

Editorial

Dear Reader,

We would like to welcome you to the latest issue of the International Journal of Interoperability in Business Information Systems (IBIS). This is a special issue on Interoperability for the Energy Sector.

Today's power networks are operated in a completely centralized fashion. Electric energy is produced by a few large power plants at very high voltages. It is distributed over long distances and transformed step-wise down onto lower voltage levels before it reaches the millions of consumers, e.g. single households, offices or factories. Operation of such power plants is scheduled based on long-term forecasts of power demand due to the enormous mechanical inertia with which such plants are only able to increase or decrease their output.

This top-down control of the grid comes at a high price: in large-scale international grids electric power may be distributed across several countries before reaching a consumer and thus result in enormous power losses. Unpredictable and typically short-term deviations from demand forecasts have to be balanced by fast and highly inefficient power plants. These plants provide so-called balancing power at peak prices due to the fact that most of the time they are operated far from peak efficiency in order to provide the power gradients needed to balance short-term demand fluctuations.

The on-going trend of integrating distributed and especially renewable power generation results in a rapid increase of such short-term fluctuations in supply situations due to the unpredictability of renewable energy sources, e.g. wind power or photovoltaic. Renewable power generation is usually installed in the form of widely dispersed small-scale plants with relatively low power output. Peaks in power consumption could theoretically be balanced with a corresponding increase in distributed power generation or vice versa (in the same geographic region with minimal power losses). However, traditional centralized power management is capable neither of identifying such situations nor of taking appropriate individual actions with millions of consumers and distributed renewable power plants connected to the grid. Modern power grids are blind to the precise supply and demand configurations on the lower voltage levels. Hence, the need for inefficient short-term balancing power increases even further.

The future electric power network, the so called Smart Grid, is an electricity network that can intelligently integrate the actions of all users connected to it - generators, consumers and those that do both - in order to efficiently deliver sustainable, economic and secure electricity supplies. Smart Grids will be composed of large collections of autonomous components. Sensors and actuators, aware of their environment, with the ability to communicate freely, will have to organize themselves in order to perform the actions and services that are required for a reliable and robust power supply.

New technologies like smart meters, home automation and demand side management through web 2.0 technologies are expected to be the major cornerstones for addressing issues e.g. controlling electric vehicles or micro-CHPs which in general are more predictable than stochastic generation. Charging and de-charging of EVs may become of interest to provide significant distributed storage capacities. Yet, this may only be achieved through integrating even more ICT technology into the grid to make it smarter and to increase the overall level of automation. One of the key issues identified by Smart

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Grid roadmaps all around the world are standards and interoperability issues connected with this development.

Following the Call for Contributions late last year we received numerous papers on the challenges of integrating components and devices into future Smart Grids enhancing not only power system operation but addressing energy efficiency issues as well. Out of these submissions our reviewers selected four high-quality contributions for this issue of the IBIS magazine aiming at outlining important solutions and applications of improving the integration of ICT between different systems of the grid.

Enjoy!

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