

# **2024 59th International Universities Power Engineering Conference (UPEC 2024)**

**Cardiff, United Kingdom  
2-6 September 2024**



**IEEE Catalog Number: CFP24569-POD  
ISBN: 979-8-3503-7974-7**

**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:	CFP24569-POD
ISBN (Print-On-Demand):	979-8-3503-7974-7
ISBN (Online):	979-8-3503-7973-0

**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](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# 2024 59th International Universities Power Engineering Conference (UPEC)

## Author Index

- 2 **Risk Assessment Based on Ion Current Measurement on a DC-GIL with Metal Particles.....1**  
Saskia Düsdieker (TU Dortmund, Institute of High Voltage Engineering)\*; Karsten Schloßer (TU Dortmund University); Til Cramer (TU Dortmund University); Frank Jenau (TU Dortmund University | Institute of High Voltage Engineering)
- 3 **Simulation Model for Incoherent Polarized Light in Spun-Fiber-Optic Current Sensors for The Application in High-Voltage Engineering.....7**  
Tobias Kuhnke (TU Dortmund University)\*; Frank Jenau (TU Dortmund University | Institute of High Voltage Engineering)
- 4 **Optimising Energy Efficiency for EVs with Hybrid Energy Storage and Advanced Control Strategies.....13**  
Mostafa Farrag (Brunel University London)\*; Chun Sing Lai (Brunel University London); Mohamed Darwish (Brunel University London)
- 5 **Study on the Analysis of Discharge Phenomena by Fluorescent Optical Partial Discharge Sensor under Different Electrical Stresses in Air.....19**  
Karsten Schloßer (TU Dortmund University)\*; Tobias Kuhnke (TU Dortmund University); Frank Jenau (TU Dortmund University | Institute of High Voltage Engineering)
- 6 **Stability Analysis and Real-Time Optimization of a Power Hardware-in-the-Loop Setup.....25**  
Lucas Braun (KIT)\*; Sebastian Kist (KIT); Michael Suriyah (KIT); Thomas Leibfried (KIT)
- 7 **Multi-Site Real-Time Co-Simulation Laboratory: Technical Challenges and Successful Stories.....30**  
Giorgio Benedetto (politecnico di torino)\*; Ettore Bompard (Politecnico di Torino); Andrea Mazza (Politecnico di Torino); Stefania Conti (Università di Catania); Domenico Villacci (Università di Napoli "Federico II")
- 8 **Spatial-Temporal Distribution Prediction of Electric Vehicle Charging Load Based on User Travel Simulation.....35**  
Jing Han (Zhengzhou University); Jun Liang (Cardiff University)\*; Yaoqiang Wang (Zhengzhou University)
- 11 **Comprehensive Analysis of Thermal Rating Methods for Buried Power Cables: Modeling Approaches and Transient Behavior.....41**  
Yasir Yaqoob (Eindhoven University of Technology)\*; Johan Morren (Eindhoven University of Technology); Han Slootweg (Enexis and Technische Universiteit Eindhoven); Peter van der Wielen (DNV and Technische Universiteit Eindhoven)
- 13 **Torque Improvement for Modified Double Stator Switched Reluctance Machines.....47**  
Zhong Gao (University College London); Alessandro Rossi (University College London); Yugesh Sundharam (University College London); Yuxiao Li (University College London); Zechen Ye (University College London); Haoran Jiang (University College London); Siyuan Zhang (University College London); Pedram Asef (University College London)\*; Shun Cai (University College London)
- 14 **Analysis of the Expansion Plan for Renewable Electrical Energy.....53**  
Maja Maletz (Otto von Guericke University)\*
- 15 **Advanced digital lab infrastructure for the development of smart power grid.....59**  
Basanta Pokhrel (Department of Electric Energy, NTNU, Trondheim)\*; Irina Oleinikova (NTNU); Salvatore D'Arco (SINTEF ENERGI AS); Santiago Sanchez-Acevedo (SINTEF Energi AS); Hans-Kristian Høidalen (Department of Electric Energy, NTNU, Trondheim); Aldrich Zeno (NTNU); Kjetil Obstfelder Uhlen (Department of Electric Energy, NTNU, Trondheim)
- 16 **Composing Small-Signal Models via the Component Connection Method with Python and Excel.....65**  
Benjamin Vilmann (Technical University of Denmark)\*; Oscar Saborio-Romano (Technical University of Denmark); Daniel Müller (Technical University of Denmark)
- 17 **Active Voltage Control and Demand Peak-Clipping using Soft Actor-Critic Method.....71**  
Thet Paing Tun (Brunel University London)\*; Ioana Pisica (Brunel University of London)
- 18 **Design and Evaluation of HVDC Power Supply for Remotely Operated Vehicle.....77**  
Sulaimon O Alimi (Teesside University); Maher Al-greer (Teesside University)\*; Ruben Pinedo-Cuenca (Teesside University)
- 20 **PV Powered Modular Pulse Generator with Embedded Energy Storage for Tumour Treating Fields.....83**  
Mahmoud Alshahat (Glasgow Caledonian University)\*; Mohamed Elgenedy (Glasgow Caledonian University); Ahmed Aboushady (Glasgow Caledonian University); Mark Williams (Glasgow Caledonian University); Sajid Nazir (Glasgow Caledonian University); Nebrase Elmrahit (Glasgow Caledonian University); Hadi Larjani (Glasgow Caledonian University, Glasgow)
- 21 **Separation of Spectral Features in Multi-Source PD Measurements Using 3CFRD Method.....89**  
bilal habib (Khalifa University); Nouredine HARID (Khalifa University of Science Technology)\*; Taiji Wang (Khalifa University); Omar Alzaabi (Khalifa University)
- 24 **Enhancing Power Grid Efficiency: A Focus on Power Loss Reduction with MAOLO Technique.....94**  
Saodah Omar (Universiti Teknologi MARA)\*; Aimi Idzwan Tajudin (Universiti Teknologi MARA); Ahmad Asri Adb Samat (Universiti Teknologi MARA); Muhammad Danial Osman (Universiti Teknologi MARA); Widjonarko Widjonarko (Universitas Jember); Stephen Robson (Cardiff University)
- 25 **An Intelligent Battery Management System for an Electric Vehicle Powered by Solar PV Array.....100**  
Ali Challob (Ministry of Electricity); Nagham Saeed (University of West London); Nur Azzammudin Rahmat (UNITEN); Vigna K. A/L Ramachandaramurthy (Universiti Tenaga Nasional); Amjad Humaidi (university of technology)\*

- 26 **Machine Learning of Solar Energy Forecasting using ensemble LSTM method.....106**  
Sahar Daebe (Brunel university)\*; Mohamed Darwish (Brunel University); Chun Sing Lai (Brunel University London)
- 27 **Power Transformer DGA Data Augmentation using Conditional Tabular Generative Adversarial Network.....112**  
Nkiru Agu (Teesside University)\*; Syed Haider (Teesside University); Gobind Pillai (Teesside University); Imran Bashir (Teesside University); Gillian Lacey (Teesside University)
- 29 **Medium Voltage Energy Cable Diagnostics – Service Provider Experiences and Diagnostic Information System.....118**  
Alexander Lüpschen (TU Dortmund University)\*; Nicolas Rehbach (TH Köln); Munam Farooqui (TH Köln); Dietlind Zühlke (TH Köln); Michael Freiburg (TH Köln)
- 32 **Impedance spectroscopy of aqueous solutions and soils using the impulse method.....124**  
Nurym Noyanbayev (Almaty University of Power Engineering and Telecommunications)\*; Ashwin Manjunath (Dayananda Sagar University); Noureddine Harid (Khalifa University of Science Technology)
- 33 **Dynamic Mode Decomposition Analysis of Very Low Frequency Oscillations on the Irish Grid.....130**  
Rossita Maclean (Queen's University Belfast)\*; Xueqin (Amy) Liu (Queen's University Belfast); Robert Best (Queen's University Belfast); Connor Duggan (EirGrid); Eoin Kennedy (EirGrid); Ray Doyle (EirGrid); David McGowan (SONI); Jason Kennedy (SONI)
- 34 **An Ant-Lion Optimization Based Approach to Solve Phase Balancing Problem in Distribution Networks.....136**  
Günnur Yeşilyurt (Istanbul Technicak University); Oguzhan Ceylan (Kadir Has University)\*
- 36 **Impact of batteries' energy trading on distribution network congestion: a Great Britain case study.....142**  
Susan Brush (University of Strathclyde)\*; Graeme Hawker (University of Strathclyde); Keith Bell (University of Strathclyde)
- 37 **Generating Industrial and Residential Load Profile Scenarios with a Multivariate Elliptical Copula Approach.....148**  
Ranier Alexander Arruda Moura (Eindhoven University of Technology)\*; Khawaja Khalid Mehmood (Eindhoven University of Technology); Anne van der Molen (Eindhoven University of Technology); Peter van der Wielen (Eindhoven University of Technology); P.H. Nguyen (Eindhoven University of Technology)
- 38 **Data Analytics for Forecasting of Texas Wind Turbines Generated Power.....154**  
P. Arun Mozhi Devan (Universiti Teknologi PETRONAS, Seri Iskandar)\*; Rosdiazli Ibrahim (Universiti Teknologi PETRONAS); Kishore Bingi (Universiti Teknologi PETRONAS); Madiha Binti Omar (Institute of Technology Petronas Sdn. Bhd); Nagarajapandian Mohan (Sri Ramakrishna Engineering College)
- 39 **Real-Time Power Dispatch in Grid-Connected Microgrids using Deep Q-Learning.....160**  
Claudio Cambampi (Federal University of Santa Maria ); Renata Lautert (Otto von Guericke University )\*; Isabel Milani (Federal University of Santa Maria); Camilo Rangel (Federal University of Santa Maria); Luciane Canha (Federal University of Santa Maria); Martin Wolter (Otto von Guericke University)
- 40 **Toward unattended 24/7 monitoring and localization of leaks of electrical insulating gases and their decomposition products.....166**  
Radislav Potyrailo (GE Vernova)\*
- 42 **Benchmarking Machine Learning Algorithms for Predicting Building Energy Performance.....172**  
Adamantios Bampoulas (University College Dublin)\*; Niall Meagher (University College Dublin); Donal Finn (University College Dublin); Eleni Mangina (University College Dublin)
- 43 **Influence of DC Harmonic Voltages on Partial Discharge Behaviour in SF6 Alternatives Gases.....178**  
Kai Zhang (Cardiff University)\*; Alistair Reid (Cardiff University); Michail Michelarakis (Cardiff University); A. Manu Haddad (Cardiff University)
- 44 **Contribution to the measurment of HVDC partial discharge inception voltage of natural gases.....184**  
Mohammed El Amine Slama (IRT Saint Exupéry, French Institute of Technology)\*; Michail Michelarakis (Cardiff University); A. Manu Haddad (Cardiff University); Meirion Hills (Cardiff University); Christopher Stone (Cardiff University)
- 45 **Analysis of Integration of Renewable Energy into HVDC System via Advanced Marx DC-DC Converter Equipped with Fault Ride-Through System.....188**  
Muhammad Sohaib Javaid (Teesside University)\*; Maria Charles (Teesside University ); Maher Al-Greer (Teesside University)
- 46 **What is the focus in achieving NetZeroCities in Eastern Europe and where to?.....194**  
Andrei Ceclan (Technical University of Cluj-Napoca, Romania)\*; Urda Adrian Ilie (Technical University of Cluj Napoca); Dan Doru Micu (Technical University of Cluj-Napoca); Radu Murteanu (Technical University of Cluj-Napoca); Ancuța Maria Măgurean (Technical University of Cluj Napoca); Timea Farkas (Universitatea Tehnica din Cluj-Napoca); Laur Calin (Technical University of Cluj-Napoca)
- 47 **Insights from Tracking the Loss Sensitivity with Respect to the Net Load in Distribution Networks.....200**  
Soheil Saadatmandi (Politecnico di Torino); Gianfranco Chicco (Politecnico di Torino)\*; Andrea Mazza (Politecnico di Torino)
- 48 **Data-driven Approach to Capturing Wide-Area Frequency Response Dynamics.....206**  
Alinana Kilembe (University of Strathclyde)\*
- 49 **The coordination between TSO and DSO in the context of energy transition - A review.....212**  
Hang Nguyen (Eindhoven University of Technology)\*; Trung Tran (Technische Universiteit Eindhoven); Koen Kok (Eindhoven University of Technology); P.H. Nguyen (Eindhoven University of Technology)
- 50 **Investigating Frequency Stability Challenges in Non-Interconnected Renewable-Rich Islands.....218**  
Evangelos Pompodakis (Hellenic Mediteranian University)\*; George Orfanoudakis (Hellenic Mediteranian University); Yiannis Katsigiannis (HMU); Georgios Kryonidis (Aristotle University of Thessaloniki); Antonios Tsikalakis (Hellenic Mediteranian University); Emmanuel Karapidakis (Hellenic Mediterranean University)
- 51 **Analysis of Overvoltages in Power Systems Due to Lightning Strikes: On the Effects of the Line Modeling Approach and Frequency-Dependent Soil Properties.....224**  
Taina Fernanda Garbelim Pascoalato (Sao Paulo State University); Walter Luiz Manzi de Azevedo (University of Campinas); Anderson Justo de Araujo (Cardiff University)\*; Amauri Gutierrez Martins-Britto (University of Brasilia); Sergio Kurokawa (Sao Paulo State University); Jose Pissolato Filho (University of Campinas)

- 52 **Synthetic Electrical Load Data Generation: A Tabular Generative Adversarial Networks Approach with Statistical and Predictive Modelling Evaluation.....**230  
*Syed Haider (Teesside University); Nkiru Agu (Teesside University)\*; Gobind Pillai (Teesside University)*
- 53 **Fault Current Limiter For Electrical Power System Protection Using Novel Electromechanical Actuator.....**236  
*Mehran Mirzaei (Czech Technical University)\*; Pavel Ripka (Czech Technical University)*
- 54 **Bacteria Detection System for Solid Specimen Based on Electrical Measurement.....**242  
*Kokona Terabe (National Institute of Technology Nara College)\*; Yoki Ikeda (National Institute of Technology Nara College); Naoto NAGAOKA (Doshisha Univ.)*
- 56 **Design of a Modular 20 kV RC Divider based on SMD Components for Power Quality Measurement Using 3D Printing.....**248  
*Saskia Düsdieker (TU Dortmund, Institute of High Voltage Engineering)\*; Tobias Kuhnke (TU Dortmund University); Henry Geisler (TU Dortmund University); Frank Jenau (TU Dortmund University | Institute of High Voltage Engineering)*
- 57 **Multi-objective Particle Swarm Optimization for Comparison of Optimal Distribution Grid Reconfiguration Tasks.....**254  
*Frederik Gielnik (Karlsruhe Institute of Technology)\*; Peter Pinter (Karlsruhe Institute of Technology); Thomas Leibfried (Karlsruhe Institute of Technology)*
- 58 **Synthesis and Characterisation of Polyethylene Glycol Nanocomposites using Impedance Spectroscopy.....**260  
*Ghania Dekkiche (University Ibn Khaldoun Tiaret, Algeria); Benabdellah Abdelkader (université de tiaret); Nouredine Harid (Khalifa University of Science Technology)\*; Yassine Chaker (University OF Tissemsilt); Mansour Debdab (University Ibn Khaldoun, Tiaret); El-Habib Belarbi (University Ibn Khaldoun, Tiaret)*
- 59 **Comparative Assessment of Wavelet and Kalman Filtering for Mode Estimation.....**265  
*Achilleas Sfetkos (Aristotle University of Thessaloniki); Georgios Barzegkar-Ntovom (Aristotle University of Thessaloniki); Efthimios Saroudis (Democritus University of Thrace); Eleftherios Kontis (University of Thessaly); Grigoris Papagiannis (Aristotle University of Thessaloniki); Theofilos Papadopoulos (Democritus University of Thrace)\**
- 60 **Numerical Analysis on PD Induced EM Signal Propagation Characteristics inside GIS.....**271  
*Bilal Habib (Khalifa University)\*; Omar al Zaabi (Khalifa University); Nouredine Harid (Khalifa University of Science Technology); Mohamed Alkhatib (UAEU)*
- 61 **Thermal Modelling of High Voltage Electrical Network Cables for Maximisation of Transmission Capacity in Underground Network Systems.....**276  
*Aodhan Jones (University College Dublin)\*; Donal Finn (University College Dublin); Tom Looby (ESB)*
- 62 **Reactive Power Management Challenges with Increasing Underground Cabling.....**282  
*Anna Shuvarina (Eindhoven University of Technology)\*; P.H. Nguyen (Eindhoven University of Technology)*
- 63 **Advanced Regression Modeling for Correlating Transformer Oil Electrical Properties with Thermal Aging Trends.....**288  
*Sifeddine Abdi (Medea University)\*; Boubakar Achraf Beseri (Medea University); A. Manu Haddad (Cardiff University); Nouredine Harid (Khalifa University of Science Technology); Ahmed Boubakeur (Ecole Nationale Polytechnique)*
- 64 **Modelling Retired Synchronous Generators as Grid Stabilising Synchronous Condensers.....**295  
*Rory O'Sullivan (ESB)\*; John Cosgrove (TUS)*
- 65 **Novel Power Park Controller for Hybrid Asymmetrical Storage Plants with Low Frequency Demand Disconnection.....**301  
*Stephen Sommerville (Brunel University)\**
- 66 **Uncertain Decision Making: A Cooperative Agent Model For Flexible Renewable Energy Communities.....**306  
*Riccardo Trevisan (University of Cagliari)\*; Emilio Ghiani (Emilio Ghiani); Marco Galici (Comillas Pontifical University); Fabrizio Pilo (University of Cagliari)*
- 67 **Rolling Horizon-Based Operation Optimisation of Energy Storage Systems and Electric Vehicles Integrated in Distribution Networks.....**312  
*Hüsna Yıldız (Yildiz Technical University); Hilal Ozdemir (Brunel University London); Ozan Erdiñç (Yildiz Technical University)\*; Ioana Pisica (Brunel University of London)*
- 68 **Electromagnetic Interference Calculations in a Mixed Underground-Submarine Cable System.....**318  
*Theofilos Papadopoulos (Democritus University of Thrace)\*; Vasiliki Tsiakiroudi (Democritus University of Thrace); Andreas Chrysoschos (Hellenic Cables); Georgios C. Christoforidis (Department of Electrical and Computer Engineering, University of Western Macedonia, Kozani, Greece)*
- 69 **Comparative Analysis of Distributed Generation control methods to enhance DG penetration in Power Distribution Grids.....**324  
*Eleni Nicolopoulou (National Technical University of Athens)\*; Georgios Poulimenos (National Technical University of Athens); Ioannis Gonos (National Technical University of Athens); Christos Christodoulou (NTUA); Spyridon Christoforos (Hellenic Distribution Network Operator); Georgios Andreakos (Hellenic Distribution Network Operator); Emmanouil Voumvoulakis (National Technical University of Athens)*
- 70 **Frequency Hopping Wireless Power Transfer within the SAE J2954 operating frequency bandwidth - a concept design.....**330  
*Graham Blankson (Brunel University London)\*; Mohamed Darwish (Brunel University); Chun Sing Lai (Brunel University London)*
- 71 **Congestion Analysis Framework for Fault Location, Isolation, and Service Restoration in Microgrids.....**336  
*Thunpisit Pothinun (Department of Electrical Engineering, Faculty of Engineering, Chiang Mai University)\**
- 72 **Optimizing the Number of Electric Vehicle Charging Stations at Forecourts to Meet Demands.....**341  
*Marwan Jaafreh Habashneh (Brunel University London)\*; Mohamed Darwish (Brunel University); Chun Sing Lai (Brunel University London)*
- 73 **Generation of Synthetic Series for Hydroelectric Plants in Brazilian Interconnected System by Metaheuristic.....**347  
*Renato Furtado (Federal University of Juiz de Fora)\*; André Luís Marcato (Federal University of Juiz de Fora); Ivo Chaves (Federal University of Juiz de Fora)*

- 74 **Understanding the Steady-State Impacts of Communication Dysfunctions on the Consensus Secondary Control of Islanded Microgrids.....353**  
Evangelos Pompodakis (Hellenic Mediteranian University)\*; Georgios Orfanoudakis (Hellenic Mediteranian University); Yiannis Katsigiannis (HMU); Emmanuel Karapidakis (Hellenic Mediterranean University)
- 75 **Advancing Electric Vehicle Technologies: A Comparative Analysis of Lithium-Ion and Emerging Solid-State Battery Systems.....359**  
Waheeb Khan (Brunel University London)\*; Mohamed Darwish (Brunel University)
- 76 **Relay Coordination in Distributed Power System Network Using Renewable Energy.....364**  
Ankita Chanda (Brunel University London); Mohamed Darwish (Brunel University)\*
- 77 **Assessing the Viability of AC to DC Microgrid Conversion: A Comprehensive Analysis of Technical and Economic Factors.....369**  
Chrysanthos Charalambous (University of Cyprus)\*; Alexis Polycarpou (Frederick University); Venizelos Efthymiou (FOSS); George E. Georghiou (University of Cyprus)
- 78 **A Machine Learning Approach for the Identification of Photovoltaic and Electric Vehicle Profiles in a Smart Local Energy System.....375**  
Vihanga Peiris (Northumbria University)\*; Goyal Awagan (Northumbria University); Jing Jiang (Northumbria University)
- 79 **Simulative Investigation of Saturation in Distribution Transformers at Underfrequency.....381**  
Johanna Geis-Schroer (Karlsruhe Institute of Technology)\*; Clemens Gräf (Karlsruhe Institute of Technology); Michael Suriyah (Karlsruhe Institute of Technology); Thomas Leibfried (Karlsruhe Institute of Technology)
- 80 **Performance Analysis of Photovoltaic Installations Based on Machine Learning Techniques.....387**  
Daniil Hulak (Brunel University London)\*; Yang Xie (School of Cyber Science and Engineering Southeast University Nanjing); Gareth Taylor (Brunel University)
- 81 **Deep Learning for Localization of Damaged Photovoltaic Panels with Hotspot Detection.....393**  
Nur Khalida Mohd Shaharin (Universiti Teknologi PETRONAS)\*; Madiha Binti Omar (Institute of Technology PETRONAS SDN BHD); nurliana.farhana (tnb research sdn. bhd.); Rosdiazli Ibrahim (Universiti Teknologi PETRONAS); Nordin Zakaria (Universiti Teknologi PETRONAS); Mochammad Faqih (Universiti Teknologi PETRONAS)
- 83 **Overview of Load Desegregation Models, Methods and Hardware.....399**  
Mircea Lancranjan (Technical University of Cluj-Napoca)\*; Dan Doru Micu (Technical University of Cluj-Napoca); Muresan Alexandru (Technical University of Cluj-Napoca); Dacian Jurj (Universitatea Tehnica din Cluj-Napoca); Alexis Polycarpou (Frederick University); Alexandru-George Berciu (Technical University of Cluj-Napoca); Levente Czumbil (Technical University of Cluj-Napoca)
- 85 **Evaluation of Linear and Non-Linear Programming Strategies for Hydrothermal Planning Using Reference Curves.....405**  
Laura Gaio (Federal University of Juiz de Fora); Renato Furtado (Federal University of Juiz de Fora); Luiz Rogério Oliveira (Universidade Federal de Juiz de Fora); André Luis Marcato (Federal University of Juiz de Fora)\*; Ivo Junior (Federal University of Juiz de Fora); Alberto Kligerman (ABAREL Tecnologia Ltda)
- 86 **A Greener Future: Electric Vehicles and Charging Infrastructure in the United Kingdom.....411**  
Christopher Wallace (Brunel University)\*; Mohamed Darwish (Brunel University); Chun Sing Lai (Brunel University London)
- 87 **Evaluation of Risk for Hydroelectric Power Plants Using Artificial Neural Networks.....416**  
Luiz Rogério Oliveira (Universidade Federal de Juiz de Fora)\*; João Alberto Passos Filho (Universidade Federal de Juiz de Fora); André Luis Marcato (Federal University of Juiz de Fora); Bruno Fânzeres dos Santos (PUC-RIO); Paulo Cordeiro (CTG Brasil); Olavo Bet (CTG Brasil)
- 89 **The Optimal Placement and Sizing of Soft Open Points to Enable Distributed Generation Hosting in Southern Romania.....421**  
Irina Picioroaga (University Politehnica of Bucharest)\*
- 90 **Surface Leakage Current Analysis of a 500 kV DC Voltage Divider under Natural Environmental Influences.....427**  
Julian Hanusrichter (TU Dortmund)\*; Tobias Kuhnke (TU Dortmund University); Frank Jenau (TU Dortmund University | Institute of High Voltage Engineering)
- 91 **A Turnkey Solution for Computing the Static Breakdown Voltage in HVDC Applications Utilising Atmospheric Parameters.....433**  
Philipp Huber (TU Dortmund)\*
- 92 **A Novel Methodology to Investigate the Impact of Electricity Market Reforms on Future Electricity Prices.....439**  
Muhammad Jamil Mustapha (Brunel University)\*; Gareth Taylor (Brunel University); Daniil Hulak (Brunel University London)
- 94 **Review and assessment of main influencing factors affecting cable sequence impedances.....445**  
Leyla Ozdemir (TUD)\*; Tom Looby (ESB); Gavin Kane (ESB)
- 95 **Innovative Methodology for Photovoltaic Power Estimation based on Coupled Thermo-Electric Models.....450**  
Waqar Ahmad (University of Basilicata (UNIBAS), University of Salerno (UNISA)); Gabriele Malgaroli (Politecnico di Torino)\*; Antonio D'Angola (Scuola Di Ingegneria, Università Della Basilicata); Filippo Spertino (Politecnico di Torino); Alessandro Ciocia (Politecnico di Torino); Diana Enescu (Valahia University of Targoviste)
- 97 **Data-Driven Local Control Design for Dead Band Control of Load Tap Changers.....456**  
Alper Savasci (Abdullah Gul University); Oguzhan Ceylan (Kadir Has University)\*; Sumit Paudyal (Florida International University)
- 98 **Assessment of an Underground Pumped Storage Hydropower for Unifei's Campus of Itajubá.....462**  
Gabriel Doyle (UNIFEI)\*; Pedro Balestrassi (Unifei); Antonio Souza (Unifei)
- 99 **Methodology for Assessing Load Demands of Megawatt Charging Stations for Electric HGVs.....468**  
Khalid Khan (Cardiff University)\*

- 100 **HVDC Switching Station Technology Review: an Analysis for Offshore MPI Projects.....474**  
*Davide Pinzan (WSP)\*; Stephen Mart (National Grid); Sehar Raza (WSP)*
- 101 **Design and Performance Analysis of Interleaved CUK Converter Using ADM Control Loop for Photovoltaic Applications.....478**  
*Farag Alargt (The Centre for Solar Energy Research and Studies)\*; Ahmed Ashur (EE Dept. University of tripoli); Ahmad Kharaz (The School of Engineering and Technology, University of Derby)*
- 102 **Frequency Behaviour Prediction based on Machine Learning for Future Low-Inertia Power Systems.....484**  
*Lu Shen (University of Strathclyde)\*; Qiteng Hong (University of Strathclyde); Campbell Booth (University of Strathclyde)*
- 104 **Effect of Ground Rods Position on Current Distribution in Ground Grid under Transient Current.....490**  
*Omar Kherif (School of Engineering, Cardiff University)\*; Salah Mousa (Cardiff University); Stephen Robson (Cardiff University); Nouredine Harid (Khalifa University of Science Technology); Huw Griffiths (Cardiff University); David Thorpe (Kingsmill Industries (UK) Limited); A. Manu Haddad (Cardiff University)*
- 105 **Enhancing Transformer Ageing Prediction in NOMs Methodology: Incorporating Demand Data Analysis.....495**  
*Arshad Syed Anwar (Glasgow Caledonian University)\*; Mohamed Farrag (Glasgow Caledonian University); Jim Baird (Glasgow Caledonian University)*
- 106 **Prototype Testing of Rim Driven Fan Technology for High-Speed Aircraft Electrical Propulsion.....500**  
*Robert Bolam (Wrexham University); Paulo Roque (Wrexham University); Yuriy Vagapov (Wrexham University)\*; Anton Dianov (Pingyang Institute of Intelligent Manufacturing, Wenzhou University, Wenzhou University)*
- 107 **Towards Net-Zero Emissions by 2050: Developing a Course Syllabus to Teach Undergraduate Students the Fundamentals of Energy Efficiency.....505**  
*Basem Alanri (Taif Univeristy)\**
- 108 **Optimising swarm grids towards supporting community loads.....511**  
*Stephen Sheridan (Technical University Dublin)\*; Jane Courtney (TU Dublin); Keith Sunderland (TU Dublin)*
- 109 **Design of a Lab-Based Digital Substation using the IEC 61850 Standard: Lessons Learned.....517**  
*Liam O'Sullivan (ESB)\*; Michael O'Donovan (Munster Technological University)*
- 112 **Reliability and Cost Assessment of AC/DC Networks for Offshore Wind Farm Integration.....523**  
*Muhammad Helal Uddin (Cardiff University)\*; Junaid Khalid (Cardiff University); Muhammad Fawad (Cardiff University); Michael Smailes (Offshore Renewable Energy Catapult); Chunjiang Jia (Offshore Renewable Energy Catapult); Rebecca Simmonds (Offshore Renewable Energy Catapult); Sheng Wang (Cardiff University); Jun Liang (Cardiff University)*
- 113 **Self-tuning Converter Control of PMSG-based Wind Turbine Using Multi-agent Deep Reinforcement Learning.....529**  
*Junaid Khalid (Cardiff University)\*; Muhammad Helal Uddin (Cardiff University); Muhammad Fawad (Cardiff University); Michael Smailes (Offshore Renewable Energy Catapult); Chunjiang Jia (Offshore Renewable Energy Catapult); Rebecca Simmonds (Offshore Renewable Energy Catapult); Sheng Wang (Cardiff University); Jun Liang (Cardiff University)*
- 114 **Intelligent Energy Management using Multi-Agent Dynamic Learning for Scheduling Commercial Electric Vehicle Charging Stations.....535**  
*Kevin Chan (University of Bath); Pedram Asef (University College London)\*; Alexandre Benoit (University of Bath)*
- 115 **Understanding the Impact of Inherent Dielectric Material Properties on PEA Output.....541**  
*Ayesha Saeed (University of Strathclyde)\*; Brian Stewart (University of Strathclyde)*
- 116 **Impact of GIS Configuration and Trapped Charge Effects on Very Fast Transient Overvoltage in 400kV Systems using ATP-EMTP.....546**  
*Mohammed Alhazmi (Cardiff University)\*; Maurizio Albano (Cardiff University); Jonathan James (Cardiff University); Anderson Justo de Araujo (Cardiff University); Omar Kherif (School of Engineering, Cardiff University); A. Manu Haddad (Cardiff University)*
- 117 **Practical Learning of DSP-based Motor Control for Engineering Students.....551**  
*Andreas Lorsch (Wrexham University); Max Schmilinsky (Wrexham University); Yuriy Vagapov (Wrexham University)\*; Robert Bolam (Wrexham University); Anton Dianov (Pingyang Institute of Intelligent Manufacturing, Wenzhou University, Wenzhou University)*
- 118 **Optimum integration of renewable energy sources to meet the supply-demand balance in an off-grid electricity network.....556**  
*Mohammad Rana (Buckinghamshire New University )\**
- 119 **An Analytical Model for Low Frequency Earthing System of the T-Pylon Transmission Tower.....561**  
*Mehrdad Mokhtari (Cardiff University )\*; Anderson Justo de Araujo (Cardiff University); David Clark (Cardiff University); Stephen Robson (Cardiff University); Maurizio Albano (Cardiff University); A. Manu Haddad (Cardiff University); Muhammad Shaban (National Grid ); Dongsheng Guo (National Grid)*
- 120 **Quantification of Induced Effects on T-pylon Transmission Lines.....566**  
*Anderson Justo de Araujo (Cardiff University)\*; Mehrdad Mokhtari (Cardiff University ); Maurizio Albano (Cardiff University); David Clark (Cardiff University); Stephen Robson (Cardiff University); Muhammad Shaban (National Grid); Dongsheng Guo (National Grid); A. Manu Haddad (Cardiff University)*
- 121 **Effect of ESDD/NSDD on AC Flashover Characteristics of Conventional and Textured SiR Outdoor Insulators.....572**  
*Adnan Krzma (Cardiff and Vale College)\**
- 122 **Investigation of Uniform and Non-Uniform Water Droplets on 24 kV Silicone Rubber Bushing Subjected to AC Electric Field Stress with Nonlinear Field Grading Material.....576**  
*Mohamed Aboshwerb (Cardiff university - School of Engineering )\*; Maurizio Albano (Cardiff University); A. Manu Haddad (Cardiff University)*
- 124 **Spectroscopic measurements of medium voltage sparking in air.....582**  
*Meirion Hills (Cardiff University)\*; A. Manu Haddad (Cardiff University); Daniel Mitchard (Cardiff University)*

- 125 **Assessing the regulating contribution of a Multi-Leg Smart Charging Infrastructure (MLSCI) under different charging scenarios.....588**  
*Fabio Bignucolo (University of Padova)\*; Luca Mantese (Università degli Studi di Padova)*
- 126 **High Voltage-Gain Non-isolated DC-to-DC Converter Design for Microinverter Applications.....594**  
*Mohammad Alrefai (Queen's University Belfast); Ahmad Elkhateb (Queens University Belfast)\*; Robert Best (Queen's University Belfast)*
- 127 **Effect of Ambient Light on the SF6 Alternative Mixture and their Decomposition Products.....599**  
*Rohith Sangineni (Cardiff University)\*; Michail Michelarakis (Cardiff University); Sukhwinder Singh (Cardiff University); David Clark (Cardiff University); Maurizio Albano (Cardiff University); A. Manu Haddad (Cardiff University); Gordon Wilson (NGET); Mark Waldron (NGET)*
- 128 **Effect of air ingress on decomposition of C4F7N gas mixture exposed to electric arcing.....603**  
*Sukhwinder Singh (Cardiff University)\*; Michail Michelarakis (Cardiff University); Rohith Sangineni (Cardiff University); David Clark (Cardiff University); Maurizio Albano (Cardiff University); A. Manu Haddad (Cardiff University); Gordon Wilson (NGET); Mark Waldron (NGET)*