

Solar-Hybrid Power Solutions for Telecom Sites - Official Technical Overview & Hardware Datasheet

EXECUTIVE SUMMARY

As telecommunications networks expand into remote, off-grid, and energy-insecure regions, the operational expenditure (OPEX) associated with diesel generator (DG) refueling and maintenance becomes both a financial burden and a logistical constraint. The Solar-Hybrid Power Solution for Telecom Sites (SHP Series) represents a paradigm shift in energy assurance, combining high-efficiency photovoltaic (PV) generation, intelligent battery energy storage systems (BESS), and grid/DG backup into a single, carrier-grade enclosure. Designed specifically for outdoor telecom shelters, macro-cell base stations, and rural distributed access nodes, this system ensures 99.999% power availability while slashing diesel consumption by up to 80% and reducing the total cost of ownership (TCO) over a 10-year lifecycle. This datasheet provides a comprehensive technical overview of the system architecture, power conversion efficiencies, environmental tolerances, and ordering logistics.



ARCHITECTURE & CHASSIS DESIGN

The SHP Series is built upon a modular, hot-swappable chassis architecture that decouples power generation from power distribution. The system is anchored by an IP65-rated outdoor cabinet constructed from galvanized steel with a powder-coated finish, offering resistance to corrosion, UV radiation, and physical intrusion. The internal rack employs a vertical busbar system that minimizes inductive losses and supports up to four MPPT (Maximum Power Point Tracking) solar charge controller modules, two bi-directional inverter/rectifier modules, and a dedicated battery management unit (BMU).

The chassis design prioritizes natural convection cooling assisted by variable-speed fans for high-ambient conditions, eliminating the need for liquid cooling and simplifying field maintenance. Front-access cabling and

swappable air filters facilitate rapid servicing without rear clearance, making it ideal for pole-mounted or wall-mounted installations. The power distribution panel (PDP) integrates AC and DC surge protection devices (SPD Type 1+2), manual bypass breakers, and a proprietary Energy Management Controller (EMC) that orchestrates the hybrid operation.

HARDWARE FEATURES

1. INTELLIGENT ENERGY MANAGEMENT CONTROLLER (EMC): The EMC is an embedded Linux-based platform that performs real-time load forecasting, battery state-of-charge (SoC) and state-of-health (SoH) monitoring, and dynamic source selection (PV priority, Grid supplement, DG backup). It supports remote firmware upgrades and SNMP v3 / Modbus TCP integration for centralized NOC monitoring.

2. HIGH-EFFICIENCY MPPT SOLAR CHARGE CONTROLLERS: Each controller module utilizes synchronous buck-boost topology with 99.2% peak efficiency. They support PV string voltages from 150V to 600V DC and incorporate anti-islanding and reverse-polarity protection.

3. BIDIRECTIONAL INVERTER/RECTIFIER MODULES: These units operate as rectifiers during grid availability to charge batteries and as inverters during grid

outages to supply 230V AC or -48V DC loads. The transition time between modes is <10ms, ensuring seamless power to sensitive telecom payloads.

4. LITHIUM IRON PHOSPHATE (LFP) BATTERY STRINGS: Factory-integrated LFP batteries with a cycle life of >6000 cycles at 80% DoD. The BMU provides cell-level voltage balancing, temperature monitoring, and overcurrent protection, communicating fault status directly to the EMC.

5. HYBRID BACKUP INTERFACE: A dedicated generator start/stop logic is included, allowing the system to automatically start a diesel genset only when the battery SoC falls below a user-defined threshold and PV irradiance is insufficient, thereby preventing unnecessary fuel burn.

COMPLIANCE & STANDARDS

The SHP Series is fully certified for global telecom deployment, holding the following certifications:

- Safety: IEC 62109-1 & -2 (Safety of power converters for PV), IEC 60950-22 (Equipment for outdoor installations).
- EMC: EN 61000-6-2 (Immunity), EN 61000-6-4 (Emissions), Class A industrial environment.
- Environmental Protection: IP65 (Dust-tight and water-jet protected), IK10 (20J

impact resistance).

- Grid Compliance: IEEE 1547 (Interconnection) and VDE-AR-N 4105 for grid-tied operations.
- Telecom Standards: ETSI EN 300 019-1-4 (Class 4.1 for weather-protected locations with controlled temperature) and ETSI EN 300 019-2-4 (Class 4.1H for vibration).

TECHNICAL SPECIFICATIONS

Parameter	Specification
Form Factor	Outdoor freestanding cabinet, IP65, 1200H x 650W x 700D (mm)
PV Input Capacity	Up to 15 kWp (depending on MPPT module configuration, 2-4 strings)
Inverter Output Power (AC)	1.5 kVA to 15 kVA (selectable, single phase 230V / 50/60Hz)
Rectifier Output (DC)	-48V DC @ 50A (expandable to 200A with parallel modules)
Battery Compatibility	LiFePO4 (LFP) – 48V nominal, capacity 5kWh to 60kWh scalable
System Efficiency	Peak > 97.5% (DC-AC), > 98% (MPPT tracking)

Operating Temperature	-25°C to +60°C (with derating above 50°C)
Ingress Protection	IP65 (cabinet), IP20 (internal modules)
Management Interfaces	Ethernet (Modbus TCP), RS-485, SNMP v3, dry contact alarms
MTBF	> 250,000 hours (calculated per Telcordia SR-332)

ORDERING OPTIONS

The SHP Series is available in five pre-configured capacity tiers (SHP-1.5K, SHP-3K, SHP-6K, SHP-10K, and SHP-15K), defined by the peak inverter output power (kVA). Each tier can be ordered with a battery capacity multiplier (M1=5kWh, M2=10kWh, M3=20kWh). A dedicated Solar Array Optimizer Kit is available as an accessory for integrating third-party PV panels. Additionally, a remote telemetry gateway with 4G/LTE backhaul can be ordered separately for sites without existing network connectivity.

