

# Guest Editorial

## Special Section on Industrial and Commercial Demand Response

**N**ONRESIDENTIAL (industrial and commercial) customers have great potentials in providing flexibility for power systems through diverse demand response (DR) programs. Intelligent energy management can be carried out with DR in industrial and commercial facilities, especially if on-site control, information, and communication technologies are available, enabling also the inherent automation capabilities of heating, ventilation, and air conditioning systems. In the dawn of the Smart Grid era, with increasing distributed generation and the conversion of traditionally passive consumers to newly active energy players in the market, DR is being effectively considered for outage management and network reinforcement deferral.

The industrial and commercial potential of DR is not yet completely understood, especially regarding the emerging advanced technologies associated with the Smart Grid. Advances in smart meter technology that allow monitoring and controlling responsive loads in near real time will also be critical enablers of DR potentials. It can be more complex to implement DR for industrial loads if compared to residential loads mainly due to the reliability management that is more vital for industrial plants. An interruption of service may lead to stopping production or violating operational constraints of the plant. Industrial processes can be interdependent and correlated, which makes it difficult to divide and conquer separately. The reason is that several manufacturing processes are critically dependent on time and must be scheduled with high precision.

Despite these technical challenges, DR solutions, if properly implemented, can reduce costs related to energy consumption and increase renewable sources exploitation. This Special Section aims at providing a forum to discuss the most recent advances on industrial and commercial DR.

In response to the call for papers for this Special Section, 54 full papers were received and thoroughly reviewed, out of which 11 high-quality manuscripts were accepted (from USA, Italy, Australia, China, South Korea, India, Brazil, Germany, Iran, and UK) and included in this Special Section.

In the first paper, “Internet-of-Things Hardware-in-the-Loop Architecture for Providing Frequency Regulation With Demand Response” by Thornton *et al.*, the authors present an architecture testbed for providing DR (telemetric monitoring and actuation of loads).

In the second paper, “Planning Energy Storage and Photovoltaic Panels for Demand Response With Heating Ventilation and Air Conditioning Systems” by Alhaider and Fan, the authors consider an integrated battery energy storage system, photovoltaic panels, and heating, ventilation, and air-conditioning systems to participate in demand response.

In the third paper, “Demand-Side Regulation Provision From Industrial Loads Integrated With Solar PV Panels and Energy Storage System for Ancillary Services” by Chau *et al.*, the authors propose an integral scheduling and control method for industrial plants with distributed solar energy resources for DR and ancillary service provision.

In the fourth paper, “Power Market Load Forecasting on Neural Network With Beneficial Correlated Regularization” by Xu *et al.*, the authors propose a beneficial correlated regularization for neural network load prediction.

In the fifth paper, “Optimal Price-Based Demand Response of HVAC Systems in Multizone Office Buildings Considering Thermal Preferences of Individual Occupants Buildings” by Kim, the author proposes a price-based DR strategy for multizone office buildings to co-optimize the energy cost of heating, ventilating, and air-conditioning units and the thermal discomfort levels of occupants.

In the sixth paper, “A Heuristic-Based Smart HVAC Energy Management Scheme for University Buildings” by Jindal *et al.*, the authors shed light on how the university’s heating, ventilation, and air-conditioning systems can be managed by taking into account various feasibility constraints in the university to improve its energy utilization.

In the seventh paper, “Data Center Control Strategy for Participation in Demand Response Programs” by Cupelli *et al.*, the authors present a framework for the optimal operation of data centers, leveraging their heating, ventilation, and air-conditioning unit, delay-tolerant information technology workload, and battery storage system for participating in DR programs.

In the eighth paper, “Commercial Demand Response Programs in Bidding of a Technical Virtual Power Plant” by Pourghaderi *et al.*, the authors propose a technical virtual power plant that aggregates the DR potential of commercial buildings and other distributed energy resources along the distribution network.

In the ninth paper, “Optimal Demand Response Scheduling for Water Distribution Systems” by Oikonomou *et al.*, the authors propose a comprehensive framework for optimizing the

participation of water distribution system operators in DR and frequency regulation markets.

In the tenth paper, “Quantifying the Potential Economic Benefits of Flexible Industrial Demand in the European Power System” by Papadaskalopoulos *et al.*, the authors present a whole-system modeling framework to comprehensively quantify the potential economic benefits of flexible industrial demand for the European power system.

In the eleventh and final paper, “Investigation of Carrier Demand Response Uncertainty on Energy Flow of Renewable-Based Integrated Electricity–Gas–Heat Systems” by Massrur *et al.*, the authors present a probabilistic tool for the energy flow analysis of an integrated multienergy carrier system considering demand response, renewable energy sources, and various load types uncertainties.

The Guest Editorial Board would like to thank the IEEE Industrial Electronics Society for providing this venue for us to organize this Special Section, the authors for their innovative and valuable contributions, and the reviewers for their prompt and comprehensive feedback and suggestions.

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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. Thank you.

J. P. S. CATALÃO, *Corresponding Guest Editor*  
Faculty of Engineering of the University of  
Porto and INESC TEC  
Porto 4200-465, Portugal  
catalao@fe.up.pt

P. SIANO, *Guest Editor*  
University of Salerno  
Salerno 84084, Italy

F. LI, *Guest Editor*  
The University of Tennessee  
Knoxville, TN 37996 USA

M. A. S. MASOUM, *Guest Editor*  
Utah Valley University  
Orem, UT 84058 USA

J. AGHAEL, *Guest Editor*  
Shiraz University of Technology  
Shiraz 71557-13876, Iran



**João P. S. Catalão** (M'04–SM'12) received the M.Sc. degree from the Instituto Superior Técnico, Lisbon, Portugal, in 2003, and the Ph.D. degree and Habilitation for Full Professor (“Agregação”) from the University of Beira Interior, Covilha, Portugal, in 2007 and 2013, respectively.

He is currently a Professor with the Faculty of Engineering of the University of Porto, Porto, Portugal, and Researcher with INESC TEC, INESC-ID/IST-UL, and C-MAST/UBI.

Dr. Catalão is an Editor for the IEEE TRANSACTIONS ON SMART GRID, an Editor for the IEEE TRANSACTIONS ON POWER SYSTEMS, and a Subject Editor for the IET RENEWABLE POWER GENERATION. From 2011 to 2018 (seven years) he was an Editor for the IEEE TRANSACTIONS ON SUSTAINABLE ENERGY. His research interests include power system operations and planning, hydro and thermal scheduling, wind and price forecasting, distributed renewable generation, demand response, and smart grids.



**Pierluigi Siano** (M'09–SM'14) received the M.Sc. degree in electronic engineering and the Ph.D. degree in information and electrical engineering from the University of Salerno, Fisciano, Italy, in 2001 and 2006, respectively.

He is an Associate Professor with accreditation for Full Professor of Electrical Energy Engineering with the Department of Industrial Engineering, University of Salerno. He has coauthored more than 330 papers including more than 170 international journal papers. His research interests include centered on demand response, on the integration of distributed energy resources in smart grids and on planning, and management of power systems.

Dr. Siano is a Chair of the Technical Committee on Smart Grids and a member of the Technical Committee on Renewable Energy Systems of the IEEE Industrial Electronics Society. He is an Associate Editor for the IEEE TRANSACTIONS ON INDUSTRIAL INFORMATICS, the IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS, and the IET RENEWABLE POWER GENERATION.



**Fangxing Li** (S'98–M'01–SM'05–F'17) is also known as Fran Li. He received the B.S.E.E. and M.S.E.E. degrees from Southeast University, Nanjing, China, in 1994 and 1997, respectively, and the Ph.D. degree from Virginia Polytechnic Institute and State University, Blacksburg, VA, USA, in 2001.

He is currently the James McConnell Professor with The University of Tennessee, Knoxville, TN, USA. His research interests include renewable energy integration, demand response, power markets, power system control, and power system computing.

Dr. Li is an Editor for the IEEE TRANSACTIONS ON POWER SYSTEMS and a Consulting Editor for the IEEE TRANSACTIONS ON SUSTAINABLE ENERGY.



**Mohammad A. S. Masoum** (SM'05) received the B.S., M.S., and the Ph.D. degrees from the University of Colorado, Boulder, CO, USA, in 1983, 1985, and 1991, respectively.

He has authored/coauthored more than 300 papers including 120 journal articles. He is currently a Faculty Member with the Department of Engineering, Utah Valley University, Orem, UT, USA. He is the coauthor of *Power Quality in Power Systems and Electrical Machines* (Elsevier, 2008 and 2015) and *Power Conversion of Renewable Energy Systems* (Springer, 2011 and 2012). His research interests include application of artificial intelligence in smart grids with high penetrations of renewable distributed generations to improve performance, stability, and power quality.

Dr. Masoum is an Editor for the IEEE TRANSACTIONS ON SMART GRID and the IEEE POWER ENGINEERING LETTERS and a Guest Editor for the IEEE TRANSACTIONS ON INDUSTRIAL INFORMATICS and the IET RENEWABLE POWER GENERATION.



**Jamshid Aghaei** (M'12–SM'15) received the M.Sc. and Ph.D. degrees from the Iran University of Science and Technology, Tehran, Iran, in 2005 and 2009, respectively.

He is currently an Associate Professor with the Shiraz University of Technology, Shiraz, Iran, and also a Research Fellow with the Norwegian University of Science and Technology, Trondheim, Norway. He is an Associate Editor for the *IET Renewable Power Generation* and *IET Generation Transmission and Distribution*. His research interests include renewable energy systems, smart grids, electricity markets and power system operation, optimization, and planning.