

ICRERA 2024
13th INTERNATIONAL CONFERENCE ON RENEWABLE
ENERGY RESEARCH AND APPLICATIONS

Speaker's name and affiliation

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Tutorial title

Supercapacitor Assisted Power Converters and Protection Systems for DC Homes and DC Appliances Based on Renewable Energy

Abstract:

Supercapacitors are typically one million larger capacitances for the same canister volume compared to electrolytic and film capacitors. Today commercial devices come in capacitance values ranging from fractional farads to 100,000 farads (per single cell) with life cycles in the range of 30 k to 1 million. They have a several orders higher power density than li-ion rechargeable batteries with a much wider operational temperature range. However, they haven't reached the energy density of rechargeable battery chemistries.

Based on the low equivalent series resistance (ESR) property of supercapacitors, a unique new family of power converters and protection systems, now known as Supercapacitor Assisted (SCA) techniques was developed. These patented SCA techniques such as SCA-low dropout regulator (SCALDO), SCA-surge absorber (SCASA), SCA-temperature modification apparatus (SCATMA) and SCA-LED are based on a new theory now published as SCA loss management (SCALoM) theory. The tutorial will present how we can develop extra low frequency DC-DC converters (based on SCALDO), high performance transient surge absorbers (based on SCASA) and high efficiency DC lighting (SCALED based) in addition to how this new approach could help in new directions for DC homes and DC appliances etc.

Keywords treated in the tutorial

- 1) Supercapacitor applications
- 2) Low frequency DC-DC converters
- 3) Transient surge protectors
- 4) DC lighting
- 5) DC white goods/DC homes
- 6) Energy efficiency