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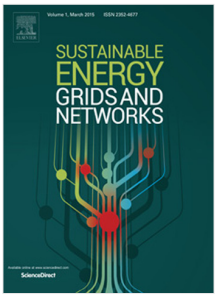

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Mohsen Eskandari, Li Li, Mohammad. H. Moradi

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Improving power sharing in islanded networked microgrids using Fuzzy-based consensus control

Mohsen Eskandari[1]; Li Li[1]; Mohammad. H. Moradi[2]

[1] Faculty of Engineering and Information Technology, University of Technology Sydney, Australia.

[2] Dept. of Electrical Engineering, Bu-Ali Sina University, Hamedan, Iran

***Abstract*—The rising world-wide trend toward developing clean energy resources has caused dispersed installation of renewable energy resources (RESs) in distribution grids. Microgrid (MG) concept is proposed as a key factor in optimal and secure integration of, mostly converter-based, RESs into power systems. One of the major challenges related to MG control is ineffectiveness of droop control in accurate power sharing which is affected by the feeder impedance. In this paper, a fuzzy-based consensus control protocol is developed to address this issue in multi-bus MGs (MBMGs). Consensus signals are inserted into the conventional droop controller as complementary part to overcome the drawback of the droop control in power sharing in MBMGs. Dynamic fuzzy coefficients of consensus signals are designed to model X/R ratio of the grid impedance in the control system. In addition, a novel small signal model of MBMG is developed, by considering the conventional droop control, MBMG power network and power lines impedance to design and assess performance of the control system. Consensus control is also incorporated into the proposed control system of MBMG to analyze the stability. Simulation results are presented to assess effectiveness of the control strategy in MATLAB\Simulink.**

***Index Terms*— Consensus Control; Power System Dynamic Stability; Fuzzy Control; Microgrid; Power Sharing; Small Signal Model;**

1. Introduction

Global warming and environment concern have caused a world-wide trend toward using clean natural resources. In contrast to conventional power plants, renewable energy resources (RESs) are installed in power systems inherently in a distributed manner [1]. This causes a great revolution in power systems in terms of control and energy management. Microgrid (MG) has been introduced as a promising solution to adapt the conventional control strategies in the coming restructured modern power systems. In addition, MG concept provides extra benefits for consumers, by autonomous operation capability, which enhances the system reliability and energy efficiency by developing energy management system among distributed generation (DG) units and loads [2]-[3]. The MG concept is implemented by means of a hierarchical control system consisting of three control levels [4]-[5]: