An Introduction to the Special Issue on Advanced Control of Energy Systems

M. Azzouzi [1], F. Neri [2]
[1] Faculty of Sciences and Technology,
Ziane Achour University of Djelfa, Djelfa, ALGERIA,
[2] Editor in Chief of WSEAS Transactions on Systems,
Department of Computer Science, University of Naples "Federico II", Naples, ITALY
Dr.Azzouzi@yahoo.fr, nerifil@gmail.com

The special Issue “Advanced Control of Energy Systems” aims to collect high quality papers, that show novel methods, ideas, and results, which advance the state of the art in the area of control of energy systems which is considered as an actual focused research area.

Conventional energy sources are costing very high and they encounter enormous problems. The fact that encourages the use of other new sources of energy that helps us to meet our daily needs and to ensure the industrial production. These sources have shown recently satisfactory results, as they start to substitute conventional sources in soon future.

The main purpose of this special issue is the need to optimally integrate and to control these resources across multiple scales from the local level to the global energy system, by providing solutions to the various problems encountered during the system operation, and to optimize the energy production while maintaining a healthy environment.

Algorithms for the maximum power tracking (MPPT), hybrid optimization algorithm and the set-up transformers was the principal techniques that was discussed and theoretically/ practically developed because they are often used to help in increasing the yield of the renewable energy systems.

A simulation had been developed of improved incremental conductance method for maximum power point tracking (MPPT) using DC-DC cuk converter. This improved algorithm is used to track MPP because it performs precise control under rapidly changing Atmospheric conditions. The MPPT fuzzy logic control gives in general good performances and more robustness to variations of the solar irradiation. The obtained results prove that the proposed control system is capable to track MPP with performance, simplicity and fast response.

A design technique is proposed to optimally select the step-up transformer, either on conventional PV plants, either on PV plants with energy storage. It is based on the evaluation of initial and operating costs. Moreover, the effects of induced network instabilities are also considered. Taking into account full life costs optimal solutions have been detected according to the network power control capabilities for a 2 MW PV plant.

The proposed approach is based on the evaluation of a probabilistic index the LPPP, to estimate the costs of energy losses related to the size of the transformer and the power and the storage capability of the ESS. Moreover, energy losses related to grid instabilities are also considered. Taking into account full life costs optimal solutions can be detected according to the grid power control capabilities.

A novel hybrid optimization algorithm, which combines a firefly algorithms and Artificial Bee Colony algorithm (FFA- ABC), is proposed for solving the economic power dispatch (EPD) problem. The hybrid algorithm involves two level of optimization, namely global search by the ABC and local search by the FFA, which cooperates in a global process of optimization. It can provide more robust convergence. The method developed was tested on the IEEE 30 bus and IEEE 57 bus. The case studies have shown that method is robust and can provide an optimal solution with fast computation time and a small number of iterations.