Growatt Hybrid Solar System Provides 24/7 Power Supply in Sierra Leone

Background

Sierra Leone is located on the Atlantic coast of West Africa, the country is still under recovering from civil war during which most infrastructures were destroyed, power quality and availability are extremely low, nationwide only 13% average population is covered by power, and most power infrastructure is restricted to the 4 main cities. In rural area the availability of power is even less than 1%, long period power outage frequently happens.

As the price of solar panels, batteries and inverters has been decreasing year by year, solar energy storage system is becoming more and more affordable, the clean and reliable power source provides another option for people in less developed areas where grid is not or seldom available.

Here is a case in Freetown, where grid is unreliable and expensive. the office building is with max 95kVA load power including computers and air conditioners, and needs power supply from a stand-alone system.

Site Survey		
Site location	Freetown	
Grid availability	No grid	
Load detail	Loads features	Computers (About 20%) + Air conditioning (about 80%)
	Loads capacity	95 kVA – Cos phi: 0.8
PV installation	Car park and building rooftop	
Equipment installation	Outdoor concrete base	
Load daily consumption	400kWh	

Growatt Solution

According to local solar radiation, load capacity and backup time requirement, Growatt proposed a solar-battery-DG storage system solution, which includes 92kWp solar modules, HPS120 integrated energy conversion system, 940kWh lead-acid battery and other accessories. It can meet more than 10h peak load backup requirement and the overall power supply covers more than 90% of load requirement, together with diesel generator, 24/7 power supply is guaranteed by the stand-alone system with minimum fuel consumption.

System configuration		
Container	40ft container,(inbuilt airconditioner, lighting and fire extinguishing system. IP54)	
Inverter	Growatt HPS120 120kW hybrid inverter	
Monitoring datalogger	Growatt Shinewebbox	
Solar	Solar power	92 kWp
	Open circuit voltage	812.7 V
	MPPT voltage	665.7 V
Battery	Battery type	2VOPZV1200
	Capacity	1200 Ah (C10)
	Qty & configuration	2*196*2V*1200Ah
Diesel generator	100kVA	

Design of the system has features listed below:

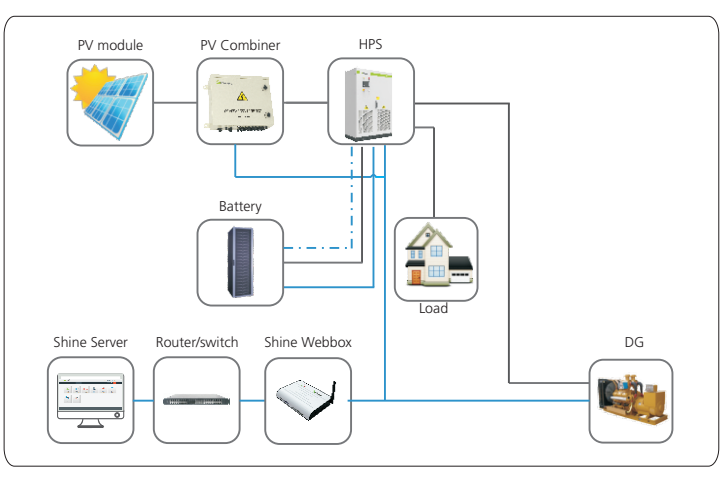
1. To save the time and cost for civil work, Growatt proposed containerized solution with inverter, battery and accessories installed in a container, with IP54 protection level it can be applied outdoor. with air-conditioner cooling, the solution can handle hot weather as well as rainy climate in Sierra Leone. all pre-assembled in factory, the installation on site is very easy.


Container


HPS in container


Battery in container

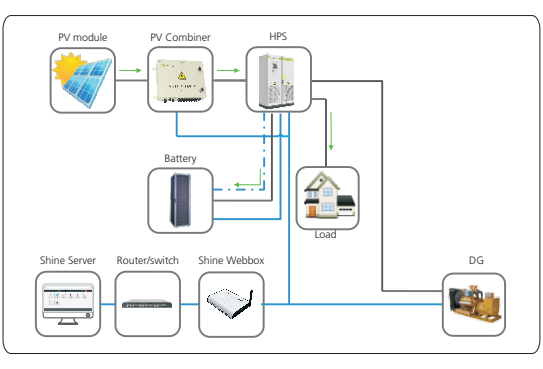
2. To handle long rainy days, a backup diesel generator is proposed also, which can provide double insurance at solar shortage during rainy season. as the brain of system, Growatt HPS controls the on and off operation of diesel generator according to system logic and battery status.



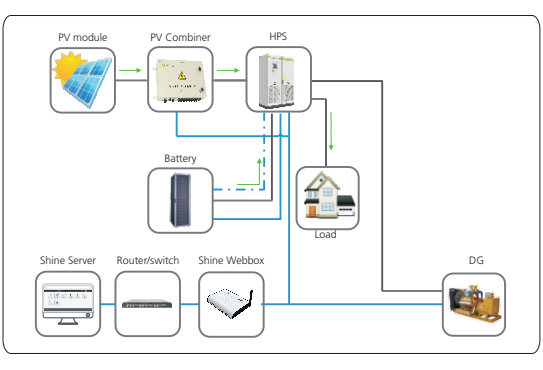
3. To ensure system work at its optimum capability, Growatt customized software control logic for this case. solar-battery-DG work in turns, maximize solar self-consumption and reduce fossil fuel consumption.

System working mode is as follows:

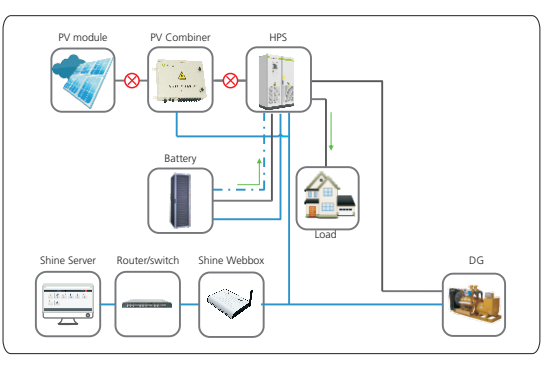
1) When solar is sufficient, solar power> load power, the solar power supply to the load, and the remaining energy charges the battery



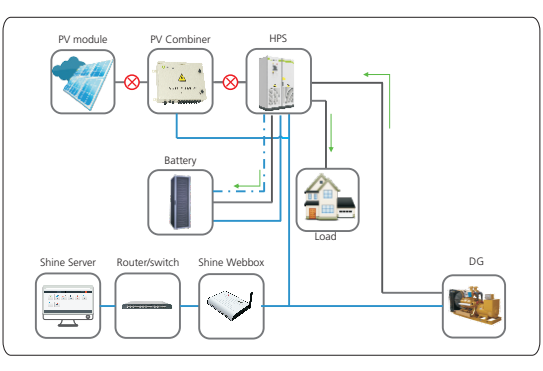
2) As the light intensity decreases, the photovoltaic power < load capacity, the photovoltaic energy is used preferentially, and the battery serves as the supplementary energy while providing the load power



3) When solar is not available, the battery supplies power to the load separately until the battery discharges to the preset SOC value; at this time, the HPS will send the start signal to start the generator, and close the DC/AC conversion to protect the battery from over discharge, which may result to shorten battery life, then generator will provide power for the load



4) During continuous rainy days, battery will stay low SOC which may reduce battery life span, HPS can charge battery from generator



System turnout

Based on local meteor condition, the estimated annual system yield will be like below:

Annual generation	142572kWh
Fuel saved	28514kg

Variable	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Insolation, kWh/m²/day	5.52	6.13	6.22	5.91	5.11	4.52	4.02	3.80	4.29	4.67	4.69	5.06
Clearness, 0 - 1	0.61	0.63	0.61	0.57	0.50	0.45	0.40	0.37	0.42	0.48	0.51	0.57
Temperature, ° C	26.32	26.71	26.53	26.45	25.72	24.95	24.18	23.98	24.39	24.67	24.75	24.88
Wind speed, m/s	4.27	4.21	4.46	4.46	4.83	4.30	4.26	3.88	3.87	3.29	3.36	3.44
Precipitation, mm	7	6	20	58	191	349	752	804	507	282	111	27
Wet days, d	0.4	0.4	1.7	5.0	15.2	22.4	27.0	27.1	24.2	21.3	9.9	2.4

The system has been in operation for more than 6 months since commissioned in February, now there's no worry about electricity shortage anymore, stable power is available 24/7 in the building which mostly from clean energy with minimum usage of fossil fuel. customer is very satisfied by the system and highly praised Growatt for its flexible solution, excellent product and also comprehensive services.

Certificate of satisfactory performance of Growatt inverter

Dear Sir:

ENVIREARTH had awarded contract to Growatt New Energy Technology to purchase Growatt Storage inverter products since 2016 for several sites including Djibouti, Nigeria, Sierra Leone,

These Storage Inverter equipment had been commissioned smoothly and run stably ever since. The Growatt Inverter system included the following equipments:

1. **Sierra Leone**
   - **A set of HPS120kW system**
2. **Dhibouti**
   - **A unit of 18000UE**
3. **Nigeria**
   - **A unit of CP100**

ENVIREARTH is satisfied with Growatt Inverter products, which has high efficiency, advanced design technology, first-class operation performance, and strong after-sales support and service.

Signed: Florian SAINT PIERRE

2018.7.25

Certificate of satisfactory