



Editorial

Optimization methods in renewable energy systems design



Sustainability is of great importance due to increasing demands and limited resources worldwide. In particular, in the field of energy production and consumption, methods are required that allow to produce energy in an efficient way, as well as to develop methods for the efficient usage of energy. The vast extension of energy sources and the growing information structure allow a fine screening of energy resources, but also require the development of tools for the analysis and understanding of huge datasets about the energy grid. Key technologies in future ecological, economical and reliable energy systems are energy prediction of renewable resources, prediction of consumption as well as efficient planning and control strategies for network stability.

To enable financially and ecologically viable projects, optimization methods have taken over a key role for planning, optimizing and forecasting sustainable systems. Typically, these approaches make use of domain knowledge in order to achieve the required goal. Even in the case that explicit domain knowledge is not available, specialized methods can also handle large raw numerical sensory data directly, process them, generate reliable and just-in-time responses, and have high fault tolerance.

The main goal of this Special Issue (SI) is to promote the research on optimization methods for their application to the renewable energy production and consumption domain.

Our SI attracted an overwhelming number of submissions. The submitted 135 articles cover a very wide range of topics related to the production of renewable energy:

- Algorithms for modeling, control, and optimization
- Prediction of wind and photovoltaic energy
- Prediction and monitoring of energy consumption
- Communication and control
- Demand side management
- Distributed energy resources
- Methods and algorithms for real-time analysis
- Planning, operation and control
- Plug-in vehicles
- Renewable energy
- Smart micro-grids
- Smart sensing
- Virtual power plants

For this particular issue of the Renewable Energy journal, we decided to accept 18 articles.

- (1) The first seven of these articles focus on different aspects of wind energy production, such as the blade design [1–3],

component failures [4], controller design [5], and also turbine modeling [6] and wind speed prediction [7]. Different single-objective [1–5] and multi-objective [6,7] optimisation approaches were used by the authors in their research.

- (2) The subsequent six articles are concerned with the bigger picture around the management of energy systems. First, aspects of building management [8], and community management [9] are investigated, as is dynamic pricing [10]. Then, three articles look at smarter ways to incorporate generators [11] and consumers such as fridges [12] and motors [13].
- (3) The final five articles deal with larger systems of components. First, two articles report on different models and the optimisation of bio-mass supply chains in general [14], and on biomass growth and regeneration [15]. Finally, the readers can learn about different heterogeneous systems that involve solar and wind technology [16,17] and hydropower and solar technology [18].

Please note that, as the final decision for several articles was pending by the cut-off deadline, it was decided to publish the subsequently accepted articles as regular papers in this journal.

Finally, on behalf of the scientific committee, we would like to express our sincere gratitude to the Editor of Renewable Energy, Professor Soteris Kalogirou and his team for their support. We also would like to thank all the reviewers of this special issue for their valuable feedback.

1. Comment

This SI is organised by the IEEE CIS Task Force on “Computational Intelligence in the Energy Domain”.

(<http://cs.adelaide.edu.au/~markus/CIS-TF-Energy/>).

List of articles

- [1] A. Pourrajabian, P.A.N. Afshar, M. Ahmadizadeh, D. Wood, Aero-structural design and optimization of a small wind turbine blade, *Renew. Energy* 87 (2016) 837–848.
- [2] D. Vučina, I. Marinić-Kragić, Z. Milas, Numerical models for robust shape optimization of wind turbine blades, *Renew. Energy* 87 (2016) 849–862.
- [3] A. Essia, H. Cherif, K. Badreddinne, Optimization of a thruster sections by Prandtl's theory, *Renew. Energy* 87 (2016) 863–868.
- [4] F.P.G. Márquez, J.M.P. Pérez, A.P. Marugán, M. Papaelias, Identification of critical components of wind turbines using FTA over the time, *Renew. Energy* 87 (2016) 869–883.
- [5] P.F. Odgaard, L.F.S. Larsen, R. Wisniewski, T.G. Hovgaard, On using pareto optimality to tune a linear model predictive controller for wind turbines, *Renew. Energy* 87 (2016) 884–891.

- [6] W. La Cava, K. Danai, L. Spector, P. Fleming, A. Wright, M. Lackner, Automatic identification of wind turbine models using evolutionary multiobjective optimization, *Renew. Energy* 87 (2016) 892–902.
- [7] N.A. Shrivastava, K. Lohia, B.K. Panigrahi, A multiobjective framework for wind speed prediction interval forecasts, *Renew. Energy* 87 (2016) 903–910.
- [8] I. Mauser, J. Müller, F. Allering, H. Schmeck, Adaptive building energy management with multiple commodities and flexible evolutionary optimization, *Renew. Energy* 87 (2016) 911–921.
- [9] R. Verschae, H. Kawashima, T. Kato, T. Matsuyama, Coordinated energy management for inter-community imbalance minimization, *Renew. Energy* 87 (2016) 922–935.
- [10] Y. Yoon, Y.-H. Kim, Effective scheduling of residential energy storage systems under dynamic pricing, *Renew. Energy* 87 (2016) 936–945.
- [11] C. Ma, P. Kaufmann, J.-C. Töbermann, M. Braun, Optimal generation dispatch of distributed generators considering fair contribution to grid voltage control, *Renew. Energy* 87 (2016) 946–953.
- [12] M. Martin Almenta, D.J. Morrow, R.J. Best, B. Fox, A.M. Foley, Domestic fridge-freezer load aggregation to support ancillary services, *Renew. Energy* 87 (2016) 954–964.
- [13] A. Chitra, S. Himavathi, Investigation and analysis of high performance green energy induction motor drive with intelligent estimator, *Renew. Energy* 87 (2016) 965–976.
- [14] B. Holo Ba, C. Prins, C. Prodhon, Models for optimization and performance evaluation of biomass supply chains: an operations research perspective, *Renew. Energy* 87 (2016) 977–989.
- [15] A. De Meyer, D. Cattrysse, J. Van Orshove, Considering biomass growth and regeneration in the optimisation of biomass supply chains, *Renew. Energy* 87 (2016) 990–1002.
- [16] D. Neves, M.C. Brito, C.A. Silva, Impact of solar and wind forecast uncertainties on demand response of isolated microgrids, *Renew. Energy* 87 (2016) 1003–1015.
- [17] H. te Heesen, V. Herbort, Development of an algorithm to analyze the yield of photovoltaic systems, *Renew. Energy* 87 (2016) 1016–1022.
- [18] I. Kougias, S. Szabó, F. Monforti-Ferrario, T. Huld, K. Bódis, A methodology for optimization of the complementarity between small-hydropower plants and solar PV systems, *Renew. Energy* 87 (2016) 1023–1030.

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