12-15 Nov, Dubrovnik, Croatia

MEDPOWER2018

Mediterranean Conference on Power Generation, Transmission, Distribution and Energy Conversion

Conference book

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Editors:

Igor Kuzle, Ninoslav Holjevac, Tomislav Capuder, Hrvoje Pandžić

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TABLE OF CONTENTS

WELCOME

It is our great pleasure to welcome you to 11th Mediterranean Conference on Power Generation, Transmission, Distribution and Energy Conversion – MEDPOWER 2018. MEDPOWER 2018 Conference is dedicated to experts carrying out research in the fields of energy and power systems and has a longstanding tradition through which it has become the platform for presenting research results, introduction of innovative technologies, exchanging ideas, networking and more.

The first MEDPOWER conference was held in Lefkosia, Cyprus in 1998 and the last one was held in Belgrade, Serbia in 2016. This time, 11th time, in Dubrovnik (Cavtat), Croatia, the organization is the joint effort of University of Zagreb, Faculty of Electrical Engineering and Computing, IET Hellas Network, IET Israel Network and IET Cyprus Network with the support of Power and Energy Chapter (PES) of the IEEE Croatia Section.

The conference program is divided into 3 tracks:

1. Operational aspects of power system, focusing on modelling and analyses,
2. Energy system challenges in the presence of growing uncertainty and unbundling
3. Integrated aspects of information and communication technologies (ICT) and energy systems

On top of the regular sessions, MEDPOWER 2018 Conference offers 4 distinguished keynote lecturers, 1 round table session sessions, and a total of 9 special sessions. Overall, the conference will host 161 papers, each of which was reviewed by at least two reviewers. The Energies best paper award is given to the best papar.

This year's MEDPOWER is hosted in Dubrovnik - one of the most beautiful and best preserved old cities in the world. The Old town, with its city walls and fortresses, numerous old churches, monuments and other historical objects, testifies to its glorious and rich history. As one of Europe's most popular and most beautiful living monuments, Dubrovnik became a UNESCO World Heritage Site in 1979 and was recently a filming location (King's Landing) of a popular Game of Thrones series.

For these 4 conference days, you will have a chance to meet, catch up and start collaborations with the experts from all over the world. Please, seize this opportunity as the conference technical and social program is designed for everyone to interact, network and share ideas to provide everyone a better future of energy.

We are looking forward to being your hosts,

Your MEDPOWER 2018 Organizing Team

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N. Duic, *Croatia*

KEYNOTE SPEAKERS

Chongqing Kang

Tsinghua University, Beijing, China

Biography

Chongqing Kang is full professor of electrical engineering in Tsinghua University. He is Chairman of Executive Committee of Department of Electrical Engineering. From 2011 to 2014 he was the Director of Centre for Teaching Excellence, Tsinghua Univ. His research interest is focused on power system planning, operation, renewable energy, low carbon technologies and load forecasting. He is Fellow of IEEE and IET, senior member of CSEE. He has been on the editorial board of 5 international journals including IEEE Transactions on Power Systems and Electric Power Systems Research. He is the Editor-in-Chief of International Transactions on Electrical Energy Systems (Wiley). He has published 3 monographs in Chinese and one book in English. He published over 300 academic papers, including over 60 IEEE Transactions papers. He has been a member of IEEE PES Long Range Planning Committee.

Integrating High Share of Variable Renewable Energy in Bulk Power Systems

Abstract: Countries around the world set a**ggressive goal for the very high share of renewables** in future power systems. However, **uncertainty and variability** of the very high penetration renewables need more flexibility to balance the generation and load. This presentation will introduce some novel approaches to provide flexibility for power systems including **concentrating solar power** (CSP), **cloud energy storage** (CES), and **multiple energy systems** (MES). CSP is an emerging controllable renewable generation technique to accommodate the uncontrollable renewable energy. CES presents a new business model to share both centralized and distributed storages to explore their flexibility potential. MES exploits the synergy of electricity, gas, and heat systems to provide flexibility. In addition, data analytics on the demand side and renewable energy are proposed to have a better understanding of electricity consumption behaviors and renewable energy output stochastic characteristics and further contribute the accommodation of renewable energy. Finally, the presentation will provide some **practice experiences** from the provincial power systems with high penetration of renewable energy in China

KEYNOTE SPEAKERS

Carlo Alberto Nucci

University of Bologna, Italy

Biography

Full professor and head of the Power Systems Laboratory of the Department of Electrical, Electronic and Information Engineering 'Guglielmo Marconi' of the University of Bologna. Author/co-author of over 300 scientific papers, of six book chapters edited by IEEE, IET etc. IEEE and IET Fellow, CIGRE honorary member. Chairman of Cigré Study Committee C4 'System Technical Performance' (2006-2012). Editor in Chief of the Electric Power Systems Research journal, Elsevier. Doctor honoris causa of the University Politehnica of Bucharest, corresponding member of the Bologna Science Academy. President of the Italian Group of University Professors of Electrical Power Systems. Member of the EU Smart City Stakeholder Platform, PES representative in the IEEE Smart City Initiatives Program.

Smart Grids as enablers for Smart Cities

Abstract: The smart grid is generally considered as the key **enabler** for the implementation **of the concept of smart city**. This invited keynote is aimed at illustrating the appropriateness of such a concept along with the necessary clarifications. The keynote will first provide a brief survey of the **power systems evolution** in the last decades, from the traditional structure standing on centralized generation and control to supply customers through AC transmission networks and distribution feeders with unidirectional energy flow, to the new structure in which more renewable generation is deployed – also at the distribution level by prosumers – through DC/AC converters, thus making it necessary more ICT and intelligence than with the traditional structure, inherently more stable. The expected diffusion of electrical mobility, which represents a further challenge especially for distribution networks is another factor that calls for more smartness of the grid of the future: the smart grid. An example of a **three-co-simulation platform** (traffic, communication network and power distribution grid) realized to study the planning and the deployment of a recharging infrastructure that offers services while meeting users requirements and preserving (or improving) at the same time the grid power quality will be presented. The keynote will eventually cover the **smart city definition and requirements**, in terms of key technologies and modeling tools that are expected to be applied in future smart cities and will **illustrate some examples of smart grid-smart city projects in which researchers of the University if Bologna**.

KEYNOTE SPEAKERS

Yury Dvorkin

New York University, USA

Biography

Yury Dvorkin (S'11-M'16) received his Ph.D. degree from the University of Washington, Seattle, WA, USA, in 2016. Dvorkin is currently an Assistant Professor in the Department of Electrical and Computer Engineering at New York University, New York, NY, USA. Dvorkin was awarded the 2016 Scientific Achievement Award by Clean Energy Institute (University of Washington) for his doctoral dissertation "Operations and Planning in Sustainable Power Systems". His research interests include power system operations, planning, and economics.

Extinction of Electric Power Distribution: What Will It Take

Abstract: Proliferation of ubiquitous **distributed energy resources** and **smart grid** sensing, monitoring, communication and control technologies has paved the way to re-considering nearly century-long business practices within electric power distribution systems. As a result, electric power distribution is gradually **evolving from a utility-centric** to an **agent-centric paradigm**, where the role of traditional distribution utilities changes from distribution itself to **pro-active management** of utility-owned, **private resources**, and **third-party aggregators** in a consensus, mutually beneficial manner. This presentation will describe recent advances in business models, data analytics, and decision analysis that make it possible to fully leverage the full range of **techno-economic benefits** of these changes and enhance the overall **efficiency of power delivery**.

KEYNOTE SPEAKERS

Yongqian Liu

North China Electric Power University, Beijing, China

Biography

Yongqian Liu got his PhD on Production Automation at Nancy 1 University in France and PhD on Hydropower Engineering and at Huazhong University of Science and Technology in China in 2002. He has 32 years of professional experience on Wind Power and Hydro Power Engineering. He is one of the founders of the Bachelor's programme "Wind Energy and Power Engineering" in China, and his achievements include strong record of numerous academic and industrial R&D projects, technological consulting projects, and 132 research papers. Currently his main research, teaching, and consulting interests are the theory and technologies on Wind Power Plant Design, and Operation and Maintenance.

Intelligent Wind Farm Technologies

Abstract:
In this speech, the objectives, concept, and functions of an **intelligent wind farm** are discussed, the framework and the technologies for intelligent wind farm are introduced, **current research status** on intelligent wind farm technologies is reviewed, the research achievements of intelligent wind farm in China are examined and the **future development** of intelligent wind farm technologies is prospected.

PROGRAM

Program overview

Monday 12th November	Tuesday 13th November	Wednesday 14th November	Thursday 15th November
8:30am - 9:00am Welcome and Intro			
9:00am - 10:30am **Parallel session:** **SES01 – SES05**	9:00am - 10:30am **Parallel session:** **SES11 – SES15**	9:00am - 10:30am **Parallel session:** **SES16 – SES20**	9:00am - 10:30am **Parallel session:** **SES21 – SES25**
10:30am - 11:00am Coffee break	10:30am - 11:00am Coffee break	10:30am - 11:00am Coffee break	10:30am - 11:00am Coffee break
11:00am - 12:00pm **Keynote 01:** **Carlo Alberto Nucci**	11:00am - 12:00pm **Keynote 02:** **Chongqing Kang**	11:00am - 12:00pm **Keynote 03:** **Yury Dvorkin**	11:00am - 12:00pm **Keynote 04:** **Yongqian Liu**
12:00pm - 1:00pm Lunch	12:00pm - 1:00pm Lunch	12:00pm - 1:00pm Lunch	12:00pm - 1:00pm Lunch
1:00pm - 2:30pm **Special session:** **SS01 – SS02**	1:00pm - 2:30pm **Special session:** **SS03 – SS04**	2:00pm – 4:00pm **Round Table Session:** **The Future of Energy in Croatia**	1:00pm - 2:30pm **Special session:** **SS07 – SS08**
2:30pm - 3:00pm Coffee break	2:30pm - 3:00pm Coffee break		2:30pm - 3:00pm Coffee break
3:00pm -4:30pm **Parallel session:** **SES06 – SES10**	3:00pm -4:30pm **Special session: SES05 – SES06**	1:00pm – 10:00pm Tourist trip Dubrovnik	3:00pm -4:30pm **Poster session** **Special session SES09**
7:00pm -11:00pm Welcome reception	7:00pm -10:00pm Gala dinner		4:45pm – 5:30 pm Closing and Awards

PROGRAM

Monday, 12/Nov/2018

8:30am 9:00am	**INTRO: Introduction to MEDPOWER 2018 in Dubrovnik, Croatia** Location: **Ragusa**				
9:00am - 10:30am	**SES-01: Monday 01 - Power system dynamics** Location: **Bobara**	**SES-02: Monday 02 - Power Flows** Location: **Šipun**	**SES-03: Monday 03 - Voltage stability** Location: **Salon VII**	**SES-04: Monday 04 - Wind power generators** Location: **Orlando**	**SES-05: Monday 05 - Power Electronics** Location: **Salon VI**
10:30am 11:00am	**Coffee break 01: Coffee Break 01**				
11:00am - 12:00pm	**KEYNOTE 01: CARLO ALBERTO NUCCI** Location: **Ragusa**				
12:00pm - 1:00pm	**Lunch 01: Lunch 01** Location: **Hotel Restaurant Cavtat**				
1:00pm - 2:30pm	**SS01: CROSSBOW** Location: **Bobara**		**SS02: BLOCKCHAINS** Location: **Orlando**		
2:30pm 3:00pm	**Coffee Break 02: Coffee Break 02**				
3:00pm - 4:30pm	**SES-06: Monday 06 - Energy Storage** Location: **Bobara**	**SES-07: Monday 07 - Power Markets** Location: **Šipun**	**SES-08: Monday 08 - Transmission lines** Location: **Salon VII**	**SES-09: Monday 09 - Reactive Power** Location: **Orlando**	**SES-10: Monday 10 - Integrated aspects ICT and energy systems** Location: **Salon VI**
7:00pm - 11:59pm	**Welcome reception: Conference opening ceremony, welcome reception and welcoming speech**				

PROGRAM

Tuesday, 13/Nov/2018

9:00am - 10:30am	**SES-11: Tuesday 01 - Microgrid Modelling** Location: **Bobara**	**SES-12: Tuesday 02 - Distributed resources** Location: **Šipun**	**SES-13: Tuesday 03 - Integrated Energy Systems** Location: **Salon VII**	**SES-14: Tuesday 04 - Flexibility** Location: **Orlando**	**SES-15: Tuesday 05 - Power Electronics** Location: **Salon VI**
10:30am - 11:00am	**Coffee Break 03: Coffee Break 03**				
11:00am - 12:00pm	**KEYNOTE 02: CHONGQING KANG** Location: **Ragusa**				
12:00pm - 1:00pm	**Lunch 02: Lunch 02** Location: **Hotel Restaurant Cavtat**				
1:00pm - 2:30pm	**SS03: FLEXCOOP** Location: **Bobara**		**SS04: SIREN** Location: **Orlando**		
2:30pm - 3:00pm	**Coffee Break 04: Coffee Break 04**				
3:00pm - 4:30pm	**SS05: INTEGRIDY** Location: **Bobara**		**SS06: WINDLIPS+FENISG** Location: **Orlando**		
7:00pm - 10:00pm	**Gala: Gala dinner**				

PROGRAM

Wednesday, 14/Nov/2018

9:00am - 10:30am	**SES-16: Wednesday 01 - Power System Dynamics** Location: **Bobara**	**SES-17: Wednesday 02- Concepts and ICT solutions** Location: **Šipun**	**SES-18: Wednesday 03- ICT-driven intelligent solutions and Smart Metering** Location: **Salon VII**	**SES-19: Wednesday 04 - Power System Protection** Location: **Orlando**	**SES-20: Wednesday 05- Data-driven modelling** Location: **Salon VI**
10:30am - 11:00am	**Coffee Break 05: Coffee Break 05**				
11:00am - 12:00pm	**KEYNOTE 03: YURY DVORKIN** Location: **Ragusa**				
12:00pm - 1:00pm	**Lunch 03: Lunch 03** Location: **Hotel Restaurant Cavtat**				
1:00pm - 10:00pm	**Tourist trip: Tourist trip Dubrovnik**				
2:00pm - 4:00pm	**RT-01: Round Table Session - The Future of Energy in Croatia** Location: **Bobara**				

PROGRAM

Thursday, 15/Nov/2018

9:00am - 10:30am	**SES-21: Thursday 01 - Power System Equipment** Location: **Bobara**	**SES-22: Thursday 02 - Forecasting** Location: **Šipun**	**SES-23: Thursday 03 - Data Driven Modelling** Location: **Salon VII**	**SES-24: Thursday 04 - Operational aspects of power system** Location: **Orlando**	**SES-25: Thursday 05 - Power System Modelling and Analyses** Location: **Salon VI**
10:30am - 11:00am	**Coffee Break 07: Coffee Break 07**				
11:00am - 12:00pm	**KEYNOTE 04: YONGQIAN LIU** Location: **Ragusa**				
12:00pm - 1:00pm	**Lunch 04: Lunch 04** Location: **Hotel Restaurant Cavtat**				
1:00pm - 2:30pm	**SS07: STORY** Location: **Bobara**		**SS08: DER** Location: **Orlando**		
2:30pm - 3:00pm	**Coffee Break 08: Coffee Break 08**				
3:00pm - 4:30pm	**PS-01: Poster Session** Location: **Šipun**		**SS09: THE GLOBAL GRID** Location: **Bobara**		
4:45pm - 5:30pm	**Closing and Awards: Conference closing and Best paper award** Location: **Ragusa**				

SESSION CHAIRS

1. SESSION 01 - Power system dynamics I

Session Chair:

Igor Kuzle, University of Zagreb Faculty of electrical engineering and computing, Croatia

2. SESSION 02 - Power flows

Session Chair:

Kenneth Bruninx, KU Leuven, Belgium

3. SESSION 03 - Voltage stability

Session Chair:

Rafael Zárate-Miñano, Universidad de Castilla - La Mancha, Spain

4. SESSION 04 - Wind power generators

Session Chair:

Hrvoje Pandzic, University of Zagreb Faculty of Electrical Engineering and Computing, Croatia

5. SESSION 05 - Power electronics I

Session Chair:

Miguel Castilla, Technical University of Catalonia, Spain

6. SESSION 06 – Energy storage

Session Chair:

Alexis Polycarpou, Frederick University, Cyprus

7. SESSION 07 – Power markets

Session Chair:

Dubravko Sabolić, Croatian Transmission System Operator Ltd. (HOPS), Croatia

8. SESSION 08 – Transmission lines

Session Chair:

Carlo Alberto Nucci, University of Bologna, Italy

SESSION CHAIRS

9. SESSION 09 – Reactive power

Session Chair:

Chongqing Kang, Tsinghua University, People's Republic of China

10. SESSION 10 – Integrated aspects ICT and energy systems

Session Chair:

Ning Zhang, Tsinghua University, People's Republic of China

11. SESSION 11 – Microgrid modelling

Session Chair:

Barry Hayes, University College Cork, Ireland

12. SESSION 12 – Distributed resources

Session Chair:

Danijel Topić, University of Osijek, Croatia

13. SESSION 13 – Integrated energy systems

Session Chair:

Filipe Soares, Institute for Systems and Computer Engineering of Porto (INESC Porto), Portugal

14. SESSION 14 - Flexibility

Session Chair:

Andrej Gubina, University of Ljubljana, Slovenia

15. SESSION 15 - Power electronics II

Session Chair:

Dr. Stjepan Sučić, Končar KET inc., Croatia

SESSION CHAIRS

16. SESSION 16 - Power system dynamics II

Session Chair:

Augustin Irizarry Rivera, University of Puerto Rico, Puerto Rico (U.S.)

17. SESSION 17 – Concepts and ICT solutions

Session Chair:

Ioannis Vlachos, NTUA, Greece

18. SESSION 18 - ICT-driven intelligent solutions and Smart metering

Session Chair:

Miltos Alamaniotis, University of Texas at San Antonio, United States of America

19. SESSION 19 - Power system protection

Session Chair:

Styliani Sarri, National Technical University of Athens (NTUA) & Regulatory Authority for Energy (RAE), Greece

20. SESSION 20 – Data-driven modelling I

Session Chair:

Manuel Serrano, ETRA I+D, Spain

21. SESSION 21 – Power system equipment

Session Chair:

Matej Zajc, University of Ljubljana, Slovenia

22. SESSION 22 – Forecasting

Session Chair:

Tomislav Capuder, University of Zagreb, Croatia

SESSION CHAIRS

23. SESSION 23 – Data-driven modelling II

Session Chair:

Gady Golan, Ariel University, Israel

24. SESSION 24 – Operational aspects of power system

Session Chair:

Yongqian Liu, North Chine Power Electric University, People's Republic of China

25. SESSION 25 – Power system modelling and analysis

Session Chair:

Carlos Moreira, INESC TEC Porto, Portugal

SESSIONS

SES-01: Monday 01 - Power system dynamics **Monday, 12/Nov/2018: 9:00am - 10:30am** *Location:* **Bobara**

Efficient Identification of Critical Load Model Parameters Affecting Transient Stability
Yue Zhu, Jovica Milanović
University of Manchester, United Kingdom; yue.zhu-5@postgrad.manchester.ac.uk

Stability Assessment of Complex Power Systems – Time Domain Simulations vs Direct Methods
Ahsan Shahid
Independent, United States of America; ahsanshahid2008@hotmail.com

An Investigation into the Impact of Generator Dispatch on Transient Stability in Power Systems with Renewable Generation
Robert Ian Hamilton, Panagiotis Papadopoulos, Keith Bell
University of Strathclyde, Glasgow; robert.hamilton@strath.ac.uk

A simple model to analyse the frequency behaviour of interconnected power systems with high renewable penetration
Alejandro Marano-Marcolini, José Luis Martínez-Ramos, Moisés García-Ruiz, Gabriel Cantos-Alcantara
Universidad de Sevilla, Spain; alejandromm@us.es

Ultra-Fast Distance Protection Algorithm in Time-Domain Based on a Gamma Model of Line
Neriton Hoxha, Jean-Claude Maun
Université Libre de Bruxelles, Belgium; nhoxha@ulb.ac.be

Analysis of the Wind Generation Impact on Inertial and Primary Frequency Response of the Croatian Electric Power System
Tomislav Baškarad, Igor Kuzle, Josip Đaković, Perica Ilak
University of Zagreb, Croatia; tomislav.baskarad@fer.hr

SESSIONS

SES-02: Monday 02 - Power Flows **Monday, 12/Nov/2018: 9:00am - 10:30am** *Location:* **Šipun**

Chance-Constrained Optimal Power Flow with Non-Parametric Probability Distributions of Dynamic Line Ratings

Nicola Viafora[1], Stefanos Delikaraoglou[2], Pierre Pinson[1], Joachim Holbøll[1]
[1]Technical University of Denmark (DTU), Denmark; [2]EEH - Power Systems Laboratory of ETH Zurich, Zurich, Switzerland; nicovia@elektro.dtu.dk

Comparison of OPF formulations considering DSO capability to provide ancillary services

Martin Bolfek[1], Tomislav Capuder[2]
[1]HEP ODS d.o.o., Croatia; [2]University of Zagreb, Faculty of electrical engineering and computing; martin.bolfek@hep.hr

Bi-level Minimum Loading Unit Commitment for Small Isolated Power Systems

Georgios Psarros, Stavros Papathanassiou
National Technical University of Athens, Greece; gpsarros@mail.ntua.gr

Robust optimization for the scheduling of isolated RES-based microgrids in developing countries

Marina Petrelli, Alberto Berizzi, Cristian Bovo, Edoardo Amaldi
Politecnico di Milano, Italy; marina.petrelli@mail.polimi.it

Expert System for topological remedial action discovery in smart grids

Antoine Marot, Benjamin Donnot, Sami Tazi, Patrick Panciatici
RTE, France; antoine.marot@rte-france.com

SESSIONS

SES-03: Monday 03 - Voltage stability **Monday, 12/Nov/2018: 9:00am - 10:30am** *Location:* ***Salon VII***

Grid Voltage Regulation with Optimal Reactive Power Effort by Active Front End Converters

Johnny Chhor, Constantinos Sourkounis
Ruhr-University Bochum, Germany; chhor@enesys.rub.de

An Under Voltage Load Shedding Scheme Based on a Short Term Voltage Instability Detection Method

Arun Joseph, Milos Cvekovic, Peter Palensky
TU delft, Netherlands, The; arun.joseph@tudelft.nl

Capacitances versus Losses in Medium-Voltage Transformer Using Bio-Inspired Computing

Rafael Bastos Santos, Alessandra Freitas Picanco
Federal Institute of Bahia - IFBA, Brazil; alepicanco@ifba.edu.br

Controlled Islanding of Power Systems Considering Voltage Stability Constraints

Panayiotis Demetriou, Alexis Kyriacou, Elias Kyriakides, Christos Panayiotou
University of Cyprus, KIOS Research and Innovation Center of Excellence, Cyprus; kyriacou.alexis@ucy.ac.cy

A Comparative Analysis of the Calculated Values and Concrete Measurements of no-load Power Losses of the 400 kV Interconnecting Transmission Link Kosovo–Albania

Gazmend Xhevdet PULA[1], Gazmend KABASHI[2], Kadri KADRIU[2]
[1]University of Prishtina, Electrical Engineering Faculty, Power Department, Kosovo; [2]KOSTT, Kosovo Transmission and Market Operator, Prishtina, Kosovo; gazmend.pula@gmail.com

SESSIONS

SES-04: Monday 04 - Wind power generators **Monday, 12/Nov/2018: 9:00am - 10:30am** *Location:* **Orlando**

Flying Start of a Permanent Magnet Wind Generator Using Discontinuous Currents and Sliding-Mode Observer
Filip Jukić, Tin Bariša, Luka Pravica, Damir Sumina
University of Zagreb Faculty of Electrical Engineering and Computing, Croatia; filip.jukic@fer.hr

Accuracy Performance of Power Voltage Transformers
Igor Žiger[1], Dijana Papić[1], Marko Čukman[1], Dalibor Filipović-Grčić[2]
[1]Končar - Instrument Transformers, Croatia; [2]Končar - Electrical Engineering Institute; igor.ziger@koncar-mjt.hr

Improved Real Time Emulator of a Wind Turbine Dynamic Model
Jakub Osmic[1], Mirza Kusljugic[1], Emir Omerdic[2], Mahdi Ebrahimisalari[3], Daniel Toal[3]
[1]University of Tuzla, Bosnia and Herzegovina; [2]Cement Factory Lukavac, BIH; [3]University of Limerick, Ireland; jakub.osmic@gmail.com

Modelling of the Wind Rotor of WECs for the Analysis of Wind Effects Influencing the Drivetrain
Katharina Günther, Benedikt Spichartz, Constantinos Sourkounis
Ruhr-University Bochum, Germany; guenther@enesys.rub.de

PI and State Space Speed Control for Drive Systems With Elastic Coupling and Very Small Inertia Ratio
Philip Krajinski, Florian Bendrat, Constantinos Sourkounis
Ruhr University Bochum, Germany; office@enesys.rub.de

Effectiveness of Wind Turbine Fast Frequency Response Control on Electrically Distanced Active Power Disturbance Mitigation
Josip Đaković, Perica Ilak, Tomislav Baškarad, Igor Kuzle
University of Zagreb, Croatia; josip.djakovic@fer.hr

Analysing Frequency Support from DFIG-based Wind Turbines - Impact of Parameters and Initial Conditions
Matej Krpan[1], Igor Kuzle[1], Yongqian Liu[2]
[1]Faculty of Electrical Engineering and Computing, Croatia; [2]North China Electric Power University, China; matej.krpan@fer.hr

SESSIONS

SES-05: Monday 05 - Power Electronics **Monday, 12/Nov/2018: 9:00am - 10:30am** *Location:* **Salon VI**

STATCOM Application for Voltage Profiling of a Distribution Grid with High Penetration of Distributed Energy Resources
Jibran Ali, Stefano Massucco, Federico Silvestro
University of Genova; jali@ncsu.edu

Performance Evaluation and Benchmarking of PLL Algorithms for Grid-Connected RES Applications
Zunaib Ali, Nicholas Christofides, Alexis Polycarpou
Frederick University, Cyprus; eng.pa@frederick.ac.cy

Comparison of Typical Power Electronics Converter Topologies for Renewable Energy Systems
Amir Trbalić, Denis Pelin, Damir Šljivac
University of Osijek, Croatia; amir.trbalic@gmail.com

Self-inductance Variations in Dynamic Inductive Charging of EVs
Ioannis Karakitsios, Nikos Hatziargyriou
National Technical University of Athens, Greece; jkarak@power.ece.ntua.gr

On a method for testing ICA based Blind Source Separation algorithm performance applicable in audio-based On-Load Tap Changer diagnostics
Adnan Secic[1], Nikica Hlupic[2], Igor Kuzle[3]
[1]DV Power Sweden / Faculty of Electrical Engineering and Computing, Zagreb, Croatia; [2]Department of Applied Computing, Faculty of Electrical Engineering and Computing, Zagreb, Croatia; [3]Power System Department, Faculty of Electrical Engineering and Computing, Zagreb, Croatia; adnan.secic@fer.hr

SESSIONS

SES-06: Monday 06 – Energy Storage **Monday, 12/Nov/2018: 3:00pm - 4:30pm** *Location:* **Bobara**

Strategies for Combined Operation of PV/Storage Systems Integrated to Electricity Markets
Thomas Carriere[1], Christophe Vernay[2], Sebastien Pitaval[2], François-Pascal Neirac[1], George Kariniotakis[1]
[1]Mines Paristech, PSL Research University, France; [2]SOLAÏS; thomas.carriere@mines-paristech.fr

Impact of the Operation of Storage Equipments in the Iberian Electricity Market Prices
Inês Amorim Gomes[1], João Tomé Saraiva[1,2]
[1]FEUP DEEC; [2]INESC TEC; jsaraiva@fe.up.pt

Characteristics of Residential Battery Storage System for Better Integration with Electric Distribution System
Karen Vanessa Montano Martinez, Sergio Ivan Alzate Drada, Agustin Irizarry Rivera, Fabio Andrade
University of Puerto Rico, Mayaguez, Puerto Rico (U.S.); karenvanessa.montano@upr.edu

Decentralized Uncertainty Mitigation through Multi-Energy Systems
António Coelho, Nilufar Neyestani, Filipe Soares, João Peças Lopes
INESC TEC, Portugal; amcoelho@inesctec.pt

A Detailed Li-ion Battery Operation Model for Day-ahead Economic Dispatch
Alvaro Gonzalez-Castellanos, David Pozo, Aldo Bischi
Skolkovo Institute of Science and Technology, Russian Federation; alvaro.gonzalez@skolkovotech.ru

A Review of Energy Storage Systems Applications
Marija Miletić[1], Zora Luburić[1], Ivan Pavić[1], Tomislav Capuder[1], Hrvoje Pandžić[1], Ivan Andročec[2], Anton Marušić[2]
[1]University of Zagreb, Faculty of Electrical Engineering and Computing, Croatia; [2]Croatian Power Utility (Hrvatska Elektroprivreda d.d.), Croatia;
zora.luburic@fer.hr

SESSIONS

SES-07: Monday 07 – Power Markets **Monday, 12/Nov/2018: 3:00pm - 4:30pm** *Location:* **Šipun**

A Primal-Dual Formulation for the Clearing of the European Day-Ahead Electricity Market
Dimitris Chatzigiannis, Pandelis Biskas, Ilias Marneris, Anastasios Bakirtzis, Alex Papalexopoulos
Aristotle University of Thessaloniki, Greece; alexp@eccointl.com

A System Dynamics / Merit Order Pricing model for liberalized power system planning
A.S. Ibanez-Lopez, B.Y. Moratilla-Soria
Comillas Pontifical Univeristy, Spain; sibanez@sloan.mit.edu

Impact of Cyber-Security Breach to Price Signals on Power Market: An Experimental Human Simulation
Gokturk Poyrazoglu[1], HyungSeon Oh[2]
[1]Ozyegin University, Turkey; [2]The State University of New York at Buffalo, USA; gokturk.poyrazoglu@ozyegin.edu.tr

Preventing Internal Congestion in an Integrated European Balancing Activation Optimization
Martin Håberg, Hanna Bood, Gerard Doorman
Norwegian University of Science and Technology, Norway; martin.haberg@ntnu.no

Balancing Services Business Use Case Development for TSO-DSO Interoperability Demonstration
Hugo Morais[1], Belén Goncer[1], Jérôme Cantenot[1], Eric Lambert[1], Gareth Taylor[2], Andrej Souvent[3], Nermin Suljanovic[3]
[1]EDF Lab Paris-Saclay Palaiseau, France; [2]Brunel Institute of Power Systems, Brunel University London, UK; [3]Elektroinstitut Milan Vidmar (EIMV), Ljubljana, Slovenia; Nermin.Suljanovic@eimv.si

Strategic Participation of Merchant Energy Storage in Joint Energy-Reserve and Balancing Markets
Arthur Schillemans[1], Gustavo De Vivero Serrano[2,3], Kenneth Bruninx[2,3,4]
[1]BCG, Belgium; [2]KU Leuven, Belgium; [3]EnergyVille, Belgium; [4]VITO, Belgium; kenneth.bruninx@kuleuven.be

SESSIONS

SES-08: Monday 08 – Transmission lines **Monday, 12/Nov/2018: 3:00pm - 4:30pm** *Location:* **Salon VII**

Short-term Ampacity Forecasting based on Linear Regression in a Distribution Line
Rafael Alberdi, Roberto Fernandez, Elvira Fernandez, Igor Albizu, Miren T. Bedialauneta, A. Javier Mazon, Agurtzane Etxegarai
University of the Basque Country UPV/EHU, Spain; igor.albizu@ehu.eus

Transmission Line Length Estimation based on Electrical Parameters
Til Kristian Vrana, Iver Bakken Sperstad
SINTEF Energi, Norway; vrana@sintef.no

Statistical Learning to Assess Overhead Line Lifespan
Vincent Laurent[1], Mathilde Mougeot[2], Christine Yang[3], Fikri Hafid[3], Jean-Michel Ghidaglia[4], Nicolas Vayatis[4]
[1]Eurobios, France; [2]LPSM, Université Paris Diderot; [3]RTE, DIrection R&D-I; [4]CMLA, ENS Paris-Saclay; vlaurent@eurobios.com

Thermal State Analysis on Bundled Overhead Line Conductors
Shahnurriman Abdul Rahman, Konstantinos Kopsidas
The University of Manchester, United Kingdom; shahnurriman.abdulrahman@manchester.ac.uk

Selection of Power Cable Accessories in The Transmission System With Presence of High Frequency Harmonics
Nebojsa Raicevic[1], Mario Vrazic[2]
[1]University of Nis, Faculty of Electronic Engineering, Serbia; [2]University of Zagreb, Faculty of Electrical Engineering and Computing, Croatia; nebojsa.raicevic@elfak.ni.ac.rs

Finite Element Modelling of Aeolian Vibrations on Stranded High-Voltage OHL Conductors
Mohammed Abdulaziz Al Aqil, Konstantinos Kopsidas
The University of Manchester, United Kingdom; mohammedabdulaziz.alaqil@manchester.ac.uk

SESSIONS

SES-09: Monday 09 – Reactive Power **Monday, 12/Nov/2018: 3:00pm - 4:30pm** *Location:* **Orlando**

Future Operational Concepts for Reactive Power Compensators in Transmission Grids
Markus Knittel[1], Janek Massmann[1], Armin Schnettler[1], Dmitrij Kamenschikow[2]
[1]RWTH Aachen University, Germany; [2]Amprion GmbH, Germany; knittel@ifht.rwth-aachen.de

Reactive Optimal Power Flow in the Temperature-Dependent Power Flow using Interior Point Method with Artificial Neural Network
Alessandra Freitas Picanco[1], Andressa Pereira Oliveira[2]
[1]Federal Institute of Bahia IFBA, Brazil; [2]Federal University Bahia's West UFOB, Brazil; afpicanco@gmail.com

Aggregated Active and Reactive Power and Energy Management of Distributed Energy Resources and Performance Evaluation
Mustafa Alparslan Zehir[1], Antonio Barbosa[2], Carlo Sandroni[3], Luigi Pellegrino[3], Riccardo Lazzari[3], Maurizio Verga[3], Mustafa Bagriyanik[1], Unal Kucuk[4], Filipe Joel Soares[2], Aydogan Ozdemir[1]
[1]Istanbul Technical University, Istanbul, Turkey; [2]INESC TEC, Porto, Portugal; [3]RSE S.p.A., Milan, Italy; [4]MAKEL Company, Istanbul, Turkey; ozdemiraydo@itu.edu.tr

Integration of Electricity Generation from RES Supported by Feed in Tariff in an Organized Electricity Market
Aleksandra Krkoleva Mateska, Petar Krstevski, Vesna Borozan, Rubin Taleski
University Ss. Cyril and Methodius in Skopje, Faculty of Electrical Engineering and IT, Macedonia, Former Yugoslav Republic of; krkoleva@feit.ukim.edu.mk

Preliminary analysis of an accidental deviation in the power system grid time
Niko Mandić[1], Minea Skok[2], Marko Rekić[1]
[1]Croatian Transmission System Operator Ltd, Croatia; [2]Energy Institute Hrvoje Požar; marko.rekic@hops.hr

SESSIONS

SES-10: Monday 10 – Integrated aspects ICT and energy systems **Monday, 12/Nov: 3:00pm-4:30pm** *Location:* **Salon VI**

Interdependencies between Smart Grids and Electricity Markets: European Status Quo
Styliani Sarri[1], Nikos D. Hatziargyriou[2]
[1]National Technical University of Athens (NTUA), Regulatory Authority for Energy (RAE); NTUA; ssarri@power.ece.ntua.gr

Efficient regulation – precondition for electricity market development
Eraldo Banovac[1], Darko Pavlović[2], Dalibor Pudić[1], Igor Kuzle[3]
[1]Croatian Energy Regulatory Agency; [2]Plinacro.; [3]Uni. of Zagreb, Faculty of Electrical Engineering and Computing; eraldo.banovac@zg.t-com.hr

Evaluating the Evolution of Distribution Networks under Different Regulatory Frameworks with Agent Based Modelling
Miguel Manuel de Villena[1], Raphael Fonteneau[1], Axel Gautier[2], Damien Ernst[1]
[1]Department of Electrical Engineering and Computer Science, Montefiore Institute, University of Liege; [2]LCII, Department of Economics, HEC Liege, University of Liege; mvillena@uliege.be

An Auction for Financial Storage Rights
Abu Alam, Joshua Taylor ; University of Toronto; a.alam@utoronto.ca

A hybrid agent-based secondary control for microgrids with increased fault-tolerance needs
Angelina D. Bintoudi[1,11], Lampros M. Zyglakis[1], Apostolos C. Tsolakis[1], Dimosthenis Ioannidis[1], Salem Al-Agtash[2], Jose L. Martinez-Ramos[3], Ahmet Onen[4], Brian Azzopardi[5], Lenos Hadjidemetriou[6], Nis Martensen[7], Mounir Khiat[8], Nicholas Borg[9], Nunziatina Fragale[10], Charis Demoulias[11], Dimitrios Tzovaras[1]
[1]Information Technologies Institute, Greece; [2]German Jordanian University; [3]Universidad de Sevilla, Spain; [4]Department of Electrical and Electronics Engineering, Abdullah Gul University, Turkey; [5]MCAST, Triq Kordin, Malta; [6]KIOS Research Center of Excellence, University of Cyprus, [7]Energynautics GmbH, Germany; [8]Département de génie électrique Laboratoire SCAMRE, Ecole Nationale Polytechnique d'ORAN; [9]Electronic Systems Design Ltd, Malta; [10]GeoSYS Ltd, Malta; [11]Department of Electrical & Computer Engineering, Aristotle University, Greece; zyglakis@iti.gr

Explorative ex-ante consumer cluster delineation for electrification planning using image processing tools
Fabian Heymann[1], Pablo Dueñas Martínez[2], Filipe Joel Soares[3], Vladimiro Miranda[4]
[1]MIT, INESC TEC and University of Porto; [2]Massachusetts Institute of Technology (MIT); [3]INESC TEC; [4]INESC TEC and University of Porto; fabian.heymann@fe.up.pt

SESSIONS

SES-11: Tuesday 01 – Microgrid Modelling **Tuesday, 13/Nov/2018: 9:00am - 10:30am** *Location:* **Bobara**

Optimal Allocation of Multiple Unified Power Flow Controllers Using Particle Swarm Optimization
Orestis Blanas, Panagiotis Karafotis, Pavlos Georgilakis
National Technical University of Athens (NTUA), Greece; panoskarafo@gmail.com

A Two-Stage Management Approach for a PV-battery Microgrid Cluster
Manuel Vaz Castro[1], Carlos Leal Moreira[1,2], Leonel Magalhães Carvalho[1]
[1]Institute for Systems and Computer Engineering, Technology and Science, Portugal; [2]Faculty of Engineering of University of Porto, Portugal; manuel.v.castro@inesctec.pt

Optimal Sizing and Economic Operation of Hybrid PV System for MBTS Using Meta-heuristic Techniques
Mahmoud Mohamed Sayed, Mohamed Shalaby, Sami Bakhoum, Haitham Mahmoud
Cairo University, Egypt; eng.haitham.2007@gmail.com

Large Signal Stability Analysis in Clustering of Microgrids Using A Hybrid Method
Kishan Veerashekar, Alexander Goepel, Matthias Luther
University Erlangen-Nuremberg, Germany; kishan.veerashekar@fau.de

Gridsol performance on the island of Crete
Revekka Gkogkou[1], Georgia Asimakopoulou[1], Aris Dimeas[1], Nikos D. Hatziargyriou[1], Maria Kourasi[2], Petros Markopoulos[2], José Miguel Estebaranz[3]
[1]National Technical University of Athens, Greece; [2]HEDNO Greece; [3]Cobra Energía; jose.estebaranz@grupocobra.com

Advanced Metering Applications in Microgrids: A Hardware-in-the-Loop (HIL) Electric Power Setup
Sergio Alzate Drada, Karen Vanessa Montano Martinez, Agustin Irizarry, Fabio Andrade
University of Puerto Rico, Mayaguez, Puerto Rico (U.S.); sergio.alzate@upr.edu

SESSIONS

SES-12: Tuesday 02 – Distributed resources **Tuesday, 13/Nov/2018: 9:00am - 10:30am** *Location:* **Šipun**

Preliminary viability assessment of an above-ground compressed air energy storage plant integrated in an existing wind farm
Manuel Chazarra[1], Juan I. Pérez-Díaz[1], Raquel Gómez-Vázquez[2], Seamus Garvey[3]
[1]Universidad Politécnica de Madrid, Spain; [2]Vías y Construcciones S.A., Spain; [3]University of Nottingham; manuel.chazarra@upm.es

Beijing Subsidiary Administrative Center Multi-Energy Systems: An Optimal Configuration Planning
Wujing Huang[1], Ning Zhang[1], Chongqing Kang[1], Tomislav Capuder[2], Ninoslav Holjevac[2], Igor Kuzle[2]
[1]Department of Electrical Engineering, Tsinghua University, Beijing, China; [2]Faculty of Electrical Engineering and Computing, University of Zagreb, Zagreb, Croatia; 163.com.hwj@163.com

Impact of Distributed Generation on Power Quality in Distribution Network
Zvonimir Klaić, Mario Primorac, Danijel Topić, Goran Knežević
Faculty of Electrical Engineering, Computer Science and Information Technology Osijek, Croatia; zvonimir.klaic@ferit.hr

Optimal Integration of Distributed Generators in the Iraq Power System
Saad Khalaf[1,2], Liana Cipcigan[1]
[1]Cardiff University, United Kingdom; [2]Al-Mustansiriya University, Iraq; khalafS@cardiff.ac.uk

The benefits of synergy between the heating and power system regarding RES volatility and balancing
Helena Čevapović[2], Ivan Rajšl[1], Nenad Švarc[2], Tomislav Robina[2]
[1]University of Zagreb Faculty of Electrical Engineering and Computing, Croatia; [2]HEP-Proizvodnja Ltd.; helena.cevapovic@hep.hr

Operation Chart Study of Multi-Inverter Photovoltaic Power Plant Connected to Medium Voltage Grid
Mihovil Ivas[2], Ante Marusic[1], Juraj George Havelka[1], Igor Kuzle[1]
[1]University of Zagreb, Faculty of Electrical Engineering and Computing, Croatia; [2]Lahmeyer International GmbH, Bad Vilbel, Germany; igor.kuzle@fer.hr

SESSIONS

SES-13: Tuesday 03 – Integrated Energy Systems **Tuesday, 13/Nov/2018: 9:00am - 10:30am** *Location:* **Salon VII**

Synergy of the electric power and gas transmission system regulation in the Republic of Croatia
Tomislav Robina[1], Nenad Švarc[1], Ivica Pavić[2], Helena Čevapović[1]
[1]HEP-Proizvodnja Ltd., Croatia; [2]University of Zagreb, Faculty of Electrical Engineering and Computing, Croatia; tomislav.robina@hep.hr

Natural Gas System Dispatch Accounting for Electricity Side Flexibility
Conor O Malley[1], Stefanos Delikaraoglou[1], Line Roald[2], Gabriela Hug[1]
[1]ETH Zurich, Switzerland; [2]University of Wisconsin, Madison, United States; omalleyc@eeh.ee.ethz.ch

Centralised Planning of National Integrated Energy System with Power-to-Gas and Gas Storages
Mathias Berger[1], David Radu[1], Raphael Fonteneau[1], Damien Ernst[1], Thierry Deschuyteneer[2], Ghislain Detienne[2]
[1]University of Liège, Belgium; [2]Fluxys SA, Belgium; mathias.berger@uliege.be

Overview of techno-economic issues of enhanced geothermal systems implementation and integration
Tena Bilić[1], Ivan Rajšl[1], Perica Ilak[1], Sara Raos[1], Siniša Šadek[1], Slavko Krajcar[1], Nenad Debrecin[1], Albert Genter[2], Eric Leoutre[3]
[1]University of Zagreb Faculty of Electrical Engineering and Computing, Croatia; [2]ES-Geothermie, Schiltigheim, France; [3]Vermilion REP SAS, Parentis-en-Born, France; tena.bilic@fer.hr

Economic and environmental assessment for enhanced geothermal systems integration into energy systems Decision-making support tool for optimal usage of geothermal energy
Perica Ilak[1], Sara Raos[1], Ivan Rajšl[1], Ghislain Trullenque[2], Tena Bilić[1], Siniša Šadek[1], Ante Marušić[1]
[1]University of Zagreb Faculty of Electrical Engineering and Computing, Croatia; [2]Département GEOS UniLaSalle; sara.raos@fer.hr

Optimized Asset Management in Distribution Systems Based on Predictive Risk Analysis
Tatjana Dokic, Mladen Kezunovic
Texas A&M University, College Station, United States of America; kezunov@ece.tamu.edu

SESSIONS

SES-14: Tuesday 04 – Flexibility **Tuesday, 13/Nov/2018: 9:00am - 10:30am** *Location:* **Orlando**

Day-Ahead Management of Smart Homes Considering Uncertainty and Grid Flexibilities
Carlos Adrian Correa-Florez, Andrea Michiorri, Alexis Gerossier, Georges Kariniotakis
MINES ParisTech, PSL-Research University, France; carlos-adrian.correa_florez@mines-paristech.fr

Distribution Network Planning Using Detailed Flexibility Models for DER
Bruna Daniela Costa Tavares, Filipe Soares
INESC TEC, Portugal; bruna.c.tavares@inesctec.pt

OPF Integrating Distribution Systems Flexibility for TSO Real-Time Active Power Balance Management
Florin Capitanescu
Luxembourg Institute of Science and Technology (LIST), Luxembourg; florin.capitanescu@list.lu

Bottom-up Approach to Compute DER Flexibility in the Transmission-Distribution Networks Boundary
Nuno Soares Fonseca[1], Nilufar Neyestani[1], Filipe Joel Soares[1], José Iria[1], Carlos Henggeler Antunes[2], Diogo Pinto[2], Humberto Jorge[2], Marta Lopes[2]
[1]INESC TEC, Portugal; [2]INESC Coimbra; nuno.s.fonseca@inesctec.pt

Predictive Voltage Control for LV Distribution Grids exploiting Flexibility from Domestic Customers
Micael Simões, Hélder Costa, André Madureira
INESC TEC, Portugal; andre.g.madureira@inesctec.pt

Flexibility Potential of Industrial Electricity Demand: Insights from the H2020 IndustRE project
Dimitrios Papadaskalopoulos, Roberto Moreira, Goran Strbac, Danny Pudjianto, Predrag Djapic, Fei Teng
Imperial College London, United Kingdom; d.papadaskalopoulos08@imperial.ac.uk

SESSIONS

SES-15: Tuesday 05 – Power Electronics **Tuesday, 13/Nov/2018: 9:00am - 10:30am** *Location:* **Salon VI**

Control of a Power Conditioning System with LCL filter for Seamless Transfers between Grid-Connected and Island Operation
Florian Bendrat, Constantinos Sourkounis
Institute for Power Systems Technology and Power Mechatronics, Ruhr University Bochum; office@enesys.rub.de

Aggregated dynamic modelling of converter-dominated active distribution networks for large voltage disturbances
Nuno Fulgêncio[1], Carlos Moreira[1,2], Leonel Carvalho[1], João Peças Lopes[1,2]
[1]INESC TEC, Portugal; [2]University of Porto, Faculty of Engineering; nuno.r.fulgencio@inescporto.pt

Variable Bandwidth Hysteresis Current Control of Voltage Source Converters with LCL Filter
Johnny Chhor, Constantinos Sourkounis
Ruhr-University Bochum, Germany; chhor@enesys.rub.de

Active Damping of LCL-Filter Resonance based on Capacitor-Current Feedback in Grid-Connected VSC
Vile Kipke, Johnny Chhor, Constantinos Sourkounis
Ruhr-University Bochum, Germany; chhor@enesys.rub.de

Grid Connected Converter Control Technique in Active Unbalanced Distribution Systems
Boris Dumnic[1], Bane Poapdic[1], Dragan Milicevic[1], Nikola Vukajlovic[1], Marko Delimar[2]
[1]University of Novi Sad, Faculty of Technical Sciences, Serbia; [2]University of Zagreb, Faculty of Electrical Engineering and Computing; dumnic@uns.ac.rs

Control developments in power electronics-based distributed generators for future grid services
Miguel Castilla, Luis Garcia de Vicuna, Jaume Miret, Antonio Camacho, Ramon Guzman
Technical University of Catalonia, Spain; miguel.castilla@upc.edu

SESSIONS

SES-16: Wednesday 01 – Power System Dynamics **Wednesday, 14/Nov/2018: 9:00am - 10:30am** *Location:* **Bobara**

Impedance-Based Modelling of Hybrid AC-DC Grids With Synchronous Generator for Interaction Study and Dynamic Improvement

Adedotun Jeremiah Agbemuko[1,2], Jose Luis Dominguez-Garcia[1], Oriol Gomis-Bellmunt[2]
[1]Institut de Recerca en Energia de Catalunya, Spain; [2]Universitat Politecnica de Catalunya; aagbemuko@irec.cat

Unbalance and Distortion Evaluation in Three-phase Systems Under Non-stationary Conditions

Panagiotis A. Karafotis, Pavlos S. Georgilakis
National Technical University of Athens, Greece; panoskarafo@gmail.com

Analysis of Power Oscillations and Their Treatment in Hydro Power Plant with Large Bulb Turbines

Miljenko Brezovec[1], Igor Kuzle[2]
[1]HEP-Proizvodnja d.o.o., Croatia; [2]Faculty of Electrical Engineering and Computing, Zagreb, Croatia; miljenko.brezovec@hep.hr

Prony Analysis and Robust RLS for electromechanical oscillations: an evaluation technique

Sjur Føyen, Mads-Emil Kvammen, Olav Bjarte Fosso
NTNU, Norway; foyen.sjur@ntnu.com

Distributed Co-Simulation for Collaborative Analysis of Power System Dynamic Behavior

Claudio David López, Milos Cvetkovic, Peter Palensky
Delft University of Technology, Netherlands, The; C.D.Lopez@tudelft.nl

SESSIONS

SES-17: Wednesday 02 – Concepts and ICT solutions **Wednesday, 14/Nov/2018: 9:00am - 10:30am** *Location:* **Šipun**

A unified model of peer to peer energy trade and electric vehicle charging using blockchains
Subhasis Thakur[1], Barry P. Hayes[2], John G. Breslin[1]
[1]National University of Ireland,Galway, Ireland; [2]University College Cork, Cork, Ireland; subhasis.thakur@insight-centre.org

Co-simulation of Electricity Distribution Networks and Blockchain Energy Trading Platforms
Barry Hayes[1,2], Subhasis Thakur[2,3], John Breslin[2,3]
[1]University College Cork, Ireland; [2]National University of Ireland Galway, Ireland; [3]Insight Centre for Data Analytics, Ireland; barry.hayes@ucc.ie

Decentralised electricty trading in the microgrid Implementation of blockchain based peer-to-peer concept for electricity trading
Perica Ilak[1], Ivan Rajšl[1], Zlatko Zmijarević[3], Lin Herenčić[2], Slavko Krajcar[1]
[1]University of Zagreb Faculty of Electrical Engineering and Computing, Croatia; [2]EKONERG - Energy and Environmental Protection Institute; [3]Department for High-Efficiency Cogeneration Croatian Energy Regulatory Agency Zagreb, Croatia; lin.herencic@ekonerg.hr

Synergies between Electric Vehicles and Distributed Renewable Generation? Census-based EV and PV adopter analysis using Mutual Information and GIS
Fabian Heymann[1], Mário Lopes[2], João M. Silva[1], Filipe Joel Soares[4], André Dias[3], Vladimiro Miranda[1]
[1]INESC TEC and University of Porto, Portugal; [2]CEiiA, Portugal; [3]CEiiA and University of Porto,; [4]INESC TEC, fabian.heymann@fe.up.pt

Design of Tools for PEV-integration Studies
Rafael Zárate-Miñano, Alberto Flores Burgos, Miguel Carrión
Universidad de Castilla - La Mancha, Spain; rafael.zarate@uclm.es

SCADA Maintenance and Refurbishment with Security Issue in Modern IT and OT Environment
Igor Ivanković[1], Ana Kekelj[1], Renata Rubeša[1], Igor Kuzle[2]
[1]Croatian Transmisison System Operator (HOPS), Croatia; [2]University of Zagreb; igor.kuzle@fer.hr

SESSIONS

SES-18: Wed 03 – ICT-driven intelligent solutions and Smart Metering **Wed, 14/Nov: 9:00-10:30am** *Location:* **Salon VII**

Conversion Error of Second Order Polynomial ZIP to Exponential Load Model Conversion
Madis Leinakse, Jako Kilter
Tallinn University of Technology, Estonia; madis.leinakse@ttu.ee

RTGo – maintenance management system with Augmented Reality SCADA integration
Miro Antonijevic, Stjepan Sucic, Zlatan Sicanica, Hrvoje Keko
Koncar KET, Croatia; miro.antonijevic@koncar-ket.hr

Testing IEC 60870-5-104 and C37.118 based Control Center Applications using a Real Time Simulation Platform
Shoaib Ansari[1], Eric Glende[2], Martin Wolter[2], Davood Babazadeh[1], Sebastian Lehnhoff[1]
[1]OFFIS e.V; [2]Otto von Guericke University Magdeburg (LENA); eric.glende@ovgu.de

Error Performance Analysis of Narrow-Band PLC Technology Enabling Smart Metering Systems
Dzemo Borovina[1], Matej Zajc[2], Aljo Mujcic[3], Andrea Tonello[4], Nermin Suljanovic[3,5]
[1]Elektroprivreda BiH, Sarajevo, BIH; [2]University of Ljubljana, Ljubljana, Slovenia; [3]University of Tuzla, Tuzla, Bosnia and Herzegovina; [4]Alpe Adria University Klagenfurt, Austria; [5]Milan Vidmar Electric Power Research Institute, Ljubljana, Slovenia; nermin.suljanovic@gmail.com

Building Automation Systems and Smart Meter Integrated Residential Customer Platform
Zafer Aydin[1], João Carlos Portela[1], Unal Kucuk[1], Mustafa Alparslan Zehir[2], Hakan Gul[2], Mustafa Bagriyanik[2], Filipe Joel Soares[3], Aydogan Ozdemir[2]
[1]MAKEL Elektrik Malz. San. Tic. Company, Istanbul, Turkey; [2]Istanbul Technical University, Istanbul, Turkey; [3]INESC TEC, Porto, Portugal; ozdemiraydo@itu.edu.tr

SIPS development method and busbar splitting scheme supported by PMU technology
Zoran Zbunjak[1], Igor Kuzle[2]
[1]HOPS, Croatia; [2]FER, Croatia; zoran.zbunjak@hops.hr

Comparison of Measured and Calculated Data for NPP Krško CILR Test
Stefica Vlahovic, Davor Grgic, Sinisa Sadek, Tomislav Fancev, Vesna Bencik
University of Zagreb, Croatia; stefica.vlahovic@fer.hr

SESSIONS

SES-19: Wednesday 04 – Power System Protection **Wednesday, 14/Nov/2018: 9:00am - 10:30am** *Location:* **Orlando**

Comparing a Simplified Decentralized with an Optimal Centralized Technique for After Fault Reconfiguration of Radial Distribution Grids

Athanasios Anastasiou, Iasonas Kouveliotis Lysikatos, Ioannis Karakitsios, Nikos Hatziargyriou
National Technical University of Athens, Greece; jkarak@power.ece.ntua.gr

Smart Transformers Control Strategies for Multi-Microgrids Islanding Operation

Mário Couto[1], João Peças Lopes[2], Carlos Moreira[2]
[1]FEUP-University of Porto, Faculty of Engineering; [2]FEUP & INSC TEC; up200503817@fe.up.pt

Advanced Techniques of System Restoration and Practical Applications

Dhruv Sharma[1], Chenxi Lin[2], Xiaochuan Luo[3], Di Wu[4], Krishnaiya Thulasiraman[5], John N. Jiang[1]
[1]School of Electrical and Computer Engineering, University of Oklahoma, Norman, OK, USA; [2]Eleon Energy Inc., Austin, TX, USA; [3]ISO New England, Holyoke, MA, USA; [4]North Dakota State University, ND, USA; [5]School of Computer Science, University of Oklahoma, Norman, OK, USA; dhruv.sharma@ou.edu

Vector Surge and ROCOF Protection Algorithms for Distributed Generator Islanding Detection

Zdravko Matisic[2], Martin Bolfek[2], Juraj George Havelka[1], Ante Marusic[1]
[1]Faculty of Electrical Engineering and Computing, Croatia; [2]Sector for grid supervision and protection, HEP ODS d.o.o.; zdravko.matisic@hep.hr

Real Time Operation of Synchrophasor Data Functions in Transmission System Control Room

Igor Ivanković[1], Renata Rubeša[1], Igor Kuzle[2], Marko Rekić[1]
[1]Croatian Transmission System Operator (HOPS), Croatia; [2]University of Zagreb; marko.rekic@hops.hr

SESSIONS

SES-20: Wednesday 05 – Data-driven modelling **Wednesday, 14/Nov/2018: 9:00am - 10:30am** *Location:* **Salon VI**

An address-matching algorithm for household-scale databases to enhance electricity demand characterization
Antoine Rogeau[1], Robin Girard[1], Georges Kariniotakis[1], Nicolas Kong[2]
[1]Centre for Processes, Renewable Energy and Energy Systems (PERSEE), Mines ParisTech, PSL University, France; [2]Enedis, France; antoine.rogeau@mines-paristech.fr

Multidimensional Smart Meter Data Analytics based on Sparse Representation Technique
Kedi Zheng, Yi Wang, Qixin Chen, Haiwang Zhong
Dept. Electrical Engineering, Tsinghua University, China, People's Republic of; zkd17@mails.tsinghua.edu.cn

Learning Uncertainty of Wind Speed Forecasting Using a Fuzzy Multiplexer of Gaussian Processes
Miltos Alamaniotis[1], Georgios Karagiannis[2]
[1]University of Texas at San Antonio, United States of America; [2]Durham University, United Kingdom; miltos.alamaniotis@utsa.edu

Evolutionary Load Morphing in Smart Power System Partitions Ensuring Privacy and Minimizing Cost
Miltos Alamaniotis, Nikolaos Gatsis
University of Texas at San Antonio, United States of America; miltos.alamaniotis@utsa.edu

Identification of Daily Patterns in Building Energy Consumption
Aulon Shabani, Ajakida Eski, Denis Panxhi, Orion Zavalani
Polytechnic University of Tirana, Albania; aulon.shabani@fie.upt.al

Extension of EMC equipment qualification test data with numerical calculations
Hrvoje Grganić[1], Davor Grgić[2]
[1]Krško Nuclear Power Plant, Slovenia; [2]Faculty of Electrical Engineering and Computing, University of Zagreb, Croatia; hrvoje.grganic@fer.hr

SESSIONS

SES-21: Thursday 01 – Power System Equipment **Thursday, 15/Nov/2018: 9:00am - 10:30am** *Location:* **Bobara**

Electric Circuit Foundation of Structural Analysis for Power Systems from a Network Perspective
Dhruv Sharma[1], Guomin Ji[1], Wanghao Fei[1], Di Wu[2], Paul Moses[1], John N. Jiang[1]
[1]University of Oklahoma, OK, USA; [2]North Dakota State University, ND, USA; dhruv.sharma@ou.edu

The Impact of Load's Phase Shift Changes on the Electric Arc Behavior in Switching Process
Marinko Stojkov[1], Tomislav Alinjak[2], Kruno Trupinić[2], Zvonimir Klaić[3], Danijel Topić[3], Tomislav Barić[3], Mario Šipoš[4], Hidajet Salkić[5]
[1]Mechanical engineering faculty Slavonski Brod; [2]HEP ODS d.o.o. Elektra Slavonski Brod, Croatia; [3]Faculty of Electrical Engineering, Computer Science and Information Technology; [4]Croatian Armed Forces; [5]PE Elektroprivreda BiH; mstojkov@sfsb.hr

Phase Shifters' Impact in Reduced Network Models
Nuno Marinho[1,2], Yannick Phulpin[1], Adrien Atayi[1], Martin Hennebel[2]
[1]EDF R&D, France; [2]GeePs | Group of electrical engineering - Paris; nuno.marinho@edf.fr

Defining connection requirements for autonomous power systems
Pedro Beires[1], Carlos Moreira[1,2], João Abel Peças Lopes[1,2], Agostinho Figueira[3]
[1]INESC TEC, Portugal; [2]Faculty of Engineering, University of Porto, Portugal; [3]EEM - Empresa de Electricidade da Madeira, Funchal, Portugal; ppbeires@inesctec.pt

Reliability criteria in power generation expansion planning
Goran Slipac[1], Mladen Zeljko[2]
[1]HEP, Croatia; [2]EIHP, Croatia; goran.slipac@hep.hr

SESSIONS

SES-22: Thursday 02 – Forecasting **Thursday, 15/Nov/2018: 9:00am - 10:30am** *Location:* **Šipun**

On PMU-based real-time estimation of voltage stability and margin
Panagiotis Mandoulidis, Costas Vournas
National technical university of Athens, Greece; pmandou@power.ece.ntua.gr

Strategic Analysis of Demand-Side Responses on Transmission and Distribution Lines in Turkey
Yusra Merve Mendi, Hatice Kaya Güven
Enerjisa Energy DSO Company, Turkey; merve.mendi@enerjisa.com

The Forecast of Electricity Consumption Using SARMA model: Bosnia and Herzegovina Case Study
Ajla Mehinovic[1], Dzemo Borovina[1], Matej Zajc[2], Miloš Pantoš[2], Nermin Suljanović[3,4]
[1]JP Elektroprivreda BiH d.d. - Sarajevo, Bosnia and Herzegovina; [2]University of Ljubljana; [3]Elektroinštitut Milan Vidmar; [4]University of Tuzla; ajla.mehinovic@epbih.ba

Short-term photo voltaic power forecasting using cloud tracking methods
Alen Jakoplic[1], Dubravko Frankovic[1], Vedran Kirincic[1], Juraj George Havelka[2]
[1]University of Rijeka, Faculty of Engineering, Department of Electric Power Systems; [2]University of Zagreb, Faculty of Electrical Engineering and Computing, Department of Energy and Power Systems; dubravko.frankovic@riteh.hr

An Experimental Forensic Test bed: Attack-based Digital Forensic Analysis of WAMPAC Applications
Asif Iqbal, Farhan Mahmood, Mathias Ekstedt
KTH, Sweden; asif.iqbal@ee.kth.se

Analysis of Possibilities of Alleviating Repercussions Caused by Large Disturbances in the EES
Robert Noskov[1], Ivica Petrović[1], Tomislav Barić[2], Hrvoje Glavaš[2], Damir Šljivac[2]
[1]HOPS, Croatia; [2]Faculty of Electrical Engineering, Computer Science and Information Technology Osijek; robert.noskov@hops.hr

SESSIONS

SES-23: Thursday 03 – Data Driven Modelling II **Thursday, 15/Nov/2018: 9:00am - 10:30am** *Location:* **Salon VII**

Model Reduction of Coherent Clusters in Power Systems
Johnny Leung[1], Michel Kinnaert[1], Jean-Claude Maun[1], Fortunato Villella[2]
[1]Université libre de Bruxelles, Belgium; [2]Elia Grid International, Belgium; johnny.leung@ulb.ac.be

Utilizing flexibility in Microgrids using Model Predictive Control
Frederik Banis, Niels Kjolstad-Poulsen, Henrik Madsen, Daniela Guericke
Technical University of Denmark, Denmark; freba@dtu.dk

Adaptive Clustering Method for Low-Voltage Electricity Customer Profiling
Susanna Mocci, Giuditta Pisano, Fabrizio Pilo, Matteo Troncia
University of Cagliari, Italy; matteo.troncia@diee.unica.it

Methodology for preparing basis in modeling long-term energy consumption in households
Vlatka Kos Grabar Robina, Alenka Kinderman Lončarević
Energy Institute Hrvoje Požar, Croatia; vrobina@eihp.hr

Analysis of energy consumption of buildings in Greece
Savvas Karras, Rebekka Gogou, Aris Dimeas, Nikos Hatziargyriou
National Technical University of Athens (NTUA), Greece; svkarras@power.ece.ntua.gr

Novel 2-D bifacial solar cell using large built-in internal electric fields: a p-i-n Structure simulation
Gady Golan
Ariel University and HIT; gadygolan@gmail.com

SESSIONS

SES-24: Thursday 04 – Operational aspects of power system **Thursday, 15/Nov: 9:00am - 10:30am** *Location:* **Orlando**

Incipient Equipment Failure Assessment and Avoidance through Robust Detection Technique
Rishabh Bhandia, Milos Cvetkovic, Jose de Jesus Chavez, Peter Palensky
Delft University of Technology, Netherlands, The; J.J.ChavezMuro@tudelft.nl

Improving the performance of HVDC system using Fuzzy-PI controller tuned by Linearized Biogeography-Based Optimization Algorithm
Mahmoud Mohamed Sayed, Tarek Abdelbadee Boghdady; Cairo University, Egypt; engtarek82@yahoo.com

Small-Signal Stability Anaylsis of Multi-Infeed VSC HVDC System under Different Reactive Power Control Strategies
Goran Grdenić[1], Marko Delimar[1], Jef Beerten[2,3]
[1]University of Zagreb Faculty of Electrical Engineering and Computing, Croatia; [2]KU Leuven Department of Electrical Engineering, Belgium; [3]Energyville, Genk, Belgium; goran.grdenic@fer.hr

Monthly scheduling with in the ecotourism microgrid considering the multi-energy losses
Ilija Batas Bijelić[1], Koraljka Kovačević-Markov[1,2], Nikola Rajaković[1]
[1]University of Belgrade, School of Electrical Engineering; [2]Mixed Holding "Power Utility of the Republic of Srpska", Bosnia and Herzegovina; batas@etf.rs

The Impact of Wind Generator on Albanian Power System Transient Stability
Rajmonda Bualoti, Marialis Celo, Marjela Qemali
Polytechnic University of Tirana, Albania; bualoti@icc-al.org

Outage Management – Unplanned Long Interruptions
Dubravko Balaško; HEP ODS, Croatia; dubravko.balasko@hep.hr

Chance-Constrained AC Optimal Power Flow Integrating HVDC Lines and Controllability
Andreas Venzke[1], Lejla Halilbasic[1], Adelie Barre[1], Line Roald[2], Spyros Chatzivasileiadis[1]
[1]Center for Electric Power and Energy, Technical University of Denmark, Kgs. Lyngby, Denmark; [2]Department of Electrical and Computer Engineering, University of Wiscosin-Madison, Madison, USA; spchatz@elektro.dtu.dk

SESSIONS

SES-25: Thursday 05 – Power System Modelling and Analyses **Thursday, 15/Nov: 9:00am - 10:30am** *Location:* **Salon VI**

Modeling Electric Vehicle Consumption Profiles for Short-Term Forecasting and Long-Term Simulation
Alexis GEROSSIER, Robin GIRARD, George KARINIOTAKIS
MINES ParisTech, PSL University; alexis.gerossier@mines-paristech.fr

On the Emerging Role of Spatial Load Forecasting in Transmission/Distribution Grid Planning
Fabian Heymann[1], Joel David Melo Trujillo[2], Pablo Duenas Martínez[4], Filipe Joel Soares[3], Vladimiro Miranda[1]
[1]INESC TEC and University of Porto, Portugal; [2]Federal University of ABC, Brazil; [3]INESC TEC, Portugal; [4]MIT, USA;fabian.heymann@fe.up.pt

Operation of a Wind-PV-Battery Hybrid Power Station in an Isolated Island Grid
Georgios Psarros, Stavros Papathanassiou
National Technical University of Athens, Greece; gpsarros@mail.ntua.gr

A Case Study of Residential Electric Service Resiliency thru Renewable Energy Following Hurricane María
Agustin Irizarry Rivera, Karen Vanessa Montano Martinez, Sergio Ivan Alzate Drada, Fabio Andrade
University of Puerto Rico, Mayaguez, Puerto Rico (U.S.); agustin@ece.uprm.edu

Use of load flow analysis for planning the measures in sustainable energy action plans for the smart island energy systems development
Antun Pfeifer[1], Evangelos Rikos[2], Christoforos Perakis[2], Goran Krajacic[1]
[1]University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture, Croatia; [2]Department of PVs and Distributed Generation, Centre for Renewable Energy Sources and Saving; antun.pfeifer@fsb.hr

Proposed change of communication architecture with TCP/IP client-server architecture to protocols adapted for the Internet of Things communication through the LabVIEW environment
Anthea Štor[1], Franjo Tonković[2]
[1]University of Zagreb, Faculty of electrical engineering and computing, Croatia; [2]Veski Ltd; anthea.stor@fer.hr

SPECIAL SESSIONS

26. **CROSSBOW -** Cross border management of variable renewable energies and storage units enabling a transnational wholesale market

Monday, 12/Nov/2018 1:00pm - 2:30pm *Location:* **Bobara**

27. **BLOCKCHAINS** in the Energy Sector

Monday, 12/Nov/2018 1:00pm - 2:30pm *Location:* **Orlando**

28. **FLEXCoop:** Democratizing the energy market through introduction of innovative demand response tools and novel business models

Tuesday, 13/Nov/2018 1:00pm - 2:30pm *Location:* **Bobara**

29. **SIREN –** Smart Integration of RENewables

Tuesday, 13/Nov/2018 1:00pm - 2:30pm *Location:* **Orlando**

30. **InteGRIDy –** Integrated Smart GRID Cross-Functional Solutions for Optimized Synergetic Energy Distribution, Utilization Storage Technologies

Tuesday, 13/Nov/2018 3:00pm - 4:30pm *Location:* **Bobara**

SPECIAL SESSIONS

31. **FENISG –** Flexible Energy Nodes in Low Carbon Smart Grid**;**
WINDLIPS – WIND energy integration in Low Inertia Power System

Tuesday, 13/Nov/2018 3:00pm - 4:30pm *Location:* **Orlando**

32. STORY – The added value of storage in distribution systems

Thursday, 15/Nov/2018 1:00pm - 2:30pm *Location:* **Bobara**

33. DER – Distributed Energy Sources Control and the Use of Flexibility in Future System

Thursday, 15/Nov/2018 1:00pm - 2:30pm *Location:* **Orlando**

34. THE GLOBAL GRID

Thursday, 15/Nov/2018 3:00pm - 4:30pm *Location:* **Bobara**

35. Round Table Session - The Future of Energy in Croatia

Wednsday, 14/Nov/2018 2:00pm - 4:00pm *Location:* **Bobara**

POSTER SESSION

PS-01: Poster Session **Thursday, 15/Nov/2018: 3:00pm - 4:30pm** *Location:* **Upper floor**

1)

Electro-mobility in Croatia

Vanja Varda[1], Igor Kuzle[2]
[1]HEP d.d., Croatia; [2]University of Zagreb FER, Croatia; vanja.varda@hep.hr

2)

Disturbance Accommodation Control of Wind Turbines Based on Sliding Mode Approach

azita sharifi faskhodi, Ahmad Fakharian
Qazvin Branch, Islamic Azad University; azita_sharifi@ymail.com

3)

Croatian Power Market Design and Market Landscape

Ivica Toljan, Marko Kelava
CROATIAN POWER EXCHANGE Ltd., Croatia; ivica.toljan@cropex.hr

4)

A Review of the Power Distribution System in the Telecommunications Sector

Swagat Gogoi
University of Petroleum and Energy Studies, India; swagat.gogoi1@gmail.com

5)

Improving the Controller Performance for a Grid Connected Wind Farm

Mahmoud Mohamed Sayed, Tarek Abdelbadee Boghdady, Omar Zahran
Cairo University, Egypt; fecu.msayed@gmail.com

6)

Model for defining the potential and value of flexibility services of multi-energy microgrids to low carbon power system operation

Ninoslav Holjevac, Tomislav Capuder, Igor Kuzle
University of Zagreb Faculty of Electrical Engineering and Computing, Croatia; ninoslav.holjevac@fer.hr

POSTER SESSION

PS-01: Poster Session **Thursday, 15/Nov/2018: 3:00pm - 4:30pm** *Location:* **Upper floor**

7)

Integration of Electricity Generation from RES Supported by Feed in Tariff in an Organized Electricity Market

Aleksandra Krkoleva Mateska, Petar Krstevski, Vesna Borozan, Rubin Taleski
University Ss. Cyril and Methodius in Skopje, Faculty of Electrical Engineering and IT, Macedonia, Former Yugoslav Republic of; krkoleva@feit.ukim.edu.mk

8)

A System Dynamics / Merit Order Pricing model for liberalized power system planning

A.S. Ibanez-Lopez, B.Y. Moratilla-Soria
Comillas Pontifical Univeristy, Spain; sibanez@sloan.mit.edu

9)

A Comparative Analysis of Short Circuit Calculation Methods and Guidelines as Applied in The Kosovo Power System - Aspects and Specifics

Gazmend Xhevdet PULA[1], Kadri KADRIU[2], Gazmend KABASHI[3], Bajram NESHATI[4]
[1]University of Prishtina, Electrical Engineering Faculty, Power Department, Kosovo; [2]KOSTT, Kosovo Transmission and Market Operator, Prishtina, Kosovo; [3]KOSTT, Kosovo Transmission and Market Operator, 10 000 Prishtina, Kosovo; [4]KEDS, Kosovo Electricity Supply Company, 10 000 Prishtina, Kosovo; gazmend.pula@gmail.com

SPECIAL ISSUE JOURNALS

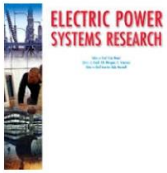
MEDPOWER2018 Special issue journals

MEDPOWER2018 conference provides an opportunity for all participants to publish a paper in a special issue with one or more of the partner journals. Only submissions that were presented at the Conference by one of the authors may be invited to a special issue.

The conference organizing committee will issue invitation letters to the best papers presented at the conference.

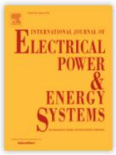
Manuscripts have to be submitted to the special issue of the journal according to instructions provided in the invitation letter (publishing guidelines, new material and extensions compared to conference paper etc.). Each manuscript will then be reviewed according to the journal policy.

ENERGIES



ELECTRIC POWER SYSTEM RESEARCH (EPSR)

IET RENEWABLE POWER GENERATION (IET RPG)



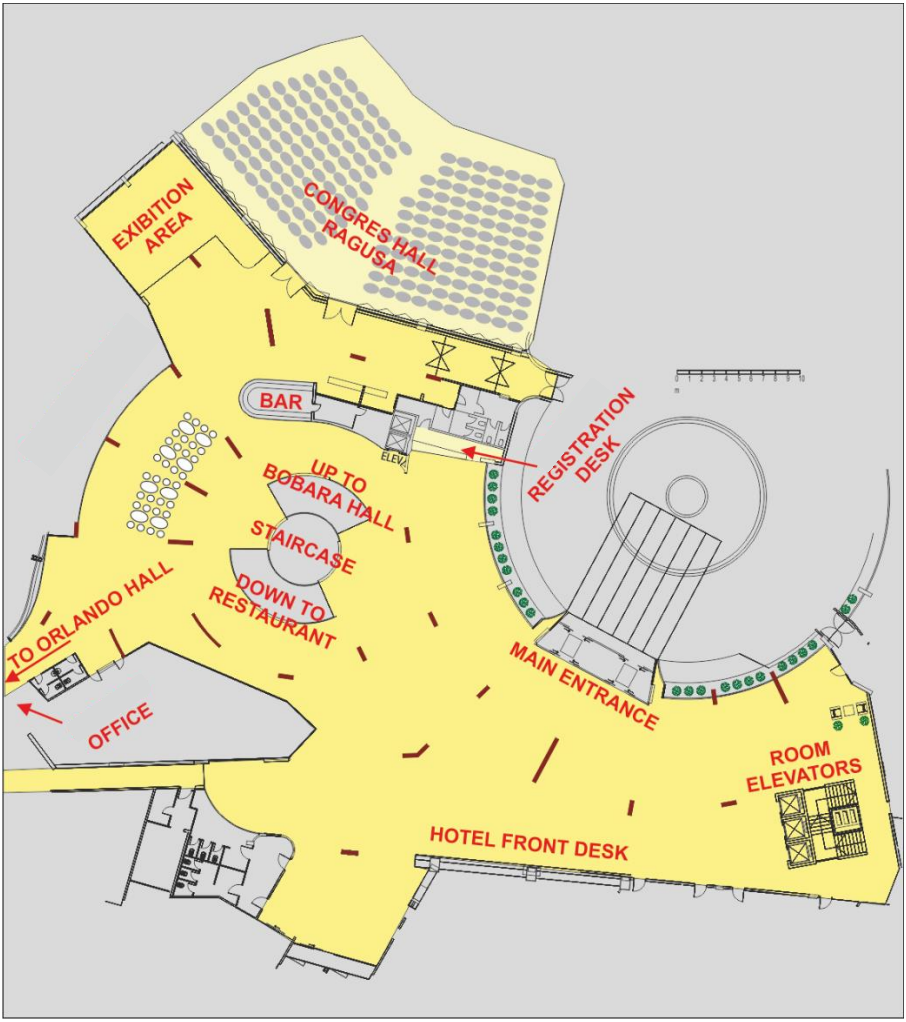
INTERNATIONAL JOURNAL OF ELECTRICAL POWER & ENERGY SYSTEMS (IJEPES)

VENUE INFORMATION

Hotel Croatia General Map

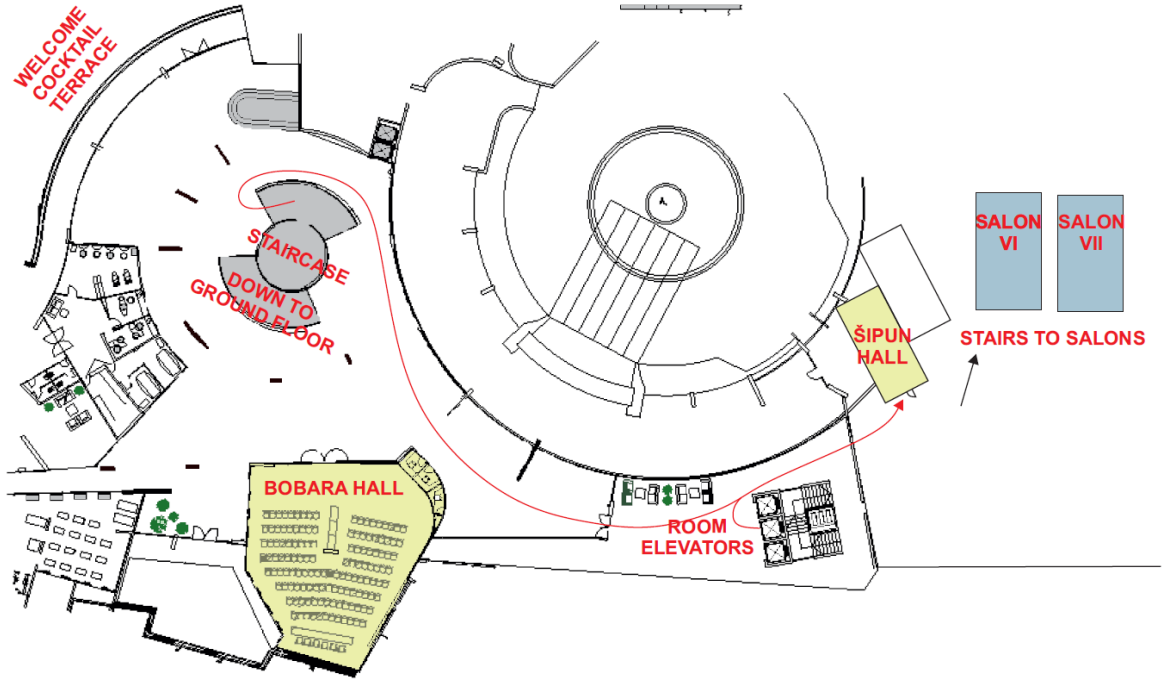
VENUE INFORMATION

Hotel Croatia – Ground floor



VENUE INFORMATION

Hotel Croatia – Upper floor I



GENERAL INFORMATION

Registration Desk Hours

Sunday, November 11th	16:00 – 23:00
Monday, November 12th	08:00 – 18:00
Tuesday, November 13th	08:00 – 18:00
Wednesday, November 14th	08:00 – 14:00
Thursday, November 15th	08:00 – 15:00

Name Badge

The admission to all conference sessions is by name badge only. Please be sure to wear your badge at all times.

Responsibility

The Organizing Committee assumes no responsibility for accident, losses, damage, delays, or any modifications to the program arising from unforeseen circumstances. It accepts no responsibility for travel or accommodation arrangements.

The participant acknowledges that he or she has no right to lodge damage claims against the Organizing Committee should the conference proceedings be hindered or prevented by unexpected political or economic events or generally by acts of God or should the non-appearance of speakers or other reasons necessitate program changes.

Internet Access

Wireless internet access is available in the hotel by choosing the 'hotelcroatia' network from your wireless options.

Conference venue & Accommodation

MEDPOWER 2018 conference will be held at the Croatia Hotel, Frankopanska 10, 20 210, Cavtat, Croatia.

T: +385 (0) 20 300 332

F: +385 (0) 20 300 329

If you arrive by plane, the Dubrovnik Airport is in Čilipi, only 5 km from the conference venue (Cavtat, Hotel Croatia). Situated on a peninsula that juts into the sea at the country's southernmost point, the Croatia Hotel, in Cavtat, combines a stunning location in Cavtat and extensive facilities with easy access to the treasures of the Adriatic coast.

GENERAL INFORMATION

Transfer services

If you wish to schedule a transfer service to the airport or downtown Dubrovnik please let us know at the registration desk or email at:

Mail: medpower2018@concorda.com

Currency

The official currency in Croatia is the kuna (1 kuna = 100 lipa). Foreign currency can be exchanged in banks, exchange offices, post offices and in the majority of tourist information offices, hotels and campsites.

Credit cards (Eurocard / Mastercard, Visa, American Express and Diners) are accepted in almost all hotels, marinas, restaurants, shops and cash machines.

Climate

The areas along the Adriatic coast have a pleasantly mild Mediterranean climate with a large number of sunny days, summers are hot and dry and winters are mild and wet. The daily average temperatures in the Dubrovnik area in November are about 14°C, highs reaching up to above 20°C. You are very likely to experience dry and warm weather during your stay. The average sea temperature in June is around 19-20°C.

Emergency Telephone Numbers

Emergency – Police, Ambulance, and Fire: 112

This number can be reached any time, day or night, regardless of where you are in the Republic of Croatia.

Calls to this number are free of charge.

Calls can be made through all operators and all telephone devices by dialing 112.

Lost and found

All materials lost or found in the auditoriums are brought to the Registration Desk located in the main lobby of the hotel.

Parking

Hotel provides parking for all its guests.

GENERAL INFORMATION

Working hours of shops

All the year round, the majority of the shops are open from Monday to Saturday from 8.00 am to 8.00 pm. In summer, the majority of the shops are open till 9.00 pm, while the shops in the Old City, particularly souvenir shops, are open till the late-night hours.

The majority of the shops are closed on Sundays and on holidays, with the exception of souvenir shops and some other shops in the Old City, which are open on Sundays and on holidays in summer.

The Gruž open-air market is open in the morning, while the flower stands remain open till the afternoon. The open-air market in the Old City is closed at noon.

For all touristic information please visit: http://visit.cavtat-konavle.com/en

Presentation Guidelines

All MEDPOWER 2018 accepted papers must be presented and discussed in person at the conference. Therefore, final acceptance of the paper and its inclusion into the conference proceedings is subject to confirmation of registration of at least one of the Authors and presentation of the paper by them at the conference.

The conference program and the presentation schedule will be available from October 15th, 2018.

IMPORTANT INFORMATION FOR PRESENTERS:

- Each paper has a slot of approximately 15 minutes including presentation and discussion. Therefore, presentations should be planned to last no more than 12-13 minutes so that there is time for a short discussion.
- **Presenters are kindly requested to be in the room for which their presentation has been scheduled at least 15 minutes before the start of the session to transfer their respective presentation to the Conference laptops.**
- There is no set PPT or PPTX template that presenters need to use.
- The provided template on conference website can be used if authors wish that

GENERAL INFORMATION

Welcome Reception

Monday, November 12, 19:00 – 22:00

Hotel Croatia – hotel upper floor and terrace

Reception with snacks and drinks

The MEDPOWER 2018 Welcome Reception will be held at the Restaurant at the Croatia Hotel. The Croatia Hotel is in an exceptionally beautiful and secluded location on a peninsula overlooking the Adriatic on one side and the picturesque historic quarter of Cavtat on the other.

This will be a perfect setting for delegates, students and companions to enjoy a social evening of food, drinks, and conversation.

The world-famous medieval walled city of Dubrovnik can be seen from some hotel terraces.

Gala Dinner

Tuesday, November 13, 19:00 – 22:00

Hotel Croatia – Restaurant Cavtat

The gala dinner at the restaurant Cavtat (Hotel Croatia) is the conference formal dinner.

GENERAL INFORMATION

Excursion

Allocated time: Wednesday, November 14, 13:00 – 20:00

Various tourist excursions will be offered at the Conference site.

Organized transfer to the Dubrovnik by bus where we meet with local guide in the Old town.

Walking City tour with guide that finishes with a walk on the city walls, where you will have a chance to get an overview of this fascinating quarter of the town and to savor the parts of the city you have explored from a different perspective.

Price per person: 60,00 EUR

Price includes:

- Bus transfer from Hotel Croatia, Cavtat to Dubrovnik
- Return transfer from Dubrovnik to the Hotel Croatia, Cavtat
- One licensed tour guide per group (25 persons)
- Entrance to the City Walls

Author Index

Correa-Florez, Carlos Adrian
Costa tavares, Bruna Daniela
Costa, Hélder
Couto, Mário
Cvekovic, Milos
Cvetkovic, Milos
Čevapović, Helena
Čukman, Marko

D

De Vivero Serrano, Gustavo
Debrecin, Nenad
Delikaraoglou, Stefanos
Delimar, Marko
Demetriou, Panayiotis
Demoulias, Charis
Deschuyteneer, Thierry
Detienne, Ghislain
Dias, André
Dimeas, Aris
Djapic, Predrag
Dokic, Tatjana
Dominguez-Garcia, Jose Luis
Donnot, Benjamin
Doorman, Gerard
Du, Pengwei
Duenas Martínez, Pablo
Dueñas Martínez, Pablo
Dumnic, Boris

E

Ebrahimisalari, Mahdi
Ekstedt, Mathias
Ernst, Damien
Eski, Ajakida
Estebaranz, José Miguel
Etxegarai, Agurtzane

F

Fakharian, Ahmad
Fancev, Tomislav
Fazlali, Majid
Fei, Wanghao
Fernandez, Elvira
Fernandez, Roberto
Figueira, Agostinho
Filipović-Grčić, Dalibor
Flores Burgos, Alberto
Fonseca, Nuno Soares
Fonteneau, Raphael
Fosso, Olav Bjarte
Fragale, Nunziatina
Frankovic, Dubravko
Fulgêncio, Nuno
Føyen, Sjur

G

Garcia de Vicuna, Luis
García-Ruiz, Moisés
Garvey, Seamus
Gatsis, Nikolaos
Gautam, Aman
Gautier, Axel
Genter, Albert
Georgilakis, Pavlos S.
Gerossier, Alexis
Ghidaglia, Jean-Michel
Girard, Robin
Gkogkou, Revekka
Glavaš, Hrvoje
Glende, Eric
Goepel, Alexander
Gogoi, Swagat
Gogou, Rebekka
Golan, Gady

Gomes, Inês Amorim
Gomis-Bellmunt, Oriol
Goncer, Belén
Gonzalez-Castellanos, Alvaro
Grdenić, Goran
Grganić, Hrvoje
Grgić, Davor
Guericke, Daniela
Gul, Hakan
Guzman, Ramon
Gómez-Vázquez, Raquel
Günther, Katharina

H

Hadjidemetriou, Lenos
Hafid, Fikri
Halilbasic, Lejla
Hamilton, Robert Ian
Han, Byung-Moon
Hatziargyriou, Nikos D.
Havelka, Juraj George

I

J

K

L

M

Mandoulidis, Panagiotis
Manuel de Villena, Miguel
Marano-Marcolini, Alejandro
Marinho, Nuno
Markopoulos, Petros
Marneris, Ilias
Marot, Antoine
Martensen, Nis
Martinez-Ramos, Jose L.
Martínez-Ramos, José Luis
Marusic, Ante
Marušić, Anton
Massmann, Janek
Massucco, Stefano
Matisic, Zdravko
Maun, Jean-Claude
Mazon, A. Javier
Mehinovic, Ajla
Melo Trujillo, Joel David
Mendi, Yusra Merve
Michiorri, Andrea
Milanović, Jovica
Miletić, Marija
Milicevic, Dragan
Miranda, Vladimiro
Miret, Jaume
Mitani, Yasunori
Mocci, Susanna
Montano Martinez, Karen Vanessa
Morais, Hugo
Moratilla-Soria, B.Y.
Moreira, Carlos Leal
Moreira, Roberto
Moses, Paul
Mougeot, Mathilde
Mujcic, Aljo

N

Nallarasan, N.
Narasimhan, S.R.
Neirac, François-Pascal
Neyestani, Nilufar
Neshati, Bajram
Nofuentes, Álvaro
Noskov, Robert

O

O Malley, Conor
Oh, HyungSeon
Oliveira, Andressa Pereira
Omerdic, Emir
Onen, Ahmet
Osmic, Jakub
Ozdemir, Aydogan

P

Palensky, Peter
Panayiotou, Christos
Panciatici, Patrick
Pandžić, Hrvoje
Pantoš, Miloš
Panxhi, Denis
Papadaskalopoulos, Dimitrios
Papadopoulos, Panagiotis
Papalexopoulos, Alex
Papathanassiou, Stavros
Papić, Dijana
Pavić, Ivan
Pavić, Ivica
Pavlović, Darko
Peharda, Domagoj
Pelin, Denis
Pellegrino, Luigi
Perakis, Christoforos
Pérez-Díaz, Juan I
Petrelli, Marina
Petrović, Ivica
Peças Lopes, João Abel
Pfeifer, Antun
Phulpin, Yannick
Phunpeng, Veena
Picanco, Alessandra Freitas
Pilo, Fabrizio
Pinson, Pierre
Pinto, Diogo
Pisano, Giuditta
Pitaval, Sebastien
Poapdic, Bane
Polycarpou, Alexis
Portela, João Carlos
Poyrazoglu, Gokturk
Pozo, David
Pravica, Luka
Primorac, Mario
Psarros, Georgios
Pudić, Dalibor
Pudjianto, Danny
Pula, Gazmend Xhevdet

Q

Qemali, Marjela

R

Radu, David
Raicevic, Nebojsa
Rajaković, Nikola
Rajan, Muthu Kumar
Rajšl, Ivan
Raos, Sara
Rehman, Sami
Rekić, Marko
Rikos, Evangelos
Roald, Line
Roald, Line
Robina, Tomislav
Rogeau, Antoine
Rubeša, Renata

S

Sabapathy, Aswin Kumar
Saifur Rahman, Fathin
Salkić, Hidajet
Sandroni, Carlo
Santos, Rafael Bastos
Saraiva, João Tomé
Sarri, Styliani
Sayed, Mahmoud Mohamed
Schillemans, Arthur
Schnettler, Armin
Secic, Adnan
Serrano, Manuel
Shabani, Aulon
Shahid, Ahsan
Shalaby, Mohamed
sharifi faskhodi, azita
Sharma, Dhruv
Shukla, Rahul
Sicanica, Zlatan
Silva, João M.
Silvestro, Federico
Simões, Micael
Skok, Minea
Slipac, Goran
Soares, Filipe Joel
Sourkounis, Constantinos
Souvent, Andrej
Sperstad, Iver Bakken
Spichartz, Benedikt
Stojkov, Marinko
Strbac, Goran
Sucic, Stjepan
Suljanovic, Nermin
Suljanovic, Nermin
Suljanović, Nermin
Sumina, Damir
Šadek, Siniša
Šipoš, Mario
Šljivac, Damir
Štor, Anthea
Švarc, Nenad

T

Taleski, Rubin
Taylor, Gareth
Taylor, Joshua
Tazi, Sami
Teng, Fei
Thakur, Subhasis
Thulasiraman, Krishnaiya
Till, Jeremy
Toal, Daniel
Toljan, Ivica
Tonello, Andrea
Tonković, Franjo
Topić, Danijel
Trbalić, Amir
Troncia, Matteo
Trullenque, Ghislain
Trupinić, Kruno
Tsolakis, Apostolos C.
Tusun, Stjepan
Tzovaras, Dimitrios

U

V

Varda, Vanja
Vayatis, Nicolas
Veerashekar, Kishan
Venzke, Andreas
Verga, Maurizio
Vernay, Christophe
Viafora, Nicola
Villella, Fortunato
Vlahović, Štefica
Vournas, Costas
Vrana, Til Kristian
Vrazic, Mario
Vukajlovic, Nikola

W

X

Y

Z

NOTES

NOTES

NOTES

NOTES

12-15 Nov, Dubrovnik, Croatia

MEDPOWER2018

Mediterranean Conference on Power Generation, Transmission, Distribution and Energy Conversion

Analysis of possibilities of alleviating repercussions caused by large disturbances in the power system

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Abstract - Various EU regulations have established rules for accessing the electricity exchange grid in order to ensure proper functioning of the electricity market while maintaining a proper level of system security. System security depends on the technical capabilities of its components to withstand disturbances and to help prevent serious interruptions or to re-establish system operation after a breakdown occurs.

At the center of the analysis are the transformer voltage regulation, the possibility of overloading the network element, the effects of blocking the regulator and the usefulness of the above on the safety of the power system.

This paper generally gives a theoretical and practical overview of measures for the automatized protection against voltage disruption and reduction of the active or reactive load of lines or transformers in the subsystem PrP Osijek. For this purpose, the possibility of using different protection and automation devices will be analyzed to preserve the basic contour of the transmission grid in order to quickly establish consumer power supply and normal system operation.

In addition to automatic protection, measures of excluding certain elements of the grid will be shown, as well as functions for blocking/activating the regulation of grid elements in order to reduce active and reactive loads of lines or transformers.

The analysis gives the effect of some measurements on a real transmission grid model. The model had to be adjusted with the grid state and load requirements that anticipated various unfavorable scenarios, which could cause the power system to break down.

Keywords— EES; automated protection; disturbances

I. INTRODUCTION

Various norms and regulations have set the power system operating rules, which include requirements for ensuring system security in operation and real-time prediction of disturbances. It is therefore important to foresee a number of procedures and measures that need to be implemented in a state of emergency.

Primary management of drive safety and safe and efficient operation of the entire power system is vital for the system operation. Therefore, the transmission system operator is responsible for maintaining drive safety in its area, and for safe and efficient operation of the entire power system. It then has to apply measures and procedures that will stop further system endangering and ultimately increase system security[7].

II. THEORETICAL ASPECTS

The main purpose of the defense of the power system from large disturbances is to ensure the prevention of disruption of the power system operation, or if the disruption occurs, it is necessary to return to the normal operating state as quickly as possible.

At different drive states, which the system reaches during exploitation, changes in different system variables, primarily changes of current, voltage, and frequency [1] are constantly occurring. Outside the normal drive state, the given variables may exceed their permissible values, which are very important for proper functioning of the system. Figure 1 shows the characteristic variables of a disturbed drive.

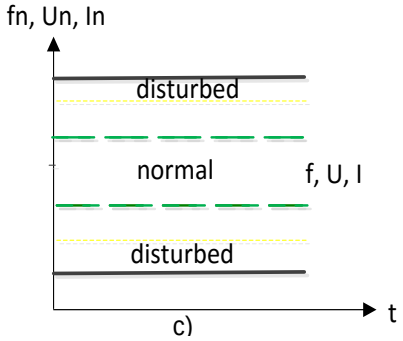

Figure 1. Display of characteristic variables and their value ranges for a disturbed drive

For variables that exceed permitted ranges, it is necessary to take certain actions and bring them, as soon as possible, to their normal drive values. Some of the measures can only be effective if applied in the shortest time possible. This can only be achieved with the application of automatic protection measures and procedures. One of the most important measures is the automatic protection from voltage breakdowns.

III. OPERATING DRIVES OF THE POWER SYSTEM AND THE DISTURBED DRIVE

Regarding the fulfillment or non-fulfillment of the safety criteria by ENTSOE, the following operating conditions of the power system are defined[6]:

- normal drive
- endangered normal drive
- disturbed drive
- system breakdown
- establishment of normal drive

The transmission system is in a disturbed drive if at least one of the following conditions is met[8]:

- there is a distortion of the limit values of voltages or power currents specified for normal or endangered normal drive,
- total short-circuit current in one the network hub is larger than the switching current at least one circuit breaker in that junction
- the frequency does not meet the criteria for normal nor endangered normal drive
- there is a malfunction of one of the following tools, ways and features:
  - possibilities for monitoring the transmission system state, including status estimation applications and options for secondary frequency regulation and power exchange control
  - controlling the system via circuit breaker operation in the bus coupler bay, operation of transformer tap changers, and other equipment used to control the transmission system elements
  - communication with the dispatch centers of other TSOs and the regional safety coordinator for safety management tools
  - tools and communication methods that the transmission system operator needs to facilitate cross-border balancing and regulating energy market operations for which these tools, modes and features are unavailable for more than 30 minutes.

IV. EXAMPLES OF POWER GRID CHANGES IN REAL TIME

In a real power grid, an example of a real event and the possibility of applying disturbance alleviation measures in the part of the Croatian power system that was affected by a major disorder was considered and illustrated in Figure 2. The system characteristics are such that the area has two main power points in TS Ernestinovo and TS Đakovo and several 110 kV power lines.

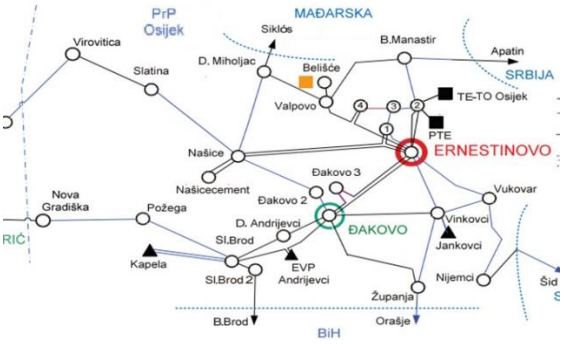

Figure 2. A section of the system affected by the disorder

IV.I. Analysis of power system state before and after the event, description of cause and sequence of events

In the first case, the busbar protection tripped both 110 kV bus systems, and the initial cause of the event was a thunderstorm, where the bus remained powered only via 110 kV network. The remaining part of the network is powered via a long 110 kV corridor and one 220/110 kV transformer.

Immediately after the failure and the occurrence of a major disturbance in the system, short-term stationary state was established and there was no overload of the network elements at that time. In some nodes, very low voltages appeared, but there were no other faults and limitations in power system. During the disturbance, there are several violations of the current limit values, i.e. the overload of the network elements and the voltage outside the normal operating range caused the state of the disturbed drive. Figure 3 shows the voltage and current at TR 220/110 kV during the event.

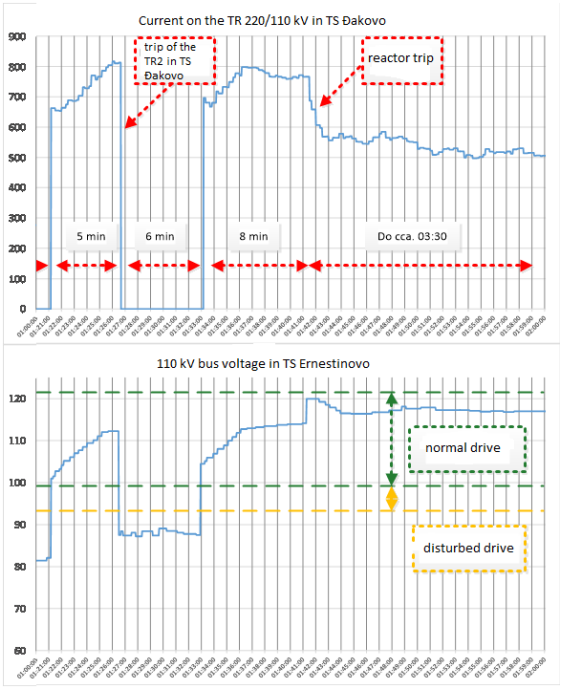

Figure 3. Voltage and current display at TR 220/110 kV during the event

Immediately after the event, the transformer 220/110 kV that supplied most of the consumption of the transmission network was not overloaded and the tap changer was in position 11. With the automatic control activated, the set nominal voltage value is maintained and the tap reaches the position 18 to reach the set voltage value as shown in Figure 4.

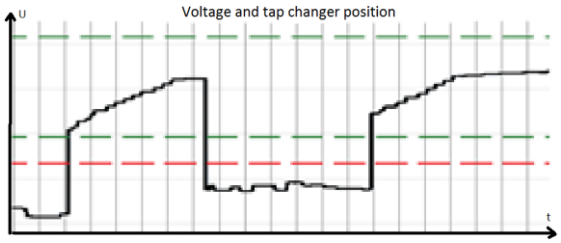

Figure 4. Display of position change of the tap changer and the respective voltage change over time

The figure shows that the increase in the position of the tap follows the increase in voltage in the network. In addition, as shown in Figure 5, the increase in the position of the tap follows and increases the load through the network element, in this case the transformer.

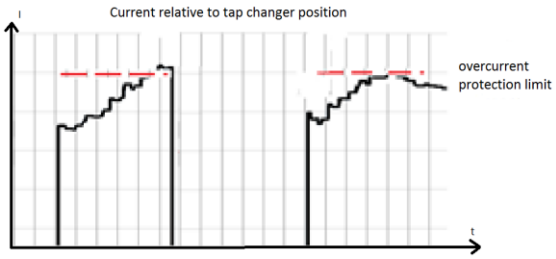

Figure 5. Display of current change on TR 220/110 kV and position of the tap and the respective voltage

From this, it can be concluded that, the automatic voltage control attempted to raise the voltage value to the set amount, but an unwanted transformer load was reached. At the same time, it was not desirable to do so by respecting the permissible load of the transformer.

If there were a possibility of automatic blocking of the voltage regulation, the desired value of load of the network element would be reached, as shown in Figure 6.

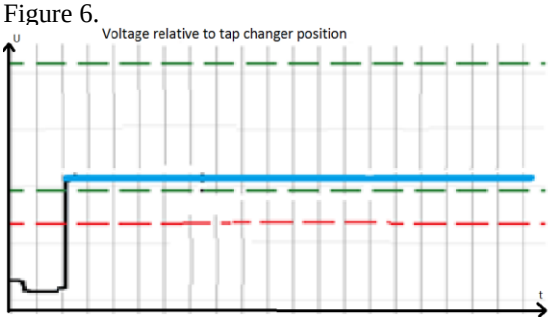

Figure 6. Display of voltage and load changes on TR 220/110 kV with voltage regulation blocked.

In the second case, the initial cause of the event is the trip of the busbar protection caused by the bus failure in the 400 kV system and the tripping of both bus systems. The remaining part of the network, due to failures or maintenance, is powered by a long 110 kV corridor, one 220 kV transmission line from neighboring BiH, and one transformer 220/110 kV. Therefore, we already have a case of relatively high loads that are powered from distant points. Immediately after the failure and the occurrence of a major disturbance in the system, short-term stationary state was established and there was no overload of the network elements at that time. In some nodes, very low voltages appeared, but there were no other faults and limitations in the power system. In such a state, consumption was maintained and for a short time, it was powered by over 220 kV transmission line.

What is important to note here is that the high voltage value on the transformer initiated the change of the transformer tap position to a higher and higher value of 110 kV voltage. Because of the increase in the position of the tap, the load was increased with the reactive power of the 220 kV connected line,

causing its overload. Figure 7 shows the change in reactive power and transformer tap position change.

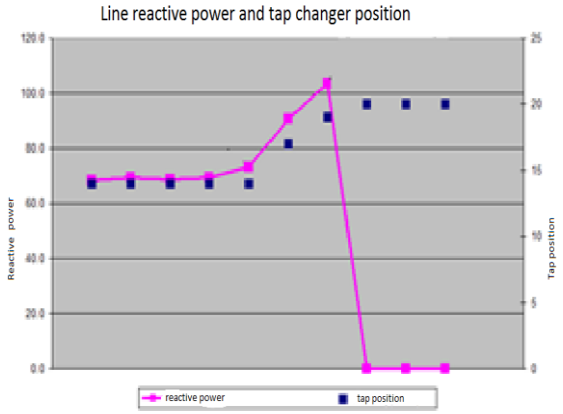

Figure 7. Transformer tap position change and changes of the reactive power of the transmission line

Increase in the reactive load of a line or transformer caused by moving the tap changer to a higher pre-set value has led to an increase in current on the same elements, as shown in Figure 8.

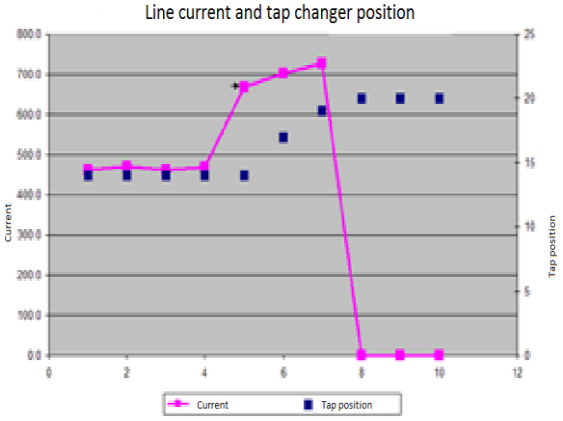

Figure 8. Dependency of the transformer tap position and current change on the transmission line

From the above-mentioned analysis of the event, it is shown that the change of the position of the voltage regulator overlaps to a higher value, and thus caused a higher voltage value on the busbar systems. If the voltage regulation was blocked, as shown in Figure 9, there would be no increase in the load on the network elements.

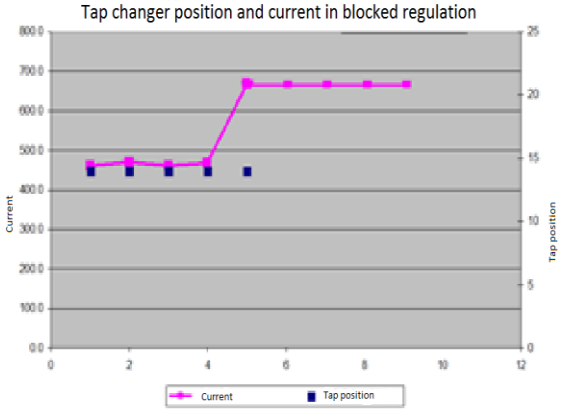

Figure 9. Display of voltage and load changes in the blocked voltage regulation state for both events

It is apparent that, as with the first event, the increase of current on any element of the network can lead to the overcurrent protection trip and the possibility of cascading system breakdown. From the Figure 6 and Figure 9 it is shown that in both cases, by blocking the transformer tap changer or by blocking the voltage regulation, there would not be an increase in the load on the network element, and thus the security of the system would be maintained. Theoretical analyzes and these cases show that there are a number of measures and procedures that would contribute to improving the state and maintaining the security in the system [2].

V. DISPLAY OF POSSIBILITIES OF ACTIONS FOR MAINTAINING SYSTEM STABILITY

From the above-mentioned analysis of events, in this case it is concluded that a range of measures that would contribute to improving the situation and increasing system security can be implemented.

A major disturbance is a condition in a system characterized by the existence of a distortion in the limit values of important variables in the power system. If this condition persists or becomes worse, partial or complete disintegration of the system may occur. Because of all this, it is necessary to act timely and prevent network disruption[9].

Of course, it is important to emphasize that each operating moment is specific to topology, transit flows, consumption and production. For this reason, the proposed motion is to determine the right course of actions necessary to the specific operating state.

These actions, suggestions for technical improvements and corrective measures that may contribute to the elimination of security threats and partial or full of the system breakdown can be summarized as follows [3]:

- Automatic circuit breaker trip of the reactor bay in the 400/110 kV hubs when the following conditions are met:
  - voltage on both 110 kV bus systems << 90 kV with 30 second time delay or

- voltage on both 400 kV bus systems << 360 kV with 30 second delay or
- disconnection of one or both TR 400/110 kV in the critical hub;

- Automatic circuit breaker closing in the capacitor bay at the set busbar voltage value and in the set time spent under conditions:
  - voltage on both 110 kV bus systems << 90 kV with a 30-second time delay.

- Blocking the automatic voltage regulation on network transformers 220 / 110kV and 400/110 kV to prevent load increase due to higher reactive power under conditions:
  - voltage on all 110 kV bus systems << 99kV with a 30 second time delay
  - the central / group unblocking of the voltage regulators of all network transformers via the SCADA system must be enabled.

- Blocking the voltage regulation on 110 / x kV transformers to prevent load increase due to higher reactive power (central or group) under conditions:
  - voltage on all 110 kV bus systems << 99kV with a 30 second time delay,
  - the central / group unblocking of the voltage regulators of all network transformers via the SCADA system must be enabled.

- By selecting manual voltage control and setting the voltage control to a lower value to reduce reactive power flows and total load through critical network elements;
- By topological partitioning of network components by switching off some of the lines and corridors to reduce the load on the critical elements of the network,
- By re dispatching production in the power system,
- By manually disassembling parts of the consumption by switching the selected TR 110/35 kV off to assure unburdening of the network;
- By automatic, group or individual unburdening of the power systems part according to selected and pre-defined nodes of the network for the purpose of preserving the power system;
- By creating scenarios for dealing with similar potential disorders or threatening states in the future,
- By performing theoretical and practical training of the operating personnel on the training simulator;

In all analyzes of an event that is characterized by voltage disruption in a 110 kV network, a considerable load or overload of the network element due to the lack of time needed for problem analysis and adequate response of the operator is indicated, and the need for an adequate automation and protection in the network is certain.

All these measures contribute to prevent system endangerment, faster recovery back to normal operation, and increased system security. All these corrective measures and each one separately would contribute to preventing system malfunctions, further endangering the system, and increasing system security [5].

VI. SUMMARY

In most European transmission systems there is not enough equipment to automatically compensate reactive power and for voltage regulation. This disadvantage is particularly expressed for major disorders in the power system, when operating personnel are not able to observe, identify and initiate corrective measures for the sake of preserving the already disturbed state in the system. Therefore, for each system, it is necessary to design, consider and apply a set of predefined automatic protection measures designed to preserve the basic contour of the system and to prevent the system from being further compromised.

Some of them are listed as measures that would particularly contribute to preventing the disruption of a part of the system in this considered example. Additionally, a general overview of all other measures that should be such as to operate on voltage and reactive power regulation or on power flows in a way that will stop the negative changes that can cause a power outage or complete disruption of the power system.

Determining a number of measures and procedures as rapid activity in the event of a disorder is extremely useful as it is necessary to be prepared before the occurrence of the disorder. This would greatly prevent the occurrence of a disturbed drive, and if it does occur, then it will quickly and easily return to the normal operating state of the system.

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