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Optimal Control of Fuel Cells and Wind Turbines

Guest Editor:

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Message from the Guest Editor

Dear colleagues,

Proton exchange membrane fuel cells (PEMFC) are the best understood and most developed fuel cells. Optimal controllers can be found in electric vehicles powered by PEMFC. Optimal controllers can be designed for PEMFF for optimal trajectory tracking, and optimal robust (H-infinity) control. In the case of solid-oxide fuel cells (SOFC), which in addition to electric energy provide a lot of heat and are also utilized for heating, optimal controllers can be designed for load tracking of grid-connected SOFC, optimal robust control to maintain safe operations with maximum efficiency under load and uncertainty variations, optimal fault-tolerant control, and optimal temperature control. In general, optimal controllers are needed for power management and power flow control in hybrid fuel cell/solar/wind/battery/ultra-capacitor systems. Optimal controllers can be also designed for other types of fuel cells, for example, optimal control for load changes in molten carbonate fuel cells and optimal control for methanol fuel cells to maintain optimal methanol concentration.

Optimal controllers for wind turbines can be designed for rotor control, pitch control, vibration control, optimal transient response, torque control, optimal power extraction, optimal energy management, fault-tolerant control, variable speed control, optimal power sharing control, robust (H-infinity) control, maximum power tracking, and other aspects of wind turbine dynamics and operations. These controllers can be designed either for individual wind turbines or for wind farms. Optimal controllers can be also used for hybrid wind/solar/battery/fuel cell systems. Since wind turbines have mechanical, electrical, and electronic components, their dynamics evolve in several time scales. The design of optimal multi-time scale controllers for wind turbines is a research area that has not been fully explored yet. Both deterministic and stochastic controllers are suitable for optimal control of wind turbine dynamics and operations.

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Message from the Editor-in-Chief

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