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Advantages of MPPT Integrated Solar Power

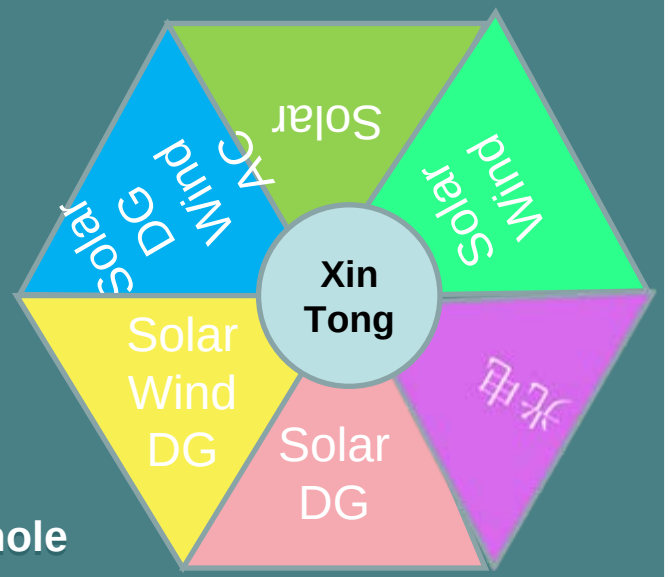
---XinTong® Solar/Wind/DG/AC Integrated Power System Introduction

Shaanxi Xintong Intelligent Technology Co., Ltd

I、Integrated Power System Brief

Integrated Power System means, to allow Solar, Wind, DG, AC Grid power etc, to be connected hybrid and controlled via a management system basing on an optimal power system.

Consists of Central control module, Solar Module, Wind Module, AC Grid Module, DG Module and so on. One or more power modules can be combined into a hybrid system according to different power capacity complementarily one by one. All these power modules are controlled by one Central Control Module, have their own multi-backup program in each power module respectively. Thus any failure of one module shall not be upgrade to the whole hybrid system.



Features- modularization, absolute voltage regulation, MPPT, high efficiency, complete function, easy erection/maintenance, high reliability/adaptability etc. Well used in remote, Grid shortage area and especially high performance in energy conservation and emissions reductions

Structure Chart of Xintong System

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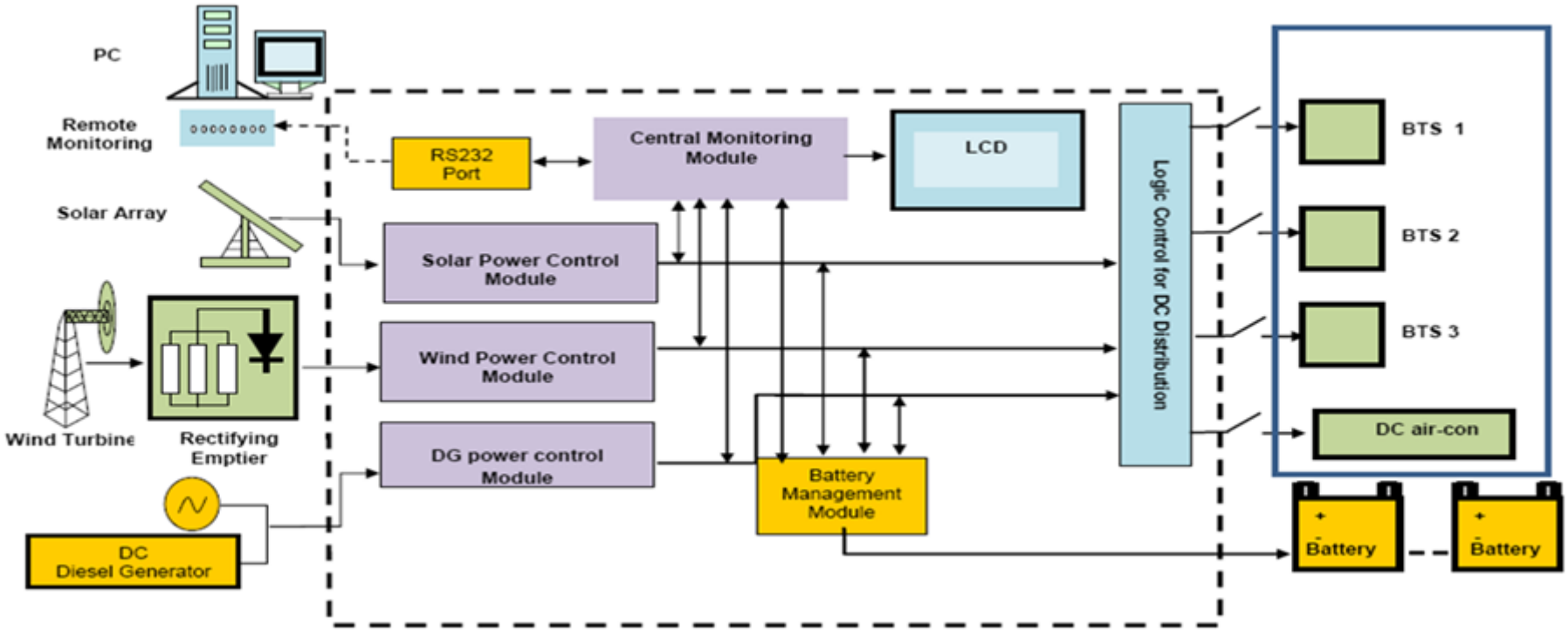
Central Control Module manages Solar/Wind/AC Grid/DG Module, all power sources connect system all the time, every input power sources are On-line-Standby. Modifying output power will NOT fulfilled via PWM. Battery is a reserved power only used when necessary automatically as requirement. With system program Multi-backup function, program are saved in each module. Thus when one single module, even the central control module, failed, the whole system can still work normally. So, the system has an extreme high reliability.



Key Technology of Integrated Power System

I: Integrated Management: Modularization, Multi-backup, Super Reliability

Solar/Wind/AC/DG Integrated System

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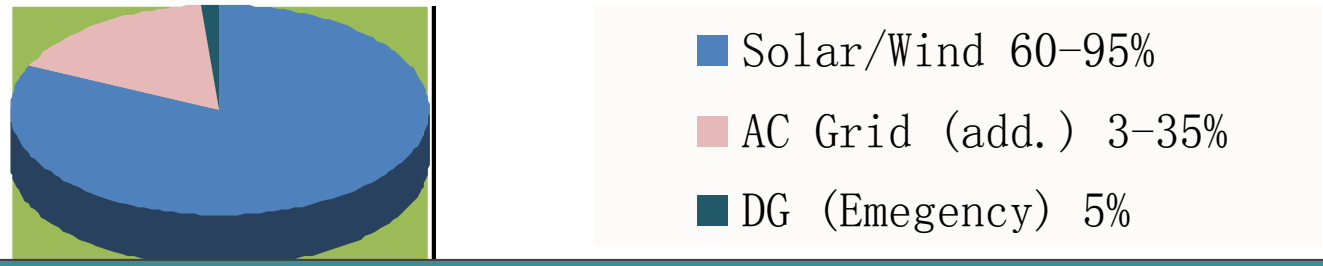
100A-1800A
Cabinet Solar/wind/AC/DC

100A-400A
Cabinet Solar/DG

100A-3000A
Cabinet Solar/AC

Power Consumption of Integrated Power System



Key Technology of Integrated Power System
II: MPPT, High system Efficiency, Precise Management

II. Solar PV & its Power control method

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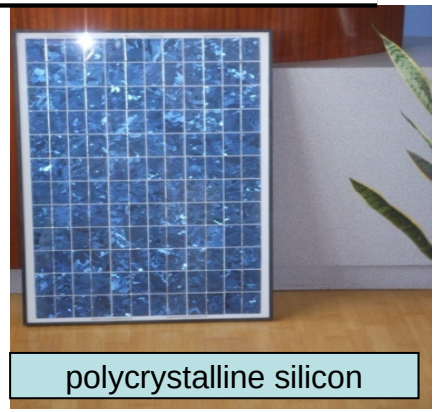
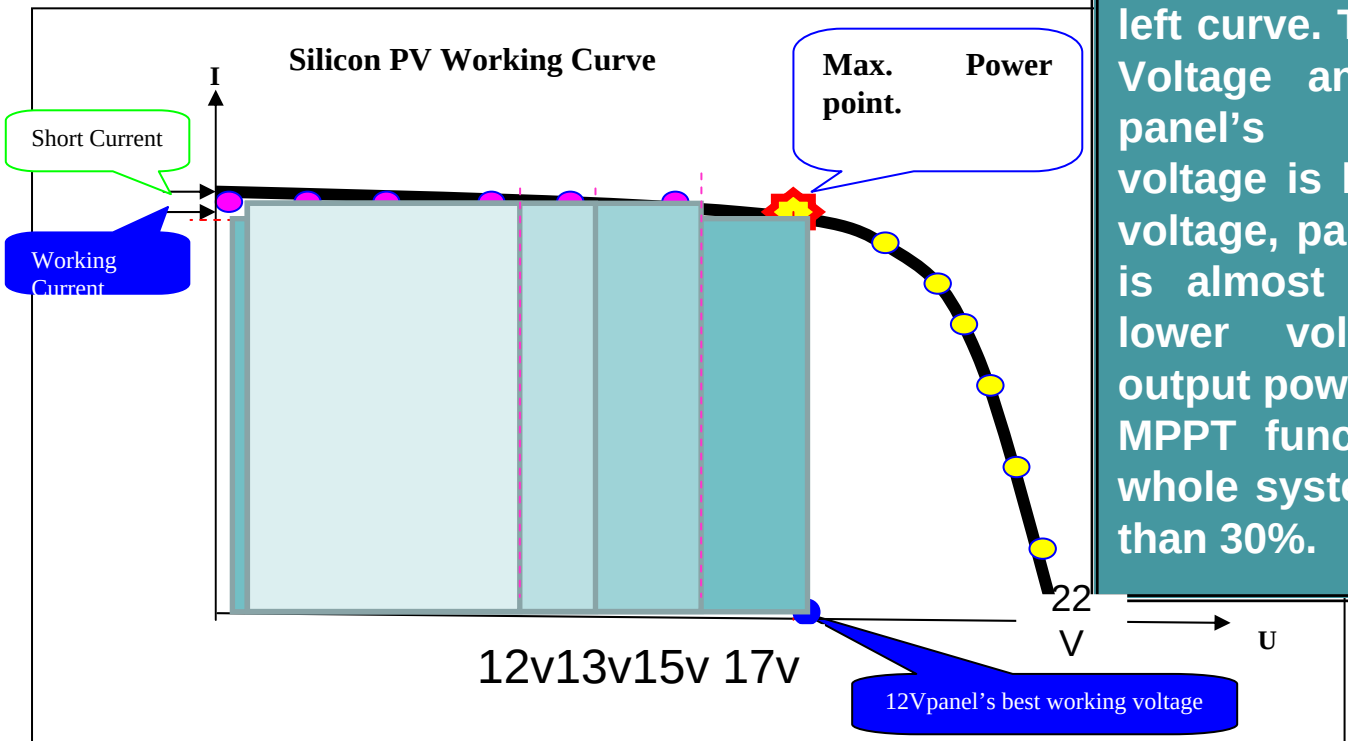
1. Features of Silicon PV

monocrystalline silicon



polycrystalline silicon

Photoelectricity conversion efficiency of these two panel can reach 17% for cell, 14% for Panel or above. Attenuation rate is less than 20% per 20 years.



Max. Power point locates in left curve. This Point has best Voltage and Current. When panel's actual working voltage is less than this best voltage, panel's output power is almost stable. Thus, the lower voltage, the lower output power during this area. MPPT function can increase whole system efficiency more than 30%.

Solar PV & its Power control method

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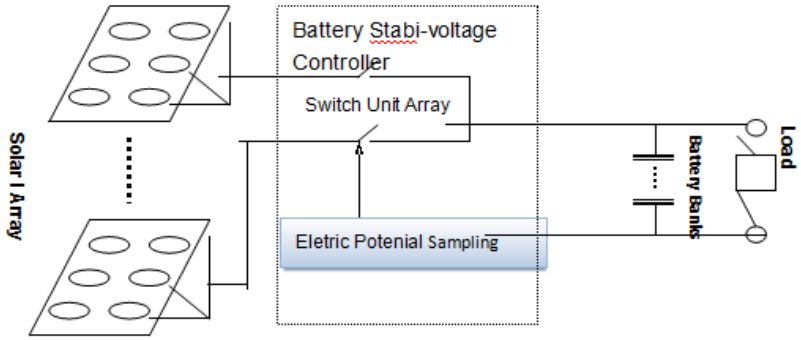
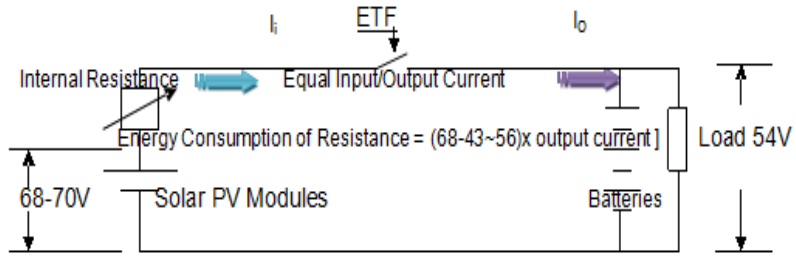
Controller is the core of the whole Solar/Hybrid Power system, and as per the theories and principles, there have two kinds of controllers:

1. Battery Stabi-Voltage Solar Charge Controller--PWM

2. MPPT DC-DC Stabi-voltage Solar Charge Controller

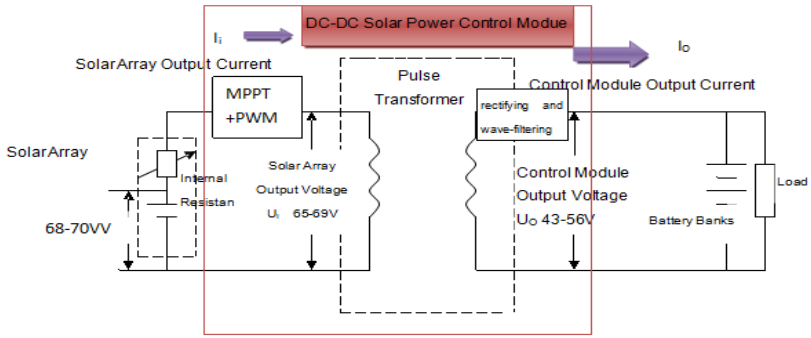


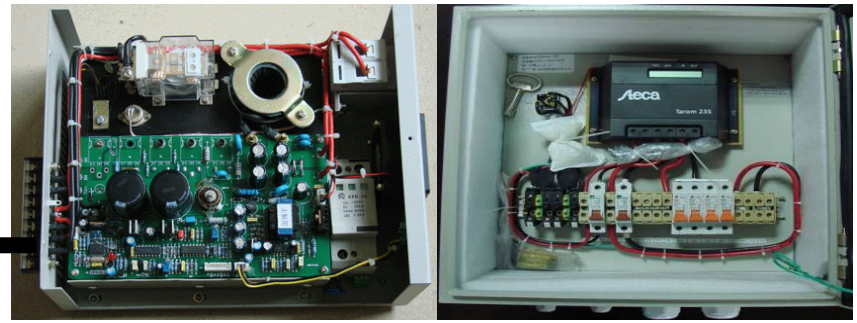


Equivalent Circuit Diagram of Battery Stabi-Voltage Controller

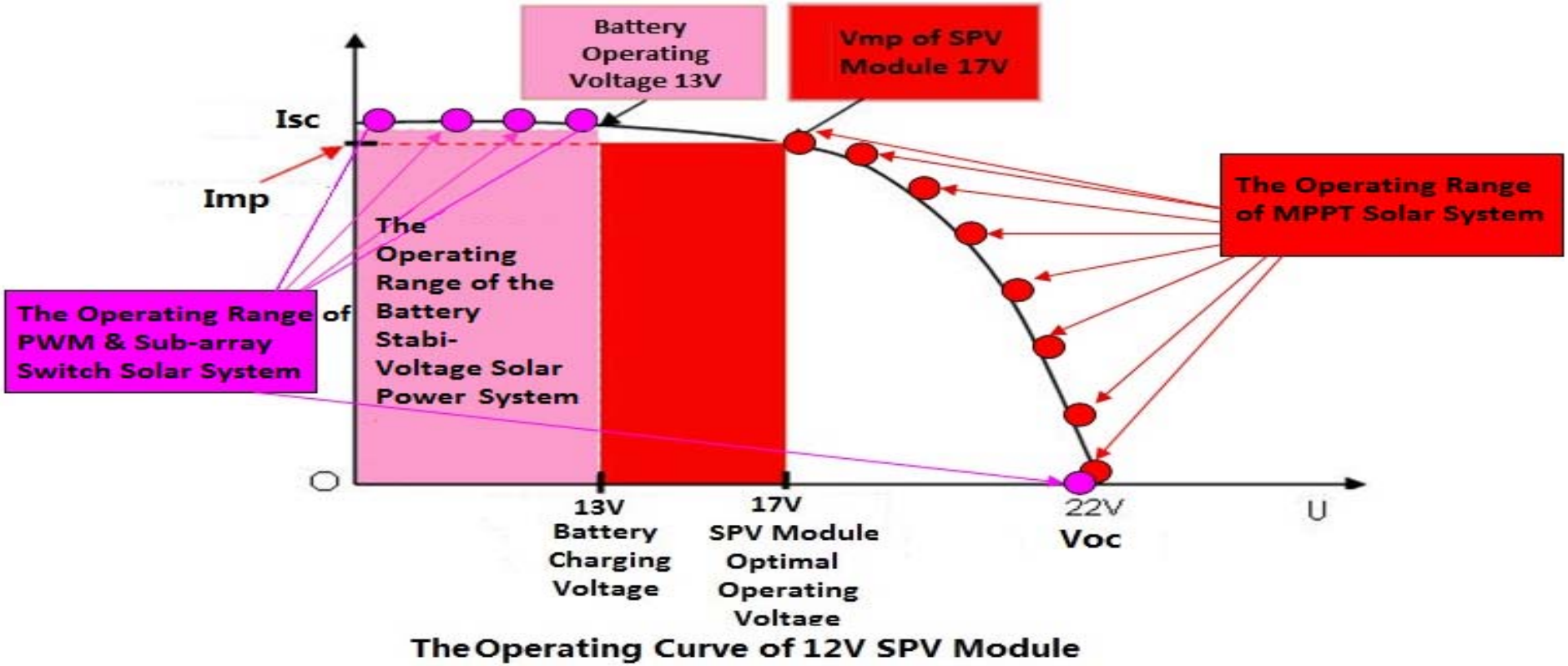
Io＞Ii

$I_o=I_i$





III. Comparison between two working curves



The Operating Curve of 12V SPV Module

In the diagram, the area pointed by the arrows is just the power output range of the solar power system on the curve of the SPV module, which is enclosed by the curve from 18V to 22V and the vertical and horizontal axis. When the battery banks lack the electricity, the solar controller will provide the maximal output power. As the battery's voltage gradually goes up, the solar power system will increase its output voltage and move closer to the Voc (22V) and lower its output power. The output of the SPV modules are linear until it gets close to the Voc; the solar controller will not disconnect the solar sub-arrays. Only when the battery is fully charged and the load is open-circuited, the solar controller can make the solar array's output voltage get to the Voc

IV. Tech. Improvement/Advantages of Xintong Integrated system

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System	Xintong Integrated system Features	Advantages
System Structure	**Modularization, Integration, Multi-backup** Central Control Module manages Solar/Wind/AC Grid/DG Module, all power sources connect system all the time, every input power sources are On-line-Standby. Modifying output power will NOT fulfilled via PWM.	Never Site-off because of equipment. Increase system reliability.
PV Array Connection	**Integrated connection** All Array connect in all the time without PWM, for smooth system using.	Using Solar power sufficient, Not using Battery privileged. Protect Battery/Extend Battery Duty life.
Input efficiency	**MPPT function, 30% more output power sufficiency** Loads is NOT bound with Battery. Can search MPP automatically	Charge Battery efficiently and safely .Increase system reliability. Protect Battery/Extend Battery Duty life.
Output efficiency	**Independent Voltage stabilization** Adjust and Set output Voltage/Current of system independently without Battery influence. System can power the load stably during the sunning day when battery disconnected.	System will NOT stop because of the accident of Battery. Easy to maintain the system in the day time without system stop. Increase system reliability and easy to maintain.
Battery Management	**Precise Battery Charge/Discharge Management** Smooth and continuing set/control output voltage. Manage Battery charging Voltage/Current according to Burk/Float charge requirement and Temperature compensation.	Assure Battery Performance/Increase Duty life.

Tech. Improvement/Advantages of Xintong Integrated system

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System	Xintong Integrated system Features	Advantages
Optional Power Sources	All Power sources connected in is mutual backup, Online standby, to use Solar power sufficiently. With intelligent option function. Solar has first priority, insufficient power will be fed by next priority power, to make sure Battery is used only when necessary.	Decrease Battery's DOD time/depth. Fulfill Energy Conservation and Emissions Reduction. Increase Battery Duty Life
Summary	1. Save Cost Basing on same performance, Decrease more than 10% PV panels, reduce site floor occupy and infrastructure, increase wind resistance performance. Over all, more than 10% investment will be saved. 2. Increase Performance Reliability. With Modularization multi-backup function, increase system reliability, assure Load working stabilization, simply maintenance. 3. Increase Battery Duty life more than 50%. Output more than 30% electricity power with the same PV panel. This part of power charge Battery rapidly and efficiently, reduce influence of Over discharge/insufficient charge. Assure Battery performance and duty life. 4. Reduce Maintenance/operating cost. According to customer report, Xintong system can reduce more than 75% failure ratio because of insufficient sunlight. **Xintong Power system has been expanded to Petroleum business as a Localization Major Product, adopted in the qualified Equipment Procurement list of China National Petroleum Company (CNPC).**	

V. Performance in Petroleum

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Used in remote Valve house, BTS, Pipe Cathode Protect, environmental monitoring,

Operation/living of Single-well site and so on.

Solar/Wind
Remote Living House

Pure Solar off-grid Power system

Solar/Wind/DC Hybrid System

Solar/AC/DC Hybrid System

Solar/Wind Hybrid System

Performance in Petroleum

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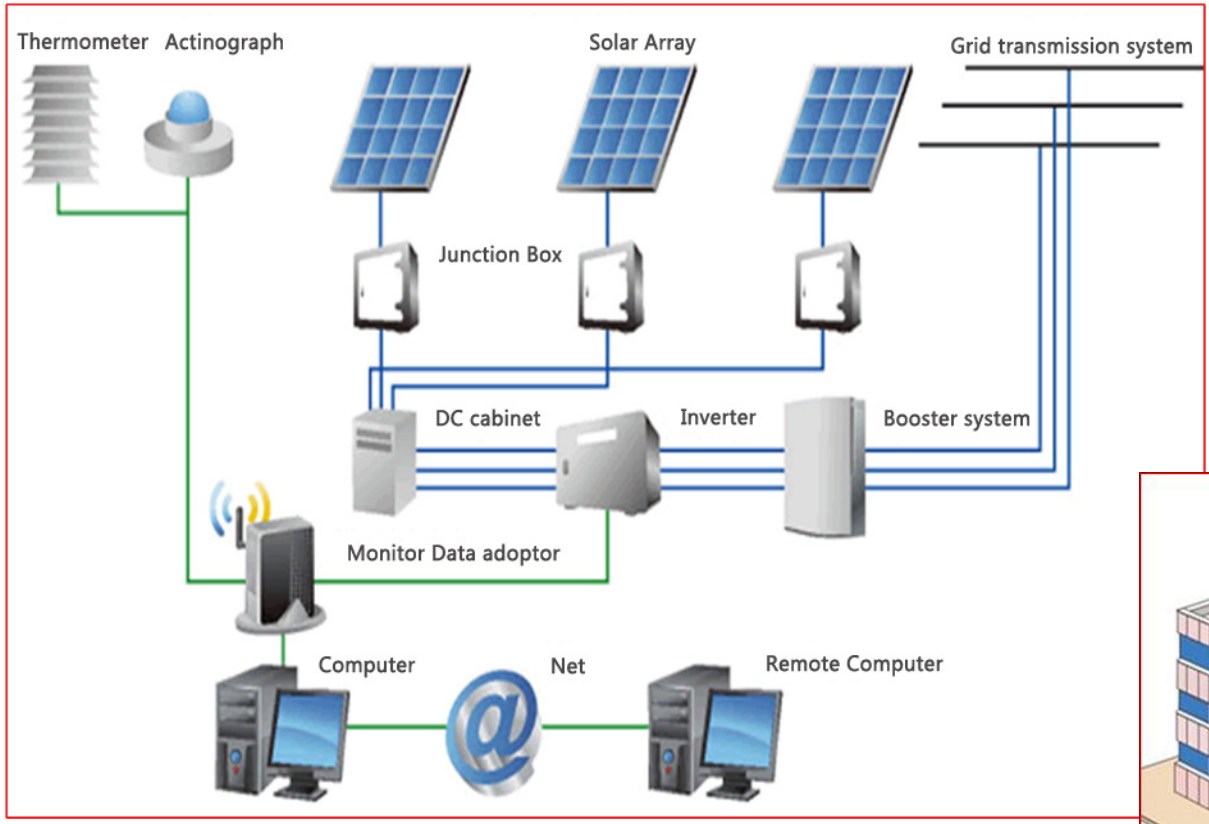
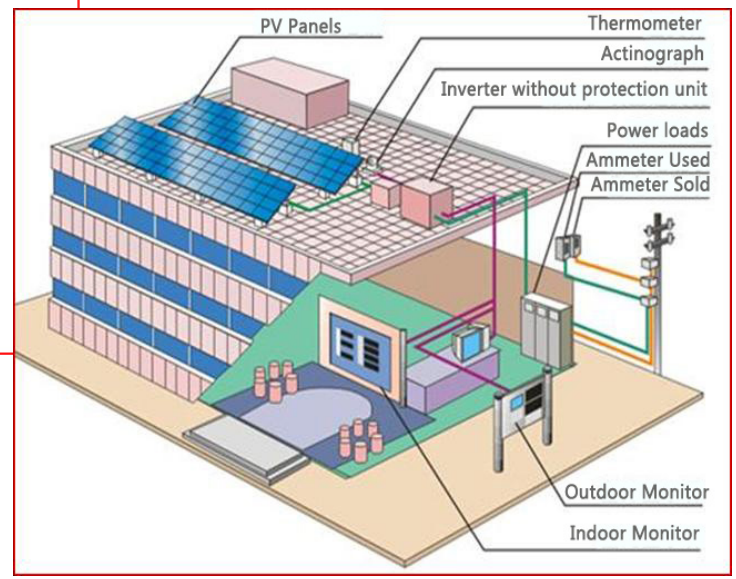
Illuminating for Office Building, Gas Station, Underground garage etc.
Fulfilling Energy Conservation and Emission Reduction



Shaanxi Xintong On-Grid Hybrid Power System



On Grid Achievements

VI. Brief of XinTong

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- Founded in 1997, about 15 Years of Experience in the Renewable Energy Industry
- Over 20,113 site solar power system which meet different condition as tropical climate, severe coldness and high humidity and high altitude. Such as Europe Union, Africa, Russia, India, Pakistan, Middle East etc.
- The sponsor and drafter of the Technical Standards of DC-DC Solar Power System for Communication Equipments in China
- The 1st Manufacturer Supplying DC-DC Solar Power Systems to Chinese Telecom Operators
- DC-DC Solar Power System Listed in 2009 National New Key Products Program
- The only MPPT Solar Power Controller Passed the Testing of Chinese Ministry of Industry and Information
- The first and only one with proprietary MPPT patent in China




Thanks!

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