

10th CONFERENCE – SEMINAR
**INTERNATIONAL SCHOOL ON NONSINUSOIDAL
CURRENTS AND COMPENSATION**

ISNCC 2010

15-18 June 2010
Łagów, Poland

PROGRAM

www.ISNCC2010.iee.uz.zgora.pl

University of Zielona Góra
Institute of Electrical Metrology
Institute of Electrical Engineering

Conference Venue

The event will be held at the Hotel "Spa Morena" in Łagów, Chopina Street, 2C. The Hotel is located 15 minutes walking distance from the strict center of Łagów.

Conference Registration

The conference registration desk will be open as follows:

Tuesday, 15 June 2010, 3:30 PM – 9:30 PM

Wednesday, 16 June 2010, 7:30 AM – 7:00 PM

Conference participants who have registered can pick up their materials, badges and other items from the registration desk which will be located on the ground floor of the Hotel "Spa Morena".

All conference participants are issued with a personal badge showing their name and affiliation. Please observe that for security reasons the badge must be worn at all times during the conference and the social events. Access may be denied to participants not wearing their badge.

Hotel Information

Conference participants will be accommodated in Hotel "Spa Morena". Ph.D. students will be accommodated in bungalows of Holiday Center of University of Zielona Góra. The Holiday Center, Szkolna Street 1, is located a few minutes walking distance from the Hotel "Spa Morena". Accommodation is included in the registration fee.

Meals

Meals (breakfasts, snacks in the coffee breaks, dinners, supper), for all conference participants, will be served in the restaurant located in the ground floor of the Hotel "Spa Morena". Meals are included in the registration fee. This information is also valid for Ph.D. students.

Welcome Party

A welcome party will be held on Wednesday, June 16, from 7:00 PM in the Restaurant "Pod Basztą" (Under the Keep). The Restaurant, Kościuszki Street 5, is located in the center of the Łagów (15 minutes walking distance from the Hotel "Spa Morena"). The Restaurant has a picnic place with access to the lake. We have planned a grill supper with nice food (among others roasted wild boar) and good beer. All participants and their companion are welcome to attend. The welcome party is included in the registration fee.

Gala Dinner

Our gala dinner will take place in Thursday, June 17, in the Atrium of the Hotel "Spa Morena". We start at 6:00 PM with concert of Quodlibet

Orchestra – mezzo-soprano and chamber music sextet. We hope to see you all at that time. After the concert (about 7:30 PM) we have planned an enjoyable evening with nice food and good wine. The concert and the gala dinner are included in the registration fee.

Swimming-pool

The swimming pool of the Hotel “Spa Morena” is open from 8.00 AM to 8.00 PM and it is free of charge for participants accommodated in the Hotel.

Oral Presentations

Oral presentation should not last longer than 15 minutes. After presentation 5 minutes for questions and answers has been scheduled.

Show up at least 10 minutes before the session starts and meet the session chairman so you have the possibility to inspect the lecture hall and its facilities (computers and digital projectors). At the session speak simple as possible and stick to the time limit so questions can be raised.

During the presentation a laptop, with installed MS Power Point 2003 and Acrobat Reader, and a projector will be available for each speaker. If you are not sure that your presentation will be reproduced properly, find in your tool an option which allows you to make your presentation portable.

Tutorial T1:

Reflections on Power Theories for Poly-Phase Nonsinusoidal Voltages and Currents

Author: J.L. Willems, Engineering Faculty, Ghent University, Belgium

This tutorial paper reviews the fundamentals of different methods for current decomposition and non-active power compensation in poly-phase power systems. The basic concepts and the properties of the instantaneous active and reactive power theory and of the active/reactive average power theory are discussed and critically compared.

Tutorial T2:

Instantaneous p-q Power Theory for Control of Compensators in Micro-Grids

Authors: E.H. Watanabe and M. Aredes, Electrical Engineering Program
Federal University of Rio de Janeiro, Rio de Janeiro, Brazil

J.L. Afonso and J.G. Pinto, Industrial Electronics Department
University of Minho Guimarães, Portugal

L.F.C. Monteiro, PROQUALI, Rio de Janeiro, Brazil

H. Akagi, Tokyo Institute of Technology, Tokyo, Japan

The main objective of this tutorial is to present the basic concepts on the instantaneous p-q Theory and then show its applicability for controlling switching converters connected in a micro-grid. These converters can be used for connecting renewable energy sources (solar, wind, and others) to the micro-grids or for harmonic, reactive power or unbalance compensation, and even for voltage regulation. The emphasis is given on the compensation characteristics derived from the p-q Theory, and simulation results of test cases are shown. Special attention is put on the oscillating component of the instantaneous real power, as it may produce torque oscillations or frequency variations in weak systems (micro-grids) generators. This oscillating component, as defined in the p-q Theory, gives the amount of oscillating energy between the source and the load, and its compensation through a switching compensator must have an energy storage element to exchange it with the load. With the p-q Theory this energy storage element can be easily calculated as a function of the average component of the instantaneous real power, which depends on the observation period.

Tutorial T3:

CPC-based comparison of compensation goals in systems with nonsinusoidal voltages and currents

Author: L.S. Czarnecki, Electrical and Computer Engineering
Department, Louisiana State University, Baton Rouge, USA

There is some level of confusion upon goals of compensation in systems with nonsinusoidal voltages and currents (NV&C), especially considering that compensation with switched compensators is a recursive process. This recursive nature of compensation is often ignored in discussions on compensation. This paper presents results of studies on recursive compensation with a switching compensator, aimed at reducing the supply current to its active component, defined according to Fryze, according to CPC power Theory, and to its working component. The paper also shows that the instantaneous reactive power p-q theory-based algorithm for switching compensator control does not provide, in the presence of the supply voltage harmonics and/or asymmetry, right control of such compensators.

Tutorial T4:

Conservative Power Theory, Sequence Components and Accountability in Smart Grids

Authors: P. Tenti, Dept of Information Engineering University of Padova,
Italy

P. Mattavelli, Dept of Technology and Management of Industrial
Systems University of Padova at Vicenza, Italy

H.K. Morales Paredes, Dept of Electrical Energy Systems,
University of Campinas, Brazil

Smart grids offer a new challenging domain for power theories and compensation techniques, because they include a variety of intermittent power sources which can have dynamic impact on power flow, voltage regulation, and distribution losses. When operating in the islanded mode, smart micro-grids can also exhibit considerable variation of amplitude and frequency of the voltage supplied to the loads, thus affecting power quality and network stability. Due to the limited power capability of smart micro-grids, voltage distortion can also get worse, affecting measurement accuracy and possibly causing tripping of protections. In such a context, a reconsideration of power theories is required, since they form the basis for supply and load characterization and accountability. A revision of control techniques for harmonic and reactive compensators is also required, because they operate in a strongly

interconnected environment and must perform cooperatively to face system dynamics, ensure power quality and limit distribution losses. This paper shows that the Conservative Power Theory (CPT) provides a suitable background to cope with smart grids characterization needs, and a platform for the development of cooperative control techniques for distributed switching power processors and static reactive compensators.

Tutorial T5:

Distributed intelligence for Smart Grid Control

Authors: A. Monti, F. Ponci, A. Benigni, J. Liu, Institute for Automation of Complex Power Systems E.ON ERC – RWTH Aachen University Aachen, Germany

This paper provides an overview of the challenges, their potential solutions and the trends in the control of electrical power distribution in presence of distributed generation. Power grids are supposed to go through a significant transformation in the close future. Distribution is supposed to be mostly affected. The tutorial reviews the current practice and outlines the possible evolutions towards a more intelligent grid able to operate more dynamically mostly under the hypothesis of a large penetration of renewable energy sources or distributed energy sources more in general. Some specific topics are then addressed with reference to recent research results such network-based control, distributed state estimation and distributed intelligence.

Tutorial T6:

Dynamic grid-flux-based control for grid connected voltage-source converters

Author: V. Staudt, Institute for Electrical Power Engineering and Power Electronics, Ruhr-University Bochum, Germany

Power-grid connected voltage-source converters provide two-way energy exchange with the grid. They are used for renewable energy applications, combined heat and power, active filtering and loads with dynamically changing working conditions. Aggravated grid codes and dynamic loads require very fast control methods. A control based on the integral of the grid voltage (called grid flux) offers extremely fast dynamics and graphical understanding.

Wednesday, 16th June 2010

8:00 AM – 9:00 AM	Breakfast
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9:00 AM – 9:30 AM	Welcome Addresses	Location: "Morena II"
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Welcome address from the ISNCC 2010 chairpersons
 Prof. L.S. Czarnecki, Louisiana State University
 The conference opening ceremony.

9:30 AM – 10:30 AM	Tutorial 1	Location: "Morena II"
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Reflections on Power Theories for Poly-Phase Nonsinusoidal Voltages and Currents

Jacques L. Willems, Engineering Faculty, Ghent University, Belgium

10:30 AM – 11:30 AM	Tutorial 2	Location: "Morena II"
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Instantaneous p-q Power Theory for Control of Compensators in Micro-Grids

E.H. Watanabe and M. Aredes, Electrical Engineering Program Federal University of Rio de Janeiro, Rio de Janeiro, Brazil

J.L. Afonso and J.G. Pinto, Industrial Electronics Department University of Minho Guimarães, Portugal

L.F.C. Monteiro, PROQUALI, Rio de Janeiro, Brazil

H. Akagi, Tokyo Institute of Technology, Tokyo, Japan

11:30 AM – 12:00 AM	Coffee Break
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12:00 AM – 2:00 PM	Lecture Session S1	Location: "Morena II"
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Chair: P. Tenti, Dept of Information Engineering, University of Padova

ID 351 ***LC - Fryze's compensator under asymmetrical voltage***

I.A. Sirotin, National Technical University "KPI" Kharkiv

ID41 ***Three-Phase Four-Wire Circuits Interpretation by means of Different Power Theories***

F.P. Marafão, E.V. Liberado, University of Campinas, H.K. Morales Paredes, L.C.P. da Silva, University of Campinas

ID136 ***APF-based Cancellation of the Source-end Zero Sequence Current***

E. Pashajavid, M. Tavakoli Bina, K. N. Toosi University of Technology

- ID191 ***Power Electronics Active Filter with Controlled Dynamics and Improved EMC***
M. Gwózdź, Poznan University of Technology
- ID266 ***Hybrid Power Filter with Single Tuned Passive Filter - Dynamical Properties***
D. Buła, M. Pasko, Silesian University of Technology
- ID161 ***Instantaneous and average compensation in polyphase systems***
J.C. Montaño, IRNAS, Spanish National Research Council, CSIC, M. Castilla, D. Borrás, J.C. Bravo, University of Seville

2:00 PM – 3:00 PM	Dinner
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3:00 PM – 5:00 PM	Lecture Session S2	Location: "Morena II"
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Chair: J.L. Willems, Engineering Faculty, Ghent University

- ID281 ***Flux-Based Control of 3-phase Active Front End***
R. Bartelt, M. Oettmeier, C. Heising, V. Staudt, Ruhr-University Bochum
- ID286 ***Pole-Restraining Control of three-phase Active Front End***
C. Heising, M. Oettmeier, V. Staudt, Ruhr-University Bochum
- ID326 ***Control Circuit for Active Power Filter with An Instantaneous Reactive Power Control Algorithm Modification***
K.P. Sozański, University of Zielona Góra
- ID346 ***Application of Conservative Power Theory to Cooperative Control of Distributed Compensators in Smart Grids***
H.K. Morales Paredes, University of Campinas, A. Costabeber, P. Tenti, University of Padova
- ID42 ***Possible Shunt Compensation Strategies Based on Conservative Power Theory***
F.P. Marafão, D.I. Brandão, Unesp – Univ Estadual Paulista, H.K. Morales Paredes, L.C.P. da Silva, University of Campinas

5:00 PM – 5:30 PM	Coffee Break
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5:30 PM – 6:30 PM	Scientific Committee Meeting	Location: "Morena II"
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7:00 PM – 11:00 PM	Welcome Party (grill)	Location: "Pod Baszta"
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Thursday, 17th June 2010

8:00 AM – 9:00 AM	Breakfast
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9:00 AM – 10:00 AM	Tutorial 3	Location: "Morena II"
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CPC-based comparison of compensation goals in systems with nonsinusoidal voltages and currents

L.S. Czarnecki, Electrical and Computer Engineering Department,
Louisiana State University, Baton Rouge, USA

10:00 AM – 11:00 AM	Tutorial 4	Location: "Morena II"
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Conservative Power Theory, Sequence Components and Accountability in Smart Grids

P. Tenti, Dept of Information Engineering University of Padova, Italy
P. Mattavelli, Dept of Technology and Management of Industrial Systems
University of Padova at Vicenza, Italy

11:00 AM – 11:30 AM	Coffee Break
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11:30 AM – 2:00 PM	Lecture Session S3	Location: "Morena II"
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Chair: E. H. Watanabe, Electrical Engineering Program
Federal University of Rio de Janeiro, Brazil

ID16 ***Orthogonality of functions describing power states in electrical circuits in Budeanu's concept***

M.T. Hartman, Gdynia Maritime University

ID96 ***Power Components Under Nonsinusoidal Conditions Using a Power Multivector***

A. Menti, T. Zacharias, J. Miliias-Argitis, University of Patras

ID176 ***A New Formulation of Apparent Power for Nonsinusoidal Unbalanced Polyphase Systems***

J.Č. Mikulović, T.B. Šekara, University of Belgrade

ID186 ***Choice of Power Factor Corrector for Effective Operation of MicroGrid and its Elements***

A. Suzdalenko, A. Stepanov, I. Galkin, Riga Technical University

ID226 ***The use of Geometric Algebra in Circuit Analysis and its Impact on the Definition of Power***

M. Castro-Núñez, E. Nowicki, University of Calgary, R. Castro-Puche, Universidad de Córdoba

- ID166 ***p-q Power Theory: Some Theoretical and Practical Aspects***
A. Bitoleanu, M. Popescu, V. Suru, University of Craiova
- Paper not available in conference proceedings
- The Non-Sinusoidal Reactive Power in the Way Our Department Sees It***
P. Polcar, University of West Bohemia
- ID291 ***The Role of Poynting Multivector in Power Theory***
M. Castilla, J.C. Bravo, M. Ordoñez, J.C. Montaño, University of Sevilla

11:30 AM – 2:00 PM	Lecture Session S4	Location: "Morena I"
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Chair: H.L. Ginn, Department of Electrical and Computer Engineering, Mississippi State University, MsState, U.S.A

- ID26 ***The Effect of PWM Frequency on the Effectiveness of Protection Against Electric Shock Using Residual Current Devices***
S. Czapp, Gdańsk University of Technology
- ID36 ***Search for disturbing loads in power network with the use of voltage and current fluctuation***
P. Otomański, G. Wiczyński, Poznan University of Technology
- ID91 ***Harmonics and Powers of Doubly Fed Induction Generators at Balanced Sinusoidal Voltages***
S. Schostan, K.D. Dettmann, I. Purellku, D. Schulz, Helmut-Schmidt-University
- ID321 ***Impact of Nonsinusoidality on Efficiency of Alternative Electricity Generation Systems***
I. Shchur, National University "Lviv Polytechnic"
- ID336 ***Using Theory of Series for Distortion Determination of Non-Harmonic Quantities of Two-Phase Systems***
B. Dobrucky, M. Benova, M. Pokorny, University of Zilina
- ID356 ***Electric Losses, Caused By High Harmonics In Electric Power Supply Systems***
I.V. Zhezelenko, Y.L. Sayenko, Priazovskiy State Technical University

2:00 PM – 3:00 PM	Dinner
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3:00 PM – 4:00 PM	Lecture Session S5	Location: "Morena II"
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Chair: Z. Fedyczak, Faculty of Electrical Engineering,
Computer Science and Telecommunications,
University of Zielona Góra, Poland

ID101 ***Comparison of new DPC methods for two- and three-level AC/DC converters***

K. Kulikowski, A. Sikorski, Bialystok University of Technology

ID192 ***Simulation and Experimental Models of 3-Phase Diode Rectifier with Power Electronics Current Modulator***

M. Krystkowiak, M. Gwóźdź, Poznan University of Technology

ID221 ***CPC Based Converter Control for Systems with Non-Ideal Supply Voltage***

H.L. Ginn, Mississippi State University

3:00 PM – 4:00 PM	Lecture Session S6	Location: "Morena I"
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Chair: M.T. Hartman, Faculty of Marine Electrical
Engineering, Gdynia Maritime University Gdynia,
Poland

ID21 ***Centralized normalization of voltage harmonics in the network with distributed nonlinear load by the third-order filters***

L.I. Kovernikova, Melentiev Energy Systems Institute SB RAS

ID61 ***The properties of the method of frequency errors correction of input circuits within the range of nonlinear operation***

L. Furmankiewicz, University of Zielona Góra

ID116 ***On Power Factor Improvement by Lossless Linear Filters in the Nonlinear Nonsinusoidal Case***

D. del Puerto-Flores, J.M.A. Scherpen, Universiteit Groningen
R. Ortega, Laboratoire des Signaux et Systèmes

4:00 AM – 4:30 AM	Coffee Break
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4:30 PM – 5:30 PM	Lecture Session S7	Location: “Morena II”
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Chair: V. Staudt, Institute for Electrical Power Engineering and Power Electronics, Ruhr-University Bochum, Germany

ID76	<i>Three-Phase AC Systems Interfaced by Current Source Matrix Converter with Space Vector Modulation</i>
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Z. Fedyczak, G. Tadra, P. Szcześniak, University of Zielona Góra

ID86	<i>Modeling and Analysis of Dynamic Properties of the Hybrid Transformer with MRC</i>
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J. Kaniewski, Z. Fedyczak, University of Zielona Góra

ID216	<i>Mathematical modeling of matrix-reactance frequency converter described by nonstationary differential equations</i>
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I.Ye. Korotyeyev, B. Zięba University of Zielona Góra

6:00 PM – 7:00 PM	Music concert	Location: Atrium
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7:30 PM – 12:00 PM	Gala Dinner	Location: Atrium
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Friday, 18th June 2010

8:00 AM – 9:00 AM	Breakfast
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9:00 AM – 10:00 AM	Tutorial 5	Location: “Morena II”
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Distributed intelligence for Smart Grid Control

A. Monti, F. Ponci, A. Benigni, and J. Liu, Institute for Automation of Complex Power Systems E.ON ERC – RWTH Aachen University Aachen, Germany

10:00 PM – 10:30 PM	Coffee Break
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10:30 AM – 11:30 AM	Tutorial 6	Location: “Morena II”
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Dynamic grid-flux-based control for grid connected voltage-source converters

V. Staudt, Institute for Electrical Power Engineering and Power Electronics Ruhr-University Bochum, Germany

11:30 PM – 12:00 PM	Closing Session	Location: “Morena II”
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12:00 PM – 1:00 PM	Dinner
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Map of the centre of Łagów

