

TECHNICAL UNIVERSITY OF KOŠICE
Faculty of Electrical Engineering and Informatics
Department of Electrical Power Engineering

**Proceedings of the 9th International Scientific Symposium on
Electrical Power Engineering**

ELEKTROENERGETIKA 2017

September 12–14, 2017, Stará Lesná, Slovak Republic

GENERAL SPONSOR



SPONSORS AND SUPPORTERS



Slovenské elektrárne, a.s.



Západoslovenská energetika, a.s.



Slovenská elektrizačná prenosová sústava, a. s.



Schrack Technik s.r.o.

MEDIA AND OTHER PARTNERS

AUTOMA

ENERGETIKA



Polish Journal of Management Studies



TECHNICAL UNIVERSITY OF KOŠICE
Faculty of Electrical Engineering and Informatics
Department of Electrical Power Engineering

**Proceedings of the 9th International Scientific Symposium on
Electrical Power Engineering**

ELEKTROENERGETIKA 2017

September 12–14, 2017, Stará Lesná, Slovak Republic

Name: Proceedings of the 9th International Scientific Symposium on Electrical Power Engineering
ELEKTROENERGETIKA 2017

Publisher: Technical University of Košice
Faculty of Electrical Engineering and Informatics
Department of Electrical Power Engineering

Published: September 2017

Editors: Michal Kolcun, Iraidá Kolcunová, Juraj Kurimský

Edition: First

Pages: 718

Circulation: 250

CDROM: Technical University of Košice, 2017

Copyright: Technical University of Košice, Slovak Republic © 2017

Manuscripts of papers submitted to Symposium Proceedings are peer reviewed by two reviewers. The review results are compiled according following procedure: the paper is accepted or rejected according match of recommendations of both reviewers. If there is conflict of review results, the paper are reviewed by third reviewer and his result is conclusive.

The Authors are responsible for contentual and lingual accuracy of their papers and the materials presented.

Technical University of Košice © 2017.

Publisher address

Technical University of Košice
Letná 9
Košice
Slovak Republic

CDROM

ISBN: 978-80-553-3195-9

ELEKTROENERGETIKA 2017 – General Informations

Symposium Guarantee

Dr. h.c. prof. Ing. Michal Kolcun, Ph.D., Technical University of Košice, SK

International Scientific Committee

- Dauren S. Akhmetbaev, L.N.EA. National University, Astana, KAZ
- Juraj Altus, University of Žilina, SK
- Anton Beláň, Slovak University of Technology in Bratislava, SK
- Július Bems, Czech Technical University in Prague, CZ
- Ľubomír Beňa, Technical University of Košice, SK
- István Berta, BME Budapest, HU
- Peter Birkner, Mainova AG, DE
- Roman Cimbala, Technical University of Košice, SK
- Ivo Doležel, AV ER Praha, CZ
- Nikolay Djagarov, N. Vaptsarov Naval Academy, BG
- Emil Dvorský, University of West Bohemia, CZ
- Anna Gawlak, Czestochowa University of Technology, PL
- Sergej Gerasimov, St. Peterburg, RUS
- Georgi Georgiev, Plethora Ltd, Varna, BG
- Janusz K. Grabara, Czestochowa University of Technology, PL
- Valerij G. Goldstein, TU Samara, RUS
- Radomír Goňo, VSB - Technical University of Ostrava, CZ
- Rainer Haller, Regensburg, DE
- Zdeněk Hradílek, VSB - Technical University of Ostrava, CZ
- Iurii Chukreyev, Ural Branch of the RAS, Syktyvkar, Russia, RUS
- František Janíček, Slovak University of Technology in Bratislava, SK
- Zdislaw Kabza, TU Opolska, PL
- Péter Kádár, Óbuda University, Budapest, HU
- Rumén Kirov, Technical University of Varna, BG
- Jaroslav Knápek, Czech Technical University in Prague, CZ
- Irida Kolcunová, Technical University of Košice, SK
- Sebastian Kot, Czestochowa University of Technology, PL
- Hristo Krachunov, Technical University of Varna, BG
- Dušan Krokavec, Technical University of Košice, SK
- Juraj Kurimský, Technical University of Košice, SK
- Jaroslav Lelák, Slovak University of Technology in Bratislava, SK
- Tatiana Lomane, Riga Technical University, LV
- Anatolij Mahnitko, Riga Technical University, LV
- Tatjana Malinina, St. Petersburg State Polytech.University, RUS
- Lubomir Marciniak, Czestochowa University of Technology, PL

- Zbyněk Martinek, University of West Bohemia, CZ
- Alexander Mészáros, Technical University of Košice, SK
- Ján Michalík, University of Žilina, SK
- György Morva, University of Budapest, HU
- Hans Michael Muhr, Technical University, Graz, AT
- Zdeněk Müller, Czech Technical University in Prague, CZ
- Vladimir Nagay, NPI, RUS
- Alexander Nazaricev, St. Peterburg, RUS
- Vladimir Nepomnyashchy, St. Peterburg, RUS
- Karel Noháč, University of West Bohemia, CZ
- Maria Nowicka-Skowron, Czestochowa University of Technology, PL
- Irina Oleinikova, Smart Grid Research Centre, Riga, LV
- Daniela Perduková, Technical University of Košice, SK
- Andrzej Rusek, Czestochowa University of Technology, PL
- Stanislav Rusek, VSB - Technical University of Ostrava, CZ
- Pavel Santarius, VSB - Technical University of Ostrava, CZ
- Antanas Sauhata, Riga Technical University, LV
- Rasid Sitdikov, TSTU Tashkent, UZB
- Karel Sokanský, VSB - Technical University of Ostrava, CZ
- Viktor Starovojtenkov, Saint Petersburg, RUS
- Tynys B. Suleimenov, L.N.EA. National University, Astana, KAZ
- Jerzy Szkutnik, Czestochowa University of Technology, PL
- Alexey Tadzhibaev, St. Peterburg, RUS
- Kolio Tasev, Technical University of Varna, BG
- Vasily V. Titkov, St. Petersburg State Polytech. University, RUS
- Josef Tlustý, Czech Technical University in Prague, CZ
- Petr Toman, VUT Brno, CZ
- Toomas Vaimann, Technical University of Tallin, EE
- Margreta Vasileva, Technical University of Varna, BG
- Zdeněk Vostracký, University of West Bohemia, CZ
- Irena Wasiak, Polytechnika Lodz, PL
- Oldřich Závíška, Siemens KWU Erlangen, DE
- Markus Zdrallek, Bergische Universität Wuppertal, DE

Scientific Review Committee

Chairman

Dr. h.c. prof. Ing. Michal Kolcun, Ph.D., Technical University of Košice, SK

Members

- Mikołaj Bartłomiejczyk, Gdańsk University of Technology, PL
- Anton Beláň, Slovak University of Technology in Bratislava, SK
- Július Bems, Czech Technical University in Prague, CZ
- Ľubomír Beňa, Technical University of Košice, SK
- Kristina Berzina, Riga Technical University, LV
- Roman Cimbala, Technical University of Košice, SK
- Zsolt Čonka, Technical University of Košice, SK
- Jiří Drápela, Brno University of Technology, CZ
- Emil Dvorský, University of West Bohemia, CZ
- Jaroslav Džmura, Technical University of Košice, SK
- Žaneta Eleschová, Slovak University of Technology in Bratislava, SK
- Anna Gawlak, Czestochowa University of Technology, PL
- Georgiev Georrgi, Plethora Ltd, Varna, BG
- Radomir Goňo, VSB - Technical University of Ostrava, CZ
- Janusz K. Grabara, Czestochowa University of Technology, PL
- Miroslav Gutten, University of Žilina, SK
- Zoltán Högya, ABB, SLOVAKIA, SK
- Stanislav Ilenin, Technical University of Košice, SK
- František Janíček, Slovak University of Technology in Bratislava, SK
- Martin Kanálik, Technical University of Košice, SK
- Michal Kolcun, Technical University of Košice, SK
- Irida Kolcunova, Technical University of Košice, SK
- Mirosław Kornatka, Czestochowa University of Technology, PL
- Michal Kosterec, Technical University of Košice, SK
- Sebastian Kot, Czestochowa University of Technology, PL
- Jozef Kováčik, VUJE, a.s., SK
- Slavomír Kučera, SAT Automation Ltd, SK
- Juraj Kurimsky, Technical University of Košice, SK
- Jaroslav Leľák, Slovak University of Technology in Bratislava, SK
- Tatjana Lomane, Riga Technical University, LV
- Anatolijs Mahnitko, Riga Technical University, LV
- Veeslav Mach, VSB - Technical University of Ostrava, CZ
- Martin Marci, Východoslovenská distribučná, a.s. , SK
- Zbyněk Martinek, University of West Bohemia, CZ
- Karel Máslo, ČEPS, a.s., Prague, CZ

- Petr Mastný, Brno University of Technology, CZ
- Dušan Medveď, Technical University of Košice, SK
- Marián Mešter, Východoslovenská distribučná, a.s. , SK
- Alexander Mészáros, Technical University of Košice, SK
- Daniel Minařík, VSB - Technical University of Ostrava, CZ
- Stanislav Mišák, VSB - Technical University of Ostrava, CZ
- Gyorgy Morva, Óbuda Unovesrity, Budapest, HU
- Karel Noháč, University of West Bohemia, CZ
- Lucie Noháčová, University of West Bohemia, CZ
- Irina Oleinikova, Smart Grid Research Centre, Riga, LV
- Jaroslava Orságová, Brno University of Technology, CZ
- Alena Otčenášová, University of Žilina, SK
- Marek Pavlík, Technical University of Košice, SK
- Daniela Perduková, Technical University of Košice, SK
- Jaroslav Petras, Technical University of Košice, SK
- Marek Roch, University of Žilina, SK
- Vladimír Šály, Slovak University of Technology in Bratislava, SK
- Peter Semančík, Východoslovenská distribučná, a.s. , SK
- Ľuboš Skurčák, VUJE, a.s., SK
- Marek Šmilňák, ABB, SLOVAKIA, SK
- Jindřich Stuchlý, VSB - Technical University of Ostrava, CZ
- Jerzy Szkutnik, Czestochowa University of Technology, PL
- Vasilii Titkov, Saint Petersburg State Polytechnical University, RUS
- Petr Toman, Brno University of Technology, CZ
- Marián Uher, VSB - Technical University of Ostrava, CZ
- Petr Vaculík, VSB - Technical University of Ostrava, CZ
- Georgii Vagapov, Kazan State Power Engineering University, RUS
- Toomas Vaimann, Technical University of Tallin, EE
- Michal Váry, Slovak University of Technology in Bratislava, SK
- Václav Veselý, Czech Academy of Sciences, CZ
- Zdeněk Vostracký, University of West Bohemia, CZ
- František Vranay, Technical University of Košice, SK
- Ján Zbojovský, Technical University of Košice, SK
- Inga Zicmane, Riga Technical University, LV
- Iveta Zolotová, Technical University of Košice, SK

Symposium Steering Committee

- Irida Kolcunová, Technical University of Košice, SK
- Juraj Kurimský, Technical University of Košice, SK
- Jaroslav Džmura, Technical University of Košice, SK
- Jana Varnavčinová, Technical University of Košice, SK
- Dagmar Kramolišová, Technical University of Košice, SK

Table of Contents

Invited Lectures	19
Ptáček Jiří, Modlitba Petr, Straka Milan, Samsely Luboš	
Trends of Development of Power Systems in the Czech and Slovak Republic Past, Present and Future	20
Grabara Janusz, Kot Sebastian	
Smog – Are Power Plants Guilty?	26
Negnevitsky Michael	
Preventing Large-Scale Emergencies in Modern Power Systems: AI Approach	30
Nazarychev Aleksandr, Tadzhibaev Aleksei, Solovyev Yury	
Russian Case Study: The Influence of Severe Weather Conditions on Reliability of Overhead Line Infrastructure	36
A: Generation of Electricity, Transmission, Distribution and Consumption of Electricity	43
Artyukhov Ivan, Bochkareva Irina, Molot Svetlana, Kalganova Svetlana, Stepanov Sergey, Trigorly Sergey	
Power Quality in Industrial Isolated Generation Power Systems with Powerful Nonlinear Consumers	44
Kouba Daniel, Celeda Jiri	
New Trends in MV Grids and Their Impacts	50
Hatibović Alen	
Advanced Calculation of the Catenary Length in the Spans of Overhead Lines	55
Georgiev Georgi, Kim Dmitriy	
Balancing of Stochastic Generation of a Renewable Park by Means of Thermal, Hydro Power Plants and Bi-directional Flows from Neighboring Energy Networks	60
Kim Dmitriy, Georgiev Georgi	
Management of the Kazakh High-Voltage Power System in the Presence of Solar Power Park	64
Valouch Viktor, Čerňan Martin, Šimek Petr, Škramlík Jiří	
Fault Identification at Microgrid-connected Converter and its Ride-through Capability	68
Kornatka Mirosław	
Simulation Method for Determining the SAIDI and SAIFI Indicators	72
Istók Róbert, Szén István	
Influence of Load on Harmonic Emission of Single Phase Rectifiers from Modern Lighting Lamps	76
Kašpírek Martin, Mezera David	
Impact of Distributed Energy Resources on the Low Voltage Distribution Network	80
Gawlak Anna, Larisch Romuald	
Impact of Asymmetry on Energy Loss and Voltage Drops in Low-voltage Lines	84
Kašpírek Martin	
Development of Low Voltage Distribution Grids With the Focus on Maximal Value of Short Circuit Impedance	88
Petráš Jaroslav, Džmura Jaroslav	
Human Interfaces Used for Smart Electric Installation Control	94
Grondys Katarzyna	
The Assessment of the Implementation of the Concept of Sustainable Development on the European Energy Market	99
Pavlova-Marciniak Iva	
Paris Agreement and the Development of Ecological Energy in Poland	104
Bostanbekov Kairat, Kim Dmitriy, Lyssenko Roman	
GIS-based Visualization of Power Flows and Voltages of Electrical Network	110
Grega Michal, Priložný Stanislav, Jedinák Martin, Gamboš Peter, Kolcun Michal, Kanálik Martin	
The Real Test of Black-start Capacity and Island Operation in East Part of Slovakia	114
Grega Michal, Priložný Stanislav, Jedinák Martin, Gamboš Peter, Kolcun Michal, Kanálik Martin	
The Real Test of Vojany Power Plant Self-Consumption Restoration after a Black-out	118
Kašpírek Martin, Drdáková Helena	
Analysis of VQ Parameters in Delivery Points of Selected Customers Supplied from MV Distribution Grid	123
Sowiński Janusz	
Medium-term Forecast of Monthly Supply of Electricity and Maximum-demand-day Power Using Adaptive Neuro-Fuzzy Inference System	128
Bartłomiejczyk Mikołaj	
Smart Grid in Practise - Implementation of the Bilateral Supply System in Gdynia Trolleybus Network	133
Bartłomiejczyk Mikołaj	
Transmission Losses Spatial Analysis of the Supply System of Electrified Urban Transport Network	138
Kolar Vaclav, Hrbac Roman, Mlcak Tomas	
Mitigation of Interferences Between Electrical Regulated Drainage and Track Circuits	142

Čonka Zsolt, Kolcun Michal, Vojtek Martin, Kosterec Michal, Suleymenov Azamat Proposal of WAMS Controlled TCSC for Improvement of Transfer Capacity in Power System	146
Deželak Klemen, Pihler Jože Estimation of Overhead Conductor Temperature using Artificial Neural Networks	151
Beňo Jaroslav, Kret Miroslav, Šmidovič Rastislav, Bracínik Peter Photovoltaic Power Generation Forecasting in Slovak Transmission System	155
Dvorsky Emil, Rakova Lenka, Hejtmankova Pavla Grid Frequency Regulation by Recycling Electrical Energy in Flywheels	159
Rakova Lenka, Dvorsky Emil, Hejtmankova Pavla Voltage Control and Load Redistribution between Decentralized Power Sources in Microgrids in Island Mode	165
Djagarov Nikolay, Bonev Milen, Grozdev Zhivko, Milushev Hristo, Djagarova Julia Behavior of Anchor-Mooring Electrical Drive Research Operated by Induction Motor and Permanent Magnet Synchronous Motor	170
Djagarov Nikolay, Djagarova Julia Investigation of Hoisting Electrical Drive with Series Electromechanic Brake Mode Operation	175
Ilenin Stanislav, Varga Ladislav Wind Load of Overhead Electrical Lines Exceeding AC 1 kV	180
Ślusarczyk Beata Conditions for ECV Charging Infrastructure Development in Poland	184
Mészáros Alexander, Gáll Vladimír Economic Analysis of Power Transformer Selection in Electrical Power Systems	190
Medved' Dušan Investigation of Influence of the Additional Electromagnetic Shielding on Domestic Appliances	196
Pavlovkin Ján, Bernát Milan, Džmura Jaroslav, Žáčok Ľubomir, Bernátová Renáta, Ďuriš Milan Teaching Generation and Transmission of Electricity with an Interactive Whiteboard	202
Mahnitko Anatolijs, Lomane Tatjana, Gerhards Janis Gerhards, Varfolomejeva Renata The Deviation of Optimization Calculations of the HPP in Cascade while is not Considered the Hydraulic Connections	209
Mahnitko Anatolijs, Berzina Kristina, Zamulko Anatoly, Veremiichuk Yurii, Nakhodov Volodymyr Research of Electrical Power Consumers Reaction in Power Consumption Management System	215
Berzina Kristina, Zicmane Inga, Lomane Tatjana, Georgiev Georgi Autonomous Power Supply Model for Passive Building	219
Berzina Kristina, Zicmane Inga, Lomane Tatjana, Georgiev Georgi PV Electrical Energy Storage of Residential Buildings Communal Space Lighting	223
Bilik Petr, Martinek Radek, Kus Vaclav, Kašpírek Martin The Influence of Power Balancer on the Electricity Meter Results in Residential houses with Photovoltaic Power Plant	227
Racz Ervin, Horompoli Balazs, Varga Andrea, Neuchel Erik-Rene Experimental Investigation Based on Analyzation of Electric Current-Voltage Characteristics on Pasan-Flasher Flashlight Irradiated Photovoltaic Cells Aged by Various Processes	231
Králík Tomáš, Bemš Július, Starý Oldřich Electricity Markets Integrations - What is the Current Status and Future Outlook of Bidding Zones Reconfiguration?	237
Velicka Richard, Santarius Pavel, Krejci Petr, Sikora Tadeusz An Alternative Method of Evaluating Voltage Deviations with Regard to the Quality of Electricity in Distribution Networks	241
Bernat Petr, Kacor Petr, Hytka Zdenek, Pavelek Tomas Modification of Pull Characteristics of Lever Magnet with Variable Reluctance	248
Beranovský Jiří, Knápek Jaroslav, Vávrová Kamila Locally Produced Solid Biofuels for Individual Space Heating - Competitiveness with Brown Coal and Heat Pumps	253
Istók Róbert Conducted and Radiated Emissions of LED Lamps and Intelligent Lighting Systems	259
Gyurov Valentin, Kirov Rumen, Iliev Ilian, Georgiev Georgi Study on Possibilities for Improvement of nergy Efficiency of Power Transformers in Electric Distribution Networks	263
Kus Vaclav, Bilik Petr Effects of Small Non-Linear Loads on the Power Grid	267
B: High Voltage Technique and Diagnostics in Power Engineering	273
Kinsht Nikolay, Petrunko Natalia Theoretical and Experimental Problems of the PD Parameters Estimation	274
Kuniewski Maciej, Furgał Jakub Detection of Transformer Windings Failures with Frequency Response Analysis Method Obtained with Different Signals	279
Brandt Martin Experimental Measurement and Analysis of Frequency Responses SFRA for Rotating Electrical Machines	284

Váry Michal, Lelák Jaroslav, Ďurman Vladimír, Pačka Juraj Examination of Insulation in Fire Retardant Cables by Time Domain Methods	289
Hopfer Nikolai, Zdrallek Markus, Dietzler Ulrik, Krampf Markus, Raquet Christoph, Ronczka Marilen, Rezaei Hamed Identification of Power Cable Conditions Based on Broadband Powerline Communication Characteristics in Distribution Grids ..	293
Vagapov Georgii, Fedotov Aleksander, Kurth Steffen, Voigt Sven A Concept for an Ice Detection System on Overhead Power Lines, Theory and Practical Results	297
Roehrich Jozef, Zydron Pawel, Szafraniak Bartłomiej Localization of E-M interference sources in air-insulated substation using VHF/UHF antenna arrays	301
Bonk Michał, Fuśnik Łukasz, Szafraniak Bartłomiej, Zydron Pawel Influence of Temperature and High-Energy Stresses on Selected Wideband Characteristics of Metal-Oxide Varistor Parameters ..	306
Pavlov Luboš, Skurčák Luboš, Altus Juraj, Roch Marek Increasing the Efficiency of Transmission of Electricity in the Transmission System	311
Sobota Rafał Natural Ionizing Radiation Absorbed by Ceramic Insulators	316
Sobota Rafał The Deconvolution Analysis of TL Curves for Current Ceramic Insulators	320
Cimbala Roman The Influence of Voltage on Surface Resistivity of Outdoor Insulator	324
Kolcunová Iraida, Csaji Pavol, Briančin Jaroslav, Fabián Martin Influence of contamination on the integral surface conductivity of insulators	331
Dolník Bystrík, Mészáros Alexander, Pavlík Marek, Zbojovský Ján, Špes Michal, Čonka Zsolt On the Undesirable EMI of Large LED Information Board	335
Koval Ludvík, Martinek Radek, Bilík Petr, Vanus Jan Measurement of Inrush Current Halogen Lamps	339
Zydroń Paweł, Kuniewski Maciej, Fuśnik Łukasz Comparison of Pseudorandom White-noise Generators Used as Signal Source for Wideband Analysis of Transformer Windings Impedance	344
Kolosok Irina, Korkina Elena, Mahnitko Anatolij A Fault Tree Cyber Security Analysis of Power System State Estimation Software	349
Moldrik Petr, Minarik Daniel, Kacor Petr, Ney Michal Application of Thermodiagnosics and Numerical Models in Research of Energy Supply Units using Hydrogen Technologies	354
Velicka Richard, Velickova Eva Assessment of the Normative Requirements for Ensuring the Safety of Powder Coating Booths in Terms of the Risk of Explosion	359
Pavlík Marek, Zbojovský Ján The Shielding Effectiveness Measuring of Brick Wall for Different Material Thickness	365
Zbojovský Jan, Pavlík Marek Calculating the Shielding Effectiveness of Materials Based on The Simulation of Electromagnetic Field	369
Džmura Jaroslav, Petráš Jaroslav Corona Electrodes for Electrostatic Precipitators Supplied with Alternating Voltage	373
C: Power Systems Relaying, Faults Analysis	377
Lomane Tatjana, Rubcovs Sergejs, Kovalenko Sergey, Berzina Kristina The Effectiveness Increasing of Earth Fault Distance Protection Operation in High-voltage Cable Line	378
Fedotov Aleksander, Vagapov Georgii, Chernova Natalia Location Of Single-Phase Ground Fault By Positive, Negative And Zero Sequence Of Overhead Power Lines In Ungrounded Power Grids Of 6 - 10 - 35 Kv Level Voltage	384
Holcsik Peter, Tompa Miklós Electrician Forms' Evaluation using Machine Learning Methods	389
Bermann Jiří, Procházka Martin Influence of Parallel Line on the Line Distance Protection Measurement	395
Nagay Vladimir, Sarry Sergei, Nagay Ivan, Kireev Pavel, Ukrainev Alexander Use of the Nonlinearity of the Arc Resistance for the Designing Main and Backup Relay Protection	399
Marciniak Lubomir Earth Fault Detectors for Indicators in Medium Voltage Networks	404
Nagay Ivan, Nagay Vladimir, Kireev Pavel, Sarry Sergei Relay Protection Designing as a Solution to the Problem of Recognizing the Regimes of the Electrical Grid	409
Kireev Pavel, Nagay Ivan, Nagay Vladimir Experimental Investigation Of Electric Arc Characteristics	414
Ukrainev Alexander, Nagay Vladimir, Nagay Ivan, Sarry Sergei, Chmihalov Gennadij Analysis of The Functioning of the Earth Fault Protection with Active Influence on the Electrical Grid	418

Grishkevich Andrey Distributed Simulation Models to Estimate Indices of Structural Reliability of Electric Power Systems	422
Misak Stanislav, Prokop Lukas Danger of Re-Ingition of an Electric Arc in a Resonant Earthing Medium Voltage System	428
D: Power System Control, Liberalisation of Electricity Market	435
Máslo Karel Frequency Stability in the Context of the European Network Codes	436
Chukreev Iurii, Chukreev Mikhail Information Technologies in Models for Assessing the Reliability of Electric Power Systems in Managing their Development	443
Chukreev Iurii, Chukreev Mikhail, Kolcun Michal Problems of Rationing Reliability in Planning of Liberalized Electric Power Systems Development	448
Akhmetbayev Dauren, Akhmetbayev Arman, Suleymenov Azamat, Kolcun Michal Modeling the Set Mode of Complex Power Grid, Based on Infeed Coefficients	453
Drholec Jiri, Gono Radomir, Rusek Stanislav, Gono Miroslava, Novak Tomas Supply Reliability of Industrial Distribution System	456
Perdukova Daniela, Fedor Pavol Optimal PI Fuzzy Controller for Nonlinear Systems	460
Medved' Dušan, Klešč Marián Modeling of Electrical off-grid Network in the Simscape Power Systems	465
Vecka Jiří, Knápek Jaroslav, Vašíček Jiří Perspectives of Cogeneration Plants and District Heating Sector - Assessment of the Impact of CO2 Auctions and Other Legislative Changes	471
Djagarov Nikolay, Djagarova Julia Hoisting Electrical Drive Mathematical Model with Series Electromechanic Brake	477
Vašíček Jiří, Vítek Miroslav New Ways of Providing Ancillary Services in a Power System	484
Prokop Lukas, Vantuch Tomas, Misak Stanislav Automated Parking System Supplied by Off-grid Power System with an Intelligent Control System	489
Negnevitsky Michael, Nguyen Hieu, Piekutowski Marian Risk Assessment of Frequency Response and Reserve Requirement for a Power System with High Wind Power Penetration	494
Gyurov Valentin, Kirov Rumen, Iliev Ilian, Vasilev Rosen Proposal for Defining f Some Optimal Parameters in Power Supply Systems of Industrial Branches in the Republic of Bulgaria .	498
Martinek Radek, Bilik Petr, Vanus Jan, Koval Ludvik, Kahankova Radana, Fajkus Marcel, Nedoma Jan Optimization of Adaptive Filter Control Parameters for Shunt Active Power Filter	502
Martinek Radek, Bilik Petr, Vanus Jan, Koval Ludvik, Kahankova Radana, Fajkus Marcel, Nedoma Jan The Effect of the Forgetting Factor and Filter Length on the RLS Adaptive Control Algorithm in Shunt Active Power Filter	508
Vanus Jan, Sykora Jiri, Martinek Radek, Bilik Petr, Koval Ludvik, Zidek Jan, Fajkus Marcel, Nedoma Jan Use of the Software PI System Within the Concept of Smart Cities	513
Vanus Jan, Machac Jaroslav, Martinek Radek, Bilik Petr, Koval Ludvik, Zidek Jan, Nedoma Jan, Fajkus Marcel Design of an Application for the Monitoring and Visualization of Technological Processes with PI System in an Intelligent Building for Mobile Devices	518
Kosmak Jakub, Misak Stanislav A Power Quality Parameters Setup for Power Quality Management Model as an Integrate Part of Active Demand Side Management	523
Pavlova-Marciniak Iva Development of Nuclear Power in Poland and COP 21	529
E: Works of PhD Students	533
Glazunova Anna, Irina Kolosok, Semshchikov Evgenii Bad Data Detection by the Dynamic EPS State Estimation Methods	534
Pálfi Judith, Holcsik Péter New Database and Theoretical Model for Power Distribution Networks	539
Hromadka Ales, Jirickova Jana, Martinek Zbynek, Sirovy Martin Comprehensive Mathematical Model of the Turbomachinery in the Czech Nuclear Power Plant Temelin	545
Mitrik Zsolt Establishment of a New Reliability Model of the Hungarian Energy Transmission Network	551
Szén István GH2 - Green Hydrogen Hydrogen Energy in the Light of Sustainability	556

Zajazcek Stanislav, Cigánek Jiří, Ďurica Maroš A New Method of Energy Calculation through Time Integration of a Vehicle Momentary Output Using a Model in Matlab – Simulink	561
Bolf Andrej, Belány Pavol, Suško Filip, Roch Marek, Altus Juraj, Repák Michal Determination of Current Probe Accuracy Depending on the Position of Conductor	565
Suško Filip, Bolf Andrej, Belány Pavol, Repák Michal, Altus Juraj The Application Possibilities of a Multi-agent System in Distribution Grid Operation	570
Novosad Ladislav, Hradilek Zdenek Model of Electric Output From Biogas Station	576
Grackova Larisa, Oleinikova Irina, Klavs Gaidis Algorithm-Based Analysis for the Charging Stations Impact Evaluation on the Low-Voltage Distribution Networks	580
Bañas Marek, Höger Marek, Altus Juraj Digital Overcurrent Relays in Industrial Networks - Advanced Fetures for Optimization of Tripping Times	585
Belány Pavol, Suško Filip, Bolf Andrej, Repák Michal, Otčenášová Alena, Roch Marek The Impact of Power Quality on Smart Metering System	591
Nazarčík Tomáš, Benešová Zdeňka Transient Analysis of Multi-Circuit Overhead Transmission Lines with Two Voltage Levels	596
Vojtek Martin, Kolcun Michal, Mikita Miroslav, Špes Michal Integration of Photovoltaic and Wind Power Plants in Low Voltage Networks using Energy Storages	602
Kosterec Michal, Kurimský Juraj, Rajňák Michal, Timko Milan, Kopčanský Peter Analysis of Thermal Field in Magnetic Fluid and Transformer Oil	608
Lachmanová Michaela Resources adequacy - Analysis of renewable generation variability	612
Baleja Richard, Novák Tomáš, Sokanský Karel, Bos Petr Mesopic Vision Utilization During Public Illumination Realisation by Means of LED	618
Muzik Vaclav, Vostracky Zdenek Assessment of Isolated Power System Frequency Defense Mechanisms	623
Ivančák Michal, Kolcun Michal, Vojtek Martin Challenges in Smart Grid	627
Varga Andrea, Racz Ervin, Kadar Peter, Investigation of Photovoltaic Panel Losses using Computer Simulations	633
Vajnar Vladimir, Vostracky Zdenek Assessment of the Breaking Characteristics of High Voltage Circuit Breakers with Respect to the Fault Circuit Interactions	639
Cimbala Roman, Kruželák Lukáš, Bucko Samuel, Kosterec Michal Analysis of Dielectric Properties in High-Voltage Insulator by Dielectric Spectroscopy (DRS)	645
Zuščák Jozef, Janiček František, Váry Michal, Hüttner Ľudovít Theoretical and Experimental Approach to the Issue of Limiting Short-Circuit Current in the LV Circuits	650
Ivanič Marián, Eleschová Žaneta, Bendík Jozef, Cenký Matej The Impact of Power Line Parameters Asymmetry on Short-circuit Currents in the Comparison with the Standard IEC 60909 ..	656
Bendík Jozef, Cenký Matej, Janiga Peter, Ivanič Marián, Eleschová Žaneta Measurement of Transformer Harmonic No-load Currents Spectrum using Magnetic Field Spectral Analysis	660
Daboul Mayada, Orsagova Jaroslava Reverse Interlocking Protection using IEC 61850 GOOSE	665
Wannous Kinan, Toman Petr, Pozzobon Pedro Effect Of Total Harmonics Distortion On Distance And Overcurrent Relays	670
Cenký Matej, Bendík Jozef, Ivanič Marián, Eleschová Žaneta Electrical Characteristics of Incompletely Unrolled Three-phase Power Cable on Wooden Drum	675
Bagi Tamás Measuring Current Distribution of Phase Conductor and Current Intesity Induced in Ground Wire on the 400 kV Transmission Line	681
Fajkus Marcel, Nedoma Jan, Stanislav Kepak, Vasinek Vladimir, Martinek Radek, Bilik Petr, Vanus Jan Energetically Passive Fiber-Optic Sensor System for the Security Windows of The Buildings	687
Fajkus Marcel, Nedoma Jan, Bednarek Lukas, Vasinek Vladimir, Martinek Radek, Bilik Petr, Vanus Jan Analysis Usability of the Energetically Passive Sensors for the Load Monitoring of Production Press Machines	692
Mutule Anna, Obushev A., Grebesh Ervins, Lvovs Aleksandrs Feasibility Study for Demand Response in Commercial Buildings	696
Špes Michal, Beňa Ľubomír, Müller Zdeněk, Vojtek Martin, Kosterec Michal, Márton Michal Effect of average environmental conditions in Slovakia at the current conductor capacity of overhead transmission line	702
Vávrová Zuzana, Szeliga Zbyszek, Dvořák Pavel, Palička Ondřej, Fojtů Radim Issues of Mercury Hg Emissions in the Czech Republic in Accordance with New Legislation Valid from 2021	708
Polewaczyk Mateusz, Robak Sylwester Studies on Interactions in Multi-Infeed Systems	713