alexandru Bitoleanu, Gheorghe-Eugen Subtirelu, Mihaita Linca</i>	

ELECTRICAL MACHINES AND ADJUSTABLE SPEED DRIVES

CALCULATION OF CURRENT TOTAL HARMONIC DISTORTION FOR A SINGLE-PHASE CURRENT SOURCE MULTILEVEL INVERTER	249
<i>Mukhtar Turarbek, Alex Ruderman, Boris Reznikov</i>	
COMPARISON OF LOSSES IN SHORT FLUX-PATH TOPOLOGIES FOR SWITCHED RELUCTANCE MACHINES	255
<i>P. Lobato, S. Rafael, A. J. Pires</i>	
ENERGY EFFICIENCY ASSESSMENT OF VARIABLE SPEED PUMP DRIVE IN INDUSTRIAL COOLING SYSTEM	261
<i>Henrik Lavric, Klemen Drobnic, Rastko Fišer</i>	
MODIFIED FIELD ORIENTED CONTROL FOR FAIL-OPERATIONAL MULTI-PHASE INDUCTION MOTOR DRIVES	267
<i>Luigi Pio Di Noia, Rosa Anna Mastromauro, Luigi Piegari, Renato Rizzo</i>	
NONLINEAR H-INFINITY CONTROL FOR HYBRID EXCITED SYNCHRONOUS GENERATORS	273
<i>G. Rigatos, P. Siano, P. Wira, M. Abbaszadeh, V. Ambrozic</i>	
OPTIMIZED SPACE-VECTOR MODULATION SCHEMES FOR FIVE-PHASE PRECISION LOW-SPEED DRIVES WITH MINIMIZING THE STATOR CURRENT RIPPLE	279
<i>Valentin Tomasov, Aleksander Usoltsev, Denis Vertegel, Pawel Szczepankowski, Ryszard Strzelecki, Nikolai Poliakov</i>	
ROBUST CONTROL OF GRID-TIED INVERTERS USING PARTICLE SWARM OPTIMIZATION AND LINEAR MATRIX INEQUALITIES	285
<i>Lucas C. Borin, Iury Cleveston, Gustavo G. Koch, Caio R. D. Osório, Everson Mattos, Vinícius F. Montagner</i>	
SIMPLE INDUCTIVE CHARGE PUMP	291
<i>Felix A. Himmelstoss, Helmut L. Votzi</i>	
STABILITY STUDY OF A MINIMUM-LOSS STRATEGY CONTROLLED DUAL-VSI DFIGN DC SYSTEM	297
<i>Gil D. Marques, Matteo F. Iacchetti, Sérgio M. A. Cruz</i>	
SYNTHESIS OF A SYSTEM FOR ADAPTING AND FEEDING A CONSUMER WITHOUT ACCESS TO THE LV NETWORK	303
<i>Mihaela Popescu, Alexandru Bitoleanu, Constantin Vlad Suru, Mircea Dobriceanu, Florin Alexandru Teodorescu, Andrei Marinescu</i>	
TAKAGI-SUGENO-KANG FUZZY PID CONTROL FOR DC ELECTRICAL MACHINES	309
<i>Luís Brito Palma, Rui Azevedo Antunes, Paulo Gil, Vasco Brito</i>	
THE EARLY DETECTION OF STATOR WINDING SHORTED TURNS IN PERMANENT MAGNET THREE PHASE GENERATORS BY ANALYSIS OF ITS PHASE VOLTAGES	317
<i>Michael Barrett</i>	
TOPOLOGIES OF HIGH TEMPERATURE MACHINES	324
<i>Daniel Roger, Nouredine Takorabet</i>	

RENEWABLE ENERGY AND ENERGY STORAGE TECHNOLOGIES

ASSESSMENT OF ENERGY STORAGE SYSTEMS FOR MULTIPLE GRID SERVICE PROVISION.....	333
<i>Jairam Ramakrishnan, Seyedmostafa Hashemi, Chresten Treholt</i>	
COMPARING THE EFFICIENCY OF CASCODE GAN AND ENHANCEMENT GAN IN BOOST CONVERTER OF PV SYSTEM	340
<i>Buket Turan Azizoglu, Abdul Balikci, Enes Durbaba, Eyup Akpinar, Ali Eren Kocamis</i>	
DETERMINATION OF SECOND-LIFE BATTERY CAPACITY AND LOAD RATING FOR A STANDALONE E-BIKE CHARGING STATION POWERED BY HYBRID RENEWABLE ENERGY SYSTEM	346
<i>Cong-Long Nguyen, Ettore Colicchio, Paolo Primiani, Louis Viglione, Kamal Al-Haddad, Lyne Woodward</i>	
DUAL EXCITED SYNCHRONOUS GENERATOR A SUITABLE ALTERNATIVE FOR WIND APPLICATIONS.....	352
<i>R. R. Abdel-Wahab, H. M. Yassin, H. H. Hanafy</i>	
ECONOMIC STUDY OF BATTERY PROFITABILITY IN RESIDENTIAL SOLAR PANEL SYSTEMS: A CASE STUDY OF BELGIUM.....	358
<i>Omid Alavi, Jolien Despeghel, Ward De Ceuninck, Marc Meuris, Johan Driesen, Michaël Daenen</i>	
FEASIBILITY STUDY OF ENERGY STORAGE SYSTEMS FOR A WIND FARM: A CASE OF EREYMENTAU REGION IN KAZAKHSTAN	364
<i>Aidana Kalakova, Yerasyl Amanbek, H. S. V. S. Kumar Nunna, Prashant Jamwal, Suryanarayanna Doolla</i>	
IMPROVING GRID SECURITY IN THE PRESENCE OF A HIGH PENETRATION OF RES THROUGH OPTIMAL PLANNING AND OPERATION OF DISTRIBUTED ENERGY STORAGE DEVICES.....	370
<i>Ricardo Pastor, Wei Yang, Nuno Pinho Da Silva, Sara Rodrigues, Francisco Reis, Xue Jinhua</i>	
JOHNSON SYSTEM FOR SHORT-TERM WIND POWER FORECAST ERROR MODELING.....	377
<i>Hang Li, Zhe Zhang, Buhan Zhang</i>	
MARKET EQUILIBRIUM ANALYSIS CONSIDERING ELECTRIC VEHICLE AGGREGATORS AND WIND POWER PRODUCERS WITHOUT STORAGE CAPABILITIES	382
<i>Oscar Diaz-Caballero, Paulo M. De Oliveira-De Jesus, Jose M. Yusta</i>	
SYSTEM REDUCTION OF OPTIMAL CONTROL PROBLEMS WITH SEASONAL STORAGE.....	388
<i>Martin Griese, Thomas Schulte</i>	

ELECTRIC MOBILITY

ELECTRIC VEHICLE CHARGING DIVERSITY FACTORS	397
<i>Luiz Artur Pecorelli Peres, José Francisco Moreira Pessanha, Antonio Guilherme Garcia Lima, Windson Braga Pereira</i>	

ENERGY MANAGEMENT SYSTEM OPTIMIZATION FOR A FUEL CELL HYBRID VEHICLE BASED ON POWER LOSSES MINIMIZATION	402
<i>Alberto Martín-Lozano, Andrés Barrado, Alba Rodríguez-Lorente, Antonio Lázaro, Cristina Fernández</i>	

LOCATION ANALYSIS OF ELECTRIC VEHICLE CHARGING STATIONS FOR MAXIMUM CAPACITY AND COVERAGE.....	409
<i>I. Safak Bayram, Sertac Bayhan</i>	

PARAMETRIC ANALYSIS OF A FUEL CELL HYBRID VEHICLE ENERGY MANAGEMENT SYSTEM.....	415
<i>Alberto Martín-Lozano, Andrés Barrado, Antonio Lázaro, Cristina Fernández, Marina Sanz</i>	

RESIDENTIAL MICROGRIDS: ARCHITECTURES, CONTROL AND INTERCONNECTION WITH THE MAIN GRID

ACCURACY ANALYSIS OF SELECTED TIME SERIES AND MACHINE LEARNING METHODS FOR SMART CITIES BASED ON ESTONIAN ELECTRICITY CONSUMPTION FORECAST.....	425
<i>Tobias Häring, Roya Ahmadihangar, Argo Rosin, Tarmo Korõtko, Helmuth Biechl</i>	

BALANCING ENERGY CONSUMPTION IN LIMITED POWER GRID WITH ACTIVE FRONT-END AND THREE PHASE DUAL ACTIVE BRIDGE SYSTEM	429
<i>Konstantin Vorobev, Ryszard Strzelecki, Nikolai Poliakov</i>	

ENERGY STORAGE EXPANSION PLANNING IN MICROGRID.....	433
<i>Roya Ahmadihangar, Amir Baharvandi, Argo Rosin, Tobias Häring, Elnaz Azizi, Tarmo Korõtko, Noman Shabbir</i>	

FAULT-TOLERANT APPROACH FOR PHOTOVOLTAIC MODULE-LEVEL POWER ELECTRONIC APPLICATIONS.....	438
<i>Dmitri Vinnikov, Andrii Chub, Oleksandr Korkh, Mariusz Malinowski</i>	

FCS-MPC AND OBSERVER DESIGN IN THE DQ SYNCHRONOUS FRAME: AN EXPERIMENTAL VALIDATION.....	445
<i>Eduardo Zafra, Sergio Vazquez, Tobias Geyer, Ricardo P. Aguilera, Leopoldo G. Franquelo, Jose I. Leon</i>	

FLEXIBILITY ENHANCEMENT OF HYBRID MICROGRIDS USING OPTIMAL H_{∞} FILTERING-BASED FUZZY CONTROL OF UIPC	451
<i>Mahdi Zolfaghari, Roya Ahmadihangar, G. B. Gharehpetian, Tobias Häring, Argo Rosin</i>	

FLEXIBILITY INVESTIGATION OF PRICE-RESPONSIVE BATTERIES IN THE MICROGRIDS CLUSTER	456
<i>Roya Ahmadihangar, Elnaz Azizi, Subham Sahoo, Tobias Häring, Argo Rosin, Dmitri Vinnikov, Tomislav Dragicevic, M. T. Hamidi Beheshti, Frede Blaabjerg</i>	

MULTI-AGENT SYSTEM FOR DISTRIBUTED ENERGY MICROGRID: SIMULATION AND HARDWARE-IN-THE-LOOP PHYSICAL MODEL	462
<i>Aleksei Yu. Kuzin, Galina L. Demidova, Dmitry V. Lukichev, Nikolai A. Poliakov</i>	

OPTIMAL LCL-FILTER STUDY FOR BUCK-BOOST INVERTER BASED ON UNFOLDING CIRCUIT.....	467
<i>Oleksandr Matiushkin, Oleksandr Husev, Dmitri Vinnikov, Carlos Roncero-Clemente</i>	

POWER SMOOTHING IN SMART BUILDINGS USING FLYWHEEL ENERGY STORAGE	473
<i>Freddy Plaum, Tobias Häring, Roya Ahmadiyahangar, Argo Rosin</i>	
RESIDENTIAL LOAD FORECASTING USING RECURRENT NEURAL NETWORKS	478
<i>Noman Shabbir, Roya Amadiyahangar, Hadi A. Raja, Lauri Kütt, Argo Rosin</i>	
THREE-LEVEL NPC DUAL-BUCK INVERTER DESIGNED TO SAFETY-CRITICAL APPLICATIONS.....	482
<i>Armando Cordeiro, V. Fernão Pires, Daniel Foito</i>	
USING V2G TECHNOLOGY AS VIRTUAL ACTIVE POWER FILTER FOR FLEXIBILITY ENHANCEMENT OF HVDC SYSTEMS	489
<i>Mahdi Zolfaghari, Roya Ahmadiyahangar, Gevork. B. Gharehpetian, Argo Rosin, Freddy Plaum</i>	

ELECTRIC VEHICLES AND SMART GRIDS

A POWER FLOW CONTROL APPROACH FOR GRID-TIED PHOTOVOLTAIC SYSTEM WITH AN INTEGRATED EV BATTERY	497
<i>Sertac Bayhan</i>	
UNIFIED THREE-PORT TOPOLOGY INTEGRATING A RENEWABLE AND AN ENERGY STORAGE SYSTEM WITH THE GRID-INTERFACE OPERATING AS ACTIVE POWER FILTER	502
<i>Ana Rodrigues, Catia Oliveira, Tiago J. C. Sousa, Luis Machado, Joao L. Afonso, Vitor Monteiro</i>	

CHARGING TECHNOLOGIES AND BATTERY STORAGE SYSTEMS FOR ELECTRIC VEHICLES

A NOVEL TOPOLOGY OF MULTILEVEL BIDIRECTIONAL AND SYMMETRICAL SPLIT-PI CONVERTER	511
<i>Vitor Monteiro, Catia Oliveira, Ana Rodrigues, Tiago J. C. Sousa, Delfim Pedrosa, Luis Machado, Joao L. Afonso</i>	
EFFICIENCY COMPARISON OF A DC-DC INTERLEAVED CONVERTER BASED ON SIC-MOSFET AND SI-IGBT DEVICES FOR EV CHARGERS.....	517
<i>Jelena Loncarski, Mattia Ricco, Vitor Monteiro, Vito Giuseppe Monopoli</i>	
IMPACT ANALYSIS OF LEVEL 2 EV CHARGERS ON RESIDENTIAL POWER DISTRIBUTION GRIDS	523
<i>Joseph Antoun, Mohammad Ekramul Kabir, Bassam Moussa, Ribal Atallah, Chadi Assi</i>	
OPPORTUNITIES AND CHALLENGES OF POWER ELECTRONICS SYSTEMS IN FUTURE RAILWAY ELECTRIFICATION	530
<i>Luis A. M. Barros, Mohamed Tanta, António P. Martins, João L. Afonso, J. G. Pinto</i>	
PARALLEL-CONNECTED CURRENT SOURCE RECTIFIERS AS THE INPUT STAGE OF THE OFF-BOARD EV BATTERY CHARGER	538
<i>Jacek Rabkowski</i>	
REAL TIME IMPLEMENTATION OF FREQUENCY SEPARATION MANAGEMENT STRATEGY OF HYBRID SOURCE FOR FUEL CELL ELECTRIC VEHICLE APPLICATIONS.....	544
<i>Bachir Bendjedja, Nassim Rizoug, Moussa Boukhnifer</i>	

ROBUST CONTROL OF BATTERY-SUPERCAPACITOR ENERGY STORAGE SYSTEM
USING KHARITONOV THEOREM 550
*Yuliia Kozhushko, Danijel Pavkovic, Tetiana Karbivska, Pavlo Safronov, Oleksandr
Bondarenko*

Author Index