thesis

by Rizwan Hanif

Submission date: 23-Feb-2018 04:19AM (UTC-0500)

Submission ID: 920217304

File name: less_chapters_1.docx (462.32K)

Word count: 11865

Character count: 67514

Multi Objective Economic Dispatch Problem of Micro Grid with Integrated Vehicle to Grid

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Session-2015

A Report Islamabad submitted to the Department of Electrical Engineering

Bahria University,

in partial fulfilment of the requirement for the degree of MS (EE)

CERTIFICATE				
We accept the work	contained in this report as a confirm	nation to the required	standard for the	
partial fulfilment of	the degree of MS (EE).			
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DEDICATION	
I, Rizwan Hanif dedicated this thesis to my parents, professor and friends who supp	port,
motivate and encourage me throughout the project, without them it would not possible	le.

DECLARATION OF AUTHORSHIP

I <u>Rizwan Hanif Reg. # 01-244152-027</u> hereby declare that content of this thesis is my own work and that it is the result of work done during the period of registration. To the best of my knowledge, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgement has been made in the text.

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ACKNOWLEDGEMENTS

I would first like to thank my thesis advisor Dr. Asad Waqar of the department of electrical engineering at Bahria University, Islamabad. The door to Dr. Asad Waqar office was always open whenever I ran into a trouble spot or had a question about my research or writing. He consistently allowed this thesis to be my own work, but steered me in the right direction whenever he thought I needed it.

Finally, I must express my very profound gratitude to my parents and to my siblings for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this thesis. This accomplishment would not have been possible without them. Thank you.

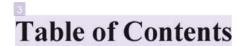
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ABSTRACT

The Power Economic Dispatch (PED) is the most important factor for the efficient operation and control of the power system. The PED is a problem related to the proper allocation of the available electrical power generating sources in order to meet the power demand at a minimized cost. Different conventional techniques are used to solve the PED problem by considering it as a conventional problem. The different conventional techniques used are Particle Linear Programming (LP), Lambda Iteration Method (LIM) and Dynamic Programming (DP) etc. The conventional techniques are not efficient enough to solve the complex PED problems. Different Artificial Intelligence (DAI) algorithms like particle Swarm Optimization (PSO), Artificial Neural Networks (ANN) and Fuzzy Logic etc. are also used to solve the non-convex PED problems.

The complexity of the PED is also increased with the increased number of sources available for power generation in the power system. The addition of the Electric Vehicles (EVs) also increases the complexity of PED problem. Most of the optimization techniques used for PED does not consider the emission constraints of the available sources while solving the PED problem. The Multi Objective Economic Dispatch Problem (MOEDP) of a Micro-Grid (MG) is established in the proposed research in which the emission constraints of the power generating sources are also considered. The power generating sources included in the proposed MG are the Wind Turbines (WTs), Photovoltaic Cells (PVs), Diesel Engine (DE), Battery Storage (BS), Fuel Cells (FCs) and EVs. The micro-grid is connected to the main grid by the distribution lines and allowed bi-directional flow of power i.e. from main grid to MG and from MG to the main grid. The Artificial Algae Algorithm (AAA) using MATLAB is used to solve the PED problem in the proposed research and the results are compared with the other optimization techniques. The comparative analysis shows that the results of AAA are better in terms of economics, emissions and convergence rate.



2.3 Literature Review	
2.4 Discussion	
CHAPTER 3	29
3.1 Modeling of Electric Vehicle	29
3.2 Problem Formulation	34
CHAPTER 4	42
4.1 Artificial Algae Algorithm	42
4.2 Case Study	45
4.3 AAA Analysis	50
CHAPTER 5	60
5.1. Conclusions	60
5.2. Future Work	60
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LIST OF FIGURES

Figure 1. 1: Natural Oil Price in Last Decade	2
Figure 1. 2: Load Demand	4
Figure 2. 1: Fuel Cost Curve	11
Figure 2. 2: Relationship between Speed and Power Output	14
Figure 2. 3: Number of Paper Published on ED	25
Figure 2. 4: No of Papers Published on MG	26
Figure 4. 1: Helical Movement of Algae	422
Figure 4. 2: Load Demand Curve	477
Figure 4. 3: Grid Price Curve	477
Figure 4. 4: Output Power of Wind	48
Figure 4. 5: Output Power of PV	48
Figure 4. 6: EVs Charging Pattern under Autonomous Mode	4949
Figure 4. 7: EVs Charging/Discharging Pattern under Autonomous Mode	500
Figure 4. 8: Output of DGs under Strategy 1	522
Figure 4. 9: Output of DGs under Strategy 2	533
Figure 4. 10: Output of DGs under Strategy 3	544
Figure 4. 11: Output of DGs under Strategy 4	566



Table 4.1: Parameters of V2Gs	45
Table 4.2: Cost parameter of Distributed Generators	46
Table 4.3: Parameter of Pollutants Emissions and Treatment Cost	46
Table 4.4: Comparison of Algorithm	51
Table 4.5: Cost Function of AAA & PSO Using Strategy 1	52
Table 4.6: Cost Function of AAA & PSO Using Strategy 2	53
Table 4.7: Cost Function of AAA & PSO Using Strategy 3	55
Table 4.8: Cost Function of AAA & PSO Using Strategy 4	56
Table 4.9: The comparative analysis of strategy 3 and strategy 2	57
Table 4.10: The comparative analysis of strategy 3 and strategy 4	58

LIST OF FLOW CHART

Flow Chart 1: EV load in Autonomous Mode	. 322
Flow Chart 2: EV Load in Coordinate Mode	. 333

ABBREVIATIONS

AAA Artificial Algae Algorithm

ASO Ant Swarm Optimization

BS Battery Storage

CG Centralized Generation

CQGA Chaotic Quantum Genetic Algorithm

CSA Cuckoo Search Algorithm

DAI Different Artificial Intelligence

DC Depreciation Cost

DE Diesel Engine

DG Distributed Generation

DM Daily Mileage

DP Dynamic Programming

ED Economic Dispatch

ESS Energy Storage System

EV Electric vehicle

FC Fuel Cell

GA Genetic Algorithm

HSA Harmony Search Algorithm

HOMER Hybrid Optimization Model for Electric Renewable

IAGA Improved Adaptive Genetic Algorithm

IICA Improved Imperialist Competitive Algorithm

INIGA Isolation Niche Immune Genetic Algorithm

IPSO Improved Particle Swarm Optimization

K.E Kinetic Energy

LIM Lambda Iteration Method

LP Linear Programming

MG Micro Grid

MOEDP Multi Objective Economic Dispatch Problem

MPEI Multiport Power Electronic Interface

MPPT Maximum Power Point Tracking

NSGA Non-Dominated Sorting Genetic Algorithm

O&M Operation and Management

PED Power Economic Dispatch

PDF Probability Density Function

PPF Price Penalty Factor

PSO Particle Swarm Optimization

PV Photovoltaic

RES Renewable Energy Sources

SOC State of Charge

SPEA Strength Pareto Evolutionary Algorithm

TCS Thermo Chemical Storage

VESS Virtual Energy Storage System

V2G Vehicle to Grid

WT Wind Turbine