# Using quasi-oppositional butterfly optimization algorithm, a probabilistic optimal power flow for a combined tidal and electric vehicle renewable energy system

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**Abstract:**
Aiming to reduce operating expenses and emissions while satisfying system restrictions, optimal power flow, or OPF, is essential for effective and sustainable power system management. Quasi-Oppositional Based Learning (QOBL) is added to the butterfly optimization algorithm in this research to improve convergence and solution accuracy when solving the OPF issue. When tested on the IEEE 57-bus system, the suggested QOBOA outperforms current optimization methods in terms of transmission loss and voltage profile improvement. Combining renewable energy sources is crucial for efficient electricity generation because fossil fuel sources are becoming more and more improved every day. The suggested solutions integrate renewable energy sources, such as tidal and electric vehicles, to reduce the demand for fossil fuels in the generation of electricity. Furthermore, the suggested approach has a great deal of promise for improving the adaptability and resilience of contemporary power grids, particularly in light of the growing integration of decentralized energy resources (DERs) and renewable

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### I. Introduction

A network that transfers energy from generators to loads is called a power system. The power system network allows the transfer of energy from generators to loads.Modern power system networks are becoming more complex to plan and operate due to factors such as significant power transfers over a greater distance, intricate coordination, challenging interactions between different system controllers, and reduced power reserves. Power system operators have always put a high premium on the safe [...] ystem.When a power system can

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system networks are becoming more complex to plan and operate due to factors such as significant power transfers over a greater distance, intricate coordination, challenging interactions between different system controllers, and reduced power reserves. Power system operators have always put a high premium on the safe and dependable operation of the system.When a power system can endure abrupt disruptions with little loss of quality of service—that is, when a disturbance happens, the system endures the resulting transient and