

Special Issue on “Power Electronics in Renewable Energy Systems”

The electrical energy consumption in Poland, as well as over the world, is still rising and we observe a steady demand to increase the capacity of power generation equipment. Generation, distribution and the use of energy should be as technologically efficient as possible and should also stimulate saving and conservation at the end user. The process of the energy market deregulation has reduced interest in investment in large power plants and opened the need for new energy sources. It is expected that two major technologies will play a key role in solving future energy problems:

- Replacement of the electrical energy production from conventional fossil based (coal, natural gas, and oil) sources to renewable energy sources (wind, sun, and hydro),
- Wide usage of high efficient, reliable power electronic converters in production, distribution and end-user systems.

An emphatic example is wind energy which – thanks to application of power electronics – is changing from being a minor energy source to currently playing an important role as a source in the energy system. Similar development is observed in PV systems installation.

Therefore, this Special Issue is devoted to presentation of the recent research trends in application of power electronic converters in distributed systems of renewable energy sources. This Issue is grouped in following main categories.

GRID INTEGRATION OF DISTRIBUTED AND WIND POWER SYSTEMS

- *Integration of distributed energy sources with electrical power grid* by I. Wasiak, Łódź University of Technology, and Z. Hanzelka, AGH University of Technology, Kraków, Poland
- *Improved grid integration of wind energy systems* by D. Schultz, Helmut Schmidt University, Hamburg, Germany

These papers discuss problems related to grid integration of distributed sources, and wind energy integration in Germany, respectively.

THREE-PHASE GRID CONNECTED CONVERTERS

- *Cooperation of induction squirrel-cage generator with grid connected AC/DC/AC converter* by A. Sikorski and A. Kuzma, Białystok University of Technology, Poland
- *Control and modulation methods of voltage source converter* by G. Radomski, Kielce University of Technology, Poland
- *Control of PWM rectifier under grid voltage dips* by M. Bobrowska-Rafał, K. Rafał, G. Abad and M. Jasinski, Warsaw University of Technology, Poland and Mondragon University, Spain

These papers are dedicated to study properties of the three-phase grid connected voltage sourced converters (VSC) which are widely used in wind and sea wave energy production. Control properties and methods to increase reliability of operation under voltage dips and higher grid harmonics are presented.

SINGLE-PHASE CONVERTERS FOR RENEWABLE SOURCES

- *Power electronic converter for photovoltaic systems with use of FPGA-based real-time modeling of single phase grid-connected systems* by S. Piróg, R. Stala and Ł. Stawiarski, AGH University of Technology, Kraków, Poland
- *Single-phase full bridge inverter with coupled filter inductors and voltage doubler for PV module integrated converter system* by Y. Jiang and J. Pan, Shanghai Jiao Tong University, China
- *A bidirectional DC/DC converter for renewable energy systems* by S. Jałbrzykowski and T. Citko, Białystok University of Technology, Poland

These papers are mainly dedicated to study and investigation of single-phase converters used in PV installation.

SPECIAL ISSUE OF POWER ELECTRONIC CONVERTERS

- *Improvement in the efficiency of the distributed power systems* by G. Benysek, University of Zielona Góra, Poland
- *High efficiency contactless energy transfer system with power electronic resonant converter* by A.J. Moradewicz, Electrotechnical Institute, Warsaw, Poland, and M.P. Kazmierkowski, Warsaw University of Technology, Poland
- *Selected conducted electromagnetic issues in distributed power systems* by R. Smoleński, University of Zielona Góra, Poland.

These papers discuss how to improve the efficiency at end-user, solution for contactless energy transfer as well as problems related to electromagnetic interference in distributed systems.

I would like to express my appreciation to the authors of this Special Issue for the high quality of their work and cooperation during the review process. Also, I would like to thank all reviewers for their valuable comments and suggestions which contributed significantly to improve the paper quality. Special thanks to Prof. Tadeusz Kaczorek, Editor-in-Chief of the Bulletin of PAS, for giving me opportunity to organize this Special Issue. Finally, I would like to thank to Ewa Kiczko, Editorial Office Secretary for her assistance and support in the management of the paper review and copyediting.

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