

**SPECIAL ISSUE**

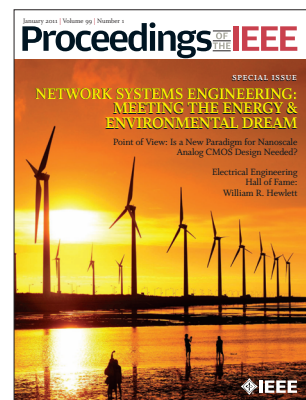
## NETWORK SYSTEMS ENGINEERING FOR MEETING THE ENERGY AND ENVIRONMENTAL DREAM

*Edited by G. Andersson, M. D. Ilić, V. Madani, and D. Novosel*

- 15 Multiple-Energy Carriers: Modeling of Production, Delivery, and Consumption**  
*By T. Krause, G. Andersson, K. Fröhlich, and A. Vaccaro*  
 | INVITED PAPER | In this unifying framework for modeling and supporting multiple-energy delivery systems, energy forms are converted in an energy hub, then delivered in a controlled manner.
  
- 28 Integration Issues of Distributed Generation in Distribution Grids**  
*By E. J. Coster, J. M. A. Myrzik, B. Kruimer, and W. L. Kling*  
 | INVITED PAPER | This paper considers the probable operating problems and challenges in connecting distributed generation to low- and medium-voltage electric power grids.
  
- 40 Smart Operation of Smart Grid: Risk-Limiting Dispatch**  
*By P. P. Varaiya, F. F. Wu, and J. W. Bialek*  
 | INVITED PAPER | Ways of managing energy systems without endangering reliability, while utilizing many intermittent resources, are discussed in this paper.
  
- 58 Dynamic Monitoring and Decision Systems for Enabling Sustainable Energy Services**  
*By M. D. Ilić*  
 | INVITED PAPER | To meet our need for energy without endangering the environment, top-down management should be balanced by appropriate peer-to-peer collaborative effort.
  
- 80 Wide-Area Monitoring, Protection, and Control of Future Electric Power Networks**  
*By V. Terzija, G. Valverde, D. Cai, P. Regulski, V. Madani, J. Fitch, S. Skok, M. M. Begovic, and A. Phadke*  
 | INVITED PAPER | The authors of this paper point out that data concentrators are now being designed and deployed and they explain why future networks should make use of synchronized measurement technology.
  
- 94 Mitigating Blackouts via Smart Relays: A Machine Learning Approach**  
*By Y. Zhang, M. D. Ilić, and O. K. Tonguz*  
 | INVITED PAPER | By using relays whose logic is adaptive to sensed conditions and can differentiate between normal and fault conditions, the authors of this paper believe large-scale blackouts can be avoided.
  
- 119 An Integrated Framework for Smart Microgrids Modeling, Monitoring, Control, Communication, and Verification**  
*By A. Vaccaro, M. Popov, D. Villacci, and V. Terzija*  
 | INVITED PAPER | In this paper, the authors envision a service-oriented architecture as a means of enabling modeling, verification, and control of microgrids.

**DEPARTMENTS**

- 3 POINT OF VIEW**  
 Is a New Paradigm for Nanoscale Analog CMOS Design Needed?  
*By L. Lewyn, and N. Williams*
  
- 7 SCANNING THE ISSUE**  
 Network Systems Engineering for Meeting the Energy and Environmental Dream  
*By G. Andersson, M. D. Ilić, V. Madani, and D. Novosel*
  
- 233 SCANNING OUR PAST**  
 Electrical Engineering Hall of Fame:  
 William R. Hewlett  
*By J. E. Brittain*
  
- 237 FUTURE SPECIAL ISSUES/SPECIAL SECTIONS**



**On the Cover:** On this month's cover we highlight wind power as an emerging energy resource to represent the challenges of network design, monitoring, and control for enabling the implementation of multiple objectives by the actors embedded at various network layers.

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## SPECIAL ISSUE: Network Systems Engineering for Meeting the Energy and Environmental Dream

### 133 The Future Renewable Electric Energy Delivery and Management (FREEDM) System: The Energy Internet

By A. Q. Huang, M. L. Crow, G. T. Heydt, J. P. Zheng, and S. J. Dale

| CONTRIBUTED PAPER | The authors of this paper suggest that it is plausible to use a plug-and-play approach to connecting resources in future electric power systems.

### 149 Green Cloud Computing: Balancing Energy in Processing, Storage, and Transport

By J. Baliga, R. W. A. Ayre, K. Hinton, and R. S. Tucker

| CONTRIBUTED PAPER | For processing large amounts of data, management and switching of communications may contribute significantly to energy consumption and cloud computing seems to be an alternative to office-based computing.

### 168 Integration of Electric Vehicles in the Electric Power System

By J. A. Peças Lopes, F. J. Soares, and P. M. Rocha Almeida

| INVITED PAPER | A conceptual framework for integrating electric vehicles into electric power systems is given; impacts and benefits arising from their use are discussed.

### 184 Achieving Controllability of Electric Loads

By D. S. Callaway and I. A. Hiskens

| INVITED PAPER | This paper discusses actively involving highly distributed loads in power system control actions; an overview of system control objectives is provided.

### 200 Demand Response With Micro-CHP Systems

By M. Houwing, R. R. Negenborn, and B. De Schutter

| INVITED PAPER | The possibilities of actively incorporating the demand side are discussed in this paper; a simple control-based price signal is used to demonstrate cost savings.

### 214 Wind Integration in Power Systems: Operational Challenges and Possible Solutions

By L. Xie, P. M. S. Carvalho, L. A. F. M. Ferreira, J. Liu, B. H. Krogh, N. Popli, and M. D. Ilić

| INVITED PAPER | This paper surveys means for integrating wind energy into power systems and suggests alternatives for reliable and cost-effective operation.

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