

SPECIAL ISSUE

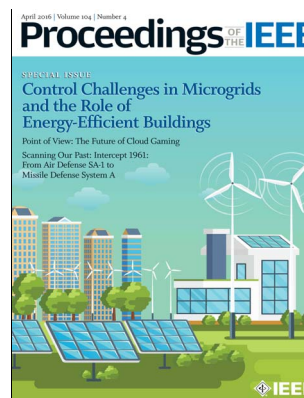
CONTROL CHALLENGES IN MICROGRIDS AND THE ROLE OF ENERGY-EFFICIENT BUILDINGS

Edited by J. Baillieul, M. C. Caramanis, and M. D. Ilić

- 697 Action-Oriented Energy Benchmarking for Nonresidential Buildings**
 By E. Mills
INVITED PAPER The paper is concerned with building energy-efficiency benchmarking. Traditional benchmarking addresses the *status quo*, e.g., by comparing the building to its peers at one point in time or longitudinally. Action-oriented benchmarking extends this process by also inferring potential energy-efficiency opportunities.
- 713 Analysis of Georeferenced Building Data for the Identification and Evaluation of Thermal Microgrids**
 By A. Schlueter, P. Geyer, and S. Cisar
INVITED PAPER This paper treats the optimal creation of thermal building networks for reducing carbon emissions.
- 726 Automated Demand Response for Smart Buildings and Microgrids: The State of the Practice and Research Challenges**
 By T. Samad, E. Koch, and P. Stluka
INVITED PAPER Recent applications with grid-integrated buildings and microgrids are extending the functionality, with increasing sophistication of how demand-side load profiles are managed and with integration of distributed storage and generation. The paper discusses demand-response capabilities of grid-integrated buildings and building microgrids.
- 745 Frequency Regulation From Commercial Building HVAC Demand Response**
 By I. Beil, I. Hiskens, and S. Backhaus
INVITED PAPER The paper discusses the role of buildings for serving the grid by providing demand response (DR) and ancillary services. Commercial heating, ventilation, and air-conditioning (HVAC) loads are potential candidates for providing such DR services as they consume significant energy and because of the temporal flexibility offered by their inherent thermal inertia.
- 758 Technologies and Magnitude of Ancillary Services Provided by Commercial Buildings**
 By Y.-J. Kim, D. H. Blum, N. Xu, L. Su, and L. K. Norford
INVITED PAPER This paper reviews available technologies and necessary control strategies for HVAC systems in commercial buildings to provide ancillary services. The focus is on buildings serving the grid by providing demand response and ancillary services.
- 780 Sustainable Reserve Power From Demand Response and Fluctuating Production—Two Danish Demonstrations**
 By B. Biegel, P. Andersen, J. Stoustrup, L. H. Hansen, and A. Birke
INVITED PAPER Two demonstration projects illustrate ways that both demand-side and generation-side distributed fluctuating resources can contribute as sources of reserve power in the future operations of power grids.

DEPARTMENTS

- 687 POINT OF VIEW**
 The Future of Cloud Gaming
 By W. Cai, R. Shea, C.-Y. Huang, K.-T. Chen, J. Liu, V. C. M. Leung, and C.-H. Hsu
- 692 SCANNING THE ISSUE**
 Control Challenges in Microgrids and the Role of Energy-Efficient Buildings
 By J. Baillieul, M. C. Caramanis, and M. D. Ilić
- 883 SCANNING OUR PAST**
 Intercept 1961: From Air Defense SA-1 to Missile Defense System A
 By M. Gruntman
- 891 FUTURE SPECIAL ISSUES/SPECIAL SECTIONS**



On the Cover: Our cover image this month features a cityscape which includes solar paneled buildings in addition to various power sources such as wind and solar.

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SPECIAL ISSUE: Control Challenges in Microgrids and the Role of Energy-Efficient Buildings

789 Cyber-Physical Modeling of Distributed Resources for Distribution System Operations

By *S. Chatzivasileiadis, M. Bonvini, J. Matanza, R. Yin, T. S. Nouidui, E. C. Kara, R. Parmar, D. Lorenzetti, M. Wetter, and S. Kiliccote*

|INVITED PAPER| The Virtual Grid Integration Laboratory (VirGIL) is a modular cosimulation platform designed to study interactions between demand-response strategies, building comfort, communication networks, and power system operation. VirGIL introduces the use of the quantized state system (QSS) methods for simulation in this cosimulation platform.

807 Co-Optimization of Power and Reserves in Dynamic T&D Power Markets With Nondispatchable Renewable Generation and Distributed Energy Resources

By *M. Caramanis, E. Ntakou, W. W. Hogan, A. Chakraborty, and J. Schoene*

|INVITED PAPER| This paper presents a distributed, massively parallel architecture that enables tractable transmission and distribution locational marginal price (T&DLMP) discovery along with optimal scheduling of centralized generation, decentralized conventional and flexible loads, and distributed energy resources (DERs).

837 Control and Communication Protocols Based on Packetized Direct Load Control in Smart Building Microgrids

By *B. Zhang and J. Baillieul*

|INVITED PAPER| Recent advances in networked systems and the anticipated breakthroughs of the Internet of Things will enable significant advances in demand-response capabilities of intelligent load networks of power-consuming devices such as HVAC components, water heaters, and building microgrids. The paper introduces a new operating framework called packetized direct load control (PDLC) that is designed to provide enhanced fairness and consumer satisfaction while at the same time reducing demand uncertainty for ISOs.

858 An Information Exchange Framework Utilizing Smart Buildings for Efficient Microgrid Operation

By *J.-Y. Joo and M. D. Ilic*

|INVITED PAPER| The authors present an information exchange framework to support the participation of buildings in demand response in microgrids. The economic objectives and physical dynamics of flexible generators and loads are aggregated by load aggregation agents and incorporated to provide optimal system operation.

865 Toward a Consumer-Centric Grid: A Behavioral Perspective

By *W. Saad, A. L. Glass, N. B. Mandayam, and H. V. Poor*

|INVITED PAPER| In addition to modern grid hardware, software, and network-control technologies, active consumer participation is seen as an integral part of the emerging smart grid. To address the challenges that this creates, this paper explores the potential of prospect theory, a Nobel-Prize-winning theory, as a decision-making framework that can help understand how risk and uncertainty can impact the decisions of smart grid consumers.

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