

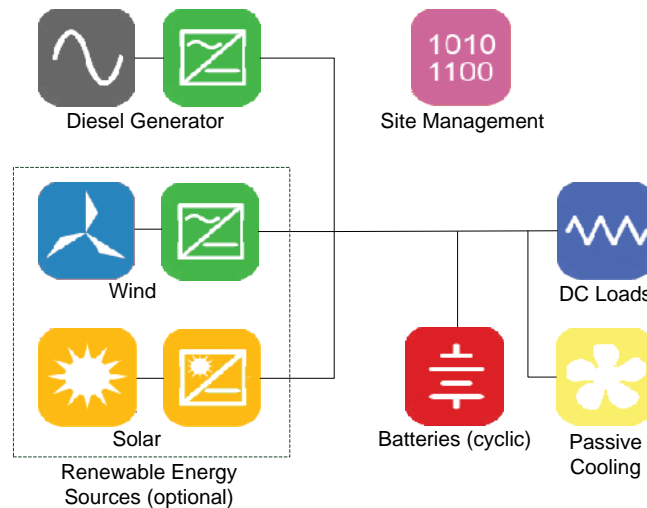
INTRODUCTION

The use of renewable energy sources for remote telecommunication systems has become more popular recently due to technological advancements and lower costs. Renewable resources such as the wind and sun offer valuable energy and reducing overall operating costs of system infrastructure, as well as reducing the carbon footprint of the system.

Modern hybrid power supply systems for telecommunication markets, which allows using 2 or more inputs from the different energy sources for feeding operators equipment in remote site areas with no or extremely unreliable AC grid, offer a clear advantage.

Being one of the world leaders in production of power supply equipment, concern UNIPOWER offers modern Hybrid DC power systems based on the Guardian platform.

Common Hybrid Bus Architecture allows simultaneous use of various energy converters as part of a uniform system. In this case power supply system input could be an electricity grid and diesel generator sets, as well as PV solar panels and wind turbines in tandem.



Typical Hybrid System

It is important to highlight that the main priority within operation of the system will be using energy derived directly from solar and wind converters.

The system utilizes deep cyclic batteries with the capability to perform a large number of discharge and recharge cycles and provide a high rate recharge acceptance, high round-trip efficiency and high temperature resistance for energy storage.

The heart of the system uses UNIPOWER Guardian AC-DC converters model FMPe30.48 is a 48V rectifier module rated at 2.9kW, which incorporates resonant technology to reduce components stresses, providing in-creased system reliability and one of the best-in class efficiency (>95%).

The rectifier features a wide input operating voltage (85-300VAC) and wide operating temperature (from -40°C to +75°C) to maximize power availability within demanding utility power environment.

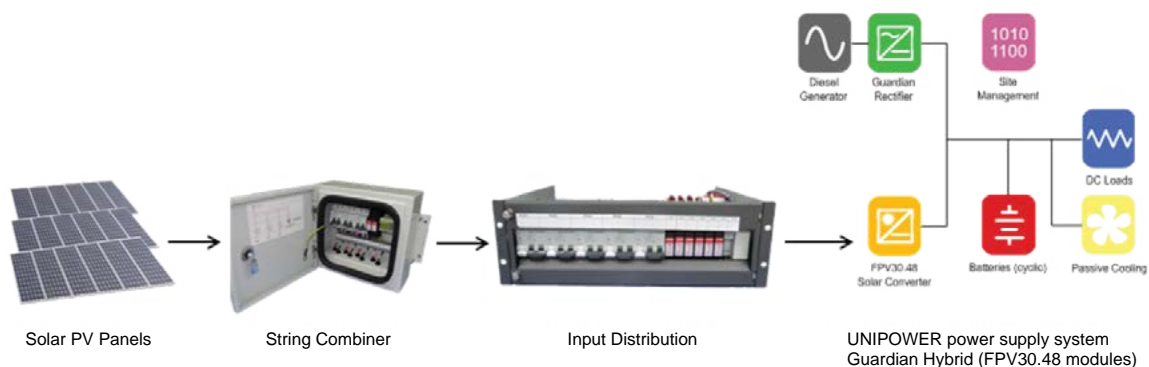


Guardian Rectifiers and Converters

FMPe30.48 modules provides 2,9kW (max.current 60A) of output power at 46-57,6VDC. Maximum extension of DC Hybrid system up to 14,5kW (using 1 x subrack with 5 x FMPe30.48).

Solar systems use the FPV30.48 module, which has a wide input voltage range: 130-360VDC (PV Input). A system solution using these converters can produce a maximum of 14,5kW (using 1 x subrack with 5 x FPV30.48).

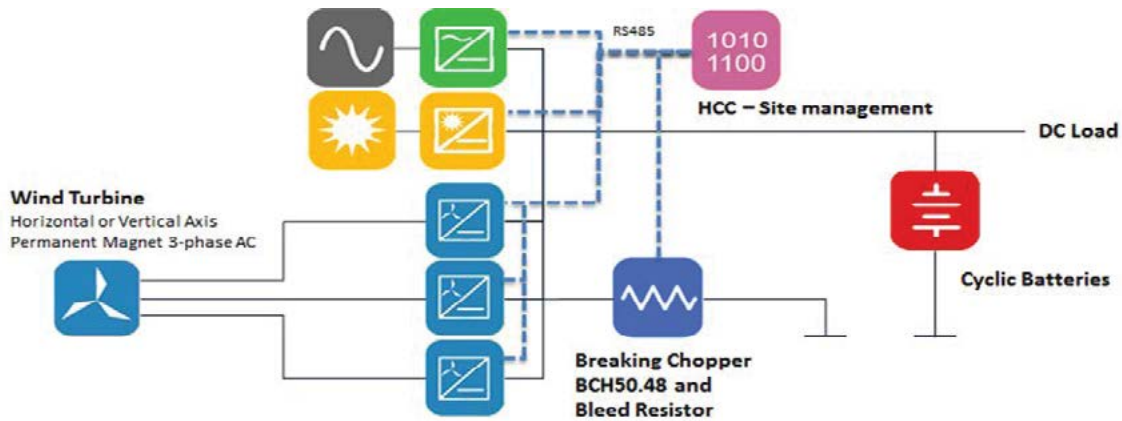
These converters feature a patented algorithm which controls the maximum power point tracking (MPPT) which is >99%. Solar cells have a complex relationship between solar irradiation, temperature and total resistance that produces non-linear output efficiency. The purpose of the MPPT algorithm is to sample the output of the cells and apply the proper resistance (load) to obtain maximum power for any given environmental conditions.



Typical Solar System

Solar panels connects to the power supply system with a special PV Distribution panel, which consists of the in-input MCBs for connecting up to 5 string combiners (1 for each solar converter), surge protection device (SPD), output terminals, ground fault detection device (GFD) and GFD fuse (compliant with UL1741). PV panels can be grounded in the positive or negative branch.

Wind energy systems would utilize the FPW30.48 modules, which have a wide input voltage and frequency range typically (8Hz – 400Hz), and provides 48VDC/2,9kW output. Maximum extension of wind converters is 8,7kW (using 1x subrack with 3 x FPW30.48).



Typical Wind Energy System

The main feature of using FPW30.48 wind converters is the inherent braking chopper control topology (internal to the converter) and the “dump” resistor control (installed in the outer box). A braking chopper is an electrical switch that limits the DC bus voltage by switching the braking energy to a resistor where the braking energy is converted to heat.

FPV & FPW converters provide a modular building block for Renewable Energy and Hybrid sites and cater for a broad spectrum of CapEx, OpEx and ROI models.

One of the most important parts of a hybrid power supply produced by UNIPOWER is a multi-functional digital HCX Advanced controller (Hybrid Site Controller), which is a microcontroller system that manages parameters of all units and monitors status of whole system.



HCX Controller

The main features of the HCC controller are:

- Intelligent management of all power supply system units and modules with local and remote connection possibilities (USB, Ethernet/SNMP),
- Includes battery manufacturers preset database, which provides complete battery management, and help to extend lifetime.
- Optimize fuel consumption and battery life for the off-grid and unreliable genset sites.
- Extensive logging of site data.
- Manages renewable energy source power prioritization and using patented algorithm of maximum power point tracking allows to minimize Total Costs of Ownership (TCO) for operators.

The modular design of UNIPOWER systems and versatile Guardian platform allows using these power systems in Indoor and Outdoor solutions that can satisfy the requirements of most Hybrid applications.

For more details, please check specifications and datasheets at www.unipowerco.com