

Guest Editorial

Introduction to the Special Section on Real-Time Demand Response

CONSUMERS are expected to play an increasingly important role in current electricity markets through smart grid systems, where risk and uncertainty are becoming central issues. The availability of an advanced metering infrastructure provides one of the building blocks for bi-directional communications between consumers and suppliers, creating an opportunity for large-scale load control within a smart grid. Hence, the concept of demand elasticity will have a more significant influence on the system topology and markets. The availability of renewable energy sources in domestic and urban areas, and feed-in tariffs, will provide the owners with the choice between selling the electricity to the grid or storing it on premises to avoid high on-peak charges. Consumer empowerment, implying intelligent demand-side management with automatic control over lighting, entertainment and heating/cooling devices, ideally interacting with network operators, will reduce consumption and contribute to flattening demand peaks. Consumers may participate in different trading floors to procure their electric energy needs in the best possible way and may contribute to reserve needs as well. Besides, real-time pricing will highly influence the outcome on demand-responsive loads. An adequate price structure could offer an incentive to electric vehicle owners to charge their electric cars in target locations and time slots. System operation and control will include automated metering applications, demand-side management, and also vehicle-to-grid strategies.

The objective of this Special Section is to address and disseminate state-of-the-art research and development in real-time demand response. In response to the call for extended abstracts for this Special Section, 167 two-page extended abstracts were received and reviewed. Authors of 82 selected abstracts were then invited to submit full papers for a second round of review, and out of which 28 high-quality manuscripts were accepted (from North and South America, Europe, Asia, and Australia/Oceania) and included in this Special Section.

The papers in this Special Section cover a wide range of topics including:

- Advanced metering infrastructures and sensing technologies.

- Intelligent control methods and bi-directional communications.
- Large-scale load control and demand elasticity.
- Energy harvesting and storage technologies.
- Demand-side management capabilities.
- Automatic control over home devices.
- Energy management and efficiency optimization.
- Optimal response to the markets by consumers and suppliers.
- Risk-controlled electricity procurement and uncertainty modeling.
- Real-time electricity pricing and volatility effects.
- Optimized charging of electric vehicles and vehicle-to-grid systems.
- Fast, large-scale, decentralized decision-making tools.

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We hope that you find this Special Section interesting and useful, serving also as a reference for future work in the field.

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