

Load Frequency Control of Standalone Microgrid By MFO-WC Based PID Controller

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Abstract

The standalone microgrids are sensitive to frequency deviations due to fluctuation in renewable generation and changes in load demand. Worthwhile and effective frequency control requires swift actions, minimal overshoot, and sustained stability under variation and disturbances. In this paper Proportional-Integral-Derivative (PID) controller is tuned by using the advanced hybrid Moth-Flame Optimization (MFO) and Water Cycle Algorithm (WCA) to enhance the frequency response of autonomous microgrid. In The hybrid MFO-WC algorithm, the MFO provide strong global exploration capability while the WCA gives the fast local convergence of best solution. Which improve the efficiency of parameter tuning and prevent from premature stagnation in local minima. The objective function is stated using the Integral of Time Absolute Error (ITAE) to minimize oscillation, overshoot, and settling time. The Simulation model of standalone microgrid is studied in MATLAB software with PID tuning. The results illustrate that the hybrid MFO-WC-tuned PID controller significantly improves dynamic frequency performance compared to conventional PID tuning and standalone optimization techniques.

Keywords

Microgrid, PID controller, hybrid MFO-WC, MATLAB.