

Tutorial proposal for EPE 2011

Title:

Tutorial on Configurations and Control of Wind Energy Conversion Systems

Authors:

Bin Wu, Yongqiang Lang, Navid Zargari, Samir Kouro

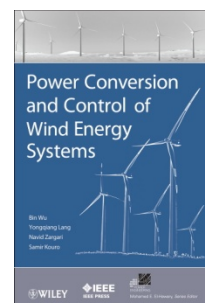
Abstract:

Wind energy is one of the fastest growing renewable energy sources of the last decade. The developments in generator, power converter and control technologies have contributed to a great extent to the increase in energy conversion efficiency, reliability, power quality and cost reduction of wind energy conversion systems (WECS). This tutorial provides a comprehensive and in-depth analysis on wind generators, power converters, and control schemes used in a variety of WECS. The tutorial covers both established and state of the art WECS configurations, and offers an overview of some promising new developments.

The tutorial is organized in nine sections, covering technology overview and market survey, electric generators and modeling, power converters and modulation techniques, wind turbine characteristics and configurations, and control schemes for fixed- and variable-speed wind energy systems. The tutorial also provides in-depth steady-state and dynamic analysis of squirrel cage induction generator, doubly fed induction generator, and synchronous generator based wind energy systems.

To illustrate the key concepts and address how to tackle real-world issues, the tutorial is complemented with several case studies, simulations and experiments.

Note: The tutorial is based on the book by the same authors entitled “Power Conversion and Control of Wind Energy Systems” to be published by Wiley-IEEE Press, May 2011.



Target audience

The expected audience includes but is not limited to:

- Undergraduate and postgraduate students in the field of power electronics
- Practicing engineers and researchers that want to get introduced or updated on wind energy conversion systems

Table of contents:

1. Introduction: Wind Energy Conversion Systems Overview
2. Fundamentals of Wind Energy Conversion System Control
3. Wind Generators and Modeling
4. Power Converters in Wind Energy Conversion Systems
5. Wind Energy System Configurations
6. Fixed-Speed Induction Generator WECS
7. Variable-Speed Wind Energy Systems Based on Squirrel Cage Induction Generators
8. Variable-Speed Wind Energy Systems Based on Doubly-Fed Induction Generator
9. Variable-Speed Wind Energy Systems Based on Synchronous Generators

Author information:

Name	Bin Wu
Title	Prof.
Affiliation	Department of Electrical and Computer Engineering, Ryerson University
Contact information	Address: 350 Victoria St., Toronto, Ontario M5B 2K3, Canada Phone: +1 416 979-5000 ext: 6484 Email : bwu@ee.ryerson.ca
Biography	<p>Prof. Wu received the Ph.D. degree in electrical and computer engineering from the University of Toronto, Toronto, ON, Canada, in 1993. After being with Rockwell Automation as a Senior Engineer from 1992 to 1993, he joined Ryerson University, Toronto, where he is currently a Professor and Natural Sciences and Engineering Research Council of Canada (NSERC)/Rockwell Industrial Research Chair in power electronics and electrical drives. He is the founder of the Laboratory for Electric Drive Applications and Research (LEDAR), Ryerson University. He has published more than 200 peer reviewed papers, authored a Wiley-IEEE Press book, and holds 27 issued/pending patents in the area of power electronics, energy systems, advanced controls, and adjustable-speed drives.</p> <p>Dr. Wu is an Associate Editor of the IEEE Transactions on Power Electronics and IEEE Canadian Review, a Fellow of the Engineering Institute of Canada, and a Registered Professional Engineer in the Province of Ontario. He is the recipient of the Gold Medal of the Governor General of Canada, the Premier's Research Excellence Award, a Ryerson Distinguished Scholar Award, a Ryerson Research Chair Award, and the NSERC Synergy Award for Innovation.</p>

Name	Yongqiang Lang
Title	Dr.
Affiliation	State Grid Electric Power Research Institute
Contact information	Address: 8 Nari Road, 210003, Nanjing, Jiangsu, China Phone: +86 139 1294 9006 Email: lyq2002hit@gmail.com
Biography	Dr. Lang received his Bachelor degree in Electrical Engineering from Harbin University of Science and Technology, China in 2000, and the Master and PhD degrees in Electrical Engineering from Harbin Institute of Technology, China in 2002 and 2006 respectively. From November 2006 to July 2009, he was a post-doctoral fellow at Ryerson University, Toronto, Canada. Currently he is a senior engineer in State Grid Electric Power Research Institute of China. His research interests include wind energy conversion system, solar energy conversion system and high power converter.

Name	Navid Zargari
Title	Dr.
Affiliation	Manager, Medium Voltage Research & Development Rockwell Automation
Contact information	Address: 135 Dundas St., N1R 5X1, Cambridge, On, Canada Phone: +1 519 740 4781 Email: nrzargari@ra.rockwell.com
Biography	Dr. Zargari received the B.Eng. degree from Tehran University, Iran, in 1987 and the M.A.Sc. and Ph.D. degrees from Concordia University, Montreal, Quebec, Canada, in 1991 and 1995 respectively. Dr. Zargari has been with the Medium Voltage R&D Department of Rockwell Automation, Cambridge since November 1994, first as a senior designer and currently as the manager of the Medium Voltage R&D department. For the past 15 years he has been involved with simulation, analysis and design of power converters for Medium Voltage AC drives. His research interests include power converter topologies and their control aspects, high power factor three phase rectifiers, VAR compensators, power semiconductors and renewable energy sources. Dr. Zargari is registered as a Professional Engineer in the Province of Ontario and is a Senior member of IEEE. He has co-authored more than 50 research papers and holds 10 US patents.

Name	Samir Kouro
Title	Dr.
Affiliation	Department of Electrical and Computer Engineering, Ryerson University
Contact information	Address: 350 Victoria St., Toronto, Ontario M5B 2K3, Canada Phone: +1 416 979 5000 ext. 2065 Email: samir.kouro@ieee.org
Biography	Dr. Kouro was born in Valdivia, Chile, in 1978. He received the M.Sc. and Ph.D. degrees in electronics engineering from the Universidad Técnica Federico Santa María (UTFSM), Valparaíso, Chile, in 2004 and 2008, respectively. In 2004 he joined as Research Assistant the Electronics Engineering Department of UTFSM, and became Associated Researcher in 2008. Since 2009 he is a Post Doctoral Fellow at Ryerson University, Toronto, ON, Canada. His main research interests include power converters, variable-speed drives and renewable energy conversion systems. Dr. Kouro has coauthored 1 book, 2 book chapters and over 40 refereed journal

	<p>and conference papers. He was distinguished by the President of the Republic as the youngest researcher of the Chilean National Fund of Scientific and Technological Development (FONDECYT) in 2004. He is co-recipient of the IEEE Industrial Electronics Magazine Best Paper Award of 2008 from the IEEE Industrial Electronics Society.</p>
--	---