2024 24th International Scientific Conference on Electric Power Engineering (EPE 2024)

Kouty nad Desnou, Czech Republic 15-17 May 2024



IEEE Catalog Number: CFP2473X-POD

979-8-3503-4878-1

ISBN:

Copyright © 2024 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:
 CFP2473X-POD

 ISBN (Print-On-Demand):
 979-8-3503-4878-1

 ISBN (Online):
 979-8-3503-4877-4

ISSN: 2376-5623

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



Invited Lectures

Tomas Gono, Lukas Vavra, Petr Krejci, Michal Jasinski, Bretislav Stacho Harmonic filter design methodology	2
Iwona Klosok-Bazan, Miroslava Gono, Hana Svehlakova Water for green hydrogen production	7
Filip Novak, Petr Moldrik, Michal Jasinski Hydrogen initiatives and development	12
Ondrej Mamula, Petr Stejskal, David Hrycej, Premysl Sucha, Matous Cejnek, Petr Kadera Stand-alone hybrid power plant for ancillary services provision	17
Electrotechnology	
Petr Moldrik, Libor Hrdina, Jan Petrov, Petr Bernat, Petr Kacor, David Lorencic Computational model of hydrogen PEM fuel cells	24
Jozef Kudelcik, Stefan Hardon, Alexey Gunya Dielectric analysis of a polyurethane enhanced by MgO or AIN particles for an application in chemical power module case	30
Jozef Bendik, Matej Cenky, Levent Racz, Balint Nemeth Static line rating of overhead power lines in various European countries	35
Illia Lazarenko, Matej Cenky, Jozef Bendik A simplified urban-scale rooftop photovoltaic potential estimation	40
Roman Hrbac, Vaclav Kolar, Stanislav Kocman, Lukas Demel, Libor Hrdina, Kamil Slany Analysis of power flows in a building with non-linear loads and a hybrid photovoltaic power plant with battery storage	46
Lukasz Rokicki, Miroslaw Parol, Piotr Palka, Marcin Kopyt, Pawel Piotrowski Real-time electrical energy balancing and limiting the peak power demand of an industrial facility using a multi-agent system - early solutions of the DIEGO project	51
Conor Healy, John G. Hayes An efficiency optimized gear-shift map to maximise the performance of a modular E-axle	57
Alexandru Baloi, Adrian Pana, Florin Molnar-Matei, Damian Cerbu, Ionut Popa LabVIEW virtual instrument for the command of an adaptive balancing capacitive compensator	63
Aleksandra Pluzek, Lukasz Nagi, Michal Koziol, Ondrej Kabot Analysis of selected parameters of Midel 7131 ester with addition of aluminum oxide Al2O3	69
Stanislav Rusnok, Pavel Sobota, Petr Kacor Partial anisotropy of non-oriented electrical steel sheet as cause of shaft voltage of induction motors	74
Zaneta Eleschova, Boris Cintula, Anton Belan, Matej Cenky, Jozef Bendik Positive impact of the OLTC blocking on the voltage stability	79

Juraj Packa, Vladimir Saly, Peter Cubon, Milan Perny Influence of water on selected dielectric properties of impregnants in the cured state	85
Zaneta Eleschova, Matus Ludva, Boris Cintula, Anton Belan, Matej Cenky, Jozef Bendik Two-winding transformer in symmetrical components	89
Johannes Buberger, Wolfgang Grupp, Tobias Hogerl, Andreas Wiedenmann, Julian Estaller, Thomas Weyh, Manuel Kuder Optimizing bidirectional AC charging efficiency of multilevel batteries: a simulation approach	95
Conor Healy, John G. Hayes Speed vectoring algorithms for drivelines with multiple modular E-axles	100
Nina Sorokina, Wolfgang Bliemetsrieder, Julian Estaller, Dominic Karnehm, Thomas Weyh, Manuel Kuder Performance analysis of reconfigurable inverter battery systems for aircraft applications	106
Electrical Engineering and Light	
Pavel Cyprich, Petr Cyprich, Jan Strossa, Vladislav Damec, Ales Havel Comparison of hysteresis current control and VOC control with SPWM and SVPWM applied to Vienna rectifier	113
Tomas Blodek, Pavel Vrtal, Tomas Kohout, Zdenek Svaty, Lubos Nouzovsky Verification of night road safety inspection by luminance analysis	119
Marek Kubatko, Stepan Kirschner, Vojtech Sotola, Kamal Hamani, Martin Kuchar Sensorless induction motor drive based on reactive power MRAS estimator using artificial neural network	124
Tadeas Holy Mathematical models of multiphase machines based on symmetrical components decomposition in relation to space harmonics	128
Michal Sahul, Peter Janiga Optimization of ESD protection design for assembly lines of headlights through risk analysis	133
Ali Aljazaeri, Petr Toman, Jan Klusacek Modelling and testing of phasor measurement unit in PSCAD	138
Ardian Hyseni, Dusan Medved, Jaroslav Petras Benford's law in electric power engineering	144
Obed Muhayimana, Mohammed Laamim, Ali Aljazaeri, Abdelilah Rochd, Petr Toman Comparative study between model-in-the-loop offline and real-time simulations for phasor measurement units	150
Patrik Kucera, Hana Karnikova, Lenka Maierova Use of satellite imagery to identify light pollution sources in urban structure – the limits and the benefits	156
Peter Janiga, Jozef Bendik, Matej Cenky, Zaneta Eleschova, Anton Belan, Boris Cintula, Juraj Packa Operation of public lighting networks at voltage lower than nominal	161

Maya Almansour, Jiri Drapela Complementary reactive power control of three-phase AC/DC voltage source converters for grid support applications	165
Jan Zbojovsky, Roman Cimbala, Peter Gabris Analysis of dielectric parameters of XLPE insulation by impedance relaxation spectroscopy	171
Tomas Novak, Pavel Valicek, Jan Latal, Stanislav Hejduk, Michal Quis Modelling of road lighting in connection with VLC requirements – case study	176
Ondrej Dolejsi, Tomas Novak, Pavel Valicek, Jan Vanus Road lighting regulation in relation to vertical illuminance and vehicle stopping distance	182
Vladimir Mostyn, Lubomir Ivanek, Petr Orsag, Stanislav Kocman, Stanislav Zajaczek, Karel Shee Train approach detection system based on track impedance measurements	186
Slavka Seckova, Florinda F. Martins, Frantisek Janicek, Miroslava Farkas Smitkova, Juraj Packa, Milan Perny Heat pump performance design for heating system in the building	192
Power Plants	
Maksymilian Przygrodzki, Rafal Gwozdz Selected problems of modelling energy storage and renewable sources for long-term analyses	199
Rafal Gwozdz, Maksymilian Przygrodzki Long-term analysis of development and demand for energy storage in Poland	205
Michal Kunicki, Michal Koziol, Ireneusz Urbaniec, Jaroslaw Zygarlicki Wavelet selection for analysis of acoustic signals emitted by partial discharges in oil insulation	211
Petr Cervenka, Jan Kruntorad Optimizing the operation of portable traffic monitoring devices using photovoltaic panels for sustainability and efficiency	216
Jan Petrov, Libor Hrdina, Petr Moldrik, Radomir Gono Diagnostic methods of photovoltaic panels: low-cost electroluminiscence	221
Libor Hrdina, Petr Moldrik, Jan Petrov, Roman Hrbac, Tomas Mlcak, Mikolaj Bartlomiejczyk The importance of heat pumps and cogeneration for the transformation of the energy sector to sustainable sources	227
Marek Hoger, Michal Bahernik Stochastic modeling of a residential PV plant operation	232
Milan Perny, Vladimir Saly, Juraj Packa, Richard Klucha Testing, analysis and diagnostics of chosen faults of photovoltaic systems	236
Dusan Medved, Michal Kolcun, Jozef Kiraly, Frantisek Margita, Ardian Hyseni, Damian Mazur	242
Analysis of electric vehicle charging process	
Aneta Bednarova, Radomir Gono, Stanislav Rusek, Jan Sobotik The path to a sustainable power production and issues to address	248

Jan Sobotik, Zdenek Hradilek, Jan Fulnecek, Aneta Bednarova Analysis of an off-grid system with photovoltaic panels	252
Vladimir Kral, Petr Bernat, Adam Betak Cost-effectiveness of heat pump in apartment buildings	257
Khuong Nguyen-Vinh, Saumith Gonapaladeniya, Nam Nguyen-Quang, Zbigniew Leonowicz A review of photovoltaic technology	262
Khuong Nguyen-Vinh, Nam Nguyen-Quang, Zbigniew Leonowicz, Tomas Novak, Radomir Gono, Ervin Racz Comparing of potential energy from the sun during a year in Czechia and Vietnam	268
Jan Fulnecek, Ondrej Kabot, Michal Kunicki, Lukasz Nagi Medium voltage covered conductors: advantages, disadvantages and high impedance faults	273
Electrical Networks	
Lechuan Piao, Fei Xue, Xiaoliang Wang, Qigang Wu, Shaofeng Lu, Bing Han Active planning of flexible and cohesive virtual microgrids	279
Huilin Zhu, Ziqian Zhang, Lothar Fickert, Guochu Chen, Yongming Zhang, Robert Schuerhuber Impedance measurement and stability analysis based on grid-connected inverter in D-Q domain	285
Karolina Cechova, Jaroslava Orsagova Monitoring level of residual currents in dispatch system by new function embedded in regulator of arc-suppression coil	289
Jiri Dvoracek, Jiri Drapela, Jan Moravek, Martin Vojtek, Petr Mastny In-field compliance testing of an existing photovoltaic power generating module	294
Krzysztof Solak, Waldemar Rebizant, Frank Mieske, Klaus Boehme ANN stabilization of negative-sequence integral protection of power transformers for turn-to-turn winding faults	300
Karel Maslo, Stanislav Macejko, Tomas Haba Grid forming inverter models for stability studies	306
Stanislav Kratochvil, Stanislav Rusek Power grid security: N-1 criterion and DACF model	312
Antonina Havrylovych, Zdenek Hradilek, Vladimir Kral Analyzing software tools to assess optimal variant of energy store	316
Karel Maslo, Vaclav Gromnica Power system dynamic model as a digital twin	322
Michal Vrana, Martin Vojtek, Jiri Drapela, Martin Kaspirek Transition of inverter generating plants to unintentional island operation in part of the distribution network	328

Miguel Kosmala Neto, Tomasz Okon, Kazimierz Wilkosz Areas of impact of nodal powers on power flows in a power system	333
Frantisek Margita, Lubomir Bena, Pawel Pijarski Calculation of the ampacity of overhead power lines under the conditions of the electric power system of the Slovak Republic	338
Matous Vrzala, Radomir Gono, Bretislav Stacho Reliability improvement with automatic transition between grid-connected and islanded modes	343
Tomas Micak, Roman Hrbac, Lukas Demel Control of outdoor lighting systems with long-distance communication	348
Olena Rubanenko, Milan Belik, Jan Timr Implementing European experiences of energy community strategy based on high utilization of renewable energy sources to distributed power grids in Ukrainian conditions	353