Droop Control Optimization Based on Gray Wolf Optimizer for AC-Microgrid

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Abstract Since the establishment of microgrids, the frequency stability and reliability in operating the voltage of microgrids have become necessary due to local sources of reactive power. Droop control technology has been successfully applied to this problem and remains popular today. This study proposes a control strategy that can be utilized to power-sharing and adjust the voltage and frequency appropriately according to the load condition. The main aim of the research is to control the frequency and voltage of microgrids under various conditions by using two algorithms, the Gray Wolf Optimizer (GWO) and Kepler Optimization Algorithm (KOA) to optimize the droop control and optimize the PI controller parameters. Simulation findings using Simulink in MATLAB demonstrate the performance of the suggested microgrid stability techniques. Finally, to evaluate the efficiency of the suggested control strategy, its results are compared with conventional methods.

Keywords Microgrid · Droop control · Gray wolf optimizer · Kepler optimization algorithm · Frequency and voltage regulation

1 Introduction

Renewable Energy Sources (RES) are becoming more critical in the quickly changing energy systems. One of the major impacts of the rising global demand for energy is the swift integration of microgrids and distributed generation sources (DGs) that use renewable resources like wind, photovoltaic systems, and fuel cells [1]. Most (DG) units are linked to the grid through power electronic converters, which can lead to system resonance and issues with protection. The energy output (both the size and shape of voltage and current) from distributed generation is not suitable

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