Editorial

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Energy Informatics

Dear reader, welcome to this special edition of the "it – information technology" journal. The issue in front of you combines the 5 best papers of the 6th PhD-workshop "Energy Informatics (Energieinformatik)" – organized in co-operation with the 4th D-A-CH-Energieinformatik conference in Karlsruhe from November 10th–13th. The aim of this workshop is for PhD-students to discuss their research about the role of ICT and Computer Science in future energy systems. The energy transition (Energiewende) – a politically supervised and accelerated shift from nuclear and fossil fuels sustainable sources of energy – yields drastic changes in the operation of existing energy systems and requires a paradigm shift in both their planning and operation. The technological aspects as well as the involvement of consumers play a crucial role in the necessary transformation process. Hence, not only the development, evaluation and application of new technologies and methods have to be investigated, but also the general regulatory conditions and complex user interactions involved when transforming such systems. These challenges are not limited to the domain of electric power systems but rather need to be extended to integrate mobility, gas and heat supply systems.

The workshop "Energy Informatics (Energieinformatik)" originally initiated by the OFFIS – Institute for Information Technology in Oldenburg, Germany, in 2009 annually invites contributions from PhD students exploring the intersection of informatics, power engineering and energy economics. This workshop presents an opportunity for PhD students to present and discuss their current work – ranging from preliminary ideas to concrete project or thesis results – with experts from within the same community.

A signature feature of this workshop is the intensive and interactive shepherding process that begins with the acceptance of a student's contribution to an incremental reviewing process. The process is designed to support the submitter in clearly defining her or his doctoral project. Once a paper is accepted – through a rigorous peer review process – to the workshop, it will be assigned to an individual member of the program committee called "shepherd" who supports the author in an iterative process sharpening the presentation of the doctoral project and its methodological foundations. For this shepherding a selected international program committee from experts with a proven scientific or industrial track record in energy informatics have agreed to participate and commit considerable time and effort to this process.

In 2015 we have received 13 submissions out of which 9 have been accepted for shepherding. After the extensive shepherding process, 5 contributions have been selected to be included in this issue.

The operation of smart grids is based on different energy management and control systems. In his contribution Denis Bytschow investigates common functionalities for achieving a stable, reliable, sustainable and economic supply of energy. Identifying similarities offers advantages for the construction of systems in terms of common features and system architectures. Mr. Bytschow introduces foundations for specifications and development of fractal architectures that are based on self-similarity.

Flexible operation of power consumers is becoming important for maintaining power balance under volatile power feed-in from renewable sources. Large potential loads are available in the industrial sector. Fabian Kern presents the concept of an energy-aware scheduling concept for test rigs in the automotive industry. The goal is to provide optimized schedules based on local power generation as well as electricity price signals.

In her work, Jennifer Schoch investigates charging strategies for battery electric vehicles taking into account empirical behaviour studies of EV users. She analyses different user groups as well as the effect of different charging strategies in a simulation-based analysis based on 11 400 real-world driving profiles and identifies that battery degradation can be reduced by up to 46% through optimized charging strategies.

Future smart grids have to cope with numerous challenges. Not all of them can be easily mapped on to monetary values. In her contribution, Marie van Amelsvoort

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presents multiple views on smart grid architectures and their aspects in order to develop adequate evaluation metrics and to build a consistent evaluation scheme for smart grid architectures.

Buildings acting as flexible loads have been often proposed to mitigate the volatility of renewable energy sources. In his work, Oleg Valgaev presents a novel short-term forecasting model for building power demand forecasting that not only considers residual load, but also scheduled demand response as well as the PV-generation of the building making it suitable for a wide-range of buildings in that sector.

These 5 authors have significantly improved their work during the workshop's shepherding process and have been selected to present their work in this journal's special edition. We would like to thank the program committee and shepherds who have committed their expertise and resources to this process and contributed to the success of this format in its 6th year

- H.-Jürgen Appelrath, University of Oldenburg
- Birger Becker, FZI Research Center for Information Technology
- Jean-Yves Le Boudec, EPFL Lausanne
- Clemens van Dinther, ESB Reutlingen
- Wilfried Elmenreich, AAU Klagenfurt
- Dominik Engel, Salzburg University of Applied Sciences
- Christoph Flath, University of Würzburg
- Veit Hagenmeyer, KIT Karlsruhe Institute of Technology
- Hans-Arno Jacobsen, TU Munich
- Dirk John, ABB
- Friederich Kupzog, AIT, Vienna
- Friedemann Mattern, ETH Zurich
- Hermann de Meer, University of Passau
- Lars Nordström, KTH, Stockholm
- Peter Palensky, TU Delft
- Christian Rehtanz, TU Dortmund
- Wolfgang Renz, HAW Hamburg
- Hartmut Schmeck, KIT Karlsruhe Institute of Technology
- Alexander Schuller, FZI Karlsruhe
- Michael Sonnenschein, University of Oldenburg
- Thorsten Staake, University of Bamberg
- Thomas Strasser, AIT, Vienna
- Jens Strüker, Fresenius University of Applied Science
- Anke Weidlich, Offenburg University of Applied Science
- Christof Weinhardt, KIT Karlsruhe Institute of Technology

The PhD-workshop is held annually, with the call for contributions being published via the website of the special interest group "Energy Informatics" of the German Informatics Society (GI) over at http://fg-ei.gi.de. The 2016 edition will be held in Klagenfurt, Austria.

Bionotes
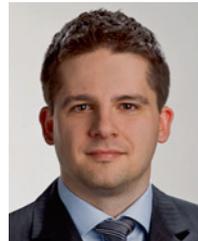
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Sebastian Lehnhoff is a Professor for Energy Information Systems at the University of Oldenburg. He received his doctorate at the TU Dortmund University in 2009. Prof. Lehnhoff is a member of the executive board of the Energy R&D division at the OFFIS Institute for Information Technology. He is speaker of the special interest group "Energy Informatics" within the German Informatics Society (GI), assoc. editor of the IEEE Computer Society's Computing and Smart Grid Special Technical Community as well as an active member of numerous committees and working groups focusing on ICT in future Smart Grids. His research interests are self-organizing energy systems, distribution grid automation as well as methods for Co-Simulation and experimental design in energy system engineering.

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Astrid Nieße studied Computer Science at the University of Applied Sciences in Bremen and finished with a Diploma in 2005. After working for a software development company she started working at OFFIS – Institute for Information Technology in 2007. Since then, she has been involved in several research and development projects as researcher, project manager and group manager. In 2015 she finished her PhD at the Environmental Informatics group, University of Oldenburg. Her thesis is focussed on the development and application of distributed algorithms and agent-based systems for distributed energy management. Her focus of interest is how to develop distributed algorithms for Smart Grid applications with both a scientific and engineering aspiration and thus facilitate the transfer to practical applications. With this expertise, she is currently active in research projects, VDI/VDE committees and cofounder of the start-up company Particon GmbH, a spin-off from OFFIS division Energy.