

APPROVAL

UNBALANCED FAULTS ANALYSIS IN GRID – CONNECTED PV SYSTEM

BY

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This thesis project was prepared under the direct supervision of the thesis supervisor, En. Rijalul Fahmi bin Mustapa. It was submitted to the Faculty of Electrical Engineering and was accepted as partial fulfilment of the requirement for Bachelor in Electrical Engineering (Hons).

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ABSTRACT

One of the renewable energy found is solar energy where photovoltaic (PV) array is used to trap the energy from the sun and convert it to energy. PV is widely use in the grid –connected system nowadays. Since the founding of this method, the technology of extracting solar energy to photovoltaic array into grid network system has been growing rapidly. However, the existence of fault in the grid system may cause a drop in the outputs and will drop even lower with penetration of photovoltaic in the system. This work presents the effects of faults penetration inside the grid – connected PV system with three unbalanced faults being tested for this purpose and the results obtained will be compared to check which one contributes to high severity towards the grid – connected PV system. To observe the effects of these faults, a model of grid – connected PV system is built using MATLAB® 2009/Simulink with the help of Simscape and SimPowerSystems toolboxes. First, a PV system is developed in order to make the photovoltaic sourcing the system using a solar cell obtained from Simscape toolbox that then lumped with 70 others solar cell to make a PV module. With the help of a booster, the output voltage of PV system has increased and regulated and linked to a three – phase inverter circuit that successfully produced AC voltage. Stepped – up transformers then are placed at the end of the inverter to boost the AC voltage to values that shows the system modelled replicate that of real – life utility. Lastly, three faults are injected to Bus 1 consecutively and Bus 3 is observed for any changes in the phase voltage magnitudes and waveforms.

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

Before proceed in discussing what work had been done, background of study with regards to the grid – connected PV system had been written in order to get an understanding of what this work is all about. Besides, problem faced in the real world that had led to this work conduction had also been discussed in this chapter alongside the objectives as to why this work had to be designed. The scope of this work also had been introduced to give a clear view about this work thesis before present a glimpse of each chapter in this work thesis in the thesis organization.

1.2 BACKGROUND OF STUDY

Growing distress over the environmental issues especially global warming plus hesitant amount of energy supplies left with the increment price of fuels led to a new approach of producing energy supplies to communities. Lots of research have been done and still being done today even to overcome these challenges by finding ways to give a cheaper and more sustainable energy to communities. Solar energy has proposed promising results in the quest of producing a better solution to this problem [1]. Solar energy, also known as photovoltaic (PV) energy is one of the most reliable forms of renewable energy and takes the second place in the fastest growing energy source used so far [2]. The energy is clean and due to its abounding reserves of raw material that is the silicon, a drop in production cost and conversion efficiency improvement has prompted the PV system to become an important role in the future