

CASE STUDY: TELECOMMUNICATIONS



HYBRID OFF-GRID TELECOM SITES

AFGHAN TELECOM, AFGHANISTAN

Hybrid off-grid telecom power conversion system for remote telecom sites

The Case

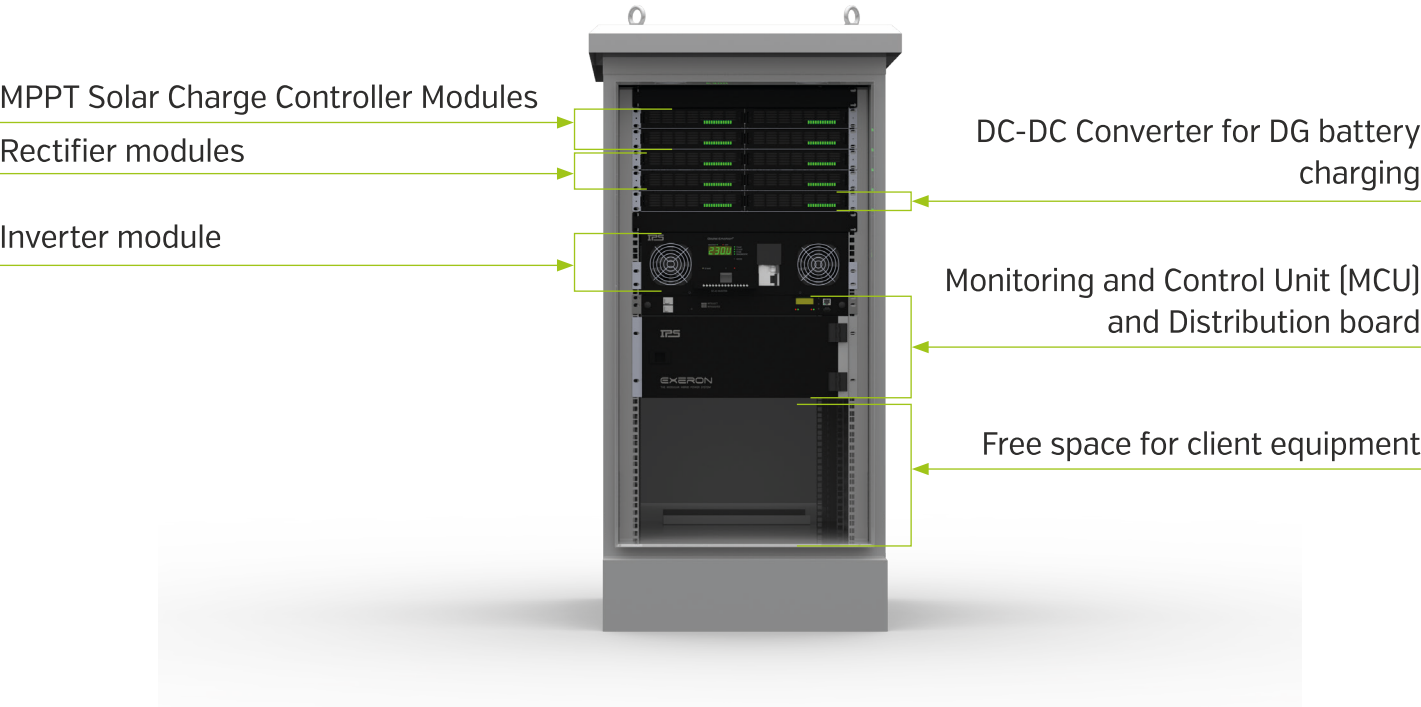
Afghan Telecom Corporation (AfTel) was incorporated on 24 September 2005 to provide unified telecommunication services throughout Afghanistan under the stewardship of Ministry of Communications & Information Technology. Currently, the company is the leading national provider of telecommunication services in the country, with roughly 20000 employees in 34 provincial capitals and 254 district centres and villages, offering traditional wire-line telephones and internet access as well as wireless and mobile services. Afghan Telecom issued an RFQ for the supply of 200 solar hybrid units for powering off-grid telecom sites within their network. The sites were distributed among different areas in Afghanistan. Aim of the project was to decrease the diesel generator running time as much as possible.

The Challenge

The supplied system was to combine power input from solar panels, backup diesel generator, and batteries in order to supply -48VDC telecom loads in the range of 1000-1300W. Additionally, the system had to include an inverter to supply AC VSAT equipment on the sites. The required minimum battery backup was 16 hours. The system had to be configured in a cabinet suitable for outdoor use, taking into account the harsh weather conditions at the project location.

The Solution

IPS designed a modular power system in a customized IP55 cabinet, with double walls and forced ventilation, capable of maintaining the required temperature and environmental conditions for the proper operation of the power electronics. The system consisted further of 6kWp input from solar PV panels, as well as 6kW of diesel generator input, sufficient to provide power to the load as well as to charge the 16-hour backup battery. In addition to the -48VDC output, the system included an inverter for providing AC power to the VSAT equipment. All input and output connections to the system were done through the customized AC and DC distribution panel, included in the system cabinet.



The IPS Configuration

IPS designed and provided the following EXERON power conversion system:

System Requirement	Exeron CM Configuration
PV system 6 kWp polycrystalline	3 x 2 kWp MMPT charge controllers SML2000
DG/ Grid input 6 kW	3 x 2 kW Rectifier modules ML2000
AC output for VSAT Equipment	1 x 500 kVA inverter modules I500B
Diesel generator battery charging	1 x DC-DC converter [48V-12V]
Battery 48V / 650Ah	Lead-Acid battery for hybrid applications (supplied by the client)

Optimal System Performance

The provided EXERON configuration allows for dramatic reduction of diesel generator running ours, with the sites operating with over 80% renewable energy component. This translates in an OPEX reduction of 87% compared to diesel-only site, and at the same time significantly increases site uptime by providing diversification of the power sources as well as reliable backup. The reduced running costs and increased reliability result in payback period of 1.8 years.

Off-grid Telecom Site, Afghanistan



Site overview



Inside of the EXERON Cabinet



Battery bank



OFF-GRID LTE WIRELESS NETWORK

INDEPENDENT TELECOM SERVICE PROVIDER, NIGERIA

Hybrid off-grid telecom power conversion system for remote telecom sites

The Case

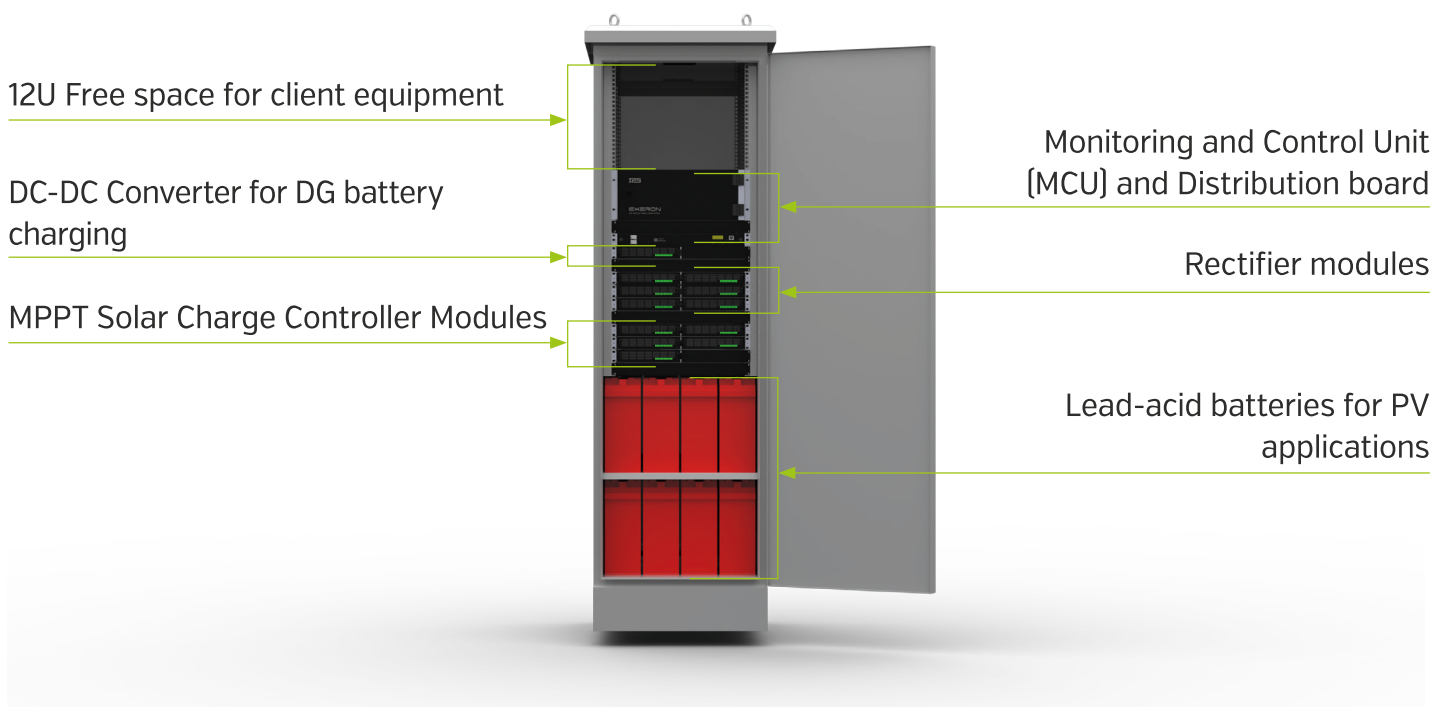
An independent wireless operator in Nigeria, founded by experienced telecommunication engineers, aimed to cover a big territory with an ultra-fast LTE network for data services and on a later basis to provide voice services as well. During the first test phase of the project 12 sites had to be installed.

The Challenge

All of the site locations are in a rural area and no electrification was available. The investor was targeting the best possible OPEX optimization while still maintaining an economically feasible initial investment cost. Due to the sites' remote locations, lowest possible maintenance cost was a must. At the same time, the high ambient temperature in combination with an extremely high relative humidity [typically between 95% and 98%] posed a significant challenge to the power equipment.

The Solution

An IP55 outdoor cabinet with double walls and special anti-corrosive coating was developed and manufactured. High temperature, multicycle batteries, specially developed for PV applications were installed. Forced ventilation guaranteed maximum $\Delta t \leq 7^{\circ}\text{C}$ temperature difference between the ambient and the inside of the cabinet. A 10 kWp PV system with polycrystalline modules were installed. The IPS site configuration was designed to secure 48h power autonomy due to the correct scaling of the PV system. A diesel generator was installed on site for additional backup. It is automatically controlled from the MCU of the IPS modular power system. In case there is not enough sunshine in two consecutive days and the battery is empty the diesel generator would start automatically to power the equipment and to charge the batteries.



The IPS Configuration

IPS designed and provided the following EXERON power conversion system:

System Requirement	Exeron CM Configuration
PV system 10 kWp polycrystalline	5 x 2 kWp MMPT charge controllers SML2000
DG / Grid input 12 KW	6 x 2 kW Rectifier modules ML2000
Diesel generator battery charging	1 x DC-DC converter [48V-12V]
Battery 48V / 380Ah	2 x 4 x 12V Lead-Acid batteries for PV applications
Free space for equipment	12U of 19" free space in the rack

Optimal System Performance

Following the successful pilot installation of the first 12 EXERON units, additional 27 installations were completed for a total of 39 off-grid sites. All sites show excellent performance with minimum DG operation. The need for maintenance site visits has been greatly reduced, thanks to the site operating mostly from solar power and battery. As a result, the OPEX costs have been decreased to nearly zero.

Off-grid LTE Site, Nigeria



PV panel structure and EXERON cabinet location



Installation of the EXERON system



Battery strings inside of the cabinet

