PERFORMANCE TEST OF SUPER CAPACITORS AS AN ELECTRICAL ENERGY STORAGE TO SUPPORT THE HOME ENERGY SYSTEM DEVELOPMENT AND LEARNING ENERGY LEARNING MEDIA

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ABSTRACT

One of the latest types of electrical storage media today is using capacitor technology. The basic principle of capacitors is similar to a battery, which can store electrical charges. The weakness of the capacitor is a very fast discharging process, but the advantages are the charging process is also relatively faster, not using chemical processes, cheaper and more durable treatment (Fahad, A. et al). Starting from here then developed and made superkapasitor. Supercapacitor is larger and larger than normal capacitor. This component makes it possible to store the electrical energy generated from the solar cell panels. In the application of superkapasitor needs to be designed to build an electronic control to control the charging process and discharging process so that it can be optimal.

This study aims to determine how the performance of superkapasitor devices when the process of storing electrical energy (charging) and also when the discharge process (discharging) with a certain duration. So that obtained a portrait of performance superkapasitor that can be used as energy storage system or energy storage system (ESS). The performance of ESS will also be examined when it is used to operate a number of household electronic appliances in the form of Home Energy System (HES) products. Furthermore, ESS and HES that have been obtained during this research will be developed and packaged as a learning medium in the field of renewable energy. This research is divided into 4 (four) research stages. The first year will complete Research-I and Research-II focusing on performance test of series and parallel series combinations of super capacitors with electronic control devices for charging, discharging. Followed by research on the potential of solar energy in Yogyakarta, especially in FT UNY with storage media using superkapasitor. The second year will complete Research III focuses on the development of ESS (using super capacitors) as an electrical energy storage device derived from solar panels for home energy systems. Followed by, Research IV4 focused on developing learning media of renewable energy from sunlight with ESS using super capacitor.

The results of Research-I and Research-II are obtained for the performance of a series of 6 super capacitors 120F / 2.7V (total 20F / 16.2V) requires about 100 seconds of charging while the 500F / 2.7V superassembler (80F / 16.2V total) takes about 400 seconds of charging time. The duration of superkapasitor charging time is directly proportional to the size of the super capacitor capacity. The larger the capacity of the super-capacitor then the longer the duration of charging time. If the capacity of the supercapacitor is increased n times (by assembling the parallel supercapacitor much more) then the length of charging time will also be longer n times from the original. Can be developed a balancer electronic circuit that serves to keep the voltage of each supercapacitor in the same condition when the process of charging is in progress. Duration of discharge time for the 20F / 16.2V superkapasitor circuit with 24V / 25W load is about 200 seconds while for the 80F / 16.2V superkapasitor the duration of discharge time is about 400 seconds. With the same load, the discharge time duration is also proportional to the capacity of the super-capacitor. The larger the capacity of the super capacitor the longer the duration of the emptying time. If the capacity of the supercapacitor is increased n times then the discharge time will also be longer n times from the original. To design an ESS, more series of 6 supercapacitor series are then assembled parallel and or serial to each other to increase the total capacity and voltage.

Kata Kunci: *Super capacitor, renewable energy, solar cell, charging control, discharging*