

International Review of Electrical Engineering (IREE), Vol 20, No 4 (2025)**A Review of Optimization Methods for Frequency Stability of the Power Systems***Tabempe Edgar Lesenyeho, Senthil Krishnamurthy***Abstract**

The rapid increase of renewable energy sources has introduced new challenges for frequency stability in innovative grid systems. As inverter-based resources displace conventional synchronous generators, system inertia diminishes, making frequency regulation and stability a concern. This literature review examines the evolution and effectiveness of optimization methods for enhancing frequency stability in smart grids. Classical control techniques, such as droop control, load frequency control, and inertia control, are analyzed in terms of their efficacy in maintaining frequency response under varying load and frequency conditions. Furthermore, the paper provides a critical survey of heuristic optimization algorithms, including Particle Swarm Optimization (PSO), Genetic Algorithm (GA), and Gravitational Search Algorithm (GSA), as well as their variants. These methods are utilized to optimize controller parameters, enhance system stability, and improve the transient response of the power system network. The paper serves as a valuable source of guidance for businesses, employees, researchers, and scholars, and catalyzes further research by inspiring and guiding future explorations. This paper highlights the potential improvements to existing techniques, as well as the strengths and limitations of the methods used. The study discusses key research areas, challenges, strengths, weaknesses of the proposed method, literature gaps, and future recommendations.