



AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

Electrical Power and Machines Engineering Department

Control of MPPT for Distributed Hybrid Solar/ Wind Generating Systems

A Thesis

Submitted in partial fulfillment of the requirements of the degree of

Philosophy of Doctor in Electrical Engineering

(Electrical Power and Machines Engineering)

Submitted By

Eng. Hanan Mohamed Ahmed Ibrahim Askaria

Supervised By

Prof. Dr. Mahmoud Abd El Hamid Mostafa

Dr. Maher El Dessouki

Cairo, 2018

Examiners' Committee

Name : Hanan Mohamed Ahmed Ibrahim Askaria
Thesis title : Control of MPPT for Distributed Hybrid Solar/wind
Generating Systems
Degree : Submitted in partial fulfillment of the requirements
for the PhD degree in electrical engineering

Name, title and affiliation

Signature

Prof. Dr. Fahmy Metwally Ahmed Bendary

Electrical Engineering Department

Faculty of Engineering at Shoubra, Benha University

Prof. Dr. Hany Mohamed Hasanien Mohamed

Electrical Power and Machines Department

Faculty of Engineering, Ain Shams University

Prof. Dr. Mahmoud Abd El-Hamid Mostafa

Electrical Power and Machines Department,

Faculty of Engineering, Ain Shams University

SUPERVISORS' COMMITTEE

Name : Hanan Mohamed Ahmed Ibrahim Askaria
Thesis title : Control of MPPT for Distributed Hybrid Solar/wind
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Degree : Submitted in partial fulfillment of the requirements
for the PhD degree in electrical engineering

Name, title and affiliation

Signature

Prof. Dr. Mahmoud Abd El-Hamid Mostafa

Electrical Power and Machines Department,
Faculty of Engineering, Ain Shams University

Associate Prof. Dr. Maher Mohamed Aly Eldessoki

Electrical Power and Machines Department,
Faculty of Engineering, Ain Shams University

STATEMENT

This thesis is submitted to Ain Shams University for the degree of Philosophy of Doctor Electrical Engineering (Electrical Power and Machines Engineering).

The work included in this thesis was carried out by the author at the Electrical and Machines Engineering Department, Faculty of Engineering, Ain Shams University, Cairo, Egypt.

No part of this thesis was submitted for a degree or a qualification at any other university or institution.

Name : Hanan Mohammed Ahmed Ibrahim Askaria

Signature:

Date : --/-/2018

ABSTRACT

One of the greatest dependable and advanced alternative energy origins was those coming from wind. Wind energy contribution with deference to the sum of active and reactive powers is growing universally. One of greatest prevalent wind energy industries is Doubly Fed Induction Generators (DFIG's) depending on variable speed variable pitch control systems that could be running through a grid or separate style. Modeling, analysis, control and dynamic details explanation of "DFIG" in all modes of operation are essential to gain optimal wind energy and precisely expect its execution.

The thesis shows an enhanced control approach for grid and rotor side converters (GSC, RSC) of a distributed DFIG depending on wind energy conversion systems (WECS's) utilizing Autonomous Groups Particles Swarm Optimization (AGPSO) and Genetic Algorithm (GA) techniques. The primary objective of this control scheme is reinforcing system constancy during transient operation of the machine considering fault circumstance as compared with the optimization tools to plan PI controllers. Based on GA and AGPSO techniques, definite objective expressions associated to voltages and currents of both stator and rotor are existing to gain the best values for controllers' parameters with the aim of achieving preferable outcomes of power and keeping dynamic system steadiness.

A proposed approach for maximum power by means of Fuzzy Logic Control is advanced. At given wind velocity, the modified system is controlled maximizing output power taken from the wind depending on wind characteristic. The proposed control strategy that achieved via a fuzzy controller (FC) is properly tuned using GA and AGPSO techniques. The success of the supposed control approaches is confirmed through emulation and theoretical analysis executed using Simulink of MATLAB program.

Key words: DFIG; Pitch Control System; Fuzzy Logic; GA Technique;

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