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SOLAR POWER ENERGY STORING STYSTEM

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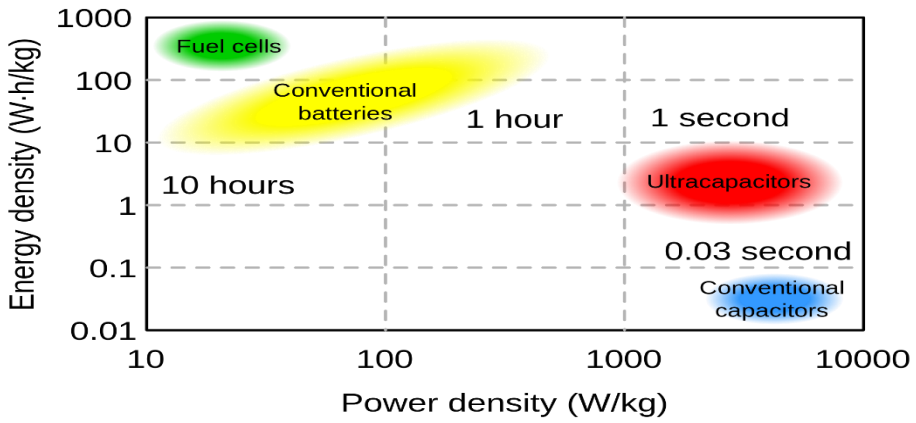
INTRODUCTION

In the time of changing global landscape, energy has become a prior focus of the all leaders of the world and technical community. There always been a great interest and primary focus for developing and refining more efficient energy storage devices. One of the device, the supercapacitor, has matured significantly over the last following time period and it has emerged with the potential to facilitate major advances in energy storage system. Supercapacitors, which is also known as ultracapacitors or electrochemical capacitors, utilize high surface area electrode materials and thin electrolytic dielectrics to achieve capacitances more of magnitude larger than conventional capacitors. In doing so, supercapacitors are able to attain greater energy densities while still maintaining the characteristic high power density of conventional capacitors.

SUPERCAPACITOR

A new technology, the supercapacitors, has emerged with the potential to enable major advances in energy storage. Supercapacitors are governed by the same fundamental and mathematical equations as same as conventional capacitors, but utilize higher surface area electrodes and thinner dielectrics to achieve greater capacitances. This features allows for energy densities greater than conventional capacitors and power densities greater than batteries. Batteries have a limitation in their maximum deliverable power because of its slow chemical process required to release their energy and its low energy density.



Conventional Chart of storage cells

STORAGE SYSTEM

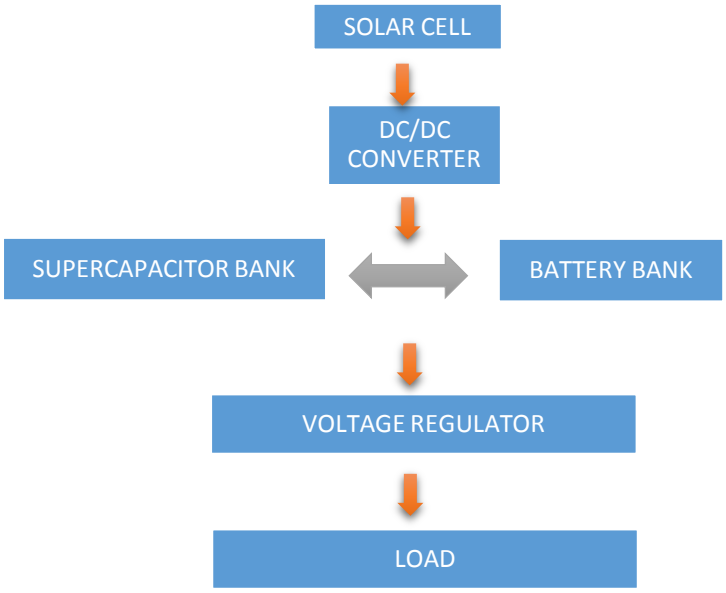
In remote areas stand-alone photovoltaic systems are most common. Generally the most common storage technology employed is the VRLA battery because of its low cost and wide availability.

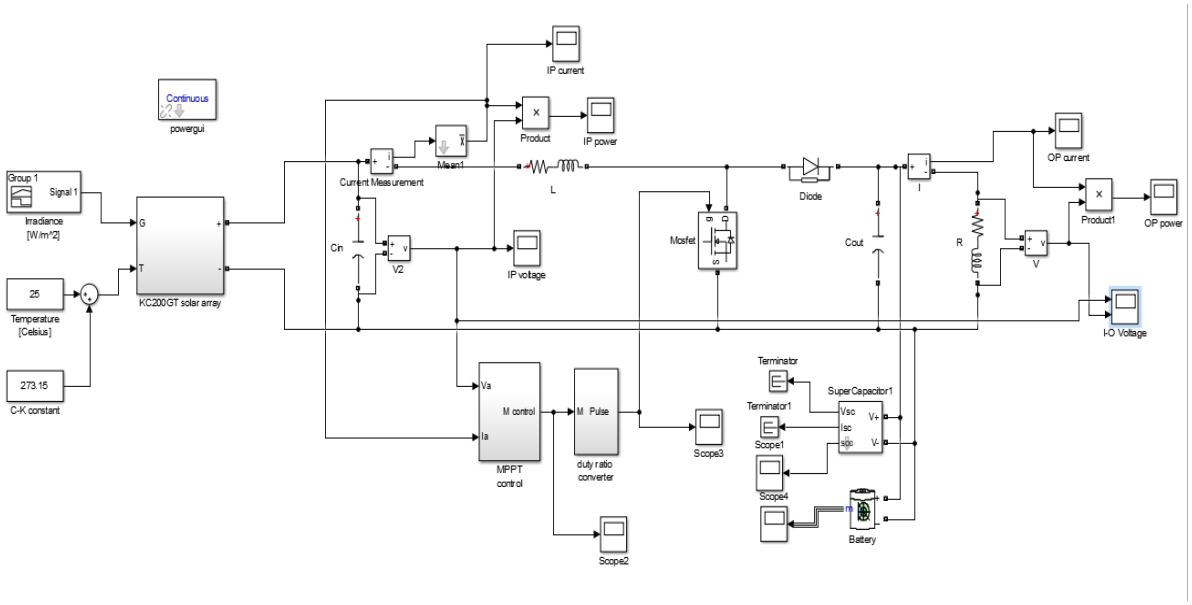
Photovoltaic panels are not an ideal source for battery charging; the output is unreliable and heavily dependent on weather conditions, therefore an optimum charge/ discharge cycle cannot be guaranteed, resulting in a low battery state of charge (SOC). Low battery SOC leads to sulphation and stratification, both of which shorten battery life [10]. Certain load applications require high current for a period of time e.g. motor starting applications; the starting current requirement can be 6-10 times the normal operating current of the motor. Normally the peak current requirements are satisfied by the VRLA battery. VRLA batteries in this situation are large in order to deal with the high current being removed from the battery.

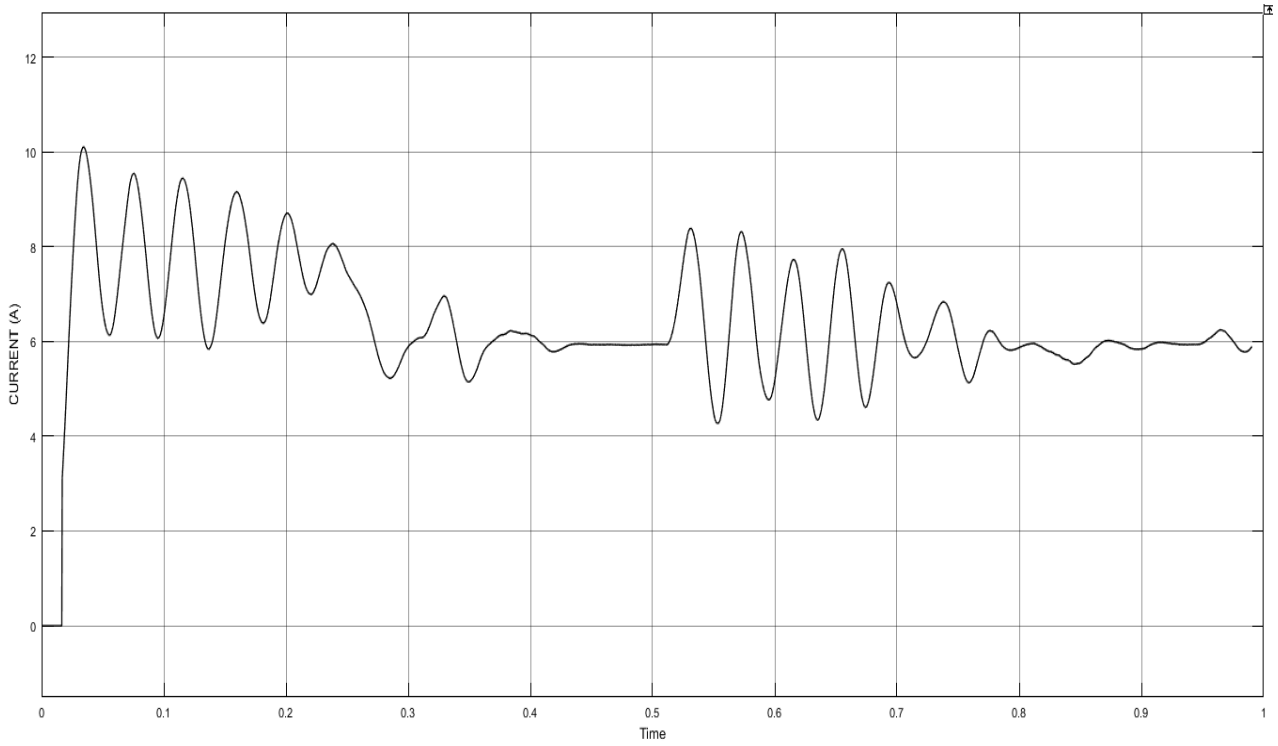
The peak current demand might only need to be met for a few seconds at a particular time. Sizing the battery around this can prove costly; in photovoltaic systems the batteries are replaced typically every 3-5 years depending on the application. By utilizing a battery supercapacitor hybrid energy storage system as shown in the battery size can be reduced and a higher SOC can be maintained.

ADVANTAGES

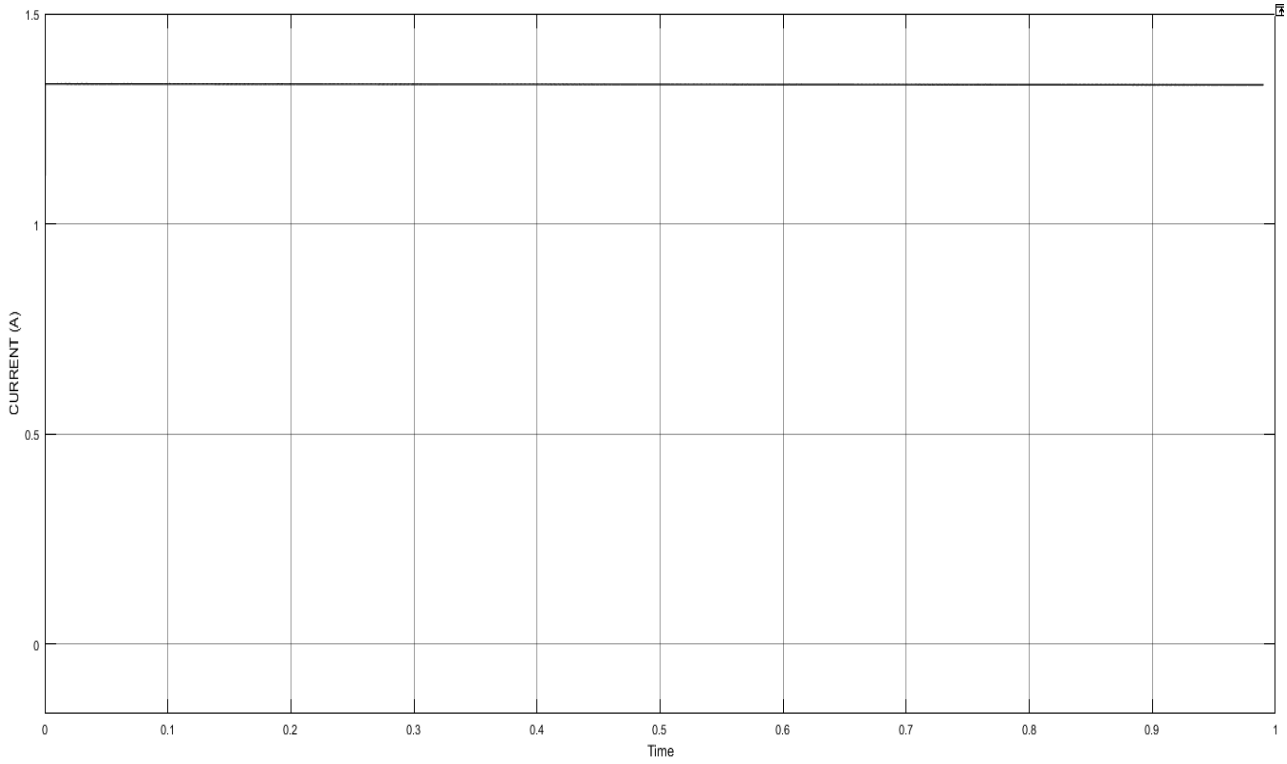
Very high rates of charge and discharge ,“Fill-in” power for wind and smart-grid system, Grid-stability ,Power quality for composite load, High cycle efficiency (up to 95%),Little degradation over hundreds of thousand cycles ,Low toxicity materials used as compare to battery and common capacitor – environment friendly ,The results show that the hybrid storage system can achieve higher specific power than the battery storage system. Parallel operation in Modeling & Simulation of energy storage system and defining the different characteristics compare to general storage system.



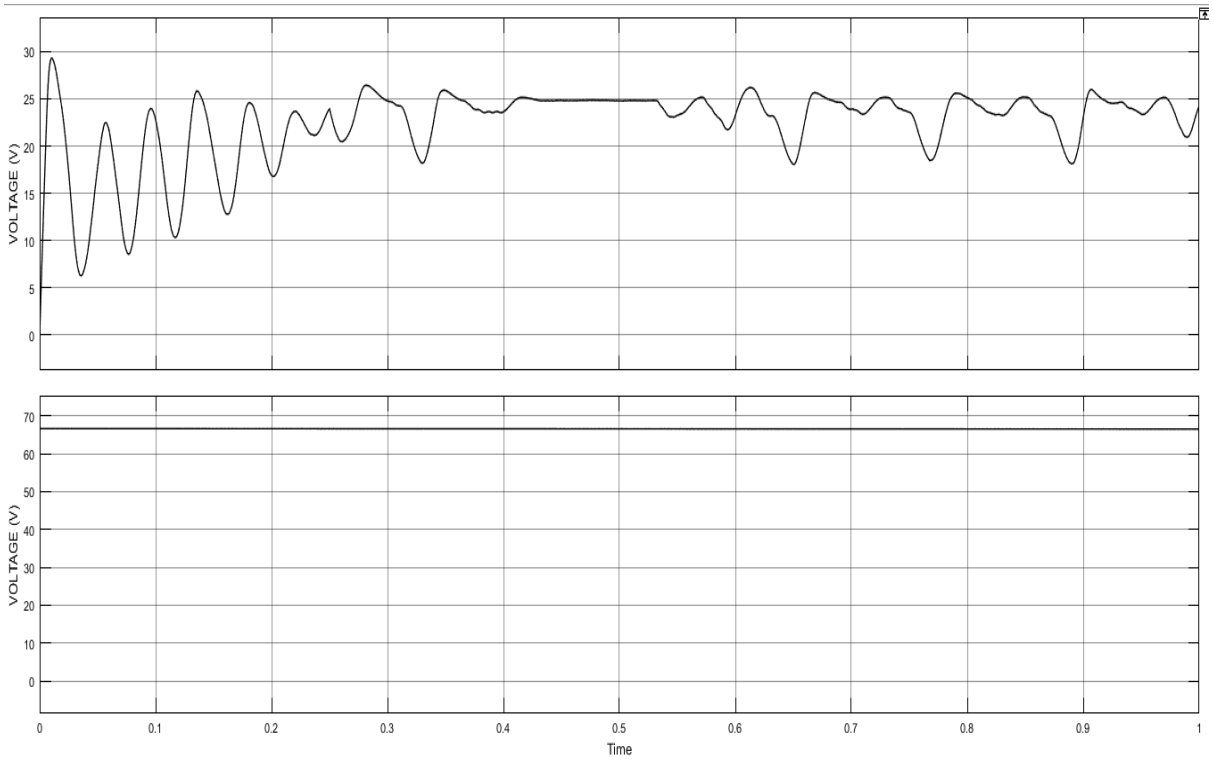




[Graph-9] INPUT CURRENT OF HYBRID SYSTEM



[Graph-10] OUTPUT CURRENT OF HYBRID SYSTEM



INPUT - OUTPUT VOLTAGE OF HYBRID SYSTEM

APPLICATION

Hybrid system for efficient solar energy applications ,Hybrid Electric Vehicles using solar energy application, Solar boats using hybrid system, Marine power controls / Radar instruments / Communications systems, Military instruments ,Light-rails and Trams, Micro grid-power stability using supercapacitor, Advance statcom with storage system using supercapacitors ,Efficient Regenerative braking system, Advance smart electronics and appliances

CONCLUSION

By using the Hybrid storage system for solar power including supercapacitor in place of general storage system, the voltage fluctuation and the voltage drop, starting impact of current for various load is to be mitigate and the utilization of solar energy smoother and also the efficiency level of solar cell can be increased.

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