

Power Energy Management Strategy of Micro-grid System

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Abstract— In this paper, the power energy management of the micro-grid system that consists of photovoltaic (PV), wind and energy storage systems is analyzed. The micro-grid is proposed to cater the load demand in standalone mode. The operation is set the PV to act as a primary source follow by the wind energy and the energy storage as a back-up source. The main focus in this paper is to propose the strategy of energy management of renewable energy sources. The design consideration and analysis are setup in Matlab/Simulink environment.

Index Terms—Micro-grid, Energy Management, Renewable Energy Systems

I. INTRODUCTION

Energy plays an important role in human activities. The utilization of fossil fuel based energy resources has increased the impact on the global environmental issues such as CO₂ emissions that contribute to global warming and a drastic climate changing. The need of exploitation of new sources such as renewable energy (RE) becomes crucial. The combination of multi-source renewable energies at the distribution stage and the proper energy management will definitely reducing the cost of operation and could deliver the best efficiency and reliability to the users.

The major problem for energy distribution is to supply the electrical power in rural area. This is because the cost that involves developing the utility grid in certain area is high due to the location and geographical condition [1]. The combination or hybrid of RE could become one of solution for that problem and also would provide a clean and none pollute energy to the isolated area [2]. Standalone of PV-Wind generation and combined with energy storage could provide uninterrupted power supply that suitable to be used in isolated or rural area [3, 4].

In this paper, the simulation model of a micro-grid system of hybrid PV-Wind generation combined with energy storage is developed by using Matlab/Simulink. The purpose of the controller is to manage the power generated that balance the supply to load demand. The objective of the systems control is to make sure no interruptions although there is uncertainty happen due to climate changes. The aim of this paper is to provide the information as a simple controller can be setup by proposing the energy management strategy for multi input of renewable energy source. The result can be used as a first step

to understand the behavior of energy management in the micro-grid system.

II. MICRO-GRID STRUCTURE

A) Systems Configuration

Figure 1 show the system for the micro-grid. In this system, the PV photovoltaic and wind sources are the premier energy that will supply to the load while battery is used as backup energy source. The system could be categorized as environmental friendly due to the renewable energies used. Energy management is the most important part in order to make sure the system configuration could deliver the electricity to the load demand without failure [5, 6, 7, 8, 9]. In this paper, the DC hybrid PV-Wind with energy storage is setup and the control is focusing in power energy management as shown in figure 1.

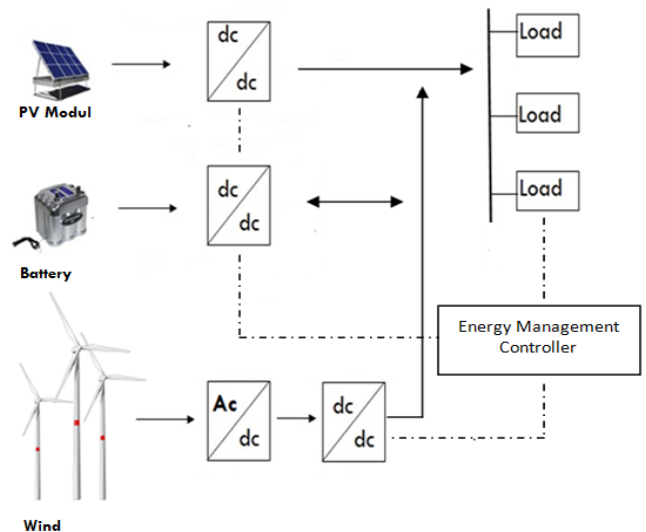


Figure 1: System configuration of the micro-grid

B) Systems Sizing

The micro-grid is designed to operate in isolated mode from the main grid. The system must make sure the energy produce can cater the load demand. Therefore, in designing the micro-grid, the sizing part is crucial part for minimizing