
Editorial

Peter W. Sauer

University of Illinois
Urbana-Champaign, USA
E-mail: sauer@ece.uiuc.edu

Biographical notes: Peter W. Sauer obtained his BSEE from the University of Missouri at Rolla, and the MSEE and PhD degrees from Purdue University. He served as a Facilities Design Engineer in the US Air Force from 1969 to 1973. He is currently the Grainger Professor of Electrical Engineering at the University of Illinois at Urbana-Champaign. His main work is in modelling, simulation, and stability analysis of power systems. He was a co-founder of PowerWorld Corporation. He is a registered Professional Engineer in Virginia and Illinois, a Fellow of the IEEE, and a member of the National Academy of Engineering.

1 Introduction

This special issue focuses on the electricity infrastructure as a critical component of society and technology. The issue begins with a discussion of the risks associated with Critical Infrastructure Protection. This is followed by ten papers that were invited from a group of grantees that participated in the US National Science Foundation (NSF) and the US Office of Naval Research (ONR) initiative. The ten papers span the scope of the EPNC initiative and provide fundamental advances to the goals of that initiative. The primary goal was to build cross-interdisciplinary partnerships that allow more unified, coherent research to ensure reliable, secure, and efficient electric power networks. The initiative also encouraged investigation into socio-economic issues, environmental issues, new pedagogy and curricula to prepare a future workforce, and development of integrated tools on grand challenge benchmark systems.

2 Contributions

The first paper presents the need for international risk governance for critical infrastructures. The remaining ten papers make contributions in two broad areas:

1 Control

- micro-mechanical switching circuit breaker
- dynamic power buffers
- power routers
- autonomous agents for controlling failures
- dynamic residential load participation.

2 Analysis

- fault detection in induction motors
- intrusion detection in SCADA
- equilibrium in electricity markets
- modelling for power system expansion
- social impact based contingency screening and ranking.

The control papers include the use of intelligent switching technologies and agents to achieve new levels of flexibility and robustness to disturbances. The analysis papers provide new detection methods and advances in system planning and operations in a competitive environment. Collectively, this special issue provides initial results from projects that seek new techniques to improve power system efficiency and security.

3 Acknowledgements

Special thanks to Professor James Momoh of Howard University and Ms. Katherine Drew of ONR for organising the EPNES research initiative and making this publication possible. Thanks also to Dr. Lamine Mili for his assistance in organising this special issue.