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*Editorial*

# Advanced Controls in Complex Clean Energy Devices, Subsystems, and Processes

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One of the mayor challenges facing current society is to transform its energy model, allowing for secure, affordable, and efficient energy. The search for new energy sources with a minimal impact on the environment has brought about new complex technical solutions that require novel control algorithms in their path to commercialization.

This is special issue aims to increase the performance and reliability of complex clean energy devices, subsystems, and processes by developing control solutions based on alternative approaches. The articles provide controls that improve the performance and reliability of complex devices or components targeting clean energy. Contributions containing research to predict, diagnose, monitor, and manage the state or condition of engineering assets using various advanced controls have been considered.

We received a total of twenty submissions, and after two rounds of rigorous review, nine papers were accepted.

Z. Jin et al. in their paper titled "Design, Modeling, and Experiments of the Vortex-Induced Vibration Piezoelectric Energy Harvester with Bionic Attachments" propose a bionic attachment structure that widens the bandwidth and efficiency of a piezoelectric energy harvester. Compared with the smooth cylinder which is taken as a carrier, in the harvester with the bionic structure the threshold speed decelerates from 1.8m/s to 1 m/s while the bandwidth increases from 39.3% to 51.4%, while its output power enhances from 0.48 to 0.56 mW. See, for example, [1].

C. Zhang et al. in their paper titled "Multiobjective Optimization of a Fractional-Order PID Controller for Pumped Turbine Governing System Using an Improved NSGA-III Algorithm under Multiworking Conditions" improve the pump turbine governing system, PTGS. This is the core control system of the pumped storage power station which is responsible for regulating the unit power, which plays an important role in maintaining the grid's requirements balancing power supply and demand. The fractional-order PID controller under single working conditions is extended to a multiobjective framework. To establish the cost function, the integral of the time absolute error index of PTGS running at low and high working water heads is considered. Finally, an improved nondominated sorting genetic algorithm III based on Latin hypercube sampling and chaos theory (LCNSGA-III) is proposed to solve the optimization problem. See also [2].

E. Otaola et al. in their paper titled "A Comparative Analysis of Self-Rectifying Turbines for the Mutriku Oscillating Water Column Energy Plant" present an analysis the performance of different self-rectifying turbines. This turbine comparison is carried out for the oscillating water column converters located at the Mutriku wave energy power plant. Further details may also be found in [3].

J.-L. Casteleiro et al. in their paper titled "Fuel Cell Output Current Prediction with a Hybrid Intelligent System" present a dynamic model of a real hydrogen fuel cell in order to apply hybrid control strategies The use of a hybrid scheme improves the performance of neural networks reducing to half the mean squared error obtained for a global model of the fuel cell. See also [4].

R. Gammoudi et al. in their paper titled "Estimation of Climatic Parameters of a PV System Based on Gradient

Method" present a novel formulation for a photovoltaic generator. The model is based in its current-voltage characteristic whose appearance depends on the climatic conditions (temperature and solar radiation). These two parameters are estimated from an experimental curve Ipv (Vpv), using novel mathematical calculation strategy. Similar approach may be found in [5].

A. Marco et al. in their paper titled "A Variable Structure Control Scheme Proposal for the Tokamak à Configuration Variable" present and apply a Sliding Mode Controller to the plasma current control problem, using the RZIp model for the Tokamak à Configuration Variable (TCV) reactor. See also [6].

H. E. Espitia et al. in their paper titled "Proposal of an Adaptive Neurofuzzy System to Control Flow Power in Distributed Generation Systems" describe the implementation of an adaptive neurofuzzy system for voltage control for a distributed generation system. Previous research may be found in [7].

S. V. Medina et al. in their paper titled "Performance Sensitivity of a Wind Farm Power Curve Model to Different Signals of the Input Layer of ANNs: Case Studies in the Canary Islands" improve the estimation of the power output of a wind farm. A wind farm power curve model is developed using artificial neural networks, and a study is undertaken of the influence on model performance when parameters such as the meteorological conditions (wind speed and direction) of areas other than the wind farm location are added as signals of the input layer of the neural network. Further research on wind farm for Canary Island may be found in [8].

R. De-Luca et al. in their paper titled "Meteorological Data-Based Optimal Control Strategy for Microalgae Cultivation in Open Pond Systems" present a control and optimization strategy for outdoor biofuel production from microalgae. It is based on weather forecast coupled to a detailed predictive model of algal productivity to online optimize the rates of fresh medium injection and culture removal into and from the pond. See also [6].

## Conflicts of Interest

The authors declare that there are no conflicts of interest.

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