

2024 IEEE 65th International Scientific Conference on Power and Electrical Engineering of Riga Technical University (RTUCON 2024)

**Riga, Latvia
10-12 October 2024**



**IEEE Catalog Number: CFP2491Z-POD
ISBN: 979-8-3503-6578-8**

**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:	CFP2491Z-POD
ISBN (Print-On-Demand):	979-8-3503-6578-8
ISBN (Online):	979-8-3503-6577-1
ISSN:	2996-1033

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

Implementation Issues of Droop Controlled DC Nanogrids: State of Charge Management of Battery Energy Storage and Impact of Sensor Gain Tolerance.....	1
<i>Sayeed Hasan, Andrii Chub, Andrei Blinov, Dmitri Vinnikov</i>	
Inrush Current Measurement and Modeling Practical Cases and Primary Methods	7
<i>Jan Markus Tinno, Lauri Kütt, Martin Parker, Jan Kulikov, Martin Jaanus</i>	
HVAC and HVDC Transmission Lines	12
<i>Josifs Survilo</i>	
Evaluating SF ₆ Alternatives in Medium and High Voltage Switchgear.....	20
<i>Davids Kronkalns, Laila Zemite</i>	
Community Battery Sizing for Distribution Level RES Hosting Capacity Improvement	28
<i>Kristjan Peterson, Noman Shabbir, Victor Astapov, Lauri Kütt, Kamran Daniel</i>	
Heat Pump Coupling with Rooftop Solar Microgeneration Array	33
<i>Dmitrijs Rusovs, Varis Žentīns, Aleksandrs Sorocins, Ludmila Jakovieva, Agnese Lickrastina</i>	
Analysis of Consumer Energy Flexibility and Applicability for Power System.....	37
<i>Merilin Metsik, Argo Rosin, Vahur Maask, Hannes Agabus</i>	
Case Study of Outdoor Digital Screens Effect on Drivers	43
<i>Martin Parker, Argo Rosin, Dago Antov, Toivo Varjas, Taavi Möller, Inna Gorislavskaja</i>	
Comparing and Combining Nuclear with Solar, Wind, and Gas	50
<i>Antans Sauhats, Konstantins Burcevs, Roman Petrichenko, Galina Bockarjova, Diana Zalostiba</i>	
Performance Enhancement of Micro Hydro Power Plant with Improved Load Controller.....	56
<i>Pratibha Chauhan, Poonam Syal</i>	
Real-Time Simulation of the Initial Dynamic Model of CE in ePHASORSim: Issues and Troubleshooting.....	62
<i>M. Ramirez-Gonzalez, A. Obushevs, F. R. Segundo Sevilla, P. Korba</i>	
Increasing Efficiency PV System Due Considering Technical Condition	68
<i>Milan Belik, Olena Rubanenko, Phaneendra Babu Bobba</i>	
Increasing Efficiency of a Condensing Boiler by Improving the Design and Operating Characteristics of the Consumer.....	73
<i>Inna Bilous, Valerii Deshko, Volodymyr Voloshchuk, Anatoliy Sapunov, Eugene Nikiforovich, Jelena Tihana</i>	
Fault Simulation and Analysis of High-Voltage Circuit Breaker's Spring Charging Mechanism Using a Universal Motor Model.....	80
<i>Bilal Asad, Toomas Vaimann, Ants Kallaste Jako Kilter, Muhammad Usman Sardar</i>	
Simulation of Energy Cooperatives in Ukraine Grid with High Level Integration of Renewable Energy Sources.....	85
<i>Olena Rubanenko, Milan Belik, Phaneendra Babu Bobba</i>	

Actuator Simulation of a Two-Wheeled Hybrid Robot Sensor Platform.....	89
<i>Vytenis Sinkevicius, Valda Sneideriene</i>	
Strengthening Active Learning with a Reinforcement Approach in Engineering Education.....	95
<i>Valery Vodovozov, Zoja Raud, Eduard Petlenkov</i>	
A DFT-Based Approach for Condition Monitoring of Switch-Mode Power Converters.....	100
<i>Lauri Kütt, Tuuli Tiivel, Martin Parker, Laur Valgur, Marek Jarkovoi, Andrii Chub</i>	
A Laboratory Investigation of a Multi-Function PR-Controlled DVR.....	105
<i>Zaid H. Ali, Tamás Guth, Bence Süto, Dávid Raisz</i>	
State of the Art of Fault Current Limiter and Application to the HVDC Systems.....	111
<i>Jalal Sahebkar Farkhani, Jonathan Cervante Gomes, Peter Jan Randewijk, Kaiqi Ma, Claus Leth Bak, Zhe Chen</i>	
Active Clamped Dual Current-Fed Bidirectional DC-DC Converter for Wide Voltage Range Applications.....	117
<i>Sachin Chauhan, Andrei Blinov, Andrii Chub, Dmitri Vinnikov</i>	
Analysis of the Temperature Dependences of Insulation Parameters for Oil High-Voltage Transformer Using the Method FDS	124
<i>Miroslav Gutten, Daniel Korenciak, Jan Kanuch</i>	
Detecting Stator Winding Inter-Turn Short-Circuit in Tidal Stream Turbines by Relative Value Temperature Analysis	128
<i>Michael Barrett</i>	
Study of the Efficiency of Electric Transport Mobile Supercapacitor Energy Storage System Charging from Overhead Catenary.....	134
<i>Girts Stana, Kaspars Kroics, Viesturs Brazis</i>	
Enhancing Electrical Engineering Education Through Project-Based Learning	138
<i>Nadezhda Kunicina, Igors Utesevs, Jelena Caiko, Roberts Grants</i>	
Improved Initial Rotor Angle Detection for Vector Controlled Permanent Magnet Synchronous Motor with Incremental Encoder.....	144
<i>Kaspars Kroics, Valerijs Maricevs</i>	
Forecasting PV Energy Generation Using Transformer-Based Architectures: A Comparative Study of Lag-Llama, TFT, and DeepAR.....	148
<i>Furqan Amjad, Tarmo Korotko, Argo Rosin</i>	
Research on the “Electric Vehicles and Automotive Electronics” Curriculum Aimed at Modernization Within the DIGITRANS Project	154
<i>Shchasiana Arhun, Andrii Hnatov, Nadezhda Kunicina</i>	
Optimal Transmission Line Switching for Congestion Management.....	160
<i>Galo Santillán, Rommel Aguilar, Carlos Quinatoa</i>	
Active Front End Converters with Voltage Balancing Capability	166
<i>Ievgen Verbytskyi, Andrei Blinov, Andrii Chub, Dmitri Vinnikov, Anna Kyselova</i>	
Refinement and Calibration of Optimization Models for Baltic Region Energy System Development	171
<i>Karlis Baltputnis, Diana Žalostība, Jana Teremranova, Patriks Pazans, Zane Broka</i>	

Minimizing Transition Costs: Choice of Green Energy Mixes and Storage Solutions in the Baltic Power System Conditions.....	177
<i>Antans Sauhats, Konstantins Burcevs, Roman Petrichenko, Galina Bockarjova, Diana Zalostiba</i>	
Lighting System Design Challenges for Vertical Farming Containers: Part 1. Perspective from Electrical Design	183
<i>Martins Marcinkevics, Ansis Avotins</i>	
Using Electric Vehicles to Enhance Power Supply Resilience of Buildings During Emergencies and Critical Situations	189
<i>Edivan Laercio Carvalho, Andrii Chub, Andrei Blinov, Dmitri Vinnikov, Anna Kyselova</i>	
Optimizing Patient Outcomes with AI and Predictive Analytics in Healthcare.....	196
<i>Jamshaid Iqbal Janjua, Taher M. Ghazal, Walid Abushiba, Sagheer Abbas</i>	
DC Bus Voltage Controller with Variable Coefficients for Supercapacitor Backup Storage System	202
<i>Kristians Gaspersons, Kaspars Kroics</i>	
Vibrational Control for Energy Balancing in Modular Multilevel Converters	208
<i>Adam Kastner, Lutz Gröll, Veit Hagenmeyer</i>	
Decarbonization, What it is	215
<i>Josifs Survilo</i>	
The Impact of Infrastructural Changes in Baltic Energy Systems on the Reliability of Their Operation After Synchronization with Energy Systems of Central Europe.....	221
<i>Anatolijs Mahnitko, Inga Zicmane, Tatjana Lomane, Timurs Kuznecovs</i>	
Direct-On-Line Synchronous Reluctance Motor Loss Segregation with Measurements	227
<i>Hannu Kärkkäinen, Matias Tiihonen, Lassi Aarniovuori, Dong Liu, Markku Niemelä, Jouni Ikäheimo</i>	
Status and Potential Role of Biomethane in the Way Towards Gas Sector Decarbonization: Case Study of Latvia	233
<i>Ance Ansone, Liga Rozentale, Uldis Bariss, Dagnija Blumberga</i>	
Digital Learning Ecosystem: Online Concept for Engineering Education	240
<i>Anatolijs Zabasta, Volodymyr Kazymyr, Nadezhda Kunicina, Oleksandr Velihorskyi</i>	
Design Issues of SSCBs for Residential DC Microgrids.....	247
<i>Tanel Jalakas, Andrii Chub, Indrek Roasto, Dmitri Vinnikov</i>	
Vulnerability Assessment of Industrial Control Systems for Colonial Pipeline and WannaCry Ransomware	253
<i>Mert Musluoglu, Nadezhda Kunicina, Jelena Caiko</i>	
Computer Vision Based Recognition Algorithm for Sea Buckthorn Harvesting Robot	260
<i>Jurijs Timofejevs, Mikhail Gorobetz, Andrejs Potapovs</i>	
Optimal Self Generation Portfolio for Multi-Apartment Building	265
<i>Jevgenijs Kozadajevs, Ivars Zalitis, Anna Mutule</i>	
Cost-Efficient Improvement of Power System's Reliability Within Limited Funds	270
<i>Guido Andreesen, Madis Leinakse, Jako Kilter, Mart Landsberg</i>	

Creation of a Smart Energy Management System in the RTU Student Campus in Kipsala	276
<i>Egils Dzelzitis, Peteris Apse-Apsitis, Edijs Lungis</i>	
Economical Calculation Basis of Synthetic Gas Production Using Alternate Renewable Resources in Combining of Hydrogen and Carbon Dioxide.....	282
<i>Aleksandrs Borisovs, Aleksandrs Dolgicers</i>	
Pick-And-Place Operation of Linear Delta Robots with Low Energy Consumption	287
<i>Valery Vodovozov, Madis Lehtla, Zoja Raud, Eduard Petlenkov</i>	
Segregation of Additional High Frequency Harmonic Losses Created by PWM Supply	293
<i>Lassi Aarniovuori, Matias Tiihonen, Shoaib Ahmed, Hannu Kärkkäinen, Markku Niemelä, Jan Barta, Ondrej Vitek</i>	
Multiobjective Optimization of Energy Pulsation and Power Dissipation in Modular Multilevel Converters (MMCs)	299
<i>Simon T. Kappenstein, Veit Hagenmeyer, Lutz Gröll</i>	
Harnessing 5G Connectivity and UAVs for Enhanced Public Safety	306
<i>Laila Zemite, Ilona Platonova, Evija Plone, Vladimirs Petrovs, Stefano Primatesta</i>	
The Importance of Including Sustainable Development Goals (SDGs) in the Educational Process of Engineers and Electrical Engineers	312
<i>Antons Patlins</i>	
Optimizing Municipal Waste Recycling for Renewable Energy Production.....	318
<i>Laila Zemite, Edgars Stipnieks, Andris Backurs, Aigars Laizans, Karlis Vonda, Patrick Cnubben</i>	
Improved Half-Bridge Z-Source Inverter Based Gamma Structure with Continuous Input Current	324
<i>Asghar Bahador, Ebrahim Babaei, Sachin Chauhan</i>	
Integrating Sustainability in Engineering with a Double Degree Program Case Study.....	330
<i>Shchasiana Arhun, Andrii Hnatov, Nadezhda Kunicina, Iryna Trunova, Olha Ulianets, Vasy Daleka</i>	
Effect of Different Selective Harmonic Elimination Solution Sets on Harmonic Distortion and Induction Motor Losses.....	336
<i>V. Burenin, J. Zarembo, O. Krievs</i>	
ESP32 Based Breathing Rate Monitoring System for Sport Activities	343
<i>Jevgenijs Telicko, Andris Jakovics</i>	
Comparative Assessment of Prosumer Support Scheme Adoption for Energy Communities in Latvia.....	349
<i>Roberts Lazdins, Anna Mutule, Lubova Petrichenko</i>	
Environmental Impact of Solar Salt as a Heat Transfer Fluid for CSP Plants	354
<i>Manuel Botejara-Antúnez, Justo García-Sanz-Calcedo, Antonio Díaz-Parralejo, Antonio Macías-García</i>	
Refurbishment of a Hydropower Plant into a Pumped Storage Facility: A Prefeasibility Study	359
<i>Antans Sauhats, Diana Zalostiba, Andrejs Utans, Roman Petrichenko, Olegs Linkevics, Santa Kiene, Ruslans Komarovs</i>	

Impact of Sampling of Load Stochastic Process on Probabilistic Loss of Load Assessment for a Power System.....	365
<i>Amir Abdel Menaem, Mohamed Elgamal, Anatolijs Mahnitko, Roman Petrichenko, Vladislav Oboskalov</i>	
Development and Analysis of Portable Heart Rate Measurement Solutions: An Overview of the State of Portable Heart Rate Measurement Solutions and Evaluation of the Future of Heart Rate Sensor Accuracy Enhancements	370
<i>Ernest Kancevics</i>	
Empowering Sustainable Mobility: The Role of Power Electronics in ADAS Technology	375
<i>Olaseinde David Olagbegi, Mariusz Stepien, Pawel Lasek</i>	

Author Index