Editors

Ki Young Kim
Dario Assante
Marian Ciontu
Jana Jirickova

Recent Researches in Electric Power and Energy Systems

- Proceedings of the 13th International Conference on Electric Power Systems, High Voltages, Electric Machines (POWER '13)
- Proceedings of the 1st International Conference on Power and Energy Systems (POES '13)

Chania, Crete Island, Greece, August 27-29, 2013

Scientific Sponsors

-Democritus University of Thrace, Greece
-Romanian-American University, Romania
-Ain Shams University, Egypt
-University De Los Andes, Venezuela
-Istanbul Technical University, Turkey
-Lucian Blaga University of Sibiu, Romania
-Megatrend University of Belgrade, Serbia
-Shu Zen College of Medicine and Management, Taiwan
-Stefan Cel Mare Universtity of Suceava, Romania
-International Telematic University Uninettuno in Rome, Italy
-Transilvania University of Brasov, Romania
-Universitatea Constantin Brancusi, Romania
-University of Ploiesti,Romania
-University of Tokushima, Japan
-University of Craiova, Romania
-University of West Bohemia, Czech Republic
-University of Genoa, Italy
-Technical University of Cluj-Napoca, Romania
-University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Romania

Recent Researches in Electric Power and Energy Systems

RECENT RESEARCHES in ELECTRIC POWER and ENERGY SYSTEMS

Proceedings of the 13th International Conference on Electric Power Systems, High Voltages, Electric Machines (POWER '13)
Proceedings of the 1st International Conference on Power and Energy Systems (POES '13)

Chania, Crete Island, Greece
August 27-29, 2013

Scientific Sponsors:

Democritus University of Thrace, Greece

University De Los Andes, Venezuela

Megatrend University of Belgrade, Serbia

Technical University of Cluj-Napoca, Romania

University of Ploiesti, Romania

University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Romania

University of Genoa, Italy

Romanian-American University, Romania

Istanbul Technical University, Turkey

Shu Zen College of Medicine and Management, Taiwan

Transilvania University of Brasov, Romania

University of Tokushima, Japan

International Telematic University Uninettuno in Rome, Italy

Ain Shams University, Egypt

Lucian Blaga University of Sibiu, Romania

Stefan Cel Mare Universtity of Suceava, Romania

Universitatea Constantin Brancusi, Romania

University of Craiova, Romania

University of West Bohemia, Faculty of Economics, Czech Republic

Recent Advances in Electrical Engineering Series | 22

ISSN: 1790-5117
ISBN: 978-960-474-328-5

RECENT RESEARCHES in ELECTRIC POWER and ENERGY SYSTEMS

Proceedings of the 13th International Conference on Electric Power Systems, High Voltages, Electric Machines (POWER '13)

Proceedings of the 1st International Conference on Power and Energy Systems (POES '13)

Chania, Crete Island, Greece
August 27-29, 2013

Published by WSEAS Press
www.wseas.org

Copyright © 2013, by WSEAS Press

All the copyright of the present book belongs to the World Scientific and Engineering Academy and Society Press. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the Editor of World Scientific and Engineering Academy and Society Press.

All papers of the present volume were peer reviewed by no less that two independent reviewers. Acceptance was granted when both reviewers' recommendations were positive.
See also: http://www.worldses.org/review/index.html

ISSN: 1790-5117
ISBN: 978-960-474-328-5

RECENT RESEARCHES in ELECTRIC POWER and ENERGY SYSTEMS

Proceedings of the 13th International Conference on Electric Power Systems, High Voltages, Electric Machines (POWER '13)

Proceedings of the 1st International Conference on Power and Energy Systems (POES '13)

Chania, Crete Island, Greece
August 27-29, 2013

Editors:
Prof. Ki Young Kim, Samsung Advanced Institute of Technology, Korea.
Prof. Dario Assante, International Telematic University Unienttuno in Rome, Italy.
Prof. Marian Ciontu, University of Craiova, Romania.
Prof. Jana Jirickova, West Bohemia Univerzity, Czech Republic.

Reviewers:
Romulus Militaru
Jan Ochodnicky
Valentina E. Balas
Sorinel Oprisan
Arjuna Marzuki
Vignesh Subbian
Hamidreza Hoshyarmanesh
Ali Hennache
Valeriy Perminov
Chellali Benachaiba
Murugan Paramasivam
Tamer Khatib
Valery Vodovozov
Mohamed Zahran
Arvind Dhingra
Ngote Nabil
El Oualkadi Ahmed
Haitham Jabbar Taha Haitham
Kostantinos Kalovrektis
Dimitrios Ventzas
Liang Zhou
Ioan Enescu
Kamyar Mehranzamir
Heimo Walter
Jacek Kolodziej
Elena Mereuta
Christos Volos
Andrzej Zak
Baburao Kodavati
Ioana Diaconescu
Mihai Cruceru
Mojtaba Shivaie
Yee Jiun Yap
Claude Bayeh
Tiberiu Socaciu
Mário Cesar do Espirito Santo Ramos
José Ignacio Hernández López
R Bala Murugan
Michael H. Schwarz
Ionel Botef
Zengshi Chen
Ahmed N. Abdalla
Hime Aguiar
Gheorghe Grigoras
Nikos Loukeris
Shahram Javadi
Chi,Chieh-Tsung Bruce
Rosli Abu Bakar
Lubnen Moussi
Mohamed Hussein
Dinko Vukadinovic
Alina Badulescu
Joao Carmo
Emre Kiyak
Pavel Varacha
Doru Nicola
Francisc Popescu
Sorin Ioan Deaconu
Daniela Litan
Dhananjay Singh
Yang Zhang
Paresh Rathod
Francisco David Moya Chaves
Mann Michael
Hsin-Jang Shieh
Oguz Arslan
Lungu Mihai Aureliu
Mihaiela Iliescu
Bahaa Kazem
Mokhtari Fouad
Brunonas Dekeris
Diariy R. Sulaiman
Satish Kumar Duraiswamy
Nayan Kumar
Gherghinescu Sorin
Cristian Fosalau
Amirhossein Fereidountabar
Vipul Arvindbhai Shah
Ragab Abdulaziz El Sehiemy
Rawid Banchuin
Manuela Panoiu
Dan Florentin Lascu
Karthikeyan Jayaraman
Boonruk Chipipop
Petr Hajek
Jenica Ileana Corcau
Kanwarjit Singh Sandhu
Ankit Patel
Hari Moha Pandey
Hakan Tozan
Kamran Mohajeri

Table of Contents

ISBN: 978-960-474-328-5

ISBN: 978-960-474-328-5

ISBN: 978-960-474-328-5

ISBN: 978-960-474-328-5

ISBN: 978-960-474-328-5

Plenary Lecture 1

Finite Element Analysis (FEA) of the Permanent Magnet (PM) Generators with the Multiple Stators

Associate Professor Erol Kurt
Gazi University
Faculty of Technology
Department of Electrical & Electronics Engineering
Ankara, TURKEY
E-mail: ekurt@gazi.edu.tr

Abstract: As a result of increasing trends on the wind energy applications, the explorations on different types of generators take attention world-widely. While many efforts have been given on modeling the new topologies of the electric machines, the cogging torque and phase voltage ripples have been main problems among the scientific manners. Since the multiple stator generators (MSGs) with permanent magnets (PMs) have higher energy densities compared to the other commercial generator systems, finite element analysis (FEA) of such generators shed a light on design optimization techniques on wind-related renewable energy explorations. On the other hand, PM generators with multiple stator systems can have minimal cogging torque values, if an appropriate design can be realized. In fact, the radially and angularly directed flux lines can help to minimize the undesired ripples and torques. According to the detailed analyses, the field morphology can have different orientations as also known from the claw pole machines, however the heating, loses and signal distortions become the main problems. With this work, a comparison between two new multiple stator generators is presented and some operational aspects are investigated in terms of finite element analysis (FEA).

Brief Biography of the Speaker: Dr. Erol KURT completed his undergraduate studies at Gazi University, Department of Physical Education in 1998 and took his M. Sc. degree from the Institute of Science & Technology of the same university in 2001. He was awarded by an European Graduate College stipendium during his Ph. D study at the Institute of Physics & Mathematics of Bayreuth University in Germany. He completed his Ph. D. degree in 2004 on the instabilities of rotating magnetic fluids. Then, he worked in Turkish Atomic Energy Authority R&D Department, Fusion Division for 3 years. Beginning from the middle of 2009, he was assigned to the position of Associate Professor at Technology Faculty of Gazi University in Ankara. His main teaching and research areas include nonlinear phenomena in electrical/electronic circuits, electric machine design, mechanical vibrations, chaos, plasmas, fusion and magnetohydrodynamics. He has authored or co-authored many scientific papers and the technical chairman to the serial conference of Int. Conf. Nuclear & Renewable Energy Resources (NuRER) and the chairman to European Conf. and Workshop on Renewable Energy Systems (ECRES and EWRES). He has been the guest editor of several special issue journals and the editor of TUBAV Journal of Science from 2011 September.

ISBN: 978-960-474-328-5

Plenary Lecture 2

Synoptic Approach of Electric Power Systems through Environmental Sustainability Key Concepts

Associate Professor Cornelia Aida Bulucea
Faculty of Electrical Engineering
University of Craiova
ROMANIA
E-mail: abulucea@gmail.com

Abstract: A sustainable industrial metabolism, integrating technical and ecological aspects should be one of the greatest challenges of humanity within the present industrial world. Starting from the observation that Nature built ordered structures and human beings are only one component in the complex web of the ecological interactions, the focus of this presentation is to enhance the way of thinking that human technical activities cannot be separated from the functioning of the entire system. Based on the strong conviction that Nature has so far generated life, Industrial Ecology seeks for a new approach of the industrial systems, viewed not in isolation from the Nature surroundings systems, but in concert with them. Within the framework of Industrial Ecology, an approach of technical systems, created by humans, and ecological systems, created by Nature, as parts of the same system, the industrial ecosystems, could provide a holistic view of the interactions and symbiosis interrelationships among human activities, industrial practices and ecological processes. This presentation goes on to adopt a dualist view, incorporating technical and environmental dimensions, to describe exergy and embodied energy applicability to electric ecosystems. Drawing up a description of the electric power system as an industrial ecosystem, with its limits and components, defining the systems operation regimes and assessing the equilibrium points of the system within the two reference frames represent key points and issues related to an appropriate analysis of electric power systems. Further on, this presentation aims to shed light the exergy analysis that overcomes the limitations of the energy analysis, and provides an illuminating way of assessing systems meaningfully, since the concept of exergy is based on both the first law of thermodynamics and the second law of thermodynamics. Exergy analysis clearly identifies the locations of energy degradation in a process, revealing how much it is possible to design more efficient an electric power system, being also a tool for addressing the impact on the environment of energy utilization, this way identifying whether an industrial system is sustainable or not.

Brief Biography of the Speaker: Cornelia Aida Bulucea is currently an Associate Professor in Electrotechnics, Electrical Machines and Environmental Electric Equipment in the Faculty of Electrical Engineering, University of Craiova, Romania. She is graduate from the Faculty of Electrical Engineering Craiova and she received the Ph.D degree from Bucharest Polytechnic Institute. In Publishing House she is author of four books in electrical engineering area. Research work is focused on improved solutions for electrical networks on basis of new electric equipment, and environmental impact assessment of electric transportation systems. She has extensive experience in both experimental and theoretical research work, certified by over 70 journal and conference research papers and 15 research projects from industry. She has held in the Association for Environment Protection OLTENIA and she is a regular invited keynote lecture for environmental engineering symposia organized by Chamber of Industry and Commerce OLTENIA. Due to WSEAS recognition as huge scientific Forum she participated over time in nineteen WSEAS International Conferences, presenting papers and chairing sessions. She was Plenary Lecturer in the 5th IASME/WSEAS International Conference on ENERGY&ENVIRONMENT (EE'10), held by the University of Cambridge, UK, February 23-25, 2010, in the 4th IASME/WSEAS International Conference on ENERGY&ENVIRONMENT (EE'09),), held by the University of Cambridge, Cambridge UK, February 24-26, 2009 and in the 8th WSEAS International Conference on POWER SYSTEMS (PS'08), held by the University of Cantabria, Santander, Spain, September 23-25, 2008. She is very proud by her over 30 papers published in the WSEAS Conferences Books and in the WSEAS TRANSACTIONS ON ENVIRONMENT AND DEVELOPMENT, WSEAS TRANSACTIONS ON CIRCUITS AND SYSTEMS and WSEAS TRANSACTIONS ON ADVANCES IN ENGINEERING EDUCATION.

ISBN: 978-960-474-328-5

Plenary Lecture 3

The Impact of Reactive Power on Energy Efficiency in Electric Drives

Professor Slobodan Mirchevski
Faculty of Electrical Engineering and Information Technologies
Department of Electric Drives
University Ss. Cyril and Methodius
Skopje, FYROM
E-mail: mirceslo@feit.ukim.edu.mk

Abstract: In the lecture a look at reactive power in energy efficiency of electric drives is taken. Usually in energy efficiency of electric drives is treated only efficiency η of working machine, motor and power converter. Induction motor, as the most used in industry, has been considered. The influence of induction motor and power converter for its supplying in consumption of reactive power and disturbance power is evaluated. The starting investigations in the elevators adjustable speed drives have demonstrated that reactive and disturbance power consumption is at least 40 % of the active power consumption. It generally means that except benefits of power electronics using for adjustable speed drives, new problems are generating in the producing, transferring, distributing and using of electric energy.

Brief Biography of the Speaker: Slobodan Angel Mirchevski has received the B.Sc. degree in electrical engineering, M.Sc. degree and Ph.D. degree from University "Ss. Cyril and Methodius"-Skopje, in 1975, 1984 and 1990 respectively. From 1975-79 he was with Mines and Steelworks "Skopje" in rolling mills departments. From 1979 to the present he is with Faculty of Electrical Engineering and Information Technologies in Skopje. Since 2000 he is a full professor for electrical drives and a head of Laboratory for electric drives. He is an author of more than 150 scientific and professional papers and many application works (more than 50) in industry. Since 2002 has a title Senior Member of IEEE. He is a supervisor of 102 diploma works, 8 M.Sc. works and 2 PhD theses. His areas of interest are electric drives and energy efficiency. Now he is a member of PEMC Council, EPE Executive Council and EPE General Assembly. He was a general chairman of conference EPE-PEMC 2010, held in Ohrid.

ISBN: 978-960-474-328-5

Plenary Lecture 4

About the Possibility of Power Quality Improvement in Ultra-High Power EAF

Assistant Professor Manuela Panoiu
Electrical Engineering and Industrial Informatics Department
Engineering Faculty of Hunedoara
Polytechnic University of Timisoara
Romania
E-mail: manuela.panoiu@fih.upt.ro

Abstract: Electric arc furnaces, especially the ones of ultra-high power, are characterized by the fact that these influence the electrical power quality at the point of common coupling, so influencing other electrical consumers. Thus, the effects produced by the ultra-high power EAF can be as following: voltage gap, generation of harmonic currents and inter-harmonics, high reactive power consumption, the three-phase unbalance, etc. All these negative effects can be influenced by each other and in some cases, these can be accentuated. In order to improve the power quality, all negative factors must be taken into account.
This research presents a study of the influence of the harmonic currents, reactive power and unbalance load on the power quality. Therefore, in order to present this study, measurements of currents and voltages, in the primary and secondary windings of the transformer for an electric arc furnace were performed. Using these measurements the indicators of the electrical power quality were determined: total harmonic distortion for the currents and voltages (THDi, THDu), unbalanced factors, power factor and both, currents and voltage harmonics. These values were calculatedduring the elaborationof the charge. The measurements were made in an electric furnace that has the capacity of 100 tones and a complete charge is finalized in approximately 3 hours. This type of furnace exists in Romania on many industrial platforms.
For the power quality improvement the proposed solutions for the reactive power compensation, harmonic currents filtering and the balancing of the electrical load, will be presented below. These solutions proposed and presented in this research are as follow: design of filters for the harmonic currents, of an installation for the load balances and of an installation for the reactive power compensation. In order to analyze the effect of these proposed solutions, simulations were performed, using the PSCAD EMTDC environment. Simulations are based on the use of an electric arc model which allowssimulating the entire electric arc furnace installation. Therefore, many simulations have been made in order to determine the optimalparameters of the model so that the simulation results to be very similar with the measured one.Thus, the measured and simulated waveforms of currents and voltages of primary and secondary furnace transformer were compared.Also, measured and simulated power factor, unbalanced factors for the currents and the voltage measured and simulated, and also the harmonic distortion coefficients measured and simulated were compared.
After the model parameters were chosen, the simulations of the electric arc furnace installation have been performed without the use of the installations for the compensation- filtering-balancing, but also with these installations, separately and together.
Follow-up the simulations, the effect of these installations on the electrical power quality can be studied.

Brief Biography of the Speaker: Manuela Panoiu was born in 1965, graduate the Computer Science Faculty, Polytechnic University of Timisoara in 1989. She receives his PhD degree in Electrical Engineering in 2001 at Polytechnic University of Timisoara and is currently Assistant Professor at the Electrical Engineering and Industrial Informatics Department of Engineering Faculty of Hunedoara, Polytechnic University of Timisoara, Romania.
Her research interests focus on modelling and simulating systems, advanced computer programming and artificial intelligence.
She has until now published over 80 research papers in Journals and conferences and participate to 10 research projects.

ISBN: 978-960-474-328-5

Plenary Lecture 5

Rationalization of Electrical Energy Usage in Oil Refinery as a Prerequisite for Implementation of Energy Management System

Professor Aleksandar Nikolic
Electrical Engineering Institute Nikola Tesla
University of Belgrade
Belgrade, Serbia
E-mail: anikolic@ieent.org

Abstract: Energy Management Systems (EnMS) becomes nowadays important for organizations where energy is a significant cost. In addition to the introduction of legislation by the International Standards Organization, companies with implemented EnMS benefits from cost savings and make a significant contribution to environmental and climate protection, for example by the permanent reduction of CO2 emissions. One of the largest electrical energy consumers is oil refinery, with average daily power demand of 25MW. With the aim to obtain reliable and accurate electrical power consumption measuring system, with the possibility of obtaining different balance consumption by manufacturing processes and products, proposed design of the new metering and information system is presented in the lecture. Metering and information system design is based on the various requirements for different electrical energy consumption reports that came from refinery departments (production, manipulation, electrical department, maintenance, investments, etc.). Furthermore, electrical department operates as a subsidiary company and need sub-billing system for other departments. Finally, production of fuel and its manipulation and transport needs several separate electrical energy consumption balances based on different products, cost allocation and energy targets. Proposed monitoring system uses state-of-art power meters that communicate over high-speed Ethernet network. In that case such a complex plant like oil refinery could be analyzed and managed easily from SCADA software. In the lecture a complete monitoring system will be explained in detail, including algorithm for consumption calculation for different departments and units. The plan is that the system for monitoring electricity consumption serves as the basis for the introduction of a complete energy management system (EnMS).

Brief Biography of the Speaker: Aleksandar Nikolic received the B.Sc., M.Sc. and Ph.D. degrees in electrical engineering in 1991, 1999 and 2009, respectively, from the Faculty of Electrical Engineering, University of Belgrade, Serbia. Since 1995 he has been with University of Belgrade, Serbia, as a Research Associate at the Department of Electrical Drives, where he is currently part-time Assistant Prof. He is now at Electrical Engineering Institute “Nikola Tesla”, Belgrade, Serbia, as a Counselor for the field of energy efficiency. He is also founder and a Head of Accredited Laboratory for Power Quality testing at Institute Nikola Tesla. His special fields of interest include power quality and energy efficiency, control of induction motor drives and industrial automation. He has published about 80 papers and one chapter in international book “Torque Control”. He is reviewer of several international Journals. A.Nikolic is a Senior member of IEEE and a Member of the Board of Serbian Power Electronics Society.

ISBN: 978-960-474-328-5

Plenary Lecture 6

LabVIEW Application for Monitoring and Control the Filtering, Compensation and Balancing System for a Nonlinear Electric Load

Assistant Professor Caius Panoiu
Politehnica University of Timisoara
ROMANIA
E-mail: caius.panoiu@fih.upt.ro

Abstract: In a complex power distribution, the circulation of the current harmonics and also their voltage drop lead to undesirable effects as the followings: distortion of the voltage waveform, additional heating in functioning of the electric devices, additional power loss or electromagnetic influence on telecommunication systems. The most important components that cause harmonic distortion into the power distribution represent the power electronic converters. For compensating this negative impact, there must be connected power conditioning devices at the interface with the power supply system in order to obtain improvements in power quality indicators. Analyzing the electric parameters acquired during the functioning of nonlinear loads represents a very important step in designing the electronic devices which must compensate the distorted regime. This paper present a LabVIEW application that is able to monitor the variation of most important electric parameters that characterize the functioning of an electrothermal installation with electromagnetic induction. Using an adapting interface and a data acquisition board connected to a computer, LabVIEW application acquires in real time samples of the current and voltage signals and shows the time variation of the following electrical parameters: RMS voltage and currents, active, reactive, distorted and apparent powers, total harmonic distortion of the current and voltage waveforms. This variation can be obtained on the entire acquisition period. Presented application also implements a system for three phase active filter command system using the sequential structures existing in LabVIEW library. The application is able to control the command pulses using the pinouts of the same data acquisition board.

Brief Biography of the Speaker: Caius Panoiu was born in 1965 and graduates in 1989 the Faculty of Electronics and Telecommunications, 'Politehnica' University of Timisoara. He receives his PhD degree in Electrical Engineering in 2001 at 'Politehnica' University of Timisoara and currently is Assistant Professor at the Electrical Engineering and Industrial Informatics Department of Engineering Faculty of Hunedoara, 'Politehnica' University of Timisoara. Romania. Caius Panoiu research interests are focused on signal processing, modeling and simulating systems, and data acquisition. He is author or co-author of over 100 research papers that are published in journals and conferences and participates to 10 research projects.

ISBN: 978-960-474-328-5

Plenary Lecture 7

The Mitigation of Fading and Shadowing Influences in Wireless Telecommunications

Professor Dragana Krstić
Faculty of Electronic Engineering
University of Niš
Serbia
E-mail: dragana.krstic@elfak.ni.ac.rs

Abstract: The wireless channels are simultaneously affected by short-term fading (fast fading) and long-term fading (shadowing). Fast fading is caused by multiple signal propagation paths. Due to the shadowing from various objects in the propagation paths, in addition to multipath fading, the quality of the received signal is also affected by slow variations of the mean signal level In wireless communication systems, various techniques for reducing fading effect and influence of shadow effect are used: diversity reception, dynamic channel allocation and power control. Upgrading transmission reliability and increasing channel capacity without increasing transmission power and bandwidth is the main goal of diversity techniques. Well-known means to mitigate the effects of fading and shadowing is diversity reception. It exploits the random nature of the radio propagation by combining, or selecting from two or more independent (or at least highly uncorrelated) fading signal paths, resulting in improved system performance. The wireless communication system following microdiversity to mitigate the effects of fast fading and macrodiversity processing to reduce shadowing effects are studed. Fast signal variations are described by several distributions such as Rayleigh, Rice, Nakagami-m, α-μ, Weibull and Hoyt. Diversity reception, based on using multiple antennas at the receiver (space diversity, with two or more branches) is a very efficient method used for improving system's quality of service. Multiple received copies of signal could be combined on various ways. Usually L-branch maximal-ratio combining (MRC) or selection combining (SC) is implemented at the micro level (single base station) and selection combining (SC) with two base stations (dual diversity) is implemented at the macro level. Complex mathematical calculations are used to obtain telecommunication system performances.

Brief Biography of the Speaker: Dragana S. Krstic was born in Pirot, Serbia. She received the BSc, MSc and PhD degrees in electrical engineering from Department of Telecommunications, Faculty of Electronic Engineering, University of Nis, Serbia, in 1990, 1998 and 2006, respectively. Her field of interest includes telecommunications theory, optical communication systems, wireless communication systems, satellite communication systems etc. She works at the Faculty of Electronic Engineering in Nis since 1990. She participated in more Projects which are supported by Serbian Ministry of Science. She has written or co-authored more about 160 papers, published in Journals and at the International/National Conferences. She has also reviewed more articles in IEEE Transactions on Communications; IEEE Communications Letters; ETRI journal; C&EE Journal; Electronics and Electrical Engineering (Elektronika ir Elektrotechnika) and other journals. She is the reviewer of the papers for many conferences and the member of technical program committees and international scientific committees of several scientific conferences. Also, she is the member of Editorial Board of International Journal On Advances in Telecommunications.

ISBN: 978-960-474-328-5

Plenary Lecture 8

Hybrid Energy Systems in the Context of the Operation of the Electricity System

Associate Professor Petr Mastny
Brno University of Technology
Faculty of Electrical Engineering and Communication
Department of Electrical Power Engineering
Brno, Czech Republic
E-mail: mastny@feec.vutbr.cz

Abstract: In connection with the development and the growing integration of renewable energy sources into energy systems, it is still important to acquire knowledge concerning the vice of their operational characteristics. Lecture is primarily focused on the operation of hybrid energy systems (photovoltaic and wind power stations with accumulation, which can operate in island operation or cooperate with electricity grid) in the conditions of the Czech Republic. The lecture describes the important operating indicators that relate to the integration of hybrid energy systems into the electricity system and their impact on the operation and management of the electricity system. Here will be describing the importance of compensation for hybrid systems, as well as the methodology for establishing the operating performance of these systems and their impact on the economy of operation. In ideal case integration of hybrid systems into ESS (Electricity Supply System) does not cause downgrade of power quality in access point (point of common coupling). Power quality is expressed by voltage quality. Ideal quality of electric power is achieved if energy is still available; voltage has its rated value, voltage waveform is a harmonic function with rated frequency and particular phases of voltage are symmetric.

Brief Biography of the Speaker: Petr Mastny was born in 1976. He graduated in Electrical Power engineering in 2000 from Brno University of Technology. His Ph.D. he obtained in October 2006. In December 2010 he has been appointed as Associate Professor at Brno University of Technology. He has been with Department of Electrical Power Engineering, Brno University of Technology, Czech Republic since 2005 and with Centre of Research and Utilization of Renewable Energy since 2010. His current position is assistant professor. His field of interest covers the problems of utilization of renewable energy source and questions of energy management systems with renewable energy sources and their influence on environment. At present he is head worker or co-worker of five research projects in the field of Alternative Power Sources and he cooperates with several private companies to solve of real applications. Petr Mastny has been member of WSEAS (The World Scientific and Engineering Academy and Society) since 2007, member of NAUN since 2009, member of IEEAM since 2010 and member of CIRED since 2009. He is author of about 75 publications in international scientific journals and conferences in field of Power Engineering and Alternative Power Sources. He has more than 55 presentations in international conferences and technical seminars and he has more than 12 citations in international scientific journals.

ISBN: 978-960-474-328-5

Plenary Lecture 9

Some Implications of a Scale Invariant Model of Statistical Mechanics to Classical and Relativistic Thermodynamics

Professor Siavash H. Sohrab
Robert McCormick School of Engineering and Applied Science
Department of Mechanical Engineering
Northwestern University
USA
E-mail: s-sohrab@northwestern.edu

Abstract: Some implications of a scale invariant model of statistical mechanics to the mechanical theory of heat of Helmholtz and Clausius will be described. Invariant definitions of reversible heat and work are introduced leading to invariant forms of the first and second laws of thermodynamics. Modified invariant definitions of heat and entropy are presented along with invariant Planck law of equilibrium energy spectrum thus closing the gap between radiation and gas theory. The volume transformation $V = V_o(1-\beta^2)^{1/2}$ and the modified transformation of relativistic pressure $p = p_o/(1-\beta^2)$ lead to an ideal gas law that is no longer relativistically invariant $pV = p_oV_o/(1-\beta^2)^{1/2}$ with $\beta = v/c$. The total thermal energy at equilibrium Q is identified as enthalpy H with the relativistic transformation $Q = H = U + PV = Q_o / (1-\beta^2)^{1/2} = H_o /(1-\beta^2)^{1/2}$. Also, Mie's theory of matter is discussed and it is shown that the total energy $\mu_oc^2 = ¾\mu_oc^2 + ¼\mu_oc^2$ of spatially finite universe is three-quarters electromagnetic (dark energy) and one-quarter gravitational (dark matter) in origin in accordance with the ideas of Pauli (Pauli, W., Theory of Relativity, Dover, 1958).

Brief Biography of the Speaker: Siavash H. Sohrab received his PhD in Engineering Physics in 1981 from University of California, San Diego, his MS degree in Mechanical Engineering from San Jose State University in 1975, and his BS degree in Mechanical Engineering from the University of California, Davis in 1973. He joined Northwestern University in 1982 and since 1990 he is Associate Professor of Mechanical Engineering at Northwestern University.

ISBN: 978-960-474-328-5

Authors Index

ISBN: 978-960-474-328-5