Energy dispatching based on predictive controller of an off-grid wind turbine/photovoltaic/hydrogen/battery hybrid system

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This paper presents a novel energy dispatching based on Model Predictive Control (MPC) for off-grid photovoltaic (PV)/wind turbine/hydrogen/battery hybrid systems. The renewable energy sources supply energy to the hybrid system and the battery and hydrogen system are used as energy storage devices. The denominated "hydrogen system" is composed of fuel cell, electrolyzer and hydrogen storage tank. The MPC generates the reference powers of the fuel cell and electrolyzer to satisfy different objectives: to track the load power demand and to keep the charge levels of the energy storage devices between their target margins. The modeling of the hybrid system was developed in MATLAB-Simulink, taking into account datasheets of commercially available components. To show the proper operation of the proposed energy dispatching, a simpler strategy based on state control was presented in order to compare and validate the results for long-term simulations of 25 years (expected lifetime of the system) with a sample time of one hour.

Energy dispatching

Hydrogen system

Off-grid system

Predictive control

Renewable energy

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Fuel cells

Hybrid systems

Hydrogen

Hydrogen storage

Model predictive control

Renewable energy resources

Wind turbines

Energy dispatching

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Predictive control systems

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numerical model

simulation

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energy resource

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photovoltaic system

renewable resource

software

wind turbine