

Special Issue on  
**Communication Technologies for Smart Grid  
 Applications**

# CALL FOR PAPERS

An increasing demand for electric power with the growth of population and industry implies environmental issues such as greenhouse gas emission. Increasing complexity of power grids, the need for an economical electricity consumption approach, growing demands, and requirements for greater reliability, security, efficiency, and environmental and energy sustainability concerns continue to highlight the need for a quantum leap in harnessing communication and information technologies to change the feature of the power grids. To address the challenges of the existing power grid, the new concept of the smart grid as the modern power grid has emerged recently. The smart grid vision aspires to improve efficiency, flexibility, security, reliability, stability, economics, and sustainability of the electricity systems using data processing, networking, communications, sensor networks, automation, and computational power.

The smart grid is expected to revolutionize electricity generation, transmission, and distribution by allowing two-way flows for both electrical power and information, including renewable energy resources and plug-in electric vehicles, applying of the advanced metering infrastructure (AMI), the information and communication technology (ICT), integrating advanced sensing, communications, and control into the traditional power systems. Unlike the conventional power grid, in which the consumers are considered as passive entities, smart grids treat them as dynamic entities, which participate in the grid operations and affect programs implemented throughout the system.

However, issues associated with communication, processing, and management must be addressed before the full benefits of the smart grid can be achieved, such as how to maximize the use of network resources and available power, how to ensure reliability and security, and how to compensate for volatile renewable energy sources and electromobility of PEVs need to be considered in the design of smart grids, which have not completely been overcome yet.

In parallel with fast growing of communication technology for power grid, there are many open issues awaiting investigation. Regarding situational awareness, integrating local power grids into interconnections poses modeling and computational challenges. Monitoring grids of various dimensionality and complexity requires scalable and modular algorithms. These may include compressing, layering, relaying, and storing the data. The “big data” challenges further extend to addressing the missing data, outliers, and the underdeterminacy of the systems, as well as model reduction tasks, for which the contemporary statistical learning approaches could provide viable solutions. The control and optimization dimensions entail conventional generation as well as renewable energy sources, interconnected via transmission and distribution networks, serving large industrial customers, and residential end users with smart appliances and plug-in electric vehicles. They may also include microgrids with distributed generation and storage. The researchers can cross-fertilize their ample expertise on resource allocation gained in the context of communication networks to optimize power network operations. Major challenges include the successful coordination of system-level economic operations such as optimal power flow and unit commitment while embracing small-scale end users through demand response and coordinated plug-in electric vehicle charging. Integrating random and intermittent renewable energy sources across all levels poses further challenges. Leveraging the markedly improved monitoring modalities in grid operations is worth careful studying. Although research efforts tackling individual problems have yielded promising outcomes, achieving the grand goal of reliable and efficient grid operations still calls for novel formulations, insightful approximations, integration, and major algorithmic breakthroughs. These networks include monitoring, automation, transmission, distribution, and consumption provided by integrating information and communication technologies.

So, there are major open issues which ask for extensive research on network science expertise and applying communication, information processing, and adaptive learning methodologies to the smart grid, such as equipping multiagent intelligent and autonomous controllers to the distributed learning, estimation, forecasting, and optimization and adaptation capabilities.

We invite authors to contribute original research articles as well as review articles to the topics related to this special issue.

Potential topics include but are not limited to the following:

- ▶ Network architecture, security issues, and hardware implementation of a home area network for smart grid
- ▶ Communication networks, distributed, and collaborative learning and decision-making in smart grid
- ▶ Cost-efficient residential energy management scheme for information-centric networking based home network in smart grid
- ▶ A random switching traffic scheduling algorithm in wireless smart grid communication network
- ▶ Robust, dynamic, bioinspired, stochastic, and convex optimization applications in smart grid
- ▶ Game-theory-based approach for energy routing in a smart grid network
- ▶ Applications of wireless sensor networks (WSNs) in smart grid
- ▶ Cloud computing, cognitive radio, resource allocation, and auctions over smart grid

Authors can submit their manuscripts through the Manuscript Tracking System at <https://mts.hindawi.com/submit/journals/jcnc/spsg/>.

Papers are published upon acceptance, regardless of the Special Issue publication date.

**Lead Guest Editor**

Amir Rastegarnia, Malayer University,  
Hamadan, Iran  
*rastegarnia@malayeru.ac.ir*

**Guest Editors**

Saeid Sanei, Nottingham Trent  
University, Nottingham, UK  
*saeid.sanei@ntu.ac.uk*

Wael Bazzi, American University in  
Dubai, Dubai, UAE  
*wbazzi@aud.edu*

Md. Kafiul Islam, Independent  
University, Dhaka, Bangladesh  
*kafiut@gmail.com*

**Submission Deadline**

Friday, 12 October 2018

**Publication Date**

March 2019