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ORIGINAL RESEARCH PAPER

Optimal Power Flow of Multi-objective Combined Heat and Power with Wind-Solar-Electric Vehicle-Tidal Using Hybrid Evolutionary Approach

Chandan Paul[1] · Tushnik Sarkar[1] · Susanta Dutta[1] · Sunanda Hazra[2] · Provas Kumar Roy[3]

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Abstract

Determining effective power generation while reducing emissions, voltage deviations, and preserving transmission line voltage stability is the goal of the proposed effort. In this presentation, the combined heat and power of economic dispatch (CHPED) system is implemented in the IEEE-30 bus to assure the best possible power flow in the transmission line while fulfilling the load demand. As the source of fossil fuel is improvising day by day it is an important aspect to combine renewable energy sources for effective power generation. Renewable energy sources including wind, solar, electric vehicles, and tidal are integrated with proposed systems to lessen the need for fossil fuels in the production of electricity. The system became more complex as a result of the presence of wind uncertainty, valve point impact, and transmission losses. To enhance system performance in dealing with non-linearity, the multi-trial vector-based monkey king evolution technique uses training-based optimization to guide control choices. To improve the search capability of the proposed technique, the suggested method mixes chaotic-op-positional-based learning (COL) with MMKE (COMMKE). The suggested COMMKE algorithm has been tested for three distinct test systems for a proposed system with and without renewable sources. In terms of convergence rate and best possible solution to the objective functions, the proposed algorithm outperforms other optimization techniques. The robustness of the recommended optimization technique has been evaluated by statistical analysis. To make this scrutiny in a rigorous manner such that the robustness of the proposed technique can be judged more reliably, an analysis of variance (ANOVA) test is employed. To address the superiority of the intended method, a comparison with tried-and-true optimization strategies has been made.

Keywords CHPED · Optimal power flow (OPF) · IEEE-30 bus · Wind energy · Solar energy · Electrical vehicle (EV) · Tidal power · Multi-trial vector-based monkey king evolution (MMKE) · Chaotic-oppositional-based (MMKE) (COMMKE)

✉ Chandan Paul
chandan815@rediffmail.com

Tushnik Sarkar
tushnik.sarkar@bcrec.ac

Susanta Dutta
susanta.dutta@bcrec.ac.in

Sunanda Hazra
sun.hazraee50@gmail.com

Provas Kumar Roy
provas.roy@kgec.edu.in

[1] Department of Electrical Engineering, Dr. B. C. Roy Engineering College, Durgapur, India

[2] Department of Electrical Engineering, Budge Budge Institute of Technology, Kolkata, West Bengal, India

[3] Department of Electrical Engineering, Kalyani Government, Kalyani, West Bengal, India

Introduction

Every thermal power plant releases heat into the atmosphere while producing thermal electricity, either through the cooling towers, the flue gas discharge, or some other mechanism. The byproducts generated during heating, which include nitrogen oxide, sulfur oxide, sulfur dioxide, and carbon dioxide, cause the energy efficiency of power-developing units to decline to an extremely low value (between 50 and 60%), and the atmosphere is subsequently contaminated. Issues pertaining to combined heat and power economic dispatch (CHPED) are critical in the field of power system research. The amount of waste heat from the steam is used to reduce the amount of pollutants released into the atmosphere and the expense of manufacturing. The heat recovery steam generator in CHPED uses chillers to recover heat lost during the production of steam and cooling. Because CHPED

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