

SPECIAL ISSUE

SMART GRID: THE ELECTRIC ENERGY SYSTEM OF THE FUTURE

Edited by H. Gharavi and R. Ghafurian

- 922 Challenges and Opportunities in Smart Grid: A Position Article**
 By G. W. Arnold
 | INVITED PAPER | This introductory article gives an overview of the concepts and purpose of the Smart Grid and the important role of communications technology in its development.
- 928 Smart Generation and Transmission With Coherent, Real-Time Data**
 By D. E. Bakken, A. Bose, C. H. Hauser, D. E. Whitehead, and G. C. Zweigle
 | INVITED PAPER | The bulk power system and power applications for wide area measurement are discussed in this paper and a set of baseline requirements for data delivery systems is derived.
- 952 A Multilevel State Estimation Paradigm for Smart Grids**
 By A. Gómez-Expósito, A. Abur, A. de la Villa Jaén, and C. Gómez-Quiles
 | CONTRIBUTED PAPER | The authors of this paper describe a multilevel state estimator architecture that can sustain growth in size, complexity of data, and information.
- 977 Translational Knowledge: From Collecting Data to Making Decisions in a Smart Grid**
 By M. Kezunovic
 | INVITED PAPER | Converting data to knowledge is the main concern of this paper, which provides a new data processing solution and illustrates it through several applications.
- 998 For the Grid and Through the Grid: The Role of Power Line Communications in the Smart Grid**
 By S. Galli, A. Scaglione, and Z. Wang
 | INVITED PAPER | The role of power line communications in the Smart Grid is addressed in this paper, which presents a review of what these communications can offer.
- 1028 Multigate Communication Network for Smart Grid**
 By H. Gharavi and B. Hu
 | INVITED PAPER | Wireless mesh networking is the main concern of this paper, which describes techniques to enhance network performance in terms of reliability, latency and throughput.
- 1046 High-Assurance Smart Grid: A Three-Part Model for Smart Grid Control Systems**
 By T. M. Overman, R. W. Sackman, T. L. Davis, and B. S. Cohen
 | INVITED PAPER | Cyber security and control for future Smart Grid systems is the topic of this paper, which recommends distributed control for grid management and hierarchical control for planning and dispatch.

DEPARTMENTS

- 915 POINT OF VIEW**
 Avoiding "Bit Rot": Long-Term Preservation of Digital Information
 By V. G. Cerf
- 917 SCANNING THE ISSUE**
 Smart Grid: The Electric Energy System of the Future
 By H. Gharavi and R. Ghafurian
- 1145 SCANNING OUR PAST**
 On Behalf of the Message
 By H. V. Kampen
- 1151 FUTURE SPECIAL ISSUES/SPECIAL SECTIONS**



On the Cover: This month we explore the Smart Grid: The Electric Energy System of the Future, and our cover is an unusual photograph of a partially illuminated power plant at night.

[Continued on page 914 ►]

SPECIAL ISSUE: Smart Grid: The Electric Energy System of the Future**1063 Options for Control of Reactive Power by Distributed Photovoltaic Generators**By *K. Turitsyn, P. Šulc, S. Backhaus, and M. Chertkov*

| CONTRIBUTED PAPER | This paper presents challenges and opportunities for distribution utilities, simulates options for managing reactive power, and discusses benefits of choosing local variables to control the system.

1074 Smart Distribution: Coupled MicrogridsBy *R. H. Lasseter*

| INVITED PAPER | The author of this paper believes that use of microgrids can simplify implementation of many Smart Grid functions, including reliability, self-healing, and load control.

1083 Advances in Wind Energy Technologies in the Context of Smart GridBy *M. Glinkowski, J. Hou, and G. Rackliffe*

| INVITED PAPER | Interconnection of large wind farms with the power grid can add a new degree of control to the power system, according to the authors of this paper.

1098 Adaptive Stochastic Control for the Smart GridBy *R. N. Anderson, A. Boulanger, W. B. Powell, and W. Scott*

| CONTRIBUTED PAPER | The main theme of this paper is that creation of the Smart Grid will provide self-healing capabilities and improved efficiency and allow load and source management for better performance.

1116 Vehicle Electrification: Status and IssuesBy *A. G. Boulanger, A. C. Chu, S. Maxx, and D. L. Waltz*

| INVITED PAPER | Current development and the challenges and opportunities for global adoption of electric vehicles are explored in this paper; these vehicles are said to empower people to effect change.

1139 The Role of Energy Storage in Development of Smart GridsBy *B. P. Roberts and C. Sandberg*

| INVITED PAPER | Energy storage aspects of the Smart Grid are discussed in this article; various storage technologies are reviewed and the importance of storage systems in electric grid operation is described.

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