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Team Members:

Sl. No.	Roll No.	Name	Cell. No.	Email
1	21B91A0272	K.BHARGAVI	7815966028	kancharapubhargavi3@gmail.com
2	21B91A02C8	RJ.JYOTSHNA	9392341605	iyotshnarj123@gmail.com
3	21B91A02B4	P.ANAND KUMAR	9701302025	anandkumar112333@gmail.com
4	21B91A02A8	N.BALAJI	7337202355	balajinagidi98@gmail.com



Sagi Rama Krishnam Raju Engineering College (A)

SRKR MARG, Chinna Amiram, Bhimavaram, W.G. Dt. - 534204

Electrical & Electronics Engineering Department

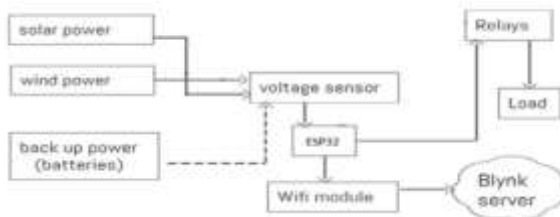


DC MICROGRID INTEGRATION WITH BATTERY STORAGE SYSTEM

ABSTRACT

DC microgrids provide an efficient energy solution using Direct Current (DC), integrating solar and wind with battery storage for stability. They minimize energy losses by avoiding AC-DC conversions, ideal for remote areas, military bases, and campuses. The Battery Storage System optimizes energy use, storing excess renewable energy and supplying it during demand peaks or low generation. Using DC-DC converters and Energy Management Systems (EMS), it ensures stable power distribution with a scalable design for grid-tied or off-grid use.

BLOCK DIAGRAM



FLOW CHART



LIST OF COMPONENTS

- ❑ Solar Panel - 15/WP/12/V
- ❑ Battery - 12V 8Ah/20hr/0.39A
- ❑ Wind -12V, min 500mA -max 1A
- ❑ LCD Display (16X2)
- ❑ Microgrid
- ❑ DC-DC Converter
- ❑ ESP32
- ❑ 4 Channel 5 relay module
- ❑ inverter
- ❑ Load(Bulb)

HARDWARE PICTURE AND RESULTS



INNOVATION

The DC Microgrid system innovates with integrated wind, solar, and battery power via DC-DC converters for reliable stabilization, outperforming single-source grids. It features automated battery charging with overcharge protection ($> 12.6V$) and instant battery takeover on fault detection ($< 2V$) by the ESP32, ensuring uninterrupted power. It also includes Wi-Fi notifications via a mobile app (e.g., Blynk) for quick alerts, and a compact ESP32 with LCD for monitoring. The inverter's DC-to-AC conversion supports versatile loads, boosting adaptability for off-grid.