

2023 IEEE 64th International Scientific Conference on Power and Electrical Engineering of Riga Technical University (RTUCON 2023)

**Riga, Latvia
9-11 October 2023**



**IEEE Catalog Number: CFP2391Z-POD
ISBN: 979-8-3503-1774-9**

**Copyright © 2023 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:	CFP2391Z-POD
ISBN (Print-On-Demand):	979-8-3503-1774-9
ISBN (Online):	979-8-3503-1773-2

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

Selection of Microcontroller Board and Stepper Motor Driver for FDM 3D Printing to Reduce Power Consumption	1
<i>Vlads Vladinovskis</i>	
Let's Take What the Sun Gives Us	7
<i>Josifs Survilo</i>	
Online Fault Detection and Diagnosis in Three-Phase Induction Machines Using the $\alpha\beta$ -Vector Approach: A Practical Implementation.....	13
<i>Miguel A. Marques, Rui Dias Jorge, Luís Filipe Mendes, Armando Cordeiro, Daniel Foito, V. Fernão Pires, J. F. Martins</i>	
Control of Pick-And-Place Robots with Reduced Power Consumption.....	20
<i>Valery Vodovozov, Zoja Raud, Eduard Petlenkov</i>	
New Experience of Fuel Cell Micro CHP Operation in Latvia	25
<i>Aleksandrs Dolgicers, Jevgenijs Kozadajevs, Ivars Zalitis</i>	
Comparison of Power Flow Methods for Distribution Grids	29
<i>Ahmed G. E. M. I. Mowafy, Ingars Steiks</i>	
Impedance Network-Based Diode-Clamped Multilevel Inverter Voltage Balancing with Cascaded Voltage Multiplier.....	35
<i>Ali Ebrahimi, Ebrahim Babaei, S. M. J. Mousavi, Hamed Mashinchi Maher, Tanel Jalakas</i>	
A Strategic Approach to Implementing Problem-Based Learning in Higher Education Through Student-Managed Laboratories and Adapting Existing Courses	42
<i>Martinš Priede, Pavels Maksimkins, Andrejs Stupans, Leonids Ribickis</i>	
Potential for Waste Heat Recovery in a Digital Currency Mining Facility: A Building Infrastructure Case Study.....	47
<i>A. Parrado-Duque, Y. Dubé, S. Charrel, C. Gader, N. Henao, K. Agbossou, Y. Guibault</i>	
Study Courses Digitalisation at RTU on the Basis of HPC Platform and Combined Learning Methodology	54
<i>Anastasia Zhiravetska, Jelena Chaiko, Nadezhda Kunicina, Julija Maksimkina</i>	
Towards Sustainable Transport: Evaluating Potencial of Hydrogen Fuel Cell Buses and Trucks in Latvia.....	60
<i>Andris Backurs, Laila Zemite, Aigars Laizans, Ilmars Bode, Aivars Starikovs, Liga Vempere</i>	
A Single-Phase High-Frequency Isolated Quasi-Z-Source AC-AC Converter Without Commutation Problem and Step-Change Frequency Operation.....	66
<i>Deniz Zargariafshar, S. M. J. Mousavi, Ebrahim Babaei, Hamed Mashinchi Maher, Naser Hassanpour</i>	
A New High Step-Up NPC-Based Switched-Capacitor Seven-Level Grid-Tied Inverter for PV Applications.....	72
<i>Milad Ghavipanjeh Marangalu, Hamed Mashinchi Maher, Dmitri Vinnikov, Tanel Jalakas</i>	
Directional Earthfault Protection Operation and Setup Aspects in Medium Voltage Compensated Network.....	78
<i>Olegs Borscevskis, Deniss Zaicevs, Maksims Jagubovs, Sergejs Ribakovs</i>	

Step-Up/Down Partial Power Converter with Enhanced MPPT Efficiency Around Zero Partiality	82
<i>Neelesh Yadav, Andrii Chub, Naser Hassanpour, Andrei Blinov, Dmitri Vinnikov</i>	
Basis of Operational Planning Methodology in Diversified Gas Distribution Systems	88
<i>Ainars Selickis, Leo Jansons, Ilmars Bode, Laila Zemite, Namejs Zeltins</i>	
Specific Electrical Loads of Multi-Apartment Residential Buildings in the Agglomeration «Moscow - Moscow Region».....	94
<i>Yuriy Soluyanov, Alexander Fedotov, Azat Akhmetshin, Vladimir Soluyanov</i>	
Secure Video IoT Monitoring System Based on ESP32	100
<i>Kristers Šabanks, Jevgenijs Telicko, Andris Jakovics</i>	
Preliminary Design Analysis of an Axial Flux Yokeless Stator Switched Reluctance Machine.....	106
<i>Shahid Hussain, Ants Kallaste, Muhammad Usman Naseer, Martin Sarap, Hans Tiismus, Toomas Vaimann</i>	
Gen Z Oriented Engineering Education in the “Industry 4.0” Age	112
<i>Zoja Raud, Valery Vodovozov, Eduard Petlenkov</i>	
Computer Simulation of the Baltic Power Systems Modes as Part of ENTSO-E Power Unit	116
<i>Anatolijs Mahnitko, Tatjana Lomane, Inga Zicmane, Timurs Kuznecovs</i>	
Analysis of the Condition Transformer After a Fault Using the SFRA and FDS Method	122
<i>Miroslav Gutten, Daniel Korenciak, Matej Kucera, Marek Paskala</i>	
The Evaluation of Cooperation Between Universities	127
<i>Antons Patlins, Leonids Ribickis</i>	
Enhancing Student Motivation and Academic Success. Effective Strategies for Promoting Study Programs in Education	133
<i>Nadezhda Kunicina, Jelena Caiko, Roberts Grants</i>	
Interrelation and Selection of Teeth Zone Parameters of a Homopolar Inductor Alternator	139
<i>Alberts Serebrjakovs, Deniss Brodnevs</i>	
Effects of Poor Quality UPS.....	145
<i>Fatih Çigrikçi, Rahmet Aybüke Bilir, Serkan Güney</i>	
The Role of Hydrogen in the Green Future of the Baltic Energy System	151
<i>Antans Sauhats, Roman Petrichenko, Lubov Petrichenko, Galina Bockarjova, Konstantins Burcevs, Marija Zima-Bockarjova</i>	
An Academic Laboratory for All-Electric Energy Communities: The Case Study of PVZEN Microgrid.....	159
<i>Paolo Di Leo, Gabriele Malgaroli, Angela Amato, Stefano Schubert, Alessandro Ciocia, Filippo Spertino</i>	
Development of Mutual Recognition of Education Approach in Advanced Computer-Oriented Engineering Technologies in the Baltic Region.....	165
<i>Nadezhda Kunicina, Anton Rassõlkin, Rasa Bruzgienne, Darius Plonis, Jelena Caiko</i>	
Purposeful Change in Transmission Line	171
<i>Josīfs Survilo</i>	
Application of Arbitrary Polynomial Chaos in the Analysis of Power System Adequacy	177
<i>Vladislav P. Oboskalov, Anatolijs Mahnitko, Danil A. Ignatev, Roman Petrichenko</i>	

Research Regarding the Methods for Computing Grounding Resistance	184
<i>Jelena Dikun, Daiva Stanelyte, Algimantas Andriusis, Daiva Stanelyte, Algimantas Andriusis</i>	
Droop Control Implementation in Bidirectional Step-Up/Down Partial Power Converter for Battery Energy Storage Applications	189
<i>Naser Hassanpour, Andrii Chub, Andrei Blinov, Dmitri Vinnikov</i>	
Zero Current Detection Circuit Based on Saturable Transformer Application in GaN Based DC-DC Converter with Triple-Mode Switching.....	195
<i>Kaspars Kroics, Kristians Gaspersons, Martin Makar</i>	
Impact of Variable Factors on the Viability and Efficiency of Energy Communities: A Scenario Simulation Study in Latvia.....	201
<i>Roberts Lazdins, Anna Mutule</i>	
An Approach to Permeance Calculation of a Teeth Zone of a HIA Using MATLAB	206
<i>Deniss Brodnevs, Alberts Serebrjakovs</i>	
Evaluation of the Efficiency of Collaboration Between Universities and Enterprises	212
<i>Antons Patlins, Leonids Ribickis</i>	
Assessing Financial and Operational Feasibility of Solar Energy Storage.....	218
<i>Davids Kronkalns, Laila Zemite, Aivo Jasevics, Leo Jansons, Andris Backurs</i>	
The MATLAB Grader: Expanding Possibilities with Various Task Versions.....	224
<i>Maris Terauds, Vladimirs Smolaninovs</i>	
Analysis of Common Mode and Rapidly Varying Voltage Profile on Stator Current Harmonics of an Inverter-Fed Induction Motor	230
<i>Muhammad Usman Sardar, Toomas Vaimann, Lauri Kütt, Ants Kallaste, Bilal Asad, Karolina Kudelina, Siddique Akbar</i>	
A Review of Energy Storage Technologies Comparison and Future Challenges	236
<i>Christos Pergamalis, Eleftherios Tsampasis, Panagiotis Gkonis, Charalambos Elias</i>	
Novel Isolated High Step-Up DC-DC Converter with Wide Input Voltage Regulation Range.....	242
<i>Saeed Pourjafar, Parham Mohseni, Oleksandr Matiushkin, Oleksandr Husev, Dmitri Vinnikov</i>	
Processes in Living Organisms as a Source of Electrical Energy.....	248
<i>Anatolijs Simonovs, Igors Uteshevs, Nadezhda Kunicina</i>	
Cultivating Future-Ready Education: Striking a Balance with Personalized Empowerment in Electrical Engineering	254
<i>Nadezhda Kunicina, Jelena Caiko, Roberts Grants</i>	
Green Day Ahead Market in Indian Power Sector	260
<i>Naresh Kumar Mhalas, Sonali Mangal, Subhendu Mukherjee, Ch Jagadeesh, Hemant Kumar Meena</i>	
Six-Phase Fault-Tolerant Inverter Using a Multilevel Nine-Switch Converter	265
<i>Armando Cordeiro, V. Fernão Pires, Daniel Foito, J. Fernando Silva</i>	
A Three-Phase Unfolding-Based PFC Topology with Two Inductors for Electric Vehicles Battery Charging	273
<i>Parham Mohseni, Oleksandr Husev, Dmitri Vinnikov, Oleksandr Matiushkin, Naser Vosoughi Kurdkandi</i>	

PV System for Emergency Power Supply of Cattle-Farm in War Conditions.....	279
<i>Milan Belik, Olena Rubanenko</i>	
Power System Modelling in the Baltic Countries: Data Accessibility and Consistency Aspects	286
<i>Jana Teremranova, Zane Broka, Karlis Baltputnis</i>	
DC Droop Control Strategies and Tuning Principles.....	291
<i>Indrek Roasto, Andrei Blinov, Dmitri Vinnikov, Laurens Mackay, Tanel Jalakas</i>	
Implementation of Hybrid PWM with Smooth Transitions Between Modulation Modes for Railway Traction Field-Oriented Control System	297
<i>V. Burenin, J. Zaremba, G. Kobenkins, O. Kriebs</i>	
Sustainable Development of the Professional Education During the Period of COVID-19.....	304
<i>Luçiana Toti, Nadezhda Kunicina</i>	
Study of the Disc-Type Electromagnetic Pump with Permanent Magnets for Liquid Metal Applications.....	310
<i>Arturs Brekis, Andrey Shishko, Imants Bucenieks, Kalvis Kravalis, Oskars Mikanovskis, Leonids Buligins</i>	
EV Battery Charging Converters with Wide Output DC Voltage Range.....	315
<i>Mohammad Mahad Nadeem, Andrei Blinov, Dmitri Vinnikov</i>	
Operation, Optimization and Taxation of Large-Scale Combined Solar and Hydro Pumped Storage Power Plant.....	321
<i>Lubov Petrichenko, Roman Petrichenko, Antans Sauhats, Galina Bockarjova, Konstantins Burcevs, Saulius Gudzius, Marija Zima-Bockarjova</i>	
Hybrid Heating System Sizing and Operation Control with Neural Network Based Simulation.....	327
<i>Dmitrijs Rusovs, Varis Žentīns</i>	
Prospects for the Use of Electric Drives in Urban Passenger Vehicle Transport in Ukraine	331
<i>Andrii Hnatov, Shchasianna Arhun, Vasiliy Mygal, Martins Bisenieks, Roberts Grants, Olha Ulianets</i>	
Optimal Generation Structure Within Sustainable Energy Communities Demand	337
<i>Yuriii Veremiichuk, Olena Yarmoliuk, Ivan Prytyskach, Vitalii Opryshko, Anatolijs Mahnitko, Tatjana Lomane</i>	
Technical Condition Assessment Framework for Steel Underground Gas Distribution Pipelines in Latvia.....	343
<i>Aleksandrs Koposovs, Leo Jansons, Ilmars Bode, Laila Zemite, Egils Dzelzitis</i>	
Comparison of GaN HEMT Power Loss Calculation Methods for Dual Active Bridge Converter	349
<i>Edgars Kalsnavs, Aleksejs Jekimovs, Marcis Prieditis</i>	
Modelling a Motor Cooling System with Stator Lamination Fins	356
<i>Oleksandr Dobzhanskyi, Sreekant Narumanchi, Jeff Tomerlin, Bidzina Kekelia, Rupert Gouws, Emily Cousineau</i>	
Digital Twin of PV System for Ukrainian Thermal Power Plant Flue Gas Cleaning Unit	361
<i>Olena Rubanenko, Milan Belik</i>	
Technical and Economic Investigation of Alternative Power Supply Scheme of Radial Medium Voltage Distribution Grid	367
<i>Lukas Herter, Samuel Grossmann, Artjoms Obushevs, Petr Korba, André Gomes</i>	

An Overview of Wide-Voltage Range Isolated DC-DC Converters	376
<i>Salman Khan, Andrii Chub, Dmitri Vinnikov</i>	
Analysis and Static Mode Optimization of Simultaneous Inductive and Capacitive Coupled Wireless Power Transfer System	382
<i>Viktor Shevchenko, Oleksandr Husev, Dmitri Vinnikov, Bohdan Pakhaliuk, Ryszard Strzelecki, Maksym Khomenko</i>	
Ensuring Fully Renewable Baltic Power System	387
<i>Antans Sauhats, Roman Petrichenko, Marija Zima-Bockarjova</i>	
A Resilient Power Supply Approach by Strategic Interconnection of Multiple Microgrids.....	396
<i>Rahul Nakka, Sukalyan Maji, Partha Kayal</i>	
Computer Vision System for Autonomous Sea Buckthorn Harvesting Robot.....	403
<i>Jurijs Timofejevs, Andrejs Potapovs, Mikhail Gorobetz</i>	
The Potential of Flexibility Utilisation for Municipalities to Optimally Use the Electricity Grid	408
<i>Linda Rüegg, Roger Hiltebrand, Artjoms Obushevs, Petr Korba</i>	
Method for Estimating the Efficiency of Energy Recycling for Electric Transport Equipped with Mobile Supercapacitor Storage System.....	418
<i>Girts Stana, Kaspars Kroics, Viesturs Brazis, Dimitar Arnaudov</i>	
Data, Analytics and Algorithms to Support Local Energy Communities	424
<i>Cristian Aguayo, Paula Carroll, Evita Kairiša</i>	
Navigating New Horizons in Electrical Engineering Education	429
<i>Nadezhda Kunicina, Jelena Caiko</i>	

Author Index