

POWER ECONOMIC DISPATCH USING WATER CYCLE ALGORITHM



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POWER ECONOMIC DISPATCH USING WATER CYCLE ALGORITHM

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Dedication

Dedicated to my loving parents

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ABSTRACT

Modern living standards, industrial development and population escalation has altered various aspects of traditional power industry. This changed situation has altered power generation practice due to concerns like rapidly increasing fuel cost, ever growing electricity demand, environmental pollution etc. Therefore, competition in electricity market has been increased to ensure provision of electricity to the consumers with highest quality at minimum cost.

In power generation, the operational planning is a major activity which includes the superlative employment of the available energy resources subjected to various constraints. Economic dispatch (ED) is the extremely challenging part of power system operational planning and is defined as a complex constrained engineering optimization problem that aims to calculate power generation of the generating units in a power system for minimum generation cost, subject to constraints.

Traditionally, Economic Dispatch (ED) has been expressed as a convex optimization problem solved with the help of conventional optimization techniques. The conventional techniques include Equal Incremental Cost Criterion, Newton's Method, Lambda Iteration Method, Linear Programming, Non-Linear Programming, Dynamic Programming etc. But economic dispatch in modern power systems is highly complex due to non-smooth (or non-convex) objective functions and various newly added constraints. The conventional optimization techniques are not capable in effectively solving this complex problem. In literature, various stochastic optimization techniques have been employed to solve non-convex economic dispatch problem and the research is being continued to achieve the best possible solution.

This research presents implementation of Water Cycle Algorithm (WCA) on economic dispatch problem. WCA is a novel metaheuristic population based algorithm, recently introduced for solving constrained engineering optimization problems. In this research, WCA has been tested on various standard test systems and its effectiveness has been verified by comparing the simulation results with those of other algorithms in literature. Simulation results have been calculated using Matlab.

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List of Abbreviations

HDIP	Hydrocarbon Development Institute of Pakistan
ED	Economic Dispatch
DP	Dynamic Programming
EP	Evolutionary Programming
PSO	Particle Swarm Optimization
GA	Genetic Algorithm
ABC	Artificial Bee Colony
ANN	Artificial Neural Networks
WCA	Water Cycle Algorithm
DED	Dynamic Economic Dispatch
E&ED	Emission and Economic Dispatch
MW	Mega Watt
Btu	British Thermal Units
CGPED	Compensating Generation Plan Economic Dispatch
MPSO	Modified Particle Swarm Optimization
NPSO	New Particle Swarm Optimization
DE	Differential Evolution
PSDEO	Particle Swarm Differential Evolution Optimization
CEED	Combined Economic Emission Dispatch
DEED	Dynamic Economic Emission Dispatch