Editor
Heimo Walter

Advances in Power and Energy Systems

Proceedings of the 12th WSEAS International Conference on Electric Power Systems, High Voltages, Electric Machines (POWER '12)

Prague, Czech Republic, September 24-26, 2012

Recent Advances in Electrical Engineering Series | 7

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Preface

This year the 12th WSEAS International Conference on Electric Power Systems, High Voltages, Electric Machines (POWER '12) was held in Prague, Czech Republic, in September 24-26, 2012. The conference provided a platform to discuss power system planning and management, electric machines, electric vehicles, batteries, high voltage engineering, renewable energy sources and technology, transmission and distribution etc with participants from all over the world, both from academia and from industry.

Its success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of this conference are published in this Book that will be sent to international indexes. They will be also available in the E-Library of the WSEAS. Extended versions of the best papers will be promoted to many Journals for further evaluation.

Conferences such as this can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors

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Plenary Lecture 1

Nodal Electricity Market Design Based on Regulated Access to Transmission Network

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Abstract: The EU legislation of the Third Energy Liberalisation Package, and its subsidiary market and network regulation, aim at a single integrated European electricity market by 2014, with operators' responsibilities, security principles and methods all harmonized. The target model that was outlined by the draft ACER guidelines is either coupling of the day-ahead market or the auction platform for long-term deals. Accomodation of multiple power system constraints with the market mechanism was encountered as a major challenge along the way toward implementation of different electricity market designs. This lecture is meant to show that the nodal model of access to the network in conjunction with the market coupling approach would yield significant benefits. The proposed nodal market design is essentially based on bids for local energy and a regulated transmission access. It supports predictability of network capacity at the point of user connection, a desirable feature for Smart Grids, discovers the real market clearing price, and mitigates power system operational risk.
The proposed nodal, or „Point – of – connection" transmission capacity makes a natural model for implicit allocation of grid capacity. Implicit allocation of nodal capacity is ensured within the energy auctions themselves. By contrary, allocation of „point – to – point" transmission capacity „rights" to market players in explicit auctions does not incentivize the TSOs to allow greater transmission system utilization being inconsitent with the monopolistic nature of transmission service. Market fragmentation and network inefficiency can be introduced when electricity and transmission capacity are auctionned separately. A nodal market design based on regulated access to power transmission network and clear separation between „commercial" congestion management and TSO's operations would lead to significant benefits. Transactions would migrate to centralized markets thus increasing market integration and liquidity since electricity is sold all at once with release of network capacity. The market players can more easily optimize their market portfolio on the base of meningful and predictable transmission capacity. The TSOs would receive adequate resources to increase network capacity. There will be enhanced market integration of intermittent RESs that are critically dependent on short notice access to the regional markets.

Brief Biography of the Speaker:
Jean Constantinescu graduated in 1968 and received the doctoral degree in 1980 in power systems from the Polytechnic University, Bucharest. He is a power system and market specialist with ROENP and a CIGRE – C2 committee member. During the period 2005 – 2010 he was the president of the Romanian Energy Institute Association – IRE, the Romanian representative to EURELECTRIC, and the editor of "Energetica" magazine. That time he also provided technical assistance for energy regulators and TSOs of Romania, Moldavia, Macedonia and Albania, and for the association of energy regulators in South - East Europe. He was the first president of the Romanian energy regulator – ANRE, the first CEO of the national power grid company – Transelectrica, director general of the Energy Research and Modernizing Institute – ICEMENERG, chairman of the Energy Commission by the Ministry of Research and Technology (1993 – 2000) and member of UCTE and EURELECTRIC boards (1999 - 2005). He was also head of the power system departments with ICEMENERG and the national power control unit. His research interests focus on consistent harmonization of electricity market design with the functionality of the physical Power System. He is author of about 120 academic articles and general papers.

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Plenary Lecture 2

Smart Grids and Building Automation

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Abstract: The electricity networks of the future, also named smart grids, are rapidly growing in order to satisfy a number of needs that traditional electric distribution systems cannot assure. Among the main challenges that smart grids allow to overcome, there is the possibility to respond to the increasing demand for electrical energy using profitably energy from renewable sources dispersed on the territory, otherwise hard to exploit, and at the same time improving efficiency in distribution and consumption. Another important issue is the capability to optimize the operation of storage systems both to shave power peaks and to promote the development of electric vehicles. Smart grids have to carry out these complex functions with high reliability, energy sustainability and security levels, taking also into account energy real-time prices. In order to reach these goals, it is necessary to introduce a massive use of advanced systems of monitoring, control and ICT (Information and Communication Technologies) that have already produced a first evolution of distribution networks and liberalised the global electricity market, allowing at the same time a more active role of the end user - also named "prosumer" (producer and consumer of energy). On the basis of the operating conditions of each network and the actual cost of kWh, a prosumer will have to decide the right amount of energy that must be acquired, produced, consumed and stored. It is quite clear that in the near future the cooperation between smart grid operators and "prosumers" will become more and more important. From this point of view, each "prosumer-node", materialized by a smart building, in addition to allowing energy exchange, will also have to allow an information exchange with the control system of the entire network in order to establish full-duplex communications not only with the central nodes, but with other prosumer-nodes as well. On the other hand, the power peaks of one prosumer-node could be compensated by the intervention of neighboring nodes in a global market context of energy buying and selling. All this will result in a significant improvement of overall energy efficiency that will strongly involve the end user, that will become more "active" in terms of both exchanged energy and decision making processes.

Brief Biography of the Speaker:
Francesco Muzi is a professor of Power Systems at the University of L'Aquila, Italy, where he has also the scientific responsibility for the Power System Group. His main research interests concern Power systems transients and dynamics, Reliability and power quality in distribution systems, Power systems diagnostics and protection. In these fields, he authored or co-authored over 100 scientific papers published in reviewed journals or presented at international conferences. He received mentions in books edited by John Wiley & Sons, New York and participated to the outline of the "IEEE Guide for improving the lightning performance of electric lines", IEEE Standards Department, New York. He has also a patent for an industrial invention, namely "Power system controlled by a microprocessor". He is a regional chairman of the Italian National Lighting Society and was a chairman or keynote lecturer in a number of international conferences organized by different prestigious societies. He is a technical reviewer for the following international journals: IEEE Transactions on Power Delivery, Electric Power Systems Research by Elsevier Science, IET Generation, Transmission & Distribution.

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