

GREEN OUR EARTH POWER YOUR VISION



## UPS / IDC REVO Lithium Battery System Solutions

- Unattended
- Intelligent operation and maintenance
- Intelligent fire protection and control
- Low TCO, OPEX
- Reduced occupied space



### SHENZHEN CENTER POWER TECH CO., LTD

Address: Rooms 9-12, 7F, Block B, Building 7, Zone 2, Shenzhen  
BayTechnological and Ecological Park, Nanshan District, Shenzhen, China  
Tel: 0755-66851118  
Fax: 0755-66850678  
Email: sales@vision-batt.com  
http://www.vision-batt.com



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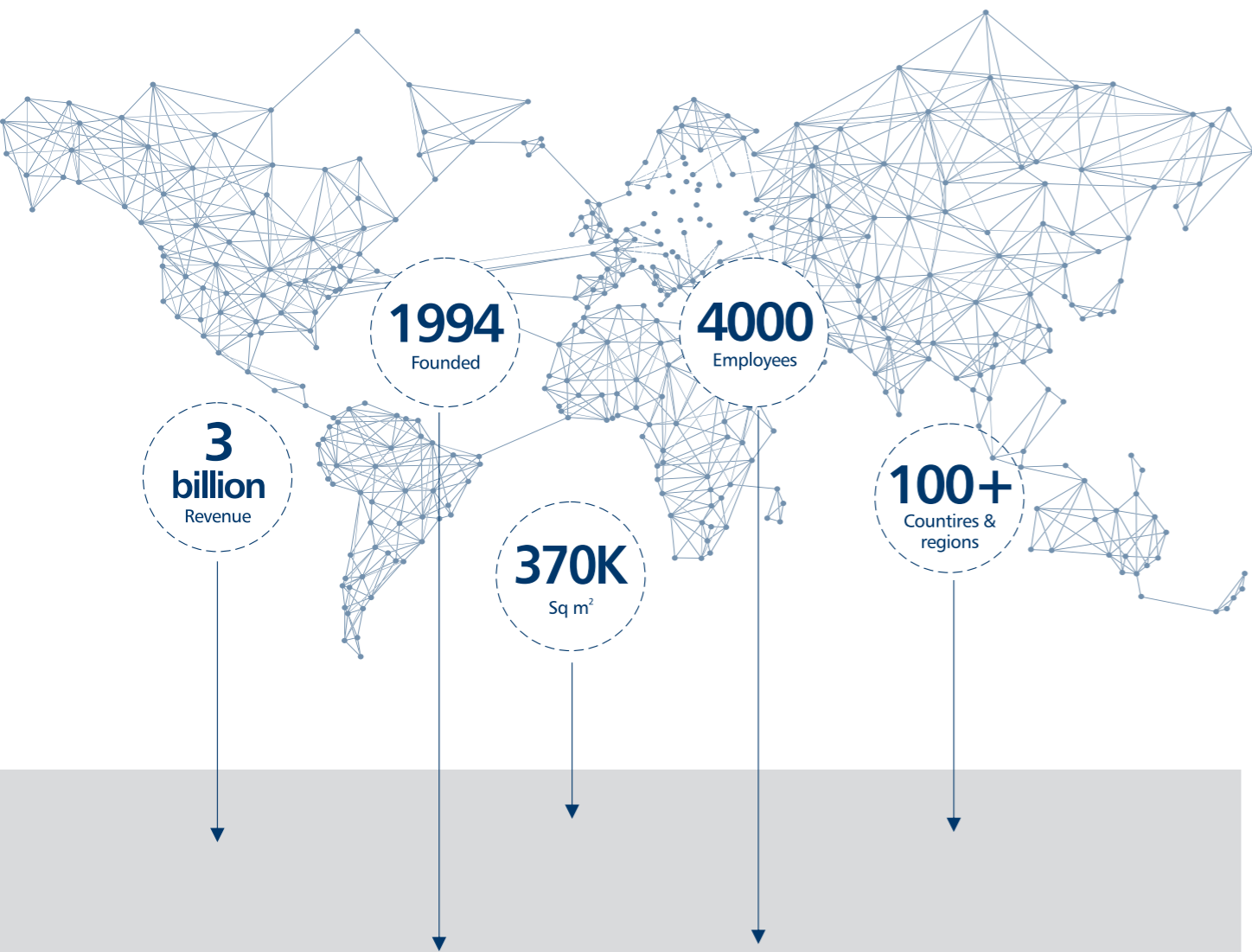


LinkedIn : @visionbattery

VISION GROUP



GREEN OUR EARTH POWER YOUR VISION

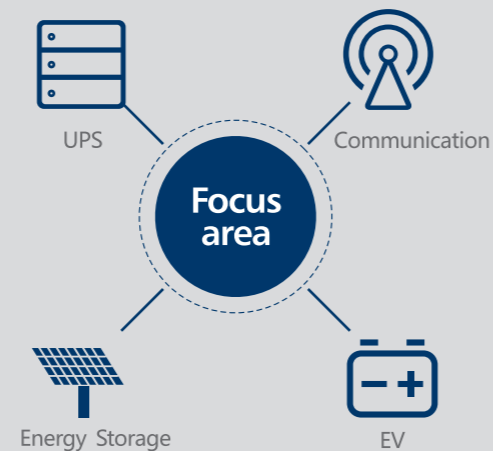


## About Vision Group

Vision Group, one of the world's leading smart stored energy solution service enterprises, was founded in Shenzhen in 1994. It currently has nearly 4,000 employees with stock code of 002733.

The Group has four major manufacture bases, i.e. Shenzhen Vision Science and Technology Park, Vietnam Vision Science and Technology Park and Hubei Vision Manufacture Base, Datong fuel cell manufacture base. covering a total area of 370,000m<sup>2</sup>. It sets up branches or offices in Mainland China, Hong Kong, Singapore, India, Europe and the United States, with service networks covering over 100+ countries and regions globally.

With the mission of "Smart Stored Energy for the World", the Vision Group devotes to realizing the beautiful vision of becoming "a leader in the world's smart stored energy solutions"; It strives to provide solutions for such products as valve-regulated lead-acid battery, lithium ion battery, zinc battery and fuel battery etc. from such industries as UPS, communication, energy stored and EV, etc., and also provides ladder utilization and added value of new energy batteries, and it desires to be a leading new energy enterprise.



# REVO Lithium Battery System Solutions



## Introduction:

REVO series are the lithium battery products independently researched and developed by Vision Group, which can be adaptive to various UPS. REVO series products adopt both Vision Group's high-rate LFP cells and BMS system independently researched and developed by Vision Group. It integrates remote cloud management system and intelligent fire protection & control module, which is of **high reliability, good stability, long service life and excellent safety performance.**

## Functions and advantages:

REVO series has four levels of safety protection to ensure the system is safe and reliable throughout its life cycle; it adopts the design of three-level management structure to accurately monitor the status of each component inside the system, so as to ensure the stability of system performance and the safety of power supply for users' load.

## Applications:

REVO series can be applied to various brands of UPS or other inverters. Users can choose different communication modes to communicate with each brand of UPS or inverters. In addition, it can also run on its own without communication. REVO series is highly compatible, which can be widely used in the industries, such as data center, financial institution, rail transit, wind-solar complementary energy storage, and backup power in the region without electric supply.



## Advantage comparison of lithium iron phosphate (LFP)

### Lithium iron phosphate (LFP) VS Nickel, Cobalt and Manganese ternary material (NCM)

Rate performance		Material stability	
Reach 30C LFP	10C NCM	(700°C) No Oxygen decomposition LFP	(200-300°C) Oxygen decomposition Easy to catch fire NCM
Pollution-free LFP	Heavy metal NCM	Easy to obtain LFP	Poor availability NCM
Environment friendly		Availability of raw materials	
Wh cost		Cycle life	
Safety		Safety	
80%DOD ≥4000 times LFP		≤2000 times NCM	

### Lithium iron phosphate (LFP) VS Valve-regulated lead-acid (VRLA)

Volume specific energy	Ratio of performance	Temperature performance
LFP	30C LFP	6C VRLA
15-35°C A/C Free LFP	20-25°C A/C Room VRLA	
Energy consumption LFP	No gas is produced LFP	Hydrogen evolution requires ventilation VRLA
Energy consumption VRLA	Intelligent maintenance LFP	BMS system need to be built externally VRLA
Energy consumption	Hydrogen evolution reaction	Maintainability
Area covered	80%DOD ≥4000 times LFP	≤500 times VRLA
	1Hs LFP	10Hs VRLA
	Cycle life	Charging time

## Cell:

REVO series uses high-rate LFP cell independently researched & developed and produced by Vision Group. The cell has good consistency, long cycle life, excellent high-rate discharge performance, which is safe, reliable, and free of fire or explosion risk. For 1C charging/discharging (100%), there shall be no less than 4000 cycles; at the most, 30C discharging can be supported (different types of cells have different maximum discharge rates)



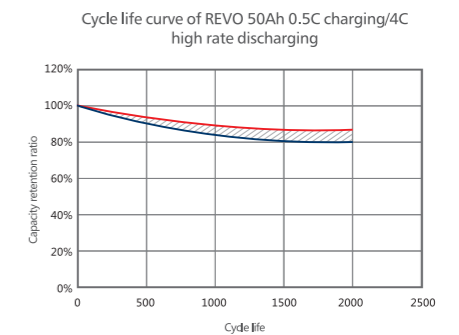
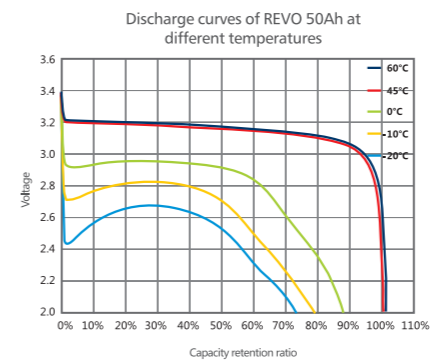
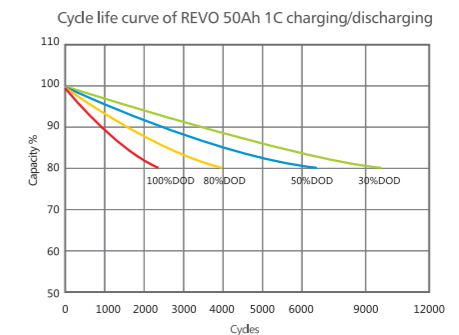
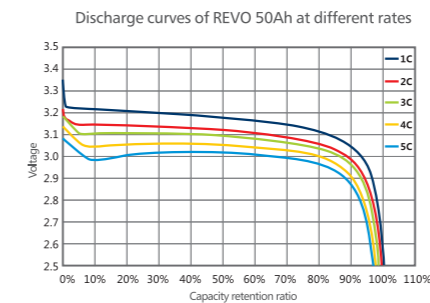
Long cycle life



Excellent discharge performance



High safety performance



## Technical parameters:

Code	Type	Shapes & dimensions				Weight	Nominal voltage	Nominal capacity	The maximum discharge rate
		Shape	Length (mm)	Width (mm)	Height (mm)				
1.1Ah	LFP	Cylindrical	18	/	650	40.5g	3.2V	1100mAh	30C
10Ah	LFP	Cubical	56	33	81	420g	3.2V	10Ah	3C
20Ah	LFP	Cubical	147	27	98	670g	3.2V	20Ah	10C
50Ah	LFP	Cubical	130	36.5	162	1630	3.2V	50Ah	5C

# Single-phase series products



Schematic diagram of product system composition

### Products advantages:

- Standard rack-mounted design or embedded design, which can support the embeddedness inside UPS body
- Secondary or tertiary management architecture, which can support external parallel connection and late expansion
- Support CANBUS or MODBUS communication
- High precision control, with the voltage accuracy of 5mV and the temperature accuracy of 0.5°C

### Core features of the products:

- High-rate discharge performance, which can support 30C discharging at the most
- High-rate discharge efficiency, which is greater than 90%
- Long service life, with the design life of 20 years
- Long cycle life, which shall be not less than 1,000 cycles in case of 4C discharging/1C charging
- High compatibility performance, which can be suitable for all kinds of lower-power UPS or other inverters

### Technical parameters:

Type	Cell	Module	Module unit	System	Nominal voltage	Max continuous output power	Weight	Dimensions
SP500	1.1Ah	12V3.3Ah	12V3.3Ah	12V3.3Ah	12.8V	500W	0.6kg	152*65*95
SP1000	1.1Ah	24V3.3Ah	24V3.3Ah	24V3.3Ah	25.6V	1000W	1.5kg	140*300*40
SP2000	1.1Ah	48V3.3Ah	48V3.3Ah	48V3.3Ah	51.2V	2000W	3.0kg	280*300*40
SP3000	1.1Ah	72V3.3Ah	72V3.3Ah	72V3.3Ah	76.8V	3000W	4.5kg	420*300*40
SP10000	1.1Ah	192V10Ah	192V10Ah	192V10Ah	204.8V	10KW	32kg	443*620*133
SP30000	20Ah	240V20Ah	240V20Ah	240V20Ah	240V	30KW	100kg	430*630*370

# Three-phase series products



### Product advantages and features:

- Adopting standard modular design, easy and convenient for installation;
- Supporting multi-module series connection, which is applicable for a variety of voltage ranges (48V\*n, 14 ≤ n ≤ 5);
- Supporting multi-module unit parallel connection, which is applicable for application scenarios with different powers and different durations of backup power;
- Compatible with 2nd/3rd-line design, which can meet the requirements of different UPS models;
- "Interactive circulation+active current sharing" technology, supporting the combined use of both new and old modules / module units.

### Core features of the products:

- High safety performance, with four-level safety protection to ensure that the system is safe and reliable (cell level, module level, module-unit level, and system level)
- Excellent high-rate discharge performance, which can support 10C discharging at the most, with the discharge efficiency not less than 95%
- Full-state management: 100% cell monomer management + functional device control
- Long service life, with the design life of 20 years
- Long cycle life: 1C charging/discharging ≥ 2,500 times; 4C discharging/0.5C charging ≥ 1,000 times
- Intelligent cloud management system: Supporting predictive operation and maintenance; operation and maintenance monitoring by cloud, which can support multi-role management
- Intelligent fire protection & control system (optional): Built-in fire protection & control system, which can guarantee the system and facilities' safety at all time (7\*24)

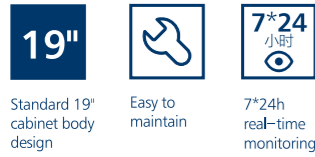


Schematic diagram of product system composition



## Module:

Standard 19-inch cabinet design, easy and fast installation; Full front wiring design, simple maintenance; Integrated single battery acquisition and management unit, to achieve 7\*24 hours of real-time online monitoring, to ensure the safe operation of the system.



Specs	Model of cell	Dimensions (mm)			Weight (kg)	Max continuous output power (kW)	Standard standby duration (min)
		D	W	H			
51.2V20Ah	1.1Ah	650	442	88	27	20.01	3
51.2V20Ah	20Ah	800	442	108	22	11	5
51.2V40Ah	20Ah	650	442	132	40	22	5
51.2V50Ah	50Ah	650	442	108	35	10.8	15
51.2V100Ah	50Ah	800	442	154	65	21.6	15

## Rack:

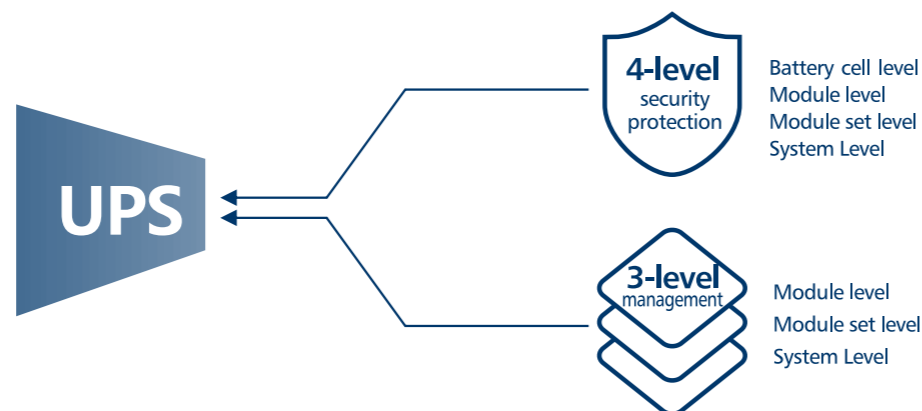
The cabinet adopts modular design, clean and beautiful, convenient layout, equipped with visual display system, real-time display system status, and status indicator light, which can quickly identify the status of each cabinet. Support FCL transportation to minimize the construction quantity.



Specs	Capacity configuration	Model of cell	Number of battery modules	Dimensions (mm)			Weight (kg)	Max continuous output power (kW)
				W	D	H		
TPM200	512.0V 20AH	1.1AH	10	600	1000	2000	320	200.1
TPH100B	512.0V 20AH	20AH	10	600	1000	2000	270	110.0
TPH200	512.0V 40AH	20AH	10	600	1000	2000	430	220.0
TP80	409.6V 50Ah	50Ah	8	600	1000	2000	480	86.7
TP100	512.0V 50Ah	50Ah	10	600	1000	2000	550	108.4
TP120	614.4V 50Ah	50Ah	12	600	1000	2000	620	130.1
TP140	716.8V 50Ah	50Ah	14	600	1000	2000	690	151.8
TP160	409.6V 100Ah	50Ah	8	600	1000	2000	760	173.4
TP200	512.0V 100Ah	50Ah	10	600	1000	2000	900	216.8
TP240	614.4V 100Ah	50Ah	12	600	1000	2300	1040	260.2

## System:

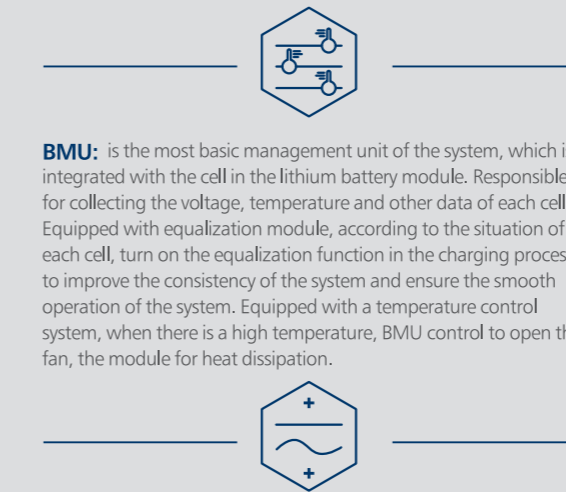
The system adopts the scheme of first series and then parallel, and the safety protection is divided into 4 levels, which are cell level, module level, rack level and system level. There are 3 levels of management, namely module level, rack level and system level. The sys is equipped with bus cabinet, which is connected to UPS uniformly.



## BMS :

### BMS functions

BMS is short for battery management system. The management system is divided into 3 levels, namely BMU, CBMS and GBMS. Through the management and protection of the cell point to point, the safety and reliability of the whole system can be ensured. The system has routine protection functions such as over-charge, over-discharge, over-temperature and balance, etc. Meanwhile, predictive management parameters such as SOC and SOH are included to manage the whole life cycle of the whole system and single cell.



**BMU:** is the most basic management unit of the system, which is integrated with the cell in the lithium battery module. Responsible for collecting the voltage, temperature and other data of each cell. Equipped with equalization module, according to the situation of each cell, turn on the equalization function in the charging process to improve the consistency of the system and ensure the smooth operation of the system. Equipped with a temperature control system, when there is a high temperature, BMU control to open the fan, the module for heat dissipation.

**CBMS:** is Rack BMS, integrated management devices, such as DC circuit breaker, relay, hall element, diode, pre-charge resistance, etc. Integrated management system, real-time analysis and processing of BMU transmitted data, and generate real-time status report, feedback to the system BMS. CBMS adopts AC and DC power supply modes. When AC input is normal, AC power supply is preferred. After AC power is off, it can be directly switched to DC power supply without switching time.

**GBMS:** is system BMS. Responsible for organizing the uploaded data of each CBMS in the system, analyzing them in real time, generating the system operation status report, and displaying it on the display screen through the communication line information is exchanged with UPS through dry contact and communication protocol (CANBUS or MODBUS).

## Security Controls



**Cell level:** The electric core adopts LFP material system, which has extremely high safety. In addition, one-way explosion-proof valve is designed on the top. In case of emergency, such as short-time connection outside, the explosion-proof valve can be punched open to cut off the circuit to prevent large safety risks.

**Module level:** The temperature control module controlled by BMU at the module level can adjust the temperature in the module in real time to ensure that the operating environment is in a controllable range.

**Rack level:** Rack level is mainly through the CBMS internal DC circuit breaker, reply, pre-charge resistance and diode and other power devices, the system to achieve overcharge, over-current, anti-reverse connection and other state management, to ensure the safety and reliability of the rack.

**System level:** The main purpose of the system is to control the pressure difference between racks in the parallel machine state, and realize the balance adjustment between racks through pre-charge resistance to ensure the safety of system operation.

### Smart cloud management system

- Support mobile APP or PC terminal monitoring management
- Management authority by roles
- Predictive operation and maintenance control
- Closed-loop operation and maintenance management

### Smart fire control system

- Heptafluoropropane fire extinguishing agent
- Design of hot melt fire pipe
- Module built-in + Cabinet protection, eliminating internal and external risks
- 7\*24h on-line monitoring, safe and free of dead angles



# Case study

## Qingdao CIM project

In 2016, Qingdao Municipal Bureau of Housing and Urban-Rural Development launched the project of "Internet + Urban and rural construction" and the construction industry in Qingdao aimed at the international mainstream, taking BIM, Internet and large data applications as the starting point to promote the conversion, transformation and upgrading of new and old types of kinetic energy. By the end of 2017, 18 projects have been listed in the first batch of pilot demonstration projects of Building Information Model (BIM) technology application in Shandong Province, and the urban construction cloud is even integrated with the "Residential construction cloud" platform of the Ministry of Housing and Construction, and has been demonstrated for construction and applied in the Northern District of Shandong Province.



## Yangzhou Project

Yangzhou Pacific Special Materials Co., Ltd. is a modern steel raw material and logistics integrated enterprise under the CITIC Pacific Special Steel Holdings. It has two production lines of medium- and high-grade oxidized pellets with an annual output of 3 million tons, a beneficiation production line of high-grade fine powder with annual output of 3 million tons, and a Yangtze River wharf with an annual throughput capacity of 20 million tons, which can also provide material transfer business.



## Vision Group's solution



- **High reliability:** Use Vision Group's Senry lithium battery, REVO series, "N+1" type lithium battery redundant parallel-connection power supply system
- **High energy density:** Compared with VRLA batteries of the same capacity, it can reduce the installation space by 60% and the weight by 70%
- **High safety:** Batteries are equipped with self-protection system to prevent overcharge, over-discharge, high temperature and unbalanced abuse, etc., so as to eliminate potential safety hazards and ensure safe and effective operation.
- **Long service life:** 10 years or more, which is 2-3 times of that of VRLA battery; cycle life: 3,000 cycles, which is 4-6 times of that of VRLA battery
- **Intelligent:** 100% cell data acquisition and analysis, visual monitoring interface; "Automatic equalization + self-protection" technology, and the data can be remotely shared in the Cloud
- **Convenient and fast:** Modular design, convenient and fast for installation, almost zero operation and maintenance cost

## Vision Group's solution

Adopting TP integrated solution of Vision Group's Senry lithium battery REVO Series

- Rack-mounted design, with front wiring, easy and convenient for installation, simple for maintenance, supporting the installation close to the wall for intelligent control, which can reduce the workload of operation and maintenance by more than 50%
- High energy density: Compared with VRLA batteries of the same capacity, it can increase the space utilization rate by more than 40%
- The system is neat and good looking, and the battery system is perfectly integrated with UPS and servers



# Case study



## Argentina

### Vision Group's solution

This VISION system 48V 100Ah battery bank supplies all the energy for the street lights in a solar town Olaroz Chico, in Jujuy, Argentina. We use the renewable and earth friendly lithium battery to produce the power for the city, which makes this city bright and clean. It benefits not only the Argentina, but all of the world.

## Philippines-Globe

### Vision Group's solution

As one of the fastest developing countries, Philippines has achieved great progress in recent years, and also one of the best appropriate places for Data Center. Many multinational tech-giants pay more attention to it by doing more IDC infrastructure there. The whole project in Manila is going to be installed with lithium battery. And now is just the first section ongoing and much more follow.



# Case study

## Europe

### Vision Group's solution

It is for a big IDC project located in western European, and now the equipment is running very well with the assistance of lithium battery.

It is working more efficiently and saves customers much more time and cost to manage the system. It also represents that lithium is getting widely interest from customers in different regions.



## Middle East

### Vision Group's solution

The lithium battery makes it possible for lamps to produce much more power and to work more efficiently. It is a good option for this area because lithium can work more stably in high temperature. So the rich solar resources in mid-east can be transferred into electricity. It improves a lot the infrastructure status and make the transportation more convenient.

The emerging lithium battery is being and becoming a more widely use in our public utilities. Green our home, prolong our life. We are living the way we dreamed of.

