Special Issue on Electrical Power Engineering

Preface

This special issue of ACTA Polytechnica Hungarica is dedicated to the advancements and challenges within electric power engineering, showcasing cutting-edge research that addresses critical aspects of modern power systems. The collection of articles offers valuable insights into enhancing grid efficiency, integrating renewable energy sources, ensuring power quality, and analyzing the impact of emerging technologies on the electric power infrastructure.

Several papers explore the integration of renewable energy sources and the optimization of energy utilization within the electric power sector. Studies on low-temperature waste heat utilization in district heating by Adam Kubín, Jiří Vašíček, Michaela Valentová and Jiří Vecka contribute to the ongoing efforts to decarbonize the sector by examining EU legislation and the potential of waste heat with large-scale heat pumps. The modeling of dynamic phenomena in small hydropower plant systems, exemplified by the case of Dobšina III in Slovakia, is investigated by Pavol Fedor and Daniela Perdukova, highlighting their importance in renewable electricity generation. Research on wake effect estimation in wind farms using machine learning algorithms by Aamer Bilal Asghar, Khazina Naveed, Ayman A. Aly, Basem Alamri and Róbert Štefko aims to optimize electricity production from wind energy through advanced predictive modeling.

Enhancing the performance and reliability of electric power grids is a central theme. The performance analysis of weighted least squares state estimation in medium voltage distribution networks is conducted by Vit Krcal, Jan Koudelka and David Topolanek, contributing to improved grid operation. The introduction of the Central Control Switch Acceleration (CCSA) method by Marek Beluščák, Róbert Mergeš, Marek Galbavý, Róbert Štefko, Marek Bobček, Barbara Rákóczi and Zsolt Čonka offers a novel approach to fault detection and switching in power distribution networks using GOOSE messaging. Furthermore, investigations into the impact of voltage harmonics on the drawn current and reactive power of appliances by Pavel Stanko, Michal Regula and Alena Otcenasova address key power quality concerns within electrical systems.

The influence of emerging technologies on electric power systems is also a significant focus. Research on semiconductor device selection for Phase-Shifted Full-Bridge converters by Daniel Gordan, Marek Pástor and Tadeáš Kmecik explores efficiency improvements in power conversion through a comparative study of GaN devices. The effects of photovoltaic generation and electric vehicle chargers on power quality in distribution networks are analyzed by Illia Diahovchenko,

Andrew Keane and Tetiana Zahorodnia, emphasizing the need for harmonic mitigation in modern electric grids. Additionally, the analysis of public EV charging load curve characteristics in urban settings by Marek Miltner, Artem Bryksa, Ondřej Štogl, Daniel Vašata, Magda Friedjungová, Jakub Zíka and Oldřich Starý, provides valuable data for planning the integration of electric vehicles into urban power systems.

Specialized studies on topics such as the dielectric response at different nanoparticle concentrations of GTL oil-based magnetic nanofluids for transformer applications by Samuel Bucko, Jozef Király and Roman Cimbala and the application of Benford's Law for anomaly detection in electricity data by Jaroslav Petráš, Ardian Hyseni, Ján Zbojovský, Marek Pavlík and Jaroslav Džmura, as well as its application on hourly differences of electricity prices by František Kurimský, Marek Pavlík, Jaroslav Petráš and Ardian Hyseni, further enrich the scope of this issue. Research on voltage-dependent corona discharge-induced EMI by Bystrík Dolník and the evaluation of anti-islanding protection methods through simulations and real inverter testing by Viktor Jurák, Martin Vojtek, David Topolanek, Jaroslava Orsagova, Jiří Drápela and Jan Morávek contributes to the understanding and enhancement of the safety and reliability of electric power systems.

In conclusion, this special issue offers a comprehensive overview of current research and innovation in electric power engineering, providing valuable insights for researchers, engineers, and stakeholders in the field.

We are very thankful to all the authors and the co-authors for their devotion during the formulation of contributions for this special issue and for sharing their results with the journal. Last but not least, we are sincerely thankful to the editorial board of journal Acta Polytechnica Hungarica for preparing and managing this issue technically, as well as Prof. Imre J. Rudas and Prof. Dr. habil. Levente Kovács for supporting the publication of this Special Issue.

Zsolt Čonka

Guest Editor