Guest Editorial Special Section on New Trends in Residential Energy Management

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AS AN important branch of power demand side management, residential energy management plays an important role in reducing the emission and enhancing the energy efficiency in the energy delivery side. Recent technical advances bring significant transformations to energy end-users. First, increasing penetrations of residential renewable energy source, electric vehicle, and residential energy storage system have been transforming residential energy consumers to be "Energy Prosumers (Producer and Consumer)," which are capable to generate and consume energy simultaneously. Second, the two-way communication infrastructure enables residential energy entities interact and exchange information flows with the external environment. Third, recent advances in ubiquitous sensing and metering technologies, such as Internet of Things, nonintrusive load monitoring, and advanced metering infrastructure, enable the deep understanding on behaviors of energy end-users and related environments. These technical advances consequently drive residential energy entities to become complex cyber-physical-social systems, which require new solutions for coordinating, managing, and optimizing residential energy resources with the active participations of end users.

Eleven papers are collected in this special section, covering several important topics in residential energy management. One paper addresses the appliance monitoring in residential buildings. In "New Appliance Detection for Nonintrusive Load Monitoring," Zhang *et al.* developed a new nonintrusive appliance load monitoring technique, which can identify newly added appliances from the total power consumption profile recorded by smart meter. One paper focuses on the energy service recommendation problem for end users. In "Bayesian Hybrid Collaborative Filtering-Based Residential Electricity Plan Recommender System," Zhang *et al*. developed a knowledge-driven electricity retail plan recommender system, which can help residential users better filter information from a group of candidate electricity retail plans.

Two papers study the peer-to-peer (P2P) energy trading of residential users. In "A Distribution Market Clearing Mechanism for Renewable Generation Units with Zero Marginal Costs," Yang *et al*. proposed a new price clearance mechanism for P2P energy markets. In "A Distributed and Resilient Bargaining Game for Weather-Predictive Microgrid Energy Cooperation," An *et al*. proposed a resilient bargaining game mechanism for enhancing energy sharing of microgrids consisting of residential buildings. These works provide new references to ongoing discussions on residential side P2P energy trading.

Three papers study the multienergy integration problem in residential buildings. In "A Distributed Double-Consensus Algorithm for Residential We-Energy," Sun *et al*. developed a distributed double-consensus algorithm for addressing the energy management problem of a residential electricity-heat-coupling system. In "Time-Coordinated Multienergy Management of Smart Buildings Under Uncertainties," Sharma *et al*. proposed a multienergy building management system; their work provides a reference for coordinately considering multiple kinds of energy sources in demand-side management. In "Preheating Quantification for Smart Hybrid Heat Pumps Considering Uncertainty," Sun *et al*. conducted a quantification analysis on the preheating effect of smart hybrid heat pumps in demand side.

Two papers focus on the energy controller design in residential side. In "Design and Value Evaluation of Demand Response Based on Model Predictive Control," Miyazaki *et al*. designed a model predictive controller for demand response; they evaluate the controller using Japan's grid data. In "Self-Normalized-Estimator-Based Control for Power Management in Residential Grid Synchronized PV-BES Microgrid," Kumar and Singh proposed a self-normalized-estimator-based controller for accommodating renewable energy and energy storage systems in a residential microgrid. These papers provide new insights on designing residential energy controllers in dynamic and high renewable penetrated environments.

Two papers study the development of home energy management system. In "A Comparison Study on Stochastic Modelling Methods for Home Energy Management Systems," Yousefi *et al*. investigated the accuracy of different stochastic methods on modeling home energy resources; their work provides new understanding on applying stochastic approaches in home energy management, which is a controversial issue in academia since residential computing power is often limited and hard to handle the complexity of stochastic based models. In "Demand-Side Energy Management Considering Price Oscillations for Residential Building Heating and Ventilation Systems," Ma *et al*. developed an energy management scheme for air conditioning systems in residential buildings; their work sufficiently considers the user's indoor thermal comfort using the predicted percentage of the dissatisfied model.

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We hope the papers collected in this special issue can provide useful references to researchers and engineers and can advance the knowledge in residential-side energy management techniques.

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