

TECHNICAL SPECIFICATION FOR
HYBRID POWER SYSTEM
Model : HPS720/1800 W



- PV Solar Power System with Battery Pack
- D.C. Generator set 10 KW
- Interface Control Panel for Solar Power System and D.C. Generator set.

Typical Configuration for Hybrid Power System

Item	Description	Unit	Qty
1	Supply 10 KW D.C. gensets with control panel.	Each	1
2	Supply 24V, 150 Wp Solar Panels	Each	12
3	Supply 2V, 500 Ahr VLRA Battery Blocks	Each	48
4	Supply Solar Support Structures	Lot	1
5	Supply 75A Solar Charge Controller 75A discharge 48V charge	Each	1
6	Supply Generator/Solar Interface - Control Panel	Each	1
7	Supply Maintenance Manuals including the Parts Catalogue for each of the units (Solar System, D.C. generator, Interface/Control/Monitoring Unit) - included with each system	Lot	1
8	Supply Consumable Spares for item 1	Lot	1
9	Local training if request (advisable)	Lot	1

1.0 INTRODUCTION

These specifications cover the supply of Photo Voltaic Solar Systems that will be operating in conjunction with a D.C. generating set and the associated control panel to provide necessary D.C. power supplies to telecommunications equipment at various sites country wide.

The power supply will consist of:

- a) The PV Solar Power System with the operating voltage of 48VDC positive ground.
- b) A 10 KW D.C. generator with an operating voltage of 48V positive ground.
- c) A control panel to interface the Solar Power System, the D.C. generating set and the rectifiers (which shall be assumed as existing).

2.0 EXISTING EQUIPMENT IN BTS CABINET

Excluded from our scope of supply,

3.0 PV SOLAR GENERATOR

3.1 System components

The solar generator system will consist of the following:

- PV Solar Modules.
- Deep Cycling Maintenance free Battery.
- Charge regulator with programmable low voltage battery disconnect capability, and Voltage/Current Monitoring.
- Support Structure for PV array.
- Lightning Surge Protection.
- Installation materials and accessories.

3.2 PV System Specification

3.2.1. General

- a) The PV solar system is designed to offer optimum compromise between monthly operational time of the diesel D.C. generator and the allowable Depth of Discharge (DOD) of the battery.
- b) The solar power system is designed to be maintenance free.
- c) The offered system components are field proven and we the bidder state that similar equipment has been deployed in .
- d) The following environmental conditions have been assumed:
 - (i) Altitude above sea level 1,000 m.
 - (ii) Ambient Temperature: 0⁰C - 45⁰C
 - (iii) Relative Humidity 95%
 - (iv) Salinity upto 2%
- e) Expected system life span is greater than 20 years (except for maintenance free battery, whose service life and warranty at stated ambient temperature is approximately 15 years).
- f) Design Total (Hybrid System) Load 360 Amp Hours per day.
- g) System Voltage 48V Positive Ground
- h) Diesel D.C. generator capacity 10 KW continuous.
- i) Estimated Generator Run Hours per month < 120
- j) The areas where the solar systems are to be installed are prone to lightning strikes. The systems to be supplied have adequate protection against lightning strikes.

3.2.2. Solar Array.

- a. The PV Array will be constructed on the basis of 24 V, 150W modules.
- b. The offered PV solar array capacity will be 1800Wp.
- c. Service life of PV Modules will be 20 years or better..
- d. Output Array voltage is 48V positive ground
- e. Offered PV Solar Module is defined by the following:
 - i. Typical Power :TBD
 - ii. Minimum Power :TBD
 - iii. Voltage at peak power :34V
 - iv. Current at peak power :4.4A
 - v. Open Circuit Voltage :43V
 - vi. Short Circuit Current :4.8A
 - vii. Cell Type :Crystal
 - viii. No. Of Cells in series: :72
 - ix. Dimensions :1618 x 814 x 35mm

- f. Each offered PV module has a factory installed Bypass diode to protect the module against reverse current.
- g. Each module will have an indelible serial number inscribed on the module.
- h. Additional fringes of solar panels will be welded together as a means of securing them at the time of installation.
- i. Each solar panel will be engraved with Uganda Telecom logo.
- j. The module will conform to IEC 61215 and its manufacture is ISO 9001 certified.

3.2.3 Solar Array Support Structure

- a. The support structure, mountings and fixing bolts/nuts are weather proof and corrosion resistant.
- b. The structure will be lightweight but strong enough to withstand Wind speeds of 120 km/hr.
- c. The supports will allow free air access to module rear
- d. It will allow tilt angle range adjustable by given steps
- e. Provision for cleaning solar panels will be afforded by the installation method.
- f. The height of the lowest side of the solar support will be 2.5 m above the ground.
- g. The stands of the structure will be bounded and connected to the Station Earth.

3.2.4. Battery.

- a. European made Deep Cycling Maintenance-free gas recombination sealed valve-regulated batteries are offered. Total Battery capacity is be 1000 Ah C10 rate at 250C. For maintenance purposes the battery string consist of two battery banks, each of 500 Ahr.
- b. Operational life at 20°C will be better than 15 years.
- c. Self-discharge rate is less than 2%/month at 25°C.
- d. Allowable DOD will be 80%.
- e. Design DOD is assumed to be 50% in normal circumstances.
- f. Offered Battery will conform to IEC 896-2 tests and DIN 40 742 part 1 safety standard. IEC 896-2 cycles shall be stated.
- g. A suitable battery rack and container, suitable for outdoor installation, occupying not more than 1 m² floor space and not higher than 1.5m is offered.

3.2.5 Charge Controller

- a. A suitable Charge/Discharge controller is offered to manage the battery charging process, disconnect the battery on a preset low voltage battery as well as affect interfacing functions with the solar panels, Batteries, Load and the Diesel Generator.
- b. The controller can send a start signal to the diesel generator if the battery voltage falls below a set value and stop the set when the battery voltage rises to a given value

- c. The offered Charge Controller shall fulfill all system requirements as laid out in these specifications.
- d. The Controller is able to handle up to 75Amps at 48V DC.
- e. The Charge controller incorporates a device to monitor the following :
 - i. Battery Voltage
 - ii. Battery Current
 - iii. Load Current
 - iv. Load Voltage
- f. The Controller has programmable functions that allow field setting of charge modes/alarm values:
 - i. Low voltage disconnect (Adjustable between 42V – 46.0V)
 - ii. Low Battery Alarm (Adjustable between 46.8V – 47.4V)
 - iii. High Voltage Alarm (Adjustable between 56.0V - 60.0V)
 - iv. Generator Start Voltage: (adjustable between 46.8V – 47.4V)
 - v. Generator stop Voltage (Adjustable between 53.2V – 56.0)

The controller has high reliability and is estimated to work without fail for a sufficiently long period which is not less than 5 years.

4.0 D.C. Generator

4.1 The D.C. Generator will be a back up to the solar system and will only run if the batteries are discharged and the voltage has dropped to a set level set.

4.2 The D.C. Generator contains the following:

- (i) A four stroke diesel engine: The engine is protected against: over-temperature, low oil pressure, over-speed, and over-cranking (during starting). There is a lockout protecting the engine against starter motor actuation while the engine is running.
- (ii) The geneset shall has a two speed engine (1200 / 1800rpm dependant on the load)
- (iii) A brushless D.C. Alternator
- (iv) Capacity: 10kW
- (v) Sound Attenuated Enclosure with noise level > 65 Dbm at 7m
- (vi) Weather proof enclosure suitable for outdoor installation.

4.3 The nominal D.C. output voltage to the telecommunications equipment will be maintained within the limits of $\pm 4\%$ for variations of load current between 10% 100% of full load and within ambient temperature range of 0-45⁰C.

Voltage overshoot is minimized to a limit of $\pm 4\%$ when switching the equipment ON or OFF.

4.4 The equipment incorporates effective suppression of electrical interference.

Radio frequency interference suppressors shall be in accordance with BSS 613 or an equivalent standard.

4.5 The noise across the D.C. supply to telecommunications equipment will not exceed 1mVrms psophometric value in accordance with CITT recommendation for the whole load range, even without a battery.

5.0 INVERTER : NON FORESEEN FOR THIS APPLICATON

6.0 Alarms

6.1 System and individual component failure is monitored by a dry contact alarm with an open/close circuit for the possibility of extending the alarms to a remote Network Maintenance Centre.

6.2 The Alarm cable is to be laid inside a PVC conduit in the ground to the DDF Rack inside the BTS Equipment Room.

6.3 The following alarms among others shall be provided:

- i. Low Battery Alarm (the alarm will be initiated before the battery voltage has reached the nominal discharge value)
- ii. High Battery Alarm (the alarm indicates the over-charging of the battery)
- iii. No output from the solar array.

7.0 HANDBOOKS/INFORMATION

7.1 A comprehensive handbook is provided

- a) Solar Plant, D.C.
- b) Generator
- c) Inverter.
- d) Batteries.

7.2 The handbook contains complete information and illustrations for installation, commissioning, operation and maintenance including the circuit diagrams of the elements of the equipment.

7.3 A complete component catalogue including information of re-ordering will be provided. A list of test equipment and tools will be included with the system.

7.4 Marking on the equipment, drawings and handbooks supplied will be in English.

7.5 Special Installation Tools for the project.

8.0 EQUIPMENT ACCEPTANCE TESTING

i. We, the supplier undertake to provide an acceptance testing specification for the equipment to International standards.

ii. Tests on the equipment in the factory will be our responsibility and validated by authorized Mobile representatives).

iii. Documentation will be provided in English for each type of equipment.